NAVAIR 01-85SAD-1

NATOPS FLIGHT MANUAL

NAVY MODEL

S-2D, S-2E, S-2G, US-2D, ES-2D

AIRCRAFT

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THIS PUBLICATION IS INCOMPLETE WITHOUT SUPPLEMENTAL FLIGHT MANUAL NAVAIR 01-85SAD-1A

ISSUED BY AUTHORITY OF THE CHIEF OF NAVAL OPERATIONS AND UNDER THE DIRECTION OF THE COMMANDER, NAVAL AIR SYSTEMS COMMAND

1 May 1971

THE AIRCRAFT 1
INDOCTRINATION 2
NORMAL PROCEDURES 3
FLIGHT PROCEDURES 4
EMER PROCEDURES 5
ALL-WEX OPERATION 6
COMM PROCEDURES 7
WEAPON SYSTEMS 8
FLT CREW COORD 9
NATOPS EVAL 10
PERFORM DATA 11
INDEX 12

CHANGE NOTICE

THESE ARE SUPERSEDING OR SUPPLEMENTARY PAGES TO SAME PUBLICATION OF PREVIOUS DATE

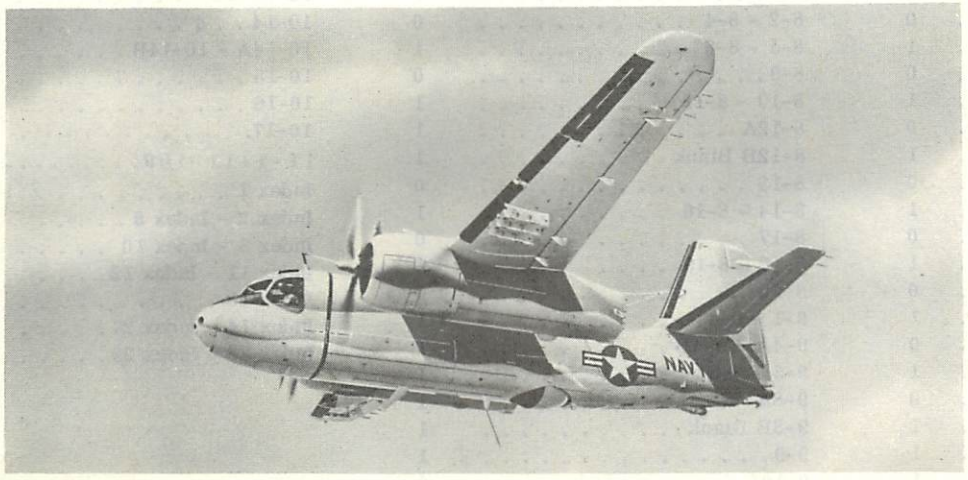
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INDEX 12

1 May 1971

Change 1 15 December 1971

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LIST OF EFFECTIVE PAGES

Insert latest changed pages; dispose of superseded pages in accordance with applicable regulations.

NOTE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line, or other change symbol, in the outer margin of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Total number of pages in this manual is 529 consisting of the following:

Page No.	# Change No.	Page No.	# Change No.	Page No.	# Change No.
Title	1	3-6	1	9-30B Blank	1
A	1	3-7 - 3-10	0	9-31	1
LOP	0	3-11	1	9-32 - 9-36	0
Flyleaf 1	0	3-12	0	9-37	1
Flyleaf 2	1	3-13 - 3-14	1	9-38	0
Flyleaf 3	0	3-15 - 3-55	0	9-38A	1
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2-7	0	9-30A	1		
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DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, D.C. 20350

LETTER OF PROMULGATION

1 MAY 1971

1. The Naval Air Training and Operating Procedures Standardization Program (NATOPS) is a positive approach towards improving combat readiness and achieving a substantial reduction in the aircraft accident rate. Standardization, based on professional knowledge and experience, provides the basis for development of an efficient and sound operational procedure. The standardization program is not planned to stifle individual initiative, but rather to aid the Commanding Officer in increasing his unit's combat potential without reducing his command prestige or responsibility.

2. This manual standardizes ground and flight procedures but does not include tactical doctrine. Compliance with the stipulated manual procedure is mandatory except as authorized herein. In order to remain effective, NATOPS must be dynamic and stimulate rather than suppress individual thinking. Since aviation is a continuing progressive profession, it is both desirable and necessary that new ideas and new techniques be expeditiously evaluated and incorporated if proven to be sound. To this end, Commanding Officers of aviation units are obligated and authorized to modify procedures contained herein, in accordance with the waiver provisions established by OPNAVINST 3510.9 series, for the purpose of assessing new ideas prior to initiating recommendations for permanent changes. This manual is prepared and kept current by the users in order to achieve maximum readiness and safety in the most efficient and economical manner. Should conflict exist between the training and operating procedures found in this manual and those found in other publications, this manual will govern.

3. Checklists and other pertinent extracts from this publication necessary to normal operations and training should be made and may be carried in Naval Aircraft for use therein. It is forbidden to make copies of this entire publication or major portions thereof without specific authority of the Chief of Naval Operations.

Thomas F. Connolly

THOMAS F. CONNOLLY
Vice Admiral, USN
Deputy Chief of Naval Operations (Air)

V76 22 MAY 73 1-120 AERO 65 AND MAU-38 SERIES BOMB RACK RESTRICTIONS

INTERIM CHANGE SUMMARY

THE FOLLOWING CHANGES HAVE BEEN CANCELED OR PREVIOUSLY INCORPORATED IN THIS MANUAL

CHANGE NUMBER(S)	REMARKS
1 thru 55	Previously incorporated or canceled

THE FOLLOWING CHANGES HAVE BEEN INCORPORATED IN THIS CHANGE/REVISION

CHANGE NUMBER	CHANGE DATE	PURPOSE
56	15 April 1969	Revise shore-based arresting gear data.
57	26 May 1969	Delete the SSQ-15 and MK 82 LDGP from internal/external stores chart
58	14 October 1969	Revised data in "Remarks" column for SUU-40/A and SUU-44A in internal/external stores chart.
59	8 April 1970	Revised Fire In Flight procedures
60	2 April 1971	Provide MK-40, 2.75 inch FFAR controlled rotation motor clearance on internal/external stores limitations.

INTERIM CHANGES OUTSTANDING - TO BE MAINTAINED BY CUSTODIAN OF THIS MANUAL

CHANGE NUMBER AND DATE	DATE CHANGE MADE	PAGES AFFECTED PURPOSE
61	1 JUN 71	AGM 12-B Bullpup "A" MK 53 1-127 MINOR STA. CHG.
62	11 AUG 71	chg. max allowable MAP AT 1-126 cruise 2000 RPM & BELOW
63	23 NOV 71	AND Bomb Bay SUS capability chg 1-127 1-128 internally external stores limitation
64	15 FEB 72	5-9 Prevent inadvertent prop feather
65	15 FEB 72	1-110 2-7 Parachute warning
66	22 MAY 73	1-124 3-20 Minimum oil pressure
67	22 MAY 73	1-126 11-3 Carburator Change
69	22 MAY 73	1-126 Removal of sway braces
70	22 MAY 73	5-14 Transformer Rectifier failure
71	22 MAY 73	1-80 Radio Communications
72	22 MAY 73	5-15 CSD Failure
75	22 MAY 73	1-125 CSD oil temp.

NATOPS/TACTICAL CHANGE RECOMMENDATION
OPNAV FORM 3500/22 (5-69) 0107-722-2002

DATE

TO BE FILLED IN BY ORIGINATOR AND FORWARDED TO MODEL MANAGER

FROM (originator)	Unit
TO (Model Manager)	Unit

Complete Name of Manual/Checklist	Revision Date	Change Date	Section/Chapter	Page	Paragraph

Recommendation (be specific)

☐ CHECK IF CONTINUED ON BACK

Justification

Signature	Rank	Title

Address of Unit or Command

TO BE FILLED IN BY MODEL MANAGER (Return to Originator)

FROM	DATE

TO

REFERENCE
(a) Your Change Recommendation Dated .....

☐ Your change recommendation dated ..... is acknowledged. It will be held for action of the review conference planned for ..... to be held at .....

☐ Your change recommendation is reclassified URGENT and forwarded for approval to .....
.....by my DTG .....

/S/ ..... MODEL MANAGER ..... AIRCRAFT

A-ODG-4

NATOPS/TACTICAL CHANGE RECOMMENDATION
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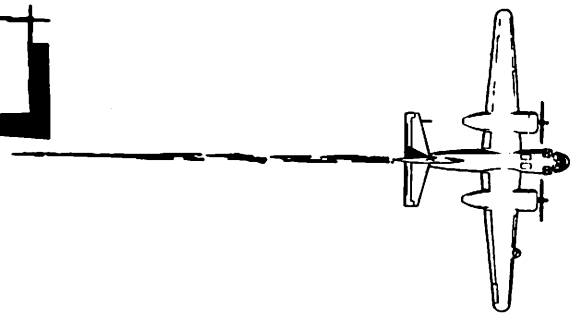
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/S/ ..... MODEL MANAGER ..... AIRCRAFT

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section VIII • WEAPONS SYSTEMS 8-1*

section IX • FLIGHT CREW COORDINATION 9-1*

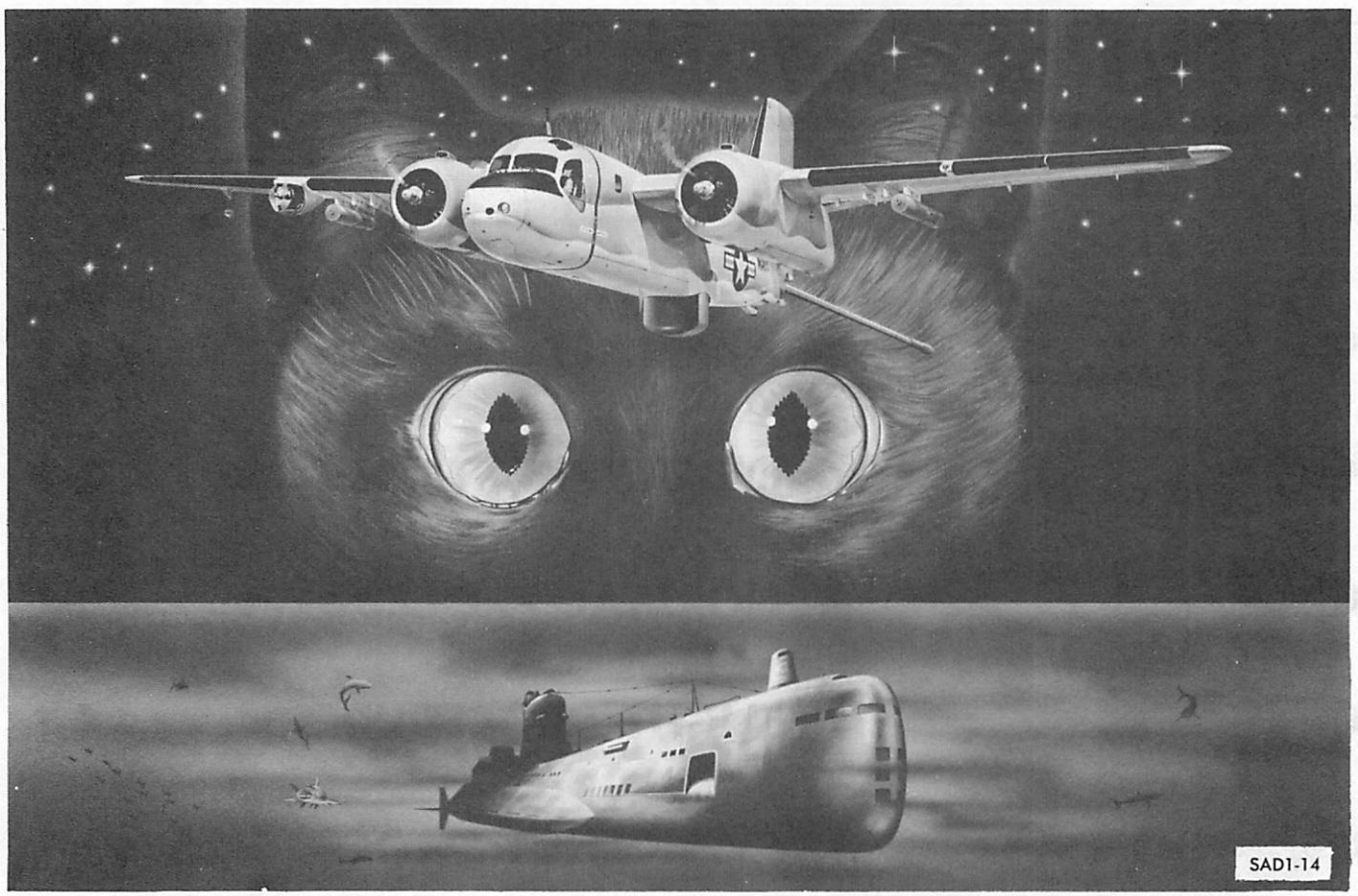
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* SEE SUPPLEMENTAL NATOPS FLIGHT MANUAL NAVAIR 01-85SAD-1A

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SCOPE

The NATOPS Flight Manual is issued by the authority of the Chief of Naval Operations and under the direction of Commander, Naval Air Systems Command in conjunction with the Naval Air Training and Operating Procedures Standardization (NATOPS) Program. This manual contains information on all aircraft systems, performance data, and operating procedures required for safe and effective operations. However, it is not a substitute for sound judgement. Compound emergencies, available facilities, adverse weather or terrain, or considerations affecting the lives and property of others may require modification of the procedures contained herein. Read this manual from cover to cover. It's your responsibility to have a complete knowledge of its contents.

APPLICABLE PUBLICATIONS

The following applicable publications complement this manual:

NAVAIR 01-85SAD-1A (Supplement)
NAVAIR 01-85SAD-1B (Pilot's Pocket Checklist)
NAVAIR 01-85SAD-1C (Operator's Pocket Checklist)
NAVAIR 01-85SAD-1D (Card Checklist)
NAVAIR 01-85SAD-1-6 (Functional Check Flight Checklist)

HOW TO GET COPIES

AUTOMATIC DISTRIBUTION

To receive future changes and revisions to this manual automatically, a unit must be established on the automatic distribution list maintained by the Naval Air Technical Services Facility (NATSF). To become established on the list or to change distribution requirements, a unit must submit NAVWEPS Form 5605/2 to NATSF, 700 Robbins Ave., Philadelphia, Pa. 19111, listing this manual and all other NAVAIR publications required. For additional instructions refer to BUWEPSINST 5605.4 series and NAVSUP Publication 2002.

ADDITIONAL COPIES

Additional copies of this manual and changes thereto may be procured by submitting Form DD 1348 to NPFC Philadelphia in accordance with NAVSUP Publication 2002, Section VIII, Part C.

UPDATING THE MANUAL

To ensure that the manual contains the latest procedures and information, NATOPS review conferences are held in accordance with OPNAVINST 3510.11 series.

CHANGE RECOMMENDATIONS

Recommended changes to this manual or other NATOPS publications may be submitted by anyone in accordance with OPNAVINST 3510.9 series.

Routine change recommendations are submitted directly to the Model Manager on OPNAV Form 3500-22 shown on the next page. The address of the Model Manager of this aircraft is:

NATOPS Model Manager
AIRASRON 30
N. A. S. Quonset Pt., Rhode Island 02819

Change recommendations of an URGENT nature (safety of flight, etc.,) should be submitted directly to the NATOPS Advisory Group Member in the chain of command by priority message.

YOUR RESPONSIBILITY

NATOPS Flight Manuals are kept current through an active manual change program. Any corrections, additions, or constructive suggestions for improvement of its content should be submitted by routine or urgent change recommendation, as appropriate, at once.

NATOPS FLIGHT MANUAL INTERIM CHANGES

Flight Manual Interim Changes are changes or corrections to the NATOPS Flight Manuals promulgated by CNO or NAVAIRSYSCOM. Interim Changes are issued either as printed pages, or as a naval message. The Interim Change Summary page is provided as a record of all interim changes. Upon receipt of a change or revision, the custodian of the manual should check the updated Interim Change Summary to ascertain that all outstanding interim changes have been either incorporated or canceled; those not incorporated shall be recorded as outstanding in the section provided.

CHANGE SYMBOLS

Revised text is indicated by a black vertical line in either margin of the page, adjacent to the affected text, like the one printed next to this paragraph. The change symbol identifies the addition of either new information, a changed procedure, the correction of an error, or a rephrasing of the previous material.

WARNINGS, CAUTIONS, AND NOTES

The following definitions apply to "WARNINGS", "CAUTIONS", and "NOTES" found through the manual.

WARNING

An operating procedure, practice, or condition, etc., which may result in injury or death, if not carefully observed or followed.

CAUTION

An operating procedure, practice, or condition, etc., which, if not strictly observed, may damage equipment.

Note

An operating procedure, practice, or condition, etc., which is essential to emphasize.

WORDING

The concept of word usage and intended meaning which has been adhered to in preparing this Manual is as follows:

"Shall" has been used only when application of a procedure is mandatory.

"Should" has been used only when application of a procedure is recommended.

"May" and "need not" have been used only when application of a procedure is optional.

"Will" has been used only to indicate futurity, never to indicate any degree of requirement for application of a procedure.

section I

AIRCRAFT

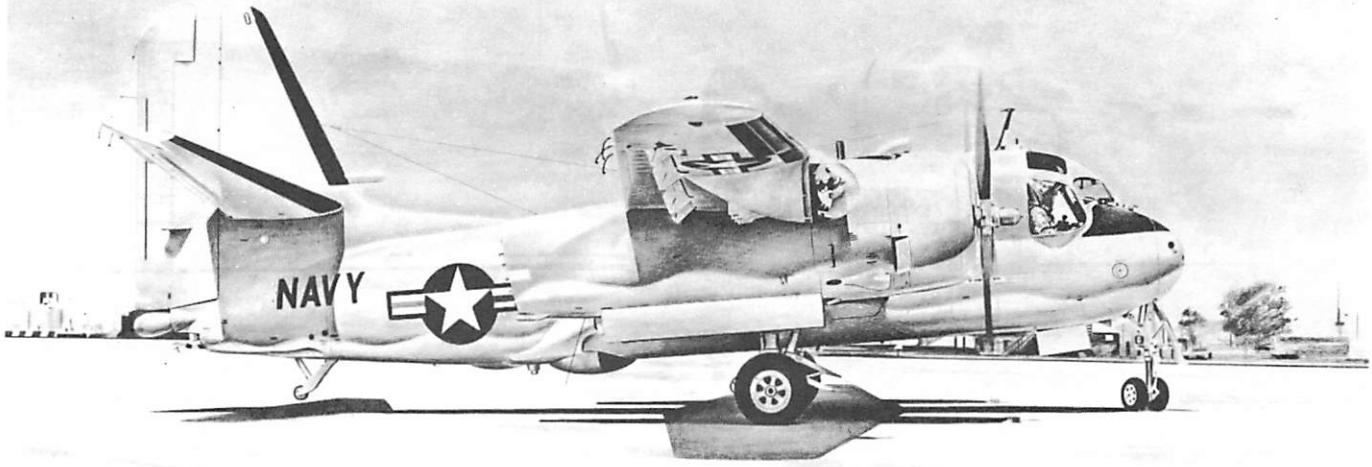


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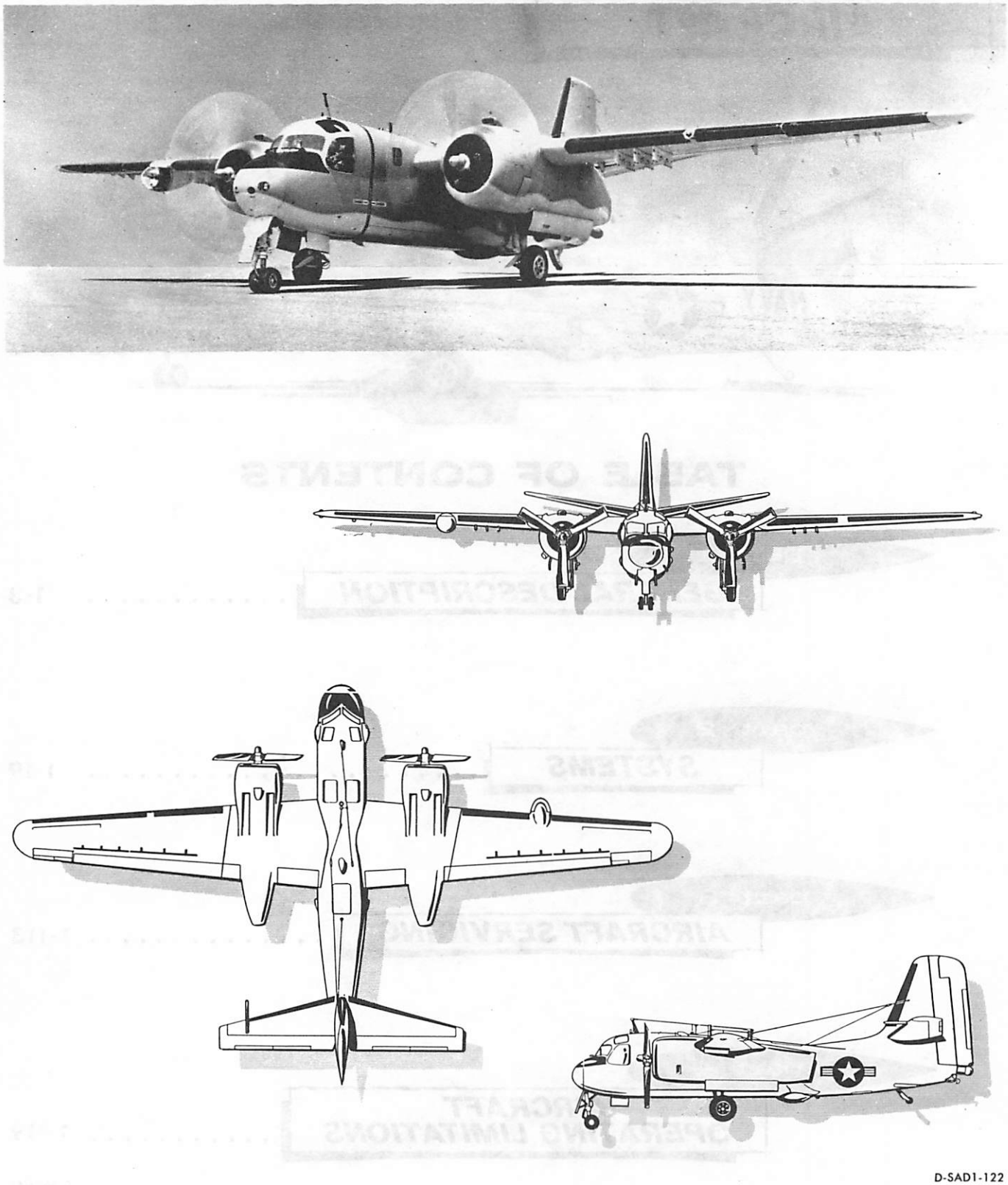
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S-2D/E/G, US-2D, ES-2D



D-SAD1-122

Figure 1-1

SUMMARY OF APPLICABLE TECHNICAL DIRECTIVES

AFC NUMBER	CLASS	TITLE	INCORPORATED	INCORPORATED THIS ISSUE ON PAGES INDICATED
				E-SADI-193-1
403	U	Improves Lighting Circuit Protection	1 June 1966	
409	U	Installation of AN/APQ-107 Radar Altimeter Warning Set.	1 June 1966	
410	U	Installation of Rescue Arrows to Operators' Portholes	1 June 1966	
412	R	Propeller Feather Light Change.	1 June 1966	
416	U	Removal of Barrier Hook (Fosdick).	1 June 1966	
420	R	Installation of Doppler Navigation Set AN/APN-153(V) in Lieu of AN/APN-122.	1 June 1966	
421		Installation of AN/APN-141(V) Altimeter.	1 June 1966	
423	U	AN/ALD-2 Direction Finder.	1 June 1966	
428		Installation of AN/AJA-8 Vertical Reference System	15 MAY 1967	
436	U	Increases MK 46 MOD 0 Torpedo Carrying Capability.	1 June 1966	
437	R	Modification of Armament Control Panel.	1 June 1966	
440	U	Installation of 31 channel AN/ARR-52A(V).		
446	U	Modification of Fuel Dump Switch	1 June 1966	
448	U	Incorporation of Scavenger Oil Strainer	1 June 1966	
417/449	U	Installation of Multi-Channel Jezebel Relay.		
453	U	Installation of AN/ARC-94 HF.	15 MAY 1967	
458	R	Changed Power Source of the AN/ARN-59 LF/ADF	1 June 1966	
463	R	Relocation of Life Raft Release Handle.	15 MAY 1967	
464	R	Heater switch, procedure, add.	15 March 1969	
469	R	D.C. Elec. Power #3 TR	27 January 1967	

Figure 1-1A (Sheet 1)

SUMMARY OF APPLICABLE TECHNICAL DIRECTIVES Cont d.

AFC NUMBER	CLASS	TITLE	INCORPORATED	INCORPORATED THIS ISSUE ON PAGES INDICATED
				E-SADI-193-2
482	R	Emerg. Access to Nose Gear	1 April 1969	
484	U	Incorp. of Multichannel Jezebel Relay, Improved	1 March 1969	
490	R	Installation of KY-28 Secure Voice Capability	15 May 1971	
491	R	Installation of Bullpup Missile Guidance System	15 May 1971	
499	R	Modification of Attitude Gyro Alarm	15 May 1971	
500	R	Installation of AN/APX-72 DOD AIMS IFF System	15 May 1971	
496	R	Avionics-Incorporation of DIFAR System, S-2G Aircraft.	1 December 1971	1-19, 2-6, 3-11, 3-14, 8-19, 9-2, 9-3, 9-5A, 9-5B, 9-6, 9-9, 9-11, 9-23, 9-37, 9-48, 10-3, 10-4, 10-14A
515	R	Avionics-Incorporation of AN/ARR-75 Sonobuoy Receiver System, S-2G Aircraft.	1 December 1971	1-80, 1-99, 3-11
516	R	Armament-Installation of MK-44/46 Torpedo Presetter, S-2E/G Aircraft.	1 December 1971	1-5, 1-72, 3-13, 4-23, 4-24, 8-5, 8-11, 8-11A, 8-15
517	R	Avionics-Installation of AN/AQH-5(V) Tape Recorder System, S-2E/G Aircraft.	1 December 1971	1-71, 1-73, 1-79, 1-80, 1-99, 1-100, 1-100A, 3-6, 3-11, 9-2, 9-13, 9-23, 9-29, 9-30, 9-31, 9-37, 9-40, 9-41, 9-41A, 9-41B, 9-41C

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part 1
GENERAL DESCRIPTION

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WARNING

Authorization and applicable limitations for carriage and/or release of any external or internal stores may be found only in Figures 1-75 in Section I, Part 4 of this manual.

AIRCRAFT

NEW The S-2D/E/G, US/ES-2D Tracker aircraft (Figure 1-1) are four-place, twin-engine, high-wing monoplanes manufactured by the Grumman Aerospace Corporation, Bethpage, Long Island, New York. The aircraft are designed for use in anti-submarine warfare, and are capable of operating from an aircraft carrier deck or land bases, with or without the aid of a catapult. The functions of the aircraft are to search for, detect, track, localize, and destroy a submarine, under all weather flight conditions.

The basic difference between the S-2's is in the equipment they use to perform their functions. Refer to Main Differences Table in this section, for a detailed listing of the equipment involved.

Note

All references to the S-2E, in text or figures, shall apply to the S-2G until otherwise noted.

Hydraulically operated equipment includes the landing gear, wing flaps, wing-fold system, radome, rudder trimmer, torpedo bay doors, arresting hook lift system, wheel brakes, SUS (Signals, Underwater Sound) NEW dispenser (S-2D/E only), marine markers dispenser, and windshield wipers. The cowl flaps, alternate air doors, oil cooler doors, propeller deicing, and MAD boom are electrically operated. Pneumatic boot-type wing and empennage deicing equipment is installed, with the inflation timing rate electrically controlled. Electrically heated anti-icing systems are provided for windshields, pitot heads, stall warning lift transducer vane, and propellers. Torquemeter oil line heating is provided by thermostatically controlled electrical elements. Heating and ventilation are provided for the new crew compartments and for anti-fogging of the pilot's and co-pilot's side windows. An Automatic Flight Control System is also installed.

ENGINE

The aircraft is powered by two Wright R1820-82A nine-cylinder reciprocating engines, each equipped with a Hamilton Standard three-bladed, full-feathering propeller, and a torquemeter nose section. Each engine is the nucleus of a complete power package or quick engine change unit, which consists of a propeller, the engine with all accessories, the engine mount and cowling, and the complete oil, air, induction, and exhaust systems. The necessary instruments, controls, wiring, tubing, and connectors are included. The complete engine units are interchangeable and only minor differences such as routing of hoses and lines exist between the left and right installations.

AIRCRAFT DIMENSIONS

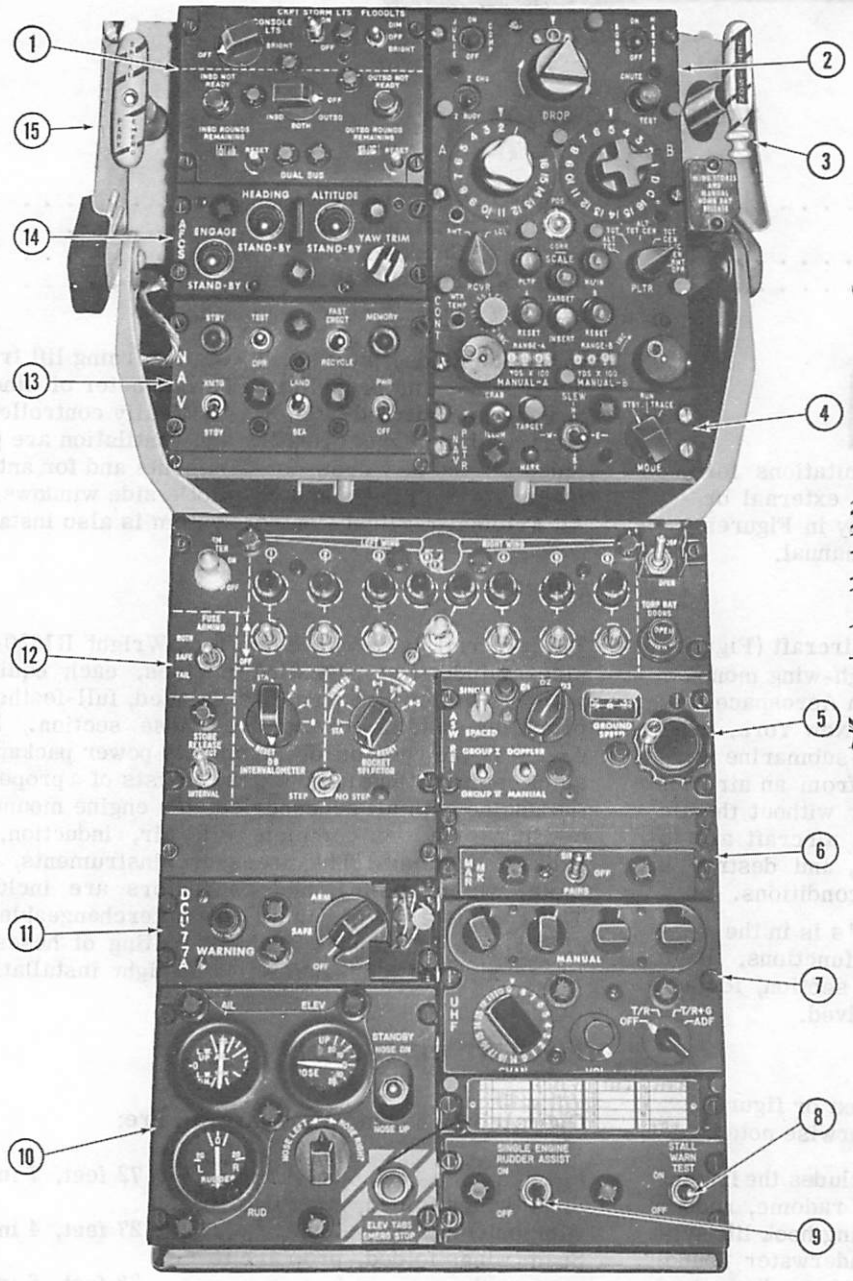
Overall dimensions of the aircraft are:

Span	72 feet, 7 inches
Span (wings folded, wing butt to wing butt)	27 feet, 4 inches
Span (wings folded, prop arc to prop arc)	28 feet, 6 inches
Span (horizontal stabilizer)	26 feet, 9.6 inches
Length	43 feet, 6 inches
Height of top of tail (three point attitude)	16 feet, 7.5 inches
Height (maximum during folding operation)	33 feet, 1 inch

PILOT'S FOLDING AND DIAGONAL CONSOLE

TYPICAL

S-2D

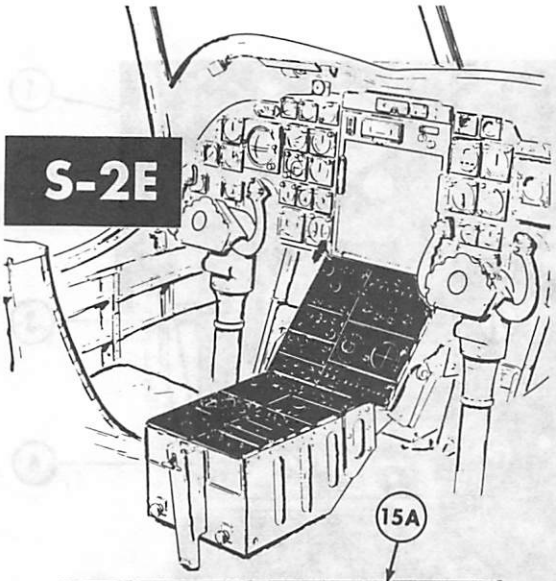


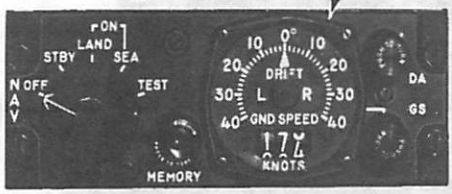


1. CONSOLE LIGHTS AND SUS DISPENSER CONTROL PANELS.
2. ELECTRONIC COMMAND SIGNALS PROGRAMMER ASA-31.
3. JETTISON HANDLE
4. PLOTTING BOARD CONTROL ASA-13.
5. SONOBUOY INTERVALOMETER.
6. MARINE MARKER LOCAL CONTROL PANEL.
7. UHF CONTROL ARC-52.
8. STALL WARNING TEST SWITCH
9. SINGLE ENGINE RUDDER ASSIST SWITCH.
10. TRIM TABS CONTROL PANEL.
11. DCU-77/A CONTROL PANEL (AERO 6A).
12. ARMAMENT CONTROL PANEL.
13. DOPPLER CONTROL—PANEL APN-122.
14. AFCS CONTROL PANEL.
15. PARKING AND EMERGENCY BRAKE HANDLE.

B-SAD1-119-1

Figure 1-2 (Sheet 1)

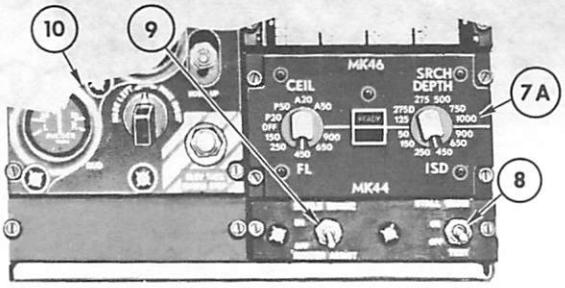




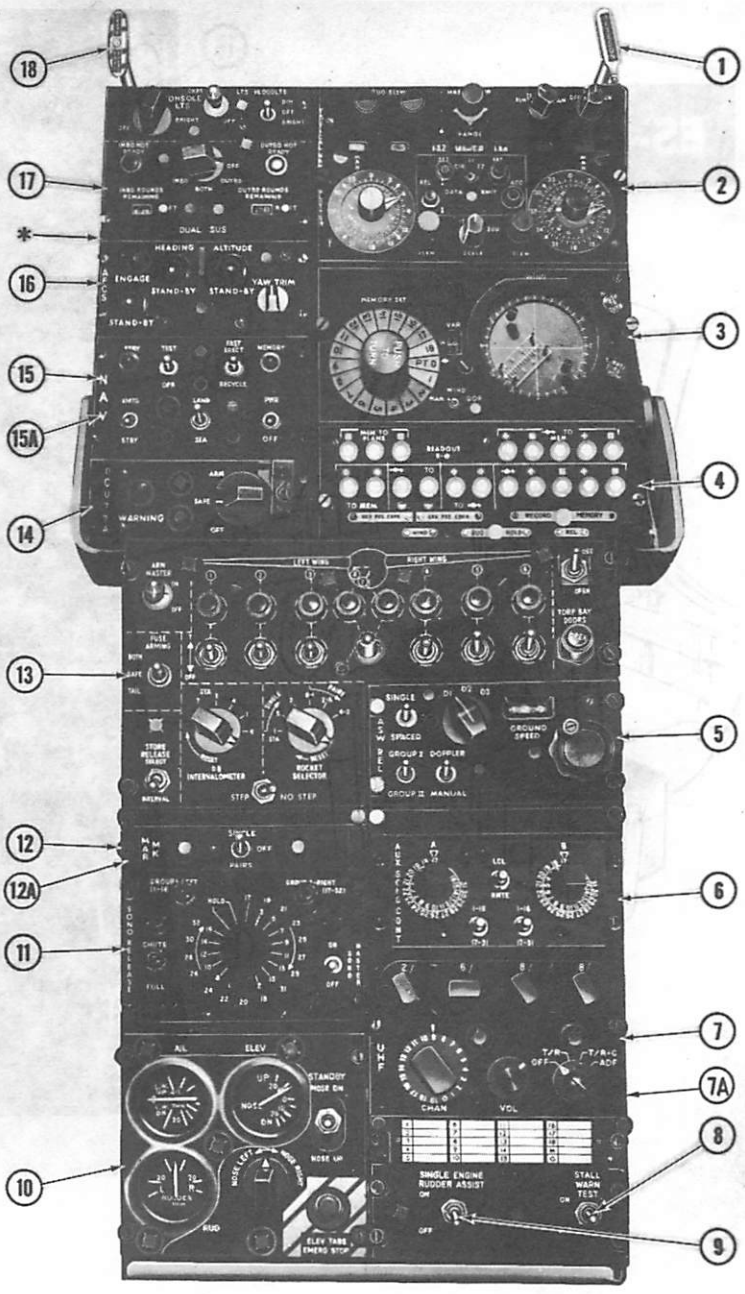
Bu No. 151638 and Subsequent and Bu No. 149275 thru 150603 incorporating AFC No. 420



AIRCRAFT INCORPORATING AFC NO. 490



Applicable to S-2E Aircraft incorporating AFC No. 516



1. JETTISON HANDLE
2. CONTROL—INDICATOR ASN-30, STROBE CHASSIS
3. CONTROL—INDICATOR ASN-30, WIND AND MEMORY CHASSIS.
4. CONTROL—INDICATOR ASN-30, PUSHBAR CHASSIS
5. SONOBUOY INTERVELOMETER
6. AUXILIARY SONO CONTROL
7. UHF CONTROL ARC-52

7A. TORPEDO DEPTH CONTROL PANEL

8. STALL WARNING TEST SWITCH
9. SINGLE ENGINE RUDDER ASSIST SWITCH
10. TRIM TABS CONTROL PANEL
11. SONO RELEASE PANEL

*12. MARINE MARKER LOCAL CONTROL PANEL

12A. SECURITY EQUIPMENT TSEC (KY-28)

13. ARMAMENT CONTROL PANEL
14. DCU-77/A CONTROL PANEL (AERO 6A)
15. DOPPLER CONTROL—PANEL APN-122

15A. DOPPLER CONTROL—INDICATOR APN-153(v)

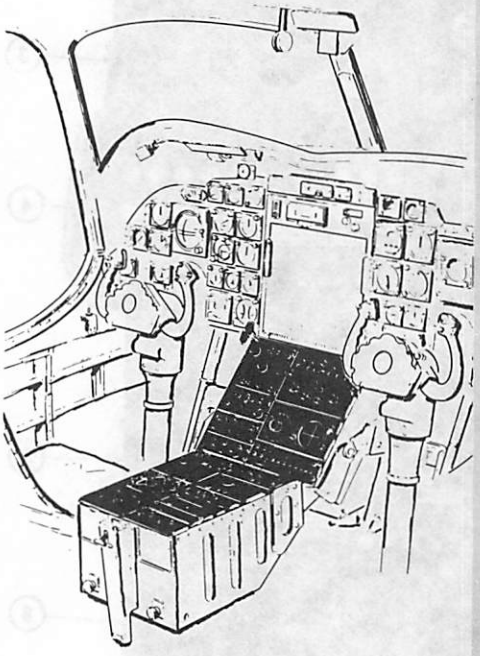
16. AFCS CONTROL PANEL
17. CONSOLE LIGHTS AND SUS CONTROL PANELS
18. PARKING AND EMERGENCY BRAKE HANDLE

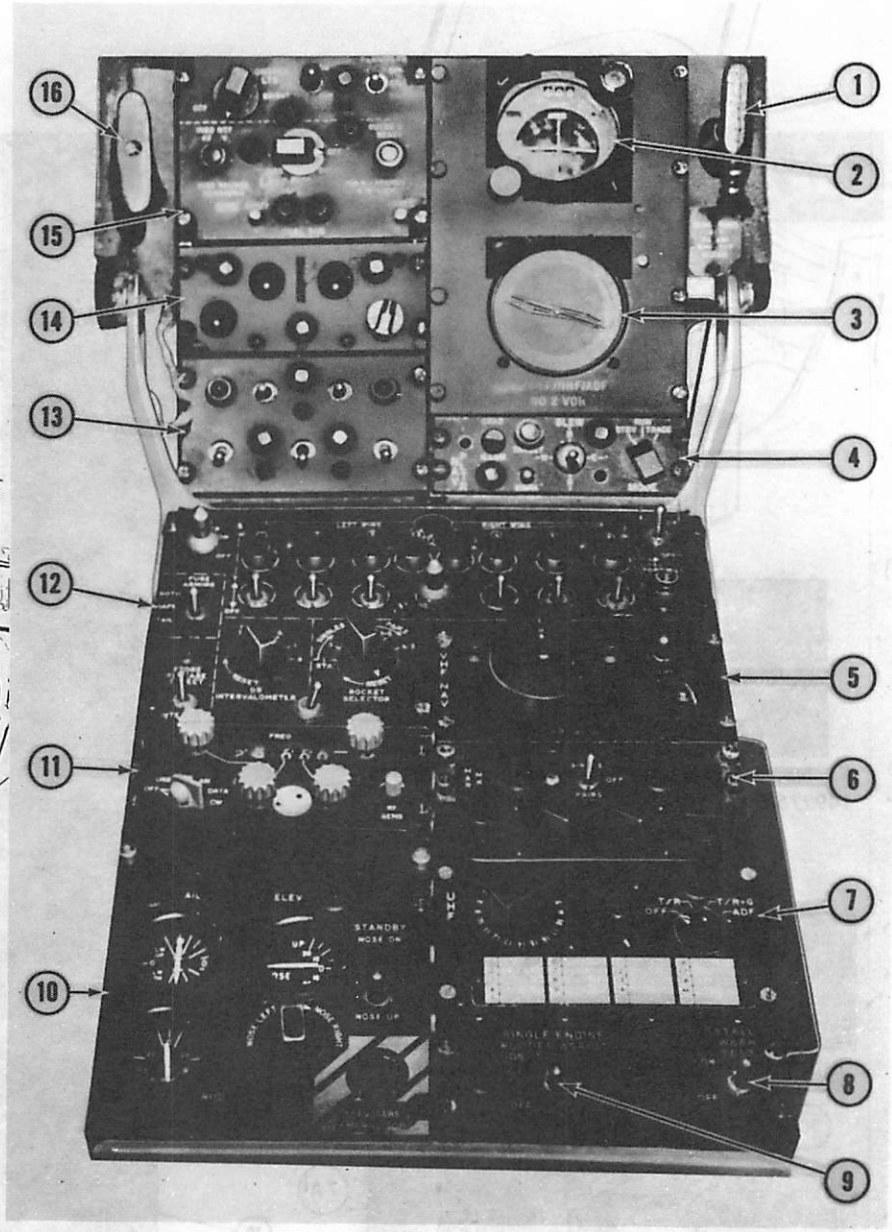
*AIRCRAFT INCORPORATING AFC NO. 490, ITEM 12 RELOCATED HERE

D-SAD1-119-2

Figure 1-2 (Sheet 2)

ES-2D



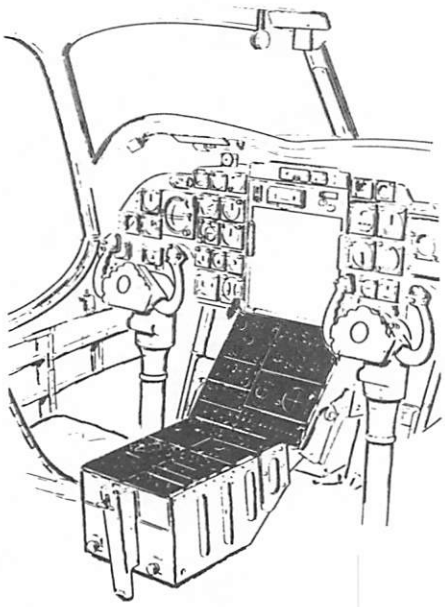


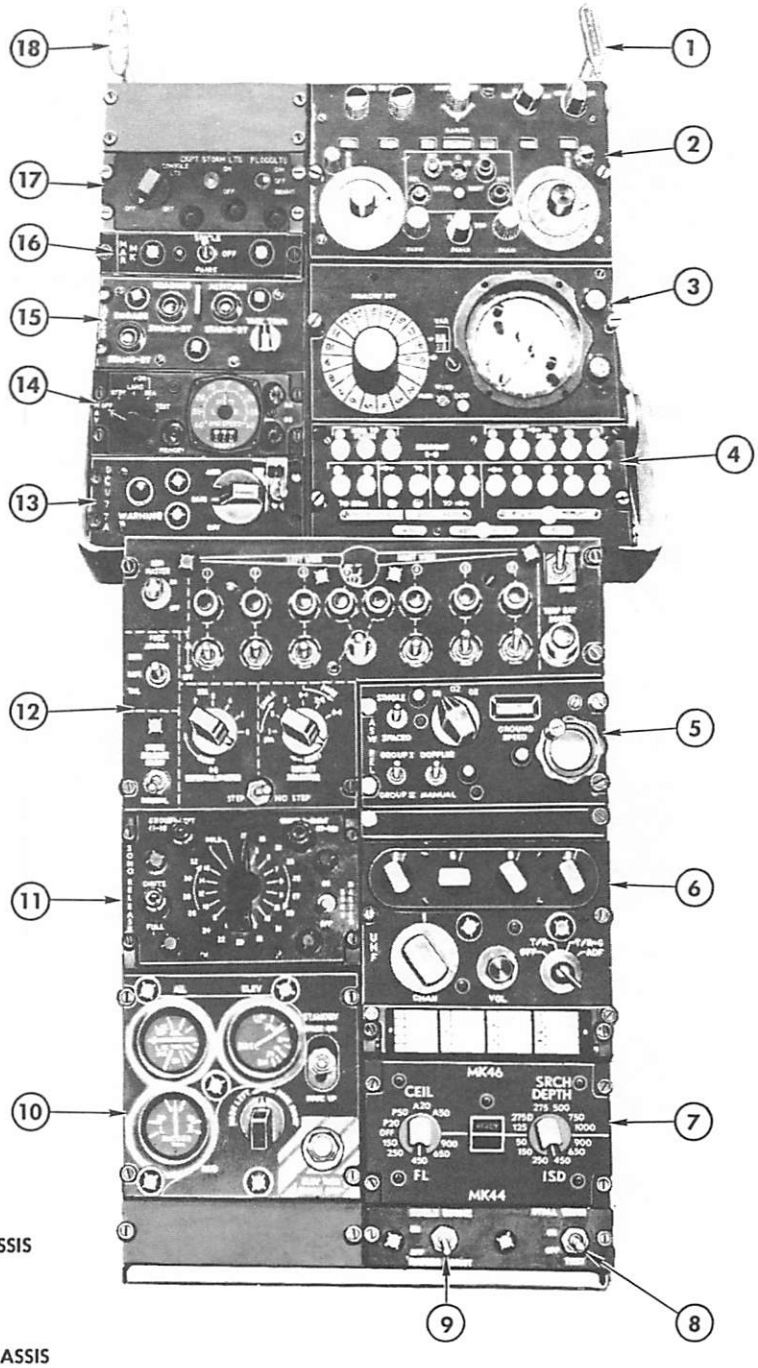
1. JETTISON HANDLE
2. No. 2 VOR CROSS POINTER COURSE INDICATOR
3. No. 1 LF/UHF/ADF BEARING INDICATOR
4. PLOTTING BOARD CONTROL ASA-13
5. VHF NAV CONTROL PANEL
6. MARINE MARKER LOCAL CONTROL PANEL
7. UHF CONTROL ARC-52
8. STALL WARNING TEST SWITCH
9. SINGLE ENGINE RUDDER ASSIST SWITCH
10. TRIM TABS CONTROL PANEL
11. HF RADIO SET CONTROL PANEL
12. ARMAMENT CONTROL PANEL
13. DOPPLER CONTROL PANEL APN-122
14. AFCS CONTROL PANEL
15. CONSOLE LIGHTS AND SUS CONTROL PANEL
16. PARKING AND EMERGENCY BRAKE HANDLE

SAD1-119-3

Figure 1-2 (Sheet 3)

S-2G





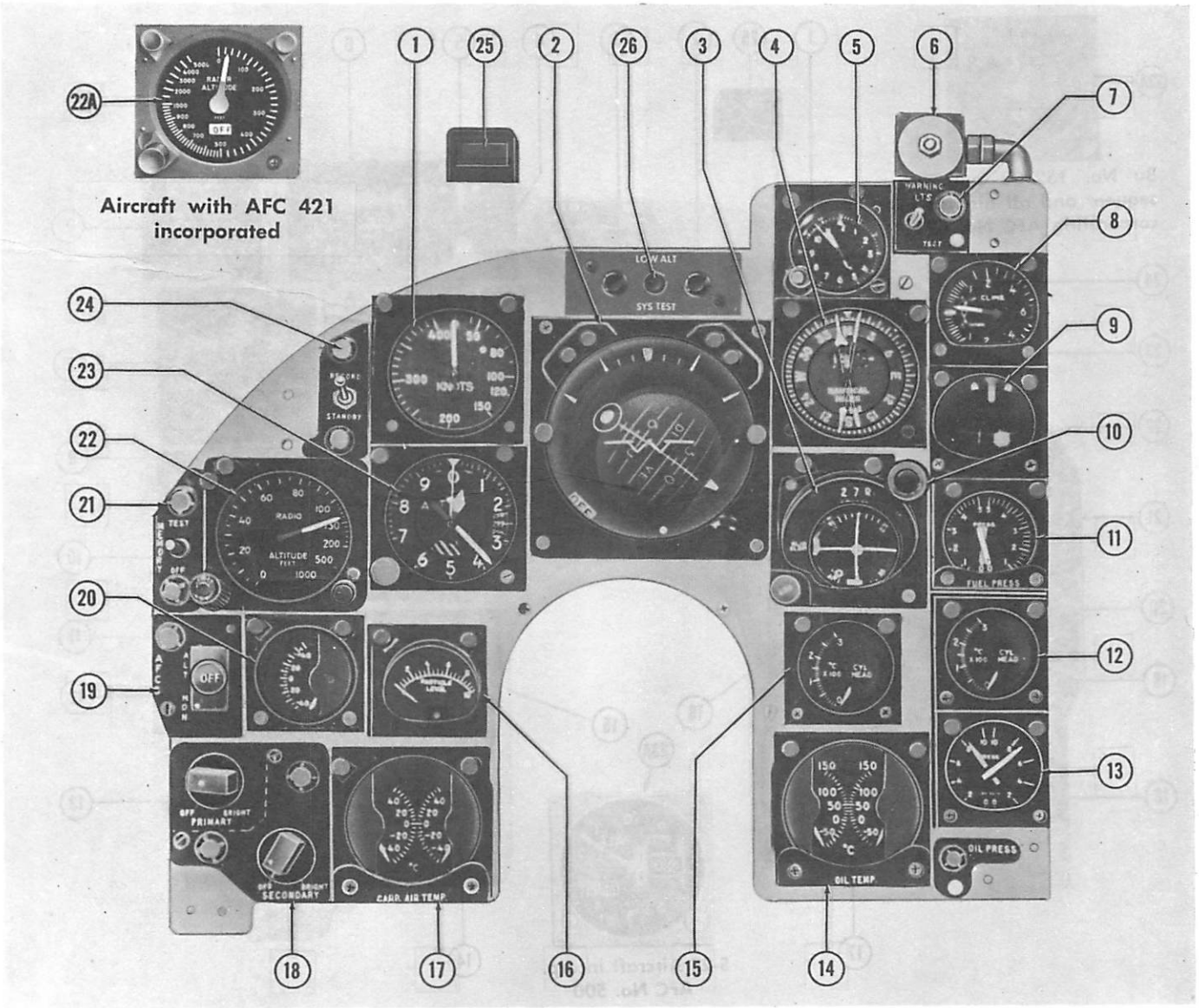
1. JETTISON HANDLE
2. CONTROL-INDICATOR ASN–30, STROBE CHASSIS
3. CONTROL-INDICATOR ASN–30, WIND AND MEMORY CHASSIS
4. CONTROL-INDICATOR ASN–30, PUSHBAR CHASSIS
5. SONOBUOY INTERVALOMETER
6. UHF CONTROL ARC–52
7. TORPEDO DEPTH CONTROL PANEL
8. STALL WARNING TEST SWITCH
9. SINGLE ENGINE RUDDER ASSIST SWITCH
10. TRIM TABS CONTROL PANEL
11. SONO RELEASE PANEL
12. ARMAMENT CONTROL PANEL
13. DCU–77/A CONTROL PANEL (AERO 6A)
14. DOPPLER CONTROL-INDICATOR APN–153(V)
15. AFCS CONTROL PANEL
16. MARINE MARKER LOCAL CONTROL PANEL
17. CONSOLE LIGHTS CONTROL PANEL
18. PARKING AND EMERGENCY BRAKE HANDLE

SADIMAR–1

Figure 1-2 (Sheet 4)

PILOT'S INSTRUMENT PANEL

S-2D TYPICAL



1. AIRSPEED INDICATOR
2. PILOT'S ATTITUDE INDICATOR (VGI)
3. CROSS-POINTER COURSE INDICATOR
4. BEARING-DISTANCE-HEADING INDICATOR
5. ELAPSED TIME CLOCK
6. WINDSHIELD WIPER CONTROL
7. WARNING LIGHTS TEST SWITCH
8. VERTICAL SPEED INDICATOR
9. TURN AND SLIP INDICATOR
10. MARKER BEACON INDICATOR LIGHT
11. FUEL PRESSURE INDICATOR (DUAL)
12. RIGHT ENGINE CYLINDER HEAD TEMPERATURE INDICATOR
13. OIL PRESSURE INDICATOR (DUAL)
14. OIL TEMPERATURE INDICATOR (DUAL)
15. LEFT ENGINE CYLINDER HEAD TEMPERATURE INDICATOR
16. PARTICLE LEVEL INDICATOR
17. CARBURETOR AIR TEMPERATURE INDICATOR (DUAL)
18. PILOT'S PRIMARY AND SECONDARY LIGHT CONTROL SWITCHES
19. ALTITUDE MONITOR INDICATOR (AFCS)
20. OUTSIDE AIR TEMPERATURE INDICATOR
21. DOPPLER RADAR MEMORY TEST SWITCH (APN-122)
22. RADAR ALTIMETER APN-117

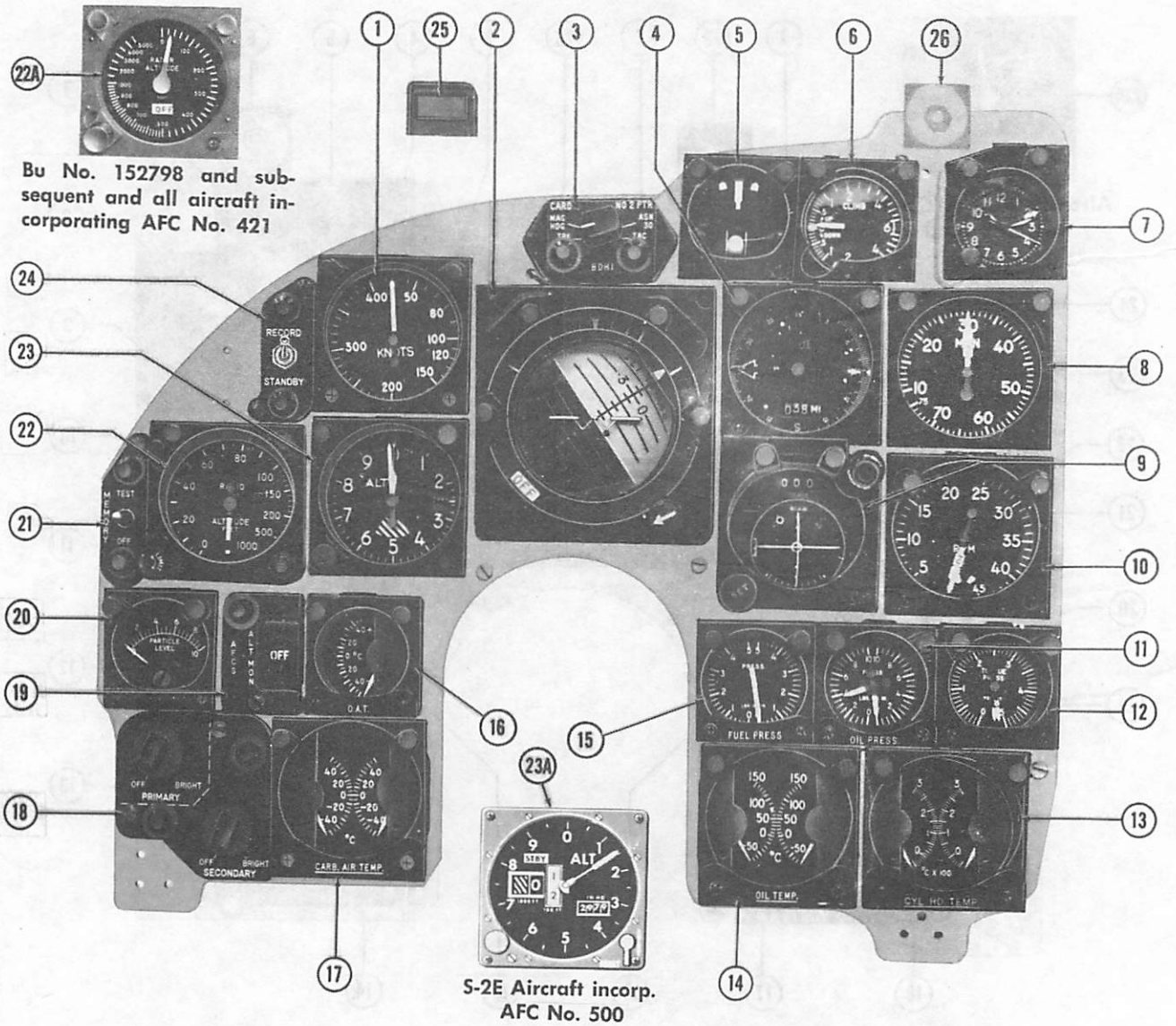
22A. RADAR ALTIMETER APN-141(V)

23. PRESSURE ALTIMETER
24. RECORDER SWITCH (RECORD/STANDBY)
25. WHEELS WARNING LIGHT
26. RADAR ALTIMETER WARNING SET TEST SWITCH

C-SAD1-162-1

Figure 1-3 (Sheet 1)

S-2E/G



1. AIRSPEED INDICATOR
2. PILOT'S ATTITUDE INDICATOR (VGI)
3. MODE SELECTOR SWITCH (BDHI)
4. BEARING-DISTANCE-HEADING INDICATOR
5. TURN AND SLIP INDICATOR
6. VERTICAL SPEED INDICATOR
7. ELAPSED TIME CLOCK
8. MANIFOLD PRESSURE GAGE (DUAL)
9. CROSS POINTER COURSE INDICATOR
10. TACHOMETER (DUAL)
11. OIL PRESSURE INDICATOR (DUAL)
12. TORQUE PRESSURE INDICATOR (DUAL)
13. CYLINDER HEAD TEMPERATURE INDICATOR (DUAL)
14. OIL TEMPERATURE INDICATOR (DUAL)
15. FUEL PRESSURE INDICATOR (DUAL)
16. OUTSIDE AIR TEMPERATURE INDICATOR
17. CARBURETOR AIR TEMPERATURE INDICATOR (DUAL)
18. PILOT'S PRIMARY AND SECONDARY LIGHT CONTROL SWITCHES
19. ALTITUDE MONITOR INDICATOR (AFCS)
20. PARTICLE LEVEL INDICATOR S-2E ONLY
21. APN-122 DOPPLER RADAR MEMORY TEST SWITCH (BUNO. 149257-149274)
22. RADAR ALTIMETER APN-117
22A. RADAR ALTIMETER APN-141(V)
23. PRESSURE ALTIMETER
23A. ALTIMETER ENCODER
24. RECORDER SWITCH (RECORD/STANDBY)
25. WHEELS WARNING LIGHT
26. WINDSHIELD WIPER CONTROL

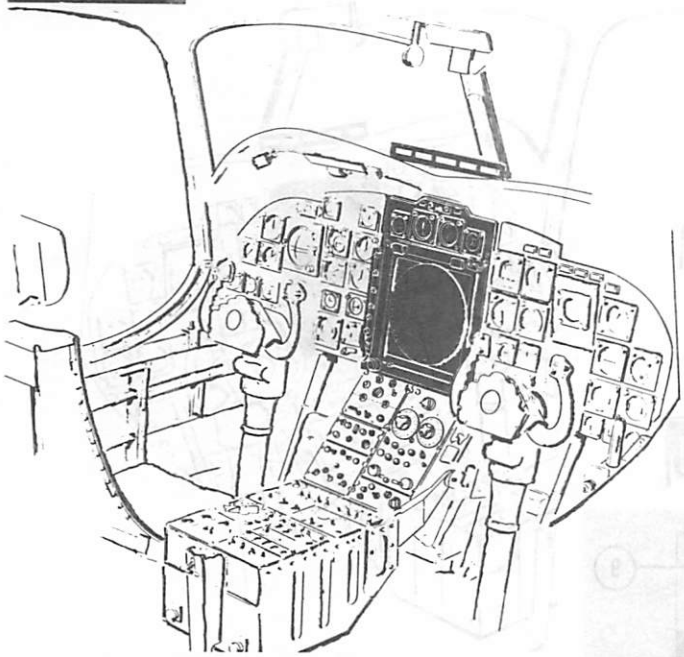
D-SAD1-162-2

Figure 1-3 (Sheet 2)

CENTER INSTRUMENT PANEL

S-2D

TYPICAL

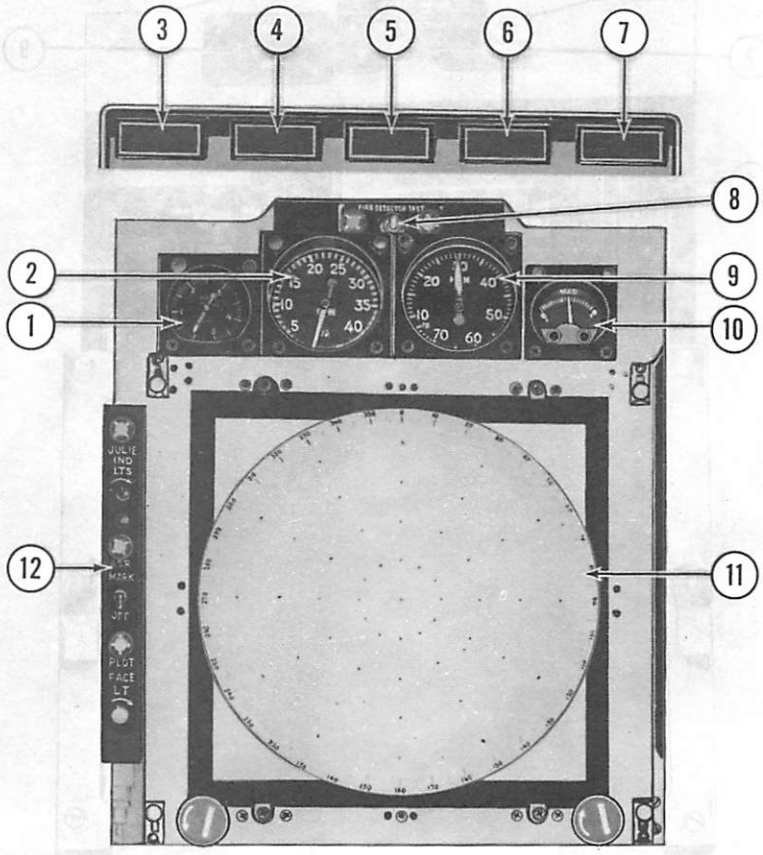


1. TORQUE PRESSURE INDICATOR (DUAL)
2. TACHOMETER (DUAL)
3. LEFT ENGINE MAGNETIC CHIP DETECTOR INDICATOR LIGHT
4. LEFT ENGINE FIRE WARNING LIGHT
5. ALTITUDE WARNING LIGHT (APQ-107)
6. RIGHT ENGINE FIRE WARNING LIGHT
7. RIGHT ENGINE MAGNETIC CHIP DETECTOR INDICATOR LIGHT
8. FIRE DETECTOR TEST SWITCH
9. MANIFOLD PRESSURE GAGE (DUAL)
10. MAGNETIC ANOMOLY DETECTOR (MAD) INDICATOR

*11. TACTICAL DISPLAY PLOTTING BOARD

12. JULIE INDICATOR LIGHTS AND ASR MARKER SWITCHES

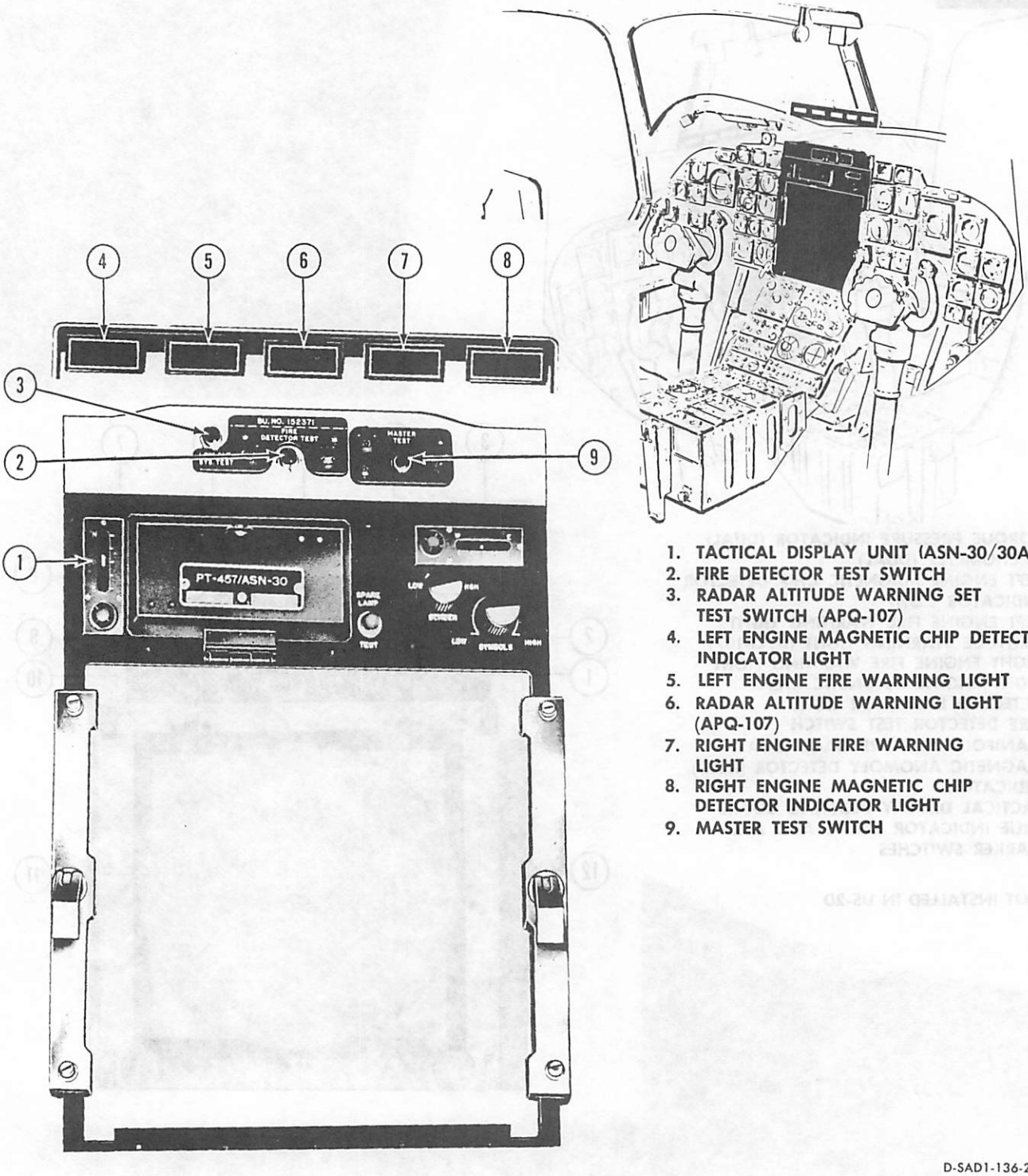
*NOT INSTALLED IN US-2D



C-SAD1-136-1

Figure 1-4 (Sheet 1)

S-2E/G



1. TACTICAL DISPLAY UNIT (ASN-30/30A)
2. FIRE DETECTOR TEST SWITCH
3. RADAR ALTITUDE WARNING SET TEST SWITCH (APQ-107)
4. LEFT ENGINE MAGNETIC CHIP DETECTOR INDICATOR LIGHT
5. LEFT ENGINE FIRE WARNING LIGHT
6. RADAR ALTITUDE WARNING LIGHT (APQ-107)
7. RIGHT ENGINE FIRE WARNING LIGHT
8. RIGHT ENGINE MAGNETIC CHIP DETECTOR INDICATOR LIGHT
9. MASTER TEST SWITCH

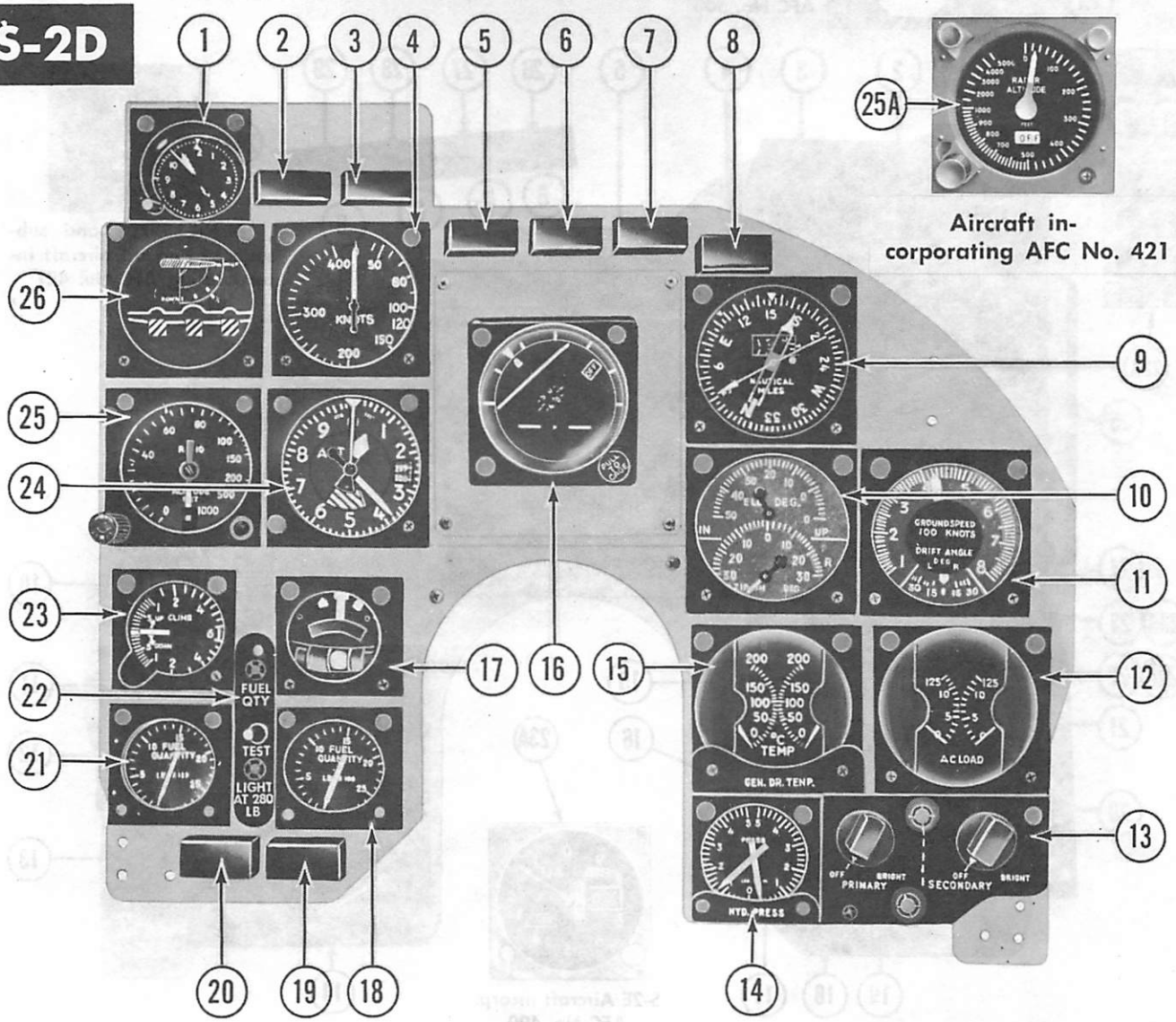
D-SAD1-136-2

Figure 1-4 (Sheet 2)

COPILOT'S INSTRUMENT PANEL

TYPICAL

S-2D

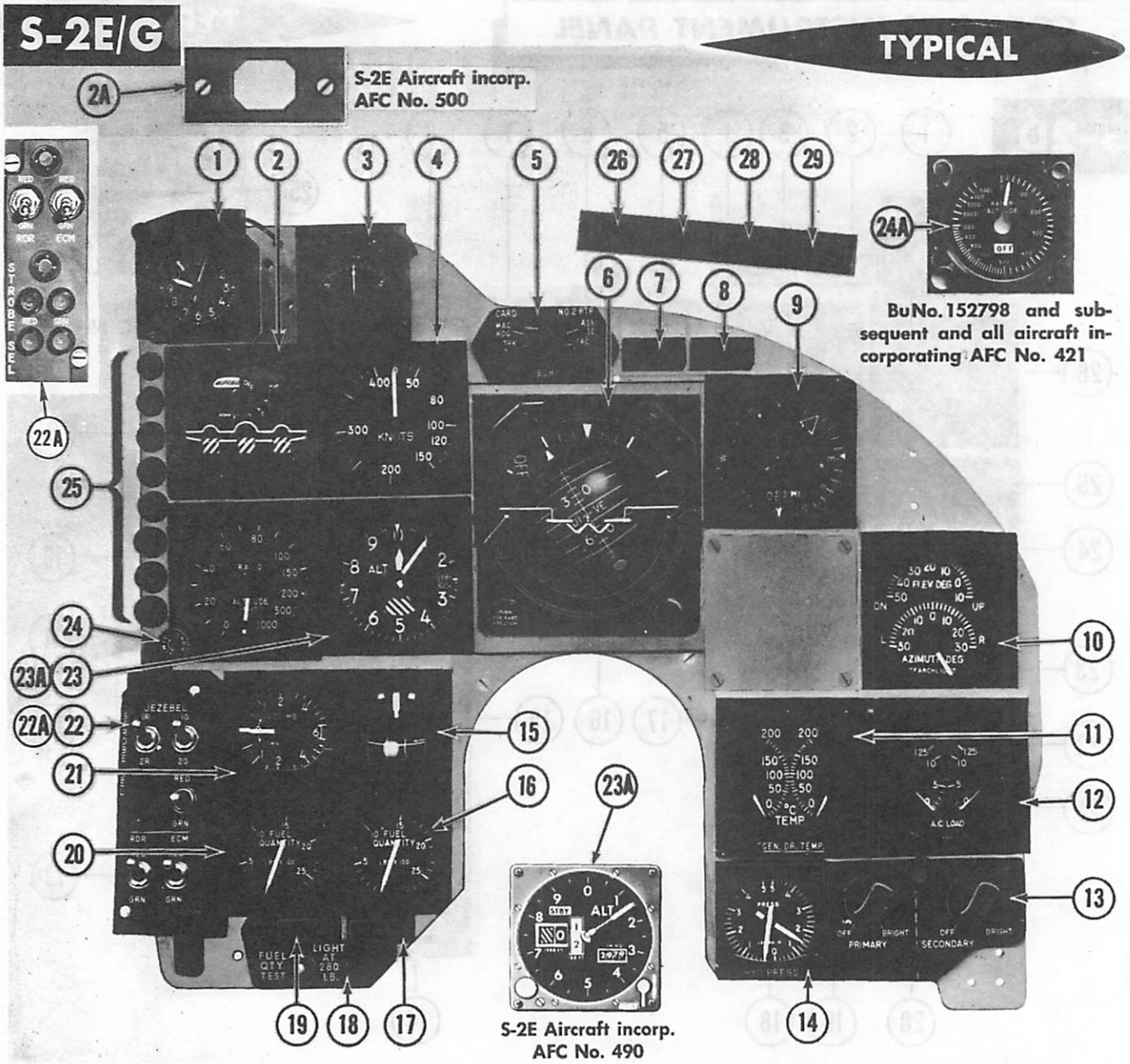


Aircraft incorporating AFC No. 421

1. ELAPSED TIME CLOCK
2. LEFT CSD WARNING LIGHT
3. RIGHT CSD WARNING LIGHT
4. AIRSPEED INDICATOR
5. LEFT GENERATOR WARNING LIGHT
6. LEFT TRANSFORMER-RECTIFIER WARNING LIGHT
7. RIGHT GENERATOR WARNING LIGHT
8. RIGHT TRANSFORMER RECTIFIER WARNING LIGHT
9. BEARING — DISTANCE HEADING INDICATOR
10. SEARCHLIGHT INDICATOR
11. GROUND SPEED-DRIFT ANGLE INDICATOR
12. AC LOADMETER (DUAL)
13. CO-PILOT'S PRIMARY AND SECONDARY LIGHT CONTROL SWITCHES
14. HYDRAULIC PRESSURE INDICATOR (DUAL)
15. CONSTANT SPEED DRIVE OIL TEMPERATURE INDICATOR (DUAL)
16. CO-PILOT'S ATTITUDE INDICATOR (GYRO HORIZON)
17. TURN AND SLIP INDICATOR
18. RIGHT FUEL TANK SYSTEM QUANTITY GAGE
19. RIGHT LOW FUEL LEVEL WARNING LIGHT
20. LEFT LOW FUEL LEVEL WARNING LIGHT
21. LEFT FUEL TANK QUANTITY GAGE
22. FUEL QUANTITY GAGE TEST SWITCH
23. VERTICAL SPEED INDICATOR
24. PRESSURE ALTIMETER
25. RADAR ALTIMETER APN-117
25A. RADAR ALTIMETER APN-141(V)
26. WHEELS AND FLAPS POSITION INDICATOR

C-SAD1-163-1

Figure 1-5 (Sheet 1)



1. ELAPSED TIME CLOCK
2. WHEELS AND FLAPS POSITION INDICATOR
2A. IFF CAUTION LIGHT
3. MAGNETIC ANOMALY DETECTOR (MAD) INDICATOR (S-2E)
4. AIRSPEED INDICATOR
5. MODE SELECTOR SWITCH (BDHI)
6. CO-PILOT'S ATTITUDE INDICATOR (GYRO HORIZON)
7. LEFT CSD WARNING LIGHT
8. RIGHT CSD WARNING LIGHT
9. BEARING-DISTANCE-HEADING INDICATOR
10. SEARCHLIGHT INDICATOR
11. CSD OIL TEMPERATURE INDICATOR (DUAL)
12. AC LOADMETER (DUAL)
13. CO-PILOT'S PRIMARY AND SECONDARY LIGHT CONTROL SWITCHES
14. HYDRAULIC PRESSURE INDICATOR (DUAL)
15. TURN AND SLIP INDICATOR
16. RIGHT FUEL TANK QUANTITY GAGE
17. RIGHT LOW FUEL LEVEL WARNING LIGHT
18. FUEL QUANTITY GAGE TEST SWITCH
19. LEFT LOW FUEL LEVEL WARNING LIGHT
20. LEFT FUEL TANK QUANTITY GAGE
21. VERTICAL SPEED INDICATOR
22. STROBE SELECTOR CONTROL , ASQ-80 (S-2E ONLY)
22A. STROBE SELECTOR CONTROL, ASQ-149 (S-2G)
23. PRESSURE ALTIMETER
23A. SERVOED BAROMETRIC ALTIMETER
24. RADAR ALTIMETER APN-117
24A. RADAR ALTIMETER APN-141(V)
25. SELECTOR PANEL, (ASQ-80 (S-2E) ASQ-149 (S-2G)
26. LEFT GENERATOR WARNING LIGHT
27. LEFT RECTIFIER WARNING LIGHT
28. RIGHT GENERATOR WARNING LIGHT
29. RIGHT RECTIFIER WARNING LIGHT

F-SAD1-163-2

Figure 1-5 (Sheet 2)

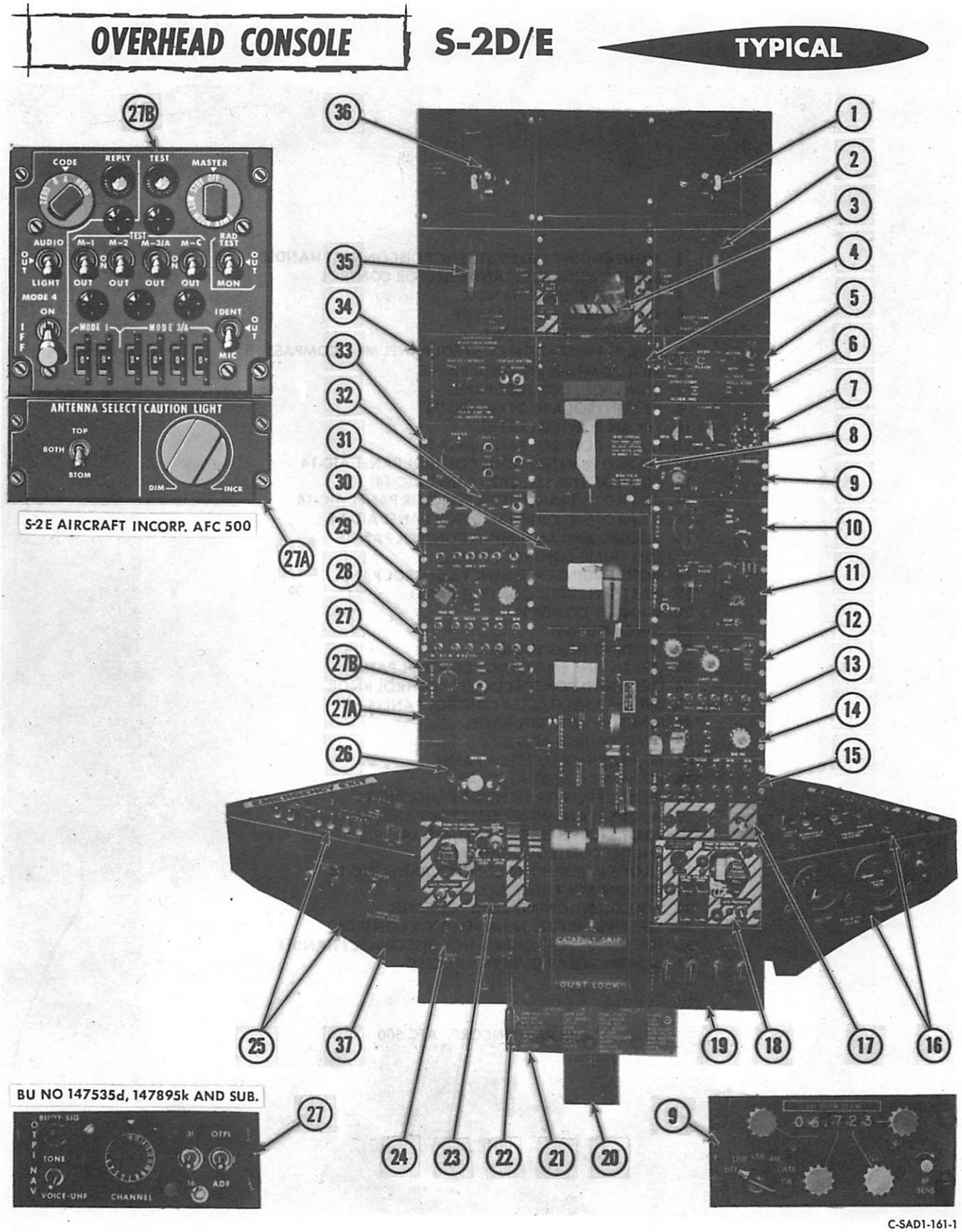
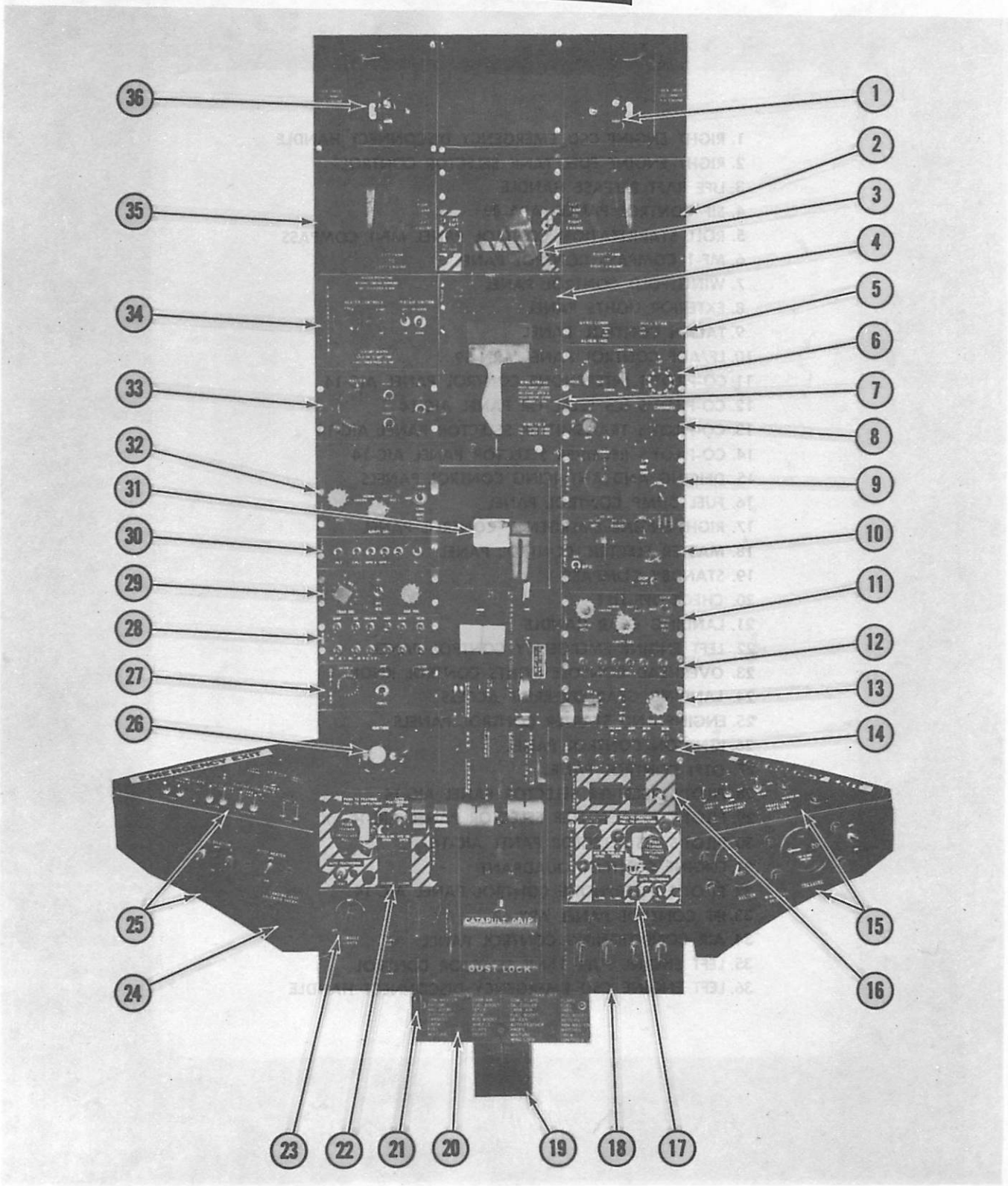


Figure 1-6 (Sheet 1)



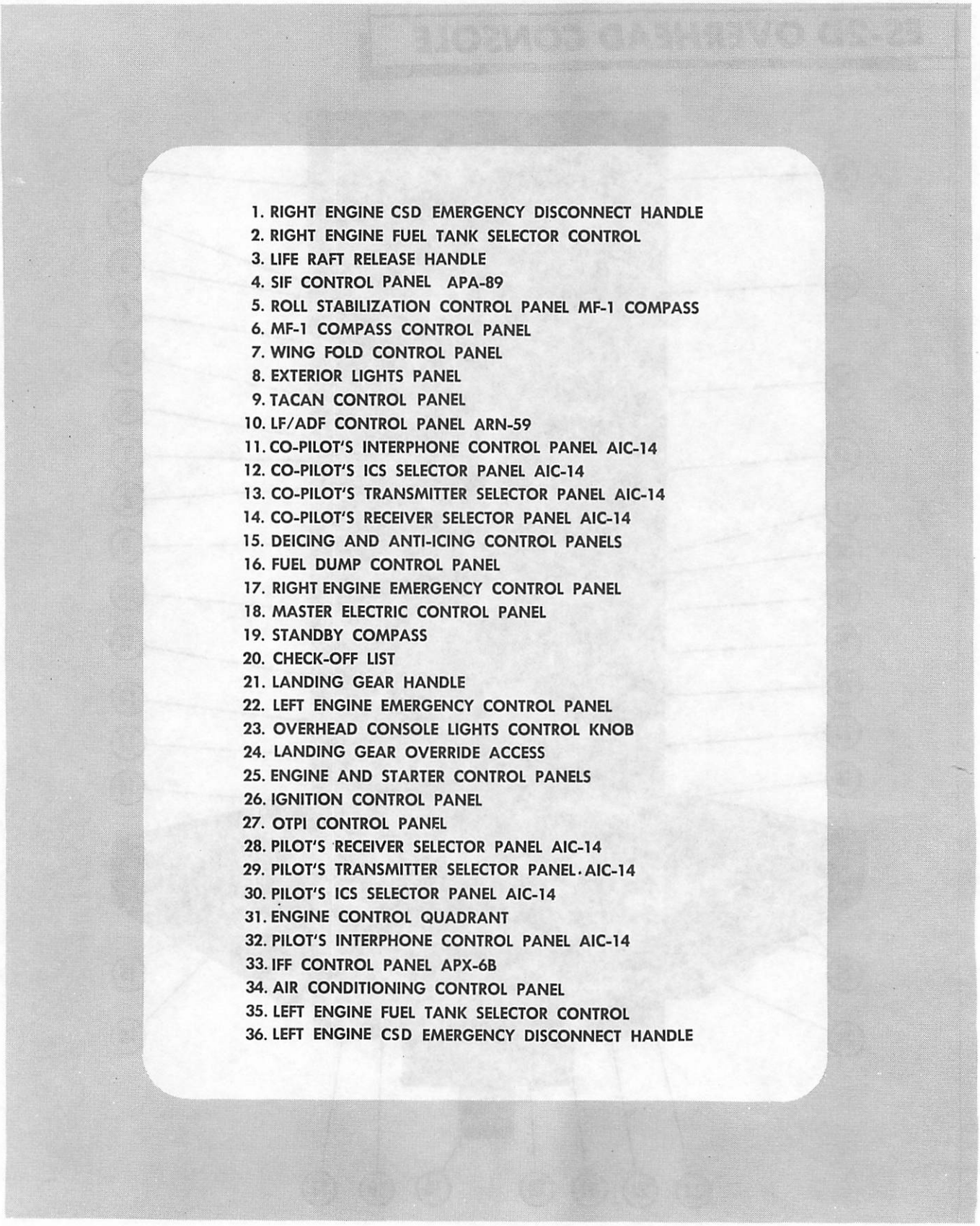
Figure 1-6 (Sheet 2)

ES-2D OVERHEAD CONSOLE



SAD1-161-3

Figure 1-6 (Sheet 3)



SAD1-161-4

Figure 1-6 (Sheet 4)

MAIN DIFFERENCES TABLE

SYSTEM	S-2E	S-2D	ES-2D	S-2G
COMMUNICATIONS				
ARC-52 UHF RADIO	X	X	X	X
ARC-39 HF RADIO	X	X	X	X
ARC-94 HF RADIO	X			X
KY-28	X AFC 490			X AFC 490
INTERCOMMUNICATIONS				
AIC-14 INTERCOM	X	X	X	X
UNH-6 TAPE RECORDER	X	X	OUT	
NAVIGATION				
ARN-21A TACAN		X	X	
ARN-52 TACAN	X 149845(120) & SUB.			X
ARN-59 LF DIRECTION FINDER	X	X	X	X
ARN-32 MARKER BEACON	X	X	X	X
APN-141 RADAR ALTIMETER	X	X AFC 421	X	X
MF-1 COMPASS SYSTEM	X	X	X	X
ARA-25A UHF DIRECTION FINDER	X	X	X	X
ASA-31		X	OUT	
ASA-13A OR AYK-2 GROUND PLOTTER	X	X	OUT	X
OA/1768A/ASA-13 PLOTTING BOARD		X	OUT	
AN/ASN-30/30A NAVIGATION COMPUTER	X			X
AN/ASQ-80 COORDINATE DATA SET	X			
AN/ASQ-149 COORDINATE DATA SET				X
AN/APN-122 DOPPLER RADAR		X	X	
AN/APN-153 DOPPLER RADAR	X			X
WARNING DEVICE				
ROLL ANGLE MONITOR	X AFC 499			X AFC 499
SEARCH RADAR				
APS-88A RADAR SET	X	X	OUT	X

A-SAD1-233-1

Figure 1-7 (Sheet 1)

MAIN DIFFERENCES TABLE—CONTINUED

SYSTEM	S-2E	S-2D	ES-2D	S-2G
IDENTIFICATION				
APX-6 IFF RADAR		X	X	
APA-89 VIDEO CODER		X	X	
AN/APX-72 DOD AIMS IFF SYSTEM	X AFC 500			X
COUNTERMEASURES				
AN/ALD-2 ECM DIRECTION FINDER		X	OUT	
AN/ALD-2B ECM DIRECTION FINDER	X			X
SEARCH-WARNING				
AKT-19 MCJR	X			X
ARR-52A ASW RECEIVER	X AFC 440	X AFC 440	OUT	
ARR-58 ASW RECEIVER		147531—147534 147536—147894	OUT	
ASA-26A RECORDER	X	X	OUT	
AQA-3A INDICATOR	X	X	OUT	
AQA-4 MOD. II INDICATOR	X	X		
AQA-7(V) SONO COMPUTER RECORDER GROUP				X
AQH-5(V) TAPE RECORDER				X
SONOBUOY RELEASE SYSTEM	X	X	OUT	X
ARR-75 SONO RECEIVER SET				X
WEAPONS SYSTEMS				
AERO 6A CONTROL	X	X	OUT	X
AWW-77 BULLPUP	X AFC 491			X AFC 491
ARMAMENT CONTROL PANEL	X	X	OUT	X
AIRBORNE DETECTION				
ASR-3 SUBMARINE DETECT.	X	X	OUT	
ASQ-10 MAGNETIC AIRBORNE DETECT.	X	X	OUT	X
AVQ-2 SEARCHLIGHT	X	X	OUT	X
SUS DISP. & STOWAGE	X	X	OUT	
MARINE MARKER SYSTEM	X	X	X	X
AUXILIARY SYSTEMS				
COUNTING ACCELEROMETER	X	X	X	X
NIGHT PHOTOGRAPHIC POD	X	X	X	X
A-13A OPERATORS CLOCK (2)	X	X	OUT	X

A-SAD1-233-2

Figure 1-7 (Sheet 2)

part 2
SYSTEMS

TABLE OF CONTENTS

Flight Control System 1-19
Stall Warning System 1-23
Automatic Flight Control System 1-24
Pitot-Static Pressure System 1-30
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Fuel Dump System 1-42
Propellers 1-43
Oil Supply System 1-47
Engine Cooling 1-47
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Engine Instruments 1-48
Starting System 1-49
Hydraulic Power Supply System 1-49
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WARNING

Authorization and applicable limitations for carriage and/or release of any external or internal stores may be found only in Figure 1-75 in Section I, Part 4 of this manual.

FLIGHT CONTROL SYSTEM

The flight control surfaces are operated from either the pilot's or co-pilot's position by means of a control wheel and two rudder pedals, which are mechanically connected to the control surfaces. All control surfaces are conventional, except that a rudder trimmer is installed for directional trimming and additional directional control in the event of failure or excessive loss of power of either engine. The rudder trimmer controls are located on the folding console. Spoilers in each wing are linked with the ailerons as part of the lateral control system. An automatic pilot is provided. Aileron and elevator trim tabs are motor-driven and the rudder tab is not directly controllable, serving only as a slave to the rudder trimmer.

FLIGHT CONTROL WHEELS

Note

NEW

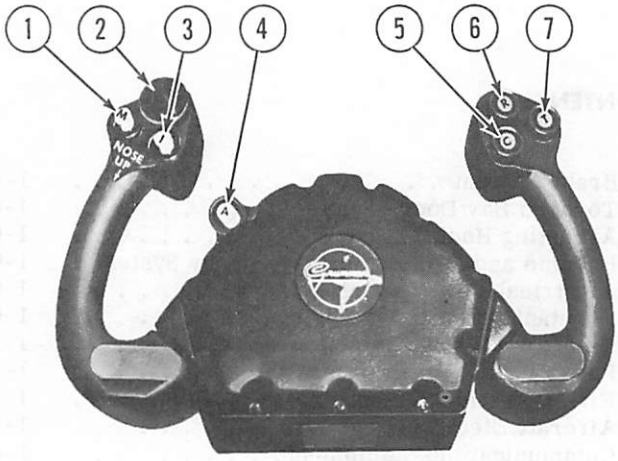
On S-2G aircraft, the C button on both flight control wheels is electrically disconnected and is nonfunctional.

Both the pilot's and co-pilot's flight control wheels (yokes) incorporate the following switches (figure 1-8): grouped together on the outboard arms are the standard elevator and aileron trim tab switch, intercommunication microphone pushbutton switch (placarded I) and radio microphone pushbutton switch (placarded M). Between the inboard and outboard arms mounted on the control wheel hub is the automatic flight control disconnect button, placarded A. The inboard arms of both flight control wheels have a T button switch for releasing torpedoes, bombs, sonobuoys, and marine markers, and a C button switch for releasing signals, underwater sound (SUS). Only the pilot's control wheel contains an R button switch for firing rockets.

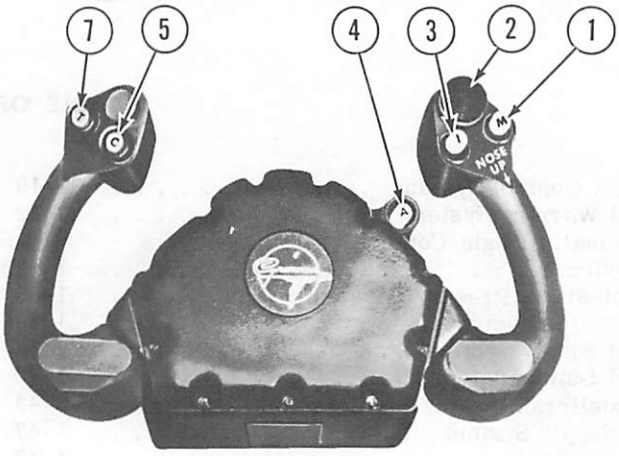
CO-PILOT'S CONTROL COLUMN DISCONNECT

The co-pilot's control column disconnect handle, placarded COLUMN DISCONNECT, is to the left of the co-pilot's control column just under and aft of the co-pilot's instrument panel. The handle enables the co-pilot's control column to be mechanically disconnected. Disconnecting the co-pilot's yoke allows the co-pilot additional space in which to perform other duties during flight. A cable is routed from the handle to a bellcrank located below the cockpit floor. The handle must be manually pulled full back to disconnect the control column from the longitudinal and lateral control systems, and turned clockwise to engage a lug under the co-pilot's control wheel. In this position, the co-pilot's control column is disengaged from the pilot's lateral and longitudinal controls and is stowed in a forward position. The AFCS is disconnected from the co-pilot's control column when the control column is in the stowed position; however, all other electrical functions remain normal. To reengage the co-pilot's

FLIGHT CONTROL WHEELS



PILOT



COPILOT

1. RADIO SWITCH
2. ELEVATOR/AILERON TRIM TAB SWITCH
3. ICS SWITCH
4. AFCS DISENGAGE SWITCH
5. SIGNAL UNDERWATER SOUND RELEASE SWITCH (NONFUNCTIONAL ON S-2G AIRCRAFT)
6. ROCKETS RELEASE SWITCH
7. TORPEDO, DEPTH BOMB, AND SONOBUOY RELEASE SWITCH

A-SAD1-209

Figure 1-8

control column, pull the handle aft sufficiently far to disengage it from the notch in the control wheel, then rotate the handle counterclockwise to a horizontal position and return handle to the full forward position. This permits the latches for the lateral and longitudinal systems to return to the locked or engaged position.

WARNING

The disconnect handle must be completely rotated through an arc of 115°. If rotation is not complete, there is a possibility of obtaining only partial engagement which may result in a complete loss of control of the lateral and longitudinal systems by the co-pilot's control column and wheel. The co-pilot's control column and wheel must be moved to a position corresponding to the pilot's selection respectively, before the lateral and longitudinal latches will engage and allow the co-pilot to assume control. If co-pilot's controls feel jammed, repeat the procedure.

LATERAL CONTROL SYSTEM

The lateral control system consists of ailerons in the wing outer panels and two spoilers in each wing outer panel, located inboard of the aileron and forward of the outer panel flap. (See figure 1-9.) The spoilers are mechanically linked with the ailerons so that as each aileron moves upward, the adjacent pair of spoilers moves upward with it and extends through the upper surface of the wing. When the aileron travels downward, the spoilers move down into the wing. The spoilers and ailerons are mechanically operated.

LONGITUDINAL CONTROL SYSTEM

The longitudinal control system consists of conventional elevators operated mechanically by a system of cables and push rods connected to the pilot's wheels (figure 1-10). Balance tabs are geared to the elevator and move as a function of elevator position.

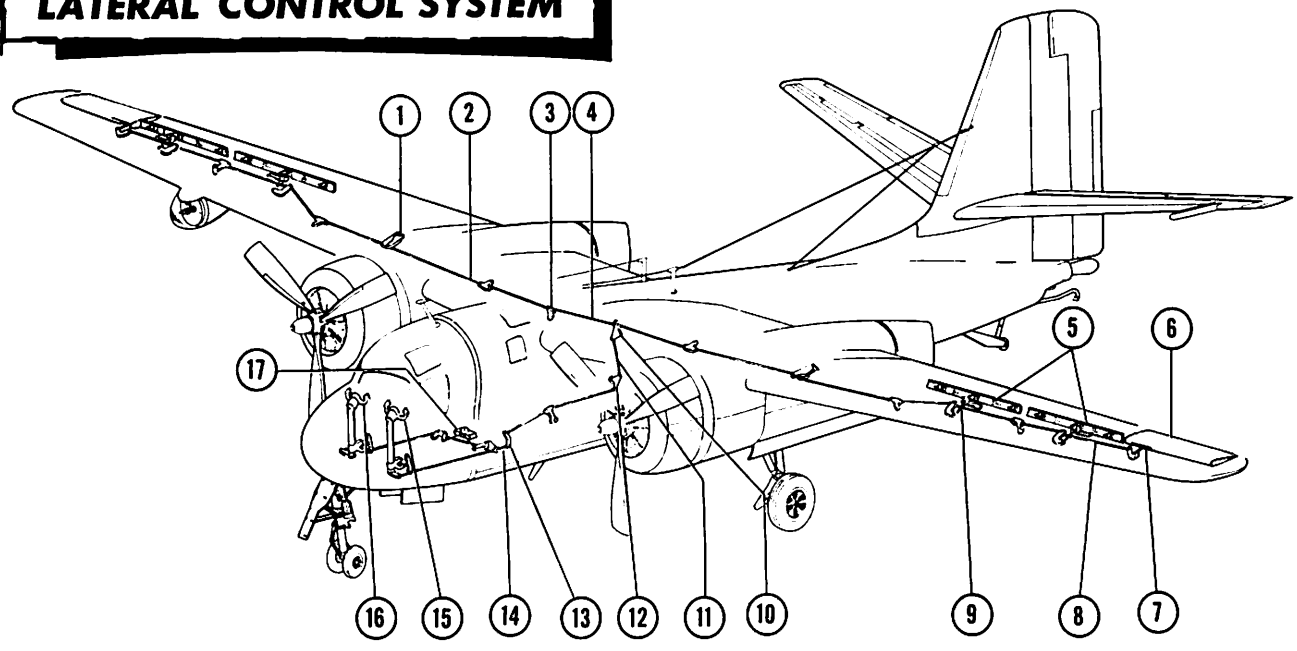
RUDDER CONTROL SYSTEM

The rudder control system consists of a rudder mechanically connected to two pairs of adjustable rudder pedals (figure 1-11) and is conventional except for its operation with the single engine rudder assist system. The rudder pedals can be adjusted by using the rudder pedal adjustment handles, one for each pilot.

Rudder Pedal Adjustment Controls

There are two rudder pedal adjustment controls, each mounted on the outboard side of the cockpit just forward of the pilot's knee.

LATERAL CONTROL SYSTEM



1. FOLD JOINT BELL CRANK
2. CONTROL ROD
3. CONTROL IDLER
4. CONTROL ROD
5. SPOILERS
6. AILERON
7. AILERON HORN ASSEMBLY
8. AILERON CONTROL ROD
9. SPOILER CONTROL ROD
10. BELL CRANK
11. CONTROL ROD
12. BELL CRANK ASSEMBLY
13. BELL CRANK ASSEMBLY
14. PUSH ROD
15. PILOT'S TRIM TAB SWITCH
16. COPILOT'S TRIM TAB SWITCH
17. AILERON SERVO (AFCS)

SAD1-37

Figure 1-9

RUDDER TRIMMER

The rudder trimmer is an auxiliary directional control surface which, in effect, increases the aircraft rudder control surface. (See figure 1-12.) The forward end of the trimmer is hinged to the vertical fin and the rudder is hinged to the aft end of the trimmer. This auxiliary surface permits directional trimming during normal flight to provide greater trimming effectiveness than a conventional trim tab, and allows sufficient directional trim for single engine operation. The trimmer is deflected for normal trimming by an electric screw jack.

SINGLE ENGINE RUDDER ASSIST SYSTEM

The single-engine rudder assist system is operated by 1,500 psi hydraulic pressure and is controlled by a solenoid-operated, two-position, three-way, ON-OFF selector valve. (See figure 1-12.) Two concentric slide valves are connected to the rudder control system through a bell crank and follow-up rod. A rudder trimmer control cylinder, actuated by the concentric slide valves, moves the rudder trimmer left or right, corresponding to rudder pedal movement. A rudder trimmer lock cylinder locks the system for normal flight, The rudder trimmer hydraulic system selected by the SINGLE ENGINE RUDDER ASSIST switch can be manually turned ON or OFF. With the RUDDER ASSIST switch OFF, the rudder trimmer can be actuated 5° left or right by an electric screw jack actuator.

For emergency use (SINGLE ENGINE RUDDER ASSIST SWITCH-ON), the rudder trimmer is deflected by hydraulically operated servomechanism. This system increases directional control with conventional use of the rudder pedals. A follow-up system positions the trimmer proportionally to rudder deflection.

Note

Operation of the rudder assist with the SINGLE ENGINE RUDDER ASSIST switch ON above 130 KIAS is not recommended during two-engine flight.

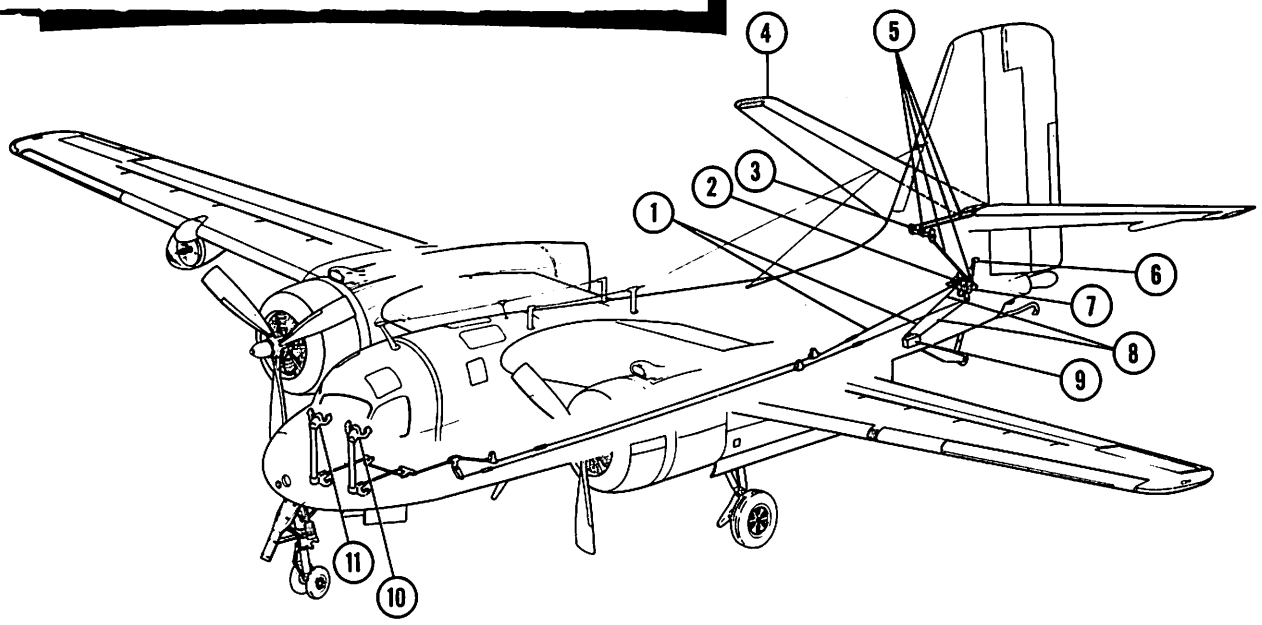
Single Engine Rudder Assist Switch

The SINGLE ENGINE RUDDER ASSIST switch on the folding console (figure 1-2) is a two-position ON-OFF toggle switch normally set in the OFF position. The switch is set to the ON position for take-off, landing, or in the event of single-engine operation.

TRIM TABS

An electrically actuated trim tab is provided on the left aileron and on each of the elevators. Rudder trimming is accomplished through an electric screw jack control of the rudder trimmer. A tab, located on the rudder is not directly controllable, but serves only as a slave to the rudder trimmer and operates with it.

LONGITUDINAL CONTROL SYSTEM



1. UP ELEVATOR CABLES
2. FORCE LINK
3. UPPER BELL CRANK
4. ELEVATOR
5. PUSH RODS
6. BELL CRANK SUPPORT
7. BELL CRANK ASSEMBLY
8. DOWN ELEVATOR CABLES
9. ELEVATOR SERVO ACTUATOR (AFCS)
10. PILOT'S TRIM TAB SWITCH
11. COPILOT'S TRIM TAB SWITCH

SAD1-38

Figure 1-10

Trim Tabs Position Indicators

Three trim tab position indicators are on the trim tabs control panel on the folding console. (See figure 1-2.) They show the setting of elevator tabs, aileron tab and rudder trimmer in degrees of tab or trimmer movement.

TRIM CONTROLS

Yoke Trim Tabs Control Buttons

A momentary contact switch for control of the aileron and elevator trim tabs is located on both the pilot's and co-pilot's control wheels. (See figure 1-8.) With the switch in the forward or aft position, the elevator trim tab is changed until the switch is released. This same switch is used to control aileron trim by moving it left and right.

Note

Normal elevator and aileron trim tab control is deactivated when the AFCS is engaged.

Elevator Trim Tabs Deactivation

ELEVATOR TRIM TABS STANDBY SWITCH

A three-position toggle switch, used as a secondary elevator trim control in the event of failure of the normal control, is on the trim tabs control panel on the pilots' folding console (figure 1-2). The switch is spring-loaded to the center OFF position and is placarded STANDBY, NOSE UP, and NOSE DN. If the elevator trim tabs STANDBY switch is used, the normal elevator trim tabs switches on both control wheels become inoperative.

ELEVATOR TRIM TABS EMERGENCY STOP PUSHBUTTON

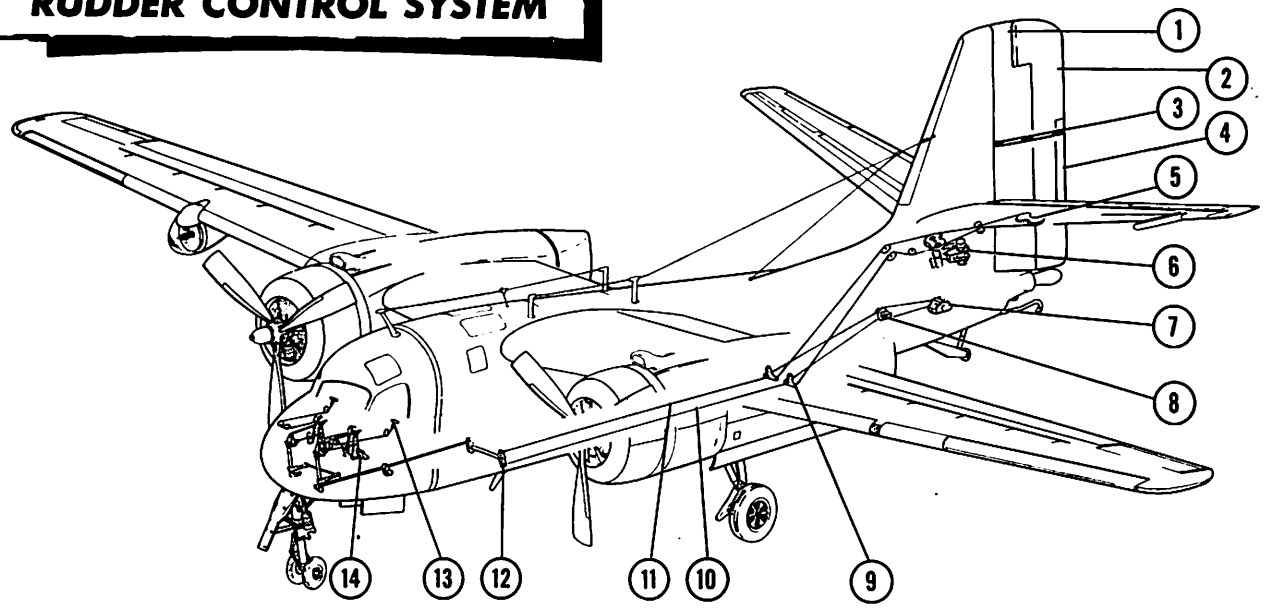
A red ELEV TABS EMERG STOP button is on the trim tabs control panel on the folding console (figure 1-2). The pushbutton can be used to halt the action of the elevator tabs if the normal control malfunctions. If the ELEV TABS EMERG STOP button is used, the normal elevator trim tabs switches on both control wheels become inoperative.

Elevator Trim Tabs Reactivation

To reactivate the normal elevator trim tabs switches if the STANDBY switch is used, both ELEV TAB EMER HOLD and ELEV TAB EMER STOP circuit breakers must be pulled out and reset (figure 1-42).

To reactivate the normal elevator trim tabs switches if the ELEV TABS EMERG STOP pushbutton is used, the ELEV TAB EMER STOP circuit breaker must be pulled out and reset (figure 1-42).

RUDDER CONTROL SYSTEM



1. RUDDER TRIMMER
2. RUDDER
3. BALANCE TAB PUSH ROD
4. BALANCE TAB
5. RUDDER HORN
6. RUDDER TRIMMER SYSTEM
7. RUDDER SERVO ACTUATOR (AFCS)
8. SERVO CABLE DRUM
9. IDLER BELL CABLE
10. LEFT RUDDER CABLE
11. RIGHT RUDDER CABLE
12. BELL CRANK
13. RUDDER PEDAL ADJUSTMENT HANDLE
14. RUDDER AND BRAKE PEDALS

SAD1-39

Figure 1-11

Rudder Trim Control

Rudder trimming is accomplished by the rudder trim control located on the trim tabs control panel on the folding console (figure 1-2). The control may be turned to the NOSE LEFT or NOSE RIGHT position to trim the aircraft to the left or right.

CONTROL SURFACES GUST LOCK

A gust lock is used to lock the control surfaces in the neutral position when the aircraft is parked. If the controls are not in neutral when the gust lock is engaged, they will automatically lock when deflected to neutral. The gust lock handle is on the engine control quadrant (figure 1-24). When engaged, it sets the system to lock the control surfaces in neutral. It also mechanically prohibits forward movement of the throttles past the 2,000 RPM position to prevent take-off with the control surfaces locked. The gust lock-handle is pulled down and aft to the locked position.

A releasing trigger on the handle must be actuated to allow movement of the handle from the locked or stowed positions. Moving the handle further aft permits the releasing trigger to be pulled down and spring tension will move the handle toward the stowed position. The handle must be checked to ensure that it is locked in the stowed position.

WARNING

The aircraft is down if no spring tension is evident when releasing the gust lock: there is a danger that all flight controls may lock.

STALL WARNING SYSTEM

An electric stall warning system gives warning of an impending stall by means of a control shaker mounted on the rudder pedals. The system gives an accurate prestall warning regardless of flap settings, power settings, accelerations and configurations by automatically compensating for these conditions. The system consists of a lift transducer, a flap position potentiometer, a lift computer, two rudder pedal shakers, an adjustment box (which is part of the computer) and a test switch. As the aircraft approaches stall speed, the small vane of the lift transducer, located on the leading edge of the left wing, senses the change in angle of attack which causes the shift in the airflow stagnation point and closes the circuit through the adjustment box to the control shaker.

Note

An aircraft wing, for any given configuration, will always stall at the same angle-of-attack, regardless of weight, dynamic pressure, or bank angle.

The lift computer compensates for thrust and flap setting, which is detected by the flap position potentiometer, and relays the current to the control shaker motor. The motor drives an eccentric mass which, in turn, vibrates the rudder pedals as a warning signal. Under different flight configurations, the rudder pedal shakers will operate at the following different airspeeds.

FLIGHT CONFIGURATION	AIRSPEED (KNOTS IAS)
POWER APPROACH	78 ± 3
LANDING	86 ± 3
CRUISE	96 ± 3

Stall Warning Test Switch

A momentary STALL WARN TEST switch on the right side of the pilots' folding console (figure 1-2) is used to check the stall warning system. Moving the switch to ON position causes the rudder pedals to vibrate.

AUTOMATIC FLIGHT CONTROL SYSTEM

The automatic flight control system (AFCS) automatically maintains the aircraft at a selected attitude about its pitch, yaw, and roll axes, and at a selected heading and altitude. The AFCS detects the rate of deviations of the aircraft from the reference attitude, which is the attitude the aircraft is flying at the time of AFCS engagement. Automatic synchronization of AFCS aircraft attitude is provided: when AFCS is not engaged, it continually synchronizes itself to the changing attitude of the aircraft as it maneuvers. When AFCS is engaged, the attitude information is automatically computed and the signals developed when the aircraft deviates from the reference attitude are processed to bring the aircraft back to reference attitude. The airspeed compensator modifies pitch signals from the control wheel force transducers in proportion to the airspeed of the aircraft. The rate-of-change of aircraft attitude is detected by the 3 rate gyros and used in the dampening of any aircraft divergent oscillations, and to assist in programing 3 axis coordinated turns.

Note

The AFCS can not be used if the pilot's VGI warning flag is extended and visible. In this case, the AFCS STANDBY-ENGAGE switch will not hold in the ENGAGE position.

The system uses both 115-volt, 400-cycle, three-phase, AC and 28 volt DC power for operation. The 115-volt, AC is obtained from the left generator AC buses through a three-phase 5-ampere AFCS AC circuit breaker. The 28-volt DC is obtained from the No. 1 transformer-rectifier bus (powered by the left generator) through a 5-ampere AFCS DC circuit breaker. Both circuit breakers are in the forward circuit breaker panel behind the co-pilot's seat (see figure 1-42).

AFCS MAJOR FUNCTIONS

NEW

1. Maintain pitch attitude within 1/2° in smooth air.
2. Maintain roll attitude within 1/4° in smooth air.
3. Hold a compass heading within 1/2°.
4. Hold altitude within ±5 feet (or 0.15 percent of the indicated pressure altitude, whichever is greater) in level flight and banks up to 20°.
5. Allow engagement in attitudes within 40° of nose up or nose down pitch and 60° of roll.
6. Allow engagement at roll rates of up to 25° per second and yaw rates up to .25° per second.
7. Automatically retrim the aircraft in pitch to prevent bump upon disengaging.
8. Allow maneuvering the aircraft up to 40° in pitch and 60° in roll by use of the pilot's or co-pilot's control wheel.
9. Automatically coordinate turns.

AFCS CONTROL PANEL

The automatic flight control system (AFCS) control panel (figure 1-13) in the diagonal console in the pilot's compartment contains the ENGAGE-STANDBY switch, HEADING-STANDBY switch, ALTITUDE-STANDBY switch and YAW TRIM knob.

Engage-Standby Switch

The ENGAGE-STANDBY switch permits engaging the automatic flight control system 1 to 1 1/2 minutes after power is applied. When switch is set to STANDBY, the AFCS is disengaged.

Note

No attempt should be made to engage the AFCS if the pilot's VGI OFF flag is visible.

Heading-Standby Switch

The HEADING-STANDBY switch engages heading control. When the switch is set to STANDBY, heading control is disengaged. Heading control is automatically disengaged when a lateral force of 4 pounds is applied to the pilot's control wheel.

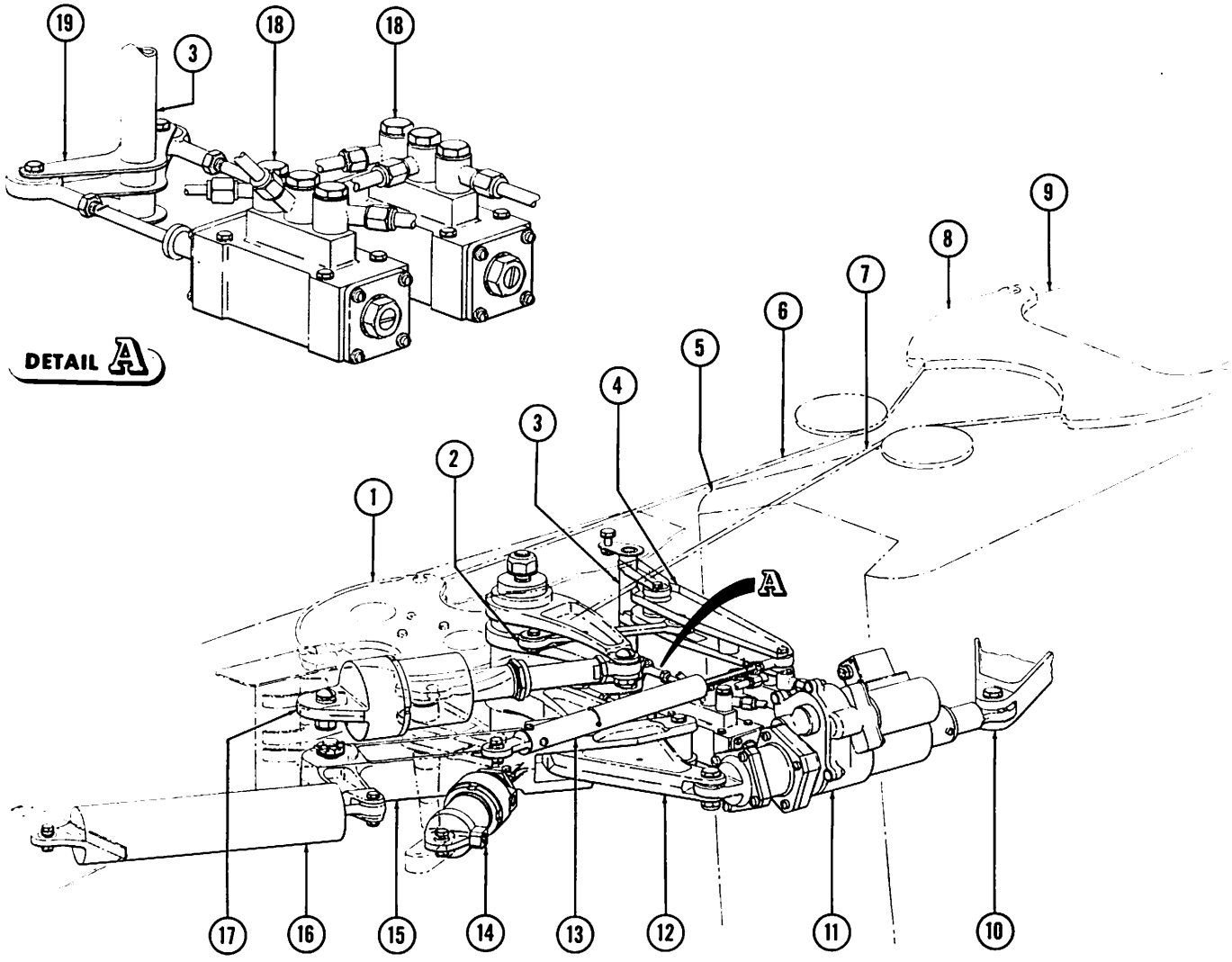
Altitude-Standby Switch

The ALTITUDE-STANDBY switch engages altitude control so that the aircraft, through AFCS, holds a constant pressure altitude. When the switch is set to STANDBY, altitude control is disengaged. When switch is set at ALTITUDE, pitch control wheel steering is inoperative.

Yaw Trim Knob

After engaging the AFCS, the YAW TRIM knob permits centering of the ball of the turn and slip indicator to eliminate sideslip. The knob may also be used to accomplish flat turns when the AFCS is engaged.

RUDDER TRIMMER

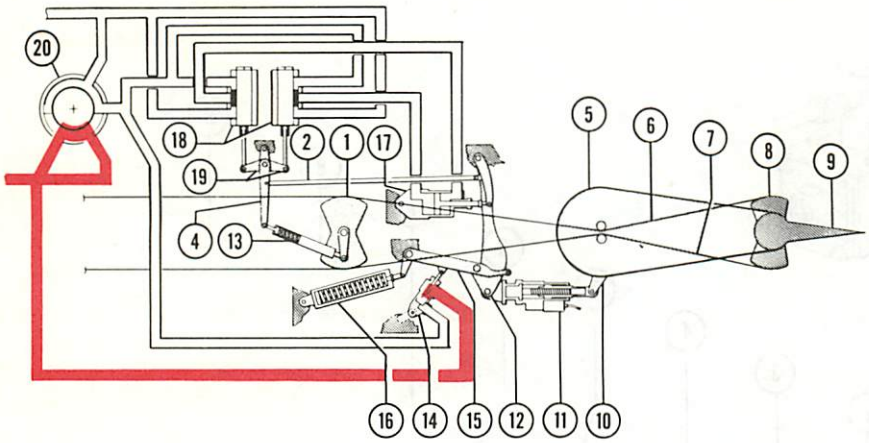


1. AFT RUDDER CONTROL SECTOR
2. FOLLOW-UP LINK
3. TORQUE TUBE
4. FOLLOW-UP ARM
5. RUDDER HORN
6. RIGHT RUDDER CABLE
7. LEFT RUDDER CABLE
8. RUDDER HORN
9. RUDDER
10. TRIMMER HORN
11. TRIMMER ACTUATOR (ELECTRIC)
12. TRIMMER CRANK (IN "TRIMMER LOCKED" POSITION)
13. SPRING LOADED PUSH ROD
14. LOCK CYLINDER (EXTENDS TO UNLOCK TRIMMER)
15. LOCK ARM
16. LOCK ARM RETURN SPRING ROD
17. TRIMMER ACTUATING CYLINDER (HYDRAULIC)
18. SLIDE VALVES
19. LOWER BELL CRANK
20. RUDDER TRIMMER SELECTOR VALVE

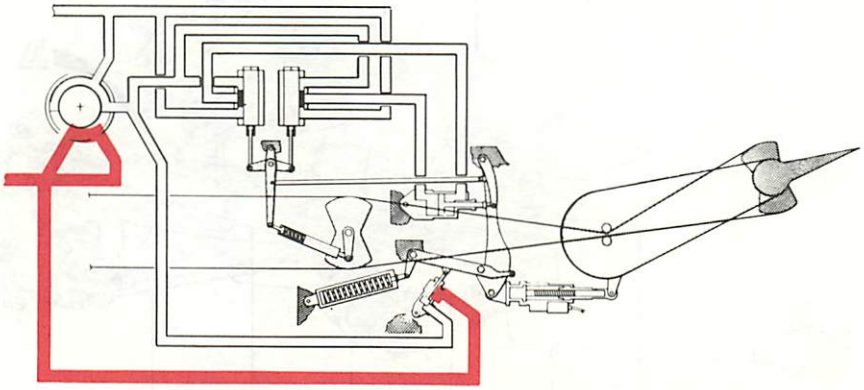
SAD1-40-1

Figure 1-12 (Sheet 1)

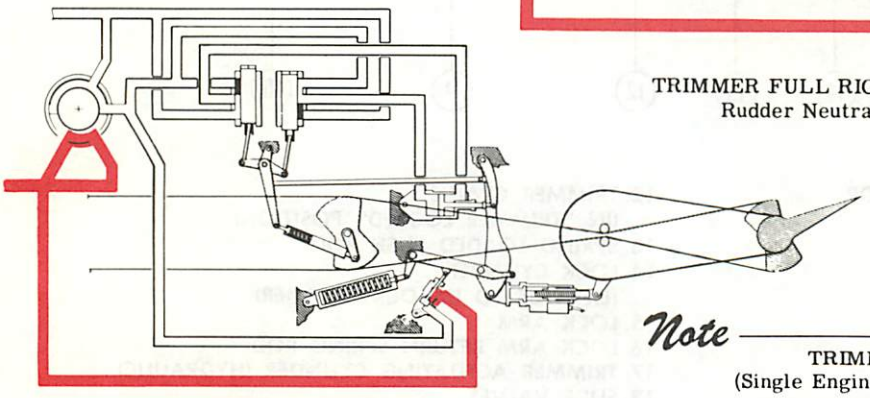
OPERATION WITH SINGLE ENGINE RUDDER ASSIST SWITCH "OFF"
(Electric actuator operating, no hydraulic pressure.)



TRIMMER NEUTRAL
Rudder Neutral



TRIMMER FULL RIGHT (5°)
Rudder Neutral



TRIMMER NEUTRAL
Rudder Full Right

Code

Pressure

Note

TRIMMER LOCKED POSITION
(Single Engine Rudder Assist Switch "OFF".)

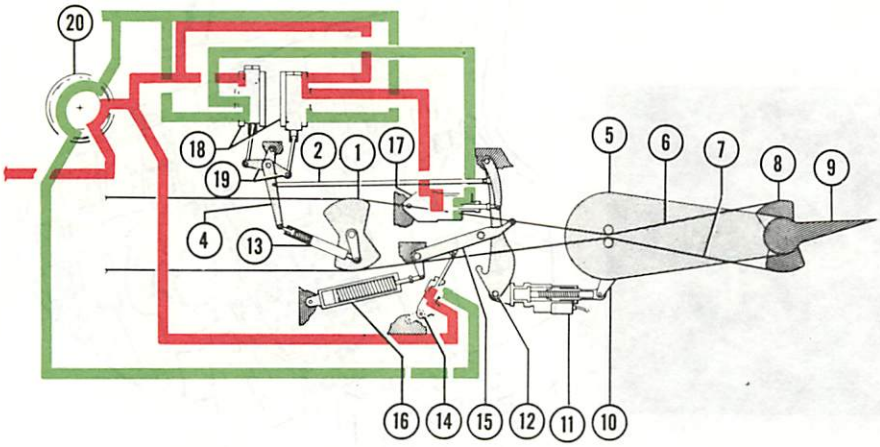
Trimmer Motion (With Electric Actuator) . . . . . 5°R, 5°L

A-SAD1-40-2

Figure 1-12 (Sheet 2)

OPERATION WITH SINGLE ENGINE RUDDER ASSIST SWITCH "ON"
(Hydraulic pressure to trimmer, electric actuator utilization optional.)

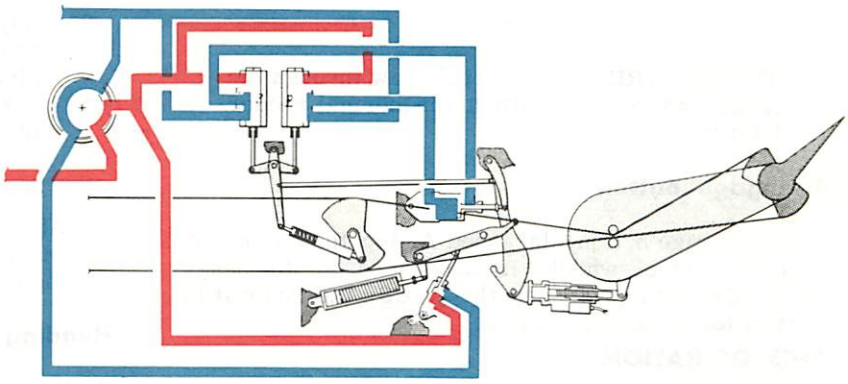
INITIATION OF EMERGENCY OPERATION



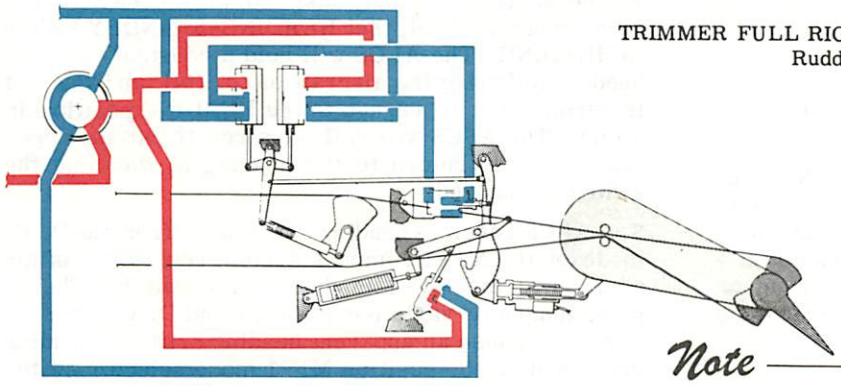
Code
- Pressure
- Return
- Static

TRIMMER NEUTRAL

Rudder deflecting right, follow-up linkage in operation and hydraulic fluid entering the trimmer operating cylinder.



TRIMMER FULL RIGHT - ACTUATOR NEUTRAL
Rudder Full Right



TRIMMER FULL LEFT - ACTUATOR NEUTRAL
Full Left Rudder

Note

TRIMMER UNLOCKED POSITION
(Single Engine Rudder Assist Switch "ON".)

Trimmer Motion (Electric Actuator in Neutral)	20°R, 20°L
Trimmer Motion (Electric Actuator Extended 5°R)	25°R, 15°L
Trimmer Motion (Electric Actuator Retracted 5°L)	15°R, 25°L

SAD1-40-3

Figure 1-12 (Sheet 3)

AFCS CONTROL PANEL

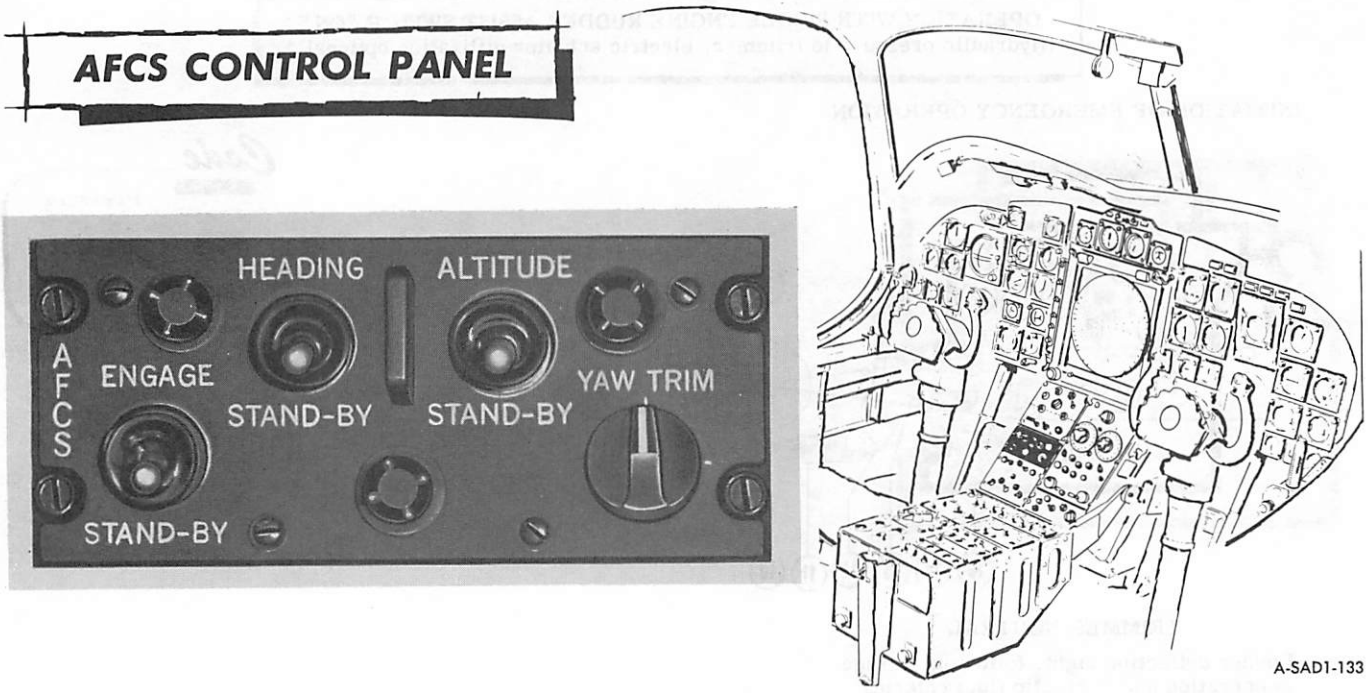


Figure 1-13

Note

The YAW TRIM knob controls yaw through the AFCS and does not affect the normal rudder trim system.

Disengage Button

The disengage button, placarded A, located on the hub of both control wheels is depressed to disengage the AFCS. This releases the AFCS: the aircraft is in trim for manual operation.

AFCS OPERATION

Engaging AFCS

To engage AFCS proceed as follows:

1. Manually trim aircraft for desired flight condition and center YAW TRIM knob.
2. Set ENGAGE-STANDBY switch to ENGAGE. The AFCS can be engaged in bank angles up to 60° and will hold aircraft in bank angle at which the switch was engaged. The AFCS can be engaged in pitch attitudes up to 40° nose up or nose down and will hold aircraft in pitch attitude at which switch was engaged.

Note

Attitudes beyond this are not recommended.

Yaw Trim

Adjust yaw trim as follows:

1. Check needle and ball of turn and slip indicator to determine sideslip.
2. Adjust YAW TRIM knob to center ball of turn and slip indicator. The YAW TRIM knob may also be used for limited flat turns if desired. Always re-center ball at completion of the flat turn.

Note

Although yoke trim switches are inoperative when AFCS is engaged, the switch on the folding console for rudder trim is operative.

Heading Hold

At the desired heading, and with all forces removed from control wheel, set HEADING-STANDBY switch to HEADING. The AFCS will hold a constant compass heading following the aircraft pitch, roll, and yaw. It is permissible to engage to the HEADING position in a turn. The AFCS will roll the aircraft into the opposite bank and return to the heading at the time the switch is engaged.

The AFCS receives heading information from the D. G. mode of the MF-1 compass system regardless of the position of the MF-1 mode selector switch. Therefore, magnetic variation changes and D. G. precession may cause an apparent heading drift. If heading drift is noticed, position MF-1 mode selector switch to D. G. Apparent heading drift should cease. To re-synchronize, move selector switch to EMER, then to MAG. If apparent heading drift does not cease, a malfunction of the compass system is indicated.

Note

The AFCS heading hold function is not connected in the EMER position, even though the STANDBY-HEADING switch will remain in the HEADING position when DG is inoperative.

Heading Change

Turn to a selected heading, release pressure on the control wheel and reengage HEADING-STANDBY switch to HEADING. AFCS will roll aircraft level and hold the new heading. The HEADING will be automatically selected to STANDBY when a turn to a new heading is executed by the pilot.

Banking and Turning

Roll force on the control wheel produces a coordinated turn up to 60° of bank. Turn coordination is automatically provided by AFCS.

Pitch Attitude Changes

Fore-and-aft forces on the control wheel grips result in pitch maneuvers if altitude control is not engaged.

Altitude Control

The altitude control, through AFCS, maintains the aircraft at a constant pressure altitude. The ALTITUDE-STANDBY switch should be placed at ALTITUDE while in level flight. If the altitude control is engaged in a nose-up or nose-down attitude, the aircraft will return to that same attitude in about 2 seconds after the altitude control is disengaged.

Note

The altitude control is not a maneuvering control nor level-out device.

Altitude Changes

If ALTITUDE-STANDBY switch is in ALTITUDE position, move switch to STANDBY position. Fly aircraft to new altitude, level off, and then set ALTITUDE-STANDBY switch to ALTITUDE. The AFCS will hold the new altitude.

AFCS Altitude Monitor

An AFCS ALTITUDE MONITOR is installed as a secondary reference to back up the barometric ALTITUDE CONTROL at altitudes below 1,000 feet. The RADAR ALTIMETER, AN/APN-117 or AN/APN-141(V) provides information to this function, in absolute height. An AFCS ALTITUDE MONITOR INDICATOR on the left side of the pilot's instrument panel (figure 1-3) indicates the condition of this AFCS function. An OFF indication is present when the AFCS ALTITUDE-STANDBY switch is in the STANDBY position, the RADAR ALTIMETER is turned OFF or malfunctioning or the aircraft is above 1000 feet AGL. With all systems operating normally, and the aircraft below 1,000 feet altitude, the ALTITUDE-STANDBY switch is placed to the ALTITUDE position, the indicator will "flip" from OFF to LIM to ON within 30 seconds. The altitude hold mode is now being controlled by the barometric altitude control, and continually checked by the ALTITUDE MONITOR. The monitor limits are ± 20 feet from 0 to 200 feet and ± 55 feet from 200 to 1,000 feet. If the aircraft deviates due to a change in low altitude barometric pressure gradients by more than these limits, the radar altimeter monitor disconnects the barometric control, returns the aircraft to the original ENGAGED altitude, then reengages the barometric control at this new pressure reference point. Whenever the RADAR ALTITUDE MONITOR takes command, the indicator "flips" from ON to LIM. Whenever this is returned to normal barometric control, the indicator will return to ON.

Note

This mode, ALTITUDE HOLD with RADAR ALTITUDE MONITOR is not recommended for flying overland below 1,000 feet altitude. The radar altimeter absolute height information will cause the aircraft to follow the terrain, hence, appear to bounce, porpoise, be erratic and/or unstable.

AUTOMATIC ELEVATOR TRIM

When the AFCS is engaged, the automatic elevator trim system compensates for aircraft pitch axis mistrim so that there is no load on the elevator servo. The elevator trim indicator shows aircraft trim condition in pitch. It will move up and down occasionally, showing that auto trim is operating. Automatic pitch trim operates at all times when AFCS is engaged, except when ±0.2g incremental is exceeded in pitch or during the time the control wheel is used in pitch. When the control wheel is moved in pitch, the auto trim is automatically cut out. If auto trim does not work during AFCS operation, a slight bump can be expected when AFCS is disengaged.

Attitude Changes

Using the control wheel, fly aircraft to a new attitude, then release pressure on the wheel and the AFCS will hold the new attitude.

Overpower

The pilot can overpower the AFCS in all axes at any time by applying control pressures of 35 pounds in pitch, 55 pounds in roll, and 125 pounds in yaw.

WARNING

Overpowering of the AFCS in pitch with altitude hold engaged does not cause the altitude hold function to disengage. Release of yoke pressure will result in a rapid opposite pitch reaction.

DISENGAGING AFCS

To maneuver the aircraft manually, press the disengage button on the control wheel and AFCS will disengage. It may also be disengaged by setting the ENGAGE-STANDBY switch on the control panel to STANDBY. Operating the elevator trim tab emergency stop

button or the elevator trim standby switch will disengage the AFCS. Heading and altitude also are disengaged when AFCS is disengaged. Without disengaging AFCS completely, altitude control can be separately disengaged by setting the ALTITUDE-STANDBY switch to STANDBY. Similarly, heading control can be separately disengaged by applying a roll force to the control wheel or by setting the HEADING STANDBY switch to STANDBY. In addition, failure of AC or DC will cause the AFCS to be disengaged; therefore, the AFCS will disengage when the left generator is turned OFF momentarily or the pilot's V.G.I. gang bar circuit breaker is pulled out.

WARNING

If only the "C" phase of A.C. power to the pilot's V.G.I. is lost, there will be no obvious indication until the gyro tumbles. The AFCS will attempt to maintain the aircraft level with respect to the gyro horizon resulting in violent pitch and roll movements. Whenever resetting pilot's V.G.I. circuit breaker gang bar, ensure all three phases are properly seated.

PITOT-STATIC PRESSURE SYSTEM

The pitot and static pressure systems supply impact (pitot) pressure and atmospheric (static) pressure to various instruments and system components. Pitot pressure is supplied by two pitot heads forward of the windshield. An electrical heating element inside each pitot head prevents moisture from freezing and obstructing the tube. The left pitot head supplies pressure to the pilot's airspeed indicator and the airspeed transmitter. The right pitot head supplies pressure to the co-pilot's airspeed indicator and the AFCS airspeed compensator. Static or atmospheric pressure is supplied through four static orifices located on the port and starboard sides of the fuselage nose section. Pressure from the lower two orifices is transmitted through tubing to a static manifold and then to the airspeed indicators, rate-of-climb indicators, barometric altitude control, altimeter data transmitter, airspeed transmitter and AFCS airspeed compensator. Pressure from the upper two orifices is transmitted through tubing to a tee fitting and then directly to the pressure altimeter.

FLIGHT INSTRUMENTS

Flight instruments include all instruments necessary for visual and instrument flight. They are generally grouped together on the pilot's instrument panel and duplicated on the co-pilot's instrument panel.

AIRSPEED INDICATORS

Two airspeed indicators are provided, one each on the pilot's and co-pilot's instrument panels (figures 1-3 and 1-5, respectively). A pointer moves over a dial calibrated from 0 to 400 KNOTS in increments of 10.

PRESSURE ALTIMETERS

Two pressure altimeters are provided, one on the pilot's and one on the co-pilot's instrument panels (figures 1-3 and 1-5 respectively). Three concentric pointers sweep a calibrated dial to indicate the altitude of the aircraft. The shortest pointer indicates altitude in thousands of feet, the intermediate pointer in hundreds of feet, and the longest pointer in tens of thousands of feet. A barometric scale is located at the right side of the face. At indicated altitudes below 16,000 feet, a wedge-shaped striped area appears at the bottom of the indicator face.

Note

The procedure for computing altimeter error will be found in Section III, Part 1, Take-Off Check List.

VERTICAL SPEED INDICATORS

The vertical speed indicators are provided, one each on the pilot's and co-pilot's instrument panels (figures 1-3 and 1-5, respectively). The dials are placarded CLIMB, UP, and DOWN and are graduated in increments of 100 FPM from 0 to 1000 FPM and 500 FPM from 1000 to 6000 FPM.

TURN AND SLIP INDICATORS

Two vacuum-driven turn and slip indicators are provided, one each on the pilot's and co-pilot's instrument panels (figures 1-3 and 1-5, respectively). Each turn and slip indicator is a combination of two flight instruments independent of each other. The turn indicator or needle indicates the rate the aircraft is turning and is calibrated so that a single needle width deflection indicates either a 3° per second or a 1-1/2° per second rate of turn. The slip indicator or ball indicates the relationship between the angle of bank and the rate of turn. The forces acting on the ball, gravity and centrifugal force are balanced in a coordinated turn and the ball is centered. NEW NEW NEW

RECORDING ACCELEROMETER

The recording accelerometer group consists of a Transducer mounted on the aft side of the bulkhead in the forward electronics compartment, and an Indicator (Figure 1-14) mounted in the left wheel well. The system operates on a 28 volts DC through the 5-ampere ACCEL circuit breaker and the right main gear uplock switch, when the gear is up and locked. The purpose of the counting accelerometer group is to maintain a cumulative record, on the Indicator, of the positive g's recorded by the aircraft during flight. The Transducer is a unidirectional sensing and transmission device capable of completing electrical circuits at 2.0, 2.5, 3.0, and 3.5 g's and transferring this information to a numerical readout on the Indicator.

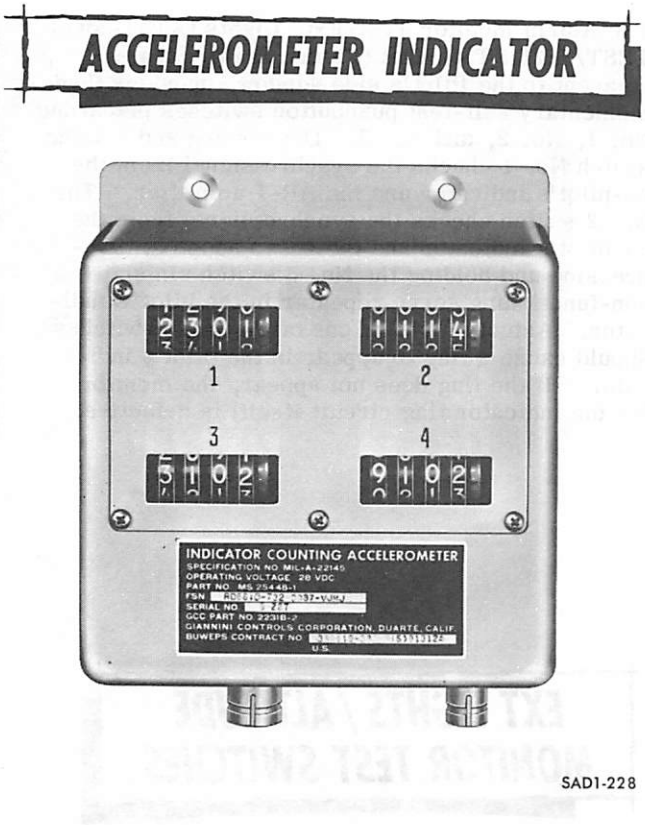


Figure 1-14

ELAPSED TIME CLOCK

On early S-2D aircraft (BuNo. 147531a through 149245s) the elapsed time clock is located on the center instrument panel. Late model S-2D (BuNo. 149246s through 149256t) and all S-2E aircraft have two clocks, one for each pilot on their respective instrument panels (figures 1-3 and 1-5).

OUTSIDE AIR TEMPERATURE INDICATOR

The outside air temperature (OAT) indicator is on the pilot's instrument panel (figure 1-3). The indicator is electrically operated by DC power and is connected to a temperature bulb protruding into the airstream. The indicator dial is calibrated in increments of 5° from -50 to +50° C (-58 to +122° F). Refer to Section XI, Part 3 for OAT corrections.

STANDBY COMPASS

A standard magnetic compass (figure 1-6) is provided for use in the event of failure of the MF-1 Stabilized Compass Set.

ATTITUDE INDICATORS

Independent attitude indicator systems are provided for the pilot's and co-pilot's instruments panels (figures 1-3 and 1-5, respectively).

Pilot's Attitude Indicator

The Pilot's attitude indicator system provides the pilot with an attitude reference indication in the roll and pitch axes. Accurate attitude indications are continuously displayed through 360 degrees roll, and 85 degrees in pitch and dive. The system consists of a roll and pitch displacement gyroscope, switching rate gyroscope, and a 5-inch remote attitude indicator. These components are interconnected by aircraft wiring to provide an operative system. The system operates on 115V, 3-phase, 400 cycle AC essential bus. The pilot's remote attitude indicator consists of a sealed servo-driven yoke and sphere assembly that forms a moving background for a miniature airplane and angle of bank index. The indicator requires no caging and is completely automatic except for adjustments of the pitching trim knob to align the horizon line on the sphere with the miniature airplane. A power failure warning flag, placarded OFF, is retracted during normal operation. This warning flag indicates loss of power to the attitude system.

WARNING

The power failure OFF flag is a warning device to indicate loss of power and may also indicate internal faults of the attitude indication systems. The indications of the attitude indicator must not be used at anytime when the power failure OFF flag is in view. Loss of power will result in inaccurate indications. Observe the motion of the sphere during turns, climbs, and dives for signs of inaccuracies, sticking, and oscillations. Any evidence of irregular operation should be noted on the yellow sheet.

Co-Pilot's Attitude Indicator

The co-pilot's attitude indicator system is a self contained unit. This unit has the same operating range as the pilot's attitude system; 115V, 400 cycle, 3-phase; AC power is obtained from the AC essential bus. In addition to fast and normal gyro erection system, the attitude indicator incorporates a demand fast erection system. The function of the demand fast erection system is to bring the gyro to its gravity vertical position, during operation, from any random position in pitch and bank.

The indicator is automatic except for adjustment of the pitch trim knob which aligns the miniature airplane with the horizon line on the sphere. When the PUSH FOR FAST ERECTION push button is pressed, the power failure warning flag will remain in view until the gyro is erect. The warning note for the pilot's attitude indicator applies.

On aircraft BuNo. 147531 through 149275, the co-pilot's gyro horizon is a self contained 3-inch instrument which consists of a moving bar and pitch scale

and a conventional roll circle. An adjustable aircraft reference bar is provided for pitch trim. The gyro must be caged to be erected. Inflight caging of the gyro should be done in level, unaccelerated flight. A flag warning indicator will appear in the upper right corner if an electrical power failure occurs.

ROLL ANGLE ATTITUDE ALARM SYSTEM

On aircraft incorporating AFC No. 499, a roll angle attitude monitor alarm system is installed to provide for a more accurate check of any erroneous roll angle indication on the pilot's attitude indicator. The roll angle monitor, using the co-pilot's attitude indicator as a standard, continuously compares the pilot's indicator roll angle value to the roll angle value shown on the co-pilot's attitude indicator. A difference of five degrees in roll angle between the two indicators, sensed and noted by the monitor, causes a warning flag to come into view on the pilot's indicator. Loss of one or more phases of the instrument three-phase power source will also cause the flag to appear. If a flag appears on the co-pilot's indicator, the monitor will disconnect the roll angle comparison circuit and the roll angle difference will no longer be monitored.

The monitor determines and performs the following functions.

- That the flag in the co-pilot's indicator is out of view.
- That synchro excitation exists.
- That the two synchro transmitters are at the same bank (roll) angle.
- That the pilot's remote indicator is following the bank angle accurately.
- That the three-phase power is supplied to the pilot's attitude system.

If any of these functions except the first is not satisfied, the flag on the pilot's indicator will be brought into view. If the first condition is not satisfied, the Monitor disconnects everything from the pilot's circuit except the three-phase power sensing circuit.

ALARM MONITOR TEST/EXTERIOR LIGHTS PANEL

The Alarm Monitor Test/Ext. Lights (ATTD MON TEST/EXT LTS) panel (Figure 1-15), located adjacent to the Pilot's side window, provides three momentary self-test pushbutton switches placarded No. 1, No. 2, and No. 3. Depressing and holding switch No. 1 checks the synchro signal from the co-pilot's indicator and the AR-1 amplifier. The No. 2 switch checks the synchro signal from the co-pilot's indicator and the servo adapter. Depressing and holding the No. 3 switch simulates a non-functioning servo repeater in the pilot's indicator. Actuation of any one of the three switches should cause a flag to appear in the pilot's indicator. If the flag does not appear, the monitor (or the indicator flag circuit itself) is defective.

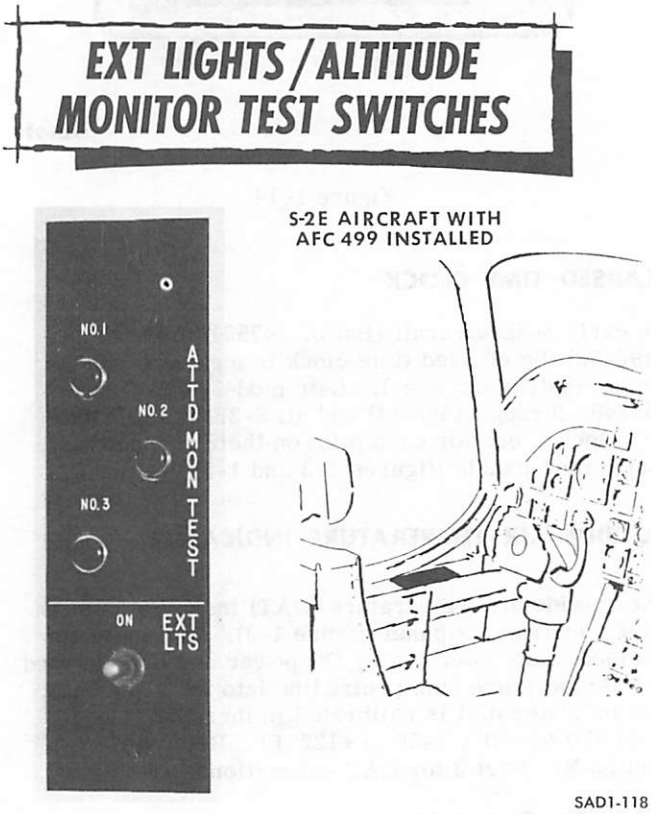


Figure 1-15

SERVOED BAROMETRIC ALTIMETER

NEW NEW NEW NEW NEW NEW NEW

In aircraft incorporating A. F. C. No. 500 the servoed barometric altimeter on the left side of the pilot's instrument panel (Figure 1-5) displays accurate pressure altitude in feet. The altimeter is electrically operated by a synchro signal received from the air data computer for normal operation. An integral standby mechanism, of the aneroid type, is incorporated and presents pressure altitude with normal barometric setting correction. The face of the altimeter is marked in 50-foot increments around the periphery of the dial and numerals ranging from 1 to 10 indicate the 100-foot increments. A single-dial pointer indicates correct altitude from 0 to 1000 feet in a complete revolution. A single drum-type counter, in the center of the instrument, also shows altitude in 100-foot increments. A dual digital counter to left of the 100-foot counter shows altitude in 1000-foot increments. A four digital counter placarded IN. HG. is used in conjunction with an altimeter setting selector control on lower left side of the instrument.

BEARING-DISTANCE-HEADING INDICATOR

A bearing-distance-heading indicator (BDHI) is located on the pilot's and co-pilot's instrument panels (figures 1-3 and 1-5, respectively). The indicators incorporate two pointers and an odometer. The No. 1 needle of both indicators displays ADF or OTPI. On S-2E aircraft, the No. 2 needle on both indicators displays TACAN or ASN-30 bearings. On S-2D aircraft, the No. 2 needle on the pilot's indicator displays TACAN or JULIE bearings and the co-pilot's indicator displays TACAN bearing only.

On S-2E aircraft, the odometers on both indicators displays TACAN or ASN-30 range information. On S-2D aircraft, the odometer on the pilot's indicator displays TACAN or JULIE range information, and the odometer on the co-pilot's indicator displays only TACAN range information.

GROUND SPEED/DRIFT ANGLE INDICATOR

The ground speed/drift angle indicator is on the co-pilot's instrument panel (AN/APM-122) or on the pilot's diagonal console (AN/APN-153(v)) (figures 1-5 and 1-2, sheet 2, respectively). This indicator displays ground speed and drift angle simultaneously without the aid of ground stations, wind estimates and ground speed data.

RADAR ALTIMETER AN/APN-141(V)

On S-2E aircraft BuNo. 152798 and subsequent, and aircraft incorporating AFC No. 421, the Radar Altimeter AN/APN-141(V) on the pilot's and co-pilot's instrument panels (figures 1-3, 1-5 and 1-16) provides accurate altitude information from 0 to 5,000 feet. It is also used as a monitor for the automatic flight control system below 1,000 feet. The pilot's and co-pilot's indicators show the aircraft's altitude on a single turn type dial that is calibrated from 0 to 5,000 feet in decreasing increments. This allows greater definition at lower altitudes. During periods of low signal return (dropout), system accuracy is questionable and indicator operation is disabled. When dropout occurs, the OFF flag appears on the indicator face and the pointer rotates behind a mask. Dropout should not occur at altitudes below 5,000 feet, but radical maneuvers greater than 30° in pitch or 50° in roll will decrease this altitude.

Control Knob

The control knob at the lower left corner of the indicator is the only operating control of the set. The



Figure 1-16

control knob turns the altimeter set on and off and can also be used to place the set into self-test. Rotating the control knob clockwise turns the altimeter set on. Approximately 3 minutes after turn-on, the set is warmed up, the indicator pointer moves from behind the mask, and the OFF flag disappears. Depressing and holding the control knob while the aircraft is airborne causes a self-test switch to close and the altitude pointer to indicate 5 ±5 feet if the set is operating properly. To turn the altimeter set OFF, rotate the control knob counterclockwise until the OFF flag appears.

Note

- AN/APN-141(V) does not incorporate a low level warning light. Low level warning indications are provided by the RAWS AN/APQ-107.
- The low altitude limit index on the indicator has no function and its position should be ignored.

RADAR ALTIMETER AN/APN-117

On S-2E aircraft BuNo. 147895, 149257 through 152379 and S-2D aircraft not incorporating AFC No. 421, the Radar Altimeter AN/APN-117 provides accurate low-level altitude from 0 to 1000 feet. It is also used as a monitor for the automatic flight control system (figures 1-3, 1-5 and 1-17). The pilot's and co-pilot's indicators show the aircraft's altitude on a single dial. The indicator needle moves over the 0 to 1000 foot scale linearly over the range of 0 to 200 feet and nonlinearly 200 to 1000 feet. The accuracy of indication is ±2 feet from 0 to 40 and ±5 percent of the indicated altitude from 40 to 1000 feet. When the signal is too weak to provide reliable operation (during maneuvers or above 1000 feet), a reliability circuit disables the indicator and rotates its pointer behind a mask.

On-Limit Switch

An ON-LIMIT rotary type switch at the left corner of the bezel is the only operating control for the radar altimeter. The equipment will begin functioning in approximately 3 minutes when the knob is turned clockwise from the off position. When rotated after being turned ON, the knob is used to set the bug pointer (see Altitude Bug Pointer paragraph below) to any desired altitude. To de-energize the equipment, rotate the knob completely counterclockwise.

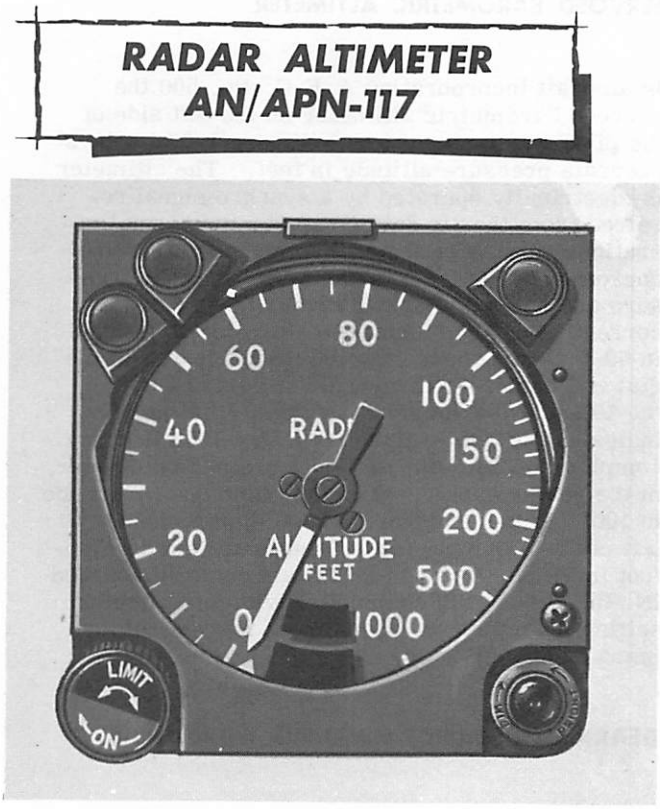


Figure 1-17

CAUTION

Allow 12 minutes warmup time after energizing the equipment to ensure final accuracy.

Altitude Bug Pointer

An adjustable bug pointer at the outside of the calibrated scale of the radar altimeter can be preset to any desired altitude between 0 and 1000 feet by means of the ON-LIMIT switch.

Radar Altimeter Low Level Warning Light

A red low limit indicator on the side of the radar altimeter (figure 1-17) goes on when flying at or below the preset limit indicator bug altitude. This

can be used as a reference for manual flight at a fixed altitude.

Note

The warning light will also go on when the reliability circuit disables the indicator.

RADAR ALTIMETER WARNING SET (RAWS) AN/APQ-107

On S-2E Aircraft BuNo. 152798 and subsequent and all Aircraft Incorporating AFC No. 409, the Radar Altimeter Warning Set (RAWS) AN/APQ-107 provides aural and visual warnings to the pilot and co-pilot when certain pre-set altitude and/or radar altimeter conditions occur. The warning is a 1000 CPS audio tone in the pilot's and co-pilot's headsets synchronized with a flashing ALTITUDE WARNING light mounted on the glare shield above the center instrument panel (figure 1-4).

The system is ON whenever the right generator bus is energized. On aircraft equipped with AN/APN-117 radar altimeter, RAWS receives inputs from the right nutcracker switch, approach light relay, altimeter A.C. circuit breaker and the radar altimeter. On aircraft equipped with AN/APN-141(V) radar altimeter, RAWS receives inputs from the right nutcracker switch, approach light relay, altimeter A.C. circuit breaker and the Signal Data Converter CV-2068. Circuit protection is provided by the two 2-AMP ALTM circuit breakers on the pilot's circuit breaker panel (figure 1-42). The RAWS will produce a warning (aural and/or visual) when any of the following conditions exist:

A. AIRCRAFT IN WHEELS-UP CONFIGURATION

1. High Altitude Warning. A 3 second aural and visual warning when the aircraft descends through 300 feet.

2. Low Altitude Warning. Continuous aural and visual warning when the aircraft is flying below 100 feet altitude.

3. Unreliable Radar Signal, Failure of Radar Altimeter Circuitry, or Loss of AC or DC power to the Radar Altimeter. Continuous aural and visual warning.

Note

Steep turn maneuvers below 900 feet, such that insufficient radar return causes radar altimeter to temporarily become unreliable, will cause the warning signal outlined in item 3 above.

B. WITH LANDING GEAR DOWN AND LOCKED

The following warnings will be inhibited:

1. Unreliable Radar Altimeter.

2. Low Altitude Aural Warning (altitude warning light is not inhibited).

A barometric switch inhibits the radar altimeter unreliable warning when the aircraft is above a pressure altitude of 700 ±200 feet above the reference altitude. Reference altitude is that altitude at which power was last applied to the RAWS. A 10 second loss of power to RAWS followed by reapplication of power will result in a new barometric switch reference altitude. The barometric switch has no effect on the accuracy of the 300 and 100 feet RAWS signals. However, a warning will occur if:

1. The barometric switch is faulty.

2. The barometric switch has been referenced at a pressure altitude greater than actual altitude being flown and the aircraft is flying above the radar altimeter limits. However, if the aircraft ascends to an altitude of 700 ±200 feet, above the referenced altitude the signals should cease.

As the aircraft descends to the normal operational altitude of the radar altimeter, the signals should cease and normal high and low altitude warnings will occur.

Note

Visual warnings are inhibited on deck, including TEST with AFC 409 Part III incorporated. Power to the visual warning circuit is fed through the starboard nutcracker switch. NEW

FUEL SUPPLY SYSTEM

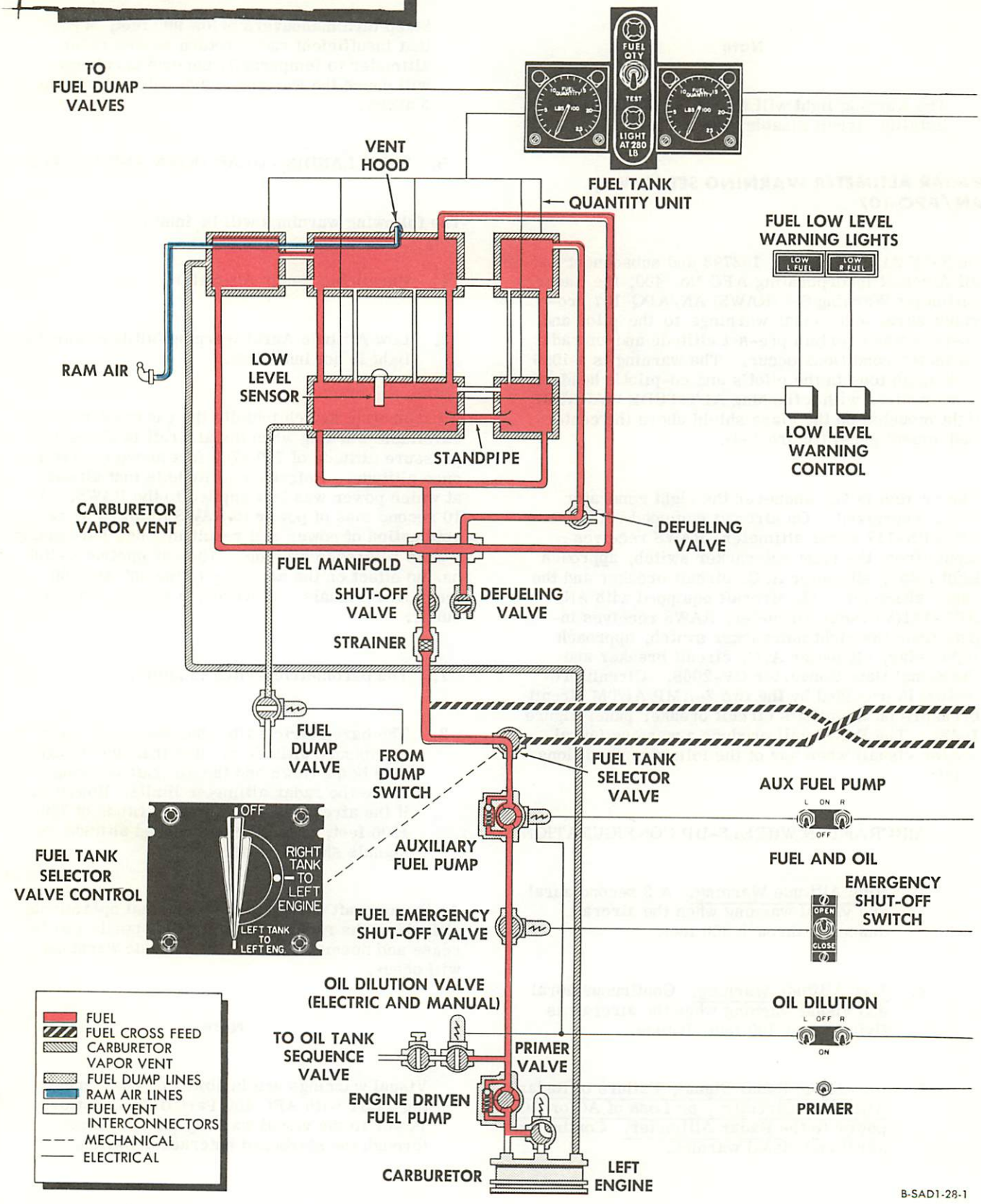


Figure 1-18 (Sheet 1)

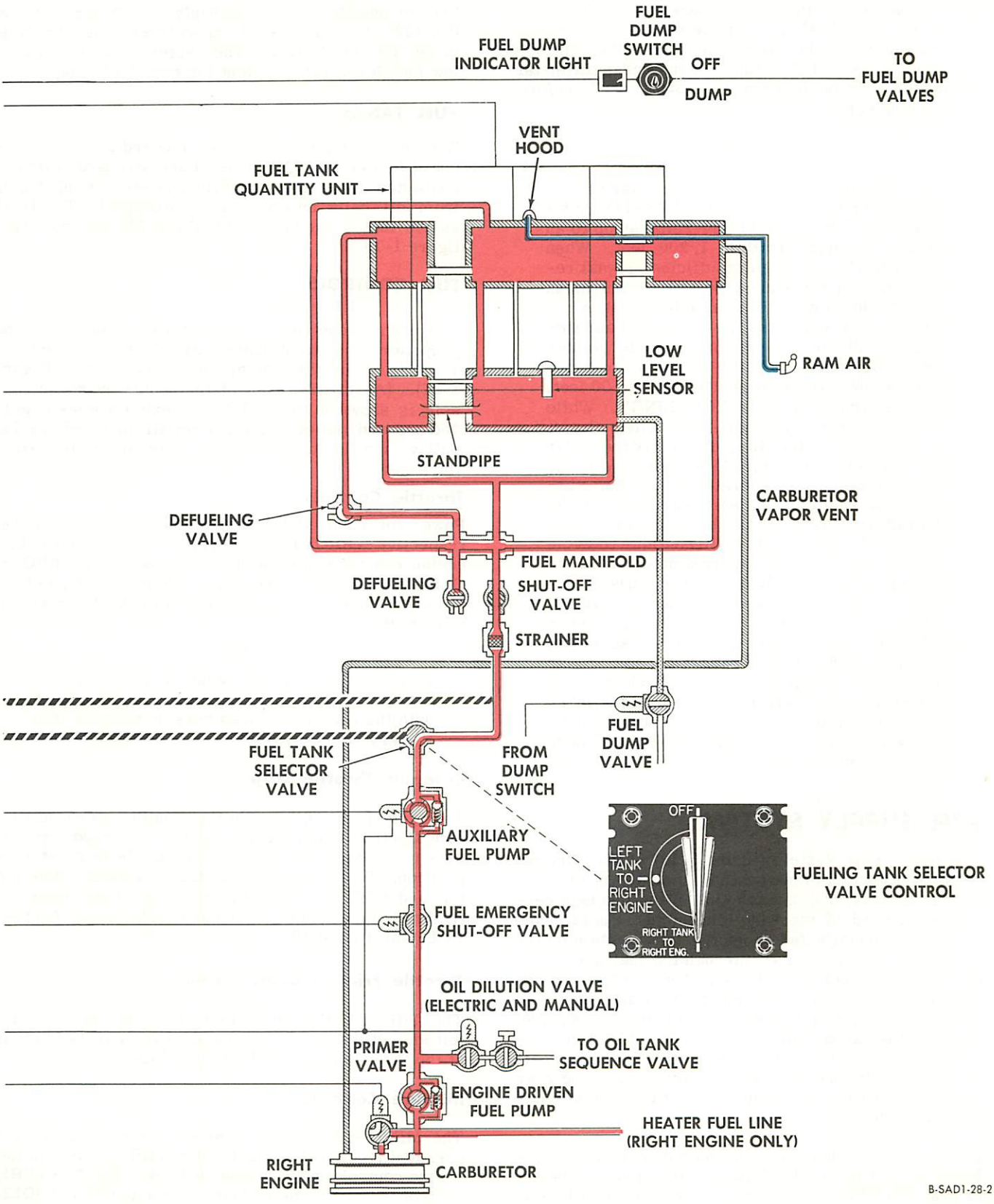


Figure 1-18 (Sheet 2)

Self Test Switch

A momentary push button LOW ALT. SYS. TEST switch on the pilot's instrument panel in S-2D aircraft and on the center instrument panel in S-2E aircraft (figures 1-3 and 1-4) will activate the aural and visual warnings in flight. In order to test the RAWS while flying above the reliable range of the radar altimeter the switch must be depressed for 3-9 seconds before the warning occurs.

Note

The following information is peculiar to aircraft equipped with the AN/APN-117 radar altimeter: The APN-117 is reliable up to an altitude of approximately 1,200 feet. When the APN-117 receives insufficient signal return, the pointer should go behind the mask and remain there until a reliable signal is received; however, as the aircraft ascends through 1,200 feet (approximately), the pointer goes behind the mask but continues to move into the low altitude region as high as 60 feet. This is referred to as "CYCLING". While the altimeter is cycling the reliability circuit still indicates reliability. Therefore the radar altimeter signals to the RAWS are exactly the same as would be generated at true low altitudes and result in a RAWS warning. As the aircraft continues to climb after this initial "CYCLE", the APN-117 will continue to cycle while in the range of approximately 1,200 to 2,000 feet. It is only during the initial "CYCLE" that spurious warnings are generated. If the aircraft altitude varies between 1,000 - 2,000 feet RAWS will generate a series of warnings (2-6 BEEPS) each time the radar altimeter first cycles. Above 2,000 feet the APN-117 pointer will remain behind the mask indicating a true unreliable condition and warnings will be inhibited until the APN-117 once again becomes reliable.

FUEL SUPPLY SYSTEM

The fuel supply system (figure 1-18) of the aircraft consists of two fuel tank systems mounted in the wing center sections, one on each side of the fuselage centerline inboard of the wing fold joints. Fuel to each engine is normally fed from the tank system on the same side as the engine, through the fuel line manifold, the fuel strainer, the selector valve, the electrically driven fuel boost pump, the emergency fuel shut-off valve, and through the engine-driven fuel pump to the carburetor. The crossfeed system consists of lines running from a tee fitting downstream of the fuel strainer, across the fuselage at the rear wing beam, to the selector valve of the opposite engine installation.

Fuel feed to each engine is controlled by a fuel selector valve (figures 1-22 and 1-20) which may be set to draw fuel through its respective crossfeed line or direct it from the tank system on the same side. All cells of each tank system are pressurized in flight by ram air taken in through a vent on the outboard side of each nacelle. The weight of the fuel in each tank is measured by an electronic, capacitance system, and is read in pounds on the indicators. To convert gallons to pounds of fuel, multiply by 6.0 per gallon at 0°C (32°F). For other temperatures refer to Table in Section XI, Part 1. The system also contains a low fuel-level warning light for each fuel tank.

FUEL TANKS

Each fuel tank consists of two inboard and three outboard fuel cells. The inboard and outboard cells are connected to a common vent system. Fuel drains from all cells into a common manifold. The total usable fuel capacity of all cells is 728 gallons. (See figure 1-19.)

FUEL CONTROLS

The engine controls for the throttle, mixture, and propeller consists of dual-control levers contained in a quadrant in the center overhead console (figure 1-24). (An overall view of the center overhead console is shown in figure 1-6.) Flexible cables lead to sectors and pulleys at the firewall and bellcranks; pulleys and flexible controls lead from the firewall to the engine.

Throttle Controls

Power for each engine is manually controlled by the respective THROTTLE control lever mounted in the engine control quadrant (figure 1-24). The THROTTLES are CLOSED when they are in the aft position and are manually moved forward to the OPEN position to increase power.

Note

Release GUST LOCK control handle (figure 1-24) and stow in full forward position flush with the center overhead console to obtain full travel of the throttles.

Catapult Throttle Grip

This grip is a "T" handle fixed on the overhead Engine Control Panel (figure 1-24) in a curved depression immediately aft of the GUST LOCK in its stowed position. When the THROTTLES are held in the full forward OPEN position by the palm of the hand the fingers will adequately reach and hold onto the CATAPULT throttle GRIP.

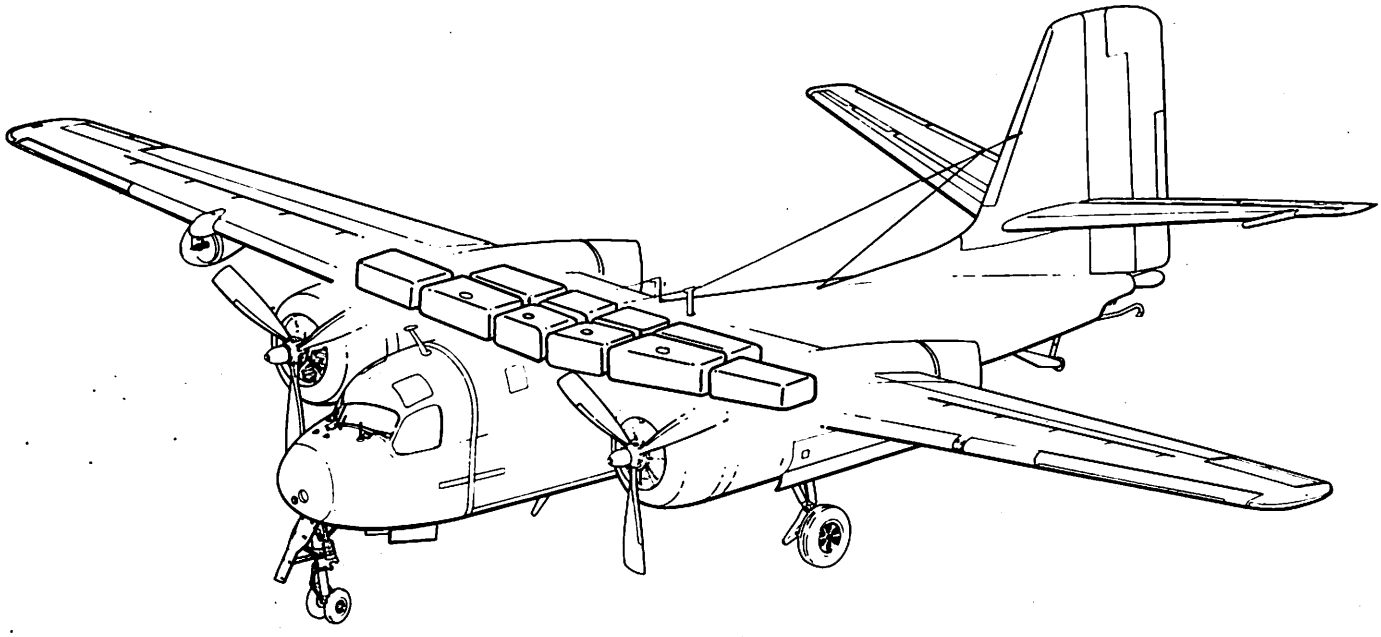
Throttle Friction Control Knob

The THROTTLE FRICTION knob is mounted on the left side of the overhead console and controls friction of the throttle levers only (figure 1-24).

Mixture Controls

The MIXTURE controls consist of a set of manually operated levers to the right of the THROTTLES on the engine control quadrant (figure 1-24). The MIXTURE control levers can be moved to three positions: IDLE CUTOFF (full aft position), NORMAL (intermediate position), and RICH (full forward position).

FUEL QUANTITY DATA TABLE



NOTE:

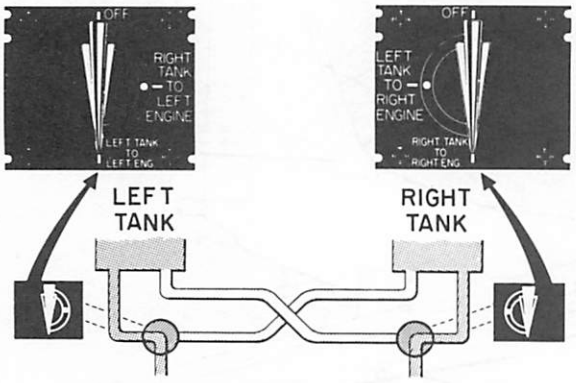
TO CONVERT GALLONS INTO POUNDS AT 0°C (32°F) MULTIPLY BY 6.0. FOR OTHER TEMPERATURES, REFER TO SECTION XI, PART 1.

TANK	NUMBER OF CELLS	USABLE FUEL		TRAPPED OR UNUSABLE FUEL		EXPANSION SPACE		TOTAL VOLUME	
		LBS.	GAL.	LBS.	GAL.	LBS.	GAL.	LBS.	GAL.
LEFT WING	5	2184	364	30	5	81	13.5	2295	382.5
RIGHT WING	5	2184	364	30	5	81	13.5	2295	382.5
TOTAL	10	4368	728	60	10	162	27	4590	765

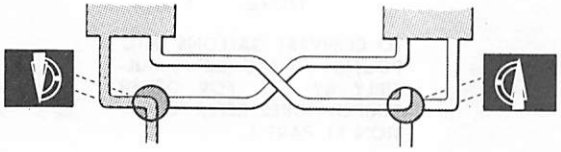
A-SAD1-27

Figure 1-19

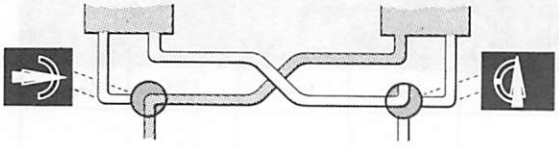
FUEL FLOW DIAGRAM



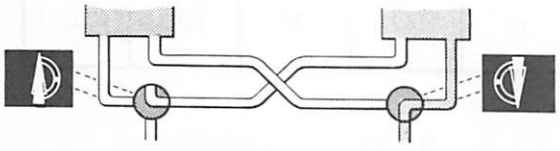
① TAKE-OFF, NORMAL CRUISE, LANDING
Left Tank To Left Engine, Right Tank To Right Engine.



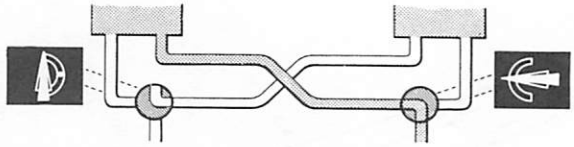
② LEFT ENGINE OPERATION
Left Tank To Left Engine, Right Engine Off.



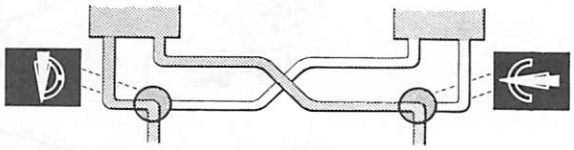
③ LEFT ENGINE OPERATION
Right Tank To Left Engine, Right Engine Off.



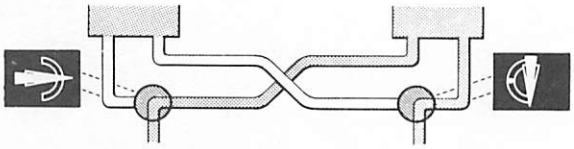
④ RIGHT ENGINE OPERATION
Left Engine Off, Right Tank To Right Engine.



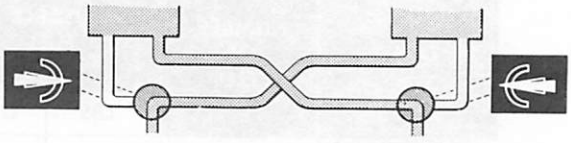
⑤ RIGHT ENGINE OPERATION
Left Engine Off, Left Tank To Right Engine.



⑥ BOTH ENGINES FROM LEFT TANK
Left Tank To Left Engine, Left Tank To Right Engine.

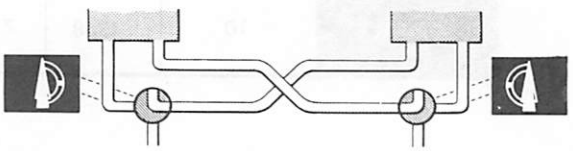


⑦ BOTH ENGINES FROM RIGHT TANK
Right Tank To Left Engine, Right Tank To Right Engine.



⑧ DOUBLE CROSS FEED OPERATION
Right Tank To Left Engine, Left Tank To Right Engine

POSSIBLE BUT NOT RECOMMENDED



⑨ SYSTEM OFF
No Fuel Flow To Either Engine

SAD1-126

Figure 1-20

Fuel Selector Valve Controls

The two fuel-selector valve controls are located aft on the center overhead console (figure 1-22). They are mechanically connected to the left and right fuel selector valves and are used to select desired fuel supply tanks. The control on the left side is used to supply fuel to the left engine from either fuel tank. The control is placarded OFF, RIGHT TANK TO LEFT ENGINE, and LEFT TANK TO LEFT ENGINE. The control on the right side is used to supply fuel to the right engine from either fuel tank and is placarded OFF, LEFT TANK TO RIGHT ENGINE, RIGHT TANK TO RIGHT ENGINE.

Fuel Quantity Gages

Two FUEL QUANTITY gages, on the co-pilot's instrument panel (figure 1-5), indicate pounds of fuel in each tank. To convert pounds of fuel to gallons, refer to Section XI, Part 1.

Fuel Quantity Gages Test Switch

A two-position momentary toggle switch is between the FUEL QUANTITY gages on the co-pilot's instrument panel (figure 1-5). With the switch in the (normal) position, the quantity of fuel in all cells registers on the fuel quantity gages. The gages may be checked for proper operation by moving the switch momentarily left to the TEST position.

Low Fuel Level Warning Lights

Two fuel warning lights placarded LOW L FUEL and LOW R FUEL are located on the co-pilot's instrument panel under the FUEL QUANTITY gages (figure 1-5). The outboard aft cell in each wing incorporates a low fuel level sensor. When the fuel level reaches 280±25 pounds in either tank (approximately 1 hour), the sensor is exposed to air, and the associated low fuel level warning light will go on. The lights are independent of calibration of the fuel quantity gages.

Note

At low fuel levels, the low fuel level warning lights are a more accurate indication of actual fuel remaining than the fuel gages, provided the aircraft is in level flight.

Fuel Boost Pump Switches

The two FUEL BOOST pump, two-position toggle switches are on the left overhead console (figure 1-21). They are electrically connected to the left and right fuel boost pumps and are placarded ON and OFF for the left (L) and right (R) engines.

Primer Switch

The PRIMER switch is a three-position, momentary-type toggle switch located on the left overhead console (figure 1-21). The switch is placarded LEFT ENGINE and RIGHT ENGINE. Positioning the switch to either position injects fuel directly to the induction system on the selected engine through the left and right sides of the carburetor adapter.

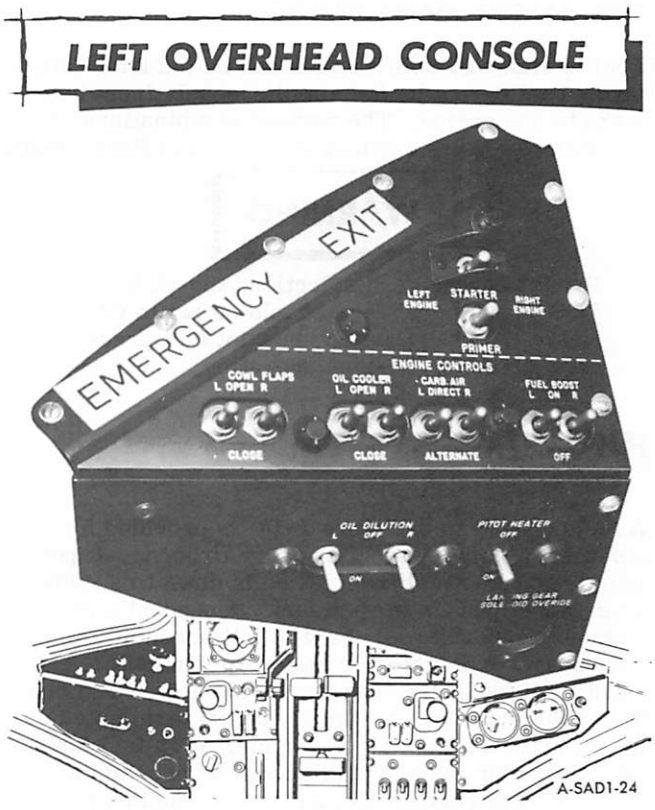


Figure 1-21

Emergency Fuel and Oil Shutoff Switches

An emergency FUEL & OIL shutoff switch is on each engine emergency control panel (figure 1-25). The guarded two-position toggle switch, normally set to OPEN, is set to CLOSE to shutoff the fuel and oil supply to each engine in case of fire or other emergency.

CARBURETOR AIR INDUCTION

Each engine is equipped with a carburetor air induction system to furnish the carburetor with either cold air, warm air, or a mixture of both. An external air scoop supplies cold ram air to the carburetor. Heated air is supplied through an electrically actuated door. The door may be positioned for cold air, hot air, or a mixture of both.

Carburetor Air Door Switches

Two single-pole, double-throw carburetor air door switches are on the left overhead console (figure 1-21). The switches are placarded CARB AIR, L and R, with DIRECT and ALTERNATE positions. When the switch is moved from its central OFF position to DIRECT, the air door actuator is electrically energized to open the cold air duct and close the alternate air duct. When the switch is placed in the ALTERNATE position, the air door actuator is electrically energized to close the cold air duct and open the alternate air duct to permit heated air to enter the carburetor. When the switch is momentarily placed in DIRECT or ALTERNATE position, any desired proportionate mixture of ram and heated air may be obtained.

FUEL SYSTEM MANAGEMENT

Fuel to either or both engines can be fed from either tank. Fuel cannot be fed simultaneously from both tanks to one engine. The various combinations of fuel selector valve settings are shown in figure 1-20.

WARNING

Prior to cross-feed selection, the FUEL BOOST pump switches should be set to ON and left ON to maintain constant fuel pressure during cross-feed operation.

FUEL DUMP SYSTEM

A fuel dump system (figure 1-18) is provided for emergency weight reduction when airborne. It permits jettisoning fuel from all cells down to a minimum of 390 pounds in each tank, dependent upon ambient temperatures. Fuel is jettisoned at a total rate of approximately 200 gallons per minute. The quantity of fuel jettisoned can be monitored and controlled by the pilot. Dumping may be terminated at any time during the dumping cycle. With fuel tanks full, jettisoning is accomplished in approximately 3 minutes. Inadvertent operation of the fuel dump system while the aircraft is on the deck is prevented by the nutcracker switch on the starboard landing gear shrink strut.

The motor-actuated dump valves, normally CLOSED, are controlled by a switch on the fuel dump control panel (figure 1-23). A fuel dump indicator light located on the pilot's overhead console is on while the fuel dump system is in operation.

Because of a standpipe, the system discontinues dumping when the fuel level reaches approximately 390 pounds. A switch in the fuel quantity indicator opens when each fuel quantity indicator reads 300 ±25 pounds and the dump valve relays are deenergized. This closes the dump valves. Ram air keeps the fuel cells from collapsing during the fuel dumping operation.

WARNING

If either fuel indicator or if the fuel quantity coaxial connectors behind the co-pilot's seat become loose or disconnected, low or zero fuel indication could result. This will prevent dumping fuel from the tank that indicates less than 300 ±25 pounds of fuel remaining.

NEW

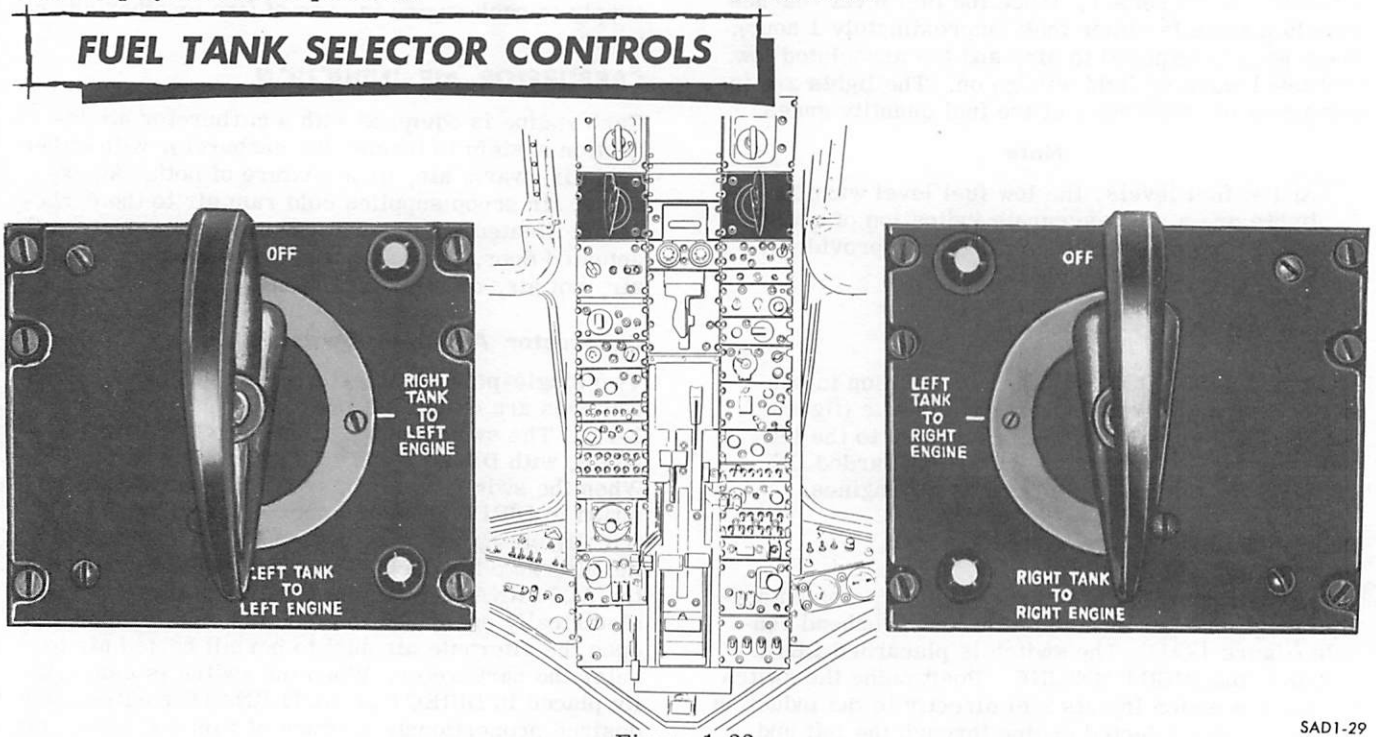
FUEL DUMP CONTROLS

Fuel Dump Switch

A lever lock fuel dump switch on the fuel dump panel on the center overhead console (figure 1-22) is electrically connected to the motor-actuated dump valves through the FUEL DUMP circuit breaker on the co-pilot's circuit breaker panel. The two-position lever lock switch can be set to DUMP or OFF. To jettison fuel, the switch must be placed in the DUMP position. The fuel dump system is inoperative when the aircraft is on deck.

Fuel Dump Warning Light

The fuel dump warning light is on the fuel dump panel (figure 1-22) on the center overhead console and is placarded FUEL DUMP. This light is on whenever the fuel dump switch is placed in the DUMP position. It remains on until the switch is returned to the OFF position whether airborne or on the deck.



SAD1-29

Figure 1-22

FUEL DUMP CONTROL PANEL

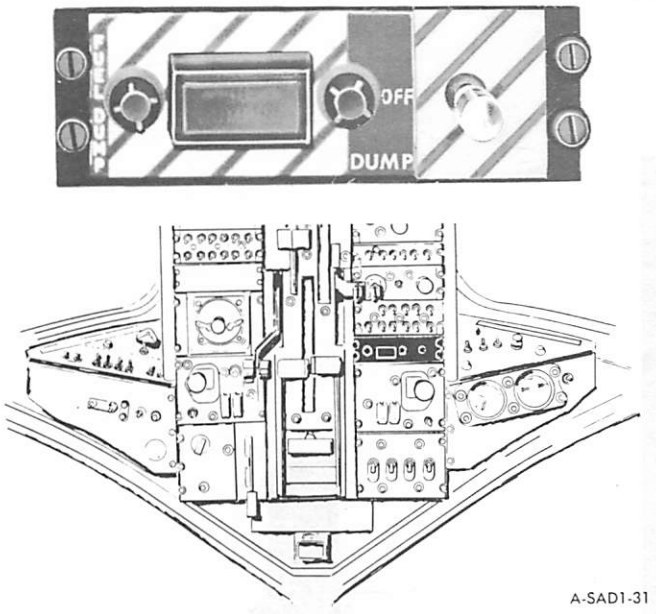


Figure 1-23

PROPELLERS

The aircraft is equipped with two 11-foot-diameter, three-blade engine-oil type, full feathering, constant-speed hydromatic propellers. Normal operation of the propellers is controlled manually by movement of levers in the cockpit. A propeller governor is mechanically connected to the propeller control handles on the engine control quadrant (figure 1-24). The propeller governor supplies engine oil under pressure, to the propeller mechanism for propeller pitch control. Manually controlled feathering and unfeathering operations are accomplished through a button-controlled feathering pump. Automatic feathering is controlled by a torquemeter sensing switch and a throttle position switch when the system is armed. Propeller deicing is accomplished by blade-heater units cemented to the leading edge of each blade.

PROPELLER CONTROLS

Propeller RPM Controls

Two manually operated PROPELLER (RPM) control levers on the engine control quadrant (figure 1-24) are used to change engine speeds by altering propeller pitch. Engine RPM is increased by moving the propeller control levers forward to INCREASE (low pitch). Conversely, a decrease in engine RPM is accomplished by moving the propeller control levers aft to DECREASE (high pitch).

Propeller Friction Control Lever

The propeller friction control lever, which has a rectangular knob for a handle, is mounted on the left side of the overhead console (figure 1-24). This lever rotates a shaft which can set the amount of friction required to hold the propeller RPM levers in the desired position. The propeller friction control is completely independent of the THROTTLE FRICTION control as they are on concentric shafts.

Propeller Feather Buttons

The two push-pull propeller feathering buttons, one for each propeller, placarded PUSH FEATHER and UNFEATHER PULL are on the left engine and right engine emergency control panels (figure 1-25).

Propeller Feather Indicator Lights

On all aircraft not incorporating AFC No. 412 a propeller feather indicator light is inside each propeller feathering button. The lights are on when power is applied to the DC essential bus.

Torque Pressure Sensing Switch Lights

On aircraft BuNo. 151670 and subsequent and S-2 aircraft incorporating AFC No. 412, a torque pressure sensing light is inside each propeller feathering button (figure 1-25). These lights indicate the position of the torque pressure sensing switches. With the auto feathering system armed, the light will come ON when the associated torque pressure sensing switch is closed. A rheostat on the right engine emergency panel controls the brightness of both lights.

Automatic Propeller Feathering Switch

Automatic feathering is controlled by a two-position toggle switch on the left engine emergency control panel. (See figure 1-25.) The switch is placarded AUTO FEATHERING, OFF, and ARMED. When the switch is set to ARMED, and the ARMED indicator light glows, power is available to the torque pressure sensing switch.

Note

With the switch set to ARMED, only one propeller can be feathered automatically. If one propeller feathers, the auto-feathering system is automatically de-armed.

Auto Feathering Armed Light

An Auto-Feathering ARMED light is located next to the AUTO FEATHERING arming switch on the left engine emergency control panel (figure 1-25). The light goes on when the switch is set to ARMED providing the auto-feathering arming circuit breaker is depressed. When the light goes on the automatic feathering system is operative.

NEW

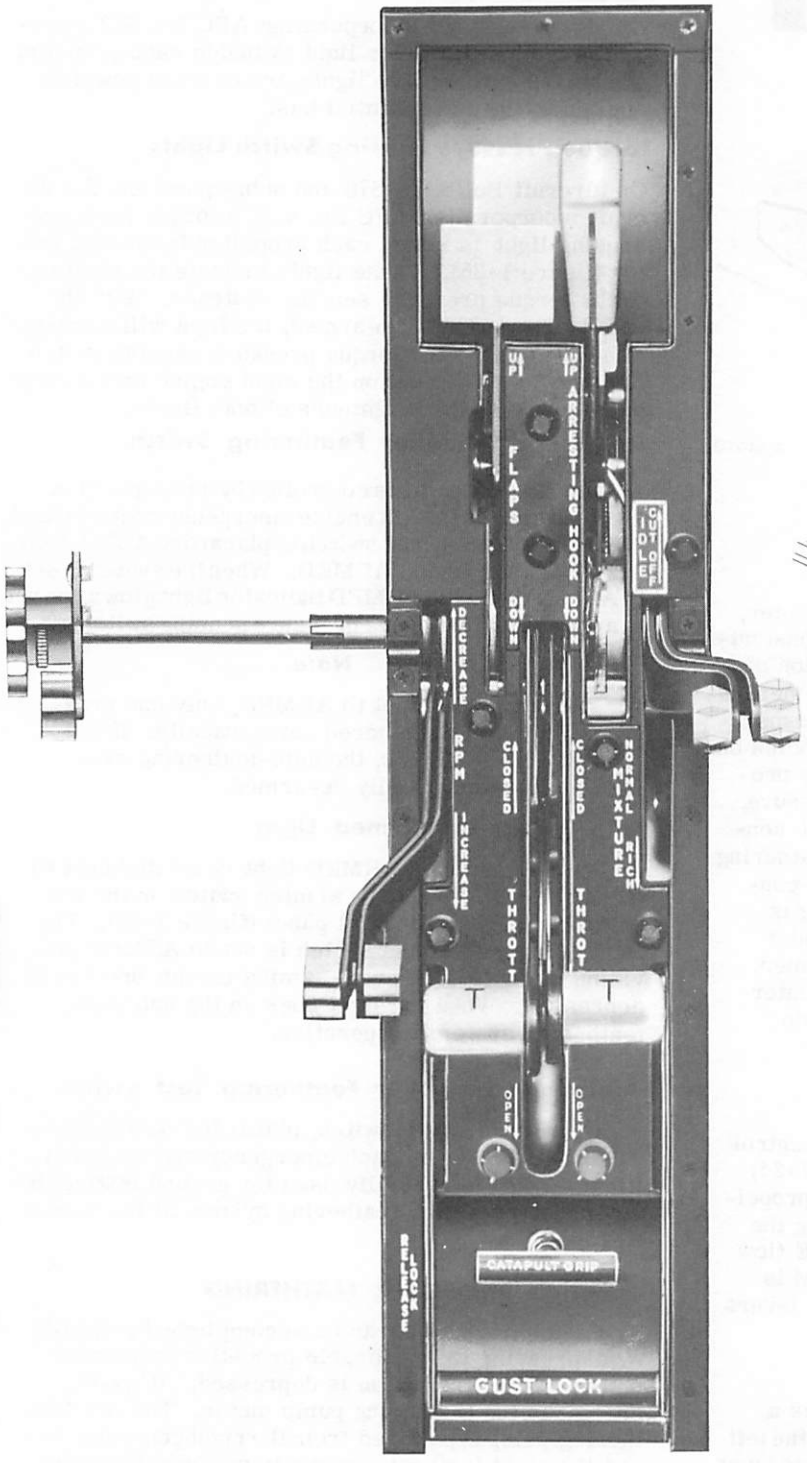
Automatic Propeller Feathering Test Switch

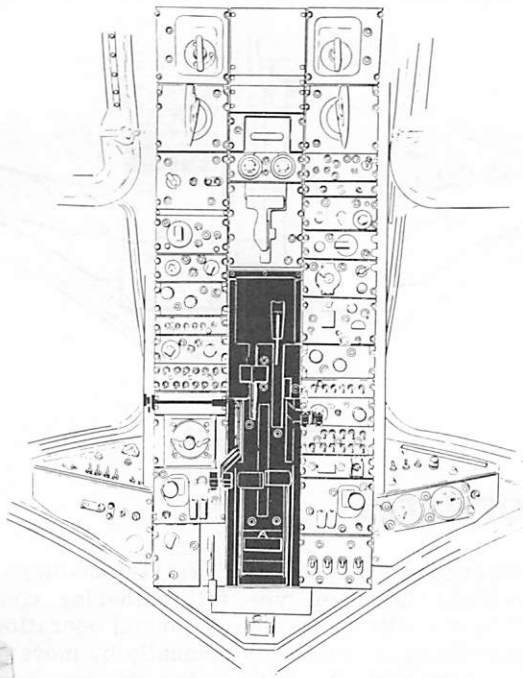
A momentary toggle switch, placarded AUTO FEATHERING TEST, on each emergency control panel (figure 1-25) is normally used for ground testing the automatic propeller feathering system at low power settings.

MANUAL PROPELLER FEATHERING

Propeller feathering can be accomplished manually by depressing the applicable propeller feathering button. When the button is depressed, AC power energizes the feathering pump motor. The left feathering pump is powered from the right generator bus and the right feathering pump is powered from the left generator bus. The pump supplies engine oil from the main oil tank to the propeller constant speed

ENGINE CONTROL QUADRANT





SAD1-23

Figure 1-24

ENGINE EMERGENCY CONTROL PANELS

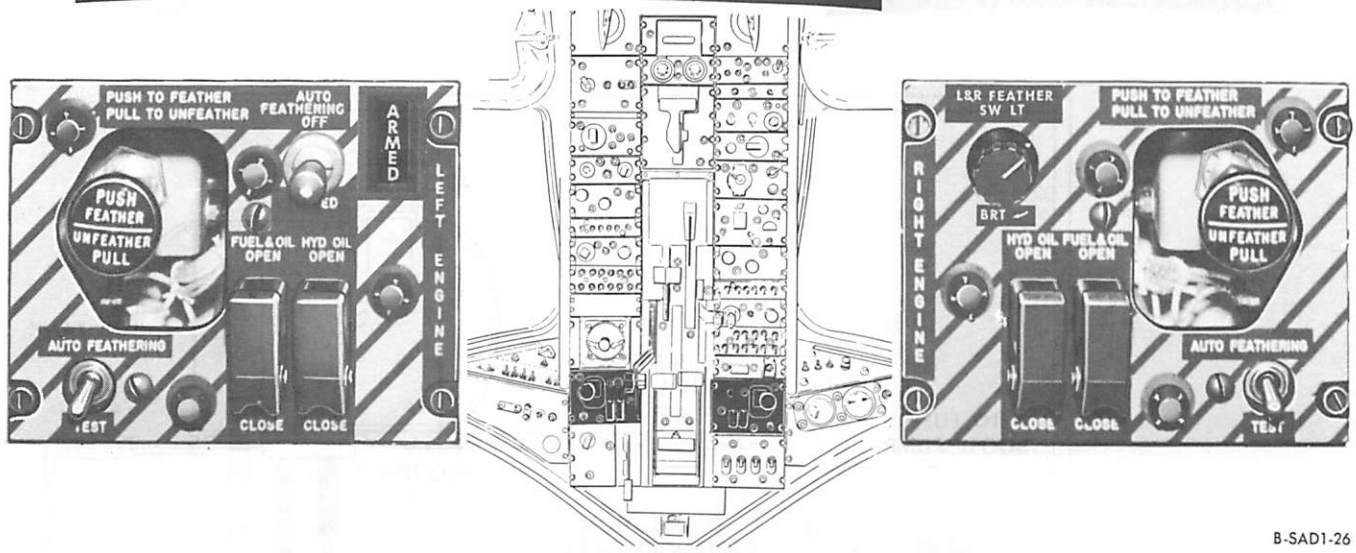


Figure 1-25

control. The feathering button remains engaged until the feathering cycle is completed, then pops out to a center position.

CAUTION

If the feathering button does not pop out, pull the button to center position and check AC loadmeter for indication of feathering pump cutout.

The duty cycle of the feathering pump is 1 minute on, 14 minutes off.

CAUTION

If the feathering button does not remain depressed, depress the button until the propeller is fully feathered.

PROPELLER UNFEATHERING

Propeller unfeathering is accomplished manually by pulling and holding the feathering button. Releasing the spring-loaded button to the OFF position stops the unfeathering operation. The propeller blades reestablish themselves in accordance with the controls set in the cockpit.

AUTOMATIC PROPELLER FEATHERING

The automatic propeller feathering system requires that the pilot manually set the AUTO FEATHERING arming switch to the ARMED position for automatic system operation. System operation depends upon two conditions which must exist before the system operates: when the throttle is advanced to at least 75% travel and when the torque pressure drops below the 125±5 PSI lower limit set into the torquemeter sensing switch. The first value is sensed by the THROTTLE position switch located in the upper right side of the firewall in each nacelle; the second value sensed by the torquemeter sensing switch measures torque pressures. The torquemeter switch opens at 142±10 PSI and will close and automatically energize the propeller feathering switch when the torque pressure sensed drops below the switch preset limit of 125±5 PSI. Due to system and gage errors, the switch should be closed before an observed torque pressure of 100 PSI.

WARNING

If the system does not go into operation before an observed 100 PSI torque pressure reading, one or more of the components of the automatic feathering system requires replacement. For check-out procedures of the automatic propeller feathering system, refer to Section III.

The pilot can override automatic feathering operation at any time by manual operation of the feathering button. The system includes a 1.5 seconds time delay after all relays are energized.

A momentary toggle switch, placarded AUTO FEATHERING TEST, on each engine emergency control panel (figure 1-25) is normally used for ground testing the automatic propeller feathering system at low power settings. With the AUTO FEATHERING arming switch set to ARMED, the ARMED indicator light ON, and the torque pressure observed below 100 PSI, holding the AUTO FEATHERING TEST switch to TEST allows power to the throttle position switch and depresses the feathering button. The feathering button then actuates the feathering pump. The feathering button must be pulled out to stop the feathering cycle. The AUTO/FEATHERING arming switch must be recycled or aircraft electrical power interrupted to rearm the system and to relight the autofeathering ARMED light after each test. NEW NEW

OIL SUPPLY SYSTEM

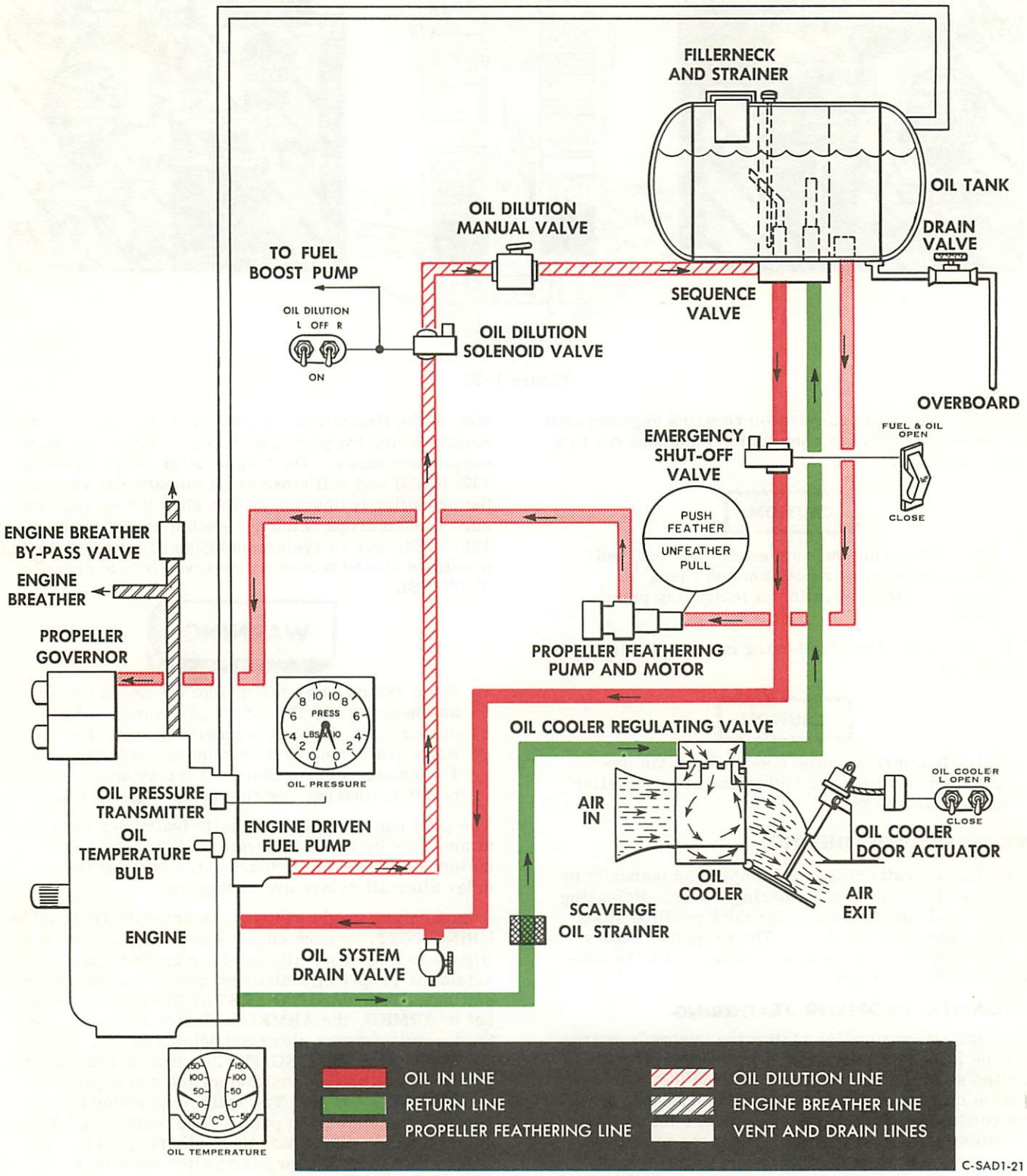


Figure 1-26

OIL SUPPLY SYSTEM

The oil supply system (figure 1-26) is an entirely self-contained unit within the power package. Each engine oil supply system consists of a supply tank, an oil strainer, an oil cooler and all necessary tubing, fittings and valves to provide engine lubrication, oil dilution, tank and engine venting, draining and propeller feathering. Oil for propeller feathering is taken from the bottom of the oil tank and run through a hose to the feathering pump. The oil tank has a capacity of 23.2 gallons and is mounted forward of the firewall between the upper engine mount tubes. For a breakdown of the oil tank capacity refer to the oil tank supply data table below.

The oil tank fillerneck is accessible through a door on the rear of the top accessory panel. This door cannot be closed unless the fillercap is properly seated. An arm attached to the door prevents it from being secured until the fillercap is properly seated. If the filler cap is not installed, a red flag will be visible on the access door. See Servicing Diagram (figure 1-70) for oil grade and specification.

ITEM	CAPACITY IN GALLONS
Stand pipe and pump	0.5
Engine Supply	15.0
Propeller feathering	1.0
Foam and expansion space	6.7
Total tank capacity	23.2

OIL CONTROLS

Oil Cooler Doors Switches

Two three-position OIL COOLER L and R switches on the left overhead console (figure 1-21) control electrically actuated doors that regulate the flow of air through the oil coolers. Each switch can be moved from the OFF position to the OPEN or CLOSE position. Returning the switch to the OFF position stops the movement of the doors in any desired position.

Oil Dilution Switches

The OIL DILUTION L and R switches are two-position momentary toggle switches on the left overhead console (figure 1-21). Each switch can be moved from the OFF position to the ON position. In the ON position and engines running, each OIL DILUTION switch operates its respective electric auxiliary fuel pump to mix raw gasoline with the engine oil supply. A manually operated valve in each nacelle must be opened prior to electric oil dilution switch operation. At all other times, the manual valve must be OFF and secured with safety wire. For further information on oil dilution, see Section VI, Cold Weather Operation paragraph.

Emergency Fuel and Oil Shutoff Switches

An emergency FUEL & OIL guarded shutoff switch is on each engine emergency control panel (figure 1-25). The two-position toggle switch, normally set to OPEN, can be set to CLOSE to shut-off the fuel and oil supply to each engine in case of fire or other emergency.

TORQUEMETER OIL LINE HEATER

A thermostatically controlled heating element encases the torquemeter oil pressure line. This keeps the oil pressure line at a constant temperature to prevent the oil in the line from congealing as a result of outside air temperature and propeller air blast. The hermetically sealed thermostat is set to maintain oil temperature between 41°C (105°F) and 93°C (200°F). The heater is supplied 28 volt DC power from the DC JUNCTION BOX (figure 1-42) through the TORQUE LINE HTR circuit breaker.

ENGINE COOLING

COWL FLAPS SWITCHES

A single electrically actuated cowl flap, located on either side of each engine accessory cowling, assists in controlling the temperature of the engine. The cowl flaps are controlled by two 3-position toggle switches on the left overhead console (figure 1-21). The switches are placarded COWL FLAPS L and R, with OPEN and CLOSE positions. Any desired engine temperature may be obtained by momentarily placing the switches in OPEN or CLOSE position.

IGNITION SYSTEM

Each engine is equipped with a low-tension ignition system. The system consists of an engine-driven dual magneto, a magneto to manifold assembly, a harness assembly, 9 transformer coils, 18 spark plug leads, and 18 spark plugs.

IGNITION CONTROLS

Master Ignition Switch

The master IGNITION switch is a two position push-pull switch which controls the individual left and right magneto switches as a combined unit. It is labelled PULL-OFF and in this position neither individual switch will operate its respective magneto. It is mounted in the center of the ignition control panel (figure 1-27).

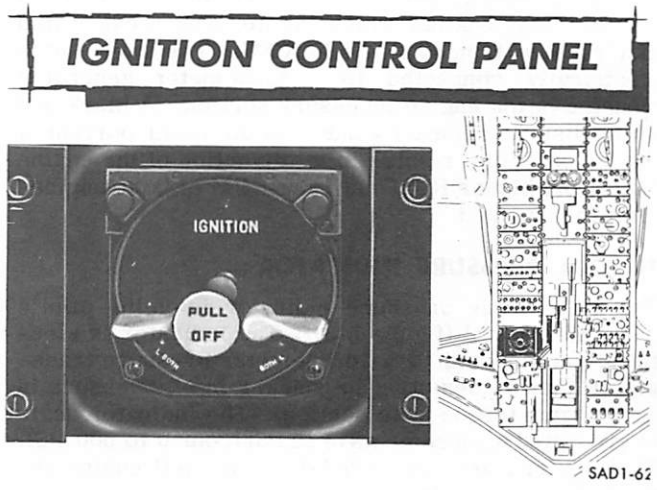


Figure 1-27

Individual Engine Magneto Switches

The individual left and right engine MAG ignition switches are on the same panel as the Master Ignition Switch (figure 1-27). Each individual engine MAG switch, placarded 1 and 2, has four positions placarded BOTH, L, R, and OFF. The individual MAG switches, when set to L or R, are used to check their respective magnetoes.

Starter Switch

The STARTER switch (figure 1-21) controls the starter circuit for both engines. The switch is a single-pole double-throw momentary-type switch which is normally OFF in the center position and ON when held in either extreme position labelled LEFT ENGINE or RIGHT ENGINE.

ENGINE INSTRUMENTS

The engine instruments are on the main instrument panels (figures 1-3 through 1-5), which consists of three separate shock-mounted panels located forward of the pilot and co-pilot. Electrically operated instruments or instruments which are a part of an electrical remote indicating system have individual circuit breakers (figure 1-42) to isolate the instrument or the system in the event of trouble. Warning and caution lights are installed to indicate unsatisfactory or dangerous conditions. A warning lights test switch is installed on the pilot's instrument panel to check the warning circuits (figures 1-3 and 1-4).

MANIFOLD PRESSURE INDICATOR

A dual manifold pressure indicator (MAP) is on the center instrument panel (figure 1-4). The indicator has two pointers, marked 1 for the left engine and 2 for the right engine. The pointers rotate over a dial marked in increments of one from 10 to 75 inches Hg. A hose connects the indicators to a fitting on the engine intake manifold just below the carburetor.

TACHOMETER

A dual tachometer (RPM) is on the left and center instrument panels (figures 1-3 and 1-4) and measures engine speed in revolutions per minute. The indicator has two pointers, marked 1 for the left engine and 2 for the right engine, which rotate over a calibrated dial ranging from 0 to 4,500 RPM. The indicator is electrically connected to a tachometer generator mounted on the engine accessory section. A black and white disc in a small window in the lower portion of the indicator dial rotates in the direction of the engine having the higher RPM until the RPM of both engines are synchronized.

TORQUE PRESSURE INDICATOR

The dual torque pressure indicator is on the pilot's instrument panel (figure 1-3). The indicator is electrically connected to a torquemeter pressure transmitter that is sensitive to changes in oil pressure in each engine torque nose section. The indicator scale is graduated in increments of 10 PSI from 0 to 500 PSI. The pointers are placarded L for the left engine and R for the right engine.

FUEL PRESSURE INDICATOR

The dual FUEL PRESS indicator is on the pilot's instrument panel (figure 1-3). The left scale is for the left engine and the right scale for the right engine. Both indicator scales are graduated from 0 to 50 PSI in increments of 2 PSI.

OIL PRESSURE INDICATOR

The dual OIL PRESS indicator is on the pilot's instrument panel (figure 1-3) and is electrically connected to an oil pressure transmitter in each engine accessory section. The left scale is for the left engine and the right scale for the right engine. The indicator scales are graduated in increments of 5 PSI from 0 to 100 PSI.

OIL TEMPERATURE INDICATOR

The dual engine OIL TEMP indicator is on the pilot's instrument panel (figure 1-3). The indicator is connected to an oil temperature bulb in the oil-in line to each engine. The left scale is for the left engine and the right scale is for the right engine. The indicator dial is calibrated in 10° increments through a range of -70° to 150°C (-94° to +302°F).

MAGNETIC CHIP DETECTOR INDICATOR LIGHTS

Two chip detector indicator lights are on the top side of the glare shield above the center instrument panel (figure 1-4). The lights are placarded L MAG CHIP DET for the left engine and R MAG CHIP DET for the right engine and can be tested by operating the warning lights test switch.

Each light is electrically connected to the front and rear magnetic sump plugs, of its respective engine through the warning lights bus. The lights provide the pilot with indications of impending engine failure as evidenced by ferrous metal chips in the engine oil. The light associated with the affected engine will be on when any chip accumulation on any of the magnetic sump plugs is sufficient to complete the electrical circuit.

CYLINDER HEAD TEMPERATURE INDICATORS

Two CYL HEAD temperature indicators, one for each engine, are on the pilot's instrument panel (figure 1-3). The indicators are electrically connected to temperature bulbs located in the No. 6 cylinder of each engine. The indicator dials are graduated in 10° increments and range from -50° to 300°C (-58° to 572° F). NEW

CARBURETOR AIR TEMPERATURE INDICATOR

The dual-element CARB AIR TEMP indicator is on the pilot's instrument panel (figure 1-3). The indicator is connected to a temperature bulb in each carburetor header and indicates the temperature of the air in the carburetor intake duct. The left dial is for the left engine and the right for the right engine. The indicator is calibrated in 5° increments through a range of -50° to +50°C (-58° to +122°F).

STARTING SYSTEM

The starting system for each engine consists of an external power relay, a starter relay, a direct cranking starting motor, and an induction vibrator to boost ignition voltage during low cranking starting speed. During starting operation DC external power is used to flash the generator field through the DC essential bus. A STARTER switch (figure 1-21) controls the starter circuit for both engines. The switch is a single pole, double-throw, momentary-type switch, which is OFF in the center position and ON when held in either extreme position. The STARTER switch utilizes the same placarding as the PRIMER switch, LEFT ENGINE, and RIGHT ENGINE. Moving the toggle from OFF to LEFT ENGINE or to RIGHT ENGINE supplies external DC power to the left engine starter circuit or to the right engine starter circuit, respectively.

HYDRAULIC POWER SUPPLY SYSTEM

The normal hydraulic system pressure is produced by two variable-volume, engine-driven pumps. The system provides an operating pressure of 3,000 PSI for the wing fold, and 1,500 PSI (see figure 1-68, sheet 4 for tolerances) for the landing gear, wing flap, arresting hook, rudder trimmer, torpedo bay door, windshield wipers, Signals, Underwater Sound dispenser, marine marker dispenser, radome and brake systems. Pressure to the 1,500-PSI systems is supplied directly whenever either engine is operating, and through a pressure reducer when the wing fold system is being operated. Two reservoirs, main and emergency, are installed; the latter is refillable in flight. The emergency hydraulic system, which is completely independent of the normal system, is provided to lower the landing gear and wing flaps and to open or close the torpedo bay doors in the event of the malfunction of the normal system. With AFC #481 incorporated the emergency hydraulic system can be used to pump up the emergency and parking brake accumulator. The emergency system consists of a reservoir, a hand-operated pump, selector valves, and necessary tubing. See figure 1-70 for servicing instructions and figure 1-28 for the hydraulic power supply system schematic diagram.

HYDRAULIC SYSTEM CONTROLS

Hydraulic Pressure Indicator

The dual HYD PRESS indicator is located on the co-pilot's instrument panel (figure 1-5). The indicator is electrically connected to the left and right pressure transmitters through a 1-amp circuit breaker. The transmitters, in turn, are connected by a line to the hydraulic pump. The HYD PRESS indicator has a range of 0 to 5,000 PSI on each indicator dial.

Emergency Hydraulic Oil Shut-Off Switch

An emergency HYD OIL shutoff switch is located on each engine emergency control panel (figure 1-25). The switches are electrically connected to shutoff valves through a 5 amp circuit breaker. The two-position toggle switches, normally in the OPEN position, can be set to the CLOSE position to prevent hydraulic fluid flow to each engine in the event of fire or other emergency.

NORMAL HYDRAULIC SYSTEM OPERATION

With engines operating, hydraulic fluid is drawn from the main reservoir to the variable-volume pump on each engine. Each pump delivers a pressure of 1,500 PSI and also contains a compensator boost chamber to deliver 3,000 PSI when the compensator boost is operated during wing folding or spreading. The pressure from each pump is directed through disconnects, filters, and check valves into the system selector valve. With the wings spread, the two-position, four-way system selector valve remains in the deenergized position, allowing 1,500 PSI to be transmitted to all selector valves in the system. When the wings are folded, being folded or being spread, both wing-fold selector valves and the system selector valve are energized. The system selector valve ports pressure to the compensator ports of the engine-driven pumps, boosting the compensator spring and allowing the pumps to build up pressure to 3,000 PSI. The WING FOLD selector valve ports the 3,000 PSI to the wing-lock lock cylinder to start the wing fold operation. During this operation, the 1,500-PSI systems are fed through a pressure reducer.

The main hydraulic reservoir is non-pressurized and has a capacity of 3.7 gallons, including fluid in the fillerneck. A sight gage for checking fluid level is located on the tank.

EMERGENCY HYDRAULIC HAND PUMP

An emergency hydraulic handpump (figure 1-29) is used to develop hydraulic pressure to extend the landing gear, extend the wing flaps, and to open or close the torpedo bay doors in the event of normal system failure or when the engines are inoperative. With AFC #481 incorporated the emergency hydraulic system can be used to pump up the emergency and parking brake accumulator.

Emergency Hydraulic Hand Pump Handle

To obtain emergency hydraulic pressure, a fitting on the pump extends above the floor in the pilot's compartment and is manually pumped fore and aft by a removable handle. The handle, normally stowed in spring clips attached to the floor inboard of the co-pilot's seat, is inserted into the pump fitting and turned clockwise to lock.

EMERGENCY HYDRAULIC SYSTEM OPERATION

When normal hydraulic system pressure is not available, an emergency hydraulic handpump, located at the left of the co-pilot's seat, can be operated to open or close the torpedo bay doors, extend the landing gear, or lower the wing flaps. The handpump produces a pressure of 1,500 PSI and its flow is directed to the system selector valves. Shuttle

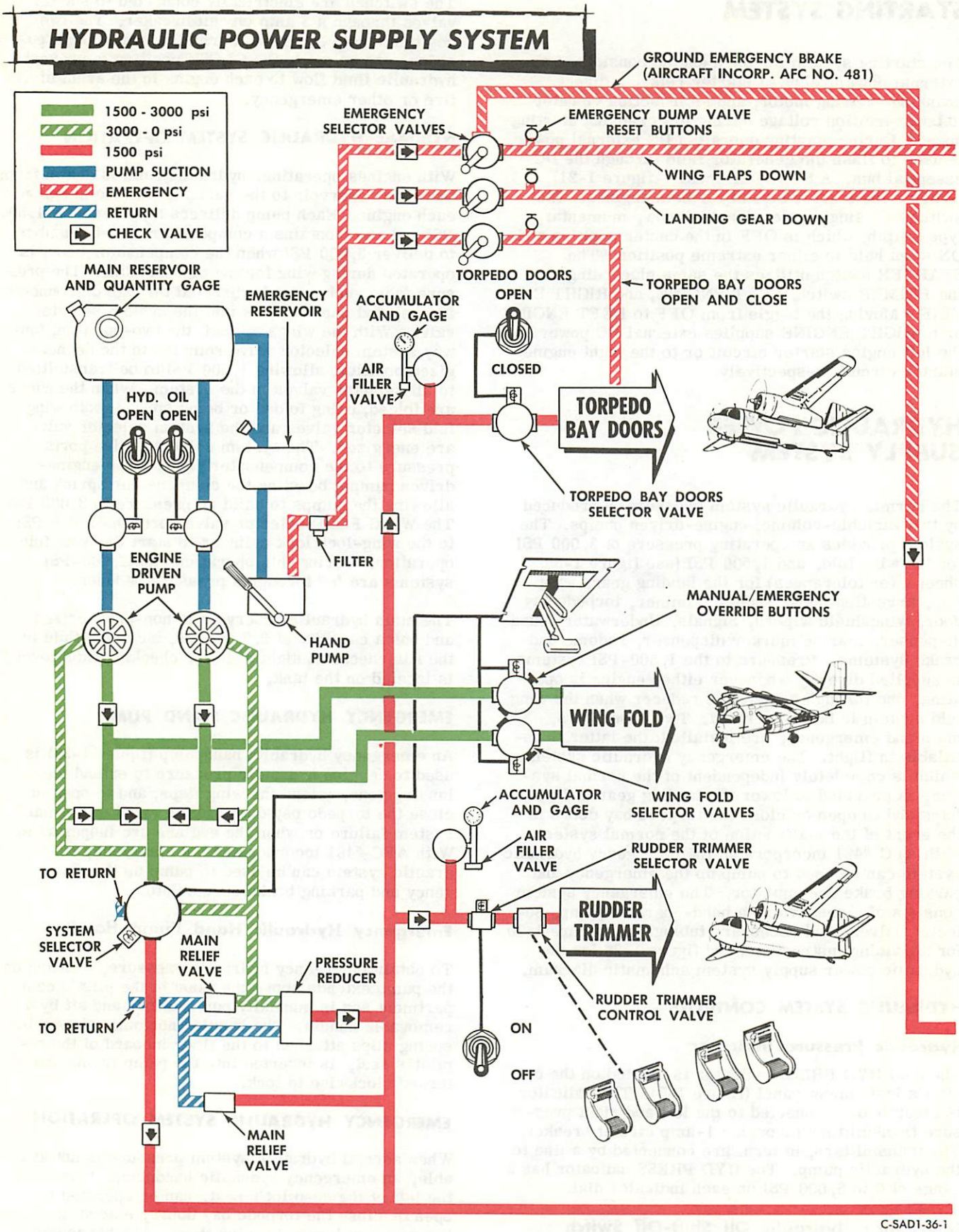


Figure 1-28 (Sheet 1)

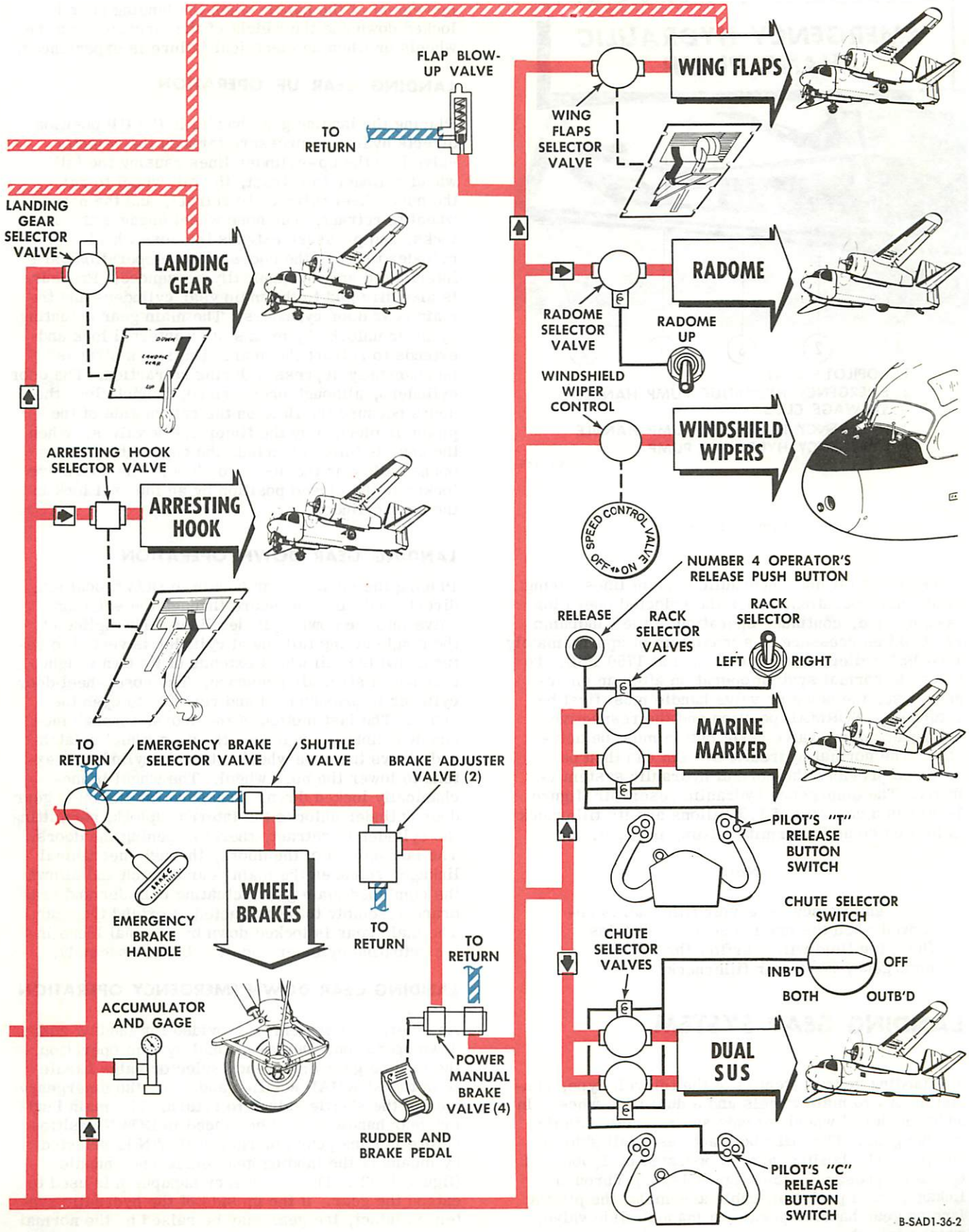


Figure 1-28 (Sheet 2)

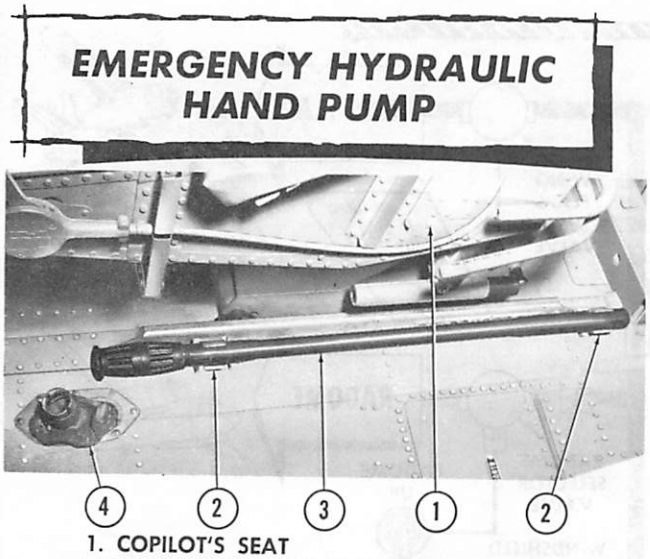


Figure 1-29

valves block off main hydraulic system lines during hand pump operation. When the selected operation is completed, continued operation of the handpump can build up pressure to a maximum of approximately 1900 PSI (relief valve cracks open at 1750 PSI). To return to normal system operation after an emergency use, the selector valve handle must first be returned to NORMAL position and the respective emergency dump valve reset button must be actuated. The normal hydraulic system can then be operated provided the normal hydraulic system is intact. The emergency hydraulic reservoir (figure 1-28) has a capacity of 1.3 gallons and its fillerneck is located so as to permit refilling in flight.

Note

If the emergency reservoir fillercap is removed when the main reservoir contains fluid, the fluid will overflow through the emergency reservoir fillerneck.

LANDING GEAR SYSTEM

The landing gear system is of the tricycle type, consisting of two main wheels and a dual nose wheel. In addition, a tail wheel extends and retracts with the landing gear. The tail wheel acts as a tail skid or bumper. The landing gear is operated by 1,500-PSI hydraulic pressure. (See figure 1-28.) Through linkage, and a push-pull cable assembly, the pilot's landing gear handle operates a manual slide valve, which ports the pressure to an up or down position. A landing gear safety solenoid operated by a nut-cracker switch on the right landing gear, prevents movement of the handle when the landing gear is locked down and the weight of the aircraft is on the wheels or when an electrical failure is experienced.

LANDING GEAR UP OPERATION

Placing the landing gear handle in the UP position directs hydraulic pressure through the selector valve into the up-cylinder lines causing the tail wheel cylinder to retract, the tail wheel to raise, the nose wheel cylinder to retract, and the nose wheel to retract. The nose wheel engages the uplocks, and pressure extends the nose wheel door cylinder to close the doors. These operations are interlocked and mechanically sequenced. Pressure is also directed to the main gear cylinders and the main gear door cylinders. The main gear actuating cylinder unlocks by means of an internal lock and extends to retract the gear. The shock strut is mechanically depressed during retraction. The door cylinders, although pressurized, cannot close the doors because the fluid on the return side of the piston is blocked by the timer check valves. When the gear is fully retracted, the timer check valve opens, allowing the doors to close. The doors are locked in the closed position by an internal lock in the door cylinder.

LANDING GEAR DOWN OPERATION

Placing the landing gear handle to DOWN position, directs hydraulic pressure through the selector valve into the down-cylinder lines. The upline of the single acting tail wheel cylinder is vented to return, and the tail wheel extends of its own weight plus shock strut air pressure. The nose wheel door cylinder is pressurized and retracts to open the doors. The last motion of the doors, through mechanical linkage, releases the nose wheel uplatch and allows the nose wheel actuating cylinder to extend to lower the nose wheel. The wheel is mechanically locked down. Pressure for the main gear door cylinder unlocks the internal uplock, permitting the cylinder to retract, thereby opening the doors. The last motion of the doors, through mechanical linkage, releases the main gear uplatch and allows the combined main gear actuating cylinder and drag brace assembly to be retracted to extend the gear. The main gear is locked down by internal locks in the actuating cylinder and drag brace assembly.

LANDING GEAR DOWN EMERGENCY OPERATION

An emergency system is provided for landing gear down operation. During normal system operation, the landing gear emergency selector valve handle is in the NORMAL position and vents the emergency side of the shuttle valves to return. The main landing gear handle should be placed in DOWN position before landing gear emergency DOWN is selected by means of the landing gear emergency handle (figure 1-32). The emergency handpump is used to extend the gear. If the up side of the hydraulic system is intact, the gear may be raised by the normal system after an emergency down has been accomplished by setting the landing gear emergency handle back to NORMAL, pushing the reset button of the

emergency dump valve located on the aft bulkhead in the operator's compartment (figure 1-33) and setting the normal control to UP.

CAUTION

When demonstrating the use of the landing gear emergency system do NOT reset and raise gear until it is DOWN and LOCKED. To prevent damage to the landing gear doors and possible jamming of the gear, ensure landing gear handle corresponds with the position of the gear before returning to the normal system.

LANDING GEAR CONTROLS

Landing Gear Handle

The landing gear handle on the pilots' overhead console (figure 1-30) is a two-position handle. The handle protrudes through a guide which has detents marked UP and DOWN and provides locking positions for the handle. The handle must be moved outboard against spring tension to move it from either detent.

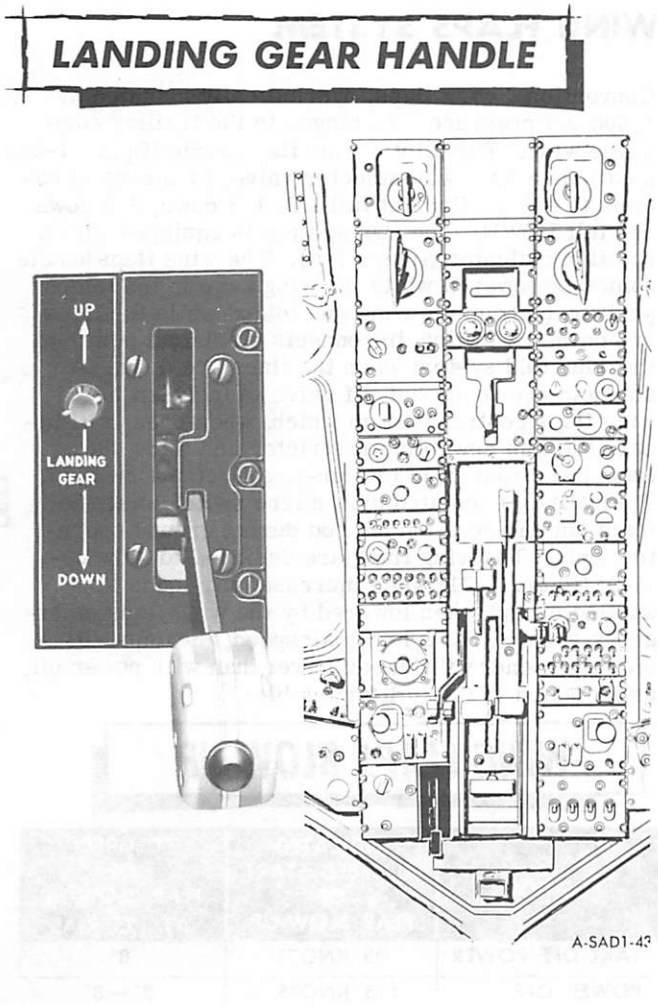


Figure 1-30

LANDING GEAR HANDLE POSITION SWITCHES

Three landing gear handle position switches are located within the pilots' overhead console and are controlled by the position of the landing gear handle. These switches perform the following functions:

1. Completes circuit to wheels down indicator and landing gear handle light.

2. Completes circuit to wheels up indicator and landing gear handle light.

3. Completes circuit to automatically raise or lower the radome or MCJR antenna (AFC 417, 449 or 484 incorp) when the radome or MCJR antenna UP/DOWN switch is in the DOWN position. The radome and MCJR antenna will automatically raise when the landing gear handle is placed down and will automatically extend when the landing gear handle is placed up. This switch also completes the circuit to automatically retract the MAD boom when the MAD boom is extended and disables the armament master control circuit when the landing gear handle is placed down.

Landing Gear Warning Light

The landing gear warning light is enclosed in the translucent knob of the landing gear handle (figure 1-30). This red light is on when the gear is in transmit or the handle is in the opposite detent from the position of the landing gear.

WARNING

If the landing gear is down and locked, but the landing gear handle is not in the DOWN detent, all indications (except position of the landing gear handle) may be ''down and locked.'' In this configuration, the ground-lock solenoid will not prohibit movement of the handle, and a small movement of the landing gear handle aft (such as might occur from a hard landing) may retract the wheels.

Wheels Position Indicator

The conventional wheels position indicator is part of the wheels and flaps position indicator on the co-pilot's instrument panel (figure 1-5). It indicates DOWN and LOCKED (WHEELS) or UP and LOCKED (UP), or the intermediate (BARBER POLE) indication of each landing gear. In the event of a landing gear malfunction, the indicator will show an intermediate indication for each wheel in an unsafe condition.

Wheels Warning Light

The wheels warning light is on top of the glare shield directly above the pilot's instrument panel (figure 1-3). The wheels warning light flashes WHEELS in red to warn the pilot that the landing gear is not

DOWN and LOCKED. Before the light starts flashing, all of the following conditions must occur:

1. Flaps not UP.
2. Landing gear not DOWN and LOCKED.
3. Both left and right throttles below minimum cruise settings (21 ± 1 inch of Hg MAP).

NUTCRACKER/SHRINK LINK SWITCH FUNCTIONS

The nutcracker switches, located in the shrink links are actuated when the weight of the aircraft is off the main landing gear. The following aircraft systems operate in conjunction with the port nutcracker switch:

1. Stall warning inoperative with aircraft on deck.
2. Approach light extinguished with aircraft on deck.
3. Wing fold inoperative when airborne.

The following aircraft systems operate in conjunction with the starboard nutcracker switch:

1. Fuel dump inoperative with aircraft on deck.
2. Wing stores jettison system inoperative with aircraft on deck.
3. Landing gear solenoid inoperative with aircraft on deck.
4. AFCS automatic trim inoperative with aircraft on deck.
5. RAWS visual warning inoperative with aircraft on deck (AFC 409 Part III incorporated).
6. Fast flap retract with aircraft on deck.

Landing Gear Solenoid Override Button

Inadvertent retraction of the landing gear is prevented by a ground-lock solenoid that prohibits movement of the landing gear handle unless the aircraft is airborne. Manual override of the ground-lock solenoid is provided by manually releasing the solenoid through the LANDING GEAR SOLENOID OVERRIDE access in the left overhead console (figure 1-21).

WARNING

The LANDING GEAR SOLENOID OVERRIDE RELEASE should not be operated on the ground except in the event of an emergency.

Landing Gear Emergency Selector Handle

The landing gear emergency selector handle is located under a hinged door between and just aft the pilots' seats (figure 1-32). The cover swings up and aft and is opened by inserting a finger in the hole of the forward end of the door. The selector valve is placarded LANDING GEAR, NORMAL and DOWN.

Landing Gear Emergency Dump Valve Reset Button

The LAND'G GEAR DUMP VALVE reset pushbutton is on the top of the bulkhead, next to the life raft release handle, aft of the Number 3 and 4 Operator's positions (figure 1-33).

WING FLAPS SYSTEM

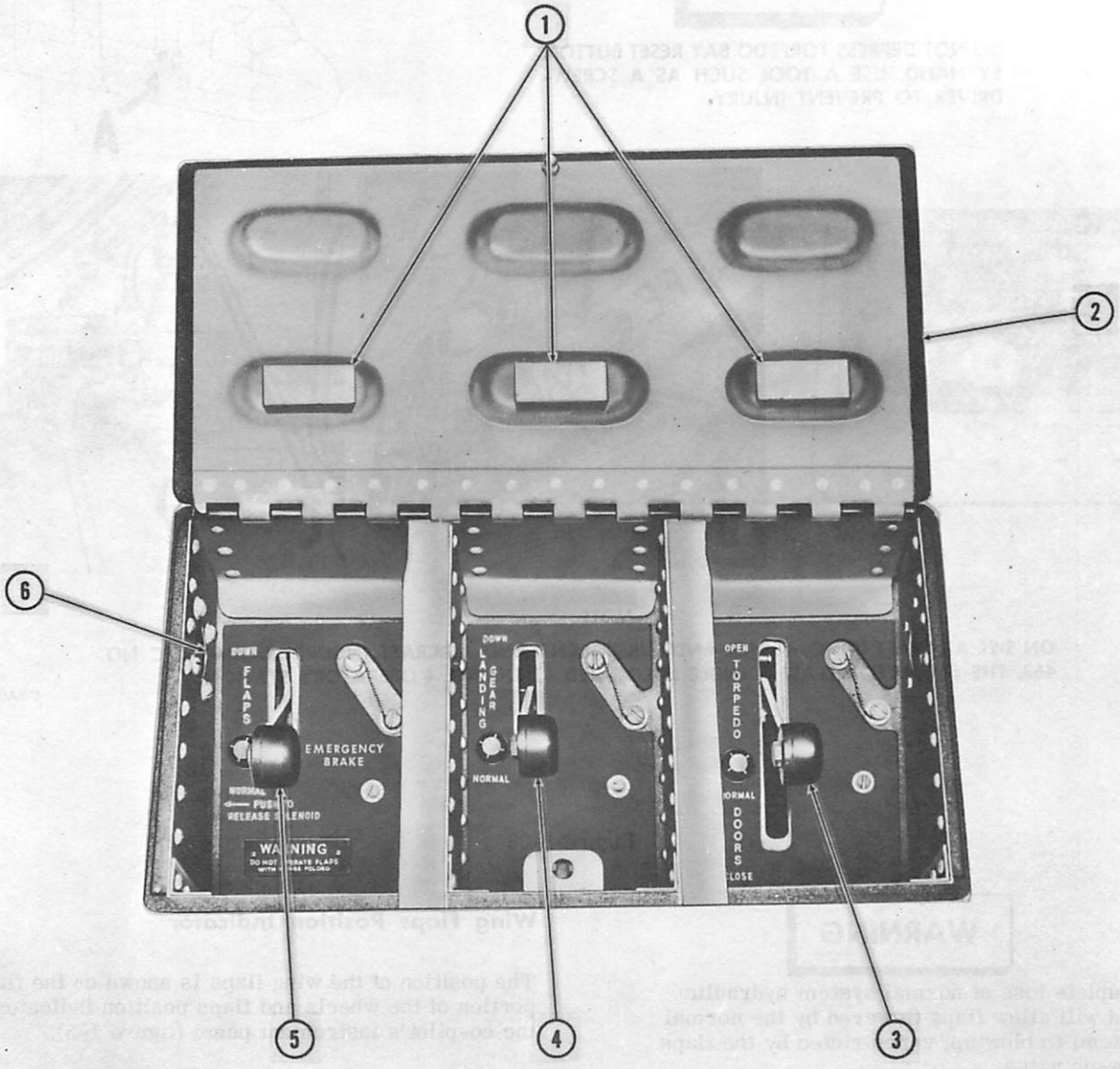
Conventional wing flaps, hydraulically actuated by 1,500 psi pressure, are hinged to the trailing edge of the wing. The pilot's wing flap handle (figure 1-24) positions a four-way selector valve, by means of cables, to set the flaps at full UP, 1/3 down, 2/3 down and full DOWN. The flap system is equipped with a position indicator (figure 1-5). The wing flaps handle cannot be lowered while the wings are in the folded position nor can the wings be folded while the flaps are down. A switch disconnects electrical power to the wing fold system when the flaps are down. A solenoid operated shut-off valve is included in the wing flaps control system which, when open, will bypass the flap down-line restrictor and allow the flaps to retract in 1/3 the in-flight retraction time. This valve is actuated by a micro switch on the left main landing gear shrink rod during ground operation only. The wing flaps are designed to blow upward (figure 1-31) when increased air loads are applied except when lowered by the wing flaps emergency system. At a lower airspeed, the flaps will blow up sooner with takeoff power than with power off, as indicated in the following table:

WING FLAPS BLOW UP

POSITION	INDICATED AIRSPEED START OF FLAP BLOW-UP	DEGREE OF FLAP BLOW-UP AT 125 KIAS
TAKE-OFF POWER	95 KNOTS	8°
POWER OFF	115 KNOTS	2° — 3°

Figure 1-31 A-SAD1-158

EMERGENCY HYDRAULIC SELECTOR HANDLES



1. SPACERS
2. COVER
3. TORPEDO BAY DOORS CONTROL HANDLE
4. LANDING GEAR **DOWN** CONTROL HANDLE
5. WING FLAPS **DOWN** CONTROL HANDLE
6. WING FLAPS SOLENOID

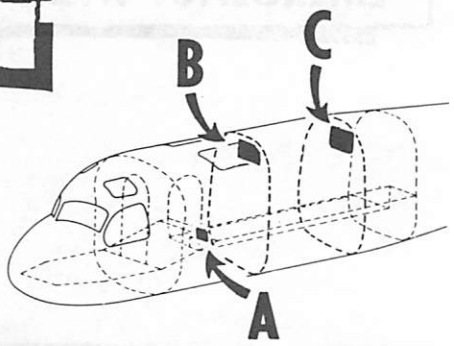
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Figure 1-32

EMERGENCY DUMP VALVE RESET BUTTONS

WARNING

DO NOT DEPRESS TORPEDO BAY RESET BUTTON BY HAND. USE A TOOL SUCH AS A SCREW-DRIVER TO PREVENT INJURY.





NOTE

ON S-2E AIRCRAFT BUNO. 153562 AND SUBSEQUENT AND AIRCRAFT INCORPORATING AFC NO. 463, THE LIFE RAFT RELEASE HANDLE IS LOCATED AT THE NO. 4 OPERATOR'S STATION.

C-SAD1-120

Figure 1-33

WARNING

Complete loss of normal system hydraulic fluid will allow flaps (lowered by the normal system) to blow up, unrestricted by the flaps blow-up valve.

WING FLAPS CONTROL

Wing Flaps Control Handle

A handle, placarded FLAPS is on the engine control quadrant (figure 1-24). Moving the handle down places the flaps in the DOWN position. Moving the handle up places the flaps in the UP position. Intermediate flap positions can be selected. Failure to place the wing flaps handle in full UP position may prevent wing fold operation.

Wing Flaps Position Indicator

The position of the wing flaps is shown on the flaps portion of the wheels and flaps position indicator on the co-pilot's instrument panel (figure 1-5).

Wing Flaps Emergency Selector Handle

The wing flaps emergency handle is beneath a hinged door in the floor of the pilots' compartment (figure 1-32). During normal system operation the handle is set at NORMAL; when it is moved to the DOWN position, the flaps can be lowered by use of the hand-pump. The wing flaps emergency control handle should never be operated when the wings are folded.

Wing Flaps Solenoid Override Button

The wing flaps emergency handle is held in the NORMAL position by a solenoid that is de-energized

when the wing lock handle is placed in the unlocked position. This prevents lowering of the flaps by handpump pressure when the wings are folded. If this solenoid becomes de-energized due to an electrical failure, the flaps emergency handle will be held at NORMAL. To release the handle to lower the flaps, the solenoid override button in the side of the control box must first be pushed outboard to disengage the solenoid. The handle is placarded PUSH TO RELEASE SOLENOID, and an adjacent arrow designates the proper direction. (See figure 1-32.) When the solenoid is released, the handle can be moved to the down position.

Wing Flaps Emergency Dump Valve Reset Pushbutton

The wing flaps emergency dump valve reset pushbutton is in the electronic compartment on the rear beam of the wing center section (figure 1-29) and is placarded wing FLAP VA. EMERG. RESET BUTTON. Depressing this pushbutton returns the system to normal operation after the emergency system has been used by returning the flaps handle from DOWN to NORMAL and pushing the reset pushbutton, placarded PUSH TO RESET, the flaps can then be raised by use of the normal flaps control, provided the up side of the hydraulic system is operative.

WING FLAPS EMERGENCY SYSTEM

During normal operation, the flaps emergency selector valve remains in the NORMAL position, with the emergency side of the shuttle valve vented to return. When the emergency DOWN position is selected and the emergency hand pump is used to lower the flaps, pressure is supplied to the shuttle valve at the cylinder, and the emergency dump valve blocks off the pressure port and vents the cylinder-up lines to the reservoir. The dump valve has a manual reset button (figure 1-33) available to the crew members. Providing the normal UP system is operative, the flap handle should be placed in a position corresponding to the actual flap setting prior to setting the emergency selector valve to the NORMAL position and pushing the reset button of the emergency dump valve.

WING FOLD SYSTEM

The wing fold system is operated by 3,000 PSI hydraulic pressure. Each wing is individually operated by a spring-centered, three-position, manual- and solenoid-operated, four-way selector valve. Two wing fold cylinders, 16 lock cylinders, a lock-lock cylinder, and a lock latch cylinder are provided for each wing. Timing sequence is achieved by two mechanically operated, four-way, two-position slide valves in each wing. The wings are unlocked and folded by levers in the pilots' compartment. Limit switches prevent unlocking and folding the wings when the weight of the aircraft is not on the main landing gear, or when the wing flaps are not fully UP. The wing fold selector valves have manual overrides so that any selection can be made in the event of electrical failure. Quick disconnects in each nacelle permit wing folding or spreading on the ground by using an external hydraulic unit. A mechanical interference between the normal flaps control handle and the lock handle prevents lowering the wing flaps when the wings are unlocked. A wing flaps emergency solenoid valve prevents emergency operation of the flaps when the wings are folded or the aircraft is without electrical power. NEW

Note

The wing spread/fold system is designed to withstand a maximum wind of 45 knots within 45 degrees relative to the aircraft heading.

During folding or spreading with one engine inoperative, the wing on the dead-engine side will fold and spread much more slowly than the opposite wing.

CAUTION

- During wing folding or wing spreading operation, external stores load must not exceed 700 pounds on each wing. Wings must not be folded when certain stores are loaded on the left wing because of structural interference. Refer to External Stores Limitations, figure 1-75, Part 4 of this section for specific restrictions.

- Do not fold wings unless flaps are fully retracted.

Note

Before starting the engines, the pilot should ensure that the WING LOCK and WING FOLD levers are set to correspond with the position of the wings. If the wings are spread, both levers should be pushed up and the outer lever flush with the panel. If the wings are folded, both levers should be down.

WING FOLD SELECTOR VALVES

A wing fold selector valve is located in the top of each wheel well for the respective wing (see figure 1-28). Manual override buttons on each valve may be used to select fold or spread during maintenance or as emergency selectors when a malfunction occurs. To operate the manual override, electrical power must be removed by disconnecting external power, then any of the following: turning both generators off, breaking or cutting the wires to the cannon plug on the wing fold selector valve, or removing the cannon plug to the same valve.

In the event of a wing spread malfunction with 3000 PSI available, disconnecting electrical power will stop the spread cycle.

The 3000 PSI for the wing fold/spread system may also be deenergized by opening the ground hydraulic access door located outboard on the port nacelle.

If the wings have not spread past the vertical position, their weight should bring them slowly back to the folded position when the electrical system is deenergized and the manual fold button is depressed or when the 3000 PSI system is deenergized.

WING SPREAD MALFUNCTIONS

1. UNINTENTIONAL WING SPREAD ON ENGINE START

   This malfunction is caused by the combination of a defective selector valve fold solenoid and failure of the lock latch cylinder to hold the sequence mechanism in the locked position.

2. PREMATURE EXTENSION OF WING FOLD LOCKING PINS

   Premature locking pin extension may be caused by one of two internal malfunctions. The first and most common is when the wing fold system is out of sequence and has extended the locking pins. The situation will normally be corrected by selecting fold in the cockpit. If the wing locking pins retract and/or the wings reverse direction of travel, no further emergency exists. However, failure of the wing fold selector valve fold solenoid will cause the wing to continue spreading.

The second malfunction is that of an internal failure of the wing lock-lock cylinder. In this instance, the wing will spread regardless of the position of the wing fold selector valve. See Wing Spread Malfunction procedures, Section V.

WING FOLD CONTROLS

Wing Spread Outer Locking Lever

The wing spread outer (locking) lever placarded PULL, on the wing fold control panel center overhead console (figure 1-34) controls locking of the wings. This lever must be pulled out to expose the inner (fold and spread) lever. A latch on the lever must be released before the lever can be pushed in to the flush (wings locked) position.

Wing Fold and Spread Inner Lever

The wing fold and spread inner lever on the wing fold control panel center overhead console (figure 1-34) controls folding and spreading of the wings. The outer locking lever must be pulled out to expose the inner (fold and spread) lever. Pulling the inner lever out will fold the wings while pushing in the inner lever will spread the wings.

Wing Fold and Spread Safety Light

An amber light on the WING FOLD control panel is on only when the outer locking lever is in the extended position and the automatic spread and lock cycle has been completed. The light extinguishes when the outer locking lever is returned to the flush position.

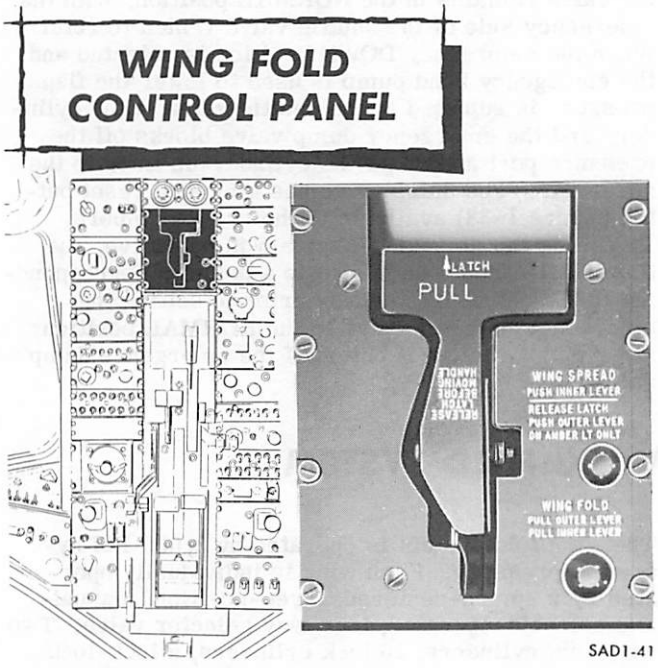
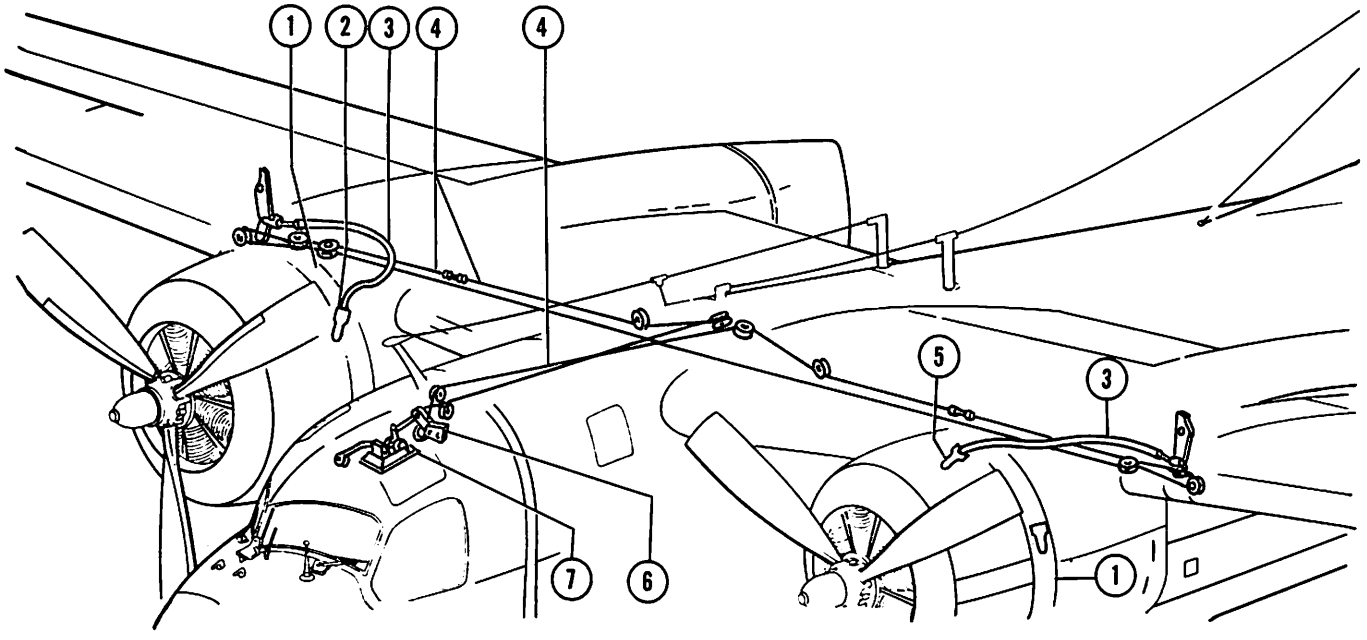


Figure 1-34

WING LOCK WARNING FLAGS



1. ENGINE BAFFLE ASSEMBLY
2. RIGHT WING LOCK WARNING FLAG
3. INDICATOR CONTROL CABLE
4. WING LOCK CONTROL CABLE
5. LEFT WING LOCK WARNING FLAG
6. WING FOLD CONSOLE PANEL—PILOTS' OVERHEAD CONSOLE
7. WING FLAP CONTROL PANEL—PILOTS' OVERHEAD CONSOLE

SAD1-42

Figure 1-35

WING LOCK WARNING FLAGS

A red wing lock warning flag is located just below the exhaust trough on the inboard side of each engine nacelle (figure 1-35). When the wings are in any position other than spread and locked, the sequence mechanism locking pin for each wing is held in the unlocked position and the warning flags are extended and in full view of the pilot and co-pilot.

BRAKE SYSTEM

The brake system consists of a pair of power manual brake valves for the pilot and a pair for the co-pilot, located at the rudder pedals, and an adjustor valve for each wheel, located in the nacelle. The pilot's and co-pilot's power manual brake valves are connected to the adjustor valves by shuttle valves. This enables either pilot or co-pilot to apply brakes. A two-position, manually operated, four-way valve (one port is plugged) and an accumulator provides for emergency and parking brake application (figure 1-28).

BRAKE CONTROLS

Brake Control Pedals

A pair of toe-actuated power/manual brake pedals are provided for both pilot and co-pilot and are a part of the normal rudder control pedal assembly. In the "power-on" mode of operation the brakes are quite sensitive as compared to the "power-off" condition.

Emergency and Parking Brake Handle

The emergency and parking brake handle is on the pilot's side of the pilot's diagonal console. The brake is placarded BRAKE, PARK, AND EMERG, and is spring-loaded. When pulled out and turned clockwise the handle will lock so that the brakes remain on.

POWER-ON OPERATION

With normal hydraulic system pressure (1, 500 PSI) available, brake pedal forces actuate the power/manual valves, causing system pressure to be metered through the adjuster valves and to the wheel brakes. A power valve meters system pressure to the brake by means of a slide valve and spring combination to give the pilot brake "feel" (load proportional to pedal travel). A normal brake operating pressure of 720 PSI is delivered to the brakes by 13° of pedal travel and 65 pounds of pedal load.

POWER-OFF MANUAL OPERATION

When hydraulic system pressure is not available, the power/manual valve functions as a brake master cylinder, with the mechanical advantage of the pedal linkage, aiding pedal forces. The adjustor valves, whose primary function is to maintain a constant brake running clearance, also produce a volumetric output of 2. 5 times the input (up to 75 PSI input pressure) in order to provide the displacement required to obtain a brake-rotors-tight condition with a minimum of pedal travel.

When brakes are being applied in the power-off condition and the hydraulic system pressure is turned on, a fading of the brake pedal is experienced. This is due to the conversion at the power/manual valve from a master cylinder to the power valve, with lower pedal force requirements.

Note

There will be considerable difference in brake pedal forces and pedal travel between power-on and power-off conditions. In power-off, a solid pedal feel is experienced and it is impossible to supply sufficient pedal force to reach full pedal travel. Power-on pedal forces are much lower for comparable brake pressures and the solid pedal feel is not experienced until full pedal travel is reached.

EMERGENCY AND PARKING BRAKE OPERATION

An emergency and parking brake handle is connected by cable to a selector valve that ports normal system pressure (1, 500 PSI) directly to a shuttle valve at the wheel brakes. A piston-type accumulator stores pressure, and is for parking use. The gage and filler valve for the accumulator are alongside the torpedo inspection door. With AFC 481 incorporated, the pressure in the emergency and parking brake accumulator can be restored after the system has been used.

The Emergency Flap DOWN control handle (Figure 1-32) is selected to the parking brake pump up position and the emergency hydraulic pump is used to restore system pressure.

CAUTION

An outside observer shall be stationed at the accumulator gauge to avoid over-pressurizing the accumulator to greater than 1500 psi.

WARNING

Approximately 8 applications of the emergency and parking brake systems can be made after engine shut-down. This exhausts the capacity of the accumulator. When the system is exhausted the parking brake accumulator gauge should read pre-load pressure of 750 to 800 psi.

TORPEDO BAY DOORS SYSTEM

Two torpedo bay doors on the left side of the lower part of the fuselage fold outward in two sections when opened, and form the left bottom side of the fuselage when closed. The doors are fastened to the fuselage by continuous hinges. They are operated by hydraulic cylinders at each end. A limit switch on the after cylinder assembly actuates when the doors are open, causing the TORP BAY DOORS OPEN light to illuminate. The torpedo bay doors system operates on 1500 PSI hydraulic pressure. The selector valve is a solenoid operated, two-position, four-way detented valve, and is installed in the torpedo bay. A piston type accumulator, installed in the hydraulic pressure line, provides for quick opening of the doors.

WARNING

- Operation of the torpedo bay doors is extremely fast. They will open or close in 0. 5 seconds. Keep personnel clear of doors during ground operation.

- Accumulator pressure can provide torpedo bay door operation without system hydraulic pressure, provided electrical power is applied to the aircraft.

An air filler valve on the left side of the aircraft provides for charging the accumulator to the required pressure. An accumulator air pressure gage is mounted in the filler valve line just below the filler valve. A manual control valve in the pilots' compartment, and a dump valve near the torpedo bay inspection door provide for emergency operation of the doors, when the hydraulic hand pump is used.

TORPEDO BAY DOORS CONTROLS

Torpedo Bay Doors Switch

The torpedo bay doors two-position toggle switch is on the armament control panel on the pilots' folding console (figure 1-2). The switch incorporates a safety guard to prevent it from being accidentally operated and is placarded TORP BAY DOORS. Prior to releasing stores from the torpedo bay, the switch is set to OPEN to operate the torpedo bay doors. The doors are closed by setting the switch to CLOSE. With AFC 457 incorporated, a TORPEDO BAY DOORS SAFETY SWITCH is provided. Power to the torpedo bay doors closing circuit is fed through this safety switch located in the top aft torpedo bay

NEW access panel. Opening this panel prevents closing the torpedo bay doors using the torpedo bay doors switch.

Torpedo Bay Doors Open Light

The torpedo bay doors OPEN press-to-test light is located below the torpedo bay doors switch on the armament control panel. This light is controlled by two limit switches and a guarding relay. When the doors are in the fully open position the light will glow OPEN. The light will remain on until the doors are fully closed again.

Torpedo Bay Doors Emergency Selector Handle

The torpedo bay doors emergency selector handle is located under a hinged door between and just aft the pilots' seats (figure 1-32). The cover swings up and aft and is opened by inserting a finger in the hole at the forward end of the door. The selector valve is placarded TORPEDO DOORS, OPEN-NORMAL-CLOSE.

Torpedo Bay Doors Emergency Dump Valve Reset Button

The TORPEDO BAY DOOR EMERGENCY RESET BUTTON is located on top of the torpedo bay just aft the Number 3 Operator's position (figure 1-33).

WARNING

Do not depress torpedo bay door reset button by hand. Use a tool such as a screwdriver to prevent injury.

NORMAL OPERATION

The torpedo bay doors are normally operated by the TORP BAY DOORS switch on the armament control panel. When the switch is set to the OPEN position, electric power is applied to the OPEN solenoid of the selector valve. The detents in the valve hold the valve in position once the selection is made. Hydraulic fluid pressure unlocks the internal locks of the cylinders and extends the piston, opening the torpedo bay doors. When the switch is set to the CLOSE position, electric power is applied to the CLOSE solenoid of the selector valve. The valve detents cause the valve to remain in this last selected position. Hydraulic pressure applied to the cylinders through the valve, causes the pistons to retreat, closing the doors.

The press-to-test TORP BAY DOORS OPEN light is controlled by two limit switches on the doors, and a relay. When the doors reach the full OPEN position, the down limit switch is actuated, closing the solenoid circuit breaker of the indicator light relay. When the relay is actuated, a circuit is completed through the relay contacts, and the up limit switch, providing a holding circuit through the relay solenoid. This action causes the indicator light to illuminate when the doors reach the full OPEN position. The indicator light remains ON until the up limit switch is actuated by the fully closed door, breaking the holding circuit to the indicator light relay. Electrical power to control normal operation of the torpedo bay doors hydraulic system and the associated indicator light, is supplied from the DC essential bus. Protection for the combined circuit is provided by the TORP BAY DOORS circuit breaker on the circuit breaker panel behind the co-pilot (figure 1-42).

TORPEDO BAY DOORS EMERGENCY SYSTEM

The torpedo bay doors emergency selector handle located under the hinged door just aft and between the pilot and co-pilot, is normally left in the NORMAL position, venting the shuttle valves to return. After a selection is made to OPEN or CLOSE, operation of the hydraulic hand pump will extend or retract the pistons as required to accomplish the selection. A shuttle valve between the emergency open and close lines blocks off the unpressurized line and directs pressure to the emergency dump valve. When operating, the dump valve blocks the pressure port to the system selector valve and opens the cylinder lines, not pressurized, back to the reservoir. The system is returned to normal operation by placing the emergency selector valve in the NORMAL position and resetting the Torpedo Bay Doors Emergency Dump Valve Reset Button. The button is held until the last position (OPEN or CLOSE) of the emergency selector handle has been selected on the TORP BAY DOORS switch. This will ensure resetting of the torpedo bay door cylinder shuttle valves. Shuttle valves at the cylinders separate the normal from the emergency lines.

ARRESTING HOOK SYSTEM

The arresting hook is raised or lowered from the pilots' compartment. Pulling the arresting hook control handle DOWN mechanically unlatches the uplock, and air pressure in the recoil struts lowers the hook. When the arresting hook control handle is placed in the up position a selector valve is mechanically actuated to permit 1,500 PSI hydraulic pressure to enter the two single-acting hook lift cylinders to raise the hook.

ARRESTING HOOK CONTROL HANDLE

The arresting hook control handle is on the engine control quadrant (figure 1-24). When pulled DOWN from the console, the handle latches into a spring-loaded clip that holds it at the DOWN position and the arresting hook extends. Releasing the clip returns the spring-loaded handle to the UP position, and retracts the arresting hook.

Arresting Hook Warning Light

The arresting hook warning light is enclosed in the translucent knob of the arresting hook handle (figure 1-24). This light is ON only when the arresting hook handle is lowered and remains ON until the hook is fully down.

If the light malfunctions, normal hook operation can be checked by holding the hook handle just short of

full UP. If the hook was extended, its return to full UP can be felt in the hook handle.

ARRESTING HOOK EMERGENCY RELEASE

In the event of failure of the arresting hook release control mechanism, the arresting hook can be lowered by manually pulling down on the overhead No. 6 cable. Refer to Section V for emergency procedure.

WARNING

Avoid contact with cable placarded No. 9 on the fairlead. This cable controls release of the MK 4 life raft, which, if inadvertently released in flight, can cause serious control difficulties.

LANDING GEAR BARRIER HOOK

The forward torque arms of the main shock struts function as a hook to engage the barrier cable whenever a barrier engagement occurs.

CATAPULT HOLD-BACK FITTING

The catapult hold-back fitting is in the fuselage just aft of the tail wheel. A release lever installed next to the hold-back fitting latches the fitting in the up or stowed position. Moving the lever down releases the fitting, which may then be pulled down and connected to the catapult hold-back cable hook. A pair of springs, connected to the hold-back fitting, returns the fitting to its stowed position when it is disengaged from the catapult hold-back cable assembly.

MAD BOOM ACTUATING SYSTEM

The MAD boom is approximately 24 feet long. In the fully extended position the MAD boom will extend approximately 16 feet from the rear of the aircraft. The diameter of the MAD boom varies from approximately 8-1/2 inches at the front section to 7 inches at the boom end. A housing assembly for the magnetometer is attached to the boom by non-magnetic screws. Two longitudinal rails at the centerline of each side of the boom form tracks for the rollers. These tracks guide and keep the boom positioned on the rollers and allow it to roll freely. The MAD boom should extend or retract in 13 ± 3 seconds.

Note

All hardware is of the non-magnetic type.

The MAD boom may be extended or retracted electrically or manually by a cable from the drum of the actuator.

The control switch for the system is located in the MAD - ECM - Radar operator's control console.

When the landing gear is lowered with the MAD boom extended, the MAD boom is automatically retracted through the actuation of the landing gear control armament safety switch provided the normal MAD boom actuating system is functional.

WARNING

DO NOT extend or retract the MAD boom at airspeeds in excess of 150 KIAS.

The control switch for the system is located on the MAD-ECM-Radar operator's control console. The electronic control amplifier is located just aft of the MAD-ECM-Radar operator. The detecting set control is located on the MAD-ECM-Radar Operator's control console.

RADOME ACTUATING SYSTEM

The Radome, in normal operation with the gear UP, is extended or retracted by hydraulic power. Operation of the hydraulic motor is controlled by a two-position RADOME UP and RADOME DOWN switch located on the MAD boom and Radome control panel in the MAD-ECM operator's position. The radome should extend or retract in 21 ± 4 seconds.

The indicator light circuits are controlled by the extend and retract limit switches. When either limit switch is actuated, motor operation is interrupted and a circuit is completed, causing the associated indicator light to go on.

When the landing gear is lowered with the radome down, the radome is automatically retracted through the actuation of the landing gear control armament safety switch provided the normal radome actuating system is functional.

WARNING

DO NOT extend or retract the radome at airspeeds in excess of 150 KIAS.

The radome switch must be in the RADOME UP position on takeoff. If the switch is left in the RADOME DOWN position, the radome will automatically extend when the landing gear is retracted.

RADOME AND MAD BOOM EMERGENCY SYSTEM

An emergency crank stored in the electronic compartment is used to extend or retract the MAD boom and to raise or lower the radome in the event of normal system failure or when the engines are inoperative. The crank handle is inserted into the appropriate fitting on the radome and MAD boom manual control (figure 1-36).

WARNING

Pull the RADOME or MAD BOOM ACT circuit breaker on the DC JUNCTION BOX prior to using the crank handle to prevent injury.

RADOME AND MAD BOOM MANUAL CONTROL

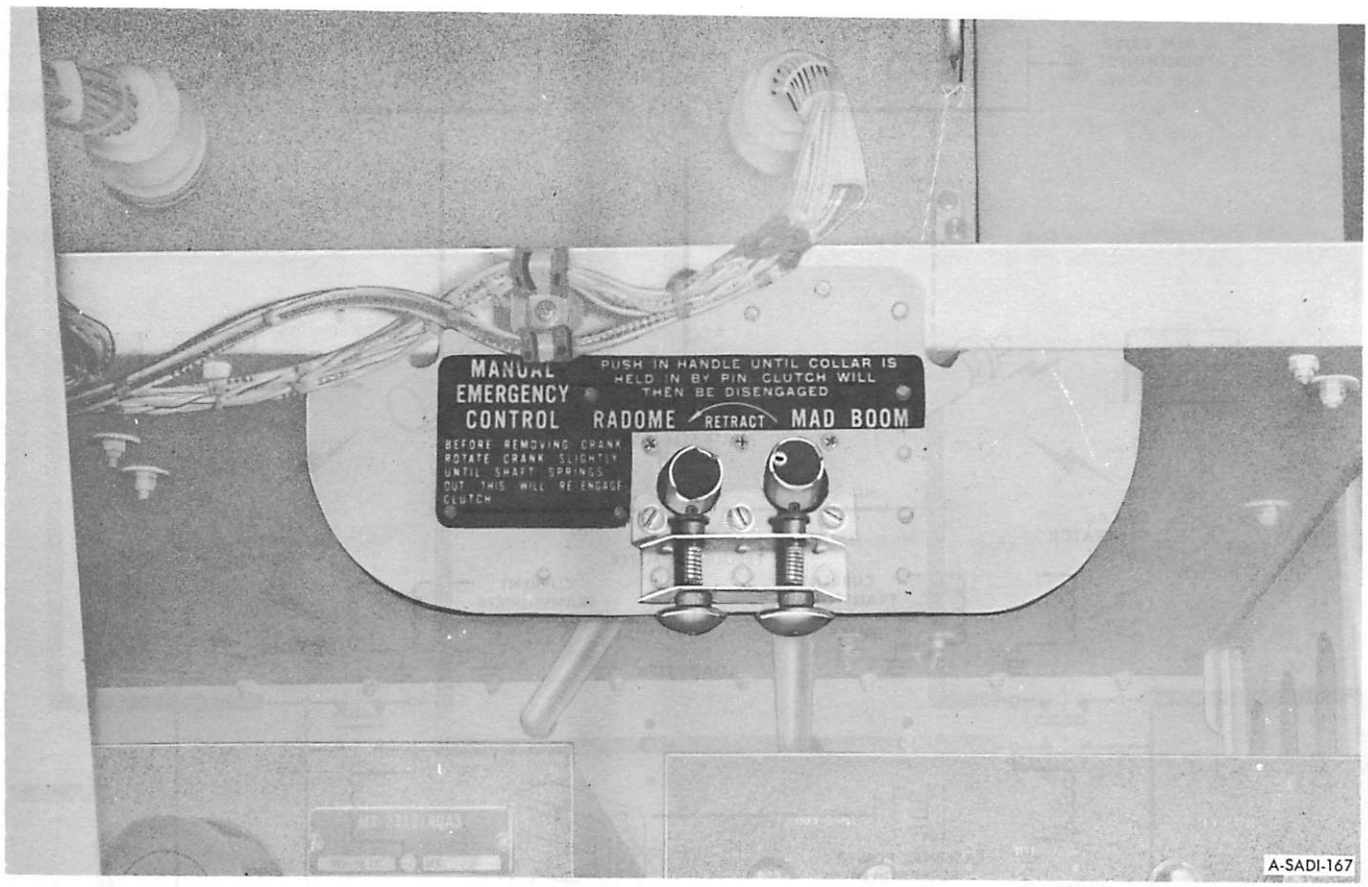


Figure 1-36

The crank handle is stowed in spring clips located on the after port bulkhead of the electronics compartment. The crank is pushed into the fitting until the collar is held in by a pin. A clutch then disengages and the boom or radome is retracted by turning the crank handle counterclockwise. Before removing the crank, rotate the handle slightly until the shaft springs out to ensure reengagement of the clutch.

NEW NEW NEW

MCJR ANTENNA ACTUATING SYSTEM
(AFC 417, 449, 484 incorporated)

The blade-type MCJR antenna located on the lower center section of the fuselage adjacent to the starboard torpedo bay door is electrically actuated by an UP/DOWN control switch on the #4 operator's folding console. The antenna should extend or retract in 30 ± 5 seconds. When the landing gear is lowered with the MCJR antenna down, the antenna is automatically raised through actuation of the landing gear control armament safety switch providing the normal antenna actuating system is functional.

Note

There is no provision for emergency retraction of the MCJR antenna.

NEW NEW NEW

ELECTRICAL POWER SUPPLY SYSTEM

The electrical power supply system is a constant-frequency AC system (figure 1-37) that has been designed for maximum reliability. Two 115/208

NEW

A C ELECTRICAL POWER DISTRIBUTION

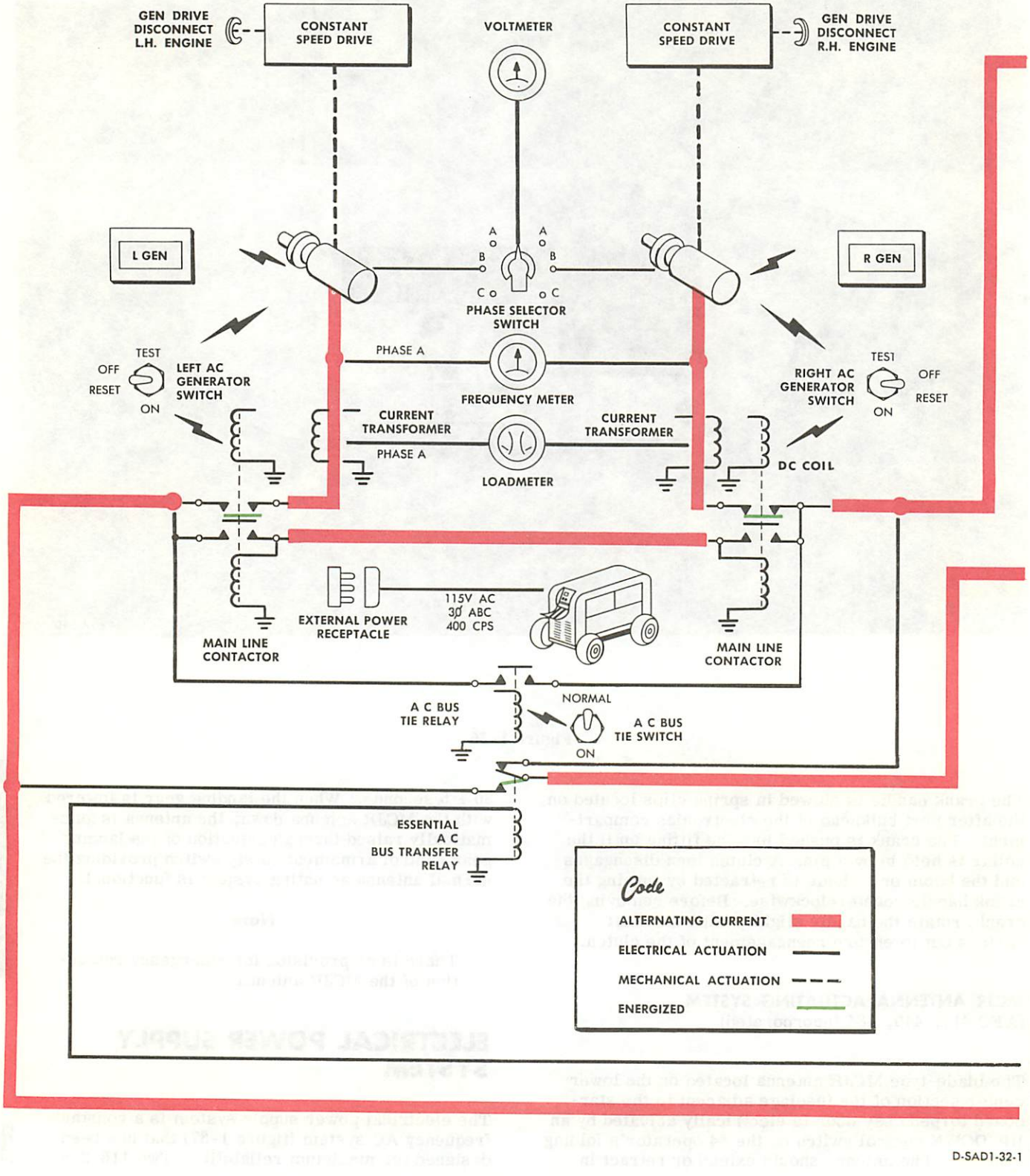


Figure 1-37 (Sheet 1)

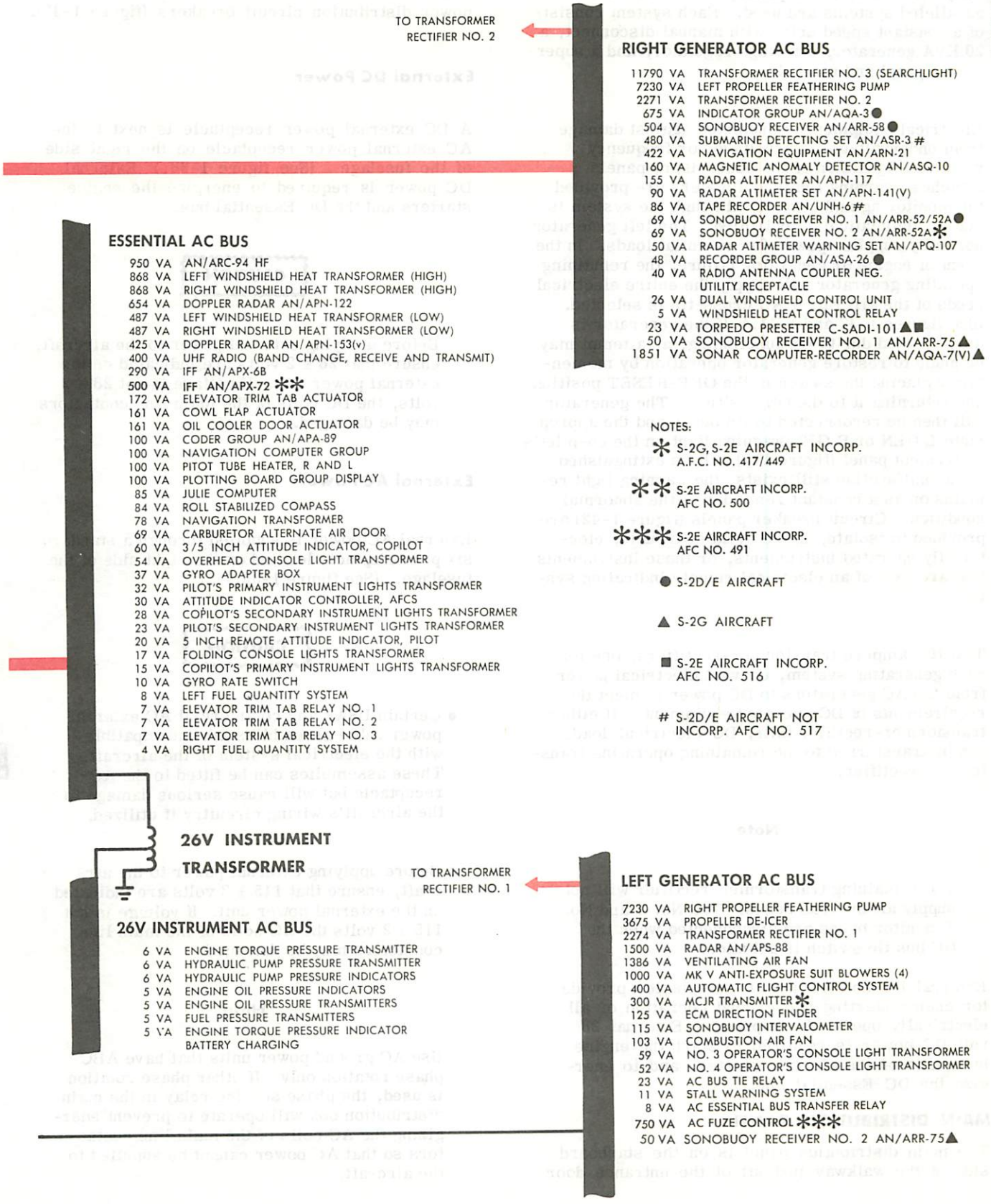


Figure 1-37 (Sheet 2)

volt, 400-cycle, three-phase, four-wire, non-paralleled systems are used. Each system consists of a constant speed drive with manual disconnect, a 20 KVA generator, a voltage regulator, and a supervisory panel and controls.

Electrical equipment is protected against damage from undervoltage, overvoltage, or frequency variations by action of the supervisory panels. Switches, warning lights and meters are provided for monitoring and control, although the system is mainly automatically controlled. The left generator normally supplies power for essential loads. In the event of engine or generator failure, the remaining operating generator will supply the entire electrical needs of the aircraft if AC cross-tie is selected. (See figures 1-37 and 1-41.) If the generator is disconnected due to malfunctioning, an attempt may be made to restore generator operation by momentarily placing the switch in the OFF-RESET position and returning it to the ON position. The generator will then be reconnected to its buses and the appropriate L GEN or R GEN warning light on the co-pilot's instrument panel (figure 1-5) will be extinguished. If the malfunction still exists, the warning light remains on as a constant reminder of the abnormal condition. Circuit breaker panels (figure 1-42) are provided to isolate, in the event of trouble, electrically operated instruments, or those instruments that are part of an electrical remote indicating system.

Two 100-ampere transformer-rectifiers, one for each generating system, convert electrical power from the AC generators to DC power to meet the requirements of DC operated equipment. If either transformer-rectifier fails, DC electrical loads can be transferred to the remaining operating transformer-rectifier.

Note

The remaining transformer-rectifier will not supply all the load buses. The No. 1 and No. 2 monitor buses are disconnected when the DC bus tie switch is actuated.

External DC and AC power receptacles provide for engine starting and ground operation of all electrically operated equipment. External 28 volt DC power is required to start the engine by means of the electric starter, and to energize the DC Essential bus.

MAIN DISTRIBUTION PANEL

The main distribution panel is on the starboard side of the walkway just aft of the entrance door and contains both main AC and DC electrical power distribution circuit breakers (figure 1-42).

External DC Power

A DC external power receptacle is next to the AC external power receptacle on the right side of the fuselage. (See figure 1-38.) External DC power is required to energize the engine starters and the DC Essential bus.

CAUTION

Before applying external power to the aircraft, ensure that 28 ± 2 volts are indicated on the external power unit. If voltage is not 28 ± 2 volts, the DC coils of the main line contactors may be damaged.

External AC Power

External AC power is supplied through a standard six pin receptacle located on the right side of the fuselage. (See figure 1-38.)

CAUTION

- Certain USAF and commercial AC external power cable assemblies are incompatible with the electrical system of the aircraft. These assemblies can be fitted to the AC receptacle but will cause serious damage to the aircraft's wiring circuitry if utilized. NEW
- Before applying external power to the aircraft, ensure that 115 ± 2 volts are indicated on the external power unit. If voltage is not 115 ± 2 volts the AC coils of the main line contactors may be damaged.

Note

Use AC ground power units that have ABC phase rotation only. If other phase rotation is used, the phase sensing relay in the main distribution box will operate to prevent energizing the AC coils of the main line contactors so that AC power cannot be supplied to the aircraft.

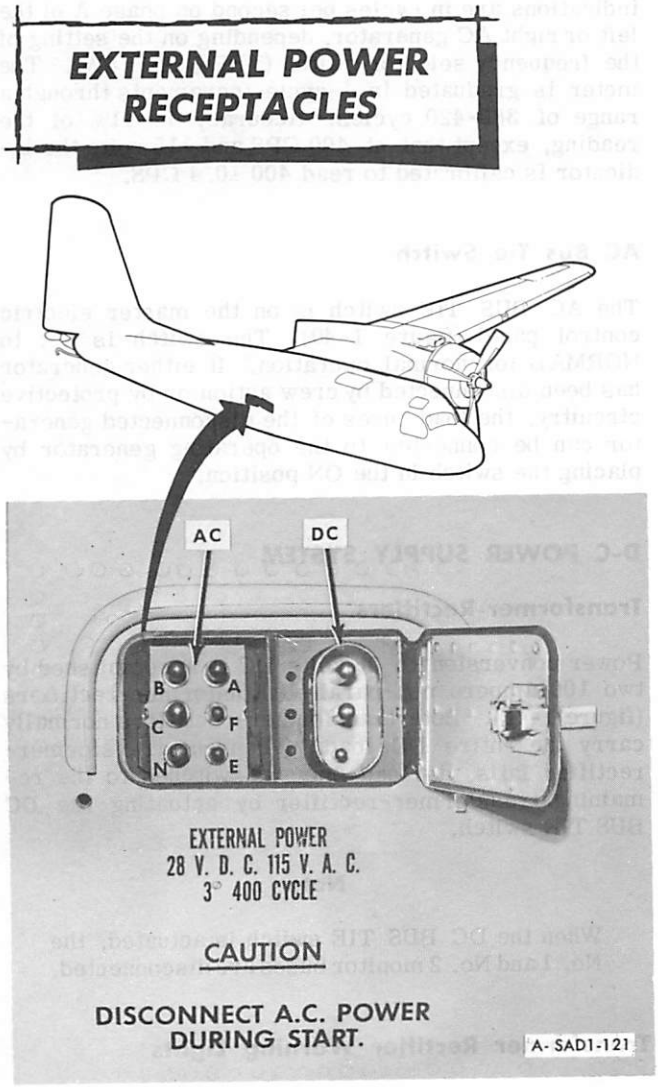


Figure 1-38

AC POWER SUPPLY SYSTEM

AC Generator

The AC power supply system is supplied by two non-paralleled 20 KVA engine-driven generating systems, one connected to each engine. An engine-mounted constant speed drive unit, designed to limit frequency variation and maintain a constant output frequency of 396 to 404 cycles per second (CPS), drives each generator. Generator voltage is controlled by a voltage regulator and frequency is controlled by a constant speed drive integral governor. Generator warning lights, placarded L GEN and R GEN, and an AC loadmeter, placarded AC LOAD, on the co-pilot's Instrument panel provide visual indications of system performance. Each generator output is indicated on the frequency meter, located on the main distribution panel (figure 1-42) and the AC voltmeter placarded AC VOLTS located to the left of the trough above the Number 3 operator's console (figure 1-39).

AC Power Distribution System

The AC power distribution system is illustrated in figure 1-37. The loads on each bus are listed in descending magnitude to aid in manually monitoring the system.

ELECTRICAL SYSTEM CONTROLS

Generator Control Switches

The two generator control three-position switches are on the master electric control panel (figure 1-40). Each is a double-pole double-throw switch placarded LEFT AC GEN and RIGHT AC GEN. With the switch in the ON position, an operating generator is connected to its respective buses; in the OFF-RESET position, the generator is disconnected from its load buses. With the switch in the TEST position, generator performance under no-load conditions may be read on the AC voltmeter and the frequency meter on the main power distribution box.

Generator Warning Lights

Two generator warning lights, placarded L GEN and R GEN, and an AC loadmeter, placarded AC LOAD, located on the co-pilot's instrument panel (figure 1-5) are connected to the warning lights bus through the left and right battery charging relays. The generator warning light is on when its respective generator is disconnected from the line or external power is supplied to the system. The lights are tested by operating the WARNING LTS-TEST switch on the pilot's instrument panel.

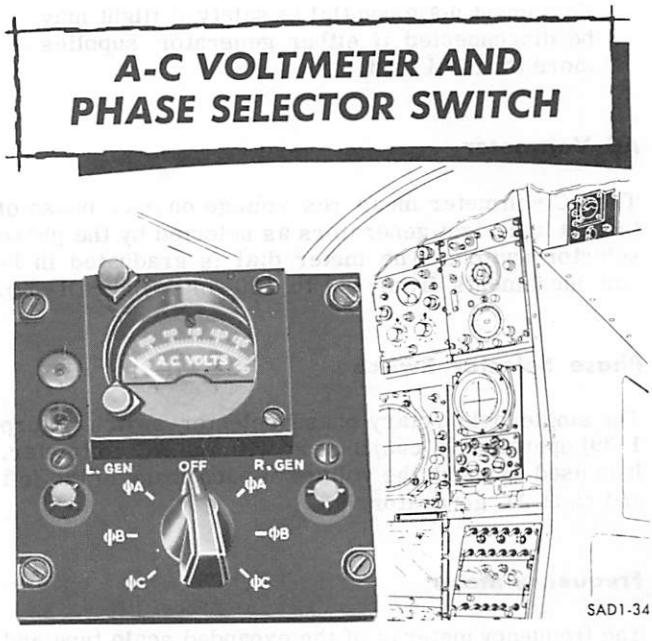


Figure 1-39

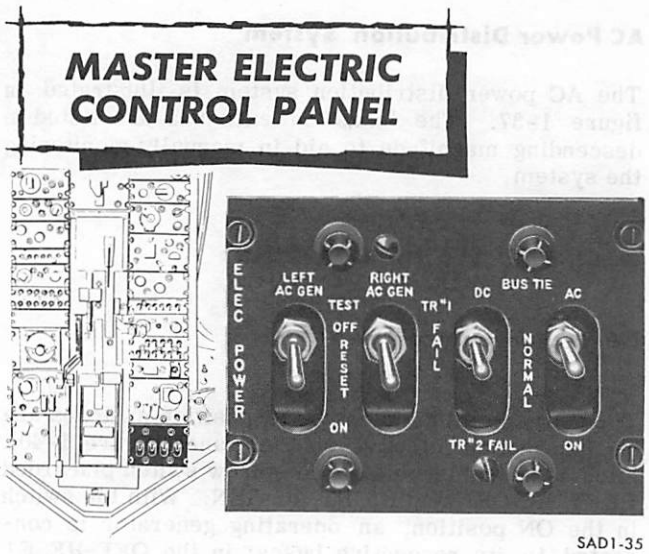


Figure 1-40

AC Loadmeter

The dual AC loadmeter is located on the co-pilot's instrument panel (figure 1-5). The left side of the dial indicates the load on the left generator; the right side indicates the load on the right generator. The dials are graduated in tenths and marked to indicate 0, 0.5, 1.0, 1.25 units, which represent the percentage of AC load.

Note

Equipment not essential to safety of flight may be disconnected if either generator supplies more than full load.

AC Voltmeter

The AC voltmeter measures voltage on each phase of the left and right generators as selected by the phase selector switch. The meter dial is graduated in 1-volt increments from 100 to 130 volts (figure 1-39).

Phase Selector Switch

The single-pole rotary phase selector switch (figure 1-39) operates in conjunction with the AC voltmeter. It is used to check the voltage of each phase of the left and right AC generator.

Frequency Meter

The frequency meter is of the expanded scale type and is located on the main power distribution box in the electronics compartment (figure 1-42). Frequency indications are in cycles per second on phase A of the left or right AC generator, depending on the setting of the frequency selector switch (FREQ SEL SW). The meter is graduated in 1-cycle increments through a range of 380-420 cycles. Accuracy is ±1% of the reading, except that at 400 CPS and 115 volts the indicator is calibrated to read 400 ±0.4 CPS.

AC Bus Tie Switch

The AC BUS TIE switch is on the master electric control panel (figure 1-40). The switch is set to NORMAL for normal operation. If either generator has been disconnected by crew action or by protective circuitry, the load buses of the disconnected generator can be connected to the operating generator by placing the switch in the ON position.

D-C POWER SUPPLY SYSTEM

Transformer-Rectifiers

Power conversion to 28 volts DC is accomplished by two 100-ampere non-parallel transformer-rectifiers (figure 1-41). Both transformer-rectifiers normally carry the entire DC load. When one transformer-rectifier fails, its load may be switched to the remaining transformer-rectifier by actuating the DC BUS TIE switch.

Note

When the DC BUS TIE switch is actuated, the No. 1 and No. 2 monitor buses are disconnected.

Transformer Rectifier Warning Lights

Two transformer-rectifier warning lights, placarded L RECT and R RECT, are on the co-pilot's instrument panel (figure 1-5). When either transformer-rectifier fails, its associated light goes on. Actuating the T/R FAIL switch to the transformer-rectifier that has failed will not extinguish the light.

Searchlight Transformer Rectifier

An additional 70 volt/120 ampere rectifier is utilized for conversion of AC power to the required DC power necessary to strike the searchlight carbon arc.

DC Bus Tie Switch

The DC BUS TIE switch is on the master electric control panel (figure 1-40). The DC BUS TIE switch is a double-pole, double-throw switch placarded T/R #1 FAIL-NORMAL-T/R #2 FAIL. When the switch is in NORMAL position, the No. 1 transformer-rectifier energizes the No. 1 transformer-rectifier bus and the No. 1 monitor bus, and the No. 2 transformer-rectifier energizes the No. 2 transformer-rectifier bus and the No. 2 monitor bus.

When the switch is thrown to either T/R #1 FAIL or T/R #2 FAIL position, the No. 1 and No. 2 transformer-rectifier buses are connected to the operating transformer-rectifier and both No. 1 monitor and No. 2 monitor buses are disconnected.

Note

The DC essential bus is not affected by bus tie provisions as it is supplied by both transformer-rectifiers through blocking diodes.

CIRCUIT BREAKER PANELS

The ENGINE, FLIGHT, ELECTRICAL, WEATHER LIGHTING, and ARMAMENT circuit breakers are located on the bulkhead immediately aft of the co-pilot's seat (figure 1-42).

The PTCL DET, SONO, RADAR or COMPUTER, IFF, ECM, ALTM, MAD, MK 5 BLOWERS (pilot and No. 3 operator), NAVIGATION or RADAR, and RADIO circuit breakers are located on the bulkhead immediately aft of the pilot's seat (figure 1-42).

DC JUNCTION BOX

The DC JUNCTION BOX, in the electronic compartment on the portside of the walkway, incorporates the ELECTRICAL, LIGHT, WEA and ENG circuit breakers (figure 1-42).

BATTERIES

The aircraft is equipped with two 24-volt nickel-cadmium batteries, located in the accessory compartment below the Number 4 operator's console. The batteries are hermetically sealed, and do not require specific gravity measurements as do conventional aircraft storage batteries. When the DC essential bus is not energized the batteries will flash the field of their respective generators. During normal operation the left and right batteries are charged, through the left and right battery charging relay, by the 26-volt AC instrument bus. Both the left and right battery charging relays are energized by the DC essential bus. NEW

During emergency operation, the right battery supplies power, through the battery bus, to the automatic life raft cylinder.

CONSTANT SPEED DRIVE SYSTEM

The constant speed drive system transforms the varying input speeds of the aircraft engine into a governed output speed for operating the AC generator. The constant speed drive system consists of an engine-mounted gear box with an emergency disconnect device, a flexible drive shaft assembly, a constant speed drive unit, and an external oil supply system completely independent of the engine oil supply system.

CAUTION

The constant speed drive oil lines must be connected to the constant speed drive oil cooler before starting the engines (two oil lines and the generator blast tube).

CSD OIL SUPPLY SYSTEM

The oil supply for each constant speed drive system (figure 1-43) is entirely self-contained within the nacelle accessory section. The system consists of an 8.4-quart tank, an oil cooler, tubing, fittings and valves to provide adequate lubrication cooling and draining. See figure 1-70 for oil grade and specification. Lubricating oil for the constant speed drive unit is stored in a nonpressurized metal reservoir (one for each system). The reservoir, installed on the upper engine mount tubes in the accessory section of the nacelle, is fitted with a fillerneck, containing a screen filter, a fillercap, and a sight gage. The fillerneck and sight gage are accessible through an access door in the upper right accessory cowl panel. The fillerneck is encircled by a scupper equipped with an overboard drain. The sight gage glass has a painted black circle concentric with the rim. When fluid is at the top of the circle, the reservoir is full. Filling instructions are on a card on the inside of the access door.

Note

Check constant speed drive oil reservoir level within 30 minutes after engine shutdown.

A security flag assembly is installed on the fillerneck to prevent closing the access door until it is retracted by the final movement of securing the fillercap. A drain valve on the bottom of the reservoir is for draining the reservoir.

CSD Warning Lights

Two constant speed drive warning lights are on the co-pilot's instrument panel. The left and right warning lights are electrically connected, through the DC ESS FDR #3, the 5-ampere WARN LTS circuit breaker. The warning lights will go on for one or more of the following reasons: insufficient charge pressure, excessive scavenge pressure, excessive oil temperature and excessive temperature of the flexible drive shaft rear bearing.

CSD Oil Temperature Indicator

A dual constant speed drive (CSD) oil temperature indicator is located on the co-pilot's instrument panel (figure 1-5) and is placarded GEN-DR-TEMP. The indicator is electrically connected to the DC power supply and to the left and right engine constant speed drive oil temperature bulbs. The pointers of the indicator move over individual dials calibrated in increments of 10° C, from -20° to +200° C (-4 to +392° F).

CSD Shaft Emergency Disconnect

The constant speed drive shaft emergency disconnect control, one on each unit, is an integral part of each engine mounted gear box assembly. When excessively high or wildly fluctuating frequency with normal voltages, excessively high temperature or other evidence of malfunctioning occurs, the constant speed drive unit may be disconnected from the engine by actuating the associated disconnect handle. (Refer to Section V, Emergency Procedures.)

CSD Emergency Disconnect Handles

The constant speed drive emergency disconnect handles (GEN DRIVE DISCONNECT) one for each ENGINE, are held in place by clips on the pilot's

D C ELECTRICAL POWER DISTRIBUTION

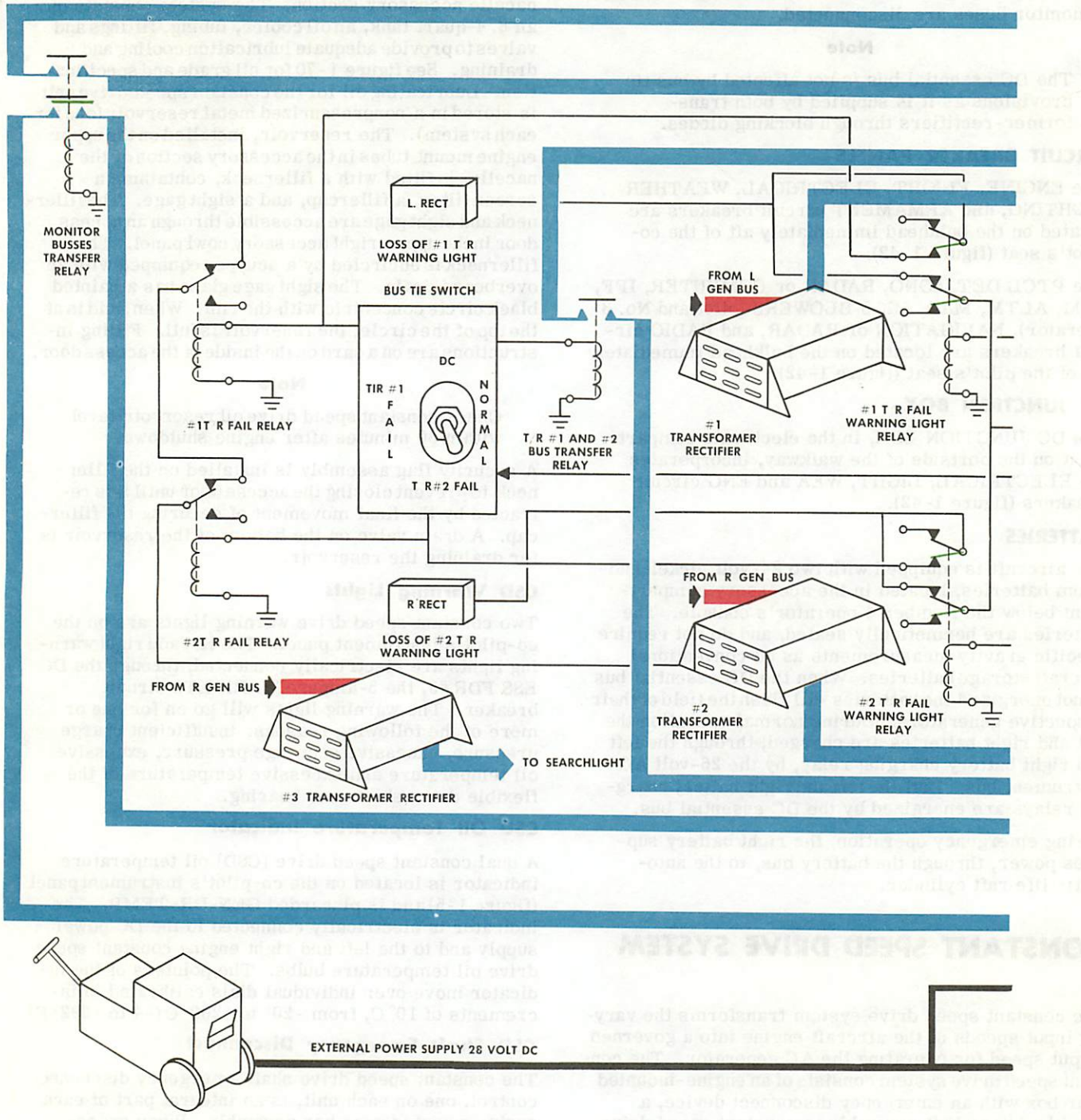


Figure 1-41 (Sheet 1)

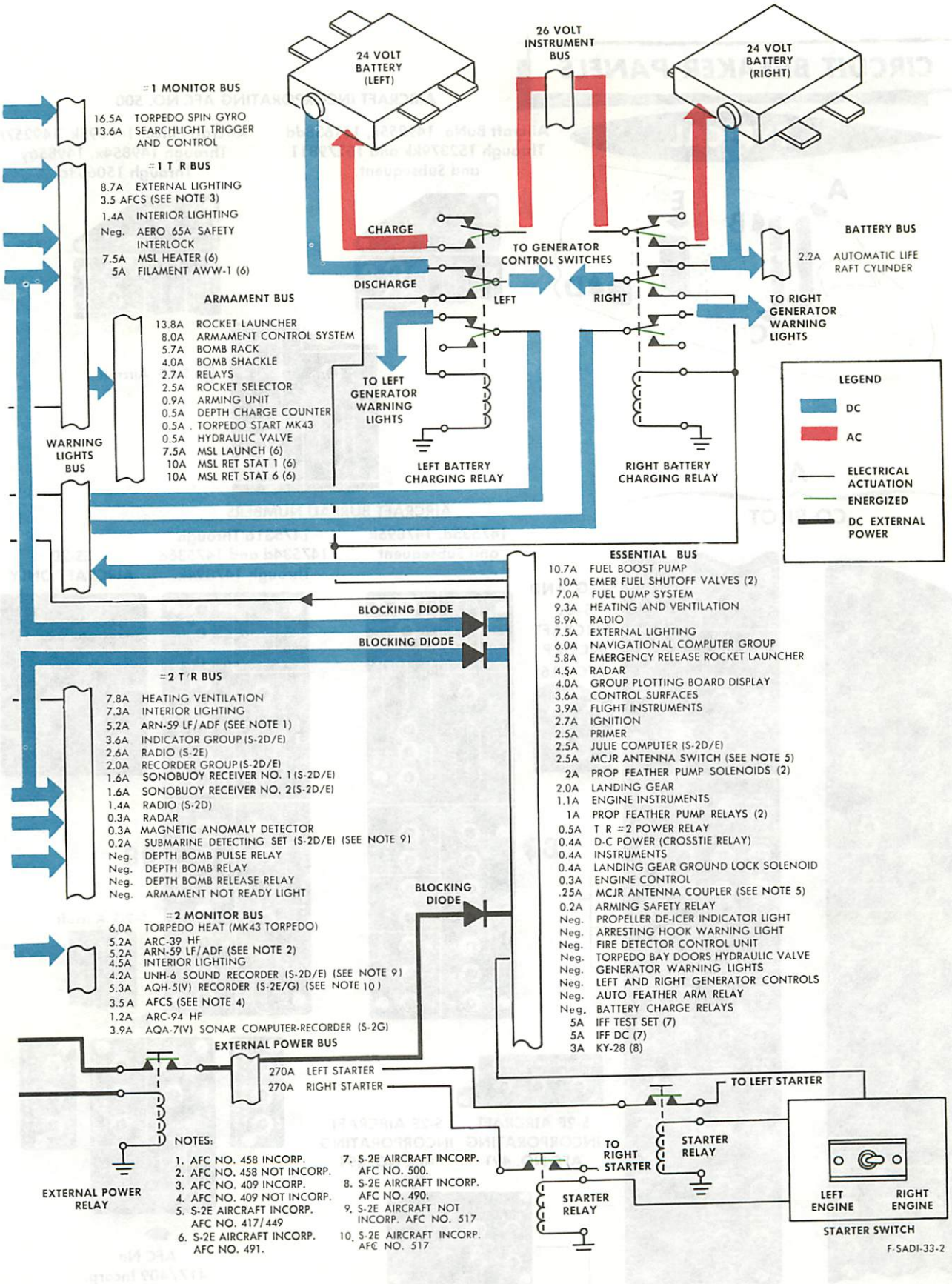
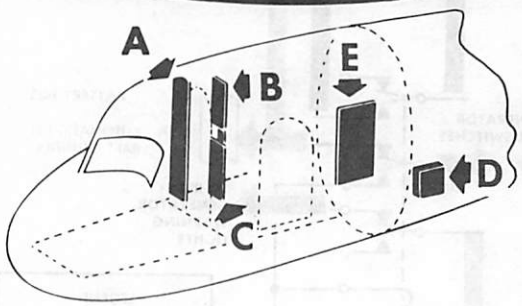


Figure 1-41 (Sheet 2)

CIRCUIT BREAKER PANELS

TYPICAL



A

CO-PILOT

AIRCRAFT INCORPORATING AFC NO. 500

Aircraft BuNo. 149855x, 151638dd Through 152379kk and 15279811 and Subsequent.

Aircraft BuNo. 147895k, 149257t Through 149854x, 149856y Through 150603cc

S-2G Aircraft

AIRCRAFT BUREAU NUMBERS

147535d, 147895k and Subsequent

147531a Through 147534d and 147536e Through 147894k

ES-2D AIRCRAFT ONLY

S-2G AND S-2E AIRCRAFT INCORP. AFC 516

S-2G Aircraft

S-2E AIRCRAFT INCORPORATING AFC NO. 491

S-2E AIRCRAFT INCORPORATING AFC NO. 491

AFC No. 417/409 Incorp.

G-SAD1-164-1

Figure 1-42 (Sheet 1)

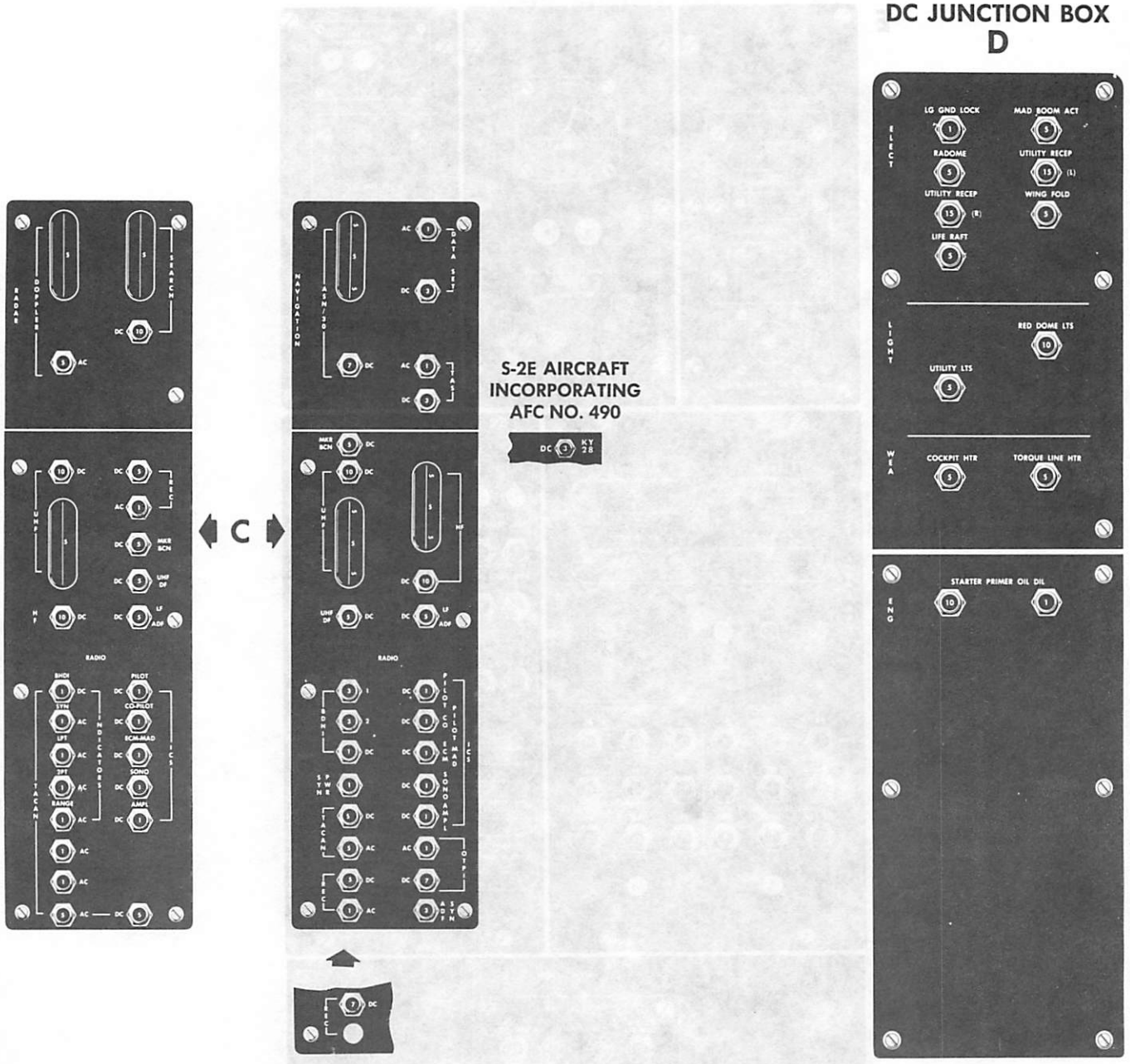
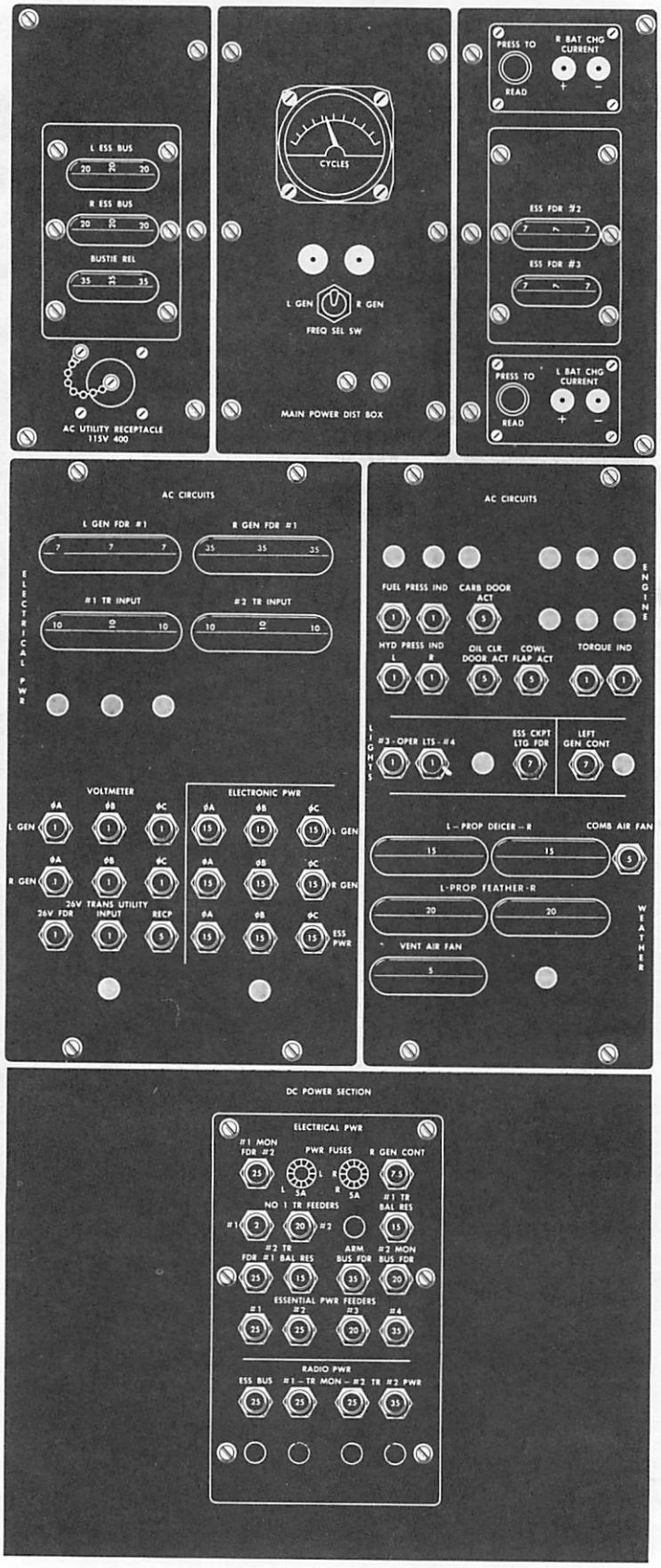


Figure 1-42 (Sheet 2)

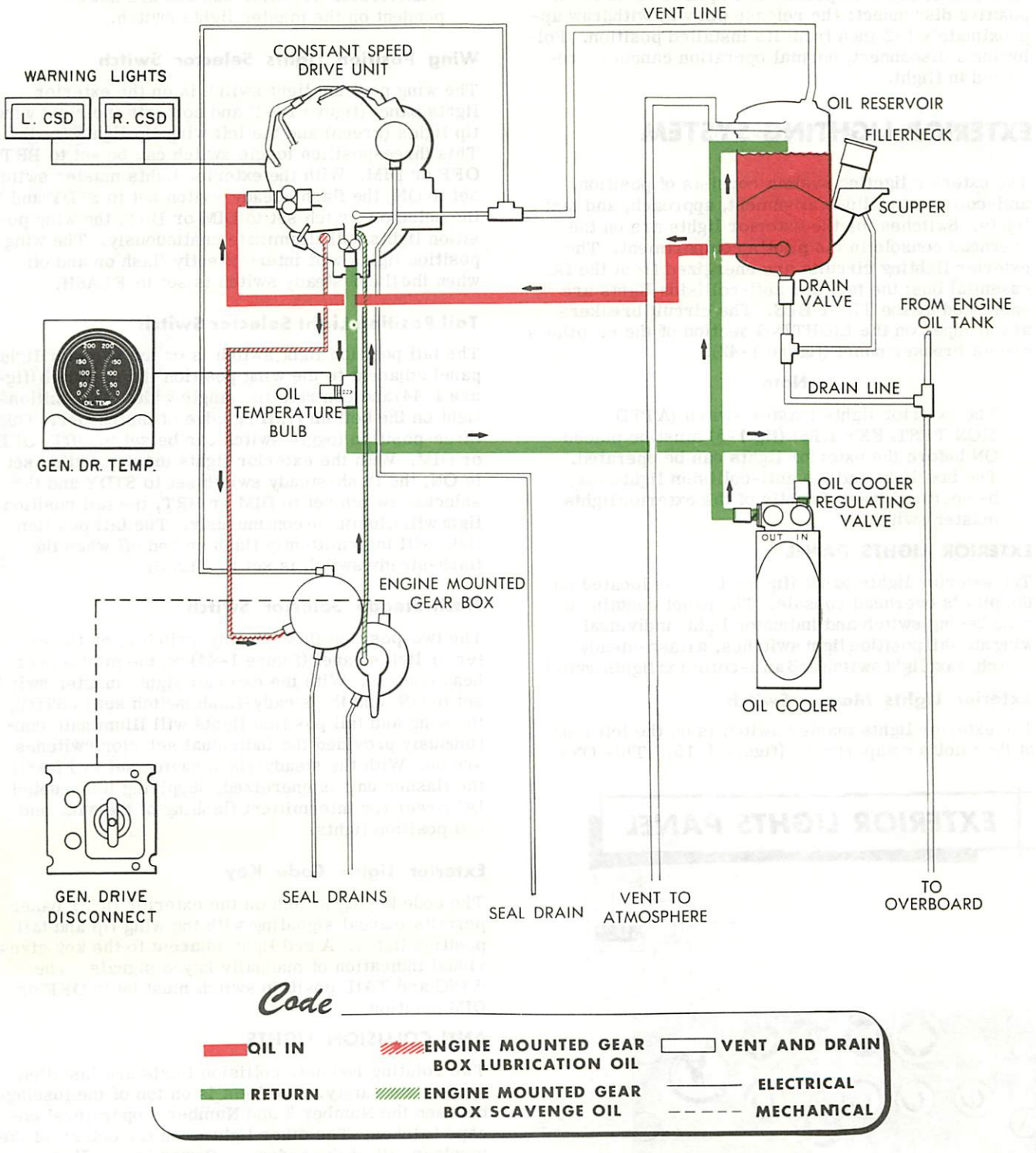
MAIN DISTRIBUTION PANEL



E-SAD1-164-3

Figure 1-42 (Sheet 3)

CONSTANT SPEED DRIVE OIL SUPPLY SYSTEM



SAD1-125

Figure 1-43

overhead console (figure 1-6). Pulling the handle transmits movement through cables and linkage to the release pin at the input end of the associated gear box. Complete disengagement occurs as the forward splined end of the input shaft separates from the splined drive of the engine power takeoff pad. A sharp hard pull of about 50 pounds is required to insure a positive disconnect: the release pin will withdraw approximately 1/2 inch from its installed position. Following a disconnect, normal operation cannot be restored in flight.

EXTERIOR LIGHTING SYSTEM

The exterior lighting system consists of position, anti-collision, attitude alignment, approach, and taxi lights. Switches for the exterior lights are on the overhead console in the pilot's compartment. The exterior lighting circuits are energized from the DC essential bus; the taxi and anti-collision lights are energized by the TR #1 BUS. The circuit breakers are grouped on the LIGHTING section of the co-pilot's circuit breaker panel (figure 1-42).

Note

NEW The exterior lights master switch (ATTD MON TEST/EXT LTS) (fig 1-5) must be placed ON before the exterior lights can be operated. The taxi light and the anti-collision lights may be operated independently of the exterior lights master switch.

EXTERIOR LIGHTS PANEL

The exterior lights panel (figure 1-44) is located on the pilot's overhead console. The panel contains a code keying switch and indicator light, individual wing and tail position light switches, a flash-steady switch, taxi light switch and anti-collision lights switch.

Exterior Lights Master Switch

The exterior lights master switch is on the left side of the pilot's compartment (figure 1-15). This ON-OFF switch must be set to ON for operation of the lights selected on the exterior lights panel.

Note

The taxi light switch and the anti-collision light switch are energized from the No. 1 transformer-rectifier bus and are not dependent on the master lights switch.

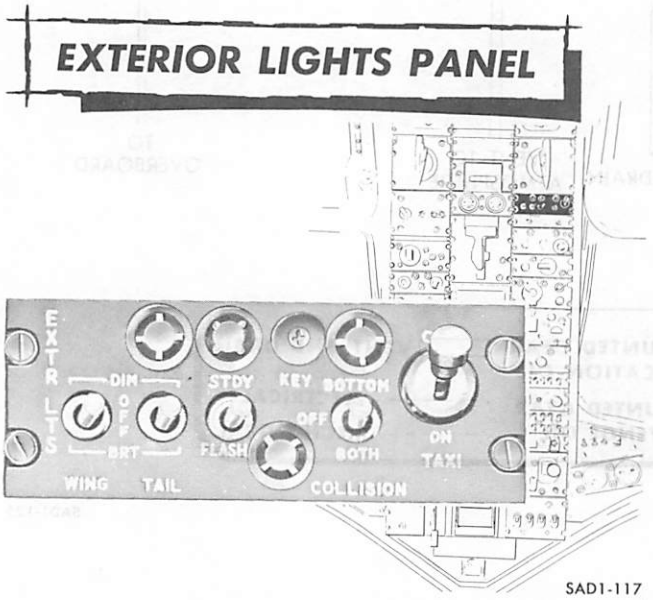


Figure 1-44

Wing Position Lights Selector Switch

The wing position light switch is on the exterior lights panel (figure 1-44) and controls the right wing tip lights (green) and the left wing tip lights (red). This three-position toggle switch can be set to BRT, OFF or DIM. With the exterior lights master switch set to ON, the flash-steady switch set to STDY and the selector switch set to DIM or BRT, the wing position lights will illuminate continuously. The wing position lights will intermittently flash on and off when the flash-steady switch is set to FLASH.

Tail Position Light Selector Switch

The tail position light switch is on the exterior lights panel adjacent to the wing position lights switch (figure 1-44) and controls the single white tail position light on the bottom trailing edge of the rudder. This three-position toggle switch can be set to BRT, OFF or DIM. With the exterior lights master switch set to ON, the flash-steady switch set to STDY and the selector switch set to DIM or BRT, the tail position light will illuminate continuously. The tail position light will intermittently flash on and off when the flash-steady switch is set to FLASH. NEW

Flash-Steady Selector Switch

The two-position flash-steady switch is on the exterior lights panel (figure 1-44) on the pilot's overhead console. With the exterior lights master switch set to ON, and the steady-flash switch set to STDY, the wing and tail position lights will illuminate continuously provided the individual selector switches are on. With the steady-flash switch set to FLASH the flasher unit is energized, supplying interrupted DC power for intermittent flashing of the wing and tail position lights.

Exterior Lights Code Key

The code keying switch on the exterior lights panel permits manual signaling with the wing tip and tail position lights. A red light adjacent to the key gives visual indication of manually keyed signals. The WING and TAIL position switch must be in OFF or DIM position.

ANTI-COLLISION LIGHTS

Two rotating red anti-collision lights are installed for inflight safety. One light is on top of the fuselage between the Number 3 and Number 4 operators' escape hatches. The other light is on the bottom of the fuselage, aft of the radome. Power is supplied through the No. 1 transformer-rectifier bus to a three-position toggle switch. Each light rotates at 45 RPM and provides 90 flashes per minute. Operation of the anti-collision lights does not require the exterior master lights switch to be set to ON.

Note

The rotating anti-collision light should be turned OFF during flight through conditions of reduced visibility where the pilot could experience dizziness as a result of the rotating reflections of the light against the clouds. The light would be ineffective as an anti-collision light since it could not be observed by pilots of other aircraft.

Anti-Collision Lights Switch

The anti-collision lights switch is on the exterior lights panel (figure 1-44). The switch is placarded BOTTOM, OFF and BOTH. Operation of anti-collision lights does not require that the exterior master lights switch be in ON position.

TAXI LIGHT

A 250-watt, fixed sealed beam taxi light is located in the nose of the aircraft. Operation of the taxi light does not require the exterior master lights switch to be set to ON.

Taxi Light Selector Switch

The taxi light selector switch is on the exterior lights panel (figure 1-44). It is a two-position ON-OFF lever lock toggle switch. Power is supplied from the No. 1 transformer-rectifier bus through the taxi light circuit breaker.

Approach Lights

Red, amber, and green approach lights in the leading edge of the left wing informs the LSO of the aircraft's approach attitude and condition of the landing gear and arresting hook. The green light indicates a high angle-of-attack, red, a low angle-of-attack, and amber indicates a normal landing condition. Airspeed equivalents of the lights are:

GREEN (slow)	91 KIAS or below
AMBER (normal)	92-98 KIAS
RED (fast)	99 KIAS or above

During normal operation the approach lights are controlled by the stall warning lift computer and energized by the landing gear down-lock and arresting hook switches. The approach light operates when the arresting hook is down and the landing gear is down and locked. Placing the exterior master lights switch to ON causes the approach lights to dim. In any other configuration the lights will be out. When the aircraft is used for field carrier landing practice (bounce drill), the ground crew may actuate a hook by-pass switch, located in the nose wheel well, that will make the approach lights a function of the landing gear only.

NEW

Note

If the arresting hook by-pass switch is actuated the approach lights will be governed by the landing gear down lock switches only. Normal system operation can be restored by extending the arresting hook, turning off all electric power, or opening and closing the APPROACH SAFETY circuit breaker.

Attitude Alignment Lights

Two attitude alignment lights, one aft of the nose wheel well and one forward of the tail wheel well, are on the lower left side of the fuselage. Each light is fitted with a yellow cover. The LSO uses the alignment lights in conjunction with the approach lights to determine the aircraft's attitude and alignment during landing approach. The attitude alignment lights are controlled by the landing gear downlock switches and the arresting hook switch.

Note

When the aircraft is employed for field carrier landing practice, the tail hook by-pass switch may be actuated by the ground crew, thus making the alignment lights a function of the landing gear only.

INTERIOR LIGHTING SYSTEM

The interior lighting system consists of the instrument panel lights, console lights, floodlights, storm lights, utility lights, and compartment dome lights. All lighting circuits are individually controlled. Interior lighting circuit protection is by circuit breakers on the right circuit breaker panel in the pilot's compartment, the main distribution panel, and the DC circuit breaker panel in the electronics compartment (figure 1-42).

INSTRUMENT LIGHTS

The instrument lights provide edge illumination for the pilot's and co-pilot's primary and secondary instruments, the emergency hydraulic panel and the standby compass. These lights receive power from the AC essential bus and are controlled by autotransformers on the pilot's and co-pilot's instrument panels. Circuit protection for these lights is by circuit breakers on the right panel in the pilot's compartment (figure 1-42).

Instrument Lights Autotransformers

The pilot's and co-pilot's primary and secondary instrument lights autotransformers are of the rotary type and are on the pilot's and co-pilot's instrument panel (figures 1-3 and 1-5). Each knob serves as an on-off switch and light intensity control. In addition, the pilot's primary instrument light autotransformer controls the dimming of the various warning lights with the exception of the fire warning lights.

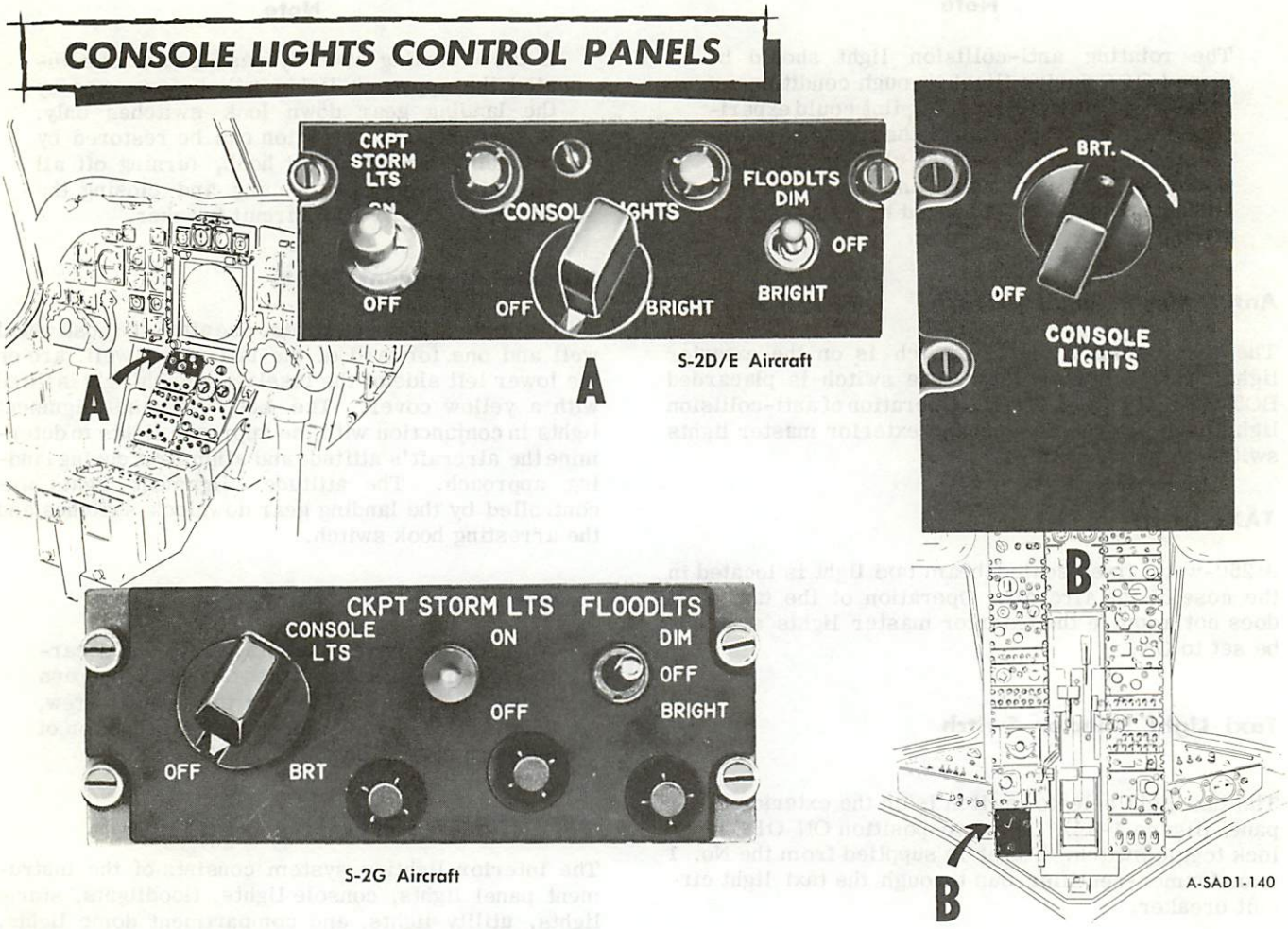


Figure 1-45

Note

The pilot's primary lights autotransformer dims the chip detector lights and APQ-107 low altitude warning lights.

CONSOLE LIGHTS

The console lights provide illumination for the pilot's overhead and folding and diagonal console and the Number 3 and Number 4 operator's console. The console lights are controlled by individual rotary knobs located on each console (figure 1-45) which serve as on-off and light intensity controls. Circuit breakers for the console lights circuits are on the right circuit breaker panel in the pilot's compartment (figure 1-42). The lights go on with minimum intensity when the knob is turned on from the OFF position and intensity increases with further rotation of the knob. Power supply is from the AC essential bus except for the No. 3 and No. 4 operators' consoles which are powered from the left generator bus.

Console Lights Control Knobs

The console lights are controlled by individual rotary knobs located on each console (figure 1-45) which serve as on-off and light intensity controls.

Floodlight Switch

The FLOODLTS three-position switch labelled OFF (central position), DIM, and BRIGHT is on the console lights control panel (figure 1-45). Power supply is from the DC essential bus.

UTILITY LIGHTS

A utility light is installed at each crew member's station for auxiliary lighting purposes. The lights are demountable and, by means of a ball and socket arrangement, may be rotated to any desired position. A switch on the lamp housing provides on-off and intensity control. The utility lights receive power from the No. 1 transformer-rectifier bus through the 5-ampere UTILITY lights circuit breaker located on the

DC circuit breaker panel on the DC junction box in the electronics compartment (figure 1-42).

DOME LIGHTS

The electronics compartment and the Number 3 and Number 4 operator's compartment have dome lights. Each light assembly is fitted with a red and a white lamp and a cover. Each dome light is controlled by a toggle switch installed next to it. In addition, a toggle-switch-controlled dome light fitted with 2 white lamps is installed overhead in the aft compartment. All white dome lights are connected to the No. 1 transformer-rectifier bus. All red dome lights are connected to the No. 2 monitored bus. The dome light circuits are protected by circuit breakers on the DC junction box in the electronics compartment (figure 1-42).

Operator's Dome Light Switch

The three-position switch for the operator's dome light is aft of the dome light. Switch positions are WHITE, OFF, and RED. A guard prevents inadvertent lighting of the white lamp by making it necessary to pull down on the guard before the switch can be set to WHITE.

Cockpit Storm Lights Switch

A lever-lock, two-position toggle switch is located on the diagonal console (see figure 1-45). With the switch set to ON, power is supplied from the No. 1 transformer-rectifier bus to the two storm lights located on the pilot's compartment aft bulkhead.

SPARE LAMPS AND FUSES

Spare lamps and fuses are stored in a special storage box in the electronics compartment.

FIRE DETECTION SYSTEM

The fire detection system warns the pilot of fire or excessive heat in either engine, engine accessory compartment or main landing gear wheel well. Each engine fire detection system is a continuous-type, automatic resetting, detector system consisting of warning light, relay, control unit, sensing elements, and connectors. A single FIRE DETECTOR test switch checks the continuity of both systems simultaneously. Each system is powered from the DC essential bus through the LEFT FIRE DET and RIGHT FIRE DET circuit breakers on the circuit breaker panels (figure 1-42). The test relay operates on DC power from the warning lights bus through the test switch and is protected by the WARN LTS circuit breaker on the circuit breaker panels. Sensing elements are placed to fully cover the areas from which a warning signal would be desired. Under normal conditions, the detector circuit operates when the sensing elements are subjected to high temperatures. The pilots are warned by warning lights, one for each engine, on top of the center instrument panel (figure 1-4).

FIRE WARNING LIGHTS

Two red fire warning lights are on the top side of the glare shield above the center instrument panel (figure 1-4) and are placarded L FIRE and R FIRE. When ON, the light indicates excessive heat or fire in the applicable engine, engine accessory compartment, or main landing gear wheel well.

Fire Detector Test Switch

The FIRE DETECTOR TEST switch is located at the top of the center instrument panel (figure 1-4). The switch is a momentary toggle switch normally in the off (center) position. When held to the right, the fire detection sensing element circuit is shorted and both fire warning lights go on. Aircraft BuNo. 149257 and subsequent have test buttons installed instead of a switch.

AIRCRAFT ELECTRONIC SYSTEMS

Note

For aircraft BUNO. effectivity, refer to systems descriptive paragraphs in this section and in Section VIII.

COMMUNICATIONS

AN/AIC-14 ICS

AN/ARC-52 UHF Transceiver

AN/ARC-94 HF Transceiver (S-2E/G only) NEW

AN/ARC-39 HF Transceiver

AN/UNH-6 Sound Recorder (S-2D/E without AFC No. 517 incorp.) NEW

KY-28-Speech Security Equipment (S-2E/G incorp. AFC No. 517)

NAVIGATION

AN/APN-141(V) or

AN/APN-117 Radar Altimeter Set

AN/APN-122 or AN/APN-153 Doppler Radar

AN/APQ-107 Radar Altimeter Warning Set

AN/ARA-25/25A UHF Direction Finder Set

AN/ARN-12 or AN/ARN-32 Marker Beacon Receiver

AN/ARN-21 TACAN Set

NEW AN/ARN-52 TACAN Set (S-2E/G only)

AN/ARN-59 LF Direction Finder Set (ADF)

AN/ASA-13A or

AN/AYK-2 Navigation Computer (S-2D only)

AN/ASA-31 Target Position Computer (S-2D only)

NEW AN/ASN-30/30A Navigational Computer Display (S-2E/G only)

AN/ASQ-80 Coordinate Data Set (S-2E only)

NEW AN/ASQ-149 Coordinate Data Set (S-2G only)

MD-1 Vertical Gyro Indicator

MF-1 Compass System

MH-67 Autopilot System (AFCS)

T-692A/ASA-13 Airspeed Computer (S-2E only)

IDENTIFICATION

AN/APA-89 SIF

AN/APX-6 IFF

AN/APX-72 Aims

DETECTION/CLASSIFICATION

AN/ALD-2/-2B ECM

AN/AQA-4(v) Indicator Group (S-2D/E only)

NEW AN/ASQ-7(v) Sono Computer-Recorder Group (S-2G only)

AN/ARR-58 Sono Receiver Set (S-2D only)

AN/ARR-52 or -52A Sono Receiver Set (S-2E only)

NEW AN/ARR-75 Sono Receiver Set (S-2G only)

NEW AN/ASA-26A Recorder Group, Sono Receiver (S-2G only)

AN/ASR-3 Detection Set (S-2D/E Without AFC No. 517 incorp.)

AN/ASQ-10A MAD

AN/AVQ-2C Searchlight

R-1047A or R-1047A/A OTPI Receiver

TD-278/A Sonobuoy Intervalometer

NEW CU-1497/ARR Antenna Coupler (MCJR) (S-2E/G incorp. AFC No. 417/449)

NEW AN/AKT-19 Telemetric Data Transmitting Set (MCJR) (S-2E/G incorp. AFC No. 417/449)

SEARCH

AN/APS-88/88A Radar

ELECTRICAL

AC Generator System
DC Transformer Rectifiers

ANTENNAS

Antennas for all electronic equipment are shown in figure 1-62.

COMMUNICATIONS EQUIPMENT

Precise and proper communications are one of the most vital links in the effective conduct of Antisubmarine Warfare operations, as well as in the safe and efficient operation of aircraft. Three basic considerations in the exercise of good communications are speed, security, and reliability: of which, reliability is the most important.

RADIO COMMUNICATIONS

The types of radio communications (figure 1-46) equipment installed in the aircraft are described in the following paragraphs:

External

1. UHF. The AN/ARC-52 UHF transmitter and receiver operates between 225.0 and 399.9 MHz has 19 preset channels available, including guard, and allows manual selection of any one of the 1,750 frequencies available. This is the primary communications equipment in the aircraft, and is usable from any of the four crew positions in the aircraft.

2. HF. The AN/ARC-39 transmitter and receiver operates on 12 preset channels in a frequency range between 2.0 and 9.1 MHz or the AN/ARC-94 transmitter and receiver which operates between 2.000 and 29.999 MHz.

Note

Where the CU-351 HF antenna coupler is utilized, the HF system must not be operated above 23.0 MHZ.

Internal

The AN/AIC-14 interphone system operates in all four crew stations. There are two amplifiers in each crew position both of which are utilized, operating under a normal situation. With the selection switch in the NORM position and ICS failure is encountered, ALT 1 is selected which utilizes one of the two amplifiers. If ICS failure is still experienced switching to ALT 2 selects the second of the two amplifiers. In the remote situation where both amplifiers have failed, the EMERG position is selected. This allows internal

COMMUNICATIONS EQUIPMENT

TYPE	DESIGNATION	USE	RANGE	LOCATION OF CONTROLS
INTERCOM-MUNICATION SET	AN/AIC-14	INTERPHONE AND RADIO SELECTION	WITHIN AIRCRAFT	EACH CREW MEMBER.
UHF COMM EQUIPMENT	AN/ARC-52	TWO-WAY VOICE COMMUNICATION	LINE OF SIGHT.	PILOT'S FOLDING CONSOLE.
HF COMM EQUIPMENT	AN/ARC-39 OR AN/ARC-94	TWO-WAY VOICE COMMUNICATION	100 N. M. (VARIABLE)	PILOT'S OVERHEAD CONSOLE.
*UHF CRYPTO DEVICE	KY-28	UHF SECURE VOICE	LINE OF SIGHT	PILOT'S FOLDING CONSOLE

*S-2E Aircraft incorporating AFC No. 490.

B-SAD1-113

Figure 1-46

communication utilizing the side tones of the UHF or HF transmitter depending on which is selected.

INTERCOMMUNICATIONS SET AN/AIC-14

This equipment is the communication system between crew members, a mixer for the audio output of various receiving equipment, and is a means for partially controlling the transmitting equipment. There is an interphone control station for each crew member (figure 1-47). An external jack is located near the nose wheel, on the left side of the fuselage.

ICS Selector Panel

This panel enables the crew member to select any other crew member at will and call him. The crew can also select any other combination or all of them.

Transmitter Selector Panel

The ICS, No. 1, and No. 2, and No. 3, positions (with AFC 484 incorporated) are the only selections possible. The remaining TRAN SEL numbers are blank.

Receiver Selector Panel

This panel allows the crew member to select any combination of receivers desirable for the work at hand.

Operation (Pilot/Co-Pilot)

Place interphone controls in the following positions:

1. Interphone Control Panel AIC-14

   INTPH VOL - Maximum (clockwise)
   AMP SEL - NORM
   MIC SEL - COLD
   VOX - Minimum (counterclockwise)

2. Transmitter Selector Panel AIC-14

   TRAN SEL - #1
   ICS - ON
   RAD VOL - Maximum (clockwise)

3. Receiver Selector Panel AIC-14

   All RCVR switches - AFT

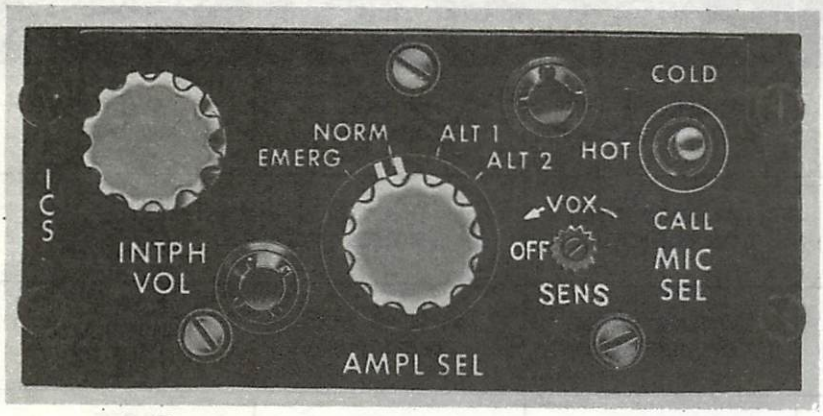
4. ICS Selector Panel AIC-14

   All ICS station select switches - AFT

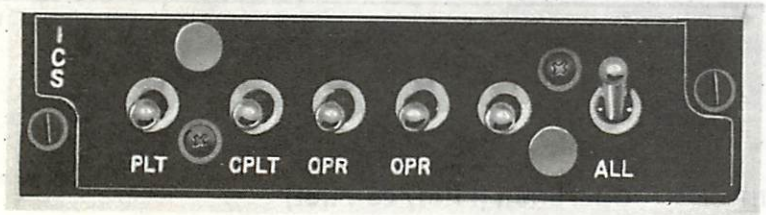
Upon placing all controls in correct position proceed as follows:

1. Hold the COLD-HOT-CALL switch to CALL position and speak into the microphone. Speech should be heard at all crew stations.
2. Select desired ICS station, place MIC SEL switch to HOT and speak into the microphone. The recipient of your call upon hearing you establishes two-way communication by selecting you on his ICS SELECT panel.

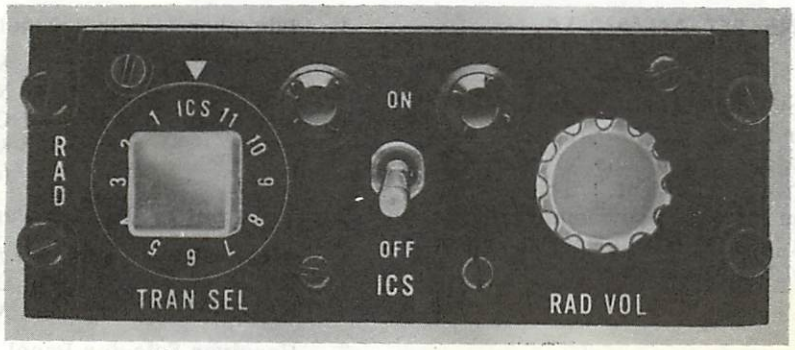
INTERCOMMUNICATION SET AN/AIC-14



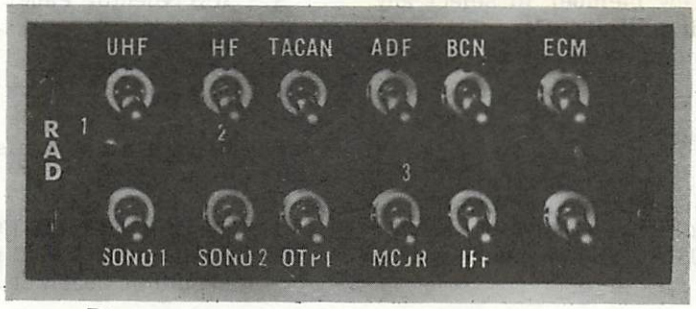
A INTERPHONE CONTROL PANEL AIC-14



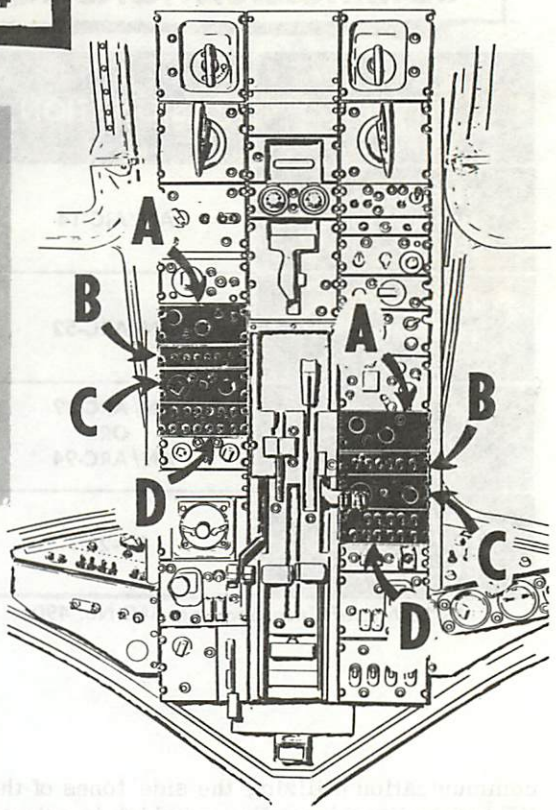
B ICS SELECTOR PANEL AIC-14



C TRANSMITTER SELECTOR PANEL AIC-14



D RECEIVER SELECTOR PANEL AIC-14



C-SAD1-142

Figure 1-47

Note

The "T" push-button must be depressed when the ALL switch is energized.

Emergency Operation

Note

No transmission will be made on emergency (distress) frequency channels except for emergency purposes in order to prevent transmission of messages that could be construed as actual emergency messages.

EMERGENCY ICS PROCEDURE

1. AMPL SEL switch to EMERG.
2. TRAN SEL to position 1 and Receiver UHF selector switch to UHF (or TRAN SEL to position 2 and Receiver HF selector switch to HF).
3. Depress "M" button and audio sidetone will be heard in the headset.

Note

UHF or HF must be selected on the receiver selector panel (corresponding to the transmitter selected for emergency ICS) at each crew station in order to receive on emergency ICS.

4. The only operating switches on the receiver selector panel that are functional in the Emergency ICS position are: TACAN, HF, and UHF.

ICS VOX Operation

An ICS VOX feature is incorporated in the interphone control panel AIC-14. This is a voice-operated circuit (VOX), that allows use of HOT mike without background audio feeding through the ICS system. ICS VOX feature is not installed on all aircraft.

Note

When utilizing the VOX control ensure the control is properly positioned in conjunction with the VOL control, as improper positioning will give intermittent and voice-clipped operation.

Auxiliary Stations ICS Operations

1. Place AUX. STA. I.C.S. switch, located at the Number 3 operator's position, to ON position.
2. At Number 3 operator's ICS Selector Panel AIC-14, place ICS ALL switch in ALL position.
3. Audio sidetone will be heard and in addition, a two-way communication will be established between the pilot, co-pilot and Number 4 operator.

Note

The ICS NOSE station, electronic compartment station and radar compartment station are all connected in parallel. This parallel combination is then connected to the Number 3 operator via the auxiliary ICS switch. All operating ICS and radio receiver controls normally available to the Number 3 operator are now available to the auxiliary stations. Radio transmitters cannot be keyed from auxiliary stations.

UHF COMMUNICATIONS SET AN/ARC-52

UHF Communications Equipment AN/ARC-52 is the primary means of communication and is used for UHF voice communication between aircraft and ground or shipboard stations. The frequency range extends from 225.0 to 399.9 MHz. The equipment provides 19 preset channels including the guard channel. Manual channel selection is also provided. The guard channel receiver is separate from the ARC-52 receiver but can be mixed with it to provide simultaneous reception upon selection.

UHF Control Panel

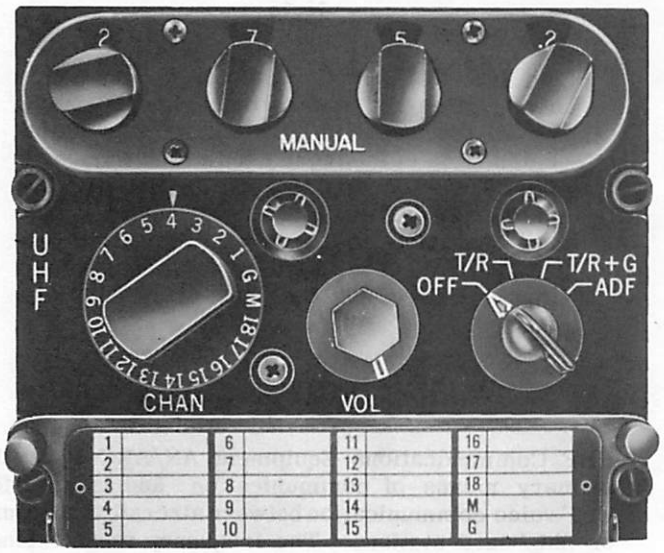
The UHF Control ARC-52 is on the pilot's folding console (figure 1-48). A four-position function selector switch turns the equipment on when advanced from the OFF position and also selects the units that will be monitored. In the T/R position, only the main receiver-transmitter is monitored; in the T/R + G position, both the main receiver and guard receiver are monitored. When this switch is set to the ADF position, the equipment is combined with the UHF direction finder set for the purpose of homing on the selected station. The switch placarded CHAN permits the selection of any of the 19 preset channels. When this switch is set to the M position, any one of 1,750 possible frequencies may be selected manually by setting the four MANUAL frequency selectors to the desired frequency. The VOL control is used to control the audio output. Provisions have been made so that the 19 preset channels may be set into the equipment directly from the control panel. This is accomplished by unlatching the hinged cover and using the peg setting tool to set up the pegs on the memory drum.

Note

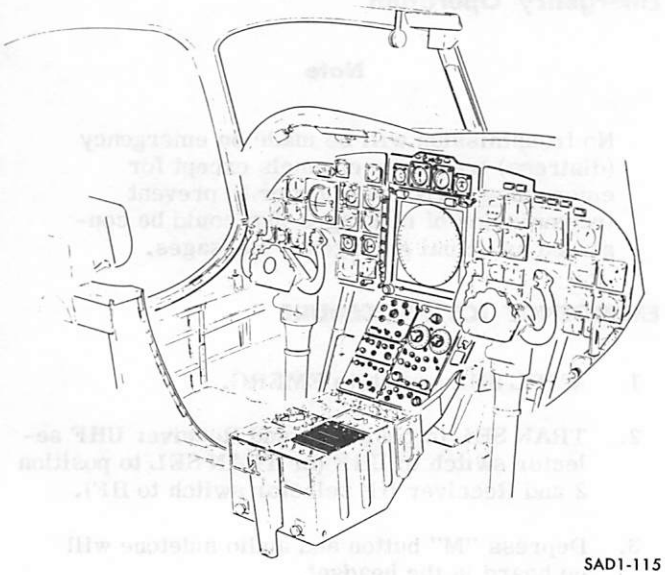
The channel available for presetting is shown on the left end of the memory drum and is not the channel indicated on the CHAN selector switch.

After presetting the channels, the frequency should be listed on the card attached to the hinged cover.

UHF COMMUNICATIONS SET AN/ARC-52



UHF CONTROL ARC-52



SAD1-115

Figure 1-48

HF COMMUNICATIONS SET AN/ARC-39

S-2D BuNo. 147531 THROUGH 149256 AND S-2E BuNo. 149257 THROUGH 150603 NOT INCORPORATING AFC NO. 453

HF Communications Set ARC-39 (HF command equipment) is a complete 12-channel, crystal-tuned, AM receiver-transmitter and is the secondary means of communications. Both receiver and transmitter cover the frequency range of 2 to 9.1 MHz in the two following bands:

1. Low band: 2 to 4.27 MHz (channels 1 through 6).
2. High band: 4.28 to 9.1 MHz (channels 7 through 12).

VOL Control

The VOL control is on the HF panel on the pilot's overhead console (figure 1-49). The VOL control is a power on-off switch and audio level potentiometer. Initial clockwise rotation of the control closes the on-off switch at the rear of the potentiometer housing. Further clockwise rotation increases the level of audio output. The level of transmitter sidetone is preset by an adjustment on the equipment and is not affected by changes in the VOL control setting. When the VOL control is rotated fully counterclockwise to the OFF position, all power is disconnected from the equipment.

Channel Selector Switch

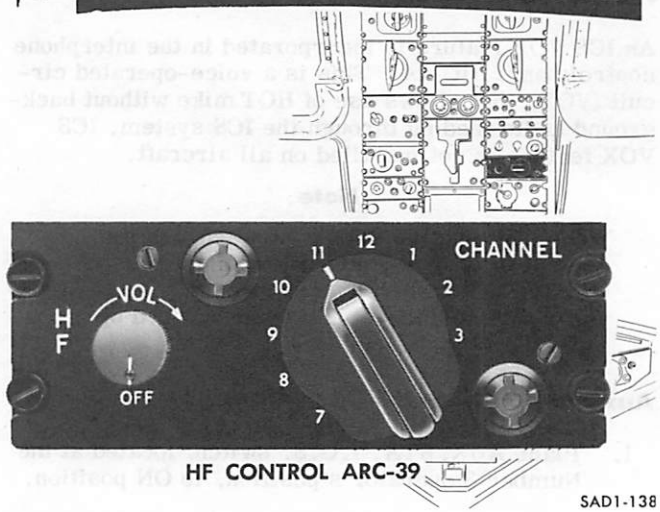
The CHANNEL selector switch on the HF panel permits selection of any one of 12 preset channels. For tuning and presetting procedures, refer to Section IX.

Energizing Equipment

Energize HF Communications Set ARC-39 as follows:

1. Place CHANNEL selector switch to desired channel on HF control panel

HF COMMUNICATIONS SET, AN/ARC-39



HF CONTROL ARC-39

SAD1-138

Figure 1-49

2. Rotate VOL control clockwise from the OFF position.

3. On Receiver Selector Panel AIC-14, set HF selector switch to HF.

4. On Transmitter Selector Panel AIC-14, rotate TRAN SEL knob to position No. 2.

5. Depress M pushbuttons on pilot's or co-pilot's control wheels, or RADIO foot switches at No. 3 or No. 4 operator's positions.

6. Establish voice contact with selected station.

Deenergizing Equipment

Deenergize HF Communications Set ARC-39 as follows:

1. On Receiver Selector Panel AIC-14, place HF toggle switch to down position.

2. On Transmitter Selector Panel AIC-14, set TRAN SEL knob to position No. 1.

3. Rotate VOL control switch to OFF position.

HF COMMUNICATIONS SET AN/ARC-94

S-2E BuNo. 151638 AND SUBSEQUENT AND BuNo. 149257 THROUGH 150603 INCORPORATING AFC NO. 453

HF Communications Set AN/ARC-94 provides single-side band or compatible AM reception and transmission and CW reception as part of an over-all HF communications system. Frequency selection in 1-KC increments over the entire band provides a total of 24,000 operating frequencies. The frequency range of this equipment is from 2.000 to 29.000 MHz.

NEW

HF Control ARC-94

The HF Control (figure 1-50) provides remote control for selecting the desired operating frequency, and is located on the pilot's overhead console. A six position function switch turns the equipment ON when advanced from the OFF position and also selects the desired mode of operation. USB (Upper Side Band), LSB (Lower Side Band), AM, DATA, or CW may be selected. However, the CW and DATA functions are not used in the present aircraft configuration. Frequency selection is accomplished by manually turning four knurled frequency knobs and reading the desired frequency in the back lighted window of the control. The RF SENS control controls the receiver sensitivity.

Energizing Equipment

Energize HF Communications Set ARC-94 as follows:

1. Advance function selector from OFF position (allow three minute warm up period).

2. On receiver selector panel AIC-14, set HF selector to HF.

3. Dial in desired frequency.

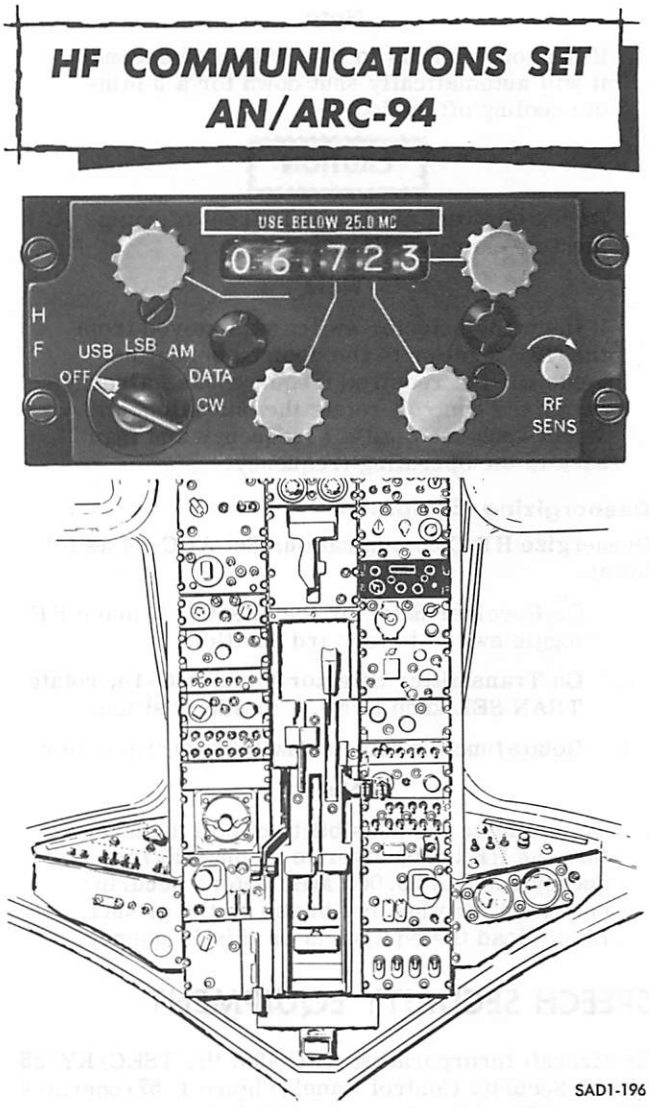


Figure 1-50

4. On Transmitter Selector Panel AIC-14 rotate TRAN-SEL knob to position No. 2.

Note

Do not attempt to load antenna without first monitoring frequency selected for message traffic.

5. Depress "M" button until tone is heard in headset. Release "M" button. When tone stops antenna is loaded.

Note

Do not attempt transmission while the equipment is loading.

6. Establish voice contact with selected station in the AM position as USB, or LSB will be determined by the station being contacted.

Note

If the coupler fails to load within 45 seconds, it will automatically shut down for a 3 minute cooling off period.

CAUTION

Do not obstruct air intake in front of equipment as damage will result.

Note

If the mode selector switch was moved from the OFF position to the desired operating mode and the required frequency was already set on the control, rotate the one-kilohertz select knob one digit off frequency and then back to the operating frequency.

Deenergizing Equipment

Deenergize HF Communications Set ARC-94 as follows:

1. On Receiver Selector Panel AIC-14, place HF toggle switch to forward position.
2. On Transmitter Selector Panel AIC-14, rotate TRAN SEL knob to No. 1 or ICS position.
3. Rotate function selector switch to OFF position.

Note

To minimize the possibility of coil damage, turn the HF transceiver to an unusual frequency such as 29.000 MHz before securing equipment or when not in use on the ground. Do not load the equipment on this frequency.

SPEECH SECURITY EQUIPMENT

On aircraft incorporating AFC 490, the TSEC/KY-28 Speech Security Control Panel (Figure 1-52) operates with the UHF-ARC-52 and the ICS AIC-14 for cipher and plain language operation.

KY-28 CONTROL PANEL

The KY-28 control panel located on the cockpit folding console provides the pilots with easy access for operation of the speech security equipment in either the cipher or plain language mode.

Note

With KY-28 equipment installed in the aircraft, procedures for handling classified/cryptographic equipment must be followed.

Power Switch

The power switch is a three-position rotary selector, placarded OFF, ON, and RLY. ON applies operating voltage to the KY-28 system, while RLY is utilized to relay messages. When power is applied to the equipment, the unit performs an automatic alarm check. A valid alarm check is indicated by an unbroken (steady) tone in the headset, followed by a double-pitched broken tone.

Cipher-Plain Switch

The cipher-plain switch is a two-position toggle switch placarded C and P. In the P position, the UHF



Figure 1-51

radio is used as a plain language transmitter/receiver. The C position is used to transmit and receive voice secure communications over the UHF radio in accord with the preset codes.

Zeroize Switch

The zeroize switch is a two position spring-loaded toggle switch that provides for the erasing of the preset KY-28 cipher (C) mode codes by placing the switch in the ZEROIZE (up) position.

Note

Only authorized personnel will reset codes.

KY-28 OPERATION

Prelaunch

1. Determine that the proper code has been set in the KY-28 equipment by qualified personnel.
2. UHF radio and ICS switches ON.
3. Power switch - ON.
4. Cipher/plain switch to P.
5. If a ground test of the equipment is desired, after a 2-minute warmup period, establish two-way plain text UHF radio communications with a suitable ground station and request an equipment check.
6. Cipher/plain switch - C
   a. Listen for a steady, unbroken tone in the headset, followed by
   b. A double-pitched broken tone.
7. Depress MIC button, hold for approximately 2 seconds, and release. The double-pitched broken tone will cease and no sound will be heard.

8. Depress MIC button and hold. A single beep tone will be heard in approximately 1 1/2 seconds. When this tone is heard, the equipment is ready to cipher transmission.

9. After beep tone is heard, establish two-way cipher UHF communications with a cooperating ground station and check for readability and signal strength.

10. Set Cipher/plain switch in accordance with tactical situation.

Note

If a ground check is not practical, the above procedures may be used to perform an in-flight check of the equipment.

Post-Launch

The speech security equipment will be operated as directed by appropriate authority.

After Landing

1. ZEROIZE switch - ZEROIZE (AS BRIEFED)

   Zeroize the code as directed by appropriate authority.

2. Power switch - OFF.

NAVIGATION EQUIPMENT

Refer to Navigation Equipment table, figure 1-52.

ROLL STABILIZED COMPASS SYSTEM MF-1

The roll stabilized compass system provides the navigational requirements for the aircraft. The system consists of both magnetic and inertial references that are essential for all latitude navigation. The inertial reference element is the roll stabilized directional gyro, which provides the proper static and dynamic accuracies in all regions of the earth. The magnetic reference element is the remote compass transmitter, which provides a long-term reference having good accuracy in regions where magnetic information is reliable. Both these references are combined in the roll stabilized compass system.

The roll stabilized directional gyro compass system provides three modes of operation. The first mode of operation is the directional gyro mode and utilizes only the roll stabilized directional gyro as a heading reference. This method of navigation is mandatory in the polar regions, where grid navigation is used.

In this mode of operation, a means has been provided for the introduction of latitude correction, necessary to compensate for apparent gyro drift due to the earth's rotation. Leveling of the roll stabilized directional gyro is maintained at all times to prevent the directional gyro from tumbling during turn maneuvers. The second mode of operation is the magnetic mode (slaved directional gyro mode) and utilizes both the roll stabilized directional gyro and the remote compass transmitter. The roll stabilized directional gyro is the short-term reference, furnishing stable heading information with very little delay. The remote compass transmitter is the long-term or average reference that slowly corrects the directional gyro information. Such corrections occur when gyro heading is in error due to drift.

The third mode of operation is the emergency mode and utilizes only the remote compass transmitter. This mode is used when the roll stabilized directional gyro or the azimuth servo loop malfunctions.

MF-1 Compass Control Panel

The roll stabilized compass control panel is in the pilot's overhead console (figure 1-53) and provides both magnetic and inertial references that are essential for all latitude navigation. Individual controls and indicators located on the control panel are discussed in the following paragraphs.

Latitude Correction Dial

The latitude correction dial is placarded LAT. The dial is used to reduce gyro errors when the mode selector switch is in DG or MAG position. The dial, after being set to flight latitude, may be corrected in flight as necessary.

Mode Selector Switch

The mode selector switch is used to define compass functions. The switch is placarded EMER-DG-MAG. The normal mode is MAG. If the switch is in MAG position it may be turned to EMER position, then back to MAG position. This will provide automatic synchronization of the compass to aircraft heading in approximately 25 seconds. The DG position is used when magnetic information is unreliable, and EMER position is used only when DG position malfunctions. Oscillations of the heading dial are normal in the EMER position.

Slew Control Switch

The slew control switch is placarded DECR-SET-INCR. When the slew control switch is turned clockwise to the INCR position, or counterclockwise to the DECR position, the slew gear train clutch is energized and an electrical signal is fed to the slew-slave motor. The correction shaft is rotated at a fast or slow speed, depending upon the position of the knob of the slew control. The SET knob is used to position the compass output to any desired heading. The slew control switch should be used only when the mode switch is in DG position and

NAVIGATION EQUIPMENT

TYPE	DESIGNATION	USE	RANGE	LOCATION OF CONTROLS
ROLL STABILIZED COMPASS SYSTEM	MF-1	MAGNETIC AND INERTIAL REFERENCE FOR LATITUDE NAVIGATION.	—	OVERHEAD CONSOLE.
TACAN, UHF NAVIGATION SET	AN/ARN-21 OR AN/ARN-52(V)	BEARING AND DISTANCE FROM AIRCRAFT TO GROUND BEACON,OR DISTANCE TO INTERROGATED AIRCRAFT.	LINE OF SIGHT TO 195 OR 300 N.M. MAXIMUM.	COCKPIT OVERHEAD CONSOLE.
DIRECTION FINDER SET, UHF/DF	AN/ARA-25A	RELATIVE DIRECTION OF RADIO SIGNALS.	LINE OF SIGHT.	INSTRUMENT PANELS. OVERHEAD AND FOLDING CONSOLES
DIRECTION FINDER SET LF/DF	AN/ARN-59	RELATIVE DIRECTION OF RADIO SIGNALS.	75-125 N. M.	OVERHEAD CONSOLE.
ON TOP POSITION INDICATOR (OTPI) SYSTEM	OTPI	RELATIVE DIRECTION OF SONOBUOY SIGNALS.	30 N. M.	OVERHEAD CONSOLE.
MARKER BEACON RECEIVER	AN/ARN-32 OR AN/ARN-12	RECEPTION OF MARKER BEACON SIGNALS FOR NAVIGATION.	—	BCN SWITCH ON ALL AN/AIC-14 CONSOLES.
DOPPLER RADAR	AN/APN-122 OR AN/APN-153(V)	GROUND SPEED AND DRIFT ANGLE COMPUTER.	—	DIAGONAL CONSOLE
RADAR ALTIMETER	AN/APN-117 OR AN/APN-141(V)	ALTITUDE INDICATION OVER TERRAIN AND WATER	0-1000 FEET. OR 0-5000 FEET	ALTITUDE INDICATORS ON INSTRUMENT PANELS.
RADAR IDENTIFICATION SET	AN/APX-6B	IDENTIFICATION	LINE OF SIGHT.	OVERHEAD CONSOLE.
	AN/APX-72 (AFC 500)	IDENTIFICATION AND ALTITUDE REPORTING	LINE OF SIGHT.	OVERHEAD CONSOLE.
SIF CODER SET	AN/APA-89	IDENTIFICATION	LINE OF SIGHT.	OVERHEAD CONSOLE.

D-SAD1-114

Figure 1-52

arbitrary heading selections are necessary (grid navigation). It may also be used to manually align the system if autosynchronization fails, or to trim the system if turning maneuvers are made with the ROLL STAB switch in the OFF position.

Correspondence Indicator

The correspondence indicator shows the difference between the remote compass transmitter and the directional gyro when the mode selector switch is in the MAG position. The indicator should be centered if accurate headings are to be maintained. Small oscillations of the indicator are normal.

When the mode selector switch is in the DG position the correspondence indicator will deflect for approximately 1/2 the latitude set in, i. e., 0° latitude centers the needle; 90° latitude provides 45 degrees deflection. The direction of deflection will be determined by the hemisphere selector; for example, N (northern hemisphere) is + on the correspondence indicator.

The indicator returns to center when the mode selector switch is in the EMER position.

Hemisphere Selector

The hemisphere selector determines direction of latitude dial corrections to the gyro. The dial should read N for northern hemisphere and S for southern hemisphere. An adjustment screw is on the panel.

Roll Stabilization Switch

The ROLL STAB switch energizes the compass roll stabilization feature to eliminate compass error during banked turns.

Roll Stabilization Alignment Indicator

The roll stabilization alignment indicator determines if roll stabilization is operating properly. With the aircraft in level flight and the roll stabilizer in ON position, the ALIGN IND should not light when pushed; if the aircraft is banked more than 6° ±2° and it is pushed, the light should go on. When the ROLL STAB switch is OFF the light will not go on, under any circumstances.

UHF NAVIGATION SET (TACAN)

The UHF Navigation Equipment (TACAN) AN/ARN-21 (aircraft BuNo. 147531a through 149275w) or AN/ARN-52(v) (aircraft BuNo. 149845w and subsequent) is an airborne interrogator-responder operating in conjunction with a surface navigation beacon transponder or other aircraft. The TACAN receives continuous indications of bearing and distance from any selected and suitably equipped surface beacon and distance from a cooperating aircraft, located within a line-of-sight. The TACAN is so designed that when correct bearing and distance information cannot be determined, the indicators rotate rapidly, and the pilot is unable to derive information.

Bearing information from the TACAN equipment is supplied to the No. 2 (double bar) pointer on the pilot's and co-pilot's bearing-distance-heading indicator (BDHI). Distance information (after selection by either the pilot or the co-pilot) from this equipment is also supplied to the BDHI for continuous display.

Note

On aircraft BuNo. 147531 through 149256, except BuNo. 147895, the Julie Computer switch must be in the OFF position for the No. 2 needle to display TACAN bearings on the pilot's BDHI.

The choice of a wide range of channels increases the probability of contacting the required beacon within the specified distance. The TACAN equipment provides the selection of 126 channels within the frequency range 962 to 1213 MHz. The transmitting channels range from 1025 to 1150 MHz in 1 MHz steps and



MF-1 COMPASS CONTROL PANEL

Figure 1-53

the receiving channels range from 962 to 1024 and 1151 to 1213 MHz in 1 MHz steps. The system operates as a duplex system, transmitting on one frequency and receiving on another. The peak power output is 1.5 to 3 kw. Warm-up time for the TACAN equipment is 90 seconds. Course deviation is also supplied by the TACAN system to the course indicator.

A Morse code signal is transmitted approximately every 37.5 seconds from a ground station, positively identifying the station. The signal is regulated by volume control on the TACAN control panel. Any crew member may receive the signal by selecting TACAN on his ICS interphone control panel.

Tacan Control Panel

The TACAN control panel is on the co-pilot's side of the overhead console (figure 1-54). This control panel contains an OFF-REC-T/R-A/A switch, a VOL control and a CHAN selector switch. When the function-selector switch is set to the REC position only bearing information is available. With the switch set to T/R, both bearing and distance indications are available. Selection of A/A position allows air-to-air mode operation. The equipment may be monitored by any crew member by setting the toggle switch on his interphone control to TACAN.

Air-To-Air Operation

Operation in the Air-to-Air mode requires prearrangement with a cooperating aircraft. The second aircraft must be equipped with a TACAN that is set to the A/A Mode and a 63 channel separation exists between aircraft. One aircraft may reply to as many as five others, but it will display only the distance to the aircraft with the strongest signal.

UHF NAVIGATION SET (TACAN) CONTROL PANEL

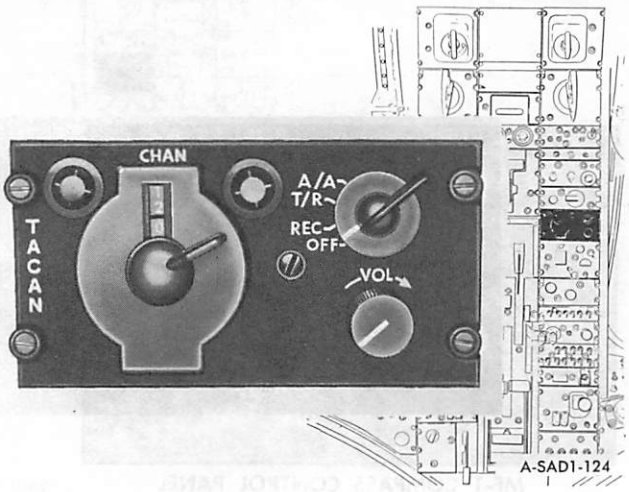


Figure 1-54

1. Set the function selector switch to A/A and the CHAN switch to the prearranged channel. Allow three minutes for equipment warm-up.
2. After a short period the range alarm on range indicator ID-388/APN will not be in view. When this occurs, read the line of sight distance to the cooperating aircraft.

Note

Bearing information is NOT provided in the Air-to-Air mode.

Indicators

A Course Indicator located on the pilot's instrument panel is a combined course indicator, flight path deviation indicator (CDI), and ambiguity indicator. This indicator provides course deviation (vertical bar), marker beacon indication, TO-FROM information, CDI OFF flag, course selector and heading indicator. The indicator also contains a horizontal bar and flag, not used in this aircraft.

The pilot's and co-pilot's BDHI No. 2 (double bar) pointer indicates magnetic bearing to the ground beacon. This indicator incorporates three synchro receivers arranged to display range information, which provides the pilot with a direct reading of the slant line distance from the aircraft to the UHF navigation ground beacon. The maximum range of the indicator is 199 or 299 nautical miles. The ARN-21 TACAN uses 195 nautical miles and the ARN-52 TACAN uses up to 299 nautical miles. The distance readout is available whenever the UHF navigation control panel selector switch is set to the T/R or A/A position. While the indicator is searching, the rapidly rotating synchro-driven numbers will be partially obscured by a warning indicator which warns the pilot against reading incorrect distance indications. On some indicators an OFF flag will cover the mileage indicator. Other indicators will stop at the last range when set to REC. Bearing indications of signals received from TACAN navigation equipment are provided by the No. 2 pointer.

Deenergizing Equipment

1. Rotate function selector switch to OFF.

DIRECTION FINDER SET AN/ARA-25A

Direction Finder Set ARA-25A (UHF direction finder) operates in conjunction with the UHF communication set ARC-52 equipment. The UHF direction finder shows the relative bearing of any UHF transmitter to which the ARC-52 equipment is tuned. The UHF direction finder is controlled through the pilot's automatic radio control ARC-52, on the pilots' folding console. The function selector switch is placarded OFF-T/R-T/R+G-ADF. When the switch is set to T/R or T/R+G, the automatic UHF command is in automatic operating condition and provides normal UHF command communications. Under these conditions, the UHF direction finder will be in standby status (with filaments heated through the ARC-52 receiver-transmitter) and ready for immediate use if required. The UHF direction finder is changed from standby to operating status by the selection of ADF on the pilots' control. The UHF/ADF control amplifier will then be fully powered through the receiver-transmitter ARC-52 and related circuits, and will control the searching and switching functions of the directional antenna. The information obtained from the antenna circuits is fed to the No. 1 (single bar) pointer on the pilot's and co-pilot's BDHI indicators. When the function switch is set to ADF, the UHF command equipment can be used only for the control and operation of the UHF direction finder and will not be able to receive normal UHF command communications. The UHF direction finder operates within the frequency limits of 225 to 399.9 Megahertz, and is limited in operating range to a line-of-sight distance that will vary with the altitude of the aircraft and the location of the transmitting signal source. NEW

Note

Bearing information obtained with torpedo bay doors open is unreliable due to antenna location.

Manual switching facilities are provided for use in the event of a failure in the automatic UHF communication set. When the function switch is placed in the OFF position, both UHF communication set and UHF direction finder are deenergized.

Energizing Equipment

Energize Direction Finder Set ARA-25A as follows:

1. Place function selector switch on folding console in T/R or T/R+G position. UHF ARC-52 is now

in automatic operating condition and UHF Direction Finder is in standby status.

2. Place function selector switch in ADF position. UHF Direction Finder is now on operating status.
3. Select ADF on the OTPI control panel.

Deenergizing Equipment

Direction Finder Set ARA-25A is deenergized when the function selector switch is placed in the OFF position.

LF/ADF DIRECTION FINDER SET AN/ARN-59

Direction Finder Set AN/ARN-59 (LF/ADF direction finder), is a light-weight airborne radio compass set that automatically provides a visual indication of direction (relative to the aircraft heading) from which the RF signal is being received. The control panel for this system, Control ARN-59, is located on the pilots' overhead console (figure 1-55).

The LF/ADF direction finder is used for position plotting, homing on aural reception of AM signals, and aural identification of keyed continuous-wave stations. The LF/ADF direction finder operates in the frequency range of 190 to 1750 kilocycles. Information is displayed on the No. 1 needle of the pilot's and co-pilot's BDHI provided that the OTPI/ADF switch is set to ADF.

Note

On aircraft not incorporating A. F. C. No. 458, loss of the No. 2 transformer-rectifier or selection of TR#1 FAIL or TR#2 FAIL position on the DC BUSSTIE switch will result in a loss of power to the AN/ARN-59.

Energizing Equipment

Energize the low frequency automatic direction finder as follows:

1. Turn VOL control clockwise.
2. Place MC BAND switch to desired frequency range.
3. Place COMP-ANT-LOOP switch in desired position.
4. Place BFO switch in desired position.

Deenergizing Equipment

Deenergize equipment by turning the VOL control fully counterclockwise.

ON TOP POSITION INDICATOR SYSTEM (OTPI)

The On Top Position Indicator System (OTPI) supplies navigational information to the No. 1 needle of the Bearing-Distance-Heading-Indicator (BDHI). On aircraft BuNo. 147531a through 147894k the OTPI system operates in conjunction with Sonobuoy Radio Receiver

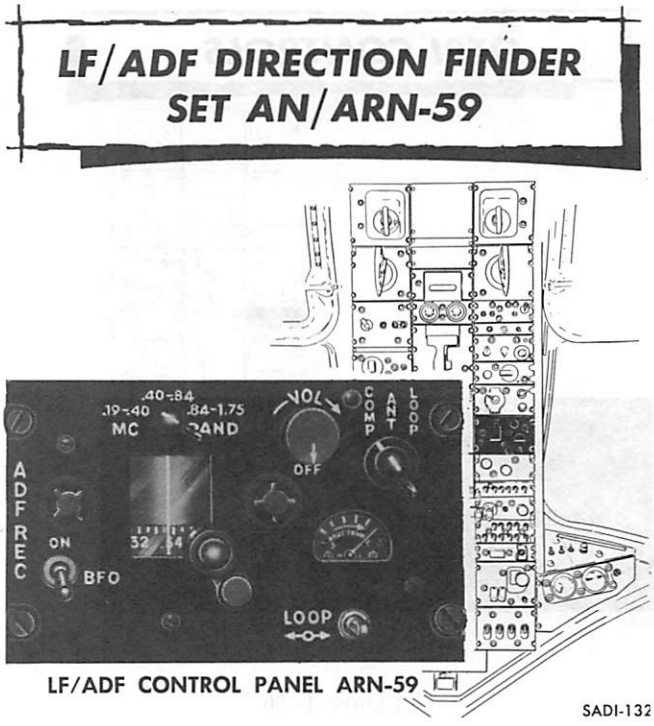


Figure 1-55

Set (ASW) ARR-58. Sonobuoy RF signals are supplied to the channel D receiver via the ARA-25A antenna. The channel D receiver detects and amplifies the RF signal. Audio output from the channel D receiver is supplied to Amplifier AM-1777/ARA-25A. The amplifier converts audio output to servo voltage which is supplied to the transmitting servo unit in Antenna ARA-25A. The output voltage from the transmitting servo is supplied to the receiver servo in the BDHI which causes the No. 1 pointer to deflect.

On aircraft BuNo. 147895k and subsequent, the OTPI Receiver obtains RF signals from the sonobuoy via the ARA-25A antenna. This signal is detected and amplified by the receiver and supplied to Amplifier AM-1777/ARA-25A. The amplifier routes this signal voltage to servos in the ARA-25A antenna system. The voltage in the ARA-25A antenna supplies servo voltage to the No. 1 pointer of the BDHI.

Note

Bearing information obtained with the torpedo bay doors open is unreliable due to antenna location.

The OTPI control panel on the pilots' overhead console (figure 1-56) incorporates the following controls:

OTPI-ADF Switch

The OTPI-ADF switch is a two-position toggle switch that selects the source of navigational information supplied to the No. 1 pointer of the BDHI. When the switch is placed in the OTPI position navigational information is supplied to the BDHI from the OTPI Receiver (in aircraft BuNo. 147895k and subsequent) or from the



Figure 1-56

channel D receiver of the ARR-58 system (in aircraft BuNo. 147531a through 147894k). When the OTPI-ADF switch is placed on the ADF position information is supplied to the BDHI from Direction Finder Set ARN-59. When this switch and the OFF-T/R-T/R+G-ADF switch, on UHF Control ARC-52, are both in the ADF position, navigational information is supplied to the BDHI from ARC-52. An interlock controlled by the ARC-52 system is provided to prevent the receiver section of ARC-52 from being used with the OTPI Receiver system when the transmitter of the ARC-52 is being keyed. The OTPI receiver is energized by setting the OTPI-ADF switch to OTPI position. To deenergize the receiver, the OTPI-ADF switch is set to ADF.

Note

The UHF/DF takes precedence over the LF/ADF.

Tone/Voice-UHF Switch

The TONE/VOICE-UHF switch is a two-position toggle switch. When placed in the TONE position it keys the ARC-52 transmitter with a 1020 CPS tone for homing purposes.

Channel Selector Switch

The CHANNEL selector switch is a double stack 16 position rotary switch. This switch tunes the OTPI Receiver to one of the output frequencies of the sonobuoys. The receiver is designed to operate on 31 frequencies; however on aircraft BuNo. 147531 through 152379 only the first 16 are used.

31-16 Switch

The 31-16 switch is a two-position toggle switch. When placed in the 16 position the OTPI Receiver may be used on channels 1 through 16. When placed in the 31 position the OTPI Receiver may be used on channels 17 through 31. On aircraft which utilize only the first 16 channels, the switch is safetied in the 16 position.

Buoy Signal Light

The signal light is a press-to-test light placarded BUOY SIG, located on the upper left corner of the OTPI control panel. The light indicates an output (of 0.25 volt, 100 CPS) from the detector threshold circuit which keys a relay in the OTPI Receiver. The keying of this relay applies a 400-cycle note to the ICS system.

MARKER BEACON RECEIVER AN/ARN-32

The Marker Beacon Receiver AN/ARN-32 is installed for the reception of marker beacon signals at a frequency of 75 MHz. While flying over a marker beacon station, a modulated tone is heard in the headset by setting the BCN toggle switch on the master interphone control to BCN. The marker indicator light also glows. The modulated tone may be monitored by any crew member. NEW

Indicator Light

An indicator light, located on the cross-pointer course indicator on the pilots' instrument panel, goes on when the marker beacon receiver is receiving marker beacon signals.

DOPPLER RADAR AN/APN-122

On aircraft BuNo. 147531 through BuNo. 149274 and BuNo. 149275 through BuNo. 150603 not incorporating A.F.C. No. 420 the Doppler Radar AN/APN-122 (figure 1-57), is a navigational aid that automatically computes and displays ground speed and drift angle without the aid of ground stations, wind estimates and ground speed data. The ground speed and drift angle indicator is on the co-pilot's instrument panel. The ground speed computer supplies heading velocity and drift velocity information to the Navigation Computer Group AN/ASA-13 when it is set for the doppler mode of operation. The ground speed and drift angle indicator supplies a synchro output that feeds ground speed information to the sonobuoy intervalometer when it is in doppler mode and the ARM MASTER switch ON. Operating controls for the equipment are on the diagonal console and the pilots' instrument panels. (See figure 1-57.)

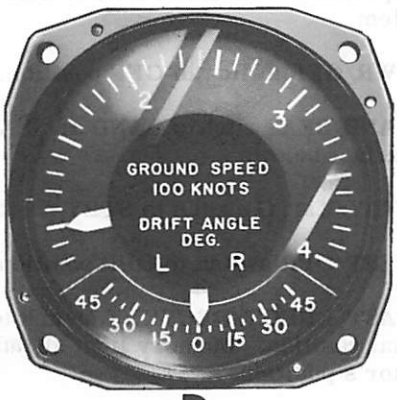
Banks in excess of 6° cause the equipment to go into memory operation and the MEMORY light to go ON on S-2 Series aircraft not incorporating AFC 428 only. System accuracy is ±5k and ±3° of indicated values, however steep pitch attitudes tend to degrade ground speed accuracy. NEW

DOPPLER RADAR AN/APN-122



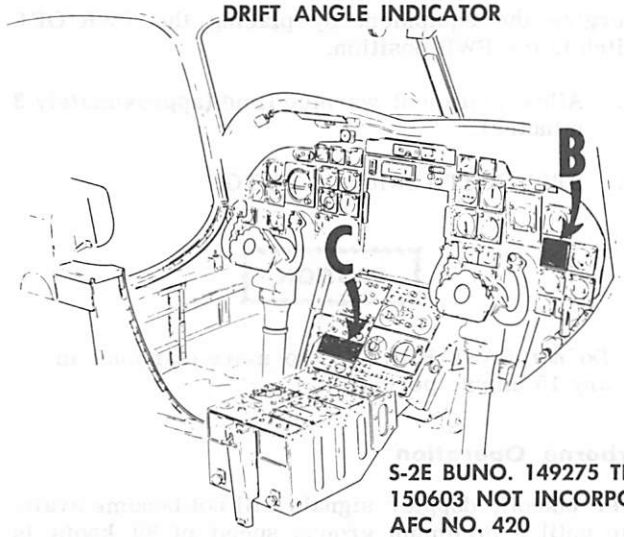
A

DOPPLER RADAR MEMORY SWITCH

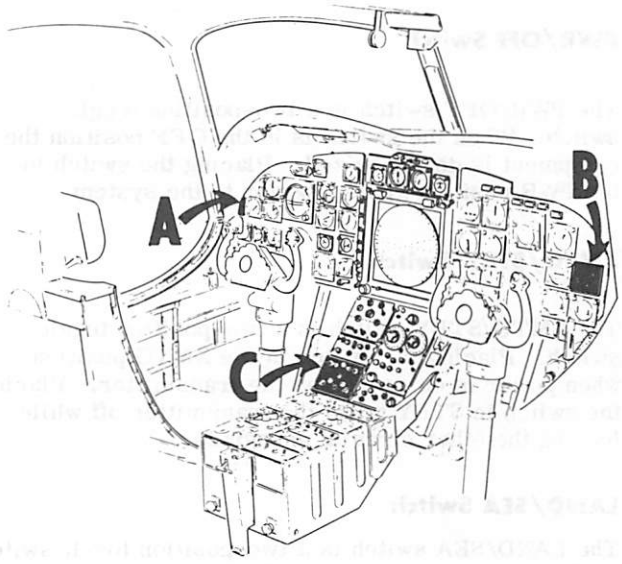


B

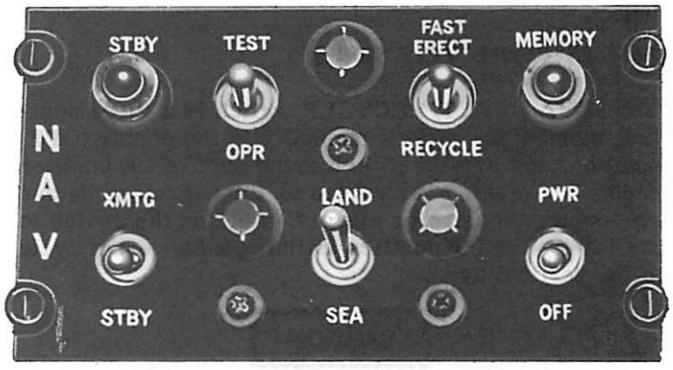
GROUND SPEED DRIFT ANGLE INDICATOR



S-2E BUNO. 149275 THROUGH 150603 NOT INCORPORATING AFC NO. 420



S-2D/E BUNO. 147531 THROUGH 149274



C

DOPPLER CONTROL INDICATOR

C-SAD1-144

Figure 1-57

CONTROL PANEL APN-122

The functions of the individual controls on the APN-122 control panel (figure 1-57) located on the diagonal console are as follows:

PWR/OFF Switch

The PWR/OFF switch is a two-position toggle switch. When the switch is in the OFF position the equipment is de-energized. Placing the switch in the PWR position applies power to the system.

XMTG/STBY Switch

The XMTG/STBY switch is a two-position toggle switch. Placing the switch in the XMTG position when power is on energizes the transmitter. Placing the switch to STBY turns the transmitter off while leaving the other circuits energized.

LAND/SEA Switch

The LAND/SEA switch is a two-position toggle switch used to compensate for the different reflective properties of water and land surfaces.

TEST/OPR Switch

The TEST/OPR Switch is a two position momentary switch normally in the OPR position. Holding the switch in the TEST position energizes the test circuit. The ground speed pointer on the indicator will go to a value of 170 to 220 knots, depending on aircraft pitch attitude.

FAST ERECT/RECYCLE Switch.

The FAST ERECT/RECYCLE switch is a three position momentary switch normally in the center (OFF) position. Holding the switch to the RECYCLE position causes the system to return to the search mode and re-acquire the doppler signals. Holding the switch to the FAST ERECT position initiates a fast erect cycle of the vertical gyro.

CAUTION

Do not FAST ERECT gyro more than once in any 15 minute period.

STBY Light

The STBY light comes on when the XMTG/STBY switch is placed to the STBY position with power applied to the system.

MEMORY Light

When on, the MEMORY light indicates that the system is operating without doppler signals and ground speed and drift angle indications are frozen to the last obtained values. The system goes into memory when the aircraft banks more than 6° (AFC No. 428 not incorporated) or when the XMTG/STBY switch is placed in the STBY position.

Memory Test Switch (S-2D/E BuNo. 147531-149274)

The memory test switch is a two-position momentary switch placarded MEMORY TEST/OFF normally in the OFF position and located on the left side of the pilot's instrument panel. Holding the switch to the TEST position places the system in memory operation. Normal operation is resumed when the switch is released.

Preflight Check

Before setting the operating controls, make certain the doppler radar circuit breakers on the circuit breaker panels behind the pilot's seat are depressed.

CAUTION

When the doppler is not being used, prior to flight turn ON and leave in STBY position to prevent damage to gyro in flight.

Set the operating controls as follows before energizing the system.

1. PWR/OFF switch to OFF position.
2. LAND/SEA switch to LAND or SEA depending on surface below.
3. STBY/XMTG switch to STBY position.
4. TEST/OPR switch to OPR position.
5. FAST ERECT/RECYCLE switch to center normal position. Memory light at Number 3 operator's position.

Energizing Equipment

Energize the equipment by placing the PWR/OFF switch to the PWR position.

1. Allow sufficient warmup time (approximately 3 minutes).
2. STBY/XMTG switch to XMTG.

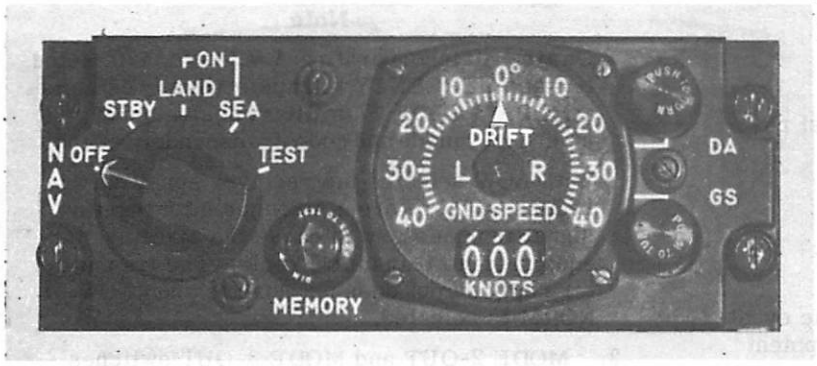
CAUTION

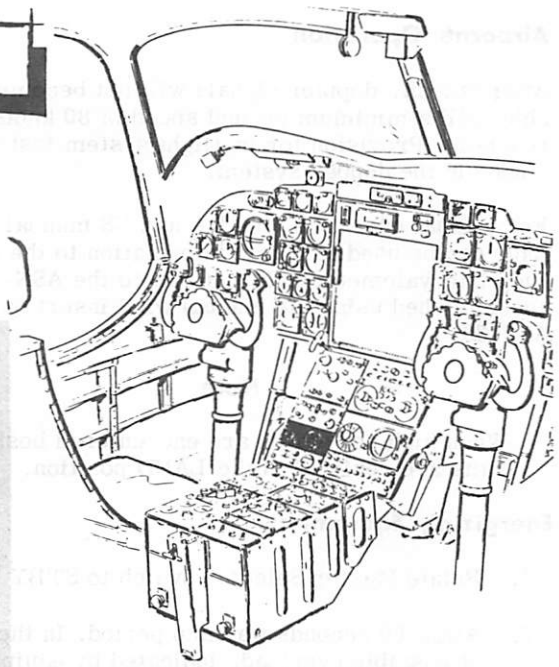
Do not FAST ERECT gyro more than once in any 15 minute period.

Airborne Operation

After takeoff, doppler signals will not become available until a minimum ground speed of 80 knots is reached. The system may be switched to the memory mode of operation by placing the STBY/XMTG switch to STBY position. Provision for in-flight system test is included in the doppler system.

DOPPLER RADAR AN/APN-153(V)





Bu No. 151638dd and subsequent and Bu No. 149275 thru 150603 with AFC No. 420 incorporated

A-SAD1-201

Figure 1-58

Deenergizing Equipment

Deenergize the equipment by placing PWR/OFF switch to the OFF position.

CAUTION

To avoid damage to the displacement gyro, do not turn off PWR switch until the aircraft has been chocked, except in case of emergency.

DOPPLER RADAR AN/APN-153(v)

On aircraft BuNo. 149275 through 150603 with A.F.C. No. 420 incorporated, and 151638 and subsequent, the Doppler Radar AN/APN-153(v) (figure 1-58) is a navigational aid that automatically computes and displays ground speed from 80 knots to the maximum speed of the aircraft and drift angle from 40 degrees left to 40 degrees right without the aid of ground stations, wind estimates or ground speed data from 40 feet AGL to the maximum altitude of the aircraft. The ground speed and drift angle indicator is located on the pilot's diagonal console. The ground speed computer supplies heading velocity and drift velocity information to the Navigation Computer Display Set AN/ASN-30 when it is set for the doppler mode of operation. The ground speed and drift angle indicator supplies a synchro output that feeds ground speed information to the sonobuoy intervalometer when it is in doppler mode and the ARM MASTER switch ON. Operating controls for the equipment are on the NAV control panel on the diagonal console.

Maneuver limits for good accuracy are 10° of pitch, 40° of roll and 40° of yaw. Within these limits, probable error is 0.2%+0.35 knots and 0.17° in drift angle.

CONTROL PANEL AN/APN-153(V)

The functions of the individual controls on the NAV control panel (figure 1-58) are as follows:

Master Selector Switch

The master selector switch is a five position rotary switch located on the left side of the panel. When the switch is in the OFF position, the equipment is deenergized. When the switch is rotated to the STBY position, power is supplied to all circuits except the magnetron. When the switch is in the ON LAND or ON SEA position the equipment is fully operational. Selecting the TEST position energizes a self-test circuit.

Memory Light

The MEMORY light is a press-to-test light on the left side of the panel. When the light is ON it indicates that the equipment is in memory supplying the last remembered wind values to the indicator and to the ASN-30 system. Memory operation can be due to either equipment failure or the limits being exceeded.

Note

If continuing memory light persists, attempt equipment reset by momentarily turning equipment OFF then ON. (APN-153 is equipped with automatic over-load protection circuitry.)

Drift Angle (DA) and Ground Speed (GS) Controls

The DA and GS controls are push-to-turn knobs located on the right side of the panel adjacent to the indicator.

Airborne Operation

After takeoff, doppler signals will not become available until a minimum ground speed of 80 knots is reached. Provision for in-flight system test is included in the dopper system.

For manual operation, the DA and GS manual controls can be used to insert information to the sonobuoy intervalometer only. Inputs to the ASN-30 are accomplished using the manual wind insert on the ASN-30.

Note

When high sea states are encountered best results are realized in the LAND position.

Energizing Equipment

1. Rotate Master Selector switch to STBY.
2. Allow 60 seconds warmup period. In the event of possible overload, indicated by equipment not timing out, recycle equipment by turning off and on.
3. Switch to the TEST mode. The GND SPEED KNOTS indicator should read 120 ±5 knots, and the DRIFT L-R dial should read 0 ±2°, and the memory light should extinguish.
4. When airborne, rotate Master Selector switch to LAND/SEA depending on surface below.

Deenergizing Equipment

1. Rotate master selector switch to the OFF position.

CAUTION

Do not rotate master selector switch to OFF until the aircraft is parked, except in case of emergency.

RADAR IDENTIFICATION SET AN/APX-6B

Radar Identification Set AN/APX-6B (IFF transponder) is an airborne transponder system of identification and recognition. This equipment operates in conjunction with Coder Group AN/APA-89. The primary purpose of the equipment is to identify the aircraft in which it is installed as friendly, when correctly challenged. This equipment also permits surface tracking and control of the aircraft. Radar identification of the aircraft containing the equipment is automatic when proper signals are received from surface or airborne interrogator-responder units transmitting specific coded pulses. In addition, the equipment enables the identification of specific friendly aircraft and provides transmission of emergency reply in response to any interrogation produced by the challenger interrogator-responder (I-R) station. The identification equipment incorporates a fixed-frequency receiver-transmitter to receive the challenging pulses at a center frequency of 1030 megahertz. The equipment transmits the replying pulses to the challenging station at a center frequency of 1090 megahertz.

Control Panel AN/APX-6B

The IFF control panel (Control C-1159/APX-6) is on the pilots' overhead console (figure 1-59). The functions of the individual controls on the panel are as follows:

1. MASTER switch - controls power and selects type of operation.

Note

- On aircraft incorporating A.V.C. No. 170, selection of EMERGENCY will automatically establish a MODE 3 CODE 77 (military equivalent of civil emergency mode and code) transponder setting.
- With LOW selected the receiver sensitivity is reduced. Therefore a stronger interrogating signal is necessary to cause the aircraft equipment to transmit a reply. The transmitter reply output does not change when LOW or NORM is selected.

2. MODE 2-OUT and MODE 3-OUT switches - used to select mode or modes to which that system will reply when properly interrogated.
3. I/P OUT-MIC switch - the momentary I/P position provides a double response on MODE 1 for 30 seconds when pressed to that position. When the switch is left in the OUT position it will give normal replies to the manually selected MODE and CODES combinations. The MIC position gives replies only when the AN/ARC-52 transmitter is keyed.

Note

On aircraft incorporation A. V. C. No. 614, the AN/APA-89 will provide a double response on Mode 3 when IP is selected.

CODER GROUP AN/APA-89

Coder Group AN/APA-89 is used with Radar Identification Set AN/APX-6 to establish the aircraft as friendly when properly challenged by friendly airborne, shipboard, and shorebased radars. The coder group in response to interrogation provides the radar identification set with trains of coded pulses for transmission in either of three modes. In addition, the coder group automatically furnishes two trains of coded replies for pilot identification purposes and four such trains for emergency purposes.

The coder group accepts the interrogation pulse from the receiver portion of the radar identification set and applies to the transmitting portion the coded pulse trains. The coding of the pulse trains delivered by the coder group varies according to the interrogation mode used. Each of the three modes of interrogation employed consists of pairs of 1-microsecond pulses, the coding for each mode being determined by the spacing between the two pulses.

Control Panel AN/APA-89

The controls for Coder Group AN/APA-89 are on Coder Control APA-89 located on the pilots' overhead

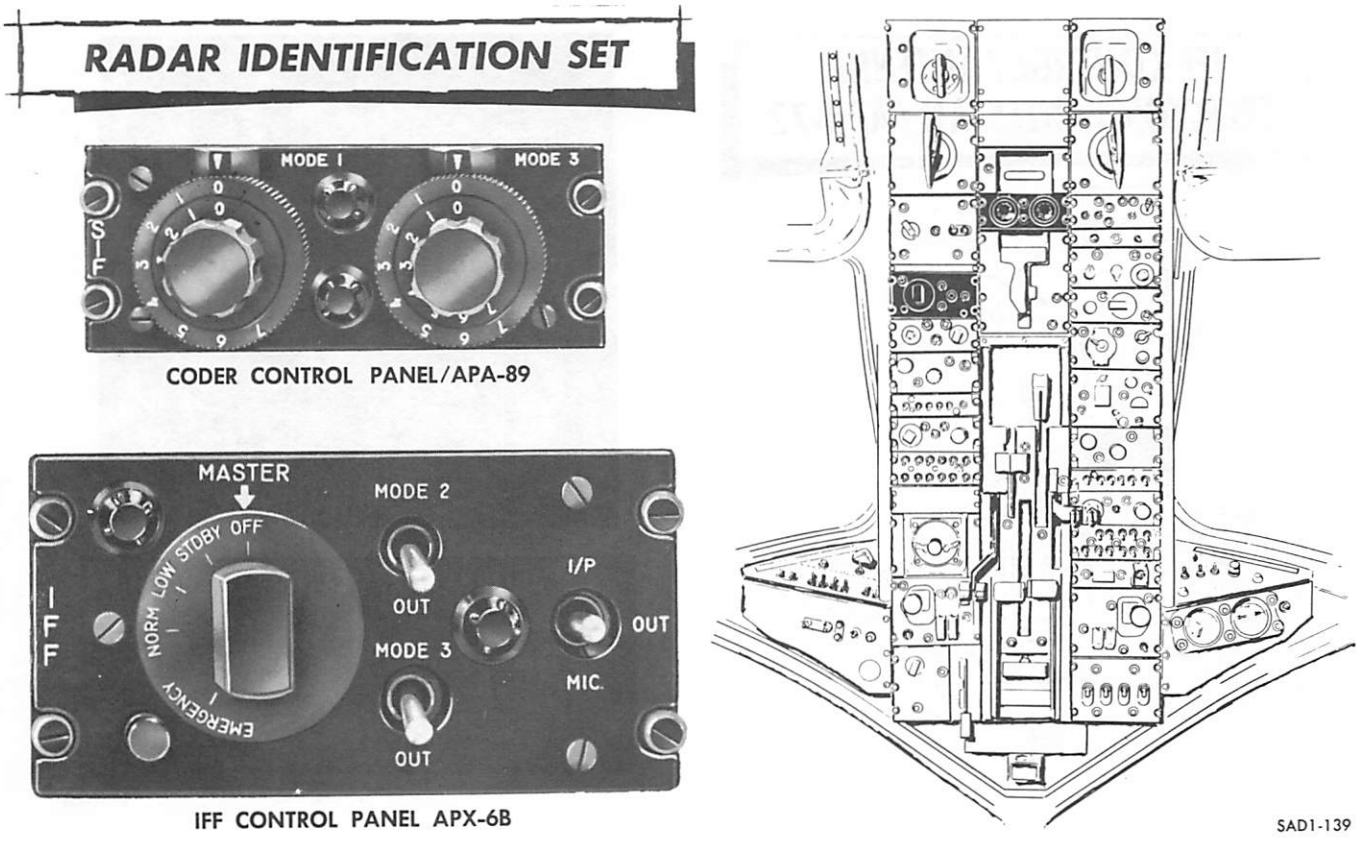


Figure 1-59

console (figure 1-59). These controls consist of two coaxial-type rotary switches placarded MODE 1 and MODE 3. Translucent numbers are placed on the skirts of the rotary switch knobs to mark the setting of the selected coded pulse train. Four rotary switches mounted behind a door on the front panel of Video Coder APA-89 (located in aft electronics compartment) provide code selections in MODE 2.

IFF TRANSPONDER SYSTEM AN/APX-72

The AN/APX-72 IFF Transponder System includes the following equipment: Receiver Transmitter RT-859/APX-72, Antenna Switching Unit, Transponder Control Set C-6280A(P)/APX (Figure 1-60), Transponder Test Set TS-1843( )/APX, Transponder Computer KIT-1A/TSEC, IFF CAUTION light, Antenna Selector Control (Figure 1-60), Pilot's Altimeter Encoded AAU-21/A (Figure 1-3) and the Co-pilot's Barometric Altimeter AAU-24/A (Figure 1-5). The system provides: automatic radar identification of aircraft position, emergency signals and altitude reporting for all modes to those interrogating facilities within operational range. The Transponder Control Set (Figure 1-60), mounted in the pilot's overhead console, provides the indicators and operating controls for operation and monitoring of the IFF Transponder system. The Transponder Test Set evaluates the performance of the transponder system and provides a GO-NO-GO indication through the TEST light on the IFF Control Panel. The test set operates in either of two modes: monitor or test. In the test mode a GO condition is indicated when the TEST light is illuminated. In the monitor mode a GO condition is indicated by the TEST light illuminating for two seconds, then extinguishing. A NO-GO condition is indicated by failure of the TEST light to illuminate. The Altimeter Encoder AAU-21/A (Servoed Barometric Altimeter, Figure 1-5) located on the pilot's instrument panel, is energized by the receiver transmitter and enables the transponder test set to report the altitude of the aircraft to an interrogating station in MODE C. When the CODE OFF flag appears on the altimeter encoder, MODE C altitude information to the receiver is disabled. The co-pilot's pressure altimeter AAU-24/A functions and displays altitude information as that depicted on the pilot's indicator. However, the co-pilot's altimeter does not reply in MODE C because it does not contain encoding circuits.

Antenna Switching Unit

The Antenna Switching Unit utilizing 38 cps, alternately connects the UHF/IFF antenna located on the vertical stabilizer and the UHF/IFF antenna located on the underside of the aircraft, to the receiver/transmitter line. This switching function allows the coverage provided by the one antenna to complement the coverage NOT provided

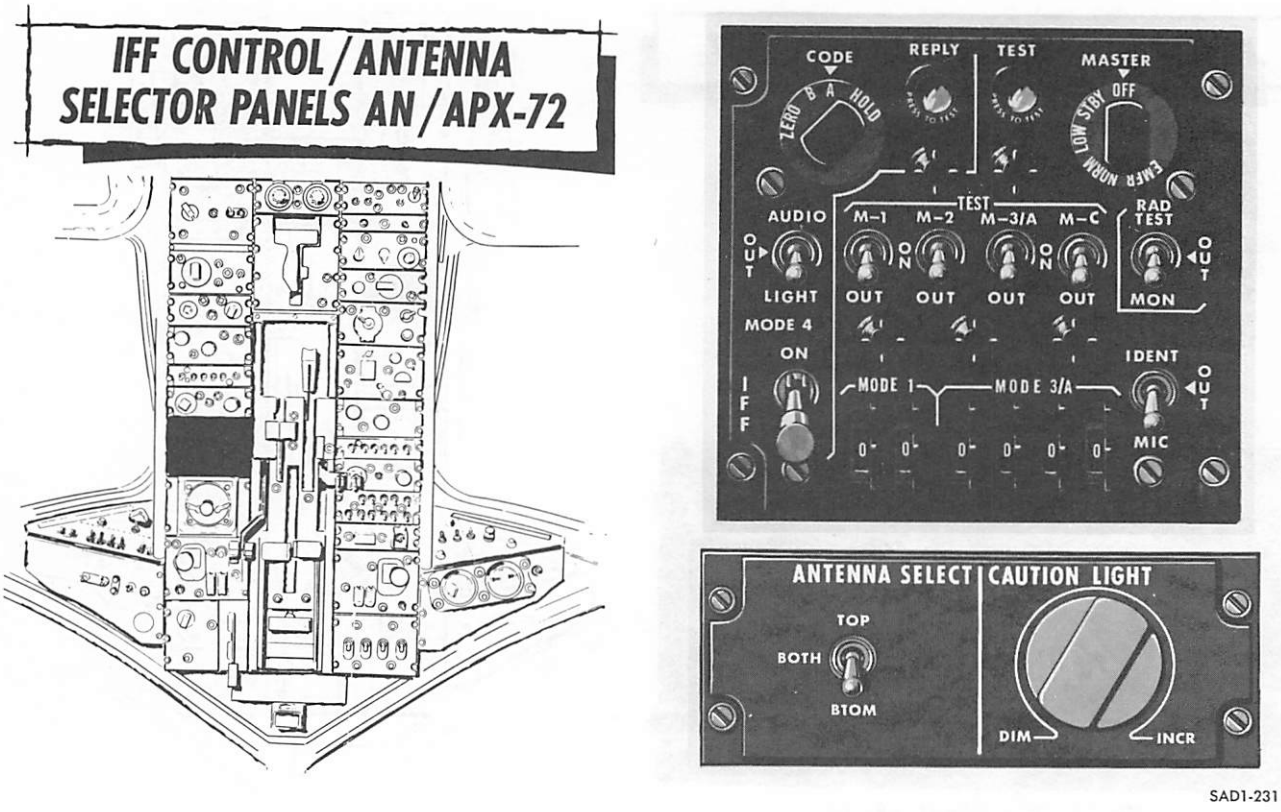


Figure 1-60

by the second antenna, thus simulating the operation of an omni-directional antenna system.

IFF Antenna Selector Panel

The IFF Antenna Selector panel (Figure 1-60), located on the overhead panel, is used to select either or both UHF/IFF antennas. A toggle switch placarded TOP, BOTH or BOTTOM enables selection of any one of three operating positions. For normal operation the switch is positioned to the BOTH position. The auxiliary positions, TOP and BOTTOM, are used in case of antenna unit or switching unit failure. The selector panel also contains a dimmer switch to control the brightness of the IFF Caution Light.

IFF Caution Light

The IFF CAUTION light (Figure 1-5) positioned under the cockpit glare shield on the co-pilot's side, provides a visual indication of mode 4 operation. The light will illuminate for approximately three seconds if the KIT-1A/TSEC computer fails or if the system fails to reply to a valid mode 4 interrogation.

IFF CONTROL PANEL

IFF MASTER Switch

The MASTER switch is a five position rotary placarded: OFF, STBY, LOW, NORM and EMER. In the OFF position power is removed from the transponder computer. In the STBY position the receiver and computer portion of the transponder are energized, but the transmitter portion is disabled and no replies can be transmitted. Selecting LOW position places the transponder set in operation at reduced receiver sensitivity. The NORM position selects maximum receiver sensitivity and the transponder should operate at maximum performance. The EMER position causes automatic transmission of emergency reply signals to Mode 1, 2, or 3/A interrogations only, regardless of the MODE switch settings (not affected by Mode C or 4 interrogations).

IDENT-OUT-MIC Switch

The IDENT-OUT-MIC switch is a three position toggle switch. Momentarily actuated (switch has spring-loaded return) to the IDENT position, the IFF

coder responds with coded replies for 15 to 30 seconds. In the MIC position the coder responds with coded replies whenever the microphone switch is actuated. In the out position, the IDENT reply is disabled.

Code Selector Switches

Six code selector switches are provided for selection of mode 1 and mode 3/A codes. Two MODE 1 thumbwheel selectors allow selection of 32 different codes. Four MODE 3/A thumbwheel selectors allow selection of 4,096 codes.

Mode Selector/Test Switches

Four mode selector/test selector switches labeled M-1, M-2, M-3 and M-C have TEST, ON and OUT positions. In the TEST position, illumination of the TEST light indicates proper operation of the mode selected. The OUT position for each switch disables its respective mode. The ON position for each switch enables the transponder to reply to interrogations for the mode selected. The M-C switch provides automatic coded altitude reporting for Air Traffic Control (ATC) identification.

RAD TEST/MON/OUT Switch

The RAD TEST/MON/OUT switch is a three position toggle switch spring-loaded to the OUT (center) position. The RAD TEST position permits the transponder set to be interrogated by selected signals from an AN/APM-123(V) or similiar test equipment. MON position turns on the monitoring circuits of Transponder Test Set TS-1843 ( )/APX. The OUT position disables the test circuits.

Mode 4 Controls

The Mode 4 controls and indicator light are grouped on the left side of the control panel. In the ON position of the MODE 4 ON/OUT a toggle switch enables the transponder to process mode 4 interrogations. To prevent accidental deactivation of mode 4, it is necessary to pull the toggle switch to an outward detent before selecting the OUT position. The mode 4 CODE selector is spring-loaded to the A position from HOLD. It is necessary to pull the selector to an outward detent to select the ZERO position. The MODE 4 AUDIO OUT LIGHT switch permits aural monitoring of Mode 4 interrogations (valid or invalid) and REPLY light monitoring of Mode 4 replies when in the AUDIO position. In LIGHT position the switch enables only REPLY light monitoring of mode 4 replies. The OUT position disables aural and REPLY light monitoring.

SOUND RECORDER AN/UNH-6

NEW On S-2D/E aircraft without AFC No. 517 incorporated, the Sound Recorder AN/UNH-6 is a dual track magnetic tape recorder whose function is to record JULIE, JEZEBEL, Radio, and ICS information. Total recording time is approximately 45 minutes. The pilot's control is a RECORD-STANDBY switch on the pilot's instrument panel (figure 1-61). With the switch set to RECORD, the recorder will run continuously and record all ICS and external communications. In the STANDBY position, recorder operation is dependent upon the position of the Number 4 operator's recorder selector control.

Note

For detailed information on the AN/UNH-6 Sound Recorder, refer to Section IX.

TAPE RECORDER SYSTEM AN/AQH-5(V)

NEW On S-2E and S-2G aircraft with AFC No. 517 incorporated, the Tape Recorder AN/AQH-5(V) is a two-speed, fourteen track magnetic tape recorder (figure 1-61A) used to record audio signals from the AN/ARR-52 or AN/ARR-75 sonobuoy receivers and ICS voice communications. Recording time using high speed operation (15 ips) is approximately one hour; slow speed operation (1-7/8 ips) will allow approximately eight hours of recording time. Primary control for operation of the tape recorder is provided to the Number 4 operator. The pilot's control is a RECORD-STANDBY toggle switch on the pilot's instrument panel (figure 61A). Placing the switch to RECORD will allow the pilot's selected ICS to be recorded. In the STANDBY position, only the ICS selected by the Number 4 operator will be recorded. For detailed information on the AN/AQH-5(V) Tape Recorder, refer to Section IX.

TRUE AIRSPEED TRANSDUCER T-692A

True Airspeed Transducer T-692A combines pitot and static pressures and outside air temperature to compute true airspeed. The true airspeed is applied to the Anti-Submarine Warfare Tactical Navigation System AN/ASN-30. The True Airspeed Transducer consists of a total temperature probe and true airspeed computer. The total temperature probe is located on the outside skin between the pilot and Number 3 operator and provides outside air temperature to the true airspeed computer. The true airspeed computer is located forward of the Number 4 operator's console and converts the static and pitot pressures and the outside air temperatures to true airspeed. The True Airspeed Transducer is energized by depressing TAS AC-DC circuit breaker on the COMPUTER circuit breaker panel (figure 1-42) behind the pilot. The True Airspeed Transducer is deenergized by pulling out TAS AC-DC circuit breaker.

VISUAL COMMUNICATIONS

Visual communications may be generated in the form of light signals to relay messages or establish emergency situations when all radio communications are inoperative.

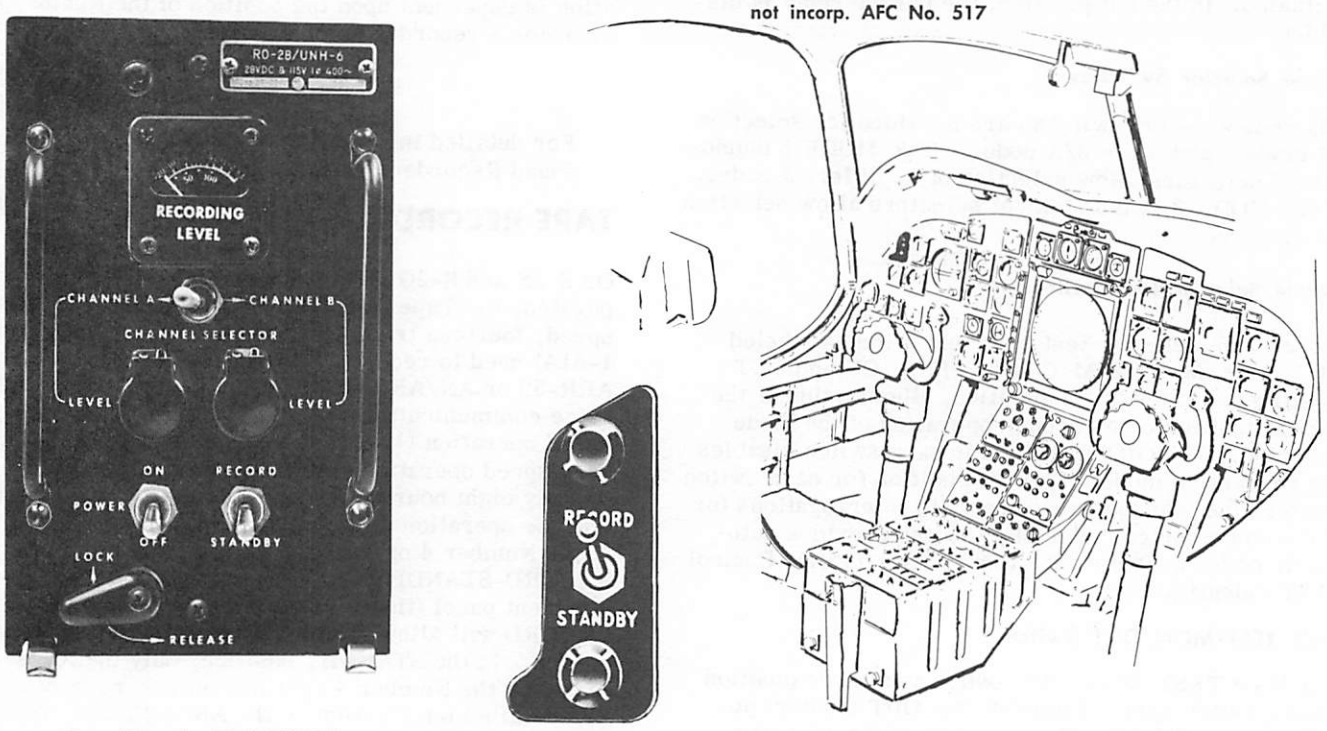
Aldis Lamp

The Aldis lamp attached to the bulkhead behind the co-pilot's seat can be plugged into either of the two

SOUND RECORDER AN/UNH-6

S-2D/E

On S-2E Aircraft
not incorp. AFC No. 517



Sound Recorder RO-28/UNH-6
(Located Aft Of No. 3 Operator's Seat)

Figure 1-61

B-SAD1-143

plug (DC power) outlets at the aft end of the folding console. Depressing the trigger on the grip type handle allows its use as a signal lamp. Great care should be taken at night to avoid destroying the pilot's night vision.

External Lights

The external lights may be controlled to transmit coded signals or indicate emergency situations in the following ways:

1. With exterior lights ON, the master exterior light switch may be actuated by the pilot to send flashers or signals as desired.
2. With the master exterior light switch ON, and the wing and tail light switches OFF or DIM, the coder key on the exterior lights panel may be used to transmit light signals with the wing and tail lights.
3. The taxi light may be used by actuating its separate switch on the exterior lights panel. The master exterior light switch does not have to be ON to use the taxi light or the anticollision lights.

AIR CONDITIONING SYSTEM

The air conditioning system (figure 1-63) provides heated or unheated ventilating to the occupied compartments of the aircraft either on the ground or in flight. The air conditioning system consists of a 100, 000 BTU combustion type heater, ventilation and combustion air blowers, distribution ducts, and temperature control. The distribution system consists of two main ducts supplying side window defogging and individually controlled foot and face outlets for the pilot, co-pilot, and two crew members. Air for both heating and ventilating enters the system through the ventilating air inlet duct in the fuselage nose section.

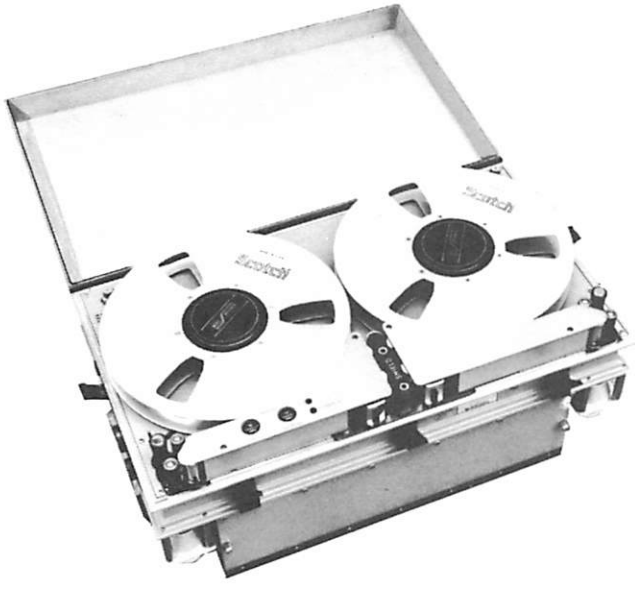
The electronics compartment is separated from the occupied compartments by a detachable insulating blanket. The electronics compartment is ventilated by ram air that enters through a manually controlled air scoop located on the left side of the aircraft below the wings, and exits through two vents on the top side of the fuselage. Much of the heat produced by the electronics equipment is also dissipated through the uninsulated skin of the compartment. Ground cooling of the electronics compartment is accomplished by connecting an external air conditioning unit.

Heat produced by special electronic equipment located below the Number 4 operator's floorboard is vented into the torpedo bay. The torpedo bay is vented to the atmosphere through fixed louvers on the left side of the fuselage.

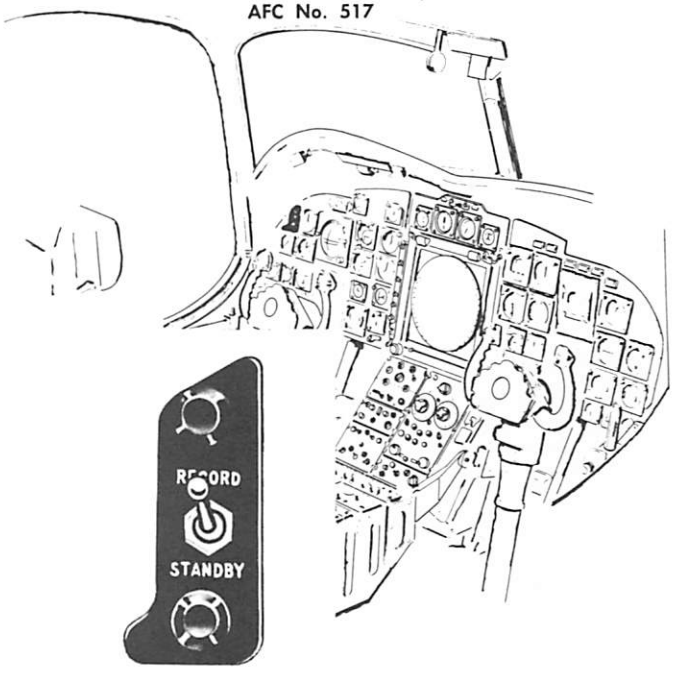
TAPE RECORDER AN/AQH-5(V)

S-2E/G

S-2E Aircraft Incorp.
AFC No. 517



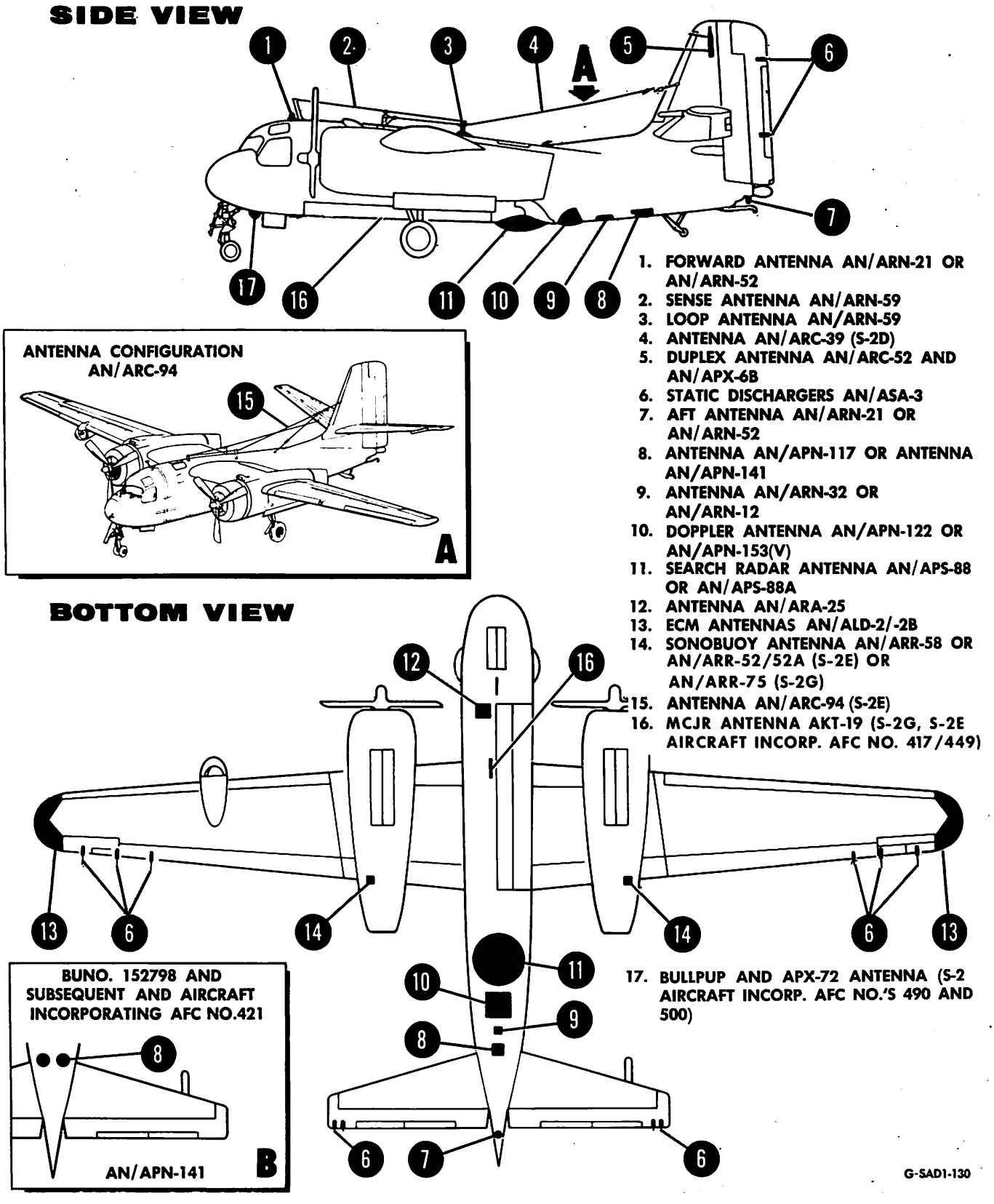
TAPE TRANSPORT RO-413(P)/AQH-5(V)
(Located Aft of No. 3 Operator's Seat)



SAD1 MAR-2

Figure 1-61A

ANTENNA INSTALLATIONS



1. FORWARD ANTENNA AN/ARN-21 OR AN/ARN-52
2. SENSE ANTENNA AN/ARN-59
3. LOOP ANTENNA AN/ARN-59
4. ANTENNA AN/ARC-39 (S-2D)
5. DUPLEX ANTENNA AN/ARC-52 AND AN/APX-6B
6. STATIC DISCHARGERS AN/ASA-3
7. AFT ANTENNA AN/ARN-21 OR AN/ARN-52
8. ANTENNA AN/APN-117 OR ANTENNA AN/APN-141
9. ANTENNA AN/ARN-32 OR AN/ARN-12
10. DOPPLER ANTENNA AN/APN-122 OR AN/APN-153(V)
11. SEARCH RADAR ANTENNA AN/APS-88 OR AN/APS-88A
12. ANTENNA AN/ARA-25
13. ECM ANTENNAS AN/ALD-2/-2B
14. SONOBUOY ANTENNA AN/ARR-58 OR AN/ARR-52/52A (S-2E) OR AN/ARR-75 (S-2G)
15. ANTENNA AN/ARC-94 (S-2E)
16. MCJR ANTENNA AKT-19 (S-2G, S-2E AIRCRAFT INCORP. AFC NO. 417/449)
17. BULLPUP AND APX-72 ANTENNA (S-2 AIRCRAFT INCORP. AFC NO.'S 490 AND 500)

Figure 1-62

AIR CONDITIONING SYSTEM

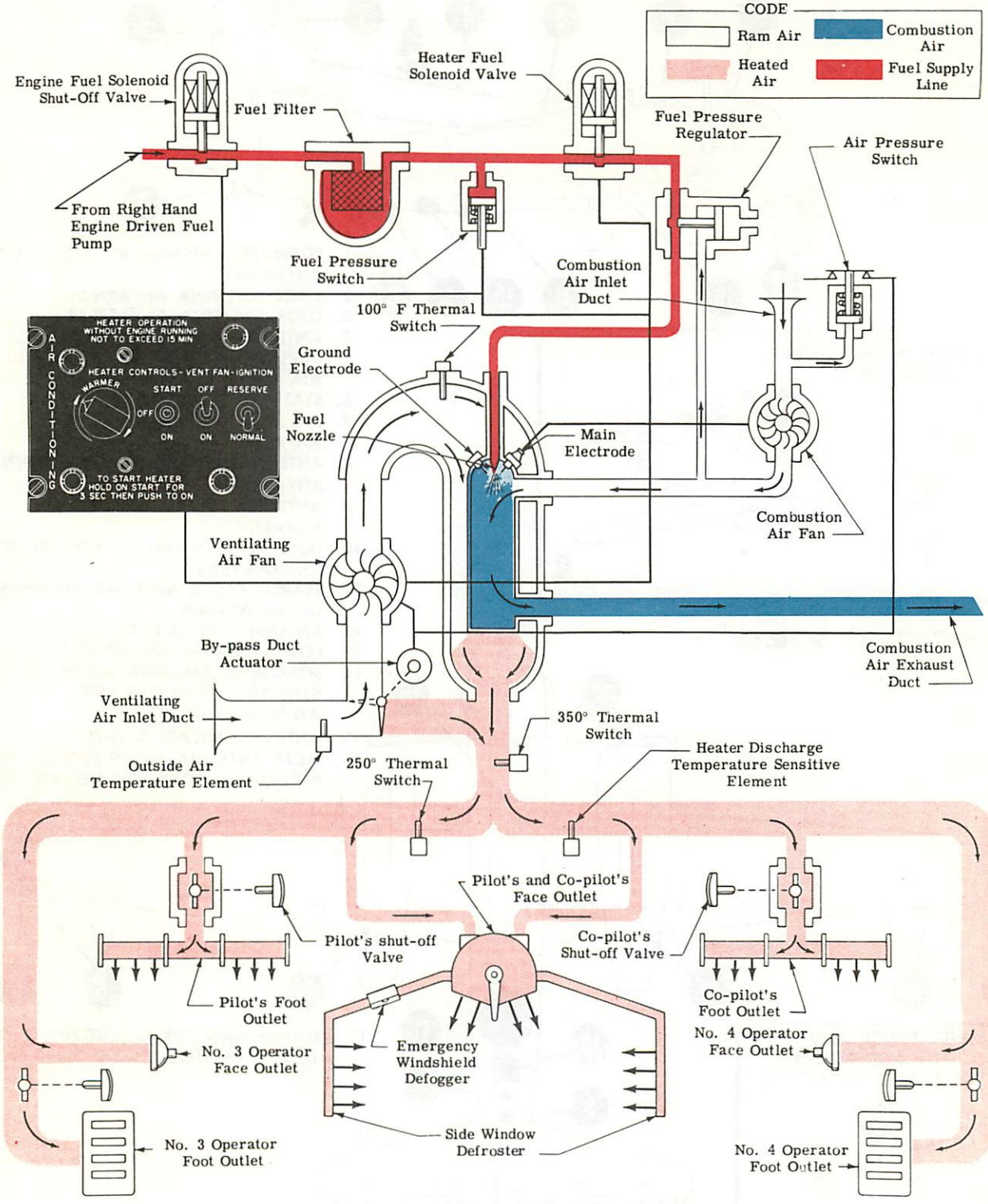


Figure 1-63

OCCUPIED COMPARTMENT HEATING

Heating air is supplied by a gasoline-fired combustion heater in the fuselage nose section. Operation of the heater is manually controlled. Once placed in operation, an electrically operated temperature control system maintains the desired compartment temperature by automatically cycling the fuel supply to the heater.

OCCUPIED COMPARTMENT VENTILATION

Ventilation air enters the system through the nose inlet duct and is supplied to the occupied compartment of the aircraft when the ventilating fan switch (figure 1-64) on the pilots' overhead console is set to ON. The ventilation air fan operates until the aircraft attains an airspeed of approximately 130 KIAS. As the ram airspeed reaches a certain velocity, an air pressure switch opens the bypass duct door and shuts off the ventilation air fan. As airspeed decreases to approximately 115 KIAS, the air pressure switch closes the bypass duct door and actuates the ventilation air fan.

ELECTRONICS COMPARTMENT VENTILATION

A large portion of the heat produced by the electronics equipment is dissipated through the uninsulated skin of the compartment. A manually controlled inlet scoop in the electronics compartment provides additional ram air ventilation. Two vents on top of the fuselage exhaust the air from the compartment. A receptacle for ground cooling is located on the bottom of the fuselage to the right of the aircraft center line.

AIR CONDITIONING CONTROL PANEL

The air conditioning control panel is on the pilots' overhead console (figure 1-64) and contains a heater OFF-ON-START switch, a ground ventilation fan ON-OFF switch, a heater ignition RESERVE-NORMAL switch, and a heater temperature rheostat.

Heater Switch

The heater switch is a three-position toggle switch located on the air conditioning control panel (figure 1-64). It can be set to OFF, ON, or momentary START and is placarded TO START HEATER HOLD ON START FOR 3 SEC. THEN PUSH TO ON. Placing the switch to ON position actuates the ventilation and combustion air fans and fuel pressure switch. The fuel pressure switch senses fuel pressure and shuts the fuel solenoid if fuel pressure is low or nonexistent.

Heater Ignition Switch

The heater ignition switch (figure 1-64) is placed in NORMAL position for all routine operations. The switch is moved to RESERVE in the event of failure of the normal ignition coil contacts. With AFC 464 incorporated, the heater fuel solenoid also shuts off fuel to the heater at the starboard nacelle when the heater is placed in the OFF position.

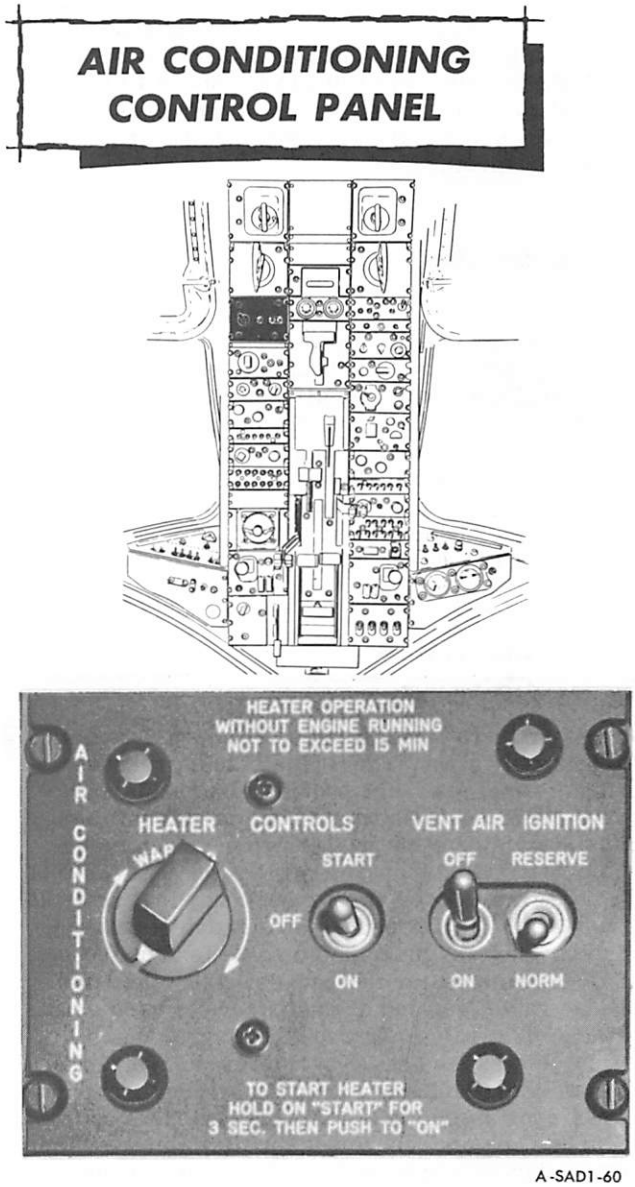


Figure 1-64

Heater Temperature Rheostat

The heater temperature rheostat is on the air conditioning control panel (figure 1-64) and is turned clockwise to raise the temperature and counterclockwise to lower the temperature.

Ventilation Fan Switch

The ground ventilation fan switch is a two-position toggle switch. (See figure 1-64.) It is placarded VENT FAN, OFF, and ON. In the ON position, the ventilation fan operates until the aircraft reaches a speed of approximately 130 KIAS. Above 130 KIAS airspeed an air pressure switch deenergizes a bypass valve, opening the air door and shutting off the ventilating air fan.

Thermal Switches

A 100°F (38°C) thermal overheat switch is between the ventilating fan and the heater to prevent heater operation if the ventilation air fan fails. A 250°F (121°C) thermal cycling switch, downstream of the heater, cycles the heater on and off to maintain a temperature of 250°F (121°C) at this point. A 350°F (177°C) thermal overheat switch is next to the 250°F switch to turn the heater off if the 250°F switch fails. (See figure 1-63.)

HEATER FUEL SYSTEM

The heater fuel system (figure 1-63) consists of two fuel solenoid valves, a fuel filter, fuel pressure regulator, fuel pressure switch, fuel nozzle and tubing. Fuel for the heater is supplied from the downstream side of the right engine-driven fuel pump. One fuel solenoid valve located near the fuel supply source is used as an emergency fuel shut-off valve. As the fuel pressure switch detects a drop in fuel pressure, one solenoid valve is actuated, shutting off the heater fuel supply. The other fuel solenoid valve, located at the heater, is used as the heater cycling valve. The fuel pressure controls the fuel flow to the heater in relation to combustion air flow, maintaining at any given altitude an approximately constant fuel-air ratio. A fuel filter safeguards the heater from foreign matter. Heater fuel consumption is approximately 10 pounds per hour.

HEATING SYSTEM OPERATION

Operate the heating system as follows:

1. Right fuel boost pump - ON (ground operation only, right engine inoperative).

2. Heater switch - hold on START for three seconds then push to ON.

Note

At approximately 130 KIAS the air pressure switch automatically operates the air inlet bypass door and shuts off the ventilating fan.

3. Heater temperature rheostat - AS DESIRED.

CAUTION

Ground operation of the heater should not exceed 15 minutes to prevent overheating the fuel boost pump (right engine inoperative).

VENTILATING SYSTEM OPERATION

Operate the ventilating system as follows:

1. AC and DC auxiliary power connected (for ground operation only).

2. Ventilating air switch - ON.

Foot Outlet Vent Controls

Individual foot registers and manually operated shutoff valves are provided at each crewmember's flight station to supply heating or ventilating air when the system is operating. The shutoff valve handle can be positioned for the desired air flow from the foot register.

Face Outlet Vent Controls

Individual face outlets are provided at the operator's flight stations to supply heating or ventilating air when the system is operating. The outlets are adjustable and can be positioned for the desired air flow. The pilot's and co-pilot's face outlet is controlled by a single control.

Emergency Windshield Defogger

By closing all foot and face outlets and opening the emergency windshield defogger, located at the pilot's station, all air from the heater is available for maximum windshield and side window defrosting in the event of electric windshield anti-icing failure.

SONOBUOY HEATING SYSTEM

Two separate heating systems, one for the left and one for the right sonobuoy plenum chambers, are installed in the nacelles. Heated air from around the engine is ducted through a port in the engine baffle assembly and through a manually operated valve to the sonobuoy plenum chamber. The system maintains sonobuoy temperatures within the specified limits 0° to 40°C (32° to 104°F). This system is not under the pilot's control during flight.

The sonobuoy heating valves, placarded OPEN and CLOSED, and used for hot or cold weather operation, are in the wheel well portion of each nacelle and are readily accessible to the ground crewman.

DE-ICING AND ANTI-ICING SYSTEMS

WING AND TAIL DE-ICING SYSTEM

The wing and tail de-icing system (figure 1-65) is conventional in design, using pneumatic deicing boots to eliminate ice formations. The de-icing boots are attached to the leading edges of the wings, wing slots, and the horizontal and vertical stabilizers. Air pressure from each of the two engine-driven air pumps inflate the de-icer boots in an electronically regulated, 60-second cycle. Suction from the inlet side of the air pumps holds the boots down between inflation cycles. Primary oil separators collect vaporized oil from the air pressure lines and return it to the engine oil pump. An electronic timer, in conjunction with solenoid distributor valves, regulates the proper sequence of the deicer boots pulsation cycle. The combination regulating and unloading valve separator removes the residual oil left in the air by the primary oil separator and maintains a constant system pressure of 15 PSI, automatically venting excess air to the atmosphere. Suction relief valves in the system regulate suction automatically. Pressure safety valves relieve excessive air pressure and check valves prevent loss of air if one air pump fails.

Wing and Tail De-Icing Switch

The two-position ON-OFF toggle switch (figure 1-66), on the right overhead console, is used to operate the de-icing system.

Air Pressure Gage

The air pressure gage (figure 1-66) is on the right overhead console.

Suction Gage

The suction gage (figure 1-66) is next to the air pressure gage and is used to check system operation.

Wing and Tail De-Icing System Operation

Operate wing and tail de-icing system as follows:

1. Turn switch ON. The cycle starts after a 20-second delay for tube warm-up. The cycle lasts 1 minute and automatically continues until the switch is turned OFF. During each cycle, each boot or boot group is fully inflated once. Observe air pressure gage for proper operation: six fluctuations of the air pressure gage between 0 to 15 PSI should occur in 30 seconds, completing one inflation period. This is followed by an approximate 30-second dwell, after which the cycle will restart.
2. Turn switch OFF. The timer rapidly trips through its remaining contacts to its homing position.

PROPELLER DE-ICING SYSTEM

Propeller de-icing is accomplished by rubber-coated blade-heater units cemented to the leading edge of each propeller blade. AC current for these heaters is transferred through the brush pad bracket assembly on the engine nose section and the slip ring assembly of the propeller assembly. The propeller deicing controls are on the right overhead console (figure 1-66).

Propeller De-Icing Switch

The propeller de-icing switch is a double-pole, double-throw, toggle switch on the right overhead console (figure 1-66). The switch is placarded FAST, OFF, and SLOW. With the switch in either the FAST or SLOW position, DC power flows from the DC essential bus, through the propeller deicer timer circuit breaker, to the two-speed deicer timer. The timer, when actuated, alternately energizes the right and left propeller deicer relays. The energizing of the relays permits AC power to flow to the propeller blade heating elements.

CAUTION

The propeller de-icing switch must be OFF during all ground operation, except when testing, to prevent warpage of the propeller blade leading edge.

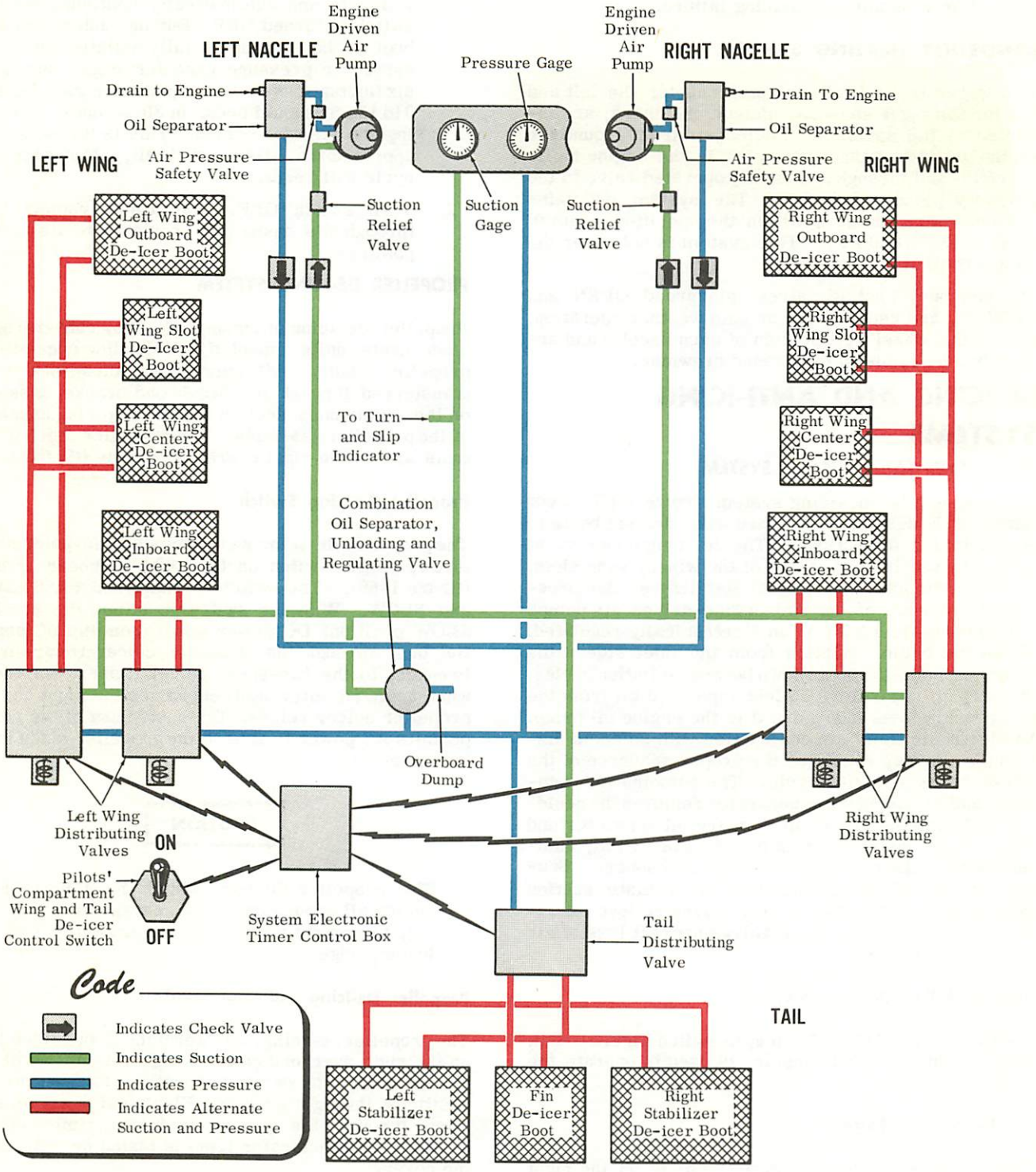
Propeller De-Icing Indicator Light

The propeller de-icing indicator light is an amber light on the right overhead console (figure 1-66). With the propeller de-icing switch set to either of its operational positions, the light goes on. Electrical power is supplied through the propeller de-icer timer circuit breaker. The indicator lamp is tested by depressing the cover.

Propeller De-Icing System Operation

Turn propeller de-icing switch to FAST or SLOW. The SLOW cycle applies heat for 1 minute and shuts off for 3 minutes. The fast cycle applies heat for 20 seconds

WING AND TAIL DE-ICING SYSTEM



SAD1-61

Figure 1-65

RIGHT OVERHEAD CONSOLE

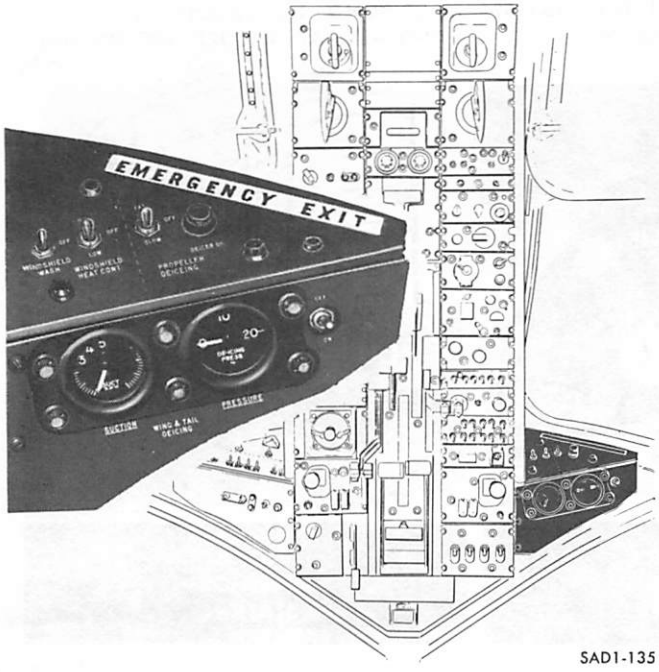


Figure 1-66

and shuts off for 1 minute. During operation of the propeller deicing system, a press-to-test indicator light remains on as an indication of system operation.

WINDSHIELD ANTI-ICING SYSTEM

An electrical anti-icing system is provided for the defogging and defrosting of the left and right windshield. The panels are constructed of two pieces of plate glass laminated with a vinyl plastic core. A transparent electrical conductive coating evenly distributed over the inner surface of the outer panel of glass is a resistance heating element. A windshield heat switch, in addition to various electrically operated automatic regulating devices, is used to control and maintain proper windshield temperature.

Windshield Heat Switch

The WINDSHIELD HEAT switch is a three-position toggle switch on the right overhead console (figure 1-66). The switch, placarded HIGH, OFF, and LOW permits maximum heating of the windshield panels when set to HIGH. The LOW position is used to reduce thermal shock in extreme cold temperatures.

WINDSHIELD WIPER SYSTEM

The hydraulically operated windshield wiper system utilizes 1500 PSI system to drive two wiper motors that are mechanically linked to two windshield wiper blades. The speed of the blades can be controlled from 75 to 250 strokes per minute. Operation of the blades is controlled by a windshield wiper control knob above the main instrument panel.

Note

In the event that the stroke of one wiper blade is limited by an obstruction, the blade will continue to operate within its limits.

CAUTION

Do not operate the wipers on a dry windshield.

Windshield Wiper Knob

The windshield wiper knob is in the top left corner of the main instrument panel (figure 1-3). Turning the knurled knob counterclockwise from the OFF position causes the associated wiper arm to oscillate. Further rotation of the knob increases the speed of the wiper to maximum rate.

WINDSHIELD WASHING SYSTEM

The windshield washing system is designed to wash the windshield by momentarily spraying fluid on the left and right windshield panels through spray nozzles. The system consists of two spray nozzles, a tank, a filter, a DC powered electric pump, a time delay relay and a windshield wash relay. The system will operate using either water or isopropyl alcohol. The tank supplies fluid to the pump and then to the spray nozzles. The pump is controlled by a spring-loaded toggle switch on the overhead console (figure 1-66).

CAUTION

Be certain, if using water, that in-flight temperatures will be above freezing.

Windshield Wash Switch

The WINDSHIELD WASH START-OFF switch is on the right overhead console (figure 1-66). This spring loaded switch controls the electrically operated pump for the windshield wash system.

PITOT HEAT SYSTEM

The pitot heat system prevents icing of the pitot pressure heads and the lift transducer. The pitot heads and the lift transducer vane contain electrical heating elements that are controlled by the PITOT HEATER switch on the left side of the pilots' overhead console.

Pitot Heater Switch

The PITOT HEAT ON-OFF toggle switch is on the left overhead console (figure 1-21). This switch controls the electrical heating elements in the pitot heads and the lift transducer vane.

LIFE RAFT RELEASE HANDLES

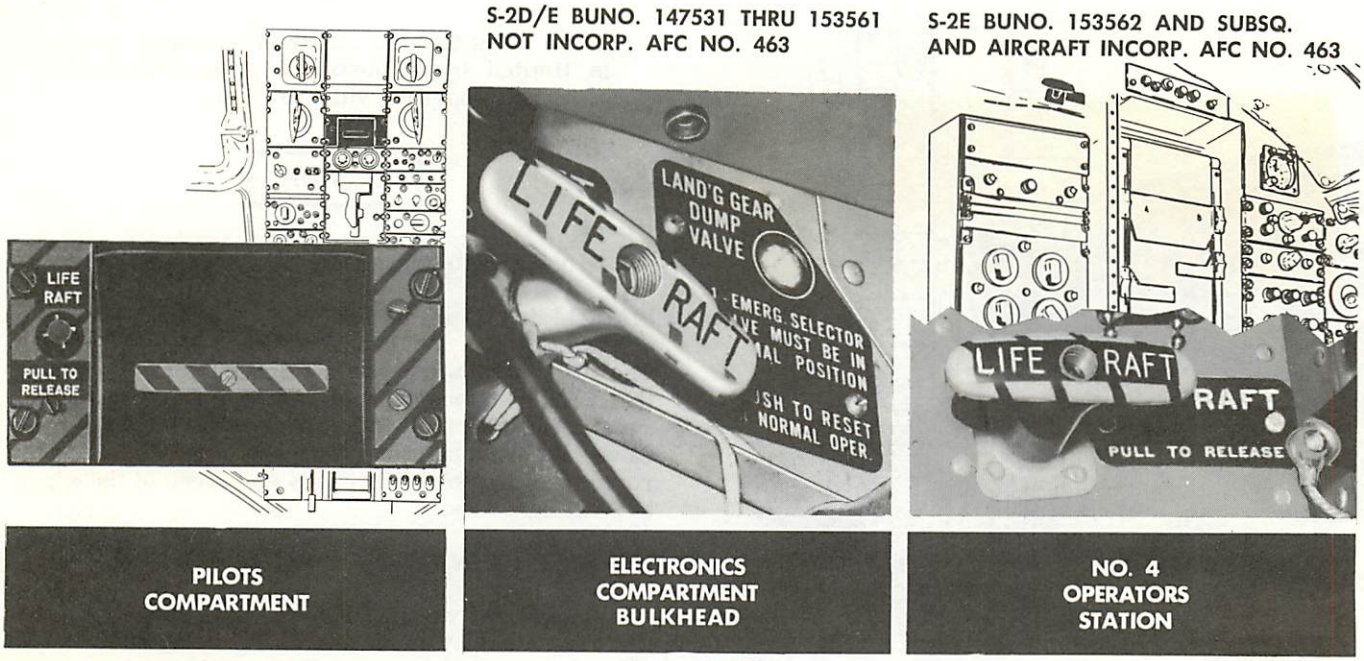


Figure 1-67

A-SADI-45

EMERGENCY EQUIPMENT

HAND FIRE EXTINGUISHERS

A 2-pound carbon dioxide (CO_2) hand fire extinguisher is in the electronics compartment, adjacent to the main entrance door.

FIRST AID KIT

The first aid kit is on a bracket, directly above the main entrance door (figure 1-68).

LIFE RAFT

The life raft is in a compartment on top center of the fuselage, aft of the wing (figure 1-68). A trough riveted to the structure contains a MK 4 Type D four-man life raft. The self-inflated life raft is released by either of the two release handles, one located in the cockpit and the other in the operator's compartment. A submersion actuator will automatically release the life raft when the actuator is submerged in salt water. The submersion actuator will not operate in fresh water.

Life Raft Release Handles

There are two life raft release handles, one on the pilots' overhead console and placarded LIFE RAFT-PULL TO RELEASE, and one on the aft bulkhead of the operators' compartment (figure 1-67).

NEW On S-2E aircraft BuNo. 153562 and subsequent and S-2D/E/G aircraft incorporating AFC No. 463, the life raft release handle in the operators' compartment is on the bulkhead above the No. 4 operator's folding console beneath the DC utility receptacle.

Life Raft Compartment Inspection Handle

The life raft compartment inspection handle is on the fuselage exterior to the right of the life raft compartment door (figure 1-68). Turning the handle opens the life raft compartment door, without inflating the life raft, permitting inspection of the life raft compartment.

Life Raft Submersion Actuator

The life raft submersion actuator is located outboard and forward of the co-pilot's seat, just above the floor, between the upholstered panel and the fuselage skin. As salt water fills the submersion actuator, it contacts two electrodes, the salt water completes a circuit, and the life raft is automatically released. Electrical power is supplied from the right battery.

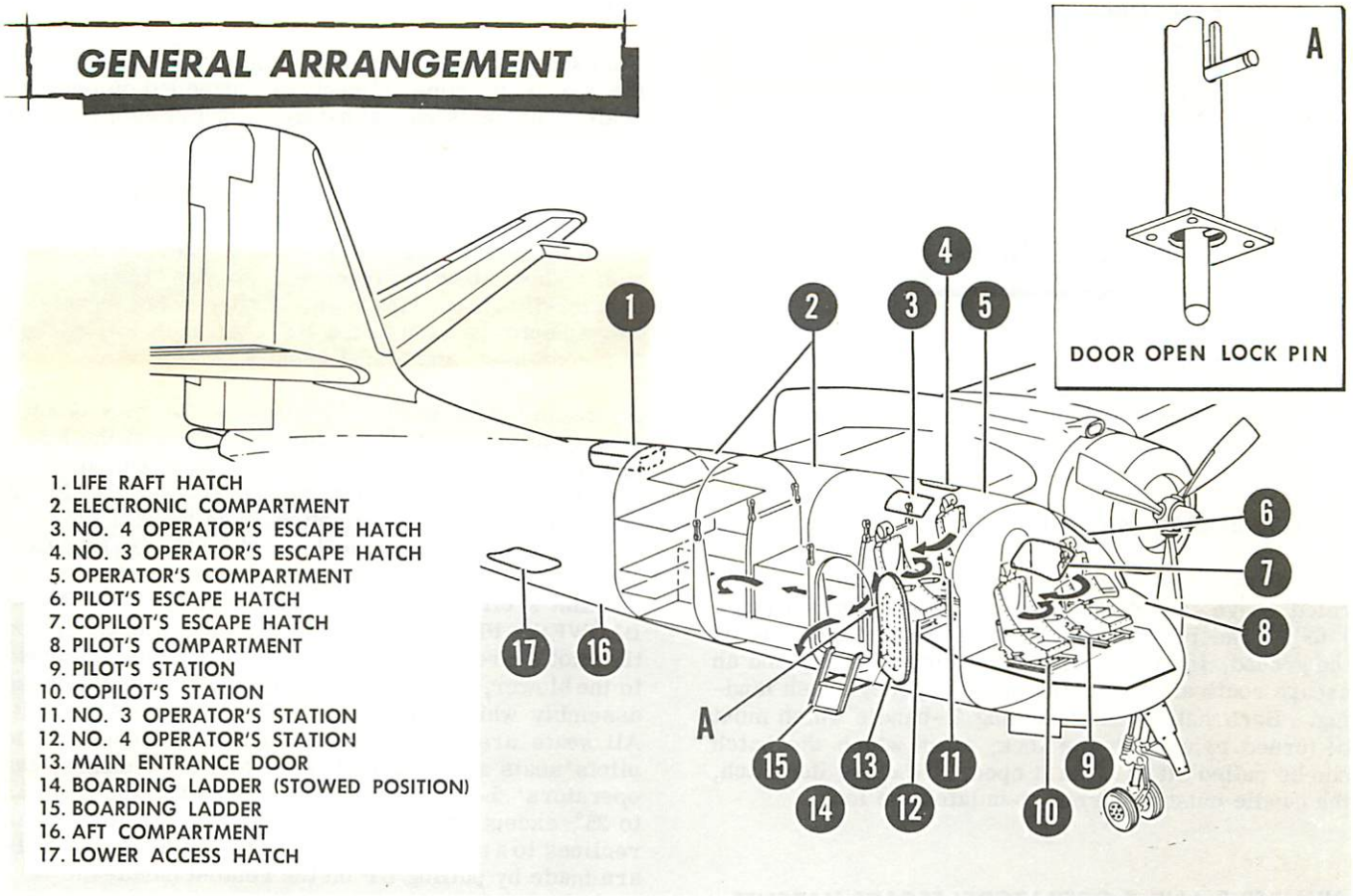
With S2/C1 Interim Airframe change #504 incorporated, both generators must be inoperative to allow automatic release of the raft. The automatic life raft release circuit is wired through the right battery charging relay. This allows battery power to be provided to the automatic life raft release circuit only when both generators are inoperative.

HATCHES

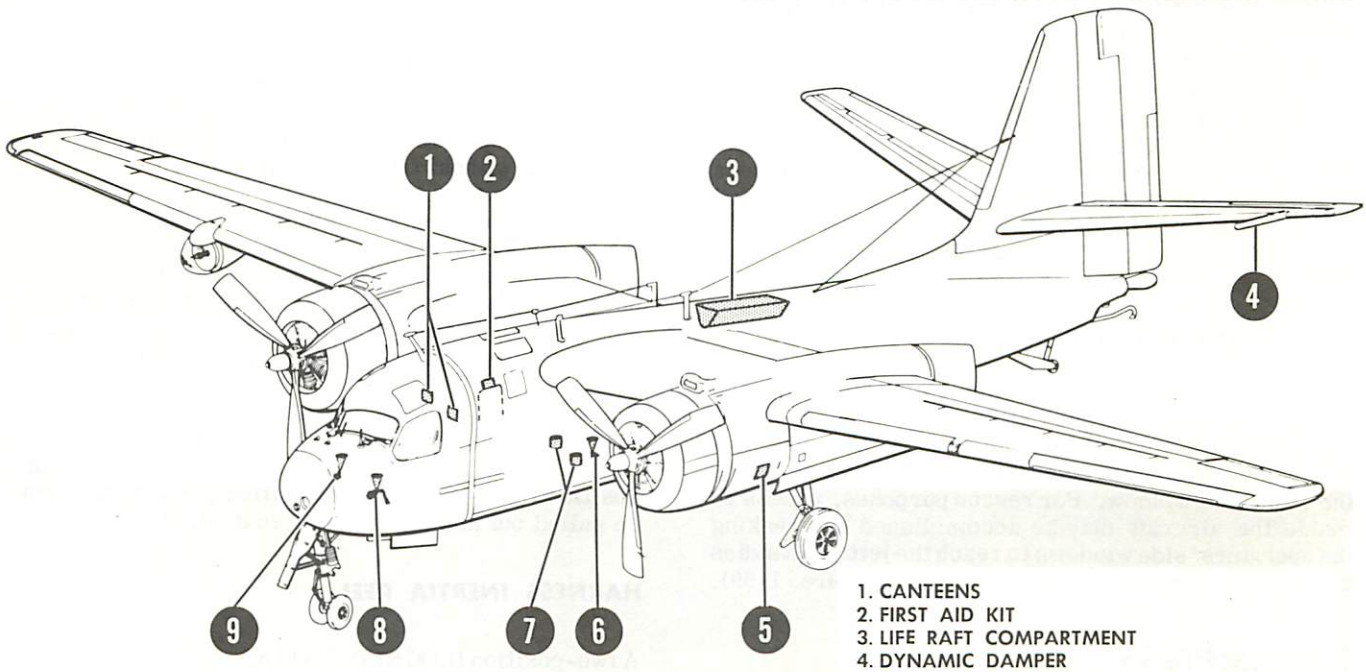
MAIN ENTRANCE DOOR

The main entrance, on the right side of the aircraft (figure 1-68), is used for normal entrance to the aircraft. The door is closed and locked by turning the normal door handle to the horizontal LOCK position. A jettison handle is provided to jettison the door for emergency bailout.

GENERAL ARRANGEMENT



1. LIFE RAFT HATCH
2. ELECTRONIC COMPARTMENT
3. NO. 4 OPERATOR'S ESCAPE HATCH
4. NO. 3 OPERATOR'S ESCAPE HATCH
5. OPERATOR'S COMPARTMENT
6. PILOT'S ESCAPE HATCH
7. COPILOT'S ESCAPE HATCH
8. PILOT'S COMPARTMENT
9. PILOT'S STATION
10. COPILOT'S STATION
11. NO. 3 OPERATOR'S STATION
12. NO. 4 OPERATOR'S STATION
13. MAIN ENTRANCE DOOR
14. BOARDING LADDER (STOWED POSITION)
15. BOARDING LADDER
16. AFT COMPARTMENT
17. LOWER ACCESS HATCH



1. CANTEENS
2. FIRST AID KIT
3. LIFE RAFT COMPARTMENT
4. DYNAMIC DAMPER
5. HYDRAULIC GROUND TEST CONNECTION
6. NO. 3 AND NO. 4 OPERATOR'S RELIEF TUBE
7. FOOD CONTAINERS
8. PILOT'S RELIEF TUBE
9. COPILOT'S RELIEF TUBE

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Figure 1-68

Main Entrance Door-Jettison Handle

A yellow jettison handle (PULL HANDLE TO JETTISON ENTRANCE DOOR) immediately aft of the door is pulled to jettison the door.

WARNING

Inadvertent pulling on the jettison handle o the jettison handle cable may release the pull out pins on the door and cause the door t separate from the aircraft.

PILOTS' ESCAPE HATCHES

Two transparent emergency sliding hatches are located above the pilot's and co-pilot's seats (figure 1-69). The two hatches provide ventilation while on the ground, improved visibility during flight, and an escape route after ditching or emergency crash landing. Each hatch has a locking T-handle which must be turned to unlatch the lock, after which the hatch can be pulled aft to slide it open. To close the hatch, the handle must be turned to unlatch the lock.

NUMBER 3 AND 4 OPERATORS' ESCAPE HATCHES

Two emergency hatches in the operators' compartment (figure 1-69) are directly above the Number 3 and Number 4 operators' seats. Both hatches can be jettisoned for emergency escape after ditching or crash landing. The Number 3 operator's hatch can also be pushed open for ground ventilation or access to the top of the aircraft for servicing, after unlocking it with a handle on the inside of the hatch. This handle is turned forward to LOCK, aft to OPEN.

Escape Hatch Jettison Handles

The jettison release for the No. 3 operator's escape hatch is a yellow and black striped handle located just forward of and above the left side window, and the No. 4 operator's jettison release is just forward of and above the right side window. For rescue purposes, access to inside the aircraft may be accomplished by breaking the operators' side windows to reach the jettison handles and jettison the overhead hatches (see figure 1-69).

FURNISHINGS

BOARDING LADDER

A boarding ladder is provided for normal entrance to the aircraft and is stowed on the inside of the main entrance door when not in use (figure 1-68). To board the aircraft, the ladder is hooked into two fittings at the base of the main entrance door frame.

SEATS

Four seats, two in the pilots' compartment and two in the operators' compartment, are provided on the aircraft. The seats can withstand a load of 40 g forward and 20 g downward.

The seats accept either the integrated seat parachute harness used with either the NB-6 or NB-7 parachute, or a standard lap belt and shoulder harness with a back pad. This latter arrangement permits attachment of a quick-fit chest parachute. Either of the above arrangements are used with a PK-2 pararaft kit, packed in a container, and a seat cushion.

WARNING
PILOTS AND CREWMEMBERS SHOULD WEAR ONLY BACK PACK PARACHUTES. USE OF AN UNAUTHORIZED PARACHUTE MAY HINDER EMERGENCY EGRESS.

erator busses through the three MK-5 BLOWERS CO-PILOT & 4TH OPER. circuit breakers located on the co-pilot's circuit breaker panel and the three MK-5 BLOWERS PILOT & 3RD OPER. circuit breakers on the pilot's circuit breaker panel. An air tube, attached to the blower, channels the forced air to a flexible hose assembly which connects to the anti-exposure suit. All seats are adjustable vertically 4 inches. The pilots' seats are adjustable fore-and-aft 5 inches, the operators' 5-1/2 inches. The seats recline from 8° to 25° except the Number 3 operator's seat, which reclines to a maximum of 18°. The above adjustments are made by pulling UP on the related handles.

CAUTION

Do not operate vertical or recline adjustment handle without first occupying seat.

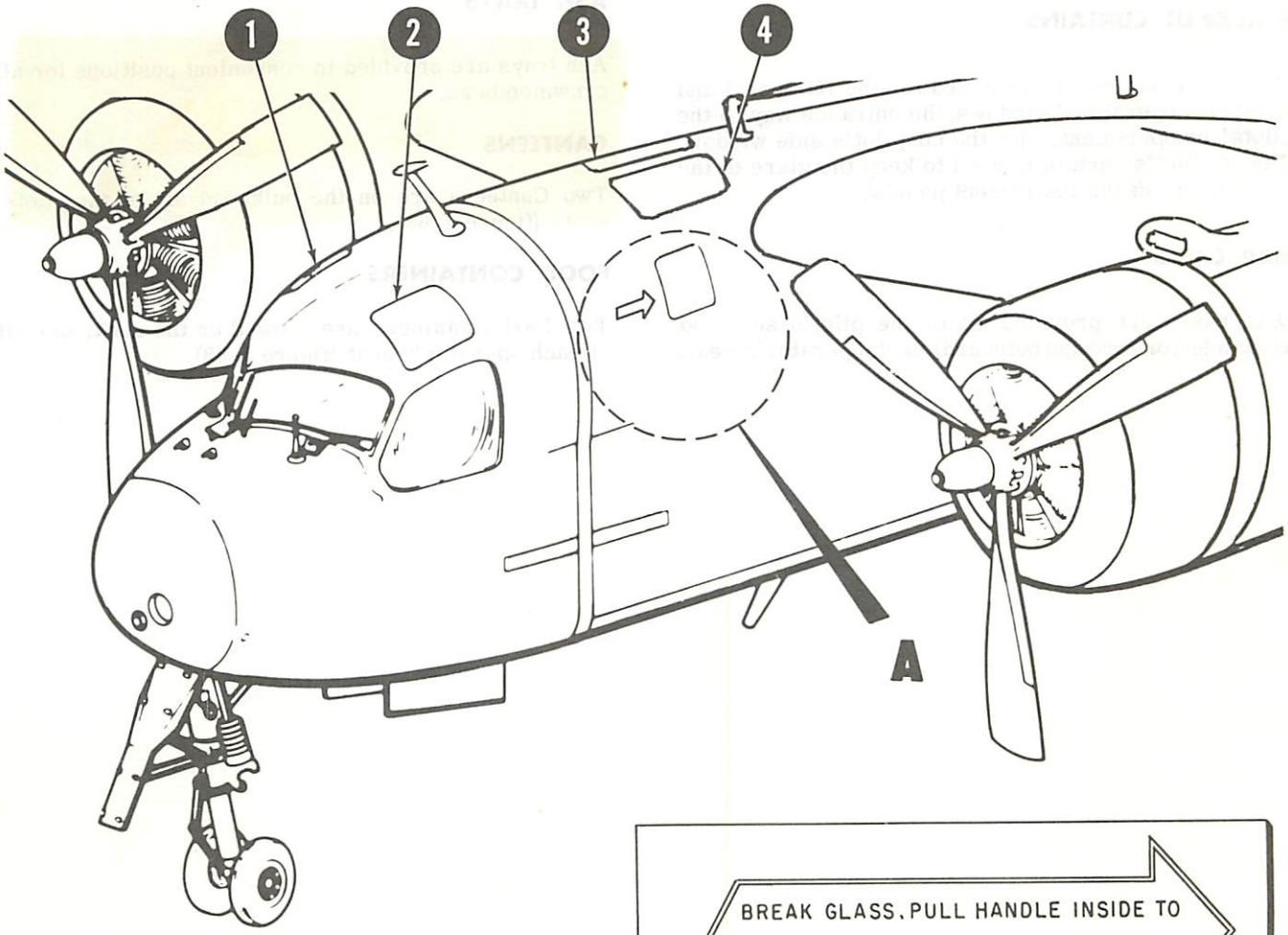
Headrests are adjustable 3 inches vertically by pulling the appropriate handle toward the front of the seat. Arm rests are adjustable 3 inches vertically and may be stowed down against the seat bucket. The actuating handle is on the forward lower part of the arm rest; squeezing the handle up permits adjustment or stowage.

An equipment release handle is on the right side in the center of the bucket. The handle has three positions: full up (unlock), full down (lock), and a center position (for equipment installation). The handle must be pulled out and then rotated to desired position.

HARNESS INERTIA REEL

A two-position (LOCKED-UNLOCKED) inertia harness reel lock is on the left forward side of each seat. Placing the control in the UNLOCKED (aft) position releases the reel to permit leaning forward. The reel automatically locks at an impact force of 2 to 3 g. When the reel is locked by an impact force, it remains locked until the handle is first moved to the LOCKED position and then returned to the UNLOCKED position. With the handle in the LOCKED position the reel harness webbing is manually locked. The handle should

ESCAPE HATCHES



1. COPILOT'S ESCAPE HATCH
2. PILOT'S ESCAPE HATCH
3. NO. 4 OPERATOR'S ESCAPE HATCH
4. NO. 3 OPERATOR'S ESCAPE HATCH

Figure 1-69

remain in the LOCKED position at all times except during straight and level flight. This provides an added safety precaution in addition to the automatic safety lock. The reel is used with two different equipment configurations. The first configuration, standard lap belt and shoulder harness, is installed by disconnecting the release cable, located on the center of the back skin, from the reel end fitting. This is done by unscrewing and stowing the cable against the back skin with clamp and screw provided on the headrest support structure. The shoulder harness is installed to this end fitting with the bolt and cap nut provided. The second configuration, integrated seat parachute harness used with NB-7 parachute, is installed by reconnecting the cable mentioned above and stowing clamp and screw to headrest support structure.

Note

The cable pin must extend 1/4 inch above the reel end fitting.

The parachute fittings may then be installed to the reel end fitting by setting the equipment release handle in the equipment installation position (center position), inserting the parachute fittings into the reel and fitting and setting the equipment release handle in the LOCK position.

BLACKOUT CURTAINS

Blackout curtains are provided for the Number 3 and Number 4 operators' windows, the entrance way to the pilots' compartment, and the co-pilot's side window. The co-pilot's curtain is used to keep the glare of the searchlight off the instrument panels.

MAP CASES

Data cases are provided aft of the pilot's seat and alongside (forward and outboard) each operator's seat.

RELIEF TUBES

Relief tubes (figure 1-68) are provided at the pilot's and co-pilot's stations. A third relief tube is just aft of the main entrance door for use by the Number 3 and Number 4 operators.

ASH TRAYS

Ash trays are provided in convenient positions for all crewmembers.

CANTEENS

Two Canteens are on the bulkhead aft of the pilots' seats (figure 1-68).

FOOD CONTAINERS

Two food containers are stowed on the deck, one aft of each operator's seat (figure 1-68).

part 3
AIRCRAFT SERVICING

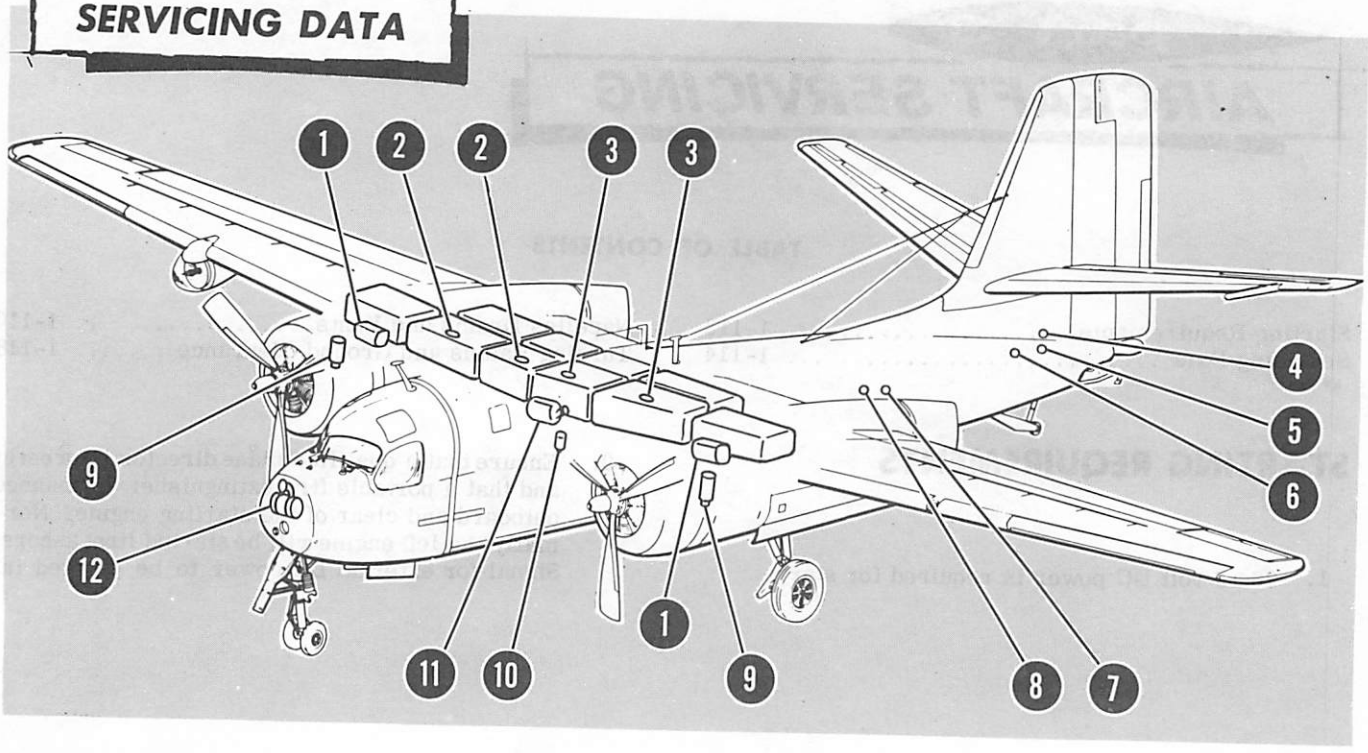
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STARTING REQUIREMENTS

1. 28 ±2 volt DC power is required for start.
2. Ensure that a qualified plane director is present and that a portable fire extinguisher is manned outboard and clear of the starting engine. Normally the left engine will be started first ashore. Signal for external DC power to be plugged in.

SERVICING DATA



1 ENGINE OIL TANK (LEFT AND RIGHT ENGINES)

OIL SPECIFICATION: ..... MIL-L-22851A TYPE II (NATO O-128)

FOR EXPECTED CONTINUOUS GROUND TEMPERATURES BELOW—4°C (25°F) SEE SECTION VI, COLD WEATHER OPERATION

TANK CAPACITIES:
23.2 US GALLONS EACH TANK

MINIMUM OIL FOR FLIGHT:
HOT .....13 GALLONS EACH TANK
COLD .....12 GALLONS EACH TANK

2 FUEL TANK FILLER CAPS (RIGHT SIDE):

FUEL SPECIFICATIONS ..... MIL-G-5572 (NATO F-22)

GRADE 115/145:
COLOR CODE .....(PURPLE)

EMERGENCY FUEL 100/130:
COLOR CODE .....(GREEN)

TOTAL VOLUME: .....382.5 US GALLONS EACH SIDE

EXPANSION SPACE: .....13.5 US GALLONS EACH SIDE

TRAPPED FUEL: .....5.0 US GALLONS EACH SIDE

USABLE FUEL: .....364.0 US GALLONS EACH SIDE

3 FUEL TANK FILLER CAPS (LEFT SIDE)
(REFER TO ITEM 2)

4 RUDDER TRIMMER ACCUMULATOR GAGE
850-900 PSI (PRELOAD)

5 ARRESTING HOOK DASHPOT GAGE (RIGHT SIDE)
390-410 PSI

6 ARRESTING HOOK DASHPOT GAGE (LEFT SIDE)
390-410 PSI

7 BRAKE ACCUMULATOR GAGE,
750-800 PSI (PRELOAD)

E-SAD1-46-1

Figure 1-70 (Sheet 1)

8 **TORPEDO BAY DOORS ACCUMULATOR GAGE**

850-900 PSI (PRELOAD)

9 **CONSTANT SPEED DRIVE OIL TANK** (L/R ENGINES)

OIL SPECIFICATION: MIL-L-23699
MIL-L-7808 (ALTERNATE)

TANK CAPACITIES: .....8.4 QUARTS EACH TANK

USABLE CAPACITIES: .....6.4 QUARTS EACH TANK

EXPANSION SPACE: .....2.0 QUARTS EACH TANK

10 **EMERGENCY HYDRAULIC RESERVOIR**

(REFER TO ITEM 11).

11 **HYDRAULIC RESERVOIR** (MAIN)

HYDRAULIC FLUID SPECIFICATION: MIL-H-5606-A
.....MIL-O-5606

SYSTEM CAPACITY:
MAIN AND EMERGENCY .....11.5 US GALLONS

RESERVOIR CAPACITY:
MAIN .....3.7 US GALLONS
REFILL LEVEL .....3.4 US GALLONS

RESERVOIR CAPACITY:
EMERGENCY .....1.3 US GALLONS

12 **WINDSHIELD WASHER TANK**

FLUID SPECIFICATION: MIL-F-5566

TANK CAPACITY: .....1.5 US GALLONS

13 **TIRES**

SIZE:

MAIN WHEEL 34x9.9/14 PLY RATED NYLON

NOSE WHEEL 18x5.5/12 PLY RATED NYLON

PRESSURE (LAND OPERATION):
MAIN WHEEL—(SEE TIRE PRESSURE CHART)
NOSE WHEEL .....175 PSI

PRESSURE (CARRIER OPERATION):
MAIN WHEEL .....180 PSI
NOSE WHEEL .....175 PSI

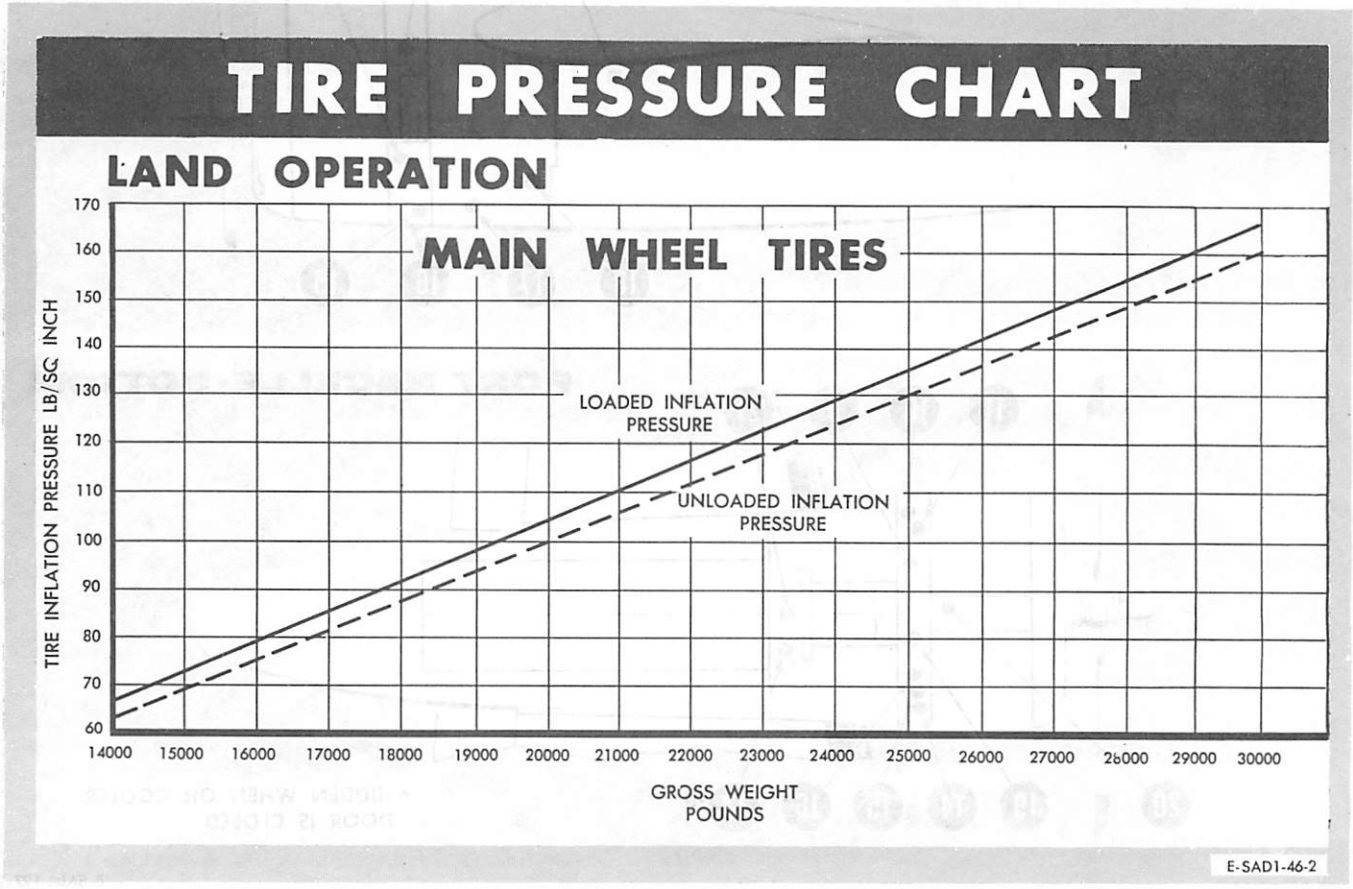


Figure 1-70 (Sheet 2)

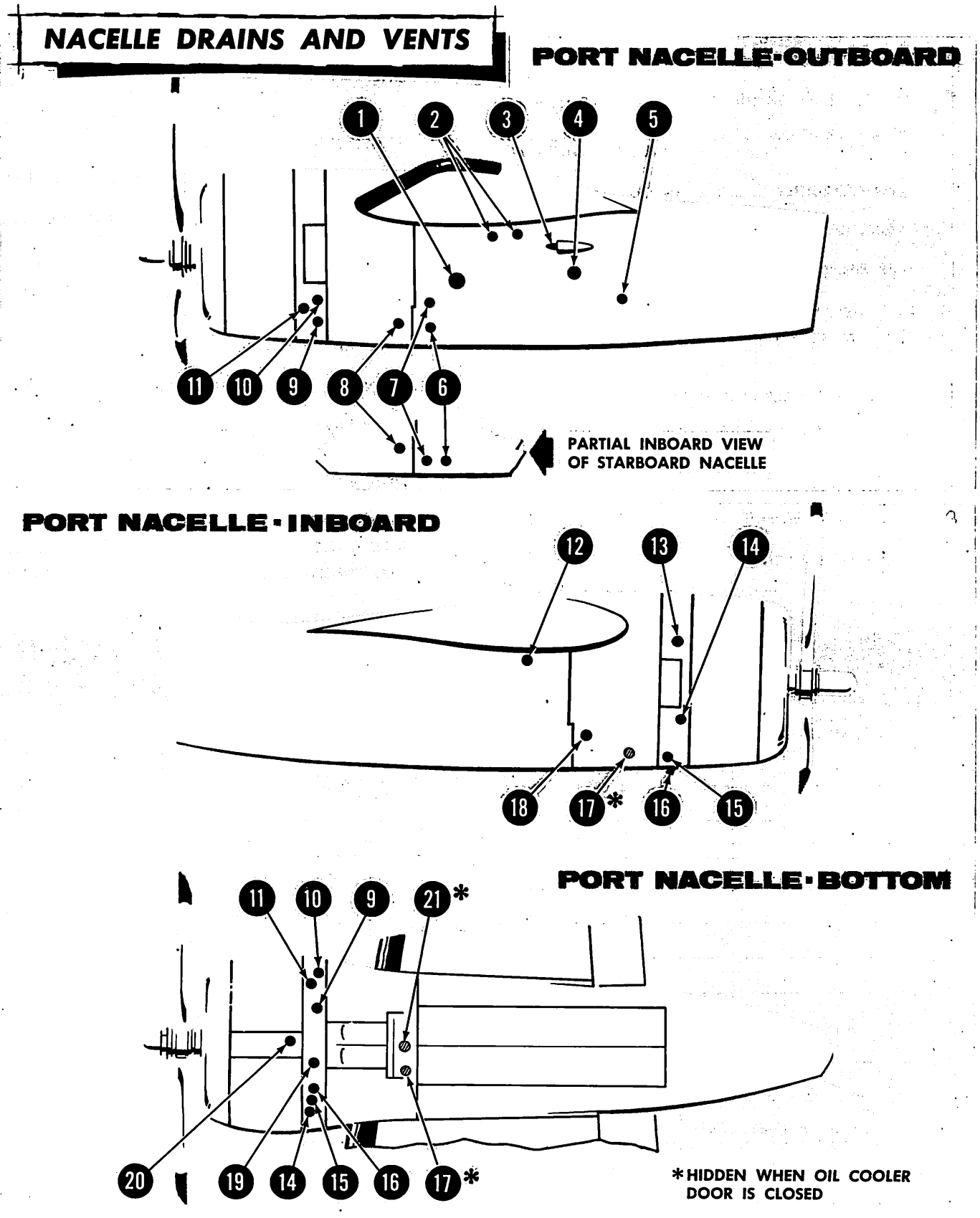


Figure 1-71 (Sheet 1)

*1 **SUCTION REGULATOR VALVE VENT:** PROVIDES AIR INTAKE FOR SUCTION SIDE OF DEICING SYSTEM WHEN SUCTION EXCEEDS 4 INCHES HG.

*2 **WING BUTT DRAINS:** DRAINS HYDRAULIC FLUID AND WATER TRAPPED IN WING BUTT CHAMBERS. HYDRAULIC FLUID EMITTING FROM THIS DRAIN INDICATES WING FOLD CYLINDER OR ASSOCIATED LINES LEAKING.

*3 **FUEL TANK PRESSURE INTAKE AND CATAPULT CHECK-VALVE VENT:** PROVIDES A POSITIVE 3 PSI PRESSURE TO CELLS IN ORDER TO ASSURE BETTER FUEL FLOW. ALSO PROVIDES A DRAIN FOR EXCESS FUEL CAUSED BY FILLING OF TANKS ABOVE FILLER-NECK. IF TANKS ARE NOT OVERFILLED AND FUEL LEAKAGE IS EVIDENT, A FAULTY FUEL VENT FLOAT VALVE SHOULD BE SUSPECTED.

4 **COMBINATION REGULATOR, UNLOADING VALVE AND OIL SEPARATOR UNIT: VENTS AIR FROM PRESSURE SIDE OF VACUUM PUMP WHEN DE-ICING SYSTEM IS NOT IN OPERATION. EXCESSIVE OIL FROM THIS VENT INDICATES A CLOGGED PRIMARY OR COMBINATION OIL SEPARATOR.

5 **COMBINATION VALVE OIL DRAIN: DRAINS ACCUMULATED OIL FROM COMBINATION VALVE OIL SEPARATOR FILTER TANK.

6 **AUX PUMP DIAPHRAM DRAIN:** FUEL LEAKAGE FROM THIS DRAIN INDICATES A DAMAGED DIAPHRAM IN THE AUX PUMP.

7 **AUX PUMP SEAL DRAIN:** FUEL LEAKAGE FROM THIS DRAIN INDICATES THAT ONE OF THE SHAFT SEALS ARE WORN OR UNSEATED. SEALS CAN BE RESEATED BY APPLICATION OF PRESSURE ON THE SYSTEM.

8 **CSD TRANSMISSION DRAIN:** CSD FLUID FROM THIS DRAIN INDICATES A WORN OR UNSEATED GARLOC SEAL ON EITHER THE INPUT OR OUTPUT SIDE OF THE TRANSMISSION.

9 **CSD EMGB OUTPUT SEAL DRAIN:** CSD FLUID EMITTING FROM THIS DRAIN INDICATES A FAULTY OUTPUT SEAL ON ENGINE MOUNTED GEARBOX.

10 **VACUUM SAFETY VALVE AIR VENT:** EXHAUST EXCESSIVE PRESSURE FROM DE-ICING SYSTEM WHEN VACUUM PUMP IS WORKING AT HIGH RPM.

11 **CSD EMGB INPUT SEAL DRAIN:** FLUID FROM THIS DRAIN INDICATES A FAULTY SEAL BETWEEN ENGINE AND INPUT SIDE OF ENGINE MOUNTED GEARBOX.

12 **FUEL CELL COMPARTMENT DRAINS:** PROVIDES A VENT AND DRAIN FOR POSSIBLE FUEL CELL LEAKAGE.

13 **CRANKCASE VENT:** VENTS OIL MIST OR EXCESSIVE CRANKCASE OIL TO THE ATMOSPHERE. EXCESSIVE CRANKCASE OIL CAN BE CAUSED BY A BAD SCAVANGE PUMP OR IMPROPER FEATHER PUMP OPERATION.

14 **SUPERCHARGER DRAIN:** FOR DRAINING EXCESS FUEL FROM THE SUPERCHARGER SECTION. DRAIN VALVE IN SUPERCHARGER OPENS WHEN ATMOSPHERIC PRESSURE EQUALS SUPERCHARGER PRESSURE. THIS WOULD ONLY OCCUR WHEN ENGINE IS NOT OPERATING. OIL FROM THIS DRAIN INDICATES SHAFT SEAL LEAKAGE OR CRACKED SUPERCHARGER CASING.

15 **ENGINE DRIVEN FUEL PUMP DRAIN:** FUEL LEAKAGE FROM THIS DRAIN INDICATES THAT ONE OF THE SHAFT SEALS ARE BAD. A FAULTY DIAPHRAM WILL DRAIN FUEL INTO THE SUPERCHARGER SECTION.

16 **HYDRAULIC PUMP DRAIN:** DRAINS FLUID FROM INPUT SECTION OF HYDRAULIC PUMP. HYDRAULIC FLUID FROM THIS DRAIN INDICATES INPUT SHAFT SEAL LEAKAGE.

17 **FEATHER PUMP DRAIN:** LOCATED INSIDE OIL COOLER AIR OUTLET CAVITY. OIL EMITTING FROM THIS DRAIN INDICATES A FAULTY SEAL BETWEEN PUMP AND MOTOR.

18 **OIL TANK OVERFLOW DRAIN:** A COMBINATION OF EXCESS FLUIDS CONNECTED TO THE FOLLOWING: (1) OIL TANK SCUPPER DRAIN; (2) OIL TANK DRAIN VALVE; (3) CSD RESERVOIR DRAIN VALVE; (4) CSD RESERVOIR SCUPPER DRAIN.

19 **CSD RESERVOIR DRAIN:** VENTS EXCESS RESERVOIR FLUID TO ATMOSPHERE. FLUID WILL USUALLY FLOW FROM VENT AFTER SHUT-DOWN DUE TO HEAT EXPANSION AND/OR FOAMING OF A NEWLY FILLED TANK.

20 **INTER-CYLINDER DRAIN:** AN ANTI-HYDRAULIC MEASURE. FLUID TRAPPED IN LOWER CYLINDERS WILL DRAIN OUT EXHAUST STACKS IF EXHAUST VALVES ARE OPEN. IF EXHAUST VALVES ARE CLOSED, FLUID WILL EXIT THROUGH THE INTER-CYLINDER DRAIN.

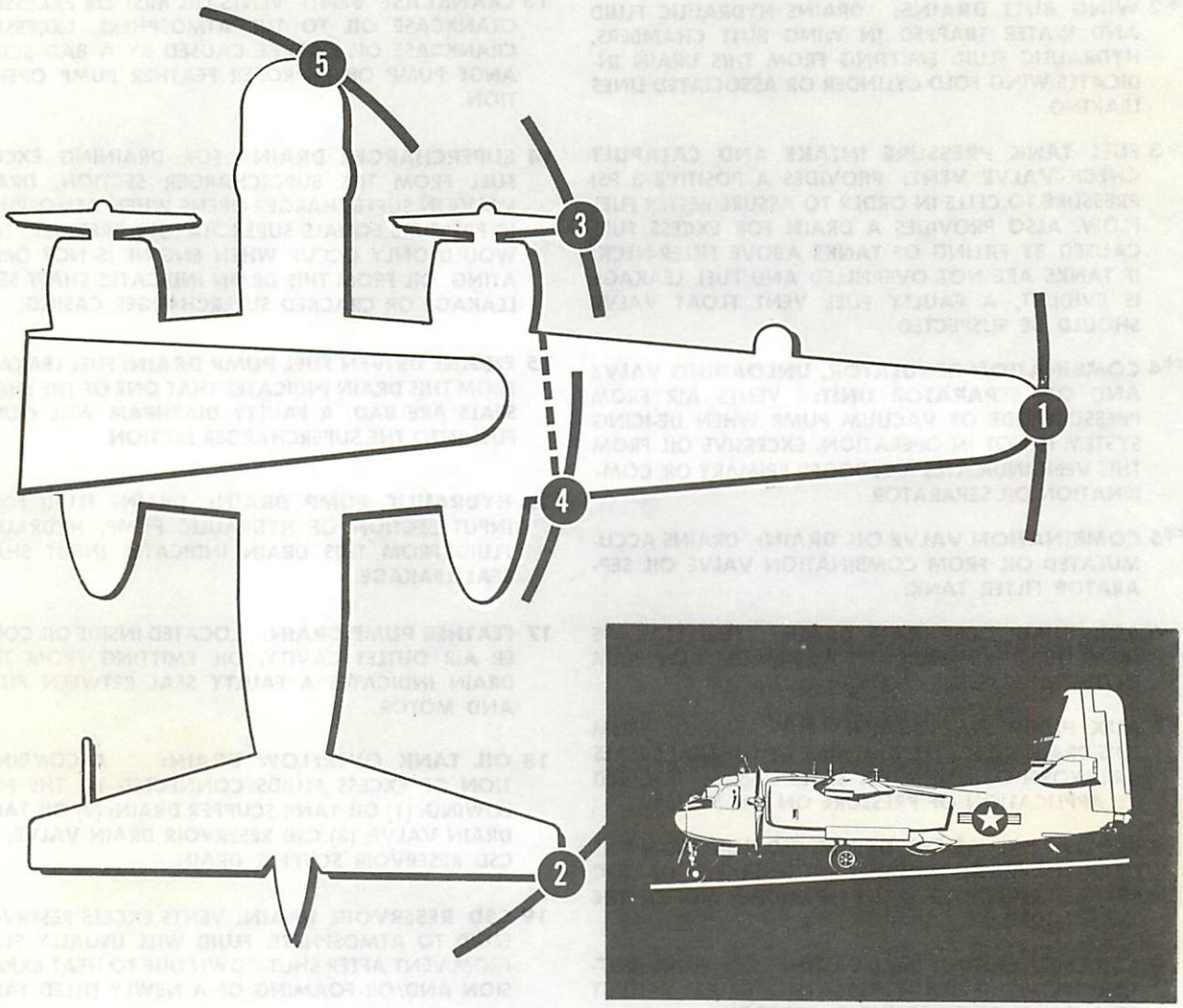
21 **AUXILIARY ENGINE BREATHER**

*ON OUTBOARD SIDE OF EACH NACELLE
**ON PORT NACELLE ONLY

C-SAD1-197-2

Figure 1-71 (Sheet 2)

TURNING RADIUS AND GROUND CLEARANCE



MINIMUM TURN RADIUS	
1. WINGS (SPREAD)	45 FT. 6½ IN.
2. STABILIZER	32 FT. 8 IN.
3. PROPELLERS	24 FT.
4. WINGS (FOLDED)	22 FT. 11 IN.
5. NOSE	19 FT. 5 IN.

GROUND CLEARANCE	
PROPELLER	1 FT. 6½ IN.
WING TIP	9 FT. 4¾ IN.
RADOME RETRACTED	1 FT. 5 IN.
STABILIZER TIP	10 FT. 5 IN.

C - SAD1-50

Figure 1-72

part 4

AIRCRAFT OPERATING LIMITATIONS

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Maneuver Limitations 1-120

OPERATING LIMITATIONS

The pilot should be aware of the operating limits indicated by the instrument markings as shown in figure 1-73 and power requirements in figure 1-74. The operating limits shown by some of these instruments are not repeated in the text of this manual.

ENGINE LIMITATIONS

Engine speeds above 2800 RPM shall be reported on the Yellow Sheet. Engine overspeed occurs above 3000 RPM. Overspeeds of 3000 to 3200 RPM required an inspection. Speeds above 3200 RPM require an engine change. Momentary overspeed or surge within the inspection required range under full throttle opening, as a result of a catapult shot or abnormally fast throttle movement, is permissible without subsequently performing the inspection. However, avoid unusually fast throttle movement when possible.

Operation at approximately 2600 RPM should be avoided whenever possible because of propeller vibrations. Also avoid the 1650 through 1900 RPM range during ground operation with propeller blades off the low pitch stop.

CAUTION

Any overboosting of the engine(s) should be reported immediately upon completion of the flight regardless of RPM at which overboost occurred.

If operation above limits in figure 1-73 occurs, each occurrence must be recorded on the yellow sheet. Items to be noted are the duration of overboost RPM, cylinder head temperature, carburetor air temperature, MAP, torque pressure, oil pressure and oil temperature.

To preclude detrimental effects of underboost (especially prolonged) on engine service life, and to increase engine reliability, at least 1 in. Hg of manifold pressure should be maintained for each 100 RPM whenever practical.

PROPELLER LIMITATIONS

The blades of the Hamilton Standard propeller, used on this aircraft, are manufactured by a special process to improve the vibratory fatigue limit and to permit operations at stress loads in excess of those allowable for conventional aluminum alloy blades. The effect of this special process is to place the surface fibers of the blades in compression, allowing higher steady and vibratory loads to be tolerated.

Overspeeding of the propeller can produce blade stresses of sufficient magnitude to nullify the beneficial effects of the special manufacturing process. Overspeeding of propeller blades of less than 20 percent above takeoff RPM is not detrimental to the blades and they may be continued in operation. Overspeeding of this nature may be caused by rapid control movement or abrupt aircraft maneuvers. Marginal overspeeding, 20 to 40 percent above takeoff RPM, may or may not require blade retirement for rework. Dependent factors are the normal design loading and other factors that will vary according to installation.

WARNING

- Momentary or sustained propeller overspeeds above 20 percent of takeoff RPM must be reported so that, in addition to the required engine change, a proper review and analysis of the propellers can be made.
- Blades subjected to positive overspeeding above 40 percent of takeoff RPM must be removed and reworked, (in accordance with pertinent directives), prior to future use.

Note

All references to the amount of overspeeding are based solely on propeller blade consideration and has no bearing on the engine. Refer to Engine Limitations paragraph, this section, for engine operating limitations.

IN-FLIGHT FEATHERING

When feathering an engine in flight in cold weather, engine should be restarted before the oil temperature drops below +40°C. Temperature below this limit will preclude use of the engine for a significant period of time.

CENTER OF GRAVITY LIMITATIONS

WARNING

Due to the CG limitations of the aircraft, carrying of baggage or cargo in the radar compartment (hell hole) is prohibited.

Baggage may be carried in the electronics compartment provided that the aft CG limits will not be exceeded. For detailed information, refer to Manual of Weight and Balance Data, AN01-1B-40.

AIRSPEED LIMITATIONS

The maximum permissible indicated airspeeds (IAS) are as follows:

SMOOTH AIR

With landing gear and flaps retracted, radome or MAD boom extended or retracted, and torpedo bay doors open or closed - 290 KIAS

To open or close torpedo bay doors - 240 KIAS

To extend or retract radome or MAD boom - 150 KIAS

To extend or retract landing gear and/or flaps - 150 KIAS

With landing gear and/or flaps down - 150 KIAS

TURBULENT AIR

In severe turbulence, speeds in the range of 135 to 160 KIAS are recommended.

ACCELERATION LIMITATIONS

The maximum acceleration permitted for flight in smooth air at gross weights of 26,250 pounds or less is 3.0g in symmetrical flight and 2.4g in unsymmetrical flight. The maximum negative acceleration permitted for flight in smooth air at gross weights of 26,250 pounds or less is 1.0 G in symmetrical flight only at a maximum permissible indicated airspeed of 220 KIAS. As gross weights in excess of 26,250 pounds, reduce acceleration to maintain a constant product of gross weight times acceleration. A suggested rule to simplify this calculation is to reduce the load factor 0.1g for every 1000 pounds above a gross weight of 26,250 pounds.

When flying in conditions of moderate turbulence, accelerations resulting from deliberate maneuvers are limited to the range of 0.5 to 1.5g at gross weights of 26,250 pounds or less. This is to minimize the possibility of overstressing the aircraft as a result of the combined effects of gust and maneuvering loads.

GROSS WEIGHT LIMITATIONS

The maximum gross weights are as follows:

Field takeoff	-	29,150 pounds
Field landing	-	24,800 pounds
Catapulting	-	29,150 pounds
Arrested landing, shipboard touch-and-go, and FCLP	-	24,150 pounds

SINGLE ENGINE PERFORMANCE WEIGHT LIMITATIONS

Refer to Section XI, Part I.

STORES-LIMITATIONS

Only the stores listed in figure 1-75 may be carried and released, singly or in combination, to the limits shown. The stores are compatible with the S-2 aircraft; however, they shall not be dropped unless airspeed and altitude parameters, based upon weapon fuzing and fragmentation patterns, are promulgated. Limitations for catapulting and arrested landings with stores are the same as the basic aircraft unless otherwise noted. NEW

"NOTE: ALL AERO 65 AND MAU-38 SERIES BOMB RACKS ARE RESTRICTED (except for emergency use) FROM:

A. FLIGHT OPERATIONS WITH WR WEAPONS (WK-57, MK-101 SPECIAL STORES).

B. FLIGHT OPERATIONS WITH SPECIAL STORES TRAINING SHAPES IN THE RETARDED MODE."

2. Full throw rolls with bank angles up to 60°.

CAUTION

At speeds above 200 KIAS, full abrupt lateral control motion will result in aircraft pitch-up. Therefore, care must be taken not to exceed the unsymmetrical load factor limits.

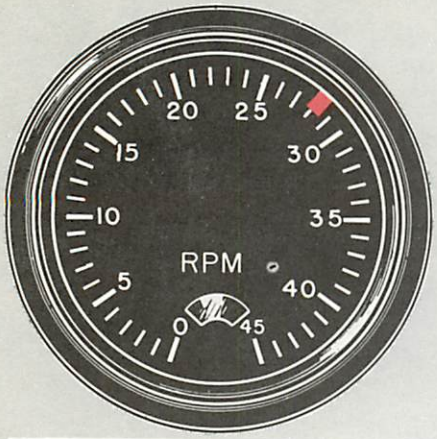
PROHIBITED

1. Abrupt control reversals.
2. Intentional spins.
3. Rolling pullouts in turbulent air.
4. Over 60° angle of bank.

RUDDER ASSIST

The aircraft may be flown in coordinated maneuvers at any speed with the rudder assist ON. A small amount of slipping or skidding normally encountered during maneuvers is permitted. Intentional sideslips with the rudder assist ON are prohibited at speeds greater than 130 KIAS and at sideslip angles greater than 15 degrees, due to the high loads imposed on the vertical tail at these higher airspeeds and yaw angles.

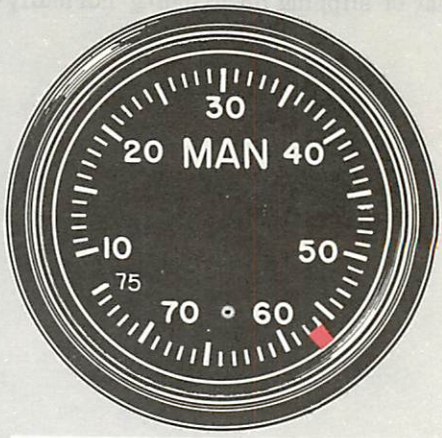
ENGINE INSTRUMENT MARKINGS/MAX OPERATING LIMITS



TACHOMETER (DUAL)



TORQUE PRESSURE INDICATOR (DUAL)



MANIFOLD PRESSURE GAGE (DUAL) (STANDARD DAY)

115/145 GRADE FUEL (COLOR CODE—PURPLE)

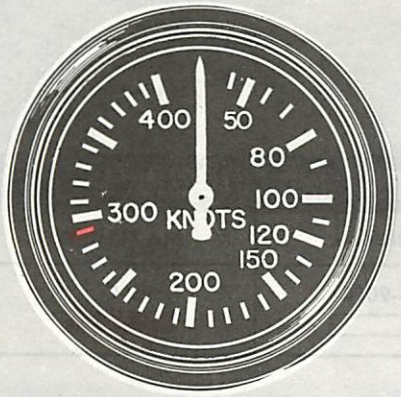
POWER	BHP	RPM	MAP	TP	MIXTURE
TAKE-OFF (5 MIN. MAX.)	1525	2800	56.5 IN. HG (S.L.) 55.5 IN. HG (800 FEET) (FULL THROTTLE)	352 PSI	RICH RICH
MILITARY (30 MIN. MAX.)	1425	2700	52.0 IN. HG (S.L.) 50.5 IN. HG (2600 FEET) (FULL THROTTLE)	340 PSI	RICH RICH
NORMAL RATED (MAX. CONT.)	1275	2500	47.5 IN. HG (S.L.) 46.0 IN. HG (3600 FEET) (FULL THROTTLE)	329 PSI	NORMAL NORMAL
CRUISE	325-1275	1450-2500	21.0—47.5 IN. HG	150-329 PSI	NORMAL
IDLE NO CSD LOAD	—	800±25	—	—	RICH

ALTERNATE (EMERGENCY) FUEL 100/130 GRADE FUEL (COLOR CODE—GREEN)

POWER	BHP	RPM	MAP	TP	MIXTURE
TAKE-OFF (5 MIN. MAX.)	1325	2800	50.0 IN. HG (S.L.) 49.5 IN. HG (2000 FEET) 48.5 IN. HG (4000 FEET) F.T. (6000 FEET)	304 PSI	RICH RICH RICH RICH
MILITARY (30 MIN. MAX.)	1275	2700	47.5 IN. HG (S.L.) 47.0 IN. HG (2000 FEET) 46.0 IN. HG (4000 FEET) F.T. (6000 FEET)	304 PSI	RICH RICH RICH RICH
NORMAL RATED (MAX. CONT.)	1200	2500	44.5 IN. HG (S.L.) 44.0 IN. HG (2000 FEET) 43.0 IN. HG (4000 FEET) F.T. (6000 FEET)	308 PSI	NORMAL NORMAL NORMAL
CRUISE	325-1200	1450-2500	21.0—44.5 IN. HG	150-308 PSI	NORMAL

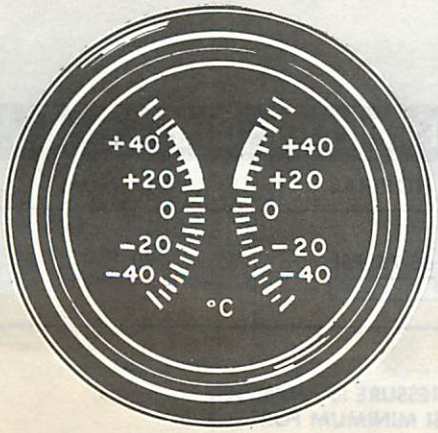
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Figure 1-73 (Sheet 1)



AIRSPEED INDICATOR GAGE

LIMIT INDICATED AIRSPEED	
FLAPS, LANDING GEAR RETRACTED, 290 KIAS RADOME OR MAD BOOM EXTENDED OR RETRACTED, TORPEDO BAY DOORS OPEN OR CLOSED	
TO OPEN OR CLOSE TORPEDO BAY DOORS	240 KIAS
TO EXTEND OR RETRACT LANDING GEAR, FLAPS, MAD BOOM OR RADOME	150 KIAS
WITH LANDING GEAR AND/OR FLAPS EXTENDED	150 KIAS

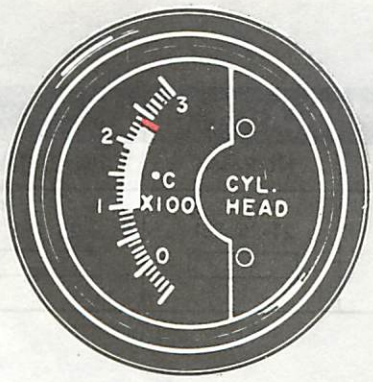


CARBURETOR AIR TEMPERATURE INDICATOR (DUAL)

DANGER OF ICING	BELOW +10°C
CONTINUOUS OPERATION	+10 TO +38°C
DANGER OF DETONATION	+38°C MAXIMUM

CAUTION

REDUCE MAXIMUM ALLOWABLE MANIFOLD PRESSURE 1 IN. HG FOR EACH 6°C CAT EXCEEDS +38°C.

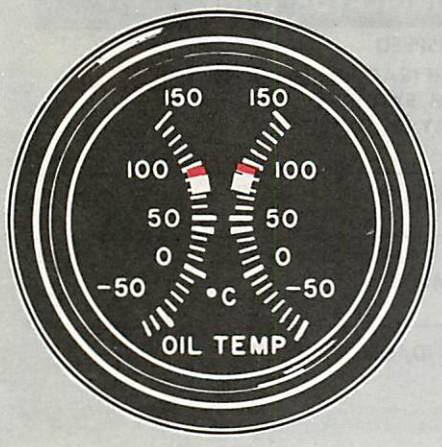


CYLINDER HEAD TEMPERATURE GAGE

TAKE-OFF (5 MINUTES MAXIMUM)	260°C
MILITARY (30 MINUTES MAXIMUM)	260°C
NORMAL RATED (MAX. CONT.)	245°C
CRUISE (70% NRP AND BELOW) RECOMMENDED	100-230°C 200°C

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Figure 1-73 (Sheet 2)



ENGINE OIL TEMPERATURE INDICATOR (DUAL)		
MINIMUM	NORMAL	MAXIMUM
40°C	75-90°C	95°C



OIL PRESSURE INDICATOR (DUAL)		
MINIMUM	NORMAL	MAXIMUM
15 PSI (FOR IDLE)	65-75 PSI	90 PSI

NOTE

"A minimum of 50 psi pressure is permitted at 1450-1900 rpm, 65 psi minimum for engine speeds above 1900 rpm. The minimum in-flight oil pressure is 50 psi at 85°C above 1450 rpm with a correction factor of 1 psi decrease/1 degree C above 85°C."



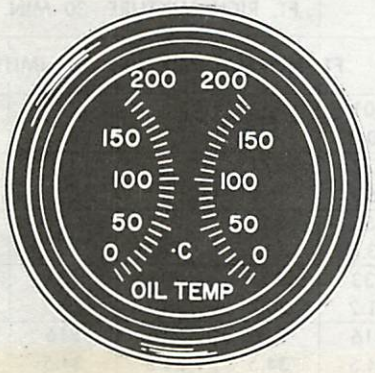
FUEL PRESSURE INDICATOR (DUAL)			
FUEL	MINIMUM	NORMAL	MAXIMUM
GRADE 115/145 OR 100/130	19 PSI (IN FLIGHT)	21-25 PSI	25 PSI

F-SAD1-127-3

Figure 1-73 (Sheet 3)



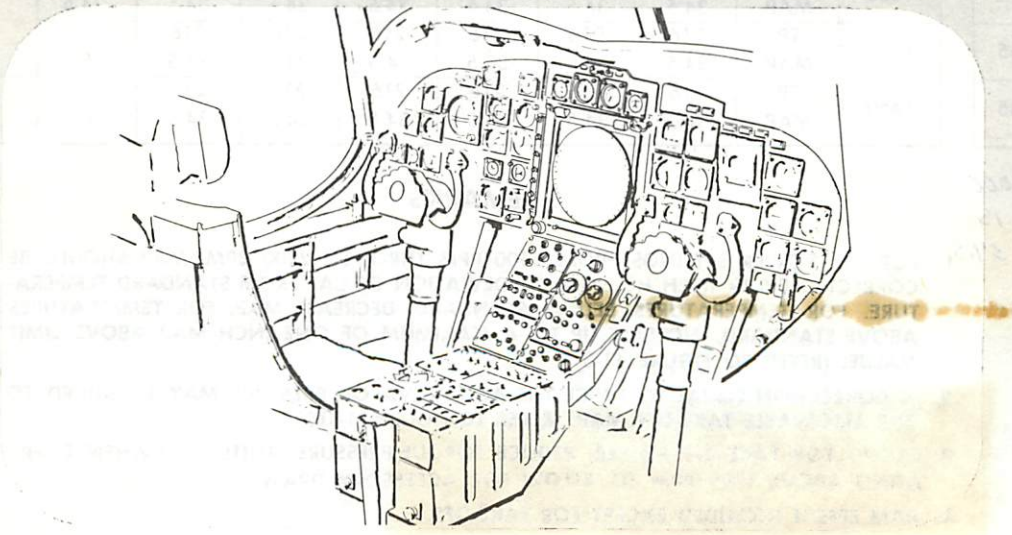
HYDRAULIC PRESSURE GAGE (DUAL)			
	MINIMUM	NORMAL	MAXIMUM
LOW PRESSURE OPERATION	1300 PSI	1500 PSI	1700 PSI
HIGH PRESSURE OPERATION	2800 PSI	3000 PSI	3200 PSI



CONSTANT SPEED DRIVE OIL TEMPERATURE GAGE (DUAL)	
AMBIENT AIR TEMPERATURE	OIL TEMPERATURE LIMIT
BELOW 4.5°C (+40°F)	85°C
4.5 TO 27°C (40 TO 80°F)	105°C
ABOVE 27°C (80°F)	120°C

CAUTION

3. Disconnect CSD at any temperature above 165 degrees C. The CSD will operate continuously between 120 degrees & and 150 degrees C without serious damage, or up to 10 minutes between 150 degrees C and 165 degrees C.



D-SAD1-127-4

Figure 1-73 (Sheet 4)

ENGINE OPERATING LIMITS



CONFIGURATION **ALL**

MODEL(S): S-2D/E
DATA AS OF: 5 April 1961
DATA BASIS: Military C-9 O.I.

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

HUMIDITY: ZERO
FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL

PERFORMANCE APPROX	
BHP PER ENG	2 ENG FUEL FLOW LB/HR
1525	2340
1425	2250
1275	1730
1125	1500
990	1235
870	980
760	775
670	650
630	610
600	570
565	535
535	505
500	465
470	435

MAXIMUM LIMITS

ENG. RPM		PRESSURE ALTITUDE								
		S. L.	1000	2000	4000	6000	8000	10,000	12,000	14,000
2800	TP	352			FT, RICH MIXTURE, 5 MIN.					
	MAP	56.5								
2700	TP	340	340	340	340	FT, RICH MIXTURE, 30 MIN.				
	MAP	52.0	51.5	50.7	50.2					
2500	TP	329	329	329	329	FT, NORMAL MIXTURE, UNLIMITED				
	MAP	47.5	47.1	46.4	45.8					
2400	TP	301	301	301	301	301	FT			
	MAP	42.5	42.2	41.9	41.4	40.8				
2300	TP	277	277	277	277	277	277	FT		
	MAP	38.8	38.3	38.0	37.4	36.7	36.2			
2200	TP	255	255	255	255	255	255	255	FT	
	MAP	35.6	35.3	35.0	34.4	33.8	33.4	32.6		
2100	TP	233	233	233	233	233	233	233	233	FT
	MAP	33.5	33.0	32.6	32.0	31.2	30.7	30.2	29.3	
2000	TP	216	216	216	216	216	216	216	216	FT
	MAP	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	
1900	TP	216	216	216	216	216	216	216	216	FT
	MAP	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	
1800	TP	216	216	216	216	216	216	216	216	FT
	MAP	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	
1700	TP	216	216	216	216	216	216	216		
	MAP	34.5	34.5	34.5	34.5	34.5	34.5	34.5	FT	
1600	TP	216	216	216	216	216	216	216		
	MAP	34.5	34.5	34.5	34.5	34.5	34.5	34.5	FT	
1500	TP	216	216	216	216	216	216			
	MAP	34.5	34.5	34.5	34.5	34.5	34.5	FT		
1450	TP	216	216	216	216	216	216			
	MAP	34.5	34.5	34.5	34.5	34.5	34.5	FT		

MAX MAP 2000 RPM + BELOW IS NOW 33" VICE 34.5

REMARKS

1. FOR ALL POWER SETTINGS FROM 2100 RPM THROUGH 2500 RPM, MAP SHOULD BE CORRECTED BY ¼ INCH HG. PER 6°C DEVIATION OF CAT FROM STANDARD TEMPERATURE. FOR TEMPERATURES BELOW STANDARD, DECREASE MAP. FOR TEMPERATURES ABOVE STANDARD, INCREASE UP TO A MAXIMUM OF ONE INCH MAP ABOVE LIMIT VALUE. (REFER TO FIGURE 11-8)
2. A CORRECTION EQUAL TO TWICE THE ACTUAL VAPOR PRESSURE MAY BE ADDED TO THE ALLOWABLE TAKE-OFF MAP. (REFER TO FIGURE 11-10)
3. EXCEPT FOR TAKE-OFF POWER, REDUCE TORQUE PRESSURE LIMITS 5 PSI WHEN OPERATING ABOVE 1900 RPM TO ALLOW FOR ACCESSORY DRAW.
4. RAM EFFECT INCLUDED EXCEPT FOR TAKE-OFF.

"NOTE. FUEL COMSUMPTION FLOW RATES AT CRUISE POWER SETTINGS CAN BE APPROXIMATELY TEN PERCENT GREATER THAN INDICATED BY THE PERFORMANCE CHARTS IN THIS SECTION WHEN THE "DASH FOUR" PN 391336-4 CARBURETOR IS INSTALLED."

D-SAD1-137

INTERNAL/ EXTERNAL STORES LIMITA1

AGM-12B REMARKS
(1) Requires incorporation of AFC 491
(2) Launch with flaps up and wings level
(3) No stores permitted on stations 2 & 5 from stations 2 & 5 Sway Braces must be removed

STORE	STATION 1 2 3 4 5 6 EXTERNAL	STATION 7 8 INTERNAL	MA AIRSPE CARRIAGI			
TORPEDOES						
MK 44 MK46 MOD 0/1/2	1 3 4 6	7 8	*			
MK 46 MOD 0/1	1 3 4 6	7 8	*			
MK 46 MOD 1 (POSITIVE BUOYANT EXERCISE AND FLEET TRACKING CONFIGURATION)	1 3 4 6	7 8	*			
ROCKET PACKS						
LAU 3A/A	1 6		*	*	+0.5 TO 3.0	NOTES 3 AND 10 ~~FOR LAU-10/A AND LAU-10A/A. JETTISON EMPTY OR FULL IN +1.0G STRAIGHT AND LEVEL FLIGHT BETWEEN 120 AND 180 KIAS~~ (NOTE 3 FOR LAU-10 ARRESTMENT RESTRICTIONS PROMULGATED BY IAAB NO. 394 (CURRENT REVISION) MUST BE COMPLIED WITH. FIRING FROM STATION 6 IS NOT PERMITTED WITH NOSE FAIRING INSTALLED. FOR LAU 10A AND 10A/A FIRE SINGLES ONLY, SLIGHT DEICER BOOT DAMAGE MAY OCCUR. ~~AERO 6A, 6A-1 AND 6A-2 ROCKET PACKS MUST HAVE THE KMU-52/A SINGLE FIRE INTERVALOMETER INSTALLED WHEN USED FOR TRAINING.~~
LAU 60/A	1 6		*	*	+0.5 TO 3.0	
LAU 61/A	1 6		*	**	+0.5 TO 3.0	
LAU 69/A	1 6		*	*	+0.5 TO 3.0	
LAU 10A	1 6		*	*	+0.5 TO 3.0	
LAU 10A/A	1 6		*	*	+0.5 TO 3.0	
LAU 32A/A	1 2 3 4 5 6		*	*	+0.5 TO 3.0	
LAU 32B/A	1 2 3 4 5 6		*	*	+0.5 TO 3.0	
LAU 56/A	1 2 3 4 5 6		*	*	+0.5 TO 3.0	
LAU 68/A	1 2 3 4 5 6		*	*	+0.5 TO 3.0	
ASW NIGHT PHOTO POD LB-11A WITH M112A1 PHOTOFLASH CARTRIDGE	1 2 3 4 5 6		*	275 (JETTISON)	+1.0 (JETTISON)	NOTE 3, STATIONS 1 THROUGH 5 FOR FERRY ONLY. ASC NO. 315 MUST BE INCORPORATED. FOR BEST PHOTO COVERAGE M112 PHOTOFLASH CARTRIDGES/AT 140 KIAS.
BOMBS/MINES						
MK 54 MOD 1 DEPTH	1 3 4 6	7	*	*	+0.5 TO 2.0	NOTES 4, 5 AND 9. STORES DIAMETER PRECLUDES LOADING ON ADJACENT STATIONS
MK 81 LDGP CONICAL FINS	1 2 3 4 5 6	7 8	*	275	+0.5 TO 3.0	
MK 81 SNAKEYE	1 2 3 4 5 6		*	275	+0.5 TO 3.0	
MK 82 LDGP CONICAL FINS	1 3 4 6		*	275	+0.5 TO 3.0	
MK 82 SNAKEYE	1 3 4 6		*	275	+0.5 TO 3.0	
MK 77 MOD 2/4 FIRE	1 3 4 6	7	*	275	+0.5 TO 3.0	
MK 53 MINE (MK 21 PARA PACK)	1 3 4 6 2 5	7	*	275	+0.5 TO 3.0	
MK 36 MINE (MK 27 PARA PACK)		7	*	250	+1.0 TO 3.0	NOTE 5.
MK 52 MINE		7	*	200	+1.0	NOTE 5. RELEASE IN LEVEL FLIGHT. ACCELERATION CARRIAGE LIMIT 0.0 TO +2.0G FOR MK52 MINE.
MK 57 SPECIAL STORE		7	*	*	+1.0	
MK 101 SPECIAL STORE		7	*	*	+1.0	
AGM-12B BULLPUP "A" (TO BE ADDED BY INTERIM CHANGE NO. 61)	1, 6		*			
PARACHUTE FLARES						
SUU 40/A	1 3 4 6		*	*	+1.0 ONLY	NOTES 3, 4, 6, AND 7. MINIMUM AIRSPEED FOR RELEASE IS 140 KIAS WING FLAPS MUST BE RETRACTED FOR FLARE RELEASE.
SUU 44/A	1 3 4 6		*	*	+1.0 ONLY	
** MK 24 MOD 3/4	1 2 3 4 5 6		*	275	+1.0 TO 3.0	NOTES 2, 3, 4, 5, 6, AND 8. MINIMUM AIRSPEED FOR RELEASE IS 120 KIAS.
** MK 45 MOD 0	1 2 3 4 5 6		*	275	+1.0 TO 3.0	

EXTERNAL AIRSPEED RELEASE. SAME AS BASIC AIRCRAFT.

D-SAD1-206-1

Figure 1-75 (Sheet 1)

INTERNAL/EXTERNAL STORES LIMITATIONS-CONTINUED

STORE	STATION 1 2 3 4 5 6 EXTERNAL	STATION 7 8 INTERNAL	MAXIMUM AIRSPEED (KIAS) CARRIAGE	MAXIMUM AIRSPEED (KIAS) RELEASE	ACCELERATION (G) RELEASE	REMARKS
PRACTICE BOMBS						
* * MK 76 MOD 4/5	1 2 3 4 5 6		275	275	+0.5 TO 3.0	NOTES 2, 3, 4, AND 5.
* * MK 106 MOD 2/3/4	1 2 3 4 5 6		275	275	+0.5 TO 3.0	
MK 124	1 3 4 6		*	275	+0.5 TO 3.0	NOTES 3, 4, AND 5.
ASW SEARCH/LOCALIZATION						
* * MK 6 MOD 3 FLOAT LIGHT	1 2 3 4 5 6		275	275	+0.5 TO 3.0	NOTE 2. FOR SINGLE CARRIAGE ON AERO 15C RACK, DOUBLE SUSPENSION BANDS REQUIRED.
* * MK 58 MOD 0 MARINE MKR	1 2 3 4 5 6		275	275	+0.5 TO 3.0	NACELLE DISPENSER CHUTES 15 (31) AND 16 (2) CONTAIN ARMING HOOK PROVISION CARRIAGE AND RELEASE. SAME AS BASIC AIRCRAFT WHEN CARRIED INTERNALLY.
* * MK 57 MOD 0, MK 61, MOD 0, MK 64 MOD 0 MK 84 SUS	1 2 3 4 5 6		275	275	+0.5 TO 3.0	NOTE 2. CARRIAGE AND RELEASE AIRSPEED SAME AS BASIC AIRCRAFT IF CARRIED INTERNALLY.
	7, 8		LBA *	175 125/MIN	+1.0	NOTE 11
SSQ-15 SONOBUOY	1 2 3 4 5 6		*	*	+1.0	MOUNT ROTOCHUTE END FORWARD. MINIMUM RELEASE ALTITUDE 300 FEET.
"A" SIZE SONOBUOYS SSQ-23, 28, 36, 38, 41, 47, 49, 53, 57	1 2 3 4 5 6		*	*	+1.0 TO 2.0	TOTAL SONOBUOY WEIGHT PER NACELLE NOT TO EXCEED 330 POUNDS. LOAD HEAVY SONOBUOYS IN LOWER CHUTES FIRST. DO NO LOAD SSQ 47/53 IN CHUTES 9 (25), 10 (26) OR 11 (27). FOR EXTERNAL CARRIAGE MOUNT ROTOCHUTE END FORWARD. MINIMUM RELEASE ALTITUDE 300 FEET.
MK 25 MARINE MKR			*	200	+1.0 TO 2.0	NACELLE DISPENSERS

NOTES

* 1. MAXIMUM AIRSPEED AND ACCELERATION LIMITS ARE SAME AS BASIC AIRCRAFT FOR CARRIAGE AND RELEASE EXCEPT WHERE NOTED.

* * 2. FOR CARRIAGE ON THE A/A37B-3 PMBR, SINGLE SUSPENSION BAND REQUIRED. WITHOUT AAC NO. 396 INCORPORATED, SIMULTANEOUS RELEASE FROM MORE THAN ONE PMBR SHOULD NOT BE ATTEMPTED. OVERLOADING OF THE ELECTRICAL SYSTEM WILL OCCUR RENDERING ALL PMBRS INOPERATIVE. MAXIMUM RELEASE ACCELERATION FROM PMBR IS 1.0 G. FOLDING OF WINGS IS PERMITTED WITH PMBR ON LEFT WING PROVIDED NOSE CONE ASSEMBLY NO. 64A81D167-1 IS USED.

3. FOLDING OF WINGS IS PROHIBITED WITH STORE ON LEFT WING TO PREVENT DAMAGE TO RIGHT WING AILERON.

4. WINGS SHOULD NOT BE FOLDED IF THE TOTAL STORE WEIGHT EXCEEDS 700 POUNDS FOR EACH WING.

5. JETTISON IS PERMISSIBLE UP TO RELEASE SPEEDS UNLESS OTHERWISE NOTED.

6. COMPLY WITH AAB 347 AND AMENDMENTS THERETO PRIOR TO CARRIAGE OF ANY PARACHUTE FLARE.

7. JETTISON DISPENSERS IN EMERGENCY ONLY AT 1.0G LEVEL FLIGHT AT 130 KIAS MINIMUM TO 180 KIAS MAXIMUM FULL OR EMPTY.

8. MODIFY S-2 PMBR KIT IN ACCORDANCE WITH HANDBOOK AE-92A PRIOR TO CARRIAGE OF PARA FLARES ON THE PMBR.

9. MINIMUM G RELEASE FROM STATIONS 7 & 8 1.0G. MAXIMUM RELEASE SPEED IS 250 KIAS FROM STATIONS 7 & 8 EXCEPT MK-54 WHICH IS SAME AS BASIC AIRCRAFT.

10. 2.75 IN. ROCKETS WITH MK-40 MOTORS ("SCARFED") MAY BE LAUNCHED ONLY FROM SEVEN ROUND LAUNCHERS OR HALF LOADED (TUBES NUMBER 1A, 2B, 3B, 4A, 5B, 6A, 7B, 8A, 9A, 10) NINETEEN ROUND LAUNCHERS. M423 POINT DETONATING FUZES ARE NOT AUTHORIZED.

11. Loading SUS in bomb bay Requires use of UDA 372/A Bomb Rack adapter.

D-SAD1-206-2

Figure 1-75 (Sheet 2)

section II
INDOCTRINATION

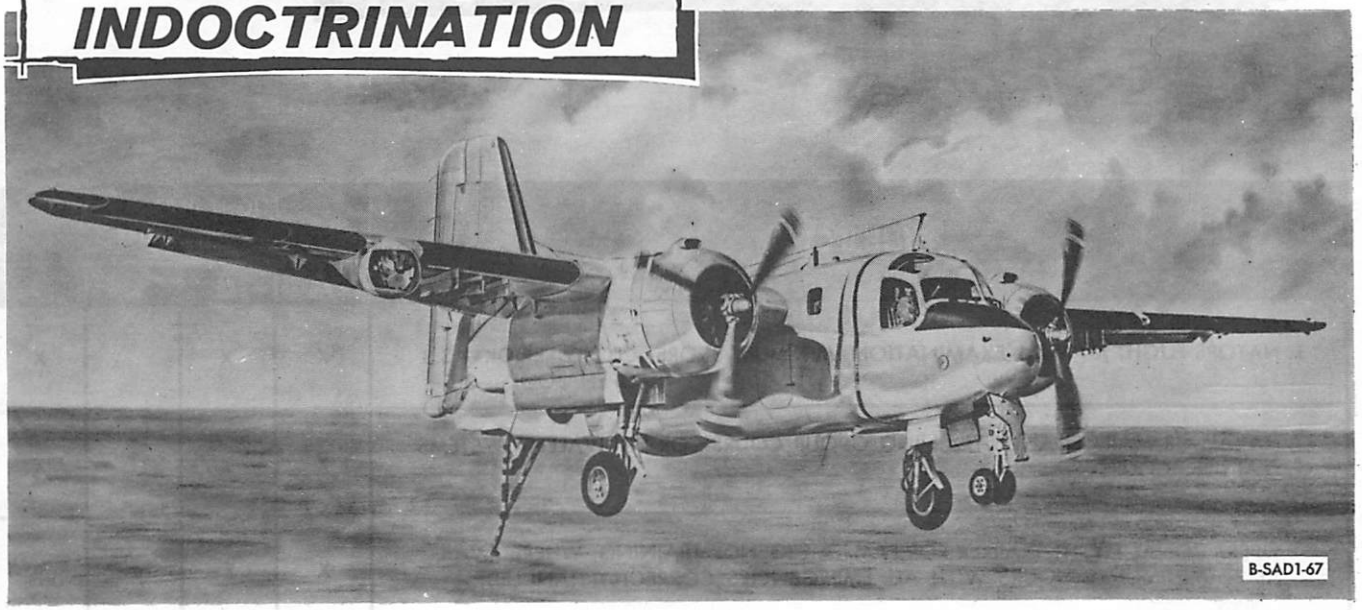


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GROUND TRAINING SYLLABUS

The Ground Training Syllabus outlined below sets forth the minimum of ground instruction which must be satisfactorily completed in order to fly the S-2 series aircraft in the capacities shown. Pilot, Crew, Passenger capacities are broken down into four categories based on the training required to meet the minimum of safety while flying in such capacities. NEW

FLIGHT PERSONNEL CATEGORIES FOR GROUND TRAINING REQUIREMENTS

NEW

A. Pilot, Ferry Pilot, Functional Check Pilot, or Non-ASW Instructor Pilot

B. ASW Plane Commander, ASW Instructor Pilot

C. Passenger

D. Non-Pilot Crewmembers

MINIMUM GROUND TRAINING REQUIREMENTS

The minimum ground training requirements (figure 2-1) for each category of flight personnel in the S-2 series aircraft shall be completed early in the training program. Safety and survival equipment checkout and bailout and ditching procedures shall be completed prior to flight. NEW

FLIGHT TRAINING SYLLABUS

SYLLABUS APPLICABILITY

The Flight Training syllabus is designed to effect the orderly and rapid qualification of pilots and aircrewmen in flying the S-2 as an aircraft and as a weapons system in ASW tactics from both carrier and shore bases. Since the scope and levels of qualification to be attained by individuals varies greatly between the initial flight training within the Naval Air Training Command and the advanced ASW training within the fleet operational squadrons, no attempt is made here to establish a flight training syllabus which would be compatible to all programs. This section sets forth the applicability of the different flight training syllabi as established by the Type or Functional Commander for pilots and aircrewmen in the S-2 aircraft. NEW NEW

It sets forth the minimum flight hour requirements and currency requirements for the purpose of attaining and maintaining certain qualifications and designations peculiar to the aircraft and its missions.

MINIMUM FLIGHT/FLIGHT HOUR REQUIREMENTS

Initial Qualification As Pilot In Command

1. The minimum flight hour requirements (figure 2-2) are established for the purpose of providing

MINIMUM GROUND TRAINING REQUIREMENTS

SUBJECT	FLIGHT PERSONNEL CATEGORIES			
	A	B	C	D
1. NATOPS FLIGHT MANUAL EXAMINATION, MINIMUM SCORE: CLOSED BOOK – 3.3 OPEN BOOK – 3.5	X	X		X
2. NAVAL AIR MAINTENANCE TRAINING GROUP COURSE, OR EQUIVALENT SYSTEMS TRAINING COURSE.	X	X		X
3. OPERATIONAL FLIGHT TRAINER FOR FAM/EMERGENCY TRAINING, WHERE AVAILABLE. (MINIMUM 8 HOURS WITH ALL EMERGENCIES CORRECTLY HANDLED).	X	X		
4. WEAPONS SYSTEM TRAINER FOR KNOBOLOGY CHECK OUT IN ASW EQUIPMENT, AND TACTICAL MISSION TRAINING FLIGHTS. (MINIMUM 8 HOURS TOTAL).		X		X
5. NIGHT VISION, DILBERT DUNKER, SURVIVAL SWIM, PARACHUTE DROP, HELO HOIST (TYPE COMMANDER REQUIREMENTS).	X	X		X
6. PRE-FLIGHT CHECK OF AIRCRAFT.	X	X		X
7. COCKPIT CHECK AND FAMILIARIZATION.	X	X		
8. SAFETY AND SURVIVAL EQUIPMENT CHECK OUT TO INCLUDE; LIFE PRESERVER, PISTOL/SIGNALLING DEVICE, HELMET, LIFE RAFT, FIRST AID KIT, FIRE EXTINGUISHER, ICS, SEAT ADJUSTMENT AND USE, ANTI-EXPOSURE SUIT WHEN APPLICABLE.	X	X	X	X
9. BAILOUT, DITCHING PROCEDURES.	X	X	X	X
10. ASW TACTICS LECTURES INCLUDING TACTICAL PUBLICATIONS, RECOGNITION, NAVIGATION, AND COMMUNICATION. (MINIMUM 35 HOURS).		X		
11. ASW TACTICS LECTURES INCLUDING TACTICAL PUBLICATIONS, RECOGNITION, COMMUNICATIONS, EQUIPMENT OPERATION, TRAINING DEVICES (MINIMUM 35 HOURS).				X

C-SAD1-19

Figure 2-1

MINIMUM FLIGHT HOUR REQUIREMENTS

INITIAL QUALIFICATION AS PILOT IN COMMAND *

CUMULATIVE TOTALS IN MODEL					
FLIGHT PHASE	TOTAL PILOT TIME	FIRST PILOT TIME	DAY FAM	FIRST PILOT INSTRUMENT TIME (ACTUAL/SIMULATED)	FIRST PILOT NIGHT TIME
DAY	10 HRS	8 HRS	8 HRS	——	——
INSTRUMENT	12 HRS	10 HRS	8 HRS	2 HRS	——
NIGHT	14 HRS	12 HRS	8 HRS	2 HRS	2 HRS FAM
DAY FCLP	40 HRS	25 HRS	8 HRS	5 HRS	5 HRS
CROSS COUNTRY/TEST	50 HRS	25 HRS	8 HRS	5 HRS	5 HRS
NIGHT FCLP	65 HRS	40 HRS	8 HRS	10 HRS	10 HRS
DAY CQ	75 HRS	50 HRS	8 HRS	5 HRS	5 HRS
NIGHT CQ	100 HRS	75 HRS	8 HRS	25 HRS	25 HRS
OTHER	DISCRETION OF COMMANDING OFFICER				

RE-QUALIFICATION AS PILOT IN COMMAND *

FLIGHT PHASE	FIRST PILOT TIME	REMARKS
DAY	5 HRS	
INSTRUMENT	5 HRS	INCLUDES 2 HRS. ACTUAL OR SIMULATED INSTRUMENT TIME
NIGHT	5 HRS	INCLUDES 2 HRS. ACTUAL OR SIMULATED INSTRUMENT TIME AND 2 HRS. NIGHT FAM.
OTHER	DISCRETION OF COMMANDING OFFICER	

* EXAMPLE:

IN ORDER FOR A PILOT TO PARTICIPATE AS THE PILOT IN COMMAND ON A CROSS COUNTRY OR TEST FLIGHT, HE MUST HAVE AT LEAST 50 TOTAL PILOT HOURS IN MODEL, INCLUDING 25 FIRST PILOT HOURS, 8 DAY FAM HOURS, 5 FIRST PILOT INSTRUMENT HOURS AND 5 FIRST PILOT NIGHT HOURS. HE NEED NOT HAVE COMPLETED AN FCLP PHASE.

B-SAD1-20

Figure 2-2

criteria for the initial qualification as the Pilot in Command in the S-2 series aircraft for a specific flight phase. The flight hour requirements listed are not to be construed as restricting pilots under instruction from participating in such flight while under the supervision of a qualified Pilot in Command occupying the Co-pilot's seat.

2. Because the S-2 series, the C-1A, and the E-1B are similar in airframe engine combination, pilot time in all these models may be counted together in meeting the flight hour requirements listed in figure 2-2, at the discretion of the Commanding Officer.

Requalification As Pilot In Command

The minimum flight hour requirements (figure 2-2) are established for the purpose of providing criteria for the requalification as the Pilot in Command in the S-2 series for the various phases of flight listed. Requalification shall be required in cases where a previously qualified Pilot in Command has not flown a minimum of five (5) hours flight time and made at least two (2) takeoffs and landings in the same model aircraft within the preceding 90 days. Commanding Officers may increase these requirements at their discretion.

Carrier Landing Qualifications

Commanding Officers may certify pilots for carrier landing qualifications in model in accordance with Type Commander requirements.

MINIMUM CURRENCY REQUIREMENTS

All flight qualifications and designations pertaining to pilots and aircrewmen shall normally remain current for as long as he regularly flies the aircraft and performs the mission required of the command, unless sooner revoked by the Commanding Officer. Pilots who during the preceding 90 days have not made at least two (2) takeoffs and landings and logged five (5) hours of flight time in the model aircraft in which qualified or have not performed the mission required of the command shall be considered no longer currently qualified and shall be required to requalify. Such pilots and second tour pilots re-qualifying in the S-2 series may be allowed to requalify without progressing through lower designations. Requalification shall consist of an appropriate checkout, including a flight familiarization phase and demonstration of the knowledge, skill, and capabilities required for the qualification or designation; to the satisfaction of the Commanding Officer certifying such qualification or designation.

FLIGHT CREW REQUIREMENTS

GENERAL

The S-2 was designed so that it could be flown by one qualified pilot in the left seat of the cockpit, with another person in the right seat to act as observer and perform the necessary co-pilot functions. This section includes the minimum crew required to fly in in the S-2 for the various types of missions, and the duties of each crewmember assigned.

TYPES OF MISSIONS

Operational/Mission Training Flights

The flight crew for operational and mission training flights shall normally consist of the Pilot in Command, the Co-pilot, the Number 3 Operator, and the Number 4 Operator.

Functional Check Flights

The flight crew shall normally consist of the Pilot in Command and the co-pilot. For functional check flights where equipments and systems must be tested in the air, the flight crew shall consist of such additional crewmembers as the Commanding Officer determines necessary.

Combat Readiness Training (CRT)

The flight crews for CRT flights shall normally consist of a pilot and a co-pilot.

Ferry/Utility Flights

The flight crew for ferry utility flights shall normally consist of the Pilot in Command and a co-pilot. Under conditions not involving actual or simulated instrument flight, the requirement for a co-pilot may be reduced. In this case, a person capable of performing lookout duties on the off pilot side.

Training requirements, check-out procedures, evaluation procedures and weather minima for ferry squadrons are governed by provisions contained in OPNAVINST 3710.6 Series.

Transport Flights

The flight crew for transport flights shall consist of the Pilot in Command and a Co-pilot, current in model, when passengers are embarked.

VIP/Orientation Flights

Flights for the express purpose of orientation of Very Important Persons (VIP) and other military or civilian personnel may be authorized by the Chief of Naval Operations. The flight crew shall normally consist of the Pilot in Command and other crewmembers required by the Commanding Officer. When it is anticipated that the flight will launch or recover under instrument conditions or in darkness, a co-pilot shall be in the co-pilot's seat during such launching and/or recovery. The person being oriented may be in the co-pilot's seat at all other times at the discretion of the Pilot in Command. When the VIP is a designated

aviator, the requirements for a co-pilot set forth above may be waived. In all cases where the VIP is not a member of, or is not in the direct employment of a U.S. Armed Service, he shall be required to complete a Release or Waiver of claim against the United States prior to commencement of the flight, in accordance with current OPNAV Instructions.

ASSIGNMENT, DESIGNATION, AND FUNCTION OF FLIGHT CREWMEMBERS

All flight crewmembers flying in the S-2 shall be classified separately as to their assignment within an aircrew, their designation as to qualification level, and their function in the operation and employment of the aircraft and its installed equipment.

Assignment

Each flight crewmember shall be assigned by the Commanding Officer as to his specific responsibility and authority within the aircrew as follows:

PILOT IN COMMAND - The classification applied to the pilot who is assigned the responsibility for the safe and successful accomplishment of the assigned mission. His authority and responsibility shall be in accordance with the current OPNAV INSTRUCTION 3710.7 (series). He shall sign the Yellow Sheet for custody of the aircraft prior to the flight, and shall report discrepancies in full, upon its termination. He is additionally responsible for furthering the training of the aircrew flying with him, whether or not they are his regularly assigned crew. When the Pilot in Command designates the co-pilot to fly the aircraft, the functions and duties of each shall normally be reversed, except the full responsibility shall remain with the Pilot in Command at all times, unless he becomes incapacitated due to injury or illness.

CO-PILOT - The classification applied to the designated aviator, or student pilot who is assigned to assist the Pilot in Command in the safe and successful accomplishment of the assigned mission. He need not necessarily be current or qualified in model. During certain training, utility and ferry flights operating solely under visual flight rules, an observer lookout may be substituted at the discretion of the Commanding Officer. NEW

ACOUSTIC OPERATOR - This classification is applied to the ASW aircrewman assigned to operate the acoustic sensor equipment.

NON-ACOUSTIC OPERATOR - This classification is applied to the ASW aircrewman assigned to operate the non-acoustic sensor equipment.

Designation

Each flight crewmember shall be identified by one or more of the following designations which pertain to his individual level of qualification in the aircraft or in the weapons system.

CARRIER ANTI-SUBMARINE PLANE COMMANDER (CAPC) - The designation granted by the Commanding Officer to those pilots who have demonstrated a thorough technical knowledge, judgment, and airmanship in the tactical employment of the S-2 weapons system in advanced carrier ASW in accordance with current OPNAV and Type Commander instructions.

CARRIER ANTI-SUBMARINE SECOND PILOT (CA2P) - The designation granted by the Commanding Officer to those pilots who have demonstrated sufficient knowledge and proficiency in basic carrier ASW as required by current OPNAV and Type Commander Instructions.

ANTI-SUBMARINE AIRCRAFT COMMANDER (AAC) - The designation granted to those pilots who have demonstrated a thorough technical knowledge, judgment, and airmanship in the tactical employment of the S-2 weapons system in advanced ASW as required by current OPNAV and CNARESTRA instructions.

ANTI-SUBMARINE AIRCRAFT SECOND PILOT (AA2P) - The designation granted by the Commanding Officer to those pilots who have demonstrated sufficient knowledge and proficiency in basic ASW as required by current OPNAV and CNARESTRA instructions.

PLANE COMMANDER - The designation granted to those pilots who have demonstrated a thorough knowledge, judgment, and airmanship in the employment of the S-2 series in other than an ASW mission as required by OPNAV Instructions.

INSTRUCTOR PILOT - The designation granted to those pilots who are assigned to conduct the flight and/or tactical training of other pilots, either in training squadrons, combat readiness squadrons, or in fleet squadrons. They normally will have been a previously designated, or will be a currently designated, CAPC in an operating fleet squadron.

REPLACEMENT PILOT - The designation applied to aviators currently undergoing a flight training syllabus in a combat readiness squadron. This designation shall be retained until redesignated.

STUDENT PILOT - The designation applied to those pilot trainees currently undergoing a flight training syllabus in the Naval Air Training Command.

ASW AIRCREWMAN - This designation is awarded to an aircrew member with the AW rating, i.e., an Aircrew Trainee or Replacement Aircrewman Concomitant with the assignment of an operator NEC.

ASW AIRCREWMAN (CNARESTRA/CNARF) - The designation granted by the Commanding Officer to those aircrewmen who have demonstrated an adequate level of knowledge and proficiency in ASW operations to meet the requirements set forth in directives promulgated by the chief of Naval Personnel. ASW Aircrewmen are authorized to wear the Aircrew Wings. NEW

INSTRUCTOR AIRCREWMAN - The designation applied to those ASW Aircrewmen who are assigned to conduct the ground and flight training of the aircrew personnel.

AIRCREW TRAINEE - The classification applied to AW crewmembers undergoing indoctrination in other than a CRAG squadron, prior to completing the minimum requirements for designation as ASW Aircrewman.

AIRCREW TRAINEE (CNARESTRA/CNARF) - The classification applied to those crewmembers undergoing training prior to completing the minimum requirements for classification as ASW Crewman. Aircrew Trainees may be assigned to flight crews.

REPLACEMENT AIRCREWMAN - The designation applied to those AW aircrew trainees currently undergoing the ASW aircrew flight and ground training syllabus in a combat readiness squadron.

PASSENGER - The classification applied to all personnel, military or civilian, who are flying in the aircraft for any purpose other than to control the aircraft in flight or to operate any of its installed equipment.

Function

Each flight crewmember shall be identified by the function he performs in the operation of the aircraft or its installed equipment, based upon the location of his flight crew station in the aircraft. Although individual members of the flight crew may fly in the various positions within the aircraft, the responsibilities and authority of each shall remain in accordance with their assignment as previously defined. The functions and duties of flight crewmembers shall be as follows:

PILOT - The term used to identify the person in the left seat of the cockpit who will normally operate the controls of the aircraft. His duties shall include, but are not limited to:

1. Performing that portion of the pre-flight inspection for which briefed.
2. Completing the action required in the use of the check lists, and giving the required replies to the co-pilot
3. Performing the starting procedure, systems and controls checks, taxiing, engine run-up, launching, recovery, and ground secure.
4. Maintaining a visual lookout from the vantage point of his flight station.
5. Instructing the co-pilot relative to the assistance he desires in maintaining control of the aircraft.

CO-PILOT - The term used to identify the person in the right seat of the cockpit if in a pilot status (non-pilots will be identified as observers). The co-pilot's duties shall include, but are not limited to:

1. Performing that portion of the pre-flight inspection for which briefed.
2. Reading and assisting in the proper completion of all check lists, making completion reports to the pilot.
3. Performing all communications functions, setting frequencies, shifting channels, and making voice reports as required.
4. Maintaining an up to date navigational plot as required by the mission.
5. Performing the duties of the tactical coordinator, maintaining an up to date tactical plot and such logs as may be required by the mission and tactics involved.
6. Maintaining a visual lookout for other aircraft, hazards to flight and targets.
7. Assisting the pilot by monitoring the instruments.

NUMBER 3 OPERATOR - The term used to identify the person in the left seat of the crew compartment. His duties shall include, but are not limited to:

1. Performing that portion of the pre-flight inspection for which briefed, normally to include the topside of the aircraft.
2. Determining and reporting the status of operating and troubleshooting the MAD, ECM, RADAR, Nuclei Detector (S-2D/E without AFC 517 incorp.) and Navigation Computer. NEW
3. Maintaining a visual lookout for other aircraft, hazards to flight, and targets; as permitted by his other duties.

NUMBER 4 OPERATOR - The term used to identify the person in the right seat of the crew compartment. His duties shall include, but are not limited to:

1. Performing that portion of the pre-flight inspection for which briefed, normally to include the electronics compartment and radar compartment (Hell Hole).
2. Determining and reporting the status of, operating and troubleshooting the JULIE and JEZEBEL Recorders (S-2D/E), DIFAR (S-2G), Sonobuoy Receivers, and Tape Recorder. NEW
3. Maintaining a visual lookout for other aircraft, hazards to flight, and targets; as permitted by his other duties.

PERSONAL FLYING EQUIPMENT REQUIREMENTS

The equipment indicated below will be worn or carried by all crewmembers on all flights in the S-2 aircraft unless other safety considerations or the design characteristics of the model aircraft dictate otherwise. All survival equipment will be secured in such a manner that it is easily accessible and will not be lost during an emergency.

1. Fire-retardant flight suit.
2. Identification tags
3. Flight gloves
4. Flight safety boots

5. Protective helmet

6. Life preserver on all over-water fights. The preserver will be equipped in accordance with the applicable NAVAIR technical bulletins.

7. An approved survival knife and sheath

8. Personal Survival Kit

9. Parachute properly fitted to the individual

WARNING
PILOTS AND CREWMEMBERS SHOULD WEAR ONLY BACK PACK PARACHUTES. USE OF AN UNAUTHORIZED PARACHUTE MAY HINDER EMERGENCY EGRESS.

NEW from land when the water temperature is 59° F or below, the outside air temperature is 32° F or below, or the combined water temperature/ OAT is 120° F or below. The Commanding Officer of the unit concerned shall make the final determination with regard to the actual wearing of the anti-exposure suit based on all pertinent factors: i.e., type and duration of assigned mission, ambient cockpit temperatures, suit ventilation features, combat versus noncombat environment, availability of search and rescue facilities, etc. NEW NEW NEW

A pistol with tracer ammunition and/or an approved signaling device will be worn for all night flights and for all flights, night or day, over water or sparsely populated areas.

13. Flashlight for all night flights

section III

NORMAL PROCEDURES



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part 1

SHORE-BASED

SCOPE

Shore based operations in the S-2 may vary from familiarization of new pilots, to full scale "around the clock" ASW operations. Many of the procedures required in shore based operations are identical with those used in shipboard operations, while others vary in major aspects. In this section, shore based procedures are discussed to cover as many operational situations as possible.

RESPONSIBILITY

While operating from a shore base, squadrons will normally conduct operational and training flights, as directed by higher authority, in order to increase and maintain operational mission readiness. However, Commanding Officers shall insure that all flight operations are conducted in conformance with the rules and regulations promulgated by the various commands and agencies controlling the fields, facilities, and areas to be used.

SCHEDULING

DAILY FLIGHT SCHEDULE

Normally all flights will be scheduled through the medium of a daily flight schedule. The schedule, as approved by the Commanding Officer, should include the following information:

1. Ground Training.
2. Event Number.
3. Brief Time, Takeoff Time, On station Time, Off Station Time and Recovery Time.
4. Mission and Alternate Mission.
5. Names of Flight Crew Members.
6. Targets, Operating Areas, Units Involved, Communications Information.
7. Briefing Officer.
8. Ordnance Load.
9. Special Instructions for Maintenance and/or the Squadron Duty Officer.
10. Other Applicable Notes (Adiz Info, Clearance, Flight Rations, etc.)

UNSCHEDULED FLIGHTS

Most Naval Air Stations accept the daily flight schedule as a local flight plan for the operations listed thereon. Deviations from the flight schedule, or additions to it, require the filing of a local flight plan or a DD-175. Extra attention must be given to basic details in planning and briefing Functional Check Flights, Administrative Flights and SAR Flights.

MISSION PLANNING

Air Anti-Submarine Warfare missions involve changing tactical situations, and require rapid shifts in tactical application within the contact area. Therefore, mission planning in ASW is necessarily limited to thorough briefings on currently available

intelligence, and the application of the proper tactics to meet the needs of the rapidly changing situation. Although training missions, navigation plans, search plans, and cross country flights may be pre-planned (Section XI, Part 2), the tactical portion of an ASW mission requires aircrews to employ their knowledge, experience originality, and even imagination in prosecuting active contacts. Those portions of missions and those complete missions which do allow planning shall be planned as thoroughly and completely as possible, in order to realize maximum safety and mission accomplishment.

Normally the runway length available for takeoff should equal or exceed the distance required to accelerate and stop the aircraft from the recommended takeoff speed unless Abort Gear is available on the runway. Accelerate-Stop distance is that distance necessary to accelerate the aircraft to minimum takeoff speed (Refusal Speed) and then abort the takeoff without external assistance. Refusal speed for computed accelerate-stop distances is depicted in Chapter XI and should be computed for all takeoff's on runways that do not have abort gear.

NAVIGATION

The importance of maintaining an accurate and current plot of aircraft position cannot be over emphasized. Accurate navigation is required first, to enable the pilot to return to his carrier or shore base upon completion of his mission, and second, to enable him to make prompt and accurate position reports of contacts. Even sophisticated mechanical navigational computers and plotters have their limitations and often fail. It is therefore necessary to always carry, and maintain a current plot on the MK-6 Plotting Board for all tactical and tactical training missions.

Equipment Available for Navigation

The following equipment is normally available to assist in the navigation required for most missions.

1. Low frequency radio beacon receiver.
2. Marker beacon receiver.
3. TACAN.
4. Doppler, ASA-31 or ASN-30.
5. Radar (ship and aircraft).
6. ECM (ship and aircraft).
7. UHF/DF (ship and aircraft).
8. OTPI.
9. MK-6 Plotting Board (Should be carried on all tactical and tactical training missions).
10. Navigation Bag.

The minimum equipment which should be carried in the Nav Bag is:

a. Navigation Computer.

b. FLIP publications.

c. Flashlight.

d. Appropriate charts for land areas.

e. Appropriate Instrument Approach Plates.

f. NATOPS Flight Manual.

Navigation Plot

When normal navigation aids become unreliable or when EMCON conditions are in effect, the co-pilot will once again be forced to rely on his ability to use the plotting board effectively. The following procedures are recommended when using the MK-6 Plotting Board.

1. Always maintain a complete log, showing times, headings, airspeeds and winds.
2. Maintain a DR Geographic plot, labeling DR positions every few minutes.
3. Maintain a constant check on the wind. At normal search altitudes below 1000 feet, wind velocities indicated on the water may be accurate. If above 1000 feet, or if the water is not visible, winds obtained at briefing should be used. Wind changes should be anticipated near frontal systems.

CRUISE CONTROL

Although the aircraft normally has more than adequate fuel aboard for its mission, pilots should cultivate the habit of fuel conservation on every flight. Although they are not frequent, occasions of being diverted to airfields ashore, holding for long periods prior to landing, lost ship, etc., occur often enough to require that such occurrences be prepared for in the planning of every mission, both at sea and ashore. (See Section XI, Part 7.)

Flight Performance Data

Power tables and charts in Section XI should be utilized to obtain the maximum effective control of fuel consumption. Normally Long Range power and Maximum Endurance power will be used as appropriate.

Fuel Log

A fuel management log should be maintained on every flight. This may be as simple as an hourly fuel summary, written down to assist in determining performance and for estimating endurance. Some low altitude tactics such as MAD localization require higher RPM than searches. Pilots must take every advantage to conserve fuel as the situation allows.

BRIEFING

The degree of success enjoyed on all flights, whether operational or non-operational, is a direct measure of the adequacy of the preparation, planning and conduct of the pre-flight briefing. This applies to individual crew members as well as personnel specifically charged with formal briefing responsibilities.

FLIGHT LEADER

The Flight Leader shall insure that all members of his flight have received an adequate and proper briefing. He shall supplement each briefing as necessary.

PILOT-IN-COMMAND

Each Pilot-in-Command shall insure that an adequate briefing has been obtained, and that his crew is fully prepared for the scheduled mission.

NON-OPERATIONAL BRIEFING

Functional check flights will be briefed by the officer in the Maintenance Department most qualified to instruct flight personnel as to the proper execution of the required checks.

OPERATIONAL BRIEFING

The complexity of ASW demands that pilots and aircrewmen be given complete, comprehensive briefings on all operations. The briefing officer shall work in conjunction with the Operations Officer, ASW Officer, Air Intelligence Officer, and any other officers concerned, in preparing the necessary information. He shall make optimum use of all graphic presentation devices, maps, charts, etc., which are available.

Pre-Operational Briefing

Immediately prior to all operations of appreciable complexity and duration, a general information brief shall be given to familiarize personnel with the overall nature of the operation. The following topics shall be included.

1. The mission and objectives of the operation, and the part squadron will play in carrying them out.
2. A brief chronological breakdown of how the operation will be conducted.
3. The geographical area in which the operation will be conducted.
4. The forces involved, both friendly and enemy, and how they will be deployed.
5. The rules of engagement set down by the governing operation order which controls the conduct of the operation.
6. Search and Rescue, EMCON, and other special communications procedures which will be used including explanation of shackles and authenticators.
7. A discussion by the Briefing Officer of the principal ASW tactics to be employed.

Pre-Flight Briefing

These briefs are presented immediately before the launching of scheduled flights, and therefore must be carried out in the most expeditious manner. It is imperative that all pilots and aircrewmen be in flight gear and otherwise ready for the brief at the designated time. ASW kits, cameras, binoculars, and any other required equipment shall be checked out by the pilots before brief time. The brief should include, but not be limited to, the following as applicable:

Note

Information marked with an asterisk (*) should be displayed on a status board in the briefing or ready room, and should be copied by pilots before commencement of the brief.

1. SCHEDULING
   - *a. Event Number.
   - *b. Take-off, On/Off Station, and Landing Times.
   - *c. Aircraft-Pilot Lineup.
   - *d. Search or Task Assigned to Each Aircraft.
2. AREA
   - a. Bearing and Distance.
   - b. Dimensions.
   - c. Navigational Hazards.
   - d. Ocean Bottom Characteristics.
   - e. Water Depth and BT information.
3. COMMUNICATIONS
   - *a. Channels and Frequencies.
   - *b. Navigational Aids.
   - *c. Lost Communications Procedures.
   - d. Authenticators, Shackles, IFF.
   - e. Reports Required.
   - f. EMCON Conditions.
4. PARTICIPATING UNITS
   - *a. Voice Calls and Side Numbers.
   - b. Disposition.
   - c. Utilization.
   - d. Submarine Intelligence; Type, Speed, Endurance, Diving Depth and ECM/RADAR information.
5. OPERATIONS
   - a. Datum and Contact Intelligence.
   - b. Searches and Tactics to be Used.
   - c. Instructions for Coordination With Other Units.
6. ORDNANCE
   - *a. Ordnance Carried.
   - b. Restrictions on Use.

7. WEATHER

   *a. Wind: Direction and Velocity at Surface and at Altitude.
   *b. Cloud Coverage, Inversion Layer Information.
   *c. Visibility.
   *d. Sea state.
   *e. Water and Air Temperature.

8. MISCELLANEOUS

   a. Other Units in the Area.
   b. Restricted or Danger Areas.
   c. Current NOTAMS, Bulletins, and Safety of Flight Information.
   d. Flight Leader Brief on Take-Off, Rendezvous, Frequency Switch, Landing Procedures, etc.

ASW KIT

ASW aircraft squadron employment includes the mission of inshore patrol and escort of convoy as well as the HUK mission, therefore, squadrons must be prepared to conduct any of these missions on short notice. Squadron commanding officers will insure that an ASW Kit is available for each aircraft. A typical ASW Kit contains the following:

NEW NEW NEW NEW NEW

1. Carrier ASW Tactical Airborne Information Document (TACAID)
2. Communications Data (NUCO codes, authenticator tables, etc.)
3. ECM data
4. UHF/DF frequencies and identifiers
5. Coordinated SEA/AIR Procedures
6. Coordinated SUBAIR Procedures
7. Appropriate logs

LINE OPERATIONS

AIRCRAFT ACCEPTANCE

The pilot in command should not accept the aircraft for flight until he is assured that the aircraft is satisfactory for safe flight and accomplishment of the assigned mission. The two major steps to be taken prior to acceptance of the aircraft are a careful examination of the aircraft's recent discrepancies and a thorough preflight inspection.

Yellow Sheets

When available at least the last ten discrepancy portions of the yellow sheet will be made available to the pilot for his examination. Any additional discrepancies should also be brought to the pilot's attention.

1. The pilot in command will insure that the plane captain has conducted a preflight inspection and has entered the appropriate information and signed the yellow sheet.

2. The pilot in command when satisfied with the yellow sheet information will sign applicable portions of the yellow sheet.

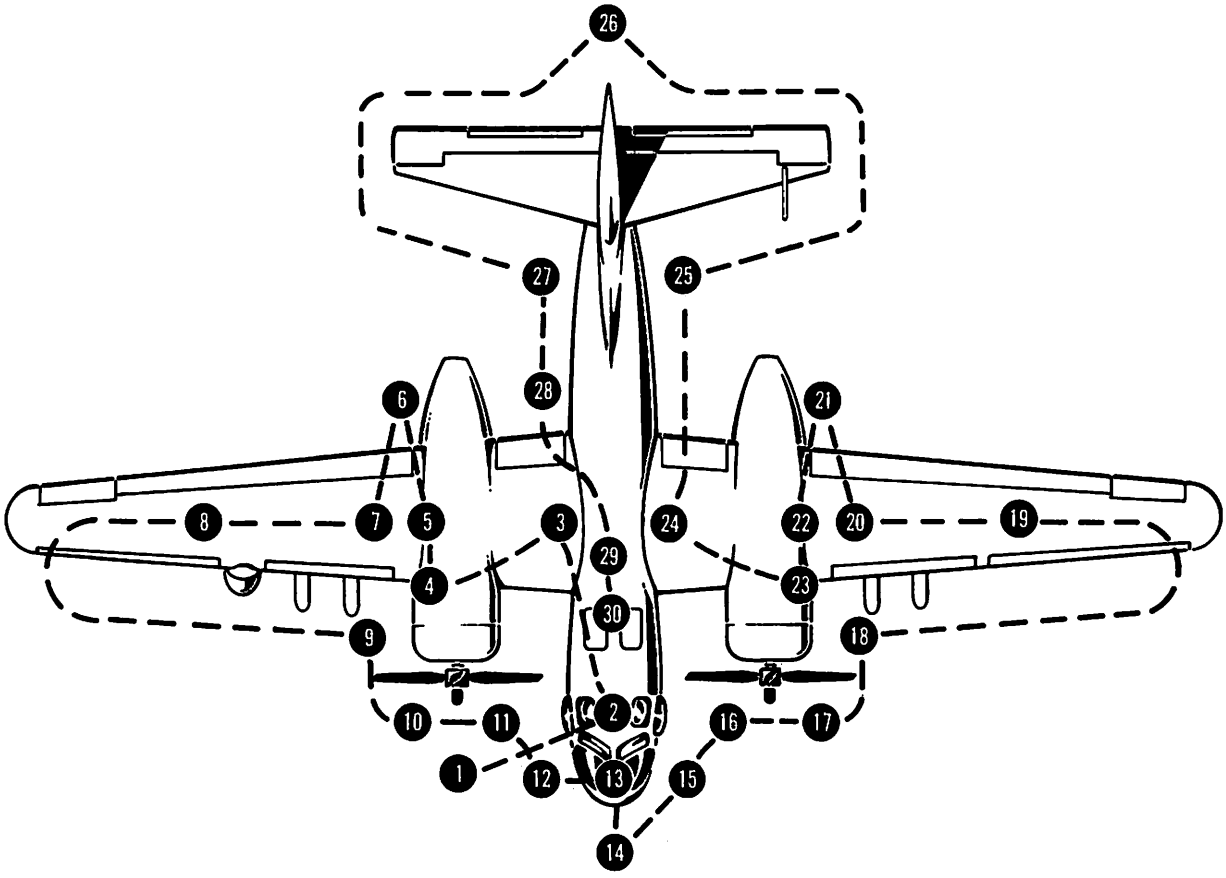
Pre-Flight Inspection

The pilot in command will cause a proper pre-flight inspection to be accomplished by his crew. It is essential that all foreign objects and loose gear be discovered during the Pre-Flight Inspection to preclude the posibility of jammed controls or injury to flight crew members during rapid acceleration or deceleration of the aircraft. Normally the inspection of the electronics compartment, the radar (Hell Hole) compartment, as well as the topside inspection will be accomplished by the crew, and the remainder of the inspection will be accomplished by the pilots. However, if no crew is included on a flight, or if crew members assigned are not fully qualified to perform the inspection, the pilots will conduct the entire inspection. Refer to figure 3-1 for the entire pre-flight inspection.

Standard Check Lists

Check lists are provided to ensure that all basic safety precautions are observed in the various phases of aircraft operation. Unless specifically noted otherwise in this section the challenge and reply method shall be utilized with the co-pilot reading and the pilot reporting completion of the necessary actions. Refer to figure 3-6.

PREFLIGHT INSPECTION



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Figure 3-1

PRE-FLIGHT INSPECTION

1 GENERAL

a. Wheel chocks and tiedowns in place.
b. Prop arcs clear.
c. General aircraft appearance.

2 INSIDE COCKPIT

a. Ignition switches off
b. Landing gear handle in down detent.

3 BETWEEN STARBOARD ENGINE AND FUSELAGE

a. Inboard wing flap for security, indications of warping or scraping of the fuselage and Nacelle, wing flap bonding wires, and excessive bushing play.
b. Security of flap push rod.
c. Trailing edge of wing section for security.
d. Fuel tank water drains (3) for leakage and fuel cell compartment drain for fluid leakage.
e. Leading edge of wing section for security and hydraulic leaks.
f. MCJR antenna for retraction (S-2E/G INCORP. AFC No. 417, 449, and 484). NEW

g. Avionics access hatch cover for security.
h. Wing lock warning flag corresponding with wing position.
i. Cowl flaps and inboard exhaust stacks for security.
j. Security of cowling.
k. Lower exhaust stacks for security.
l. Oil cooler for security of cowl flap, fire detecting element, and evidence of leaks.

4 ON STARBOARD MAIN MOUNT AND NACELLE

a. Main landing gear door actuating cylinder for evidence of hydraulic leaks.
b. Push rods from actuating cylinder to each door, and associated bolts and nuts (10) for security.
c. Security of up-lock and down-lock micro switches.
d. Landing gear down lines and "B" nuts for cracks and hydraulic leaks.
e. Landing gear drag strut (actuating cylinder) for security and hydraulic leaks and absence of the ground lock.
f. Front of tire for cuts and wear.
g. Shrink strut for security; check bottom fitting bolts (2) not binding and nut-cracker switch.
h. Main oleo strut for smoothness, cleanliness and proper extension.
i. Brake shuttle valve, brake lines, brakes for hydraulic leaks and brakes for proper installation.
j. Rear of tire for cuts and wear.
k. Uplock roller for apparent position of contact with "J" hook.
l. Outboard side of tire for condition and inflation.
m. Wheel for cracks, breaks or corrosion.
n. Inflation valve for evidence of tube slippage.

5 IN STARBOARD WHEEL WELL

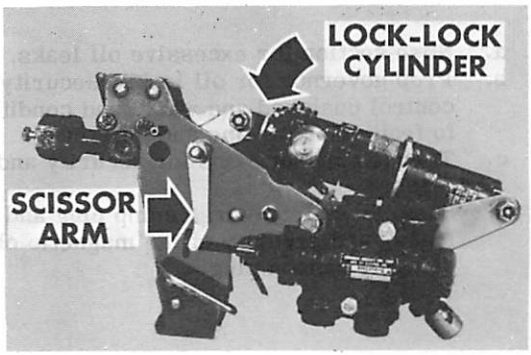
a. Outboard door for security and rubber seal
b. Brake lines and adjustor valve for security and hydraulic leaks.
c. Security of upper shrink link.
d. All fuel lines and defueling valves for leaks.
e. Hydraulic lines for leaks and chafing.
f. Electrical fuel shutoff valve for leaks, cannon plug and correct position (one o'clock).
g. Auxiliary pump for fuel leaks; mounting bracket for cracks; radio noise filter and cannon plugs (3) for security.
h. Fuel selector valve for fuel leaks.
i. AC generator and blast tube for security.
j. Fire detecting elements and amplifier for security.
k. Overhead and wing fold fittings for evidence of fuel leaks and hydraulic leaks and outboard fuel tank drain for leakage.
l. All structural members for security and evidence of cracks and breaks.
m. Marine marker dispenser for security and condition of doors and loading.
n. Security of push rod and attachments to landing gear uplock assembly and outboard door.
o. Braces to landing gear uplock assembly for cracks and breaks.
p. "J" hook for condition.
q. Landing gear timer check valve for hydraulic leaks.
r. Flap push rod and bell cranks for security, cracks or breaks.
s. Fuel dump solenoid for closed position (indicator pointing outboard).
t. Security of sonobuoy chutes inspection cover.
u. Remainder of wheel well for wrinkled skin, popped rivets and tools adrift.

6 AFT STARBOARD NACELLE

a. Skin condition
b. Security of sono antenna.
c. Security and loading of sono chutes.
d. Security and condition of fuel dump pipe.

7 STARBOARD WINGBREAK, WING FOLDED

a. Flap hinge bolt installed and outboard wing flap for security and indication of warping or scraping on nacelle, wing flap bonding wires and excessive bushing play.
b. Security of flap push rod.
c. Fuel tank vent and wing butt drains (2) for leaks.
d. Wing lock strap for security, breaks, kinks and cleanliness.
e. Wing fold/spread actuating cylinders for evidence of hydraulic leaks.
f. Wing fold gust lock cable for security.
g. Hydraulic lines and wing fold/spread actuating area for hydraulic leaks.
h. Wire bundle for evidence of chafing.
i. Wing lock-lock cylinder fully retracted. Check for near vertical position of scissor arm on sequence valve (see arrows below).



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8 STARBOARD WING, SPREAD POSITION

a. Flap and aileron for condition.
b. Flap hinge bolt and outboard wing flap for security, cracks and breaks.
c. Wing tip light for condition.
d. Slot for condition of deicer boot.
e. Wing deicer boot for condition.
f. Searchlight for security of dome, and condition of reflector and carbon.
g. Access covers for security.
h. Wing racks and stores for security and loading.
i. Wing locking pins engaged and flush with lower surface (8 pins).
j. Fuel tank vent and wing butt drains (2) for leaks.

9 OUTBOARD SIDE OF STARBOARD ENGINE

a. Cowling, dzus buttons for security.
b. Constant speed drive oil cooler for FOD, fluid leaks and security.
c. Cowl flap and outboard exhaust stack for security.

10 STARBOARD PROPELLER

a. Cotter pin on prop dome cap.
b. Safety wire on prop dome retainer ring.
c. For oil leaks in vicinity of prop dome and at butt end of each blade.
d. Each prop deicer for security.
e. Each blade for nicks and cracks.
f. Deicer "pigtails" attached to prop and cannon plug installed and safety wired.
g. Prop shaft for oil leak.

11 STARBOARD ENGINE

a. Nose section for excessive oil leaks.
b. Prop governor for oil leaks, security of control push rod and wheel and condition fo feathering oil line and "B" nut.
c. Torque pressure line for security and leaks.
d. Sump for safety-wired sump plug and oil leaks, and security of the magnetic chip detector cannon plug.
e. Inside of engine cowling for rags and tools.
f. Ignition harness for security.
g. Cylinders for condition of cooling fins and baffles.
h. Push rods and rocker box covers for security and oil leaks.
i. Spark plugs and leads.
j. Cowling bonding wires (4).

12 STARBOARD SIDE OF NOSE SECTION

a. Cleanliness of canopy and windshield.
b. Windshield wiper assembly.
c. Both static ports open and flush.

13 NOSE WHEEL WELL

a. Wheel well doors and fittings for security.
b. Hydraulic lines for leaks and chafing.
c. Rod end fittings to nose wheel well door actuating cylinder for cracks or breaks. Fittings should not be bent.
d. Splash shield and dust curtains for security and condition.
e. Down lock micro switch for security.
f. Yoke over-center for absence of nose wheel ground-lock (C clamp).
g. Yoke latch release bolt not binding.
h. Nose wheel lift cylinder for hydraulic leaks and banjo fitting pointing aft.
i. Shimmy damper for proper lubrication and pin extension (9/64 to 17/64), bearing condition (2) nose wheel alignment and attaching fittings.
j. Nose wheel oleo strut for smoothness, cleanliness and proper extension. Nose wheel tires for inflation and condition.
l. Scissors pointing forward.
m. Security of nose wheel fairing.

14 FRONT OF NOSE SECTION

a. Windshield washing tank cover for security.
b. Air inlets for absence of FOD.
c. Pitot tubes minus covers and not bent.
d. Open hinged nose section and secure with supports.
   (1) ASR-3 air-intake line clear of rudder cross over push rod.
   (2) ASR-3 circuit breakers, water level, fuses, general security.
   (3) Fuel and hydraulic lines for leaks.

(4) Rudder linkages and controls for security and absence of FOD.
(5) Safety wire on windshield tank plug and fuel filter bowl.
(6) Heater ignition element cannon plugs for safety wire.
(7) Security of heater shield and evidence of soot in heater ducts.
(8) Nose section closed and secured.

15 PORT SIDE OF NOSE SECTION

a. Cleanliness of canopy and windshield.
b. Windshield wiper assembly.
c. Both static ports open and flush.

16 PORT PROPELLER

a. Cotter pin on prop dome.
b. Safety wire on prop dome retainer ring.
c. For oil leaks in vicinity of prop dome and at butt end of each blade.
d. Each prop deicer for security.
e. Each blade for nicks and cracks.
f. Deicing "pigtails" attached to prop and cannon plug installed and safety wired.
g. Prop shaft for oil leak.

17 PORT ENGINE

a. Nose section for excessive oil leaks.
b. Prop governor for oil leaks, security of control push rod and wheel and condition of feathering oil line and "B" nuts.
c. Torque pressure lines for security and leaks.
d. Sump for safety-wired sump plug and oil leaks, and security of the magnetic chip detector cannon plug.
e. Inside of engine cowling for rags and tools.
f. Ignition harness for security.
g. Cylinders for condition of cooling fins and baffles.
h. Push rods and rocker box covers for security and oil leaks.
i. Spark plugs and leads.
j. Cowling bonding wires (4).

18 OUTBOARD SIDE OF PORT ENGINE

a. Cowling, dzus buttons for security.
b. Cowl flap and outboard exhaust stack for security.

19 PORT WING SPREAD

a. Security of flap push rods.
b. Fuel tank vents and wing butt drains (2) for leaks.
c. Wing locking pins engaged and flush with lower surface (8 pins).
d. Wing racks and stores for security and loading.
e. Access covers for security.
f. Wing deicer boot for condition.
g. Slot for condition of deicer boot.
h. Wing tip light condition.
i. Flap hinge bolt and outboard wing flap for security, cracks and breaks.
j. Flap and aileron for condition.

20 PORT WING BREAK, WING FOLDED

a. Wing lock-lock cylinder fully retracted. Check for near vertical position of scissor arm on sequence valve.
b. Wire bundle for evidence of chafing.
c. Hydraulic lines and wing fold/spread actuating area for hydraulic leaks.
d. Wing fold gust lock cable for security.
e. Wing fold/spread actuating cylinder for evidence of hydraulic leaks.
f. Wing lock strap for security, breaks, kinks, and cleanliness.
g. Fuel tank vent and wing butt drains (2) for leaks.
h. Security of flap push rod.
i. Flap hinge bolt installed and outboard wing flap for security and indications of warping or scraping on nacelle, wing flap bonding wires and excessive bushing play.

21 AFT PORT NACELLE

a. Security and condition of fuel dump pipe.
b. Security and loading of sono chutes.
c. Security of sono antenna.
d. Skin condition.

22 PORT WHEEL WELL

a. Wheel well for wrinkled skin, popped rivets, and tools adrift.
b. Security of recording accelerometer and cover.
c. Security of deicing lines and deicing oil filter.
d. Security of sonobuoy chutes inspection cover.
e. Fuel dump solenoid for closed position (indicator pointing outboard).
f. Flap push rod and bell cranks for security, cracks or breaks.
g. Landing gear timer check valve for hydraulic leaks.
h. "J" hook for condition.
i. Braces to landing gear uplock assemble for cracks and breaks.
j. Security of push rod and attachments to landing gear uplock assembly and outboard door.
k. Marine marker dispenser for security and condition of doors and loading.
l. All structural members for security and evidence of cracks and breaks.

m. Overhead and wing fold fittings for evidence of fuel leaks and hydraulic leaks and outboard fuel tank drain for leakage.
n. Fire detecting elements and amplifier for security.
o. AC generator and blast tube for security.
p. Fuel selector valve for fuel leaks.
q. Auxiliary pump for fuel leaks; mounting bracket for cracks; radio noise filter and cannon plugs (5) for security.
r. Electrical fuel shutoff valve for leaks, cannon plugs, and correct position (one o'clock).
s. Hydraulic lines for leaks and chafing.
t. All fuel lines and defueling valves for leaks and fuel strainer and fuel check valve for safety wire.
u. Security of upper shrink link.
v. Brake lines and adjustor valve for security and hydraulic leaks.
w. Outboard door for security of rubber seal.

23 PORT MAINMOUNT AND NACELLE

a. Inflation valve for evidence of tube slippage.
b. Wheel for cracks, breaks or corrosion.
c. Outboard side of tire for condition and inflation.
d. Uplock roller for apparent position of contact with "J" hook.
e. Rear of tire for cuts and wear.
f. Brake shuttle valve, brakes, and brake lines for hydraulic leaks.
g. Main oleo strut for smoothness, cleanliness and proper extension.
h. Shrink strut for security; check bottom fitting bolts (2) not binding and nut-cracker switch.
i. Front of tire for cuts and wear.
j. Landing gear down lines and "B" nuts for cracks and hydraulic leaks.
k. Landing gear drag struts (actuating cylinder) for security and hydraulic leaks and absence of the ground safety lock.
l. Security of up-lock and down-lock micro switches.
m. Push rods from actuating cylinder to each door, and associated bolts and nuts (10) for security.
n. Main landing gear door actuating cylinder for evidence of hydraulic leaks.

24 BETWEEN PORT ENGINE AND FUSELAGE

a. Oil cooler for security of cowl flap, fire detecting element, and evidence of leaks.
b. Lower exhaust stacks for security.
c. Constant speed drive oil cooler for FOD, fluid leaks and security.
d. Security of cowling.
e. Cowl flaps and inboard exhaust stack for security.
f. Wing lock warning flag corresponding with wing position.
g. Mirror for brightness.
h. Leading edge of wing section for security and hydraulic leaks.
i. Fuel tank water drains (3) for leakage and fuel cell compartment drain for fluid leakage.
j. Trailing edge of wing for security.
k. Security of flap push rod.
l. Inboard wing flap for security, indications of warping or scraping of the fuselage and Nacelle, wing flap bonding wires, and excessive bushing play.
m. Torpedo bay door for hydraulic leaks.
n. Catapult fittings for condition.
o. Fuselage access doors closed.
p. Electronics equipment airscoop clear.
q. Torpedo bay doors accumulator, minimum 850 psi.
r. Brake accumulator, minimum 750 psi.

25 AFT FUSELAGE, PORT SIDE

a. RADOME air deflector for security and clear.
b. Condition of antennas.
c. Condition of deicers, stabilizer, vortex generators, and dynamic damper.
d. Fuselage and empennage for overstress.
e. Rudder assist accumulator minimum 850 psi.
f. Tail hook dash pot accumulator pressures 390-410 psi.
g. Rudder assist assembly for hydraulic leaks.
h. Tail wheel lift cylinder for security and hydraulic leaks.
i. Tail wheel for condition.
j. Port elevator and trim tab for security.

26 TAIL OF AIRCRAFT

a. Rudder trimmer screwjack and fitting for security and cracks.
b. Rudder, rudder balance tab and rudder trimmer for security.
c. Vicinity of tailhook for hydraulic leaks.
d. Hook and hook point for condition.
e. MAD boom cover for security.
f. Tail position lights.

27 AFT FUSELAGE, STARBOARD SIDE

a. Condition of antennas.
b. Condition of deicers, stabilizer and vortex generators.

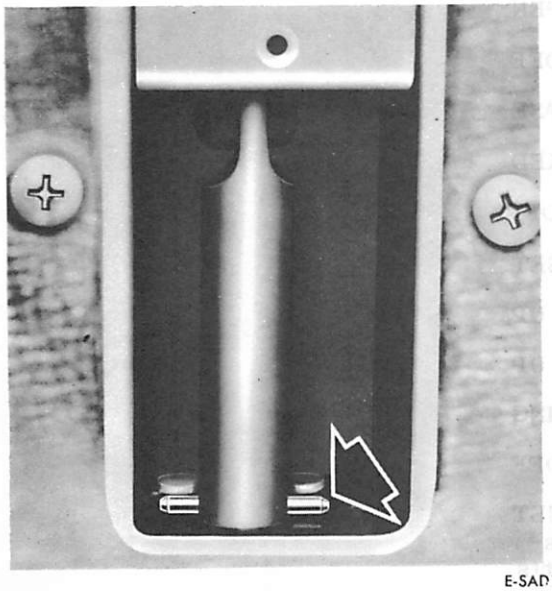
c. Fuselage and empennage for overstress.
d. Starboard elevator and trim tabs.

28 CENTER FUSELAGE

a. Radar compartment (hell hole) for loose gear, equipment security, control cable condition, compartment light switch OFF, access hatch closed and flag flush.
b. Radome Air Deflector.
c. Radome retracted and dome not damaged.
d. Life raft hatch secure, handle pointing aft and safety wired.

29 PART I – INTERIOR PRE-FLIGHT

a. Fire extinguisher, first aid kit and main door jettison handle present and secured.
b. Breakaway wire on main door jettison handle and upper hinge pin of door intact.
c. AC and DC Main Distribution Panel for all circuit breakers IN.
d. DC Junction Box circuit breakers IN.
e. Hydraulic dump valve re-set buttons (3) for position.
f. MAD boom and radome manual crank present and stowed.
g. Crew compartment life raft release handle secured and breakaway wire intact.
h. Hydraulic reservoir for quantity and a spare can of hydraulic fluid for storage.
i. Number 3 and 4 operators' hatches locked. Check breakaway wire on forward dog No.4 operators' hatch intact and locking pin fully seated (as illustrated below). Check emergency release handles fully forward and breakaway wires intact.



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j. Radome switch UP/MAD boom switch CENTER.
k. MCJR antenna switch UP.
l. Aileron bellcrank and push rod assemble behind No. 3 operators' seat is clear.
m. Compartment clean and clear of foreign objects.

29 PART II – FOR FLIGHTS NOT INVOLVING AIRCREWMAN, PERFORM THE FOLLOWING ADDITIONAL CHECKS:

a. Electronics compartment light OFF.
b. No. 4 operators' seat FULL FORWARD.
c. No. 3 and 4 operators' seat parachutes - strapped down.
d. No. 3 and 4 operators' ICS Mike - cold.
e. MAD power switch - on.
f. MAD function switch - HTR REG.
g. MAD recorder - off/locked.
h. Radar power switch - off.
i. Left paper roller lock inside JEZ cabinet RELEASED.
j. JEZ recorder - OFF.
k. AQA-7(V) recorder power switch (S-2G) - OFF.
l. AQA-7(V) protective cover - STOWED.
m. ARR-75 receiver power switches, No. 1 and No. 2 (S-2G) - OFF.
n. AQH-5(V) tape RCD switch (S-2E and S-2G with AFC 517 incorp.) - OFF.
o. No. 4 operator's foot vent - CLOSED.

30 TOP SIDE OF AIRCRAFT

a. Antennas for security.
b. Fuel and oil tanks for required levels and security of caps (cap locks pointing aft) and oil cover plates secure.
c. Upper exhaust stacks for cracks and security.
d. Carburetor air intakes for plugs/foreign objects.
e. CSD filler cap installed and cover closed.
f. Wing deicer boots and spoiler bonding wires for condition.
g. Searchlight for security of dome and condition of reflector and carbons.
h. Jury struts removed and all access panels secured.
i. Wing racks and stores for security and loading.
j. Life raft compartment door flush with fuselage, handle pointing aft and safety wired.
k. Upper deck hydraulic hatch section cover flush and secure.
l. Check hoist access hatches for fluid.
m. Number 3 operators hatch closed and locked.

PRE-START CHECK LIST

The co-pilot shall challenge the pilot on each item listed, and shall receive the proper answer prior to making the next challenge. The co-pilot shall visually monitor the action of the pilot as each item is completed.

1. PARACHUTES ..... FITTED
2. MAGS ..... OFF
3. PARKING BRAKE ..... SET
4. PITOT HEAT ..... OFF
5. COWL FLAPS ..... OPEN
6. OIL COOLERS ..... OPEN
7. CARB AIR ..... DIRECT
8. AUX PUMPS ..... ON
9. GEAR HANDLE ..... DOWN/DETENT
10. GUST LOCK ..... STOWED
    Hold yoke to avoid letting it slam forward.

WARNING

The aircraft is down if no spring tension is evident when releasing the gust lock. There is a danger that the flight controls may lock.

11. GENERATORS ..... ON
12. BUS TIES ..... NORMAL
13. DEICERS ..... FOUR OFF
14. AUTO FEATHER ..... OFF
15. EMERG SWITCHES ..... OPEN
16. FUEL DUMP ..... OFF
17. PROPS ..... FULL INCREASE
18. THROTTLES ..... CRACKED
19. MIXTURES ..... IDLE CUT OFF
20. ICS ..... SET
21. FLAPS ..... UP
22. HOOK ..... UP
23. WINGS/SELECTOR ..... CORRESPONDING
24. HEATER/VENT ..... OFF
25. LIGHTS ..... SET
    For all night operations ashore set EXT Lts-Master switch to ON. Set anti-collision lights to BOTH.

CONTINUED ON NEXT PAGE

PRE-START CHECK LIST—CONTINUED

26. RADIOS/IFF ..... OFF

27. CSD DISCONNECTS ..... WIRED

28. RAFT HANDLE ..... WIRED

29. FUEL SELECTORS ..... CROSSFEED

30. CIRCUIT BREAKERS ..... CHECKED
(SEARCHLT TRANS RECT circuit breaker OUT)

31. EMERG HYD CONTROLS ..... NORMAL

32. PUMP HANDLE/SOCKET ... STOWED/CLEAR

33. RUDDER ASSIST ..... OFF

33A. TORP DEPTH CONTROL ..... OFF
(S-2E and S-2G with AFC 516 incorp.)

34. ARM MASTER ..... OFF

35. TORP BAY DOORS .....CORRESPONDING

36. EQUIPMENT ..... OFF

a. Radar altimeter..... OFF

b. Doppler ..... OFF

c. ASA-31 or ASN-30 ..... OFF

d. Searchlight amplifier ..... OFF

e. ROLL STAB ..... OFF

37. MANIFOLD PRESSURE ..... REPORT (IN. HG)
Static reading should be within .5 in. Hg of field barometric pressure.

(EXTERNAL POWER)

CAUTION

Do not plug in external AC power during starting or main line contactors may be damaged.

38. WHEELS POSITION INDICATOR ..... ALL DOWN

39. WARNING LIGHTS ..... CHECKED

a. Generator Warning Lights ..... ON

b. T/R Warning Lights..... ON

c. CSD Warning Lights ..... ON

d. Fire Warning Lights ..... TEST

e. Master Test ..... TEST

(1) Wheels Warning Light ..... ON

(2) Landing Gear Handle Light ..... ON

CONTINUED ON NEXT PAGE

PRE-START CHECK LIST—CONTINUED

(3)	Chip Detector Lights	ON
(4)	Low Fuel Level Warning Lights ..	ON
(5)	Fuel Dump Light	ON
(6)	Auto Feather Arm Light.....	ON
(7)	Arresting Hook Light	ON
(8)	ASQ-80 or ASQ-149 Selector Panel Lights (S-2E/G)	ON

NEW

STARTING

1. Pilot check throttle position switches as follows: Arm auto feather. Advance port throttle past 75% of full travel checking feather button actuation. Close throttle. Pull feather button back to neutral position. Rearm auto feather and repeat the procedure for the starboard throttle. Turn auto feather off. Recheck throttle cracked.
2. The co-pilot will check full travel of the aileron trim tab both ways and return the aileron trim tab to a position other than zero using the aileron trim tab switch.
3. The co-pilot will check the electrical rudder trim for 5 degrees of travel both left and right, and return the rudder trim to zero using the trim tab switch.
4. Ensure that a qualified plane director is present and that a portable fire extinguisher is manned outboard and clear of the starting engine. Normally the left engine will be started first.
5. On signal from the director turn the propeller through 6 blades with the starter.
6. Push master ignition switch to ON and turn the individual engine MAG switch to BOTH.
7. Switch primer to the associated engine intermittently until the engine starts firing, then hold the primer switch steady and release the starter switch.

CAUTION

- Continuous cranking should not exceed 30 seconds. If the engine does not start, release the starter switch and allow the starter to cool for 1 minute. Starter cycle is 30 seconds ON, 1 minute OFF, 30 seconds ON, 5 minutes OFF.
- Never attempt to start on the mixture control because of the possibility of hydraulic lock and the danger of backfiring with resultant damage to the carburetor induction system.

Note

A cold engine requires more priming than a warm engine. Excessive throttle and intermittent priming after the engine is firing are the principal causes of backfiring. An over-rich mixture is sluggish, but will not caust backfire. If backfire occurs, shut down and inspect engine for evidence of damage.

Adjust the throttle to hold 1000 RPM on the primer and move the mixture control to RICH. When the RPM commences to drop, release the primer switch.

8. If the CSD warning lights are not extinguished within 15 seconds of engine operation, or if a light extinguishes and comes back ON, shut down the engine immediately and investigate the cause.
9. The generator should cut in at approximately 1000 RPM. As soon as the generator cuts in, oil pressure should be indicated. If the generator does not cut in, attempt a maximum of two resets. If unsuccessful, secure the engine. If 40 psi oil pressure is not indicated within 20 seconds after the engine has started firing, shut down the engine and investigate the cause.
10. When the engine is running smoothly on the carburetor, co-pilot check the suction on the engine (3.50 to 5.00 in. Hg.).

CONTINUED ON NEXT PAGE

STARTING—CONTINUED

If greater than 90 psi oil pressure is indicated after start, 1200 RPM shall not be exceeded until minimum engine operating temperatures have been achieved. NEW

If after minimum engine operation temperatures have been achieved, and the oil pressure exceeds 90 psi at 1200 RPM, shut down the engine and investigate the cause.

11. The co-pilot shall run the elevator trim tab full nose up and full nose down. During return to 0° use elevator emergency STOP button to deactivate normal trim control. Check elevator trim tab standby switch for operation in both directions and leave the elevator trim tab in a position other than 0°. NEW
12. When the director signals for the other engine to be started, start the engine as in steps 5 through 10.
13. Insure both generators are operating and that all electrical system warning lights are out. When the right engine is running smoothly on the carburetor, give the director the signal for the external power to be disconnected, and retard the right throttle to 800 RPM while lineman disconnects the external power. Engine speed should not be reduced to below 800 RPM because of the heavy vibration encountered in the lower RPM ranges. Such vibrations may cause damage to the constant speed drive shaft.

PRE-TAXI CHECK LIST

After getting an ICS check, complete the Pre-Taxi Check List as follows:

1. AUX PUMPS ..... OFF/DROP
2. GENERATORS/BATTERIES ..... CHECKED

   a. Check all GEN and RECT warning lights OUT.

   b. Turn ON pilot's or co-pilot's utility light or storm lights during daylight hours. Ensure radar altimeter low level warning lights ON or ground vent blower energized.

   c. Switch left generator OFF. Observe pilot's VGI OFF flag come into view momentarily. Observe left generator and left T/R warning lights ON. If VGI OFF flag does not come into view or comes into view and remains, the AC Essential Bus Transfer Relay is malfunctioning and the aircraft is down. Observe utility light OUT.

   d. Set DC BUS TIE switch from NORMAL to T/R #1 FAIL. Observe utility light and TR #1 warning light ON. Return switch to NORMAL. NEW

   e. Set AC BUS TIE switch to ON. Observe L RECT warning light OUT. Set AC BUS TIE switch to NORMAL.

   f. Switch left generator ON. Observe all GEN and RECT warning lights OUT. If left generator does not come back on the line, attempt a maximum of two resets. If unsuccessful, the aircraft is down.

   g. Switch right generator OFF. Observe right generator and right T/R warning lights ON. Observe radar altimeter low level warning lights OUT or ground vent blower or stall warning automatically deenergized. If VGI OFF flag comes into view and remains, the AC Essential Bus Transfer relay is malfunctioning and the aircraft is down.

   h. Set DC BUS TIE switch from NORMAL to T/R #2 FAIL. Observe radar altimeter low level warning lights and TR #2 warning light ON or ground vent blower or stall warning reenergized. Return switch to NORMAL. NEW

   i. Set AC BUS TIE switch to ON. Observe R RECT warning light OUT. Set AC BUS TIE switch to NORMAL.

CONTINUED ON NEXT PAGE

PRE-TAXI CHECK LIST—CONTINUED

j. Turn left generator OFF, to ON, to OFF.

k. Turn right generator ON.

l. Turn left generator ON.
Observe all GEN and RECT warning lights OUT. If either generator does not come back on the line it indicates the respective battery is below limits and the aircraft is down.

CAUTION

Energizing equipment prior to checking the generators could be detrimental because of the interruptions in power.

3. TRIM TABS ..... CHECKED

Note

The normal elevator trim control should be regained after completion of the generator checks. If normal control is not regained, pull and reset elevator tab emergency HOLD and STOP circuit breakers to reactivate.

4. RADIOS/IFF ..... ON

a. UHF to ON

b. HF to ON

c. TACAN to REC (90 second warmup required prior to selecting T/R)

d. LF/ADF to ON

e. IFF to STBY

5. EQUIPMENT ..... ON

a. Radar altimeter to ON

b. Doppler to ON/STBY

c. ASA-31 or ASN-30 to STBY (as required)

d. Searchlight amplifier switch to START.

e. Grant permission to energize ASW equipment.

f. ROLL STAB. to ON

6. CSD TEMPERATURES ..... CHECKED

7. HYD PRESSURE ..... CHECKED

8. STALL WARNING ..... CHECKED

9. CARB ALT AIR ..... CHECKED
Set CARB AIR switches to ALT and note a rise in carb air temperature within 30 seconds. Return switches to DIRECT. Check temperature to ensure a drop to normal.

CONTINUED ON NEXT PAGE

PRE-TAXI CHECK LIST—CONTINUED

10. DEICERS ..... CHECKED
    If anticipating use of deicers during flight, check them for normal operation.
11. FUEL ..... DIRECT/QUANTITY
    a. Read total fuel quantity.
    b. Test indicators for proper functioning.
12. CIRCUIT BREAKERS ..... CHECKED
13. MAGS ..... GROUND CHECKED
    At 800 RPM, check each MAG switch for grounding as follows:
    a. Master ignition switch to OFF momentarily, then back to ON.
    b. Left engine MAG switch to L, to R, to OFF, then back to BOTH.
    c. Right engine MAG switch to L, to R, to OFF, then back to BOTH. Pause momentarily at each L and R position to insure no dead MAGS.
14. CREW REPORT ..... READY TO TAXI

Note

The remaining items on this Check List may be deferred until signaled.

15. BRAKES ..... CHECKED
    Leaving the parking spot.
16. WINGS ..... SPREAD/LOCKED

On signal from the director:

a. SPREAD (APPROX. 5 FT. TIP TRAVEL) then FOLD wings.

CAUTION

- The aircraft shall not be in motion. An observer, in addition to the plane director, must be stationed at the wing break to check for premature extension of wing locking pins.
- Aircraft with wings folded or jury struts removed should be taxied and spotted/parked well clear of all aircraft making high power turn-ups. The wing spread/fold system is designed to withstand a maximum wind of 45 knots within 45° relative to aircraft heading.

b. SPREAD wings as signaled.

c. When wings are spread and locked hydraulically, the amber light ON and the hydraulic pressure has dropped, the "T" handle may then be stowed.

(1) Check wing tips down.

(2) Check both hydraulic pressures down.

(3) Check amber light ON.

CAUTION

Unless the above 3 conditions are met the "T" handle shall not be stowed. The wing fold and spread inner lever shall not be actuated (jiggled) other than for a wing fold/spread cycle of 5 feet tip travel (minimum).

(4) Stow and lock "T" handle. Do not force "T" handle into the locked position.

(5) Check amber light OUT.

(6) Check both locking flags IN.

CONTINUED ON NEXT PAGE

PRE-TAXI CHECK LIST—CONTINUED

17. FLAPS/RUDDER ASSIST/
CONTROLS . . . . . CHECKED

a. Only after wings are spread and locked, extend full flaps as signaled by the director in order for linemen to check for proper operation, position and security. Linemen will check each wheel well for hydraulic and fuel leaks and signal to the director that both flaps and wheel wells are in an up or down status. Check flap indicator for corresponding indication with flap control. Retract flaps on signal.

b. On signal from director, turn Rudder Assist ON and exercise rudder trimmer at full deflection as signaled. Check 20 degrees of travel both ways on rudder trim indicator. Hold the rudder deflected at 5-8 degrees and turn Rudder Assist OFF while holding rudder pedals stationary. Rudder trim indicator should return to 0° within 10 seconds under no wind conditions. Repeat check with opposite rudder deflected. Linemen will check rudder trimmer to insure the direction of travel agrees with the signals given by the director and that the rudder trimmer centers from both directions. Linemen will signal to the director the up or down status of the rudder.

c. Exercise elevator control as signaled. Linemen will insure that position of elevator agrees with signal of director and signal to the director that elevator control is in an up or down status.

d. Exercise aileron control as signaled. Director will insure that position of ailerons and spoilers agrees with his signals.

Note

See Section VII, Figure 7-1 for flight control check signals.

18. LIGHTS . . . . . CHECKED/SET

19. FLIGHT INSTRUMENTS . . . . . ERECT/SET

a. Gyro horizon. Set horizon bar and insure OFF flag is not showing.

b. MF-1. Select EMER. then MAG position. Check compass card for alignment and slight oscillation. Check meter for sensing oscillations. Insure proper hemisphere and latitude selections. Test alignment of roll stabilization. Check with standby (wet) compass. Check BDHI mode selector switch for proper position (S-2E).

c. Vertical speed indicator. Check for proper calibration.

d. Turn and slip indicator. Check the needle aligned vertically and the ball in the center.

TAXI

The nose wheel is free swiveling and does not incorporate a locking device. When ready to leave the flight line, signal the taxi director to pull chocks. On signal to taxi, add power, apply normal brakes and release parking brake. Release brakes, and as the aircraft commences rolling, reduce power to minimum required to maintain forward motion. This has completed the brake check. Steer and control speed by use of differential throttle settings and intermittent braking action.

CAUTION

- Use a minimum of 800 RPM due to heavy vibrations encountered at lower RPM which in turn could result in damage to the constant speed drive shafts.

- Maintaining a slow speed may avert taxi mishaps and brake failures. A good rule of thumb is never taxi any faster in close quarters or congested areas than a person normally walks. The co-pilot will continually ascertain safe clearance for the starboard side of the aircraft.

WARNING

Do not apply the parking brake while the aircraft is moving, except in an emergency.

CAUTION

Excessive use of the rudder assist on the ground may result in damage to the internal seal of the trimmer actuating cylinder. The single engine rudder assist should not be used for taxiing.

Taxi directors will utilize standard signals as outlined in NWP-41(B) and the CVA/CVS NATOPS Manual. If there should be doubt as to the meaning of any signal, the pilot should stop the aircraft until the directions are understood. If a pilot becomes disoriented, or if his night vision becomes impaired, he should stop and request instructions before proceeding.

If the wings were not spread at the line, follow signals to a clear area and spread wings as directed in the pre-taxi check list. After taxiing to the run-up area, allow the aircraft to roll straight ahead to assure nose gear alignment. Stop the aircraft with brake pedals prior to setting the parking brake.

ENGINE RUN-UP

Prior to take-off, the following procedures shall be adhered to:

1. Engine Gauge Check
   Set throttles at 1200 RPM and check the following:

   a. Oil temperature ..... 40° to 90° C

   b. Cylinder head temperature .. 100° to 245° C

   c. Carburetor air temperature ... above 10° C

   d. CSD temperature ..... within limits

Note

In cross wind conditions, the CSD temperatures may be split. To prevent CSD temperatures from exceeding the limits, attempt to reposition aircraft into the wind.

CONTINUED ON NEXT PAGE

ENGINE RUN-UP –CONTINUED

Set throttles at 1500 RPM and check the following:

e. Oil pressure ..... 50 to 75 PSI
(65 PSI for ~~1800~~ 1900 RPM or above)

f. Fuel pressure ..... 21 to 25 PSI

2. Propeller Check
Exercise prop governors by running prop controls back to FULL DECREASE, forward to FULL INCREASE, then back to FULL DECREASE RPM. Low RPM should be no less than 1200 RPM.

3. Propeller Unfeather Check
Momentarily PULL each feather button in turn and observe a rise in RPM on each engine. Return prop controls to FULL INCREASE RPM and check for 1500 RPM.

4. Propeller Manual Feather Check
Push in each feather button in turn and allow approximately 200 RPM drop, observe rise in opposite AC loadmeter then return feather button to neutral.

5. Propeller Automatic Feather Check
Check propeller Automatic Feathering System by:

a. Set auto feathering OFF-ARMED switch to ARMED. Check ARMED light ON.

b. Make certain that both torque pressures are below 100 PSI.

c. Hold left auto feathering test switch to TEST position, observe feather button snap IN and RPM decrease. Allow approximately 200 RPM drop. Pull feather button OUT past neutral momentarily. RPM should return to 1500.

d. Re-cycle auto feathering OFF-ARMED switch to OFF, then to ARMED and repeat step c with the right engine. Re-cycle auto feathering OFF-ARMED switch to ARMED. If a propeller should reach full feather, shut down and get the assistance of a qualified mechanic.

e. Re-cycle propellers through their full range.

f. Advance one throttle at a time to field barometric pressure and observe torque pressure sensing switch light out. Then perform steps 6 and 7 before retarding throttle to 1200 RPM. Repeat procedure for the other engine.

On aircraft not incorporating torque pressure sensing switch lights, accomplish step g.

g. Advance one throttle at a time to field barometric pressure and check the auto feather system by setting the auto feathering test switch to TEST. (If the engine starts to feather, immediately unfeather. With a torque pressure sensing switch failure of this type, do not arm the Autofeather System during any phase of the flight if operational necessity precludes mission abort.) Then perform steps 6 and 7 before retarding throttle to 1200 RPM. Repeat procedure for the other engine.

CONTINUED ON NEXT PAGE

ENGINE RUN-UP—CONTINUED

Note

- Any time a torque pressure sensing switch malfunctions and remains closed, a good engine will be automatically feathered if the auto feathering ARMED-OFF switch is ARMED and the 75% throttle position micro switch is activated.
- Torque pressure sensing switch lights may flicker on and off during taxi and ground operation if low torque pressures are encountered.

6. Field Barometric Pressure Check
   With manifold pressure set at field barometric pressure, add field temperature in degrees centigrade to 2250. The RPM should read the algebraic sum plus or minus 40.

7. Magneto Check
   While at field barometric pressure set the mixture control to NORMAL to ensure proper engine operation, then return it to RICH. Move the engine MAG switch from BOTH to R to BOTH to L to BOTH, momentarily stopping on the R and L positions, and noting the RPM drop at each position. Normal RPM drop is between 0 to 75 RPM provided no engine roughness is encountered. The maximum allowable drop is 75 RPM. A maximum difference of 40 RPM drop is permissible between the R and L positions. During prolonged ground operation, lead compound deposits may foul the spark plugs. If the engine will not check out, conduct a burnout. Repeat the magneto check on the affected engine. If the engine still does not check out, return to the line and down the aircraft.

Note

- A magneto check is required for each 15 minutes of ground operation.
- Torque pressure drop as a measure of power loss during the magneto check should be used to verify the observed RPM drop. During the magneto check a 10 PSI drop in torque pressure is equal to a 75 RPM drop.
- When the mixture control is placed in NORMAL, a 10% drop in torque pressure is allowable.

8. Repeat steps 6 and 7 for the other engine.

GROUND BURNOUT

A burnout will scavenge lead compound deposits. Perform a burnout for 1 minute as follows:

1. MIXTURE ..... RICH
2. PROPS ..... 2100 RPM (Governed)
3. THROTTLES ..... 205 PSI Torque Pressure

CAUTION

It is recommended that 200°C cylinder head temperature is not exceeded during the ground burnout.

TAKE-OFF CHECK LIST

Prior to taxiing into position on the runway complete the Take-off Check list as follows:

1. TRIMS TABS ..... SET
   a. Rudder - 0°
   b. Aileron - 0°
   c. Elevator - 0° (For normal field take-off)
2. COWL FLAPS ..... OPEN
3. OIL COOLERS ..... SET
4. CARB AIR .....AS REQ'D
   Reduce maximum allowable take-off Manifold Pressure 1 in. for each 6°C of Carb Air Temperature above 38°C to avoid detonation.
5. AUX PUMPS ..... ON/RISE
6. FUEL ..... DIRECT/QUANTITY
7. PROPS ..... FULL INCREASE
8. MIXTURES ..... RICH
9. AUTO FEATHER ..... ARMED
10. CAT GRIP ..... SET
11. FRICTION LOCKS ..... SET
12. AFCS ..... STANDBY
13. PITOT HEAT/DEICERS ..... SET
14. RADIOS/IFF ..... SET
    a. UHF as required.
    b. HF as required.
    c. TACAN to T/R.
    d. LF/ADF as required.
    e. IFF/SIF as required.
15. DOPPLER .....XMIT/TEST
16. ALTIMETERS/RAWS ..... CHECKED/SET
    a. Radar altimeter ON. Set altitude limit on APN-117.
    b. Low altitude system test button. Press for tone.
    c. Pressure altimeter. Set the local field altimeter setting in the Kollsman index windows.

Note

Compare the pressure altimeter reading to the known field elevation. The altimeter is unsatisfactory for instrument flight if the difference is greater than 75 feet.

NEW NEW

CONTINUED ON NEXT PAGE

TAKE-OFF CHECK LIST—CONTINUED

17. WINGS ..... LOCKED

    a. Tips down.

    b. Locking flags IN and FLUSH.

    c. "T" handle locked

    d. Amber light OUT.

    e. Both hydraulic pressures down (1300-1700 PSI)

18. FLAPS ..... SET
    Use 1/3 flaps for normal field take-off. Check handle and flaps position indicator corresponding.

19. CONTROLS ..... FREE

20. RUDDER ASSIST..... ON
    Insure rudder tracks in the direction of rudder pedal travel. NEW

21. LOOSE GEAR ..... STOWED

22. HARNESS ..... LOCKED

23. HATCHES ..... LOCKED
    Shall be locked open for carrier operation.

24. LIGHTS ..... AS REQUIRED

25. COMPASSES ..... ALIGNED

26. CREW ..... BRIEF/REPORT
    (SEE TAKE-OFF, CREW DUTIES)
    Each station report "Ready For Take-Off" to the pilot. The pilot shall instruct the co-pilot on the required back-up procedures with additional instruction as desired. NEW

TAKE-OFF

CLEARANCE NEW

After completion of the Take-Off Check List and receipt of IFR clearance, as applicable, contact the Tower or controlling agency for take-off clearance. The clearance should include any abnormal instructions in executing a proper departure from the field, and must include either "Hold short", "Cleared into position and hold", or "Cleared for take-off". Any instruction or clearance which requires further clearance from the tower prior to take-off must be acknowledged. When cleared for take-off, visually check for aircraft on final approach, and taxi into position (refer to figure 3-2).

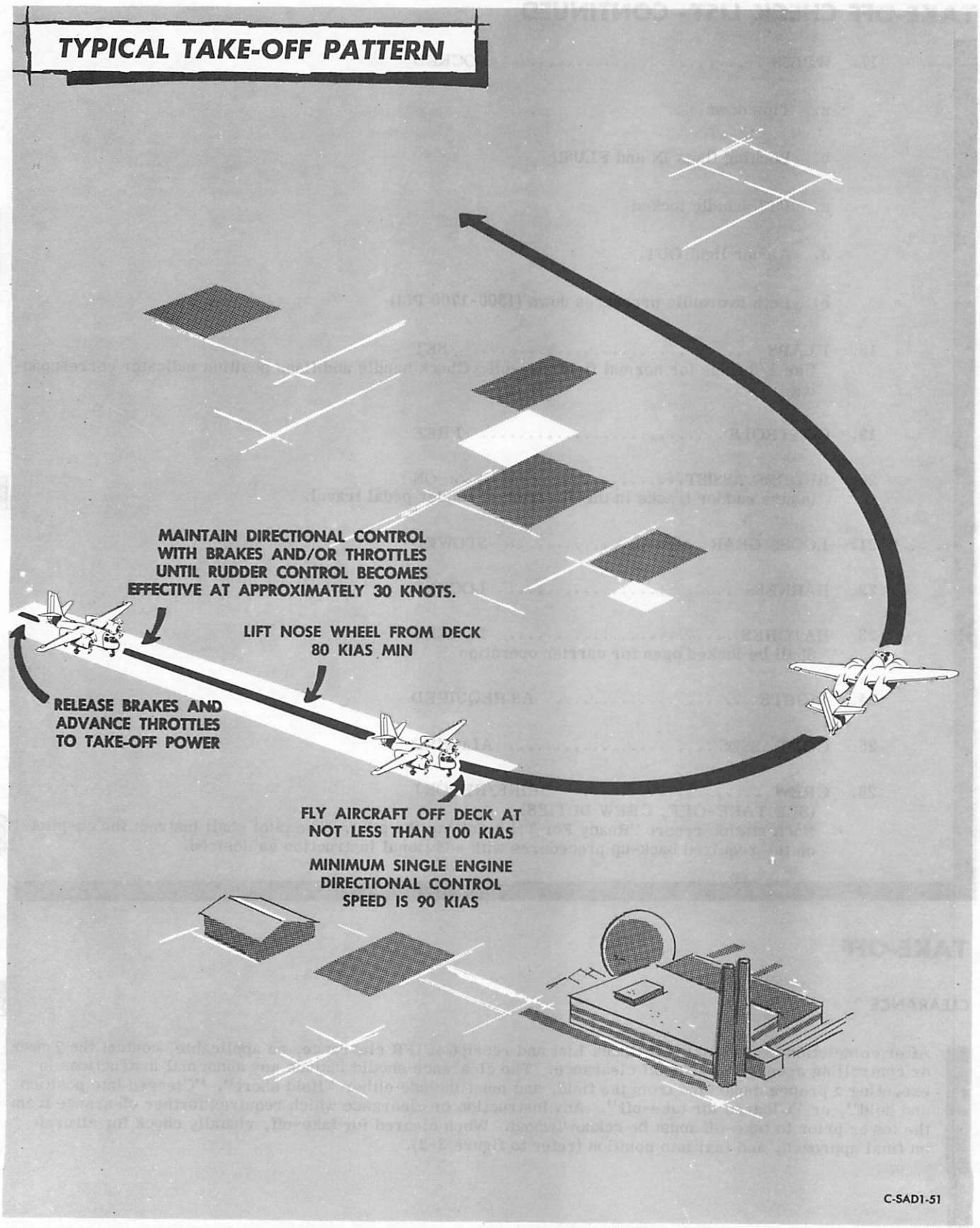

TYPICAL TAKE-OFF PATTERN
MAINTAIN DIRECTIONAL CONTROL WITH BRAKES AND/OR THROTTLES UNTIL RUDDER CONTROL BECOMES EFFECTIVE AT APPROXIMATELY 30 KNOTS.
LIFT NOSE WHEEL FROM DECK 80 KIAS MIN
RELEASE BRAKES AND ADVANCE THROTTLES TO TAKE-OFF POWER
FLY AIRCRAFT OFF DECK AT NOT LESS THAN 100 KIAS
MINIMUM SINGLE ENGINE DIRECTIONAL CONTROL SPEED IS 90 KIAS
C-SAD1-51

Figure 3-2

TAKE-OFF—CONTINUED

CREW DUTIES

1. The co-pilot shall back up the pilot on props, throttles, mixtures.

2. The co-pilot shall monitor all engine instruments and warning lights for indication of malfunction. If malfunction is apparent, tap pilot on right arm and point to the visible indication. If take-off is aborted, inform the tower immediately.

3. In the event of a serious malfunction before exceeding safe abort speed, power will be reduced by the pilot and the take-off will be aborted.

4. If malfunction occurs after passing safe abort speed, take-off will be continued and it will be treated as an in-flight emergency.

5. Both pilots should agree as to which engine has failed or malfunctioned if autofeather has not occurred. That propeller will be feathered by the pilot in command or on his command.

6. The pilot shall brief the crew of any deviations from normal take-off duties and/or additional instructions.

TAKE-OFF PROCEDURE

For a normal take-off, the center line of the runway should be used as a directional guide. In general, ailerons will be used to keep the wings level, and the rudder used to maintain directional control. During night and limited visibility conditions, the gyro horizon may be used to attain the proper take-off attitude. Formation take-off is not permitted. After all checks are complete and final clearance is received, take-off shall be made as follows:

1. Hold brakes, advance throttles to 30" MAP and check all engine gauges, warning lights, and instruments for proper functioning. Check torque pressure sensing switch lights OUT. The co-pilot shall indicate to the pilot that he is ready for take-off with a "thumbs up", and back up the pilot as briefed.

Note

- Any time a torque pressure sensing switch malfunctions and remains closed, a good engine will be automatically feathered if the auto feathering ARMED-OFF switch is ARMED.

- If the auto feather ARMED light is inoperative it may indicate a failure of the power circuit to the feather pumps. Prior to take-off in such cases, de-arm the system and ensure proper functioning of the power circuit to the feather pumps by completing a manual feather check.

- Under conditions of meeting operational requirements but not involving maximum gross weight loading, the take-off may be made with the auto-feathering system de-armed if a sensing switch malfunction has been determined.

CONTINUED ON NEXT PAGE

TAKE-OFF PROCEDURE—CONTINUED

2. Release the brakes and add take-off power, limiting T.P. or MAP, whichever comes first, (apply static MAP correction).

CAUTION

There are no throttle stops installed. Full throw of the throttles may result in overboost of the engines. Because of increasing ram air pressure during the take-off, monitor MAP and TP closely.

3. At approximately 30 knots the rudder will become effective for directional control. At 80 KIAS min., lift the nose wheel off the deck and establish a flying attitude. Fly off at not less than 100 KIAS and continue to accelerate to climb airspeed of 130 KIAS.

4. The landing gear should be retracted only when there is insufficient runway remaining on which to safely abort the take-off and re-land. In no case should the landing gear be retracted before the aircraft is completely airborne and safely climbing.

5. After the landing gear has been retracted, reduce to climb power. Care should be taken to avoid overboosting during power reduction.

6. Prior to reaching 130 KIAS turn the rudder assist switch to OFF. Flaps should not be raised below 300 feet of altitude. During touch and go landing pattern flaps may be left at 1/3 and the rudder assist ON, if the airspeed does not exceed 130 KIAS.

NEW

Auto feather may be secured passing 500 feet AGL. Cowl flap oil cooler and carburetor air adjustments may be made as necessary during climbout. Auxiliary fuel pumps may be switched OFF, and mixtures placed to NORMAL passing 1000 feet AGL or at cruise altitude.

Prior to moving mixture controls to NORMAL, recheck their position in RICH, then shift the mixture controls to NORMAL, one at a time.

Note

During climb or descent it is recommended that the mixtures be set to RICH.

POST TAKE-OFF CHECK LIST

Upon reaching the desired altitude the pilot shall cause the Post Take-Off Check List to be checked for completion as follows:

1. LIGHTS ..... AS REQUIRED

2. RUDDER ASSIST ..... OFF

CONTINUED ON NEXT PAGE

POST TAKE-OFF CHECK LIST – CONTINUED

3. FLAPS ..... SET

4. AUX PUMPS ..... OFF/DROP
   Set auxiliary fuel pump switches to OFF, one at a time, while monitoring fuel pressure.

5. AUTO FEATHER ..... OFF

6. COWL FLAPS ..... AS REQUIRED

7. OIL COOLERS ..... AS REQUIRED

8. CARB AIR ..... AS REQUIRED

Note

Prior to applying initial carburetor ALTERNATE air, place the mixture controls to RICH to prevent engine instability. Return mixtures to NORMAL after carburetor air temperature is stabilized. Subsequent applications are allowable in normal detent.

9. MIXTURES ..... NORMAL

10. INSTRUMENTS/NACELLES ..... CHECKED

LANDING

PRE-LANDING CHECK LIST

Prior to entering the traffic pattern for landing, the Pre-Landing Check List shall be completed as follows:

1. MAD BOOM/RADOME/
   MCJR ANTENNA ..... IN/UP/UP

2. ARM MASTER ..... OFF
   All arming switches off.

3. RADIOS/NAVAIDS ..... SET

4. DEICERS ..... AS REQUIRED

CONTINUED ON NEXT PAGE

LANDING—CONTINUED

Note

Windshield heat may be turned to LOW to prevent fogging.

5. RADAR ALTIMETER ..... SET

6. HEATER ..... OFF

7. LIGHTS ..... SET

8. LOOSE GEAR ..... STOWED
   Nav Bag, Plotting Board, Camera, etc., should be stowed for arrested landings.

9. HARNESS ..... LOCKED

10. CREW ..... REPORT
    Each station report "ready for landing" to pilot.

11. MIXTURES ..... RICH

CAUTION

Before moving mixtures to RICH, ensure that torque pressure is not at maximum allowable to preclude overboosting the engine.

12. CARB AIR ..... AS REQUIRED

13. AUTO FEATHER ..... ARMED
    Ensure armed light ON.

14. AUX PUMPS ..... ON/RISE

LANDING CHECK LIST

Upon entering the landing pattern, the pilot will complete Landing Check List. Prior to reaching the abeam position, the Landing Check List shall be reviewed by the normal challenge and reply method. However, after the initial landing of a series of touch and go landings, only the items preceded by an asterisk ⊛ shall be checked by the challenge and reply method. The other items will be visually checked by the co-pilot.

1. HOOK . . . . . AS REQUIRED

*2. WHEELS . . . . . DOWN/LOCKED
    Lowered at 150 KIAS or less and checked DOWN visually.

    a. Main mounts fully extended. Nose wheel sighted visually off port engine nacelle reflector during daylight operations.

    b. Wheel position indicator indicates all three wheels DOWN and LOCKED.

    c. Landing Gear handle in DOWN detent and warning light OUT.

    d. Hydraulic pressure is normal.

    e. WHEELS warning light is OUT. (Will not give warning if flaps are in full UP position.)

CONTINUED ON NEXT PAGE

LANDING - CONTINUED

3. RUDDER ASSIST ..... ON
   At 130 KIAS or less.

4. COWL FLAPS/OIL
   COOLERS ..... AS REQUIRED
   Should be opened here for a series of touch and go landings, but may be left closed if landing is to be full stop.

5. HATCHES ..... LOCKED
   Shall be locked open for Carrier Operations.

*6. FLAPS ..... SET
   Should be actuated in increments of 1/3 to determine that all four sections are extending together. Check flaps position indicator.

*7. PROPS ..... FULL INCREASE
   An intermediate RPM range may be used prior to reaching the abeam position. Care should be taken to avoid overspeed due to rapid application of RPM.

PATTERNS AND AIRSPEEDS

The pattern for all landings shall be as published in the Operations Manual for the field in use. This will normally require a 1000 foot altitude AGL on the downwind leg. The Tower or controlling agency may issue additional governing instructions during the approach and landing maneuvers. The distance abeam for No Flap and Single Engine landings shall be approximately one and one-half times the distance for normal landings. Refer to figure 3-3 for the Field Landing Pattern and Airspeeds.

NORMAL LANDING TECHNIQUE

Normal landings are accomplished by maintaining rate of descent until just above the runway, then making a slight transition to check the rate of descent. When main wheels contact the runway power should be reduced to idle. The nose wheel should be held slightly off the runway. After the aircraft speed has been reduced, the nose wheel should be lowered to the runway while there is elevator control remaining. With the nose wheel on the runway, raise the flaps and commence braking by light application of pressure on the pedals in sufficient time to prevent the use of field arresting gear if brakes malfunction. The degree and use of the brakes will be commensurate with runway remaining, distance to available arresting gear, temperature, and particularly braking coefficient.

SHORT FIELD LANDING TECHNIQUE

Short field landings are accomplished by flying a full flap approach. After touchdown, lower nose wheel to the runway, apply normal braking while raising flaps to full up position and placing pilot's/co-pilot's yoke to full aft position.

TOUCH-AND-GO LANDINGS

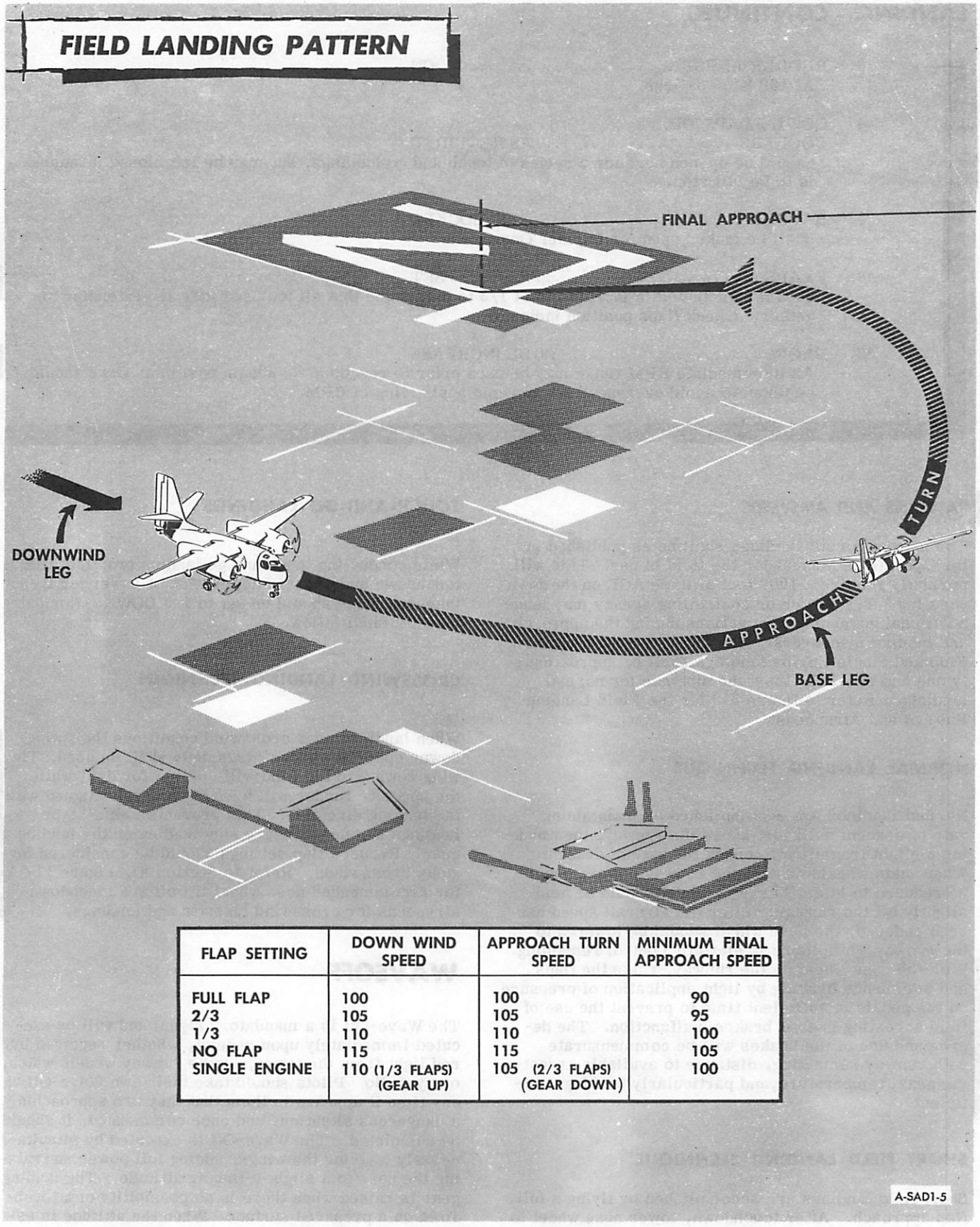
While conducting touch and go landing practice, after touchdown and prior to application of power for the take-off, flaps should be set to 1/3 DOWN. Normal take-off shall follow.

CROSSWIND LANDING TECHNIQUE

When landing under crosswind conditions the "wing down, opposite rudder" technique shall be used. The wing down into the wind will correct for drift while the opposite rudder will keep the aircraft aligned with the landing direction. This prevents "skid" type landings and unnecessary side loading on the landing gear. Reduced flap settings should be considered for gusty crosswinds. Refer to Section XI, Figure 11-11 for recommended nose wheel lift off and touchdown airspeeds for crosswind takeoffs and landings.

WAVEOFF

The Wave-Off is a mandatory signal and will be executed immediately upon receipt, whether received by red light from the tower, by the runway wheels watch, or by radio. Pilots should take their own Wave-Off at any time it appears to them that they are approaching a dangerous situation, and once commenced, it should be completed. The Wave-Off is executed by simultaneously leveling the wings, adding full power and raising the nose to a slight climbing attitude. The landing gear is raised when there is no possibility of a touchdown on a prepared surface. When the attitude is established, raise the flaps in 1/3 increments consistent with best single engine performance (see figures 11-33 and 11-34). Retrim the aircraft.



FLAP SETTING	DOWN WIND SPEED	APPROACH TURN SPEED	MINIMUM FINAL APPROACH SPEED
FULL FLAP	100	100	90
2/3	105	105	95
1/3	110	110	100
NO FLAP	115	115	105
SINGLE ENGINE	110 (1/3 FLAPS) (GEAR UP)	105 (2/3 FLAPS) (GEAR DOWN)	100

Figure 3-3

POST LANDING

After touchdown the co-pilot shall raise the flaps as briefed. After the aircraft has been taxied clear of the landing runway, the pilot shall cause the post-landing Check List to be completed as follows:

1. FLAPS ..... UP
2. COWL FLAPS/OIL COOLERS ..... OPEN
3. CARB AIR ..... DIRECT
4. AUX PUMPS ..... OFF
5. AUTO FEATHER ..... OFF
6. RUDDER ASSIST ..... OFF
7. PITOT HEAT/DEICERS ..... OFF
8. LIGHTS AS REQUIRED
9. UNNECESSARY RADIOS OFF
10. DOPPLER STBY
11. WINGS AS REQUIRED

May be folded while taxiing, but pilots should avoid making any quick turns while wings are in a near vertical position. High centrifugal forces encountered can damage wing folding systems. Caution should also be exercised in selecting wing fold under adverse conditions (high winds, crosswinds, rough taxi ways, mats, etc.).

CAUTION

- During wing folding or wing spreading operation, external stores load must not exceed 700 pounds on either wing. Wings must not be folded when certain stores are loaded on the left wing due to structural interference. Refer to External Stores Limits, figure 1-71 in Section I, for specific restrictions.
- Do not fold wings unless flaps are fully retracted.

GROUND SECURE

After aircraft is parked, initially set the throttles at 800 RPM, and complete the Ground Secures Check List as follows:

1. PARKING BRAKE ..... SET
2. MAGS ..... GROUND CHECK
3. SCAVENGE ENGINES ..... 1200 RPM/30 SECS MIN.
   Less oil drippage will occur after shutdown if scavenging is done at 1200 RPM.
4. EQUIPMENT/UHF ..... OFF
5. GENERATORS ..... OFF
6. MIXTURES ..... IDLE CUT OFF

CONTINUED ON NEXT PAGE

GROUND SECURE—CONTINUED

7. FUEL SELECTORS ..... OFF

8. MAGS ..... OFF

9. LIGHTS ..... OFF

   a. Master exterior

   b. Wing and Tail

   c. Anti-collision

   d. Interior lights

10. GUST LOCK ..... LOCKED
    Position controls for locking.

11. WHEELS ..... CHOCKED

12. PARKING BRAKE ..... AS REQUIRED

13. HATCHES ..... CLOSED

POST-FLIGHT INSPECTION

Inspect aircraft for hydraulic, fuel and oil leaks after each flight.

DE-BRIEFING

The importance of proper post flight procedures cannot be over emphasized. It is through completion of the yellow sheet that aircraft discrepancies requiring repairs are reported, and flight-time is recorded in the various Log Books. Tactical and intelligence information must also be relayed to proper authority for sound evaluation of the mission or exercise conducted. The more information derived in post flight de-briefings, the better the results that can be anticipated in future operations.

Each flight should be thoroughly de-briefed immediately upon its return covering the following as applicable:

1. Completion of ASW de-briefing forms required by higher authority.

2. Intelligence in the form of photographs, MAD traces, Julie/Jezebel traces, tape recordings, logs, plots, and other information of Intelligence value.

3. The success of the mission including contacts, action taken, tactics employed, and results.

4. Recommendations for improvement of tactics, procedures, and techniques, flight and radio discipline, etc.

5. Completion of syllabus flights, attainment of crew qualifications, and results of competitive exercises.

AUXILIARY CHECKS

Note

The following checks are not usually performed for every flight. They do apply to both shore and carrier based procedures if desired.

ASW PHOTOGRAPHIC EQUIPMENT

PRE-FLIGHT INSPECTION

After completion of operational tests and loading by the Weapons Division, the LB-11A photo pod shall be inspected as follows:

1. POD ..... SECURED
   Securely suspended on AERO 15C/D rack, and rack locked.
2. SWAY BRACES ..... TIGHT
3. CABLE ASSEMBLY ..... CONNECTED
   To the wing receptacle.
4. ACCESS DOORS ..... SECURED
5. CAMERA LENS ..... CLEAN
6. PHOTO CELL COVER ..... LOCKED OPEN
7. CARTRIDGES ..... LOADED
   May be loaded after the aircraft is manned.

PRE-START CHECK LIST

Prior to applying external power to the aircraft, check the following:

1. CIRCUIT BREAKERS ..... OUT
   CAMERA POD TEST and CAMERA POD TO FACILITATE NO VOLTAGE TEST)
2. ARM MASTER ..... OFF
3. CAMERA-ROCKET RACK #6 ..... CAMERA
4. SALVO SWITCH ..... OFF
5. READY SWITCH ..... OFF

If due to restrictions or hazardous conditions, the following items may be performed after take-off when clear of shipping or populated areas; however, any corrective action is not available after the aircraft is airborne.

After power is applied to the aircraft and the cartridges containers are installed, perform the following:

1. ARM MASTER ..... ON

WARNING

Do not perform the following steps on deck with flare cartridges installed.

2. READY SWITCH ..... ON
3. FLARE FAILURE ..... PRESS TO TEST
   Light should illuminate. If it does not illuminate when depressed, it indicates a burned out lamp which must be replaced in order to complete the check. If the light illuminates prior to being depressed, the cartridge containers are not secure in the ejector and must be tightened.
4. OPERATE LIGHT ..... PRESS TO TEST
   Light should illuminate.

CONTINUED ON NEXT PAGE

ASW PHOTOGRAPHIC EQUIPMENT—CONTINUED

5. ARM MASTER ..... OFF

6. READY SWITCH ..... OFF

DE-ICING AND ANTI-ICING EQUIPMENT CHECK

WING AND TAIL DE-ICING SYSTEM

Check wing and tail de-icing system as follows:

1. Wing and Tail De-icing Boots ..... CHECK
   Instruct a ground crewman to observe operation of wing and tail de-icer boots.

2. Throttles ..... SET AT 1200 RPM

3. Wing and Tail De-icing Switch ..... ON

4. Wing and Tail De-icing Pressure Gage ..... CHECK
   Observe pressure gage. Six fluctuations of pressure gage between 0 and 15 PSI should occur in approximately 30 seconds, completing one inflation period. This is followed by an approximate 30-second dwell period. The cycle will then repeat itself.

5. Vacuum Pumps ..... CHECK
   Close both throttles, then open left throttle to approximately 1500 RPM. Observe 0.2 to 0.3 inch Hg rise on suction gage. Close left throttle and repeat check with right throttle.

PROPELLER DE-ICING SYSTEM

Check propeller de-icing system as follows:

1. Throttles ..... SET AT 1200 RPM

2. Propeller De-icing Switch ..... FAST
   Amber light ON. Observe AC loadmeter reading: 20 seconds RISE, 20 seconds DROP, 20 seconds rise.

3. Propeller De-icing Switch ..... SLOW
   Amber light ON. Observe AC loadmeter: 60 seconds RISE, 60 seconds DROP, 60 seconds RISE.

4. Propeller De-icing Switch ..... RETURN TO OFF

WINDSHIELD DE-ICING SYSTEM

Check windshield de-icing system as follows:

1. Throttles ..... SET AT 1200 RPM

2. Windshield Heat Switch ..... LOW
   Observe change in AC loadmeter reading.

3. Windshield Heat Switch ..... HIGH
   Observe change in AC loadmeter reading.

4. Windshield Heat Switch ..... RETURN TO OFF

AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS) FLIGHT CHECK

Upon reaching a safe altitude, check the AFCS YAW TRIM Knob control centered and proceed as follows:

1. Aircraft ..... CLIMB ATTITUDE

2. Engage Stand-By Switch ..... ENGAGE
   AFCS should engage and maintain climb attitude.

3. Pilot's (or Co-pilot's) AFCS Disengage Button ..... DEPRESSED
   Manually retrim aircraft for normal cruise.

Note

The altitude control is not to be used as a leveling-out device.

4. Engage Stand-By Switch ..... ENGAGE

5. Turn and Slip Indicator ..... CHECK
   Check to see if ball of turn and slip indicator is centered. If not, center ball using YAW TRIM knob.

6. Control Wheel Steering ..... CHECK
   Check control wheel steering in roll and pitch. Control should be positive and AFCS should maintain any selected attitude below the recommended attitude of 60 degrees of bank and 40 degrees of pitch. Test for reasonable pitch attitudes only. Check that altitude does not change.

7. Turn Coordination ..... CHECK
   Check that ball of turn and slip indicator remains near the center during roll maneuvers and after bank establishment.

8. Altitude Stand-By Switch ..... ALTITUDE
   Note engagement altitude. Altitude should be maintained within ±5 feet of selected altitude or .15% of indicated pressure altitude whichever is greater. This applies when angle of bank is less than 20°, air is smooth, and inaccuracies of static source are not included.

9. Aircraft ..... BANK LEFT OR RIGHT
   Bank aircraft 20 degrees left or right. Altitude should be maintained with ±5 feet of selected altitude or .15% of indicated pressure altitude, whichever is greater. Small pitch forces on the control wheel should not operate the aircraft in pitch.

10. Aircraft ..... DECREASE BANK
    Place aircraft in slight bank (less than 10 degrees).

11. Heading Stand-By Switch ..... HEADING
    Aircraft should roll out and maintain compass heading within ±0.5 degrees of indicator reading. No apparent roll oscillation should be noted while aircraft is maintaining heading. Perform heading test for at least 3 minutes.

12. Control Wheel ..... APPLY LATERAL FORCE
    A lateral force of 4 to 6 pounds on the control wheel automatically disengages the heading control. HEADING STAND-BY switch automatically switches to STAND-BY.

13. Heading Stand-By Switch ..... HEADING

14. Aircraft Speed ..... DECREASE
    Decrease aircraft speed to 120 KIAS.

15. Elevator Trim Indicator ..... CHECK
    Check that elevator trim indicator shows occasional up and down movement indicating automatic pitch trim is operating.

CONTINUED ON NEXT PAGE

AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS) FLIGHT CHECK –CONTINUED

Note

Although yoke trim switches are inoperative when AFCS is engaged, the RUDDER TRIM switch on the folding console is operative.

16. Pilots' (or Co-pilot's) AFCS Disengage Button ..... DEPRESSED
Little or no bump should be experienced.

17. Engage Stand-By Switch ..... ENGAGE

18. Aircraft Response ..... CHECK
All modes should operate in the same manner as at cruise speed but with slightly less accuracy. Control wheel movement in pitch should feel approximately the same as at normal cruise. More roll force will be needed to obtain the same roll rates noted in cruise configuration.

19. Aircraft Speed ..... INCREASE
Increase speed to 180 to 190 KIAS.

20. Aircraft Attitude ..... CHECK
Control column should move but there should be no aircraft oscillation. Heading and altitude control operation should be normal.

21. Pilot's Pitot Pressure System ..... CHECK
If a loss of pitot pressure to the AFCS airspeed compensator in the pilot's pitot pressure system occurs when flying above 160 KIAS, perform the following:

a. Disengage AFCS.

b. Reduce IAS below 160 knots.

c. Re-engage AFCS. Use extreme caution when re-engaging the AFCS and be prepared to expect pitch sensitivity, which is induced by undamped control column damping.

Note

Above 160 KIAS under this condition, the aircraft, when disturbed in pitch (a gust, for example) will begin a long-period, divergent longitudinal oscillation. At low speeds (120 KIAS) the aircraft, when disturbed in yaw, will exhibit a low-amplitude, long-period directional hunting up to a maximum of ±3 degrees.

22. Aircraft Speed ..... DECREASE
Decrease airspeed and descent to an altitude of less than 1000 feet above water.

23. Altitude Stand-By Switch ..... ALTITUDE
Engage altitude control when aircraft reaches normal cruise configuration.

24. Radar Altimeter and Barometric Altimeter ..... CHECK
Check that the two altimeters read approximately the same and check altitude monitor indication.

25. Pilot's (or Co-pilot's) AFCS Disengage Pushbutton ..... DEPRESSED
Observe that all three AFCS control switches return to STAND-BY positions.

AGM-12B BULLPUP MISSILE SYSTEM PROCEDURES

PRE-FLIGHT INSPECTION

After completion of the operational tests and loading by the Weapons Division, the missile and Aero 5A launcher will be pre-flighted by the pilot as follows:

1. Missile ..... SECURE
   Securely suspended on Aero 5A-1 launcher, secured to Aero 15D bomb rack, rack locked.
2. Safety Pin Aero 15D Bomb Rack... INSTALLED
3. Four (4) Canards ..... SECURE
   Not rubbing nose section.
4. Crystal Channel ..... SECURE/MATCHED
   Nose section access hole/electronics compartment.
5. Forward Umbilical ..... CONNECTED
   Breakaway plug in cleat, cleat locking pin in place.
6. Nose Section Initiator Shorting Pin ..... IN
   Red flag visible.
7. Forward Aero 5A-1 Detent .. FULLY ENGAGED
8. Four Wings ..... INSTALLED/SECURE
9. Aft Umbilical Breakaway Plug ..... IN CLEAT
   Cleat locking pin "solid" position. Connector not plugged in launcher.
10. Ordnance Safety Switch .....INSTALLED
    Red flag visible.
11. Tracking Flares ..... INSTALLED
    Fully seated.
12. Tail Cone ..... INSTALLED/SECURE
13. Wing to Launcher Cable . INSTALLED/SECURE
14. Aero 15D Jettison Squib ..... INSTALLED
15. Transmitter Crystal Channel ..... MATCHED

PRE-START CHECK LIST

Prior to applying external power to the aircraft, check the following:

1. Master Armament ..... OFF
2. Missile and Armament Circuit Breakers .. OUT
3. Missile Control Panel Switches..... SAFE

PRE-LAUNCH

Performed on the catapult or "Hot Spot":

1. Recheck Ordnance Switches ..... SAFE
2. Circuit Breakers ..... OUT
   Master Arm, Arming and all Bullpup.
3. Stray Voltage Test .....
   Performed by Ordnanceman on Aero 5A-1.
4. Aft Umbilical Connector ..... PLUGGED IN
   Performed by Ordnanceman.
5. Safety Pins ..... REMOVED
   Ordnanceman remove three (3) pins, show red flags to pilot/co-pilot.

AFTER AIRBORNE

Perform this check when airborne and safely clear of friendly forces:

1. Circuit Breakers ..... IN
2. Master Arm ..... ON
3. Bomb Station Select Switch ..... OFF
4. Ready-OFF Switch ..... OFF
   Warm-up time requires a minimum of five (5) minutes prior to firing.
5. Fly-By Check with R947/DRM3
   Tester ..... COMPLETED

WARNING

When the READY-OFF switch is on READY, the transmitter is on. This switch must not be placed in READY position except when actually firing the missile.

FIRING CHECK LIST

To fire the missile, perform the following:

1. Station Select Switch ..... SELECT
   Station 1 or 6 to match selected missile.
2. Port-Starboard Switch .. DESIRED LAUNCHER
3. Arm-Safe-Unarm Switch ..... ARM

CONTINUED ON NEXT PAGE

FIRING CHECK LIST – CONTINUED

4. Ready-OFF Switch ..... READY

5. Launch Missile ..... FIRE
   Lift the launch toggle switch and push forward to the FIRE position. When the missile is seen in front of the aircraft, after motor burnout, begin controlling with the missile control switch.

UPON MISSILE IMPACT

1. Missile Control Panel Switches .... OFF/SAFE

2. Master Arm ..... OFF

3. Circuit Breakers ..... PULLED
   Not required if second missile is to be launched.

PRE-LANDING CHECK LIST

To be performed prior to landing with or without missile aboard.

1. Missile Control Panel Switches ..... SAFE

2. Master Arm ..... OFF

3. Circuit Breakers ..... PULLED
   Master Arm, Arming and all Bullpup.

EMERGENCY PROCEDURES

HANGFIRE - Missile smokes on the launcher:

1. Drop Missile and
   Launcher ..... PRESS "T" PICKLE
   Position station selector to insure selected missile only will drop from rack. Both missile and launcher will drop.

2. Jettison Handle ..... PULL IF ABOVE FAILS

CONTINUED ON NEXT PAGE

EMERGENCY PROCEDURES – CONTINUED

MISSFIRE - Nothing happens.

1. Circuit Breakers and Switches ..... RECHECK/RESET

2. FIRE BUTTON ..... LIFT/PUSH TO FIRE

WARNING

If missile fails to fire, maintain a safe heading for 15 minutes before attempting to fire the other or before landing.

part 2
CARRIER-BASED

SCOPE

Carrier based operations require a state of pilot training and proficiency beyond that necessary for shore based operations. In addition to understanding and complying with all current instructions applicable to piloting Naval aircraft, the pilot must become thoroughly familiar with shipboard operating procedures, policies and instructions. For additional information regarding carrier operations, refer to the CVA/CVS NATOPS Manual.

SCHEDULING

Aboard ship the flight schedule is promulgated by the operations department and becomes an order of the Commanding Officer of the Ship. The Air Group Commander (CAG), or his representative, coordinates air group scheduling with the ship. Since the Commanding Officer of the squadron is at all times responsible for the combat readiness of his unit, he must coordinate his needs with the ship through the CAG representative. The squadron flight schedule shall be promulgated in support of the Daily Air Operations Schedule. Assignment of aircrews to specific missions is a squadron function. Squadron scheduling must take every advantage of the flights and services available to further the airmanship and ASW training of each individual pilot, aircrewman and complete aircrew. Flights should normally be scheduled for a cycle time which will permit the accomplishment of the mission and still allow sufficient fuel for diversion to a shore station in case the aircraft condition, ship arresting gear condition, or weather conditions preclude recovery at the ship. This cycle time should also take crew fatigue into consideration.

BRIEFING

The briefing procedures will be the same as presented in Part 1, Shore Based Operations. In addition to the procedures in Part 1, the following information will be presented at shipboard preflight briefings.

1. Take-off information.
2. Position and intended movement (PIM).
3. Nearest land, bearing and distance (magnetic).
4. Nearest field, bearing and distance (magnetic).
5. Alternate field.
6. Weather at nearest and alternate fields.
7. Navigation aids at nearest and alternate fields.
8. CCA procedures, altitude assignments, frequencies and expected approach times.
9. Procedures in the event of communication or navigation aids failure.
10. Landing.

FLIGHT DECK OPERATIONS

GENERAL

The majority of the procedures followed at a shore base are also applicable to operations aboard ship. However, due to the confined area of a flight deck or a hangar deck and the large numbers of personnel directly connected with the movement, launching, and recovery of aircraft within these confined areas, every pilot operating an aircraft from an aircraft carrier must thoroughly know and understand the additional procedures, signals, limitations, and safety precautions involved.

PRE-FLIGHT

The preflight will be conducted in accordance with the procedure outlined in Part 1, Section III. If the aircraft is "down" ensure that flight deck control is notified immediately.

PRE-STARTING/STARTING

The starting procedures for the S-2 series on a flight deck or hangar deck are exactly the same as on a shore station, however, some differences will be noted as follows:

1. Aboard ship no aircraft is to be started except through the direction or approval of the Air Officer or his direct representative.
2. All aircraft to be started shall be under the control of a flight deck or hangar deck director.
3. Normally the outboard engine of an aircraft parked on the flight deck will be started first.
4. Aircraft shall be started at night with external lights off.
5. Pilots shall be constantly alert for signals from the flight deck director which may be of an emergency nature.
6. All tie downs shall remain on the aircraft until the director signals their removal.

TURN-UP

After completion of the Pre-Taxi Check List, either before or after wings are spread and locked, the turn up and engine checks shall not be commenced without approval of the director controlling the aircraft. Pilots shall remain alert for signals from him to delay or discontinue engine turn up. Pilots shall not allow themselves to be unduly hurried or pressured into moving the aircraft to the takeoff position. If unable to satisfy himself that this aircraft is in all respects ready for launch, the pilot shall request permission from Primary Fly to complete the necessary procedures and checks but at the same time he must not cause undue delay in deck operation. He must be alert for instructions to taxi forward to clear the landing area for any incoming emergency. Prior to take-off, the pilot will insure completion of the Take-Off Check List with the following additions:

1. Flaps - Set 2/3 DOWN or as directed.
2. Trim Tabs - Set as shown in table below.
3. Catapult Grip - DOWN for catapult launches.
4. Hatches - LOCKED OPEN, (P, CP)

CONTROL SETTINGS

FREE DECK LAUNCH

FLAPS	AILERON	RUDDER	ELEVATOR
1/3	0°	0°	0°
2/3	0°	0°	2° N D
FULL	0°	0°	2° N D

CATAPULT

FLAPS	AILERON	RUDDER	ELEVATOR
1/3	0°	2° NR	2° N D
2/3	0°	2° NR	0°
FULL	0°	2° NR	2° N D

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TAXIING

Taxiing an aircraft on a carrier is done under the positive control of a taxi director. No situation offers a greater test of teamwork and skill than that which must exist between the Pilot and his taxi director. While taxiing aboard ship the following rules must be adhered to:

1. All Pilots must be thoroughly familiar with all taxi signals used aboard ship.
2. The Pilot's undivided attention must be given to the taxi director; however, he shall also make himself completely aware of any situation visible to him which endangers the safety of his aircraft.
3. The taxi director must be in full view in order that signals may be recognized. At night both signal wands must be seen or the aircraft must be stopped.
4. Pilots should cause no undue delay in taxiing forward. At the same time pilots should not permit themselves to be dangerously hurried.
5. At night all exterior lights shall be OFF in order to avoid blinding flight deck personnel.
6. When STOP signals are given and held, the parking brake should be set to avoid inadvertent movement, except when aircraft is over shuttle.
7. When taxied onto an elevator for striking below, the pilots shall remove their helmets as soon as the engines are shut down. This will aid in hearing whistle signals while being maneuvered on the hangar deck.

HANGAR DECK OPERATIONS

GENERAL

The dimensions of the aircraft make its movement on the hangar deck hazardous at all times. The propellers, depending on position, may extend 7" beyond the wing butt.

TOWING

Due to the small clearance between the vertical stabilizer and the overhead of the present day CVS, extreme caution must be exercised when moving the aircraft.

CAUTION

A nose block will be secured to the nose wheel oleo to prevent the vertical stabilizer from being thrown against the overhead when the brakes are applied.

Before moving the aircraft, depress the brake pedals, release the parking brake and then the brake pedals. The aircraft will have approximately eight applications of the emergency brake available after the engines have been shut down.

LAUNCH OPERATIONS

FREE DECK LAUNCH

WARNING

Minimum IAS for single engine directional control speed is 90 knots. If sufficient deck run length is not available for 90 KIAS take-off speed, the aircraft should be catapult launched.

1. After completion of the Take-off Check List, a turn up signal is given by the Launching Officer. Hold brakes and advance throttles to 30 inches of manifold pressure, and scan all engine instruments for proper operation. If the aircraft develops a malfunction and the Pilot does not desire to launch, both he and the copilot shake their heads from side to side and indicate aircraft is down with a thumbs down, and standby for taxi signals. If ready for launch, give the appropriate signal to the Launching Officer. When signaled "Cleared For Takeoff", the pilot releases the brakes, and advances throttles smoothly to take-off power. The co-pilot monitors all engine instruments. Directional control is maintained with rudders. Prior to reaching the number one elevator the nose wheel should be eased off the deck, placing the aircraft in a flying attitude. In this attitude the aircraft will be flown off the deck just prior to reaching the bow.

CAUTION

Allowing the nose wheel to skip on the deck after rotation may cause the nose wheel to cock.

Retract the landing gear after clearing the bow. After establishing a normal climb attitude, raise flaps in 1/3 increments and set power for climb.

2. The free deck launch on the angled deck carrier starts from slightly left of center of the axial deck, and angles toward the center of the bow.

3. At night the turn up signal is given with a green wand. Insure the wing and tail running lights are set. Indicate "Ready for takeoff" by switching the master exterior light switch to ON. A "NO GO" at night is indicated by not turning on the running lights. Reduce power and inform Primary Fly of the situation.

WARNING

Exercise care in the use of power when the deck is slippery. In the event of a free deck launch, grease may exist in the arrestment wire area.

CATAPULT LAUNCH

1. After completing the Takeoff Check List, the aircraft will be taxied onto the catapult and positioned for the "holdback fitting". A nosewheel steering device may be used to guide the aircraft onto the catapult. If so, no directional brake signals will be given, but the use of both brakes simultaneously and smoothly will effect slowing or stopping as signaled. Taxi should be with a minimum amount of power versus brakes and signals must be answered promptly and precisely. Particular care must be taken to avoid over-running the proper holdback position.

2. After the holdback fitting is in place, the director may signal for a little power to facilitate hooking up the bridle. As soon as the bridle is secured, a "release brakes" signal is given and tension is taken on the catapult. The parking brake should be rechecked in the OFF position and the pilot's heels should be dropped to the deck to avoid unintentional brake application from this time on.

3. The turn up signal will be given in the same manner as for a free deck launch. On the catapult full power is set and the pilot's fingers are placed around the catapult grip.

CONTINUED ON NEXT PAGE

LAUNCH OPERATIONS—CONTINUED

CAUTION

Care must be exercised not to overboost the engines, because no sea level throttle stop is installed.

Note

While at full power, but prior to signaling ready for launch, the pilot checks engine instruments to insure normal operation. Also check that a faulty auto feather sensing switch is not automatically feathering a good engine. The co-pilot watches the Catapult Officer for possible signals.

4. During daylight give the appropriate signal to the Catapult Officer when ready to launch. At night the signal is given by turning preset running lights to ON with the master exterior light switch. In daytime a "NO GO" signal is executed by both pilots shaking their heads from side to side. At night a "NO GO" is indicated by not turning the lights ON. In both instances broadcast "SUSPEND". In any case the pilot will keep full power on until the Catapult Officer has given the signal to throttle back to idle.

5. After the ready signal has been given, maintain the yoke in a neutral position. Do not attempt to fly the aircraft during the catapult run. Upon reaching the end of the flight deck, maintain a climbing attitude and retract the landing gear. When established in a climb, proceed in the same manner as for a deck launch.

CAUTION

At 1/3 flap setting during high wind conditions, avoid tendency to over-rotate to prevent damage to the aircraft by the bridle on launch.

6. On night launches, both catapult and free deck, the co-pilot should set the running lights to bright, and anti-collision lights as required, shortly after leaving the deck.

ARRESTMENT OPERATIONS

ARRESTED LANDINGS

After flying the appropriate pattern, receiving the cut, and engaging the wire, proceed as follows:

1. At night turn master light switch - OFF.
2. Hook - UP on signal.
3. Flaps - UP if final landing. If expecting immediate takeoff, set to 2/3 or as directed.
4. Trim tabs - If expecting immediate takeoff, set to takeoff setting.
5. Brakes - as signaled.
   a. Stay off brakes to allow roll back and dis-engagement of the hook from the arresting wire.
   b. When the hook is disengaged, the director will signal for brakes and/or power to stop backward movement.

CONTINUED ON NEXT PAGE

ARRESTMENT OPERATIONS—CONTINUED

6. Taxi clear or line up as directed. If a final landing, fold wings as soon as flaps are up, on signal.

WARNING

Simultaneous use of excessive power against brakes shall be avoided to preclude the possibility of locking the brakes thus reducing the braking coefficient.

TOUCH-AND-GO LANDINGS

After receiving the cut, and touching the deck, take-off power is applied smoothly while maintaining the take-off attitude. When safely airborne the landing gear is retracted. When directed by the pilot, the co-pilot backs up the pilot on the quadrant as briefed and selects 2/3 flaps. When clear, parallel ships course.

NON-ARRESTED LANDINGS (BOLTERS)

Non-engagement of the arresting wires which results in an unintentional touch and go, is referred to as a "Bolter." A bolter is readily apparent by the lack of deceleration immediately after touchdown. The pilot must be prepared to add takeoff power and proceed as in touch and go landings.

BARRICADE ARRESTMENT

See Section V for procedures.

WAVE-OFF

NEW NEW NEW NEW NEW

The Wave-off signal, given by flashing red lights and/or radio transmission is a mandatory signal and shall be executed immediately. Pilots should execute their own Wave-Off at any time it appears to them that the aircraft is approaching a dangerous situation, and once commenced it shall be completed. A cut signal is not mandatory if received after a wave-off is initiated by the pilot. The Wave-Off is executed by simultaneously leveling the wings, adding full power and raising the nose to a slight climbing attitude. The co-pilot shall immediately raise the hook and then back up the pilot as briefed. The landing gear is raised when well clear of the landing area. When the climb is established raise the flaps in 1/3 increments consistent with best single engine performance (see figures 11-33 and 11-34). Once clear of the ship, fly parallel to the ship's course.

THE CUT

The Cut is a mandatory signal except as noted above and should only be given when the aircraft is in a safe position for landing. Pilots will not take their own cut. Taking a wave off after a Cut signal has been received is hazardous. It may result in an inflight arrestment and subsequent injury to personnel and/or damage to the aircraft.

CLEARING THE LANDING AREA

When clear of the arresting gear, the taxi forward will be done under the control of directors. After the flaps are up, the wing fold system will be activated on signal from the director. Speed in clearing the landing area is essential, however, control of the aircraft must be maintained.

WARNING

Simultaneous use of excessive power against brakes shall be avoided to preclude the posibility of locking the brakes, thus reducing the braking coefficient.

The dimensions of the aircraft necessitates extreme care when approaching a parking location in close proximity to aircraft, equipment and personnel. The crew will remain strapped in their seats and will not disembark from the aircraft until directed by the Pilot in Command.

DE-BRIEFING

The de-briefing of flights while operating from a carrier shall be conducted as specified in Part 1 for Shore Based Operations.

STANDARD S-2D/E CHECK LIST

PRE-START

PARACHUTES ..... FITTED
MAGS ..... OFF
PARKING BRAKE ..... SET
PITOT HEAT ..... OFF
COWL FLAPS ..... OPEN
OIL COOLERS ..... OPEN
CARB AIR ..... DIRECT
AUX PUMPS ..... ON
GEAR HANDLE ..... DOWN/DETENT
GUST LOCK ..... STOWED
GENERATORS ..... ON
BUS TIES ..... NORMAL
DEICERS ..... FOUR OFF
AUTO FEATHER ..... OFF
EMERG SWITCHES ..... OPEN
FUEL DUMP ..... OFF
PROPS ..... FULL INCREASE
THROTTLES ..... CRACKED
MIXTURES ..... IDLE CUT OFF
ICS ..... SET
FLAPS ..... UP
HOOK ..... UP
WINGS/SELECTOR ..... CORRESPONDING
HEATER/VENT ..... OFF
LIGHTS ..... SET
RADIOS/IFF ..... OFF
CSD DISCONNECTS ..... WIRED
RAFT HANDLE ..... WIRED
FUEL SELECTORS ..... CROSSFEED
CIRCUIT BREAKERS ..... CHECKED
EMERG HYD CONTROLS ..... NORMAL
PUMP HANDLE/SOCKET ..... STOWED/CLEAR
RUDDER ASSIST ..... OFF
ARM MASTER ..... OFF
TORP BAY DOORS ..... CORRESPONDING
EQUIPMENT ..... OFF
MANIFOLD PRESSURE ..... REPORT (IN. HG)

(EXTERNAL POWER)
WHEELS POSITION INDICATOR ..... ALL DOWN
WARNING LIGHTS ..... CHECKED

PRE-TAXI

AUX PUMPS ..... OFF/DROP
GENERATORS/BATTERIES ..... CHECKED
TRIM TABS ..... CHECKED
RADIOS/IFF ..... ON
EQUIPMENT ..... ON
CSD TEMPERATURES ..... CHECKED
HYD PRESSURE ..... CHECKED
STALL WARNING ..... CHECKED
CARB ALT AIR ..... CHECKED
DEICERS ..... CHECKED
FUEL ..... DIRECT/QUANTITY
CIRCUIT BREAKERS ..... CHECKED
MAGS ..... GROUND CHECKED
CREW REPORT ..... READY TO TAXI
BRAKES ..... CHECKED
WINGS ..... SPREAD/LOCKED
FLAPS/RUDDER ASSIST/CONTROLS ..... CHECKED
LIGHTS ..... CHECKED/SET
FLIGHT INSTRUMENTS ..... ERECT/SET

ENGINE RUN-UP ..... COMPLETE

TAKE-OFF

TRIM TABS ..... SET
COWL FLAPS ..... OPEN
OIL COOLERS ..... SET
CARB AIR ..... AS REQUIRED
AUX PUMPS ..... ON/RISE
FUEL ..... DIRECT/QUANTITY
PROPS ..... FULL INCREASE
MIXTURES ..... RICH
AUTO FEATHER ..... ARMED
CAT GRIP ..... SET
FRICTION LOCKS ..... SET
AFCS ..... STANDBY
PITOT HEAT/DEICERS ..... SET
RADIOS/IFF ..... SET
DOPPLER ..... XMIT/TEST
ALTIMETERS/RAWS ..... CHECKED/SET
WINGS ..... LOCKED
FLAPS ..... SET
CONTROLS ..... FREE
RUDDER ASSIST ..... ON
LOOSE GEAR ..... STOWED
HARNESS ..... LOCKED
HATCHES ..... LOCKED
LIGHTS ..... AS REQUIRED
COMPASSES ..... ALIGNED
CREW ..... BRIEF/REPORT

POST TAKE-OFF

LIGHTS ..... AS REQUIRED
RUDDER ASSIST ..... OFF
FLAPS ..... SET
AUX PUMPS ..... OFF/DROP
AUTO FEATHER ..... OFF
COWL FLAPS ..... AS REQUIRED
OIL COOLERS ..... AS REQUIRED
CARB AIR ..... AS REQUIRED
MIXTURES ..... NORMAL
INSTRUMENTS/NACELLES ..... CHECKED

LOW ALTITUDE

HARNESS ..... LOCK
GLOVES ..... ON
CHIN STRAPS ..... TIGHT
RADOME ..... UP
RADAR ALTIMETER ..... ON
AUTO FEATHER ..... ARMED
AUX PUMPS ..... ON
CO-PILOT'S CONTROL COLUMN ..... ENGAGED

F-SAD1-182-1

Figure 3-4 (Sheet 1)

STANDARD S-2D/E CHECK LIST

PRE-LANDING

MAD BOOM/RADOME/MCJR ANTENNA	IN/UP/UP
ARM MASTER	OFF
RADIOS/NAVAIDS	SET
DEICERS	AS REQUIRED
RADAR ALTIMETER	SET
HEATER	OFF
LIGHTS	SET
LOOSE GEAR	STOWED
HARNESS	LOCKED
CREW	REPORT
MIXTURES	RICH
CARB AIR	AS REQUIRED
AUTO FEATHER	ARMED
AUX PUMPS	ON/RISE

LANDING

HOOK	AS REQUIRED
WHEELS	DOWN/LOCKED
RUDDER ASSIST	ON
COWL FLAPS/OIL COOLERS	AS REQUIRED
HATCHES	LOCKED
FLAPS	SET
PROPS	FULL INCREASE

POST LANDING

FLAPS	UP
COWL FLAPS/OIL COOLERS	OPEN
CARB AIR	DIRECT
AUX PUMPS	OFF
AUTO FEATHER	OFF
RUDDER ASSIST	OFF
LIGHTS	AS REQUIRED
PITOT HEAT/DEICERS	OFF
UNNECESSARY RADIOS	OFF
DOPPLER	STBY
WINGS	AS REQUIRED

GROUND SECURE

PARKING BRAKE	SET
MAGS	GROUND CHECK
SCAVENGE ENGINES	1200 RPM/30 SEC
EQUIPMENT/UHF	OFF
GENERATORS	OFF
MIXTURES	IDLE CUT OFF
FUEL SELECTORS	OFF
MAGS	OFF
LIGHTS	OFF
GUST LOCK	LOCKED
WHEELS	CHOCKED
PARKING BRAKE	AS REQUIRED
HATCHES	CLOSED

EMERGENCY SHUTDOWN

MIXTURES	IDLE CUT-OFF
PROPELLER	FEATHER/FULL DECREASE
EMERGENCY SWITCHES	AS REQUIRED
FUEL SELECTOR	AS REQUIRED

IN FLIGHT SECURE

RUDDER ASSIST	ON
PROP(S)	FULL INCREASE
THROTTLE(S)	AS REQUIRED
MIXTURE(S)	RICH
WHEEL(S)	UP
FLAPS	AS REQUIRED
JETTISON	AS REQUIRED
AUTO FEATHER	AS REQUIRED
THROTTLE	AS REQUIRED
PROPELLER	FEATHER/FULL DECREASED
MIXTURE	IDLE CUT-OFF
EMERG FUEL/OIL/HYD	AS REQUIRED
COWL FLAPS/OIL COOLER	AS REQUIRED
AUX PUMP	OFF
FUEL SELECTOR	OFF
MAG	OFF
AUTO FEATHER	OFF
GENERATOR	AS REQUIRED
AC BUS TIE	AS REQUIRED
ELECTRICAL LOAD	REDUCE

IN FLIGHT RESTART

MIXTURE	IDLE CUT OFF
THROTTLE	CLOSED
PROP	FULL DECREASE
FUEL SELECTOR	DIRECT
AUX PUMPS	ON
EMERG FUEL/OIL/HYD	OPEN
MAG	BOTH
FEATHER BUTTON	PULL TO 800 RPM
MIXTURE	RICH
WARM UP	1500/18" TO 100° CYL TEMP
COWL FLAPS/OIL COOLER	AS REQUIRED
GENERATOR	ON
BUS TIE	NORMAL
POST TAKE OFF CHECK LIST	CHECK

G-SAD1-182-2

Figure 3-4 (Sheet 2)

part 3

FUNCTIONAL CHECK FLIGHTS

FUNCTIONAL CHECK FLIGHTS

PROCEDURES

The Functional Check Flight procedures contained herein are for post calendar and post aircraft rework flights, sequenced in the order in which they shall be performed. Other Functional Check flights required by NAVAIRINST 4790.2 are similar to the calendar check and any additional guidelines necessary are promulgated as part of the Functional Check Flight Checklist. NATOPS procedures will apply during the entire check flight. Only additional procedures not covered elsewhere in this manual are expounded upon. Functional Check Flight Checklists, published by Naval Air Systems Command, shall be carried in flight for use as a guide and for recording flight data. At the discretion of the unit Commanding Officer, additional Functional Check flights, based upon the type and amount of work accomplished and its effect upon the safety and reliability of aircraft operation are authorized and encouraged. These flights shall be conducted under the guidelines contained herein or in the Functional Check Flight Checklists.

REQUIREMENTS

The Functional Check Flight shall be performed after the completion of certain scheduled and unscheduled maintenance using the applicable Functional Check Flight Checklist. Only those pilots designated by the Commading Officer, in writing, shall fly as Pilot in Command on check flights. The flight crew for check flights shall consist of the Pilot in Command, the Co-pilot and such other crew member as the Commanding Officer determines necessary; however, passengers shall not be carried. Check flight personnel shall familiarize themselves with the Functional Check Flight Requirements prior to the flight and be fully NATOPS qualified in the S-2D/E series. A daily inspection is required prior to any check flight.

CONDITIONS

To test feather a propeller the aircraft must be flown at least 4,000 feet AGL in VFR weather. Approaches to stalls shall be flown with the aircraft at least 8,000 feet AGL in VFR weather. Post maintenance check flights should be conducted during daylight hours, within local flying areas, and under visual flight rules. However, if necessary to accomplish the mission, unit commanders may authorize check flights under conditions other than the above, if in his opinion the flight can be conducted with an acceptable margin of safety under existing weather conditions. This authority may not be delegated. Portions of the flight that are considered critical should be conducted in the vicinity of a suitable landing area.

PRE-TAKEOFF

PREFLIGHT INSPECTION

Perform preflight inspection in accordance with Section III. Particular attention shall be placed upon the security and integrity of all changed components.

PRE-START

1. Record the static MAP for each engine. Compare these values to the field barometric pressure. An error of 0.5 inch Hg. is allowed in the MAP gauge.

2. Obtain OAT from the cockpit indicator and the dew point from published data and record.

CONTINUED ON NEXT PAGE

PRE-TAKEOFF – CONTINUED

3. Record published station altimeter setting.

4. Check warning lights, wheels position indicator, throttle position switches aileron trim tabs and rudder trim tabs in accordance with Section III.

PRE-TAXI

1. Check the elevator trim tabs, elevator emergency stop button and elevator trim tab standby switch after aircraft AC power becomes available, in accordance with Section III.

2. Check batteries, generators, carburetor alternate air and deicing equipment in accordance with Section III.

3. In addition to the normal brake check, operate each brake separately. There should be positive response with no sponginess, chattering or fading.

4. Check wings, flaps, rudder assist, flight controls and lights as directed by the aircraft director and in accordance with Section III, and Section VII.

5. Actuate the ground ventilation fan switch and check for proper operation of tne air ventilation system.

TAXI/TURN UP

Measure the Carbon Monoxide concentration at crew breathing levels both with hatches open and closed, at each of the following headings relative to the wind direction: 0°, 90°, 180°, and 270°. Record wind velocity. The maximum carbon monoxide concentration in any occupied part of the aircraft shall not exceed 0.02 percent.

Flight Instruments

1. The pilots VGI and co-pilots attitude gyro should show aircraft attitude.

2. The BDHI indicators should show the magnetic heading of the aircraft.

3. The turn-and-bank needle should move in the direction of turn and the ball should move opposite to the direction of turn.

4. The standby compass should indicate magnetic heading of the aircraft.

Propeller Performance

Perform propeller unfeather, manual feather and auto feather checks in accordance with Section III. With the propellers at full decrease the RPM should be 1250-1400. 1200 RPM is minimum for flight acceptance. Record full decrease RPM.

Engine Instrument Recordings

With the propeller controls at full low pitch advance the throttles to 1800 RPM. Record applicable engine pressure and temperature readings.

Engine Performance

Perform field barometric power check, magneto check and lean drift check in accordance with Section III. Record RPM, torque pressure, MAG drops and torque pressure changes. While advancing the throttles with the auto feather system armed, observe the opening of the torque pressure sensing switch by noting the torque pressure sensing light extinguish in the propeller feather button. The torque pressure sensing switch should open at 142 ± 10 psi. While retarding the throttle observe the torque pressure sensing light illuminate in the propeller feather button. The torque pressure sensing switch should close at 125 ± 5 psi. Record the torque pressures at which the torque pressure sensing switches open and close.

CONTINUED ON NEXT PAGE

PRE-TAKEOFF – CONTINUED

IN-FLIGHT

Climbing to 8000 Feet

Engine Performance (TAKE OFF)

Observe Engine RPM, MAP and engine pressure and temperatures, as applicable, for correct readings.

Note

Check-list limits are for sea level take-off using grade 115/145 fuel. Refer to Section XI Part 4 for non-sea-level performance and Section I for power settings with alternate fuel (100/130).

Engine Performance (Fast Climb)

Observe MAP, engine pressures and temperatures, as applicable, for correct readings.

Aircraft Systems

1. Observe that the radar altimeter follows the pressure altimeters (if over water or flat terrain) to the appropriate altitude and that the index pointer becomes properly masked above operating altitude of the radar altimeter.

2. Lower the radome prior to cruise altitude at an airspeed of 150 KIAS or less and record time required. The radome should indicate DOWN in 21 ± 4 seconds.

3. Extend the MAD boom prior to cruise altitude at an airspeed of 150 KIAS or less and record the time. The MAD boom should indicate OUT in 13 ± 3 seconds.

CRUISE ALTITUDE

Engine Performance (Cruise Power)

Note

- Selection of RPM, MAP and torque pressure (engine power) settings are optional within the limits set forth in Section I.

- Adjust mixture from RICH to NORMAL; one engine at a time. At Cruise power setting; check RPM, torque pressure and MAP indications; propeller controls and throttles for alignment. Set power at 2000 RPM, 210 psi torque pressure with the mixtures RICH. Slowly adjust mixture from RICH to NORMAL and observe maximum torque pressure (best power). Continue to NORMAL detent and observe torque pressure. Torque pressure drop from best power to normal, should not exceed 15%. With MAP matched, throttles should match and the difference in torque pressure should not exceed 25 psi. Observe engine RPM, MAP and engine temperature and pressure readings as appropriate.

Aircraft Systems

1. Actuate fuel dump and visually check for start and stop capability.

2. Observe the fuel gauges for decrease in fuel quantity as fuel is used.

3. Actuate tail hook and verify proper functioning by light indication and jarring of the tail hook handle on retract when the handle is held slightly down from the stowed position.

CONTINUED ON NEXT PAGE

PRE-TAKEOFF – CONTINUED

4. Check the AFCS in accordance with Section III.

5. In normal cruise configuration, at 110 KIAS, carefully trim aircraft directionally, using NOSE LEFT/NOSE RIGHT rudder trim switch. With feet on rudder pedals, place Single Engine Rudder Assist switch ON. Under optimum conditions no trim change will result. If trim change is evident, bring aircraft back in trim by first using foot force on rudder pedals and then rudder trim to relieve this force. Record amount and direction of trim required to accomplish this. Trim should not exceed one-half degree. After completing the above test repeat at 130 KIAS.

Note

Operation of the rudder assist above 130 KIAS is not recommended during two engine flight.

6. Trim aircraft for straight and level flight at 140 KIAS.

   (a) Observe aileron for proper response to trim selection. Indication should be 0 ± 3 degrees in level flight.

   (b) Observe elevator for proper response to trim selection.

   (c) Observe rudder for proper response to trim selection. Indication should be 0 ± 1 degree in level flight.

7. Normal hydraulic pressure should be 1500 ± 200 psi.

8. After the radar and MAD equipment checks are completed, lower the landing gear and observe the automatic raising of the radome and retraction of the MAD boom, record times.

Note

After automatic retraction of radome, ensure radome position switch is in the UP position.

9. At an indicated airspeed of 240 KIAS or less, check normal operation of torpedo bay doors. Doors should open and close in approximately 0.5 seconds. Check emergency operation of torpedo doors by placing emergency selector to OPEN. Operate hand pump to extend doors. When extended, place emergency selector to CLOSED and operate hand pump to close doors. Reset torpedo bay door dump valve with doors closed and torpedo bay switch in the closed position.

WARNING

Do not use finger to reset torpedo bay dump valve as injury may result.

10. Check landing gear emergency operation at an airspeed of 150 KIAS or less.

CAUTION

Emergency landing gear systems must be checked in the following sequence to avoid rupture of hydraulic lines. Select DOWN on emergency landing gear control. Pump gear until DOWN indication shows in wheels position indicator. Place gear handle in DOWN position. Position emergency selector valve to NORMAL (neutral position). Reset landing gear dump valve and raise gear by normal system. Landing gear retraction time should not exceed 14 seconds.

CONTINUED ON NEXT PAGE

PRE-TAKEOFF – CONTINUED

11. At an airspeed of 130 KIAS or less, select 1/3 flap position. Retard throttles. Select 2/3 and full DOWN positions and return to full UP position. Flap position indication should correspond to position selected. Place wing flap emergency selector in DOWN position and lower flaps with hand pump. Place normal flap position selector to DOWN position, re-position emergency selector handle to NORMAL position, reset the dump valve and raise flaps with normal system.

CAUTION

Do not exceed 130 KIAS during emergency flap operation.

12. Check automatic propeller feathering using the procedures on the Inflight Secure Checklist, Section V.

Note

Feather button should pop out. AC loadmeter should indicate feather pump cut-out, within 7 seconds after propeller has feathered. If feather button fails to pop out, pull feather button out manually and check for drop on AC loadmeter. Attempt to cool engine oil to 80 degrees C or below and again check the propeller pressure switch for proper operation. The feather pump operating cycle is 1 minute ON and 14 minutes OFF.

13. Stall Warning System

WARNING

Do not perform full stalls, it may result in inverted flight.

(1) Perform power-off clean approach to stall as set forth in Section IV. Record KIAS at actuation of stall warning system.

(2) Perform power-off dirty approach to stall as set forth in Section IV. Record KIAS at actuation of stall warning system.

14. Check heater for operation and heat control. Check vent air fan for cut-out at approximately 125 KIAS.

Note

The heater will automatically shut off when the cabin temperature reaches 27 degrees C. Measure the carbon monoxide concentration level for each crew station during the normal climb (mixtures rich); and normal cruise. Ventilators and hatches should be closed during the tests. If higher readings than 0.005 are obtained open hatches and vents. Remeasure the carbon monoxide concentration to determine if safe flight may be continued.

15. With the heater operating at maximum capacity, measure the carbon monoxide concentration at the pilot and crew heater outlets. The maximum carbon monoxide concentration shall not exceed 0.005 percent.

Note

Do not reuse sampling bulb after one hours usage.

16. Operate the searchlight in accordance with Section IV.

CONTINUED ON NEXT PAGE

PRE-TAKEOFF – CONTINUED

17. Record frequency and phase voltages of both generators. If abnormal voltages are noted, check and record voltages under no load conditions by selecting TEST position with the generator control switch. Adhere to emergency procedures in Section V, should abnormal generator indications be observed.

18. Turn on windshield wash, check operation of windshield wiper throughout entire range and observe increase in speed, sweep and smooth operation. Select OFF as blades reach PARK position.

CAUTION

Do not operate windshield washer using water when operating in freezing temperatures; do not operate wipers on dry windshield.

19. Check the operation of the MCJR antenna.

COMMUNICATIONS AND NAVIGATION EQUIPMENT

Communications and Navigation equipment shall be checked in accordance with the procedures set forth in Section I.

MISSION EQUIPMENT

Mission equipment shall be checked as indicated:

1. AN/ASN-30 Navigational Computer Display Set. Perform pre-flight check of initial settings and inflight operations in accordance with NAVAIR 01-85SAD-1A (CONFIDENTIAL)

2. AN/ASA-31 Target Position Computer Group. Perform inflight computer accuracy check in accordance with NAVAIR 01-85SAD-1A (CONFIDENTIAL)

3. AN/ASQ-80 Coordinate Data Set. Perform inflight checks in accordance with Section IX.

4. Check the OTPI for proper functioning in accordance with Section VIII.

5. AN/ASQ-10 Magnetic Anomaly Detector. Perform inflight adjustments and check in accordance with Section IX.

6. AN/ALD-2 ECM Direction Finder. Perform inflight check in accordance with NAVAIR 01-85SAD-1C.

7. AN/ASR-3 Condensation Nuclei Detector. Perform inflight check in accordance with Section IX.

8. AN/APS-88 Radar. Perform the following abbreviated check;

   (a) Observe control panel test meter current of .6 ± 2 for AN/APS-88 and .7 ± 3 for AN/APS-88A.

   (b) Control panel test meter crystal current is .6 ± 1 for AN/APS-88 and .7 ± 2 for AN/APS-88A.

   (c) AFC lock-on current indications should be steady. Sweep should be centered, ranges should be linear and extend to scope radius. INT

CONTINUED ON NEXT PAGE

PRE-TAKEOFF – CONTINUED

control should be functional and range mark intensity variable by MKR INT control. Check the following range scales:

RANGE	RANGE MARKS	INDICATOR LIGHT
3-30/1	Minimum 2 or 3 range marks Maximum 30 range marks	ON
3-30/5	Minimum No range marks Maximum 6 range marks	ON
50/10	5 range marks	ON
100/20	5 range marks	ON
240/30	5 range marks	ON

(d) Heading marker intensity control should be functional. Place bearing switch to RE and bearing marker relative. Move bearing switch to N and to S (180 difference) and check scope presentation. There should be no appreciable change in STAB mode with ± 15 degree pitch and bank maneuvers.

9. Check for proper clock operation (2).

10. AN/ARR-58/52/52A Sonobuoy Radio Receiving Set. Perform inflight check in accordance with NAVAIR 01-85SAD-1A (CONFIDENTIAL).

11. AN/ASA-26 JULIE Recorder. Perform inflight check in accordance with NAVAIR 01-85SAD-1A (CONFIDENTIAL).

12. AN/UNH-6 Tape Recorder. Record at least 10 minutes ICS conversation, UHF audio or sonobuoy audio one at a time, from pilot and Number 4 Operator positions. Pilot on channel A and Number 4 Operator on Channel B. Observe VU meter on tape recorder for zero audio peak average of ICS and audio on both channels. After flight, replay tape on magnetic tape recorder. Audio should not be affected by background noise.

13. AN/AQA-4 (V) JEZEBEL Indicator. Perform inflight check in accordance with NAVAIR 01-85SAD-1A (CONFIDENTIAL).

14. AN/AKT-19 MCJR Transmitter. Perform antenna and transmitter check in accordance with NAVAIR 01-85SAD-1A (CONFIDENTIAL).

Flight instruments as required.

LANDING

Landing Checks

Below 1000 Feet:

1. The AFCS should engage below 1000 feet and the AFCS altitude monitor ON/OFF Limit indicator should indicate proper operation in the pilots AFCS Altitude Monitor.

2. Check the wheels warning light place propellers in full low pitch and reduce airspeed to 100 KIAS. With the gear up and the flaps down, retard both throttles. Record the MAP at which wheels warning light commences to flash.

3. Check radar altimeter against pressure altimeter for proper altitude indication.

4. Descend aircraft through 300 feet with the wheels up or down. The RAWS should give a 3 second aural and visual warning. When below 100 feet, with the wheels down a continuous visual signal should be noted.

CONTINUED ON NEXT PAGE

PRE-TAKEOFF –CONTINUED

POST LANDING

POST LANDING CHECKS

Prior to Shut Down:

1. Raise flaps and note flap indication. If flaps do not indicate UP, reset the flap dump valve with the control handle in the position depicted by the flap indicator.

CAUTION

Do not attempt to fold wings with the flaps down.

2. Fold wings and note position of both wings prior to entering parking area.

3. Perform idle mixture check and record RPM rise as the mixture is slowly retarded from the normal detent.

After Engine Shut Down:

1. Check the emergency and parking brake accumulators pump-up feature (AFC 481) by applying the parking brake several times to partially bleed the accumulator. With a qualified observer stationed outside the aircraft to observe the parking brake accumulator gauge, select parking brake in the emergency hydraulic system compartment. Pump the parking brake accumulator to 1500 psi. Re-apply parking brake.

2. Perform post flight inspection, checking for fuel, oil and hydraulic leaks.

section IV
FLIGHT PROCEDURES

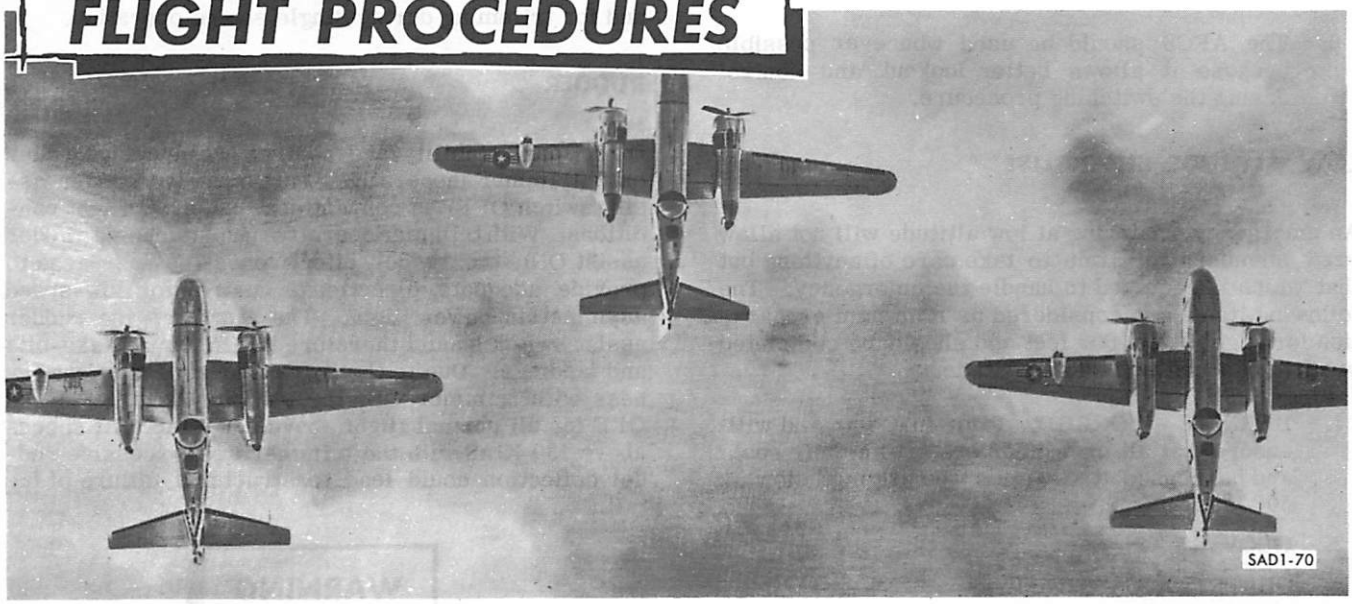


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WARNING

Information contained in this section does NOT constitute authorization to carry or release any internal or external stores. For stores authorization and applicable limitations, see Figure 1-75 in Section I, Part 4 of this manual.

SCOPE

This section is devoted to the flight characteristics and standard operating procedures relating to the many general facets of flying the S-2D/E. Engine operating procedures and emergency procedures are not included herein as they are the subjects of other sections of this manual.

SWITCHING PILOTS

From time to time it will be necessary for the pilot and co-pilot to exchange positions while airborne. To standardize the method by which this exchange is accomplished, it shall be done as follows:

1. Prior to undertaking the switch, attain an altitude of not less than 1000 feet, and place the mixture controls in the RICH position.
2. Pilot will maintain level flight.
3. The co-pilot will vacate his seat and transfer the pilot's headset cord to the co-pilot's jack.
4. The pilot will move to the right seat and continue to maintain level flight until the co-pilot (the new pilot) is completely strapped in and ready to take control in the left seat.

5. The new co-pilot passes control, receives a positive acknowledgement from the pilot, and straps himself in. The mixture controls may then be returned to NORMAL.

6. The AFCS should be used whenever possible because it allows better lookout and control during the switching procedure.

LOW ALTITUDE CHECK LIST

An emergency occurring at low altitude will not allow crew members the time to take care of anything but that which is required to handle the emergency. The following items are considered as minimum preparation for flight below 500 feet and should be completed prior to descent below this altitude.

1. HARNESS - LOCKED. Pilot-in-Command will ensure that all crewmembers are in their seat and harnessed at all times when flying below 500 feet.
2. GLOVES - ON.
3. CHIN STRAPS - TIGHT.
4. RADOME - UP. Unless required for tactics.
5. RADAR ALTIMETER - ON. Set desired altitude limit (APN-117 only).
6. AUTO FEATHER - ARMED.
7. AUX PUMPS - ON.
8. CO-PILOT'S CONTROL COLUMN - ENGAGED.

FLYING CHARACTERISTICS

FLAPS

Flaps are used to lower aircraft stall speed. When flaps are lowered at airspeeds near the stall speed a slight nose-down pitch change and a decrease in drag results. This nose-down pitch change occurs throughout the aircraft's speed range but decreased drag results only at lower airspeeds. At some increased airspeed, the use of flaps results in a drag penalty. In the operating range above the minimum single engine control speed of 90 KIAS and below 112 KIAS, minimum aircraft drag and optimum performance is obtained with a 1/3 flap setting. Above 112 KIAS, optimum performance is obtained with flaps UP.

AILERONS

Although the lateral control consists of both ailerons and circular arc spoilers their combined effect is similar to conventional ailerons so far as the pilot is concerned. The aileron effectiveness is greater and the aileron forces are somewhat lighter than would be expected for this size and type of aircraft. Generally, on the first familiarization flight a slight amount of overcontrolling is encountered. The tendency to overcontrol laterally will be more noticeable with flaps down than with flaps up.

AILERON TRIM TAB

The aileron trim tab, located on the port aileron, is used to correct minor lateral out-of-trim conditions and for trimming during single engine operation.

RUDDER

Directional stability and control when using rudder only (trimmer inoperative, single engine rudder assist switch OFF) is conventional under all flight conditions. With trimmer operative (single engine rudder assist ON), the rudder effectiveness is increased to provide adequate directional control for low-speed asymmetric power flight. The single engine rudder assist switch should therefore be ON for all take-offs and landings. Due to the increased rudder effectiveness with trimmer ON, the switch should be turned OFF for all normal flight above 130 KIAS. At speeds above 130 KIAS with the trimmer ON, excessive rudder deflection could lead to structural failure of the tail.

WARNING

Intentional side-slips, with rudder trimmer ON, other than those required for normal cross-wind landings are PROHIBITED.

RUDDER TRIM TAB

The directional trimmer, driven electrically through a total travel of 10 degrees, 5 degrees right and 5 degrees left, is very sensitive. For normal two-engine flight throughout the speed and power range, no more than ±1 degree of electric trim is required. At high indicated airspeeds, only a momentary touch of the switch is necessary to retrim. The five degrees of trim, left and right, is provided to reduce the pedal forces for single engine operation. The directional trimmer should be checked for its zero position prior to take-off. A slight change in directional trim will be noticed, when the single engine rudder assist switch is turned ON after the aircraft is trimmed for single engine rudder assist switch OFF operation, or vice versa. This is due to the relative streamlining of the rudder and trimmer.

CAUTION

Do not trim rudder on ground with rudder assist ON unless rudder is centered.

During the rudder trim indicator check prior to take-off with rudder assist ON, full rudder throw should show 20°R and 20°L for corresponding rudder action. If different readings are encountered, center rudder (use control lock) and trim to zero, then unlock controls and repeat full rudder throw check.

ELEVATOR

In the clean configuration, the aerodynamic maneuvering forces are approximately 45 pounds per g. Starting from zero trim, a pull force of only 90 pounds will result in the design limit load factor of 3.0g being attained. Care must be exercised during pull-ups, following dives in which the push forces are not trimmed out, because the forces will be correspondingly lower.

ELEVATOR TRIM TAB

The electrically driven trailing edge elevator trim tabs are extremely powerful in trimming out the wheel forces. At high indicated airspeeds, they are very sensitive. Only a momentary flick of the trim tab switch is required for trimming.

RADOME OPERATION

Extension of the radome causes a very slight nose-up trim change which may be trimmed out with elevator tab.

TORPEDO BAY DOORS OPERATION

Opening the torpedo bay doors at any speed causes negligible trim changes when the radome is retracted or extended.

MAD BOOM OPERATION

Extension and retraction of the MAD boom causes no noticeable effect on the control or stability of the aircraft.

NORMAL OPERATING AIRSPEEDS

NEW The following standards are the normal operating airspeeds for the S-2 series. They do not restrict pilots from using other airspeeds or power settings where required.

CAUTION

Fast descents in low ambient temperatures at 1500 RPM and 15 inches MAP should be avoided to prevent excessive cooling.

Note

For best engine performance use maximum torque pressure for RPM selected unless limiting MAP is reached first. (Refer to Section I, Figure 1-74).

DESCRIPTION	KTS/IAS	RPM	MAP
SLOW CRUISE	130	1450-1800	—
NORMAL CRUISE	140	1450-1800	—
FAST CRUISE	155	2100	—
SLOW FLIGHT	90	2300	—
NORMAL CLIMB	130	2300	35"
FAST CLIMB	120	2500	45"
NORMAL DESCENT	130	1450-1800	(500 FPM)
FAST DESCENT	150	1500	15"
INSTRUMENT FINAL APPROACH ADF/TACAN/GCA, (GEAR—DOWN 2/3 FLAPS)	105	FULL INCREASE	—
CCA (FLAPS—DOWN GEAR— DOWN)	CARRIER APPROACH SPEED	FULL INCREASE	—

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IN-FLIGHT BURNOUT

During extended cruise power operation, lead compound scavenging (burnout) will be accomplished to reduce the possibility of backfire caused by fouled spark plugs. Conduct a one minute burnout after each hour of cruise power operation as follows:

1. MIXTURES - RICH
2. PROPS - 2100 RPM
3. THROTTLES - ADJUST TO 205 PSI Torque Pressure. Above 10,000 feet MSL, refer to Section I, Max Engine Operating Limits Figure 1-74.

Note

The burnout requirements are accomplished whenever power above 2100 RPM and 205 PSI torque pressure is used. The next burnout need not be repeated until one hour later.

STALLS

STALL WARNING

There is essentially no aerodynamic stall warning in the form of a buffet in any configuration. An artifical stall warning device shakes the pilot's and co-pilot's rudder pedals. The stall warning may cut in at any airspeed. The warning system should operate between 1.05 and 1.10 times the indicated stalling speed. The percentage warning above the stall falls into the above range regardless of power, flap or landing gear configuration.

WARNING

- Do not practice approach to stalls with greater than 50 percent normal rated power as the aircraft can attain very nose-high attitudes with very low indicated airspeeds. Recovery from such unusual attitudes is positive but the time required for recovery will depend upon nose attitude and indicated airspeed at the start of recovery. As an example, the lower the indicated airspeed the longer the recovery time. It is cautioned that the raising of flaps will aggravate the condition and increase the altitude required for recovery.

- With more than 50 percent normal rated power and a very nose-high attitude, the elevators may become ineffective. Reduction of power may be necessary to regain elevator control. This reduction of power causes the nose to drop, reducing angle of attack and increasing airspeed, thus increasing the altitude required for recovery.

STALL CHARACTERISTICS

Power Off — Clean Configuration Stalls

A mild roll-off of either the right or left wing and nose-down pitch generally indicates the stall. Normal stall recovery by use of forward wheel effects recovery of the aircraft rapidly. The roll-off can be controlled and the wings held level, resulting in a straight nose-down pitch, if lateral control is promptly applied. The rudder should not be used to pick up a wing because of the possibility of overcontrolling and a resultant spin. See figure 4-1 for basic stall speeds.

Power On — Clean Configuration Stalls

With power for level flight at 130 to 140 KIAS, the aircraft rolls off moderately fast at the stall. As the stall speed is approached, elevator forces increase slightly. At high power engine settings a pitch-up occurs prior to the stall and a push force on the control columns is required to maintain control.

Accelerated Stalls

When an accelerated stall is encountered, prompt recovery by use of slight forward wheel is necessary. The aircraft should be given time to increase airspeed, for a secondary accelerated stall may occur if a pullup is made too soon after recovery. Power-on accelerated stalls in either the clean or landing configuration usually roll off to the right. Moderate air frame buffet occurs at approximately 0.25g before roll-off occurs. For example, at 120 KIAS buffet occurs at approximately 1.8g with roll-off occurring at approximately 2.0 to 2.05 g.

Power Off — Landing Configuration Stalls

Stall recovery is more easily accomplished in the power-off landing configuration. Generally, a straight nose-down pitch occurs, although a mild right or left roll-off sometimes occurs simultaneously with the nose-down pitch. Lateral control is more responsive when the flaps are down and the roll-off can be easily controlled. The aircraft is very stable longitudinally, as evidenced by a large rearward motion of the wheel and moderately heavy pull forces.

Power On — Landing Configuration Stalls

With power for level flight at about 85 KIAS, a mild-to-moderate roll-off, usually to the right, occurs before the nose pitches down. This roll-off should be controlled by the wheel and not by the rudder pedals. As in the clean configuration, an increase in power above 50% normal rated power will decrease the elevator forces. Any increase in power, after a wing has dropped, will accelerate the roll-off.

PRACTICE APPROACHES TO STALLS

For demonstration of stall characteristics and recovery procedures, the approaches to stalls will be practiced as set forth below. The following chart contains information concerning the configuration and power settings to be used for practicing the various approaches to stalls.

TYPE	CONFIGURATION	RPM	MAP
POWER OFF	CLEAN	2100	17"
POWER ON	CLEAN	2100	23"
STEEP TURN	CLEAN	2100	23"
POWER OFF	DIRTY	2500	17"
POWER ON	DIRTY	2500	23"
APPROACH TURN	LANDING	2500	28"– 17"

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Stall Check List

Approaches to stalls shall be commenced above 8000 feet (AGL) after the Stall Check List has been completed as follows:

1. Loose Gear - STOWED
2. Props - SET
3. Mixtures - RICH
4. Rudder Assist - OFF (Except for Approach-Turn Stall)
5. Shoulder Harness - LOCKED
6. Clearing Turn - MINIMUM OF 90 DEGREES

Entry Procedures

After completion of the check list set power and configuration as shown above for the type desired. Entry shall be as follows:

POWER OFF/ON-CLEAN/DIRTY

Maintain wings level and avoid slipping and skidding while easing the nose up slightly to decrease airspeed slowly. Check effectiveness of ailerons and rudder while approaching the stall. Use ailerons to keep wings level.

STALL SPEEDS



CONFIGURATION **ALL**

MODEL(S): S-2D/E
DATA AS OF: MARCH 1967
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL

TAKE-OFF

POWER—TAKE-OFF
FLAPS—1/3 DOWN
LANDING GEAR—DOWN

CAUTION

WITH MORE THAN 50% NORMAL RATED POWER THE AIRCRAFT WILL ATTAIN VERY NOSE - HIGH ATTITUDES AS THE AIRCRAFT APPROACHES THE STALL. RECOVERY IS INCREASINGLY DIFFICULT AS TAKE-OFF POWER IS APPROACHED.

GROSS WEIGHT—LBS.	STALLING SPEED—KNOTS IAS ANGLE OF BANK				
	0°	15°	30°	45°	60°
21,000	72	73	77	86	102
25,000	78	80	84	93	110
29,000	84	85	90	100	119

CRUISE

POWER—CRUISE
FLAPS—UP
LANDING GEAR—UP
FOR POWER OFF INCREASE ALL SPEEDS BY 5%

GROSS WEIGHT—LBS.	STALLING SPEED—KNOTS IAS ANGLE OF BANK				
	0°	15°	30°	45°	60°
21,000	87	89	93	103	123
25,000	94	96	101	112	133
29,000	101	103	108	120	143

APPROACH

POWER—APPROACH
FLAPS—FULL DOWN
LANDING GEAR—DOWN

GROSS WEIGHT—LBS.	STALLING SPEED—KNOTS IAS ANGLE OF BANK				
	0°	15°	30°	45°	60°
21,000	71	72	76	84	100
23,000	74	75	79	88	105
25,000	77	78	82	91	109

LANDING

POWER—OFF
FLAPS—FULL DOWN
LANDING GEAR—DOWN

CAUTION

MAXIMUM LANDING WEIGHT
FIELD—24,800 LBS.
CARRIER—24,150 LBS.

GROSS WEIGHT—LBS.	STALLING SPEED—KNOTS IAS ANGLE OF BANK				
	0°	15°	30°	45°	60°
21,000	77	78	83	91	109
23,000	80	81	86	96	113
25,000	83	85	89	99	117

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Figure 4-1

STEEP TURN

Bank aircraft 45 degrees to the left and increase back pressure on the yoke to maintain altitude as the aircraft approaches a stall

APPROACH TURN

Bank aircraft 15 degrees to the left with Rudder Assist ON, reduce throttle to 17 inches MAP, and commence simulated approach to a landing. Slowly raise the nose to a landing attitude and maintain 15 degrees of bank.

Recovery

Recovery shall be accomplished at the first indication of any one of the following:

1. Activation of stall warning system.
2. Airframe buffet.
3. Loss of altitude (mushing).
4. 80 KIAS.

Recovery Procedures

Recovery procedures for approaches to stalls are:

1. Power OFF/ON - Clean
   Push the nose over to a position slightly below the horizon and add power to 30 inches MAP. Prevent excessive altitude loss.
2. Power OFF/ON - Dirty
   Push the nose over to a position slightly below the horizon and add power as necessary to prevent excessive altitude loss. Raise the landing gear. Raise the flaps in 1/3 increments as airspeed increases.
3. Steep Turn
   Relax back pressure, roll wings level and add power to 30 inches MAP.
4. Approach Turn
   Simultaneously add power as necessary, level wings, apply forward yoke pressure and neutralize controls to minimize loss of altitude during recovery. Raise landing gear. Raise flaps in 1/3 increments as airspeed increases.
5. General
   a. Care must be taken to avoid over-boosting engines on recovery.
   b. DO NOT USE RUDDER TO ASSIST RECOVERY.
   c. In order to avoid inverted flight, wing drops must be controlled in all approaches to stalls. Ailerons are quite effective, even at slow speeds.

WARNING

An inverted position may result if the wing drop is not controlled. If this does occur, roll out to level flight. Do not attempt to pull through.

d. Recover with a minimum loss of altitude.
e. Raise gear in recovery from approach to dirty stalls.

SPINS

WARNING

Intentional spins are prohibited.

The S-2 Aircraft is not designed structurally for spins. Spin tunnel tests indicate the following spin recovery procedures for all loadings and conditions of the aircraft.

NORMAL SPINS

Perform normal spin recovery in the following manner:

1. Full rapid rudder reversal, followed approximately one-half turn later by movement of the elevator to at least two-thirds down, will give optimum recovery. Use of the rudder trimmer increases the ability to recover.
2. Lateral control against the spin (wheel left in a right spin) is favorable for recovery, whereas lateral control with the spin has an adverse effect on recovery.

INVERTED SPINS

Recover from inverted spins in the following manner:

1. Apply full rudder against the spin and neutralize lateral and longitudinal controls.
2. Roll out. DO NOT PULL THROUGH.

SPINS DURING LANDING CONFIGURATION

If a spin is inadvertently entered in the landing configuration, the flaps and landing gear should be retracted and recovery attempted immediately. The aircraft will probably recover satisfactorily from a spin of one turn or less, but recovery from a fully developed spin may be unsatisfactory.

INSTRUMENTS

The elementary aspects of instrument flying are covered in the All Weather Flight Manual. Professional pride and the desire for self-preservation should in themselves, motivate the Naval Aviator toward the highest degree of instrument proficiency. One of the most important phases of ASW qualification is proficiency in instrument flying. All pilots are required to maintain valid instrument ratings. It is the responsibility of the individual pilot to maintain his proficiency in the use of publications and procedures necessary to conduct safe, professional instrument flight.

PRACTICE PATTERNS

Basic instrument patterns (figure 4-2) are included in this section for use in procedures and proficiency training. The patterns should include practice with both full and partial panel. Practice of all types of instrument approaches with full and partial panel is strongly encouraged.

SAFETY PRECAUTIONS FOR SIMULATED INSTRUMENT FLIGHT

Observer

Due to the fact that the pilot flying simulated instruments is unable to observe activity outside of the aircraft, and the co-pilot is giving part of his attention to the performance of the pilot, it is necessary to have an outside observer. The observer must be thoroughly briefed as to his duties, to include the proper method of reporting observed traffic. He shall be stationed in the Number 3 Operator's seat to observe traffic on the pilot's side of the aircraft.

Flight Altitudes

Although the density of traffic is greater in the immediate vicinity of landing fields and associated approach facilities, the possibility of mid-air collision is almost as great when operating outside these areas. Therefore, whenever possible all flights conducted under VFR, including practice instrument flights, shall conform to the appropriate published flight altitudes in order to minimize the danger of mid-air collision.

GENERAL APPROACH PROCEDURES

Typical LF/ADF/MDF/VOR/TACAN Instrument Approach

Prior to executing an instrument approach, the pilot shall brief the co-pilot on specific duties expected.

Items to be covered include: Monitoring entire approach, advising pilot when aircraft approaches altitude restrictions or pilot deviates appreciably from published procedure, when aircraft is clear of clouds or landing area is in sight.

When commencing an LF/ADF/MDF/VOR/TACAN Approach (figure 4-3) depart initial approach fix and descend to the procedure turn altitude at 130 KIAS. Prior to reaching final approach fix or gate complete the Landing check list (2/3 flaps) and slow to 105 KIAS. Continue the approach at 105 KIAS to the airport. Voice reports will be made as directed, however, the normal VOICE reports are made when:

1. Commencing approach or leaving altitude.
2. In/Out of procedure turn. (On request only.)
3. Final approach fix.
4. Contact or missed approach.

Typical GCA

Prior to performing the Landing Check List, the pattern (figure 4-4) will be flown at 130 KIAS. Prior to intercepting the glide path, slow to 105 KIAS, Gear DOWN, 2300 RPM and 2/3 FLAPS. Upon intercepting the glide path advance the props to FULL INCREASE RPM and complete the Landing Check List. When the glide path is intercepted commence a normal rate or descent at 105 KIAS. The co-pilot will review the Landing Check List. When in visual contact with field, the co-pilot will report "contact" to the pilot.

Typical Missed Approach

When commencing a missed approach, level the wings, if applicable, apply power as desired (minimum of 45 inches MAP), raise the landing gear and commence a normal climb. When airspeed allows, reduce power to a climb power setting (2300 RPM, 35 inches MAP) and raise flaps in 1/3 increments. Execute the missed approach procedure or proceed as otherwise directed. Make necessary voice report and state intentions.

NIGHT FLYING

The mission of a VS squadron requires a pilot to do a large part of his flying at night. Night flying is generally very closely related to instrument flying. Often night flights will be conducted almost entirely under instrument conditions. It is imperative that pilots insure that all instruments are functioning properly and that lights and radios are working before take-off. Flashlights with red lenses will be carried by the pilots on all night flights. Although night patterns around a field are essentially the same as day patterns, a longer landing interval shall be used for safety reasons.

PREPARATION

Prior to every night mission, pilots should insure that they are properly night adapted. This shall normally commence during the briefing, and night adaption must be maintained through the use of red goggles, red lighted rooms and passages to the aircraft. Every crew member should carry a red lensed flashlight on all night flights.

AIRCRAFT LIGHTING

Aircraft lighting during night flight operations has a very definite bearing on the safe accomplishment of the mission, and correct procedures must be followed.

Interior Lighting

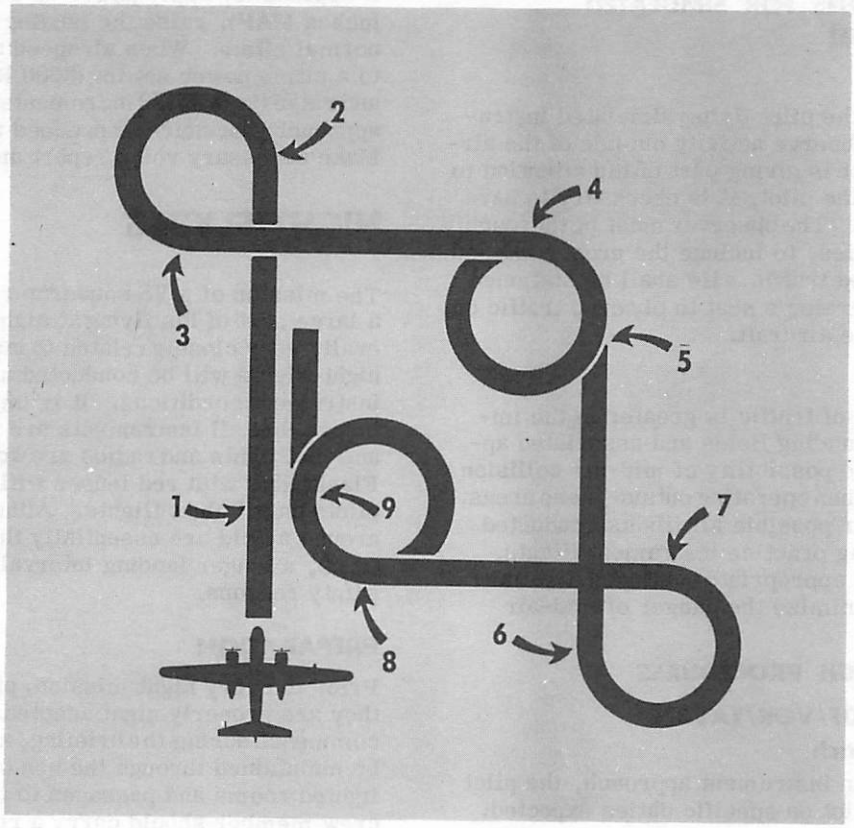
1. The interior lighting must be kept to the minimum amount which will still allow complete visibility of all instruments and gauges. Excessive cockpit lighting decreases outside visibility.

Note

Cockpit lighting prior to starting is available through the use of the instrument panel floodlights. Floodlights may also be used as a backup in the event of instrument lights failure.

2. Cockpit lighting prior to and during searchlight or night photo runs should include full brilliance of all flight instruments, plus the use of the instrument panel floodlights in order to allow the pilot to see the instruments while the searchlight or photo flash bomb is illuminating.

INSTRUMENT PATTERNS

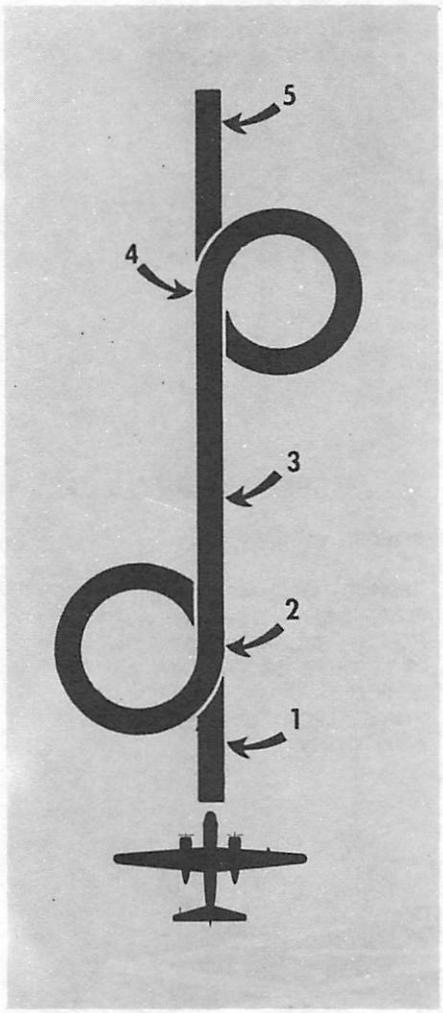


"CHARLIE" PATTERN

1. START, STRAIGHT AND LEVEL TWO MINUTES NORMAL CRUISE
2. CLIMB 667 FT. PER MINUTE, SRT FOR 270° GAIN 1000 FT.
3. FAST CRUISE TWO MINUTES, STRAIGHT AND LEVEL
4. REDUCE POWER AND SLOW FIRST 90° OF TURN, THEN DESCEND STANDARD RATE 360° .
5. COMMENCE STANDARD RATE CLIMB, TWO MINUTES GAIN 1000 FT.
6. LEVEL OFF, LEFT SRT FOR 270° ACCELERATE TO NORMAL CRUISE
7. CLIMB STANDARD RATE, STRAIGHT, FOR TWO MINUTES
8. LOWER WHEELS GOING INTO RIGHT SRT, DESCEND 800 FPM
9. RECOVER AT STARTING ALTITUDE, AT NORMAL CRUISE

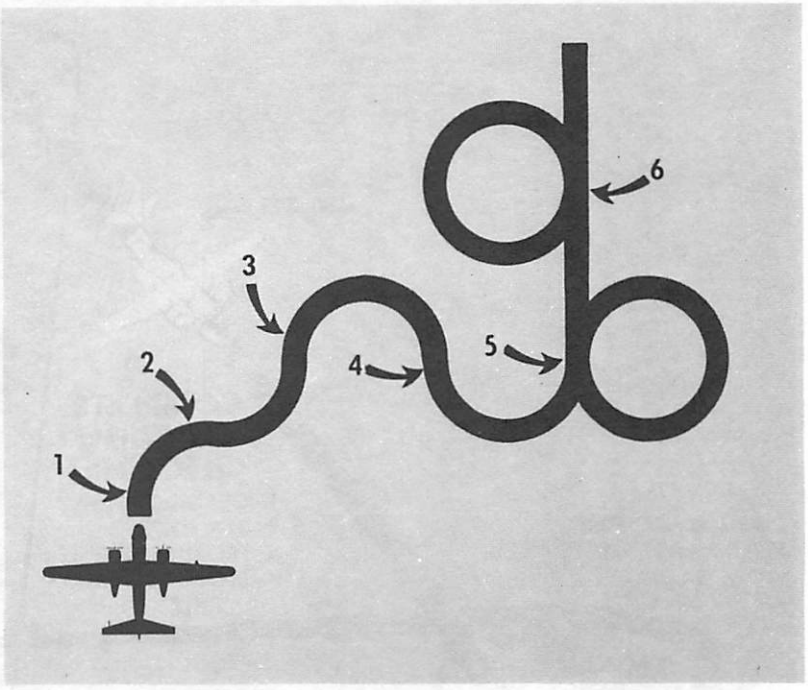
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Figure 4-2 (Sheet 1)



"OSCAR" PATTERN

1. ENTER PATTERN ON BASE ALTITUDE AT NORMAL CRUISE
2. CLIMBING LEFT SRT, GAIN 1000 FT.
3. 1-2 MINUTES STRAIGHT AND LEVEL AT SLOW CRUISE
4. DESCENDING RIGHT SRT LOSE 1000 FT.
5. RECOVER STRAIGHT AND LEVEL. RETURN TO NORMAL CRUISE



"TURN" PATTERN

1. 15° BANK, 90° RIGHT TURN
2. 15° BANK, 90° LEFT TURN
3. 30° BANK, 180° RIGHT TURN
4. 30° BANK, 180° LEFT TURN
5. 45° BANK, 360° RIGHT TURN
6. 45° BANK, 360° LEFT TURN

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Figure 4-2 (Sheet 2)

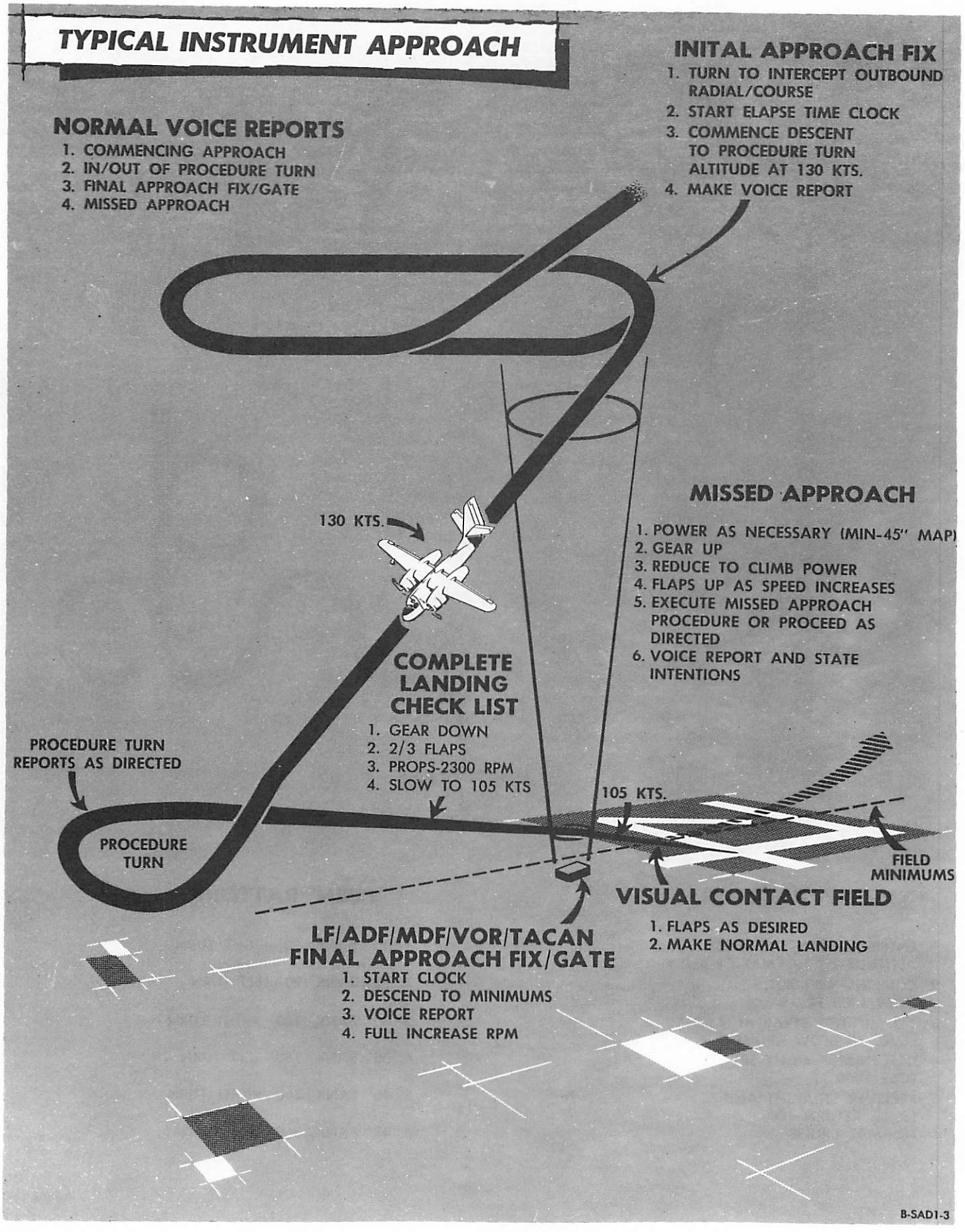

TYPICAL INSTRUMENT APPROACH
INITAL APPROACH FIX
1. TURN TO INTERCEPT OUTBOUND RADIAL/COURSE
2. START ELAPSE TIME CLOCK
3. COMMENCE DESCENT TO PROCEDURE TURN ALTITUDE AT 130 KTS.
4. MAKE VOICE REPORT
NORMAL VOICE REPORTS
1. COMMENCING APPROACH
2. IN/OUT OF PROCEDURE TURN
3. FINAL APPROACH FIX/GATE
4. MISSED APPROACH
130 KTS.
MISSED APPROACH
1. POWER AS NECESSARY (MIN-45" MAP)
2. GEAR UP
3. REDUCE TO CLIMB POWER
4. FLAPS UP AS SPEED INCREASES
5. EXECUTE MISSED APPROACH PROCEDURE OR PROCEED AS DIRECTED
6. VOICE REPORT AND STATE INTENTIONS
COMPLETE LANDING CHECK LIST
1. GEAR DOWN
2. 2/3 FLAPS
3. PROPS-2300 RPM
4. SLOW TO 105 KTS
PROCEDURE TURN REPORTS AS DIRECTED
105 KTS.
PROCEDURE TURN
FIELD MINIMUMS
VISUAL CONTACT FIELD
1. FLAPS AS DESIRED
2. MAKE NORMAL LANDING
LF/ADF/MDF/VOR/TACAN FINAL APPROACH FIX/GATE
1. START CLOCK
2. DESCEND TO MINIMUMS
3. VOICE REPORT
4. FULL INCREASE RPM
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Figure 4-3

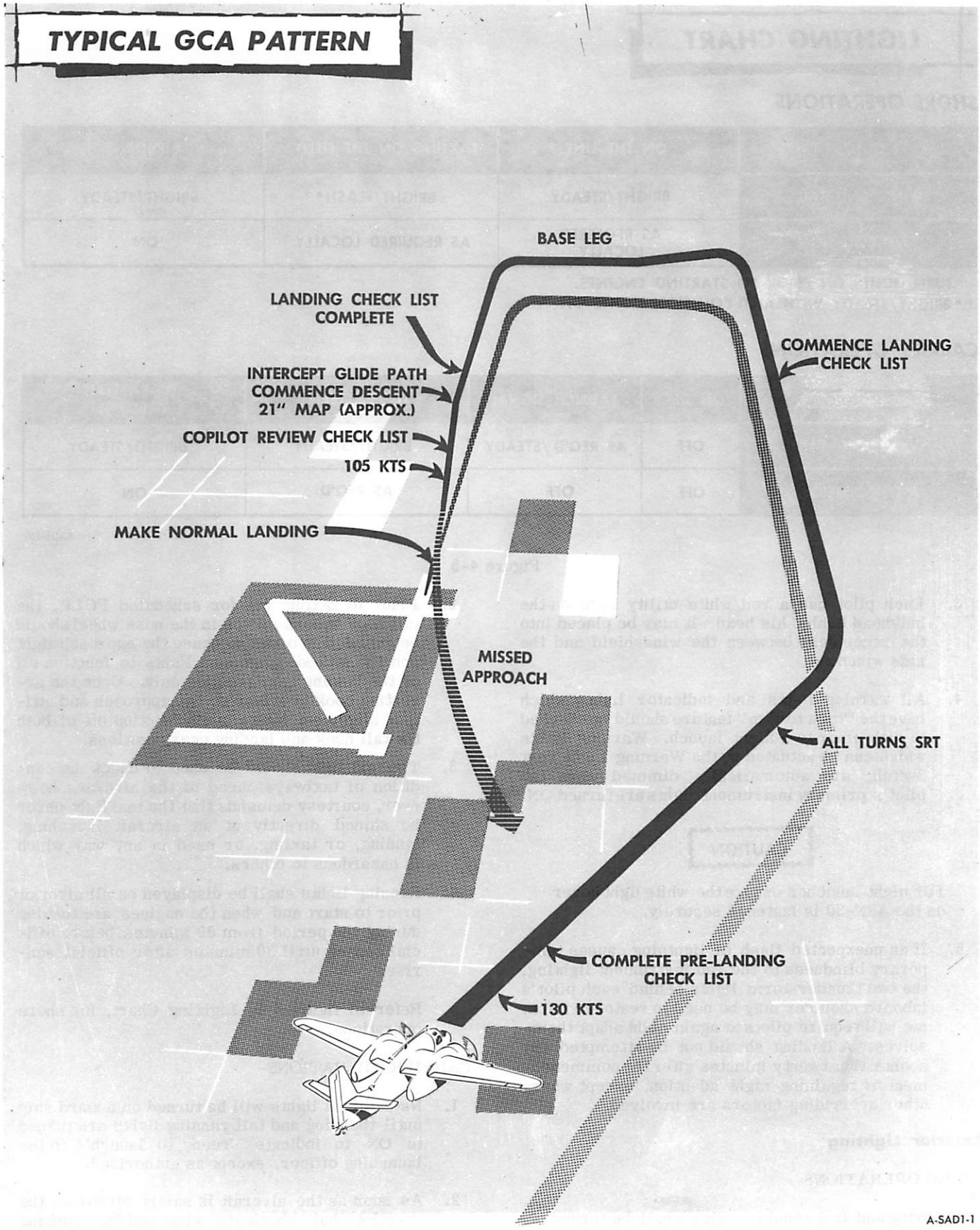

TYPICAL GCA PATTERN
BASE LEG
LANDING CHECK LIST COMPLETE
COMMENCE LANDING CHECK LIST
INTERCEPT GLIDE PATH COMMENCE DESCENT 21" MAP (APPROX.)
COPILOT REVIEW CHECK LIST
105 KTS
MAKE NORMAL LANDING
MISSED APPROACH
ALL TURNS SRT
COMPLETE PRE-LANDING CHECK LIST
130 KTS
A-SAD1-1

Figure 4-4

LIGHTING CHART

SHORE OPERATIONS

LIGHTS	ON THE LINE *	TAXIING ON THE FIELD	AIRBORNE
WING AND TAIL	BRIGHT/STEADY	BRIGHT/FLASH**	BRIGHT/STEADY
ANTI-COLLISION	AS REQUIRED LOCALLY	AS REQUIRED LOCALLY	ON

*TURN LIGHTS ON PRIOR TO STARTING ENGINES.
**BRIGHT/STEADY WITH ANTI-COLLISION LIGHTS ON

CARRIER OPERATIONS

LIGHTS	ON DECK	LAUNCH SIGNAL	"C" PATTERN	"D" PATTERN AIRBORNE
WING AND TAIL	OFF	AS REQ'D /STEADY	BRIGHT/STEADY	BRIGHT/STEADY
ANTI-COLLISION	OFF	OFF	AS REQ'D	ON

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Figure 4-5

3. Each pilot has a red/white utility light on the bulkhead behind his head. It may be placed into the receptacle between the windshield and the side window.

4. All warning lights and indicator lights which have the "turn to dim" feature should be checked to dim prior to a night launch. Warning lights which can be actuated by the Warning Light Test Switch, are automatically dimmed when the pilot's primary instrument lights are turned ON.

CAUTION

For night launches ensure the white light cover on the ASN-30 is fastened securely.

5. If an unexpected flash of lightning causes temporary blindness to the red instrument lighting, the two thunderstorm lights behind each pilot's inboard shoulder may be used to restore vision, but will require pilots to again night adapt themselves. A landing should not be attempted any sooner than twenty minutes after the commencement of regaining night adaption, except where other overriding factors are involved.

Exterior Lighting

FIELD OPERATIONS

1. Wing and tail running lights shall be turned on prior to starting. Supplying external DC power for starting will cause them to illuminate, and warn personnel that the engines are running.

2. Prior to taxiing out for scheduled FCLP, the tail hook bypass switch in the nose wheel should be actuated in order to cause the approach light and the attitude alignment lights to function off of the landing gear position only. Once the arresting hook is actuated, the approach and attitude alignment lights again function off of both the tail hook and landing gear positions.

3. The taxi light should be used to check the condition of taxiways ahead of the aircraft; however, courtesy demands that the taxi light never be shined directly at an aircraft launching, landing, or taxiing, or used in any way which is hazardous to others.

4. Running lights shall be displayed on all aircraft prior to start and when the engines are turning during the period from 30 minutes before official sunset until 30 minutes after official sunrise.

5. Refer to figure 4-5, Lighting Chart, for shore operations.

CARRIER OPERATIONS

1. No external lights will be turned on aboard ship until the wing and tail running lights are turned to ON to indicate "ready to launch" to the launching officer, except as authorized.

2. As soon as the aircraft is safely airborne, the co-pilot shall check the wing and tail running lights ON BRIGHT and anti-collision lights ON as briefed in order to be seen by other aircraft and the ship.

3. In the operating area running lights shall remain on BRIGHT at all times when in the vicinity of or operating with other aircraft. However, the anti-collision lights may be turned OFF to minimize confusion between aircraft in recognizing the heading and position of the others.
4. When operating on a search in an isolated area and under the radar surveillance of a communicating surface vessel or aircraft, it is often advantageous to extinguish all exterior lights to avoid visual detection by target submarines. In such cases the Pilot in Command may turn off all exterior lights and so advise his controlling ship or aircraft. If at any time he is advised of other aircraft in his general vicinity which he is unable to immediately see, or if the controlling ship reports that it is unable to continue holding him on its radar, he shall immediately turn his running lights to bright. The anticollision light need not be turned on unless the running lights fail. Loss of two way communications between the aircraft and the controlling ship or aircraft requires the immediate use of running lights until communications are again established.
5. All single aircraft transiting to and from their assigned operating areas must show a minimum of three bright running lights. Anti-collision lights shall be used as briefed.
6. Refer to figure 4-5, Lighting Chart, for carrier operations.
7. Additional lighting information is contained in Section III, Part Two.

FORMATION

Because formation flying requires more precision than single aircraft operations, it promotes a high degree of flight dicipline and attention to the minor details of flying not otherwise attained. In addition, multiplane formations are inherently safer under certain conditions than the same number of aircraft operating singly in the same area. A good example is the Delta Pattern during periods of marginal VFR weather. Other occasions when multiplane formations become desirable are: proceeding between ship and shore in large numbers, for aerial parades, and flyovers. For these reasons, formation flying must be learned properly and practiced frequently enough to ensure safe and smooth accomplishment. The procedures set forth in this manual apply to all types of formation flying. The visibility restriction in S-2D/E may be partially compensated for by consideration and smoothness on the part of the leader, and alterness on the part of the wingman. All signals for changes in formation will normally be given and acknowledged by radio.

Note

Night formation is prohibited.

BRIEFING

Formation flying will normally not be done unless it has been briefed on the ground prior to flight. The Flight Leader will conduct a thorough briefing, including place, altitude, type of rendezvous, base course and speed for rendezvous, type of formation to be used, and other pertinent data. He will control all voice communications for the flight such as taxi and take-off clearance. Any formation procedures other than as set forth herein shall be covered during the briefing by the flight leader, who must assure himself that the pilots in the flight are capable and experienced enough to handle such procedures successfully. Of paramount importance on any formation brief is the use or radio frequencies. Flight Leader must specify during brief what frequencies are to be used, and where and when changes are to be made.

LEAD

It is essential that Flight/Division leaders be thoughtful in their actions and extremely smooth in the execution of all maneuvers. The Flight Leader, when in level flight, normally carries a power setting commensurate with normal/fast cruise. The remainder of the aircraft in the flight will adjust power setting as necessary to maintain position. Flight Leaders must be careful never to turn into an echelon and to be discriminate in the maximum angle of bank utilized. As the number of aircraft in the formation increases, the maximum angle of bank should decrease. Descents are made utilizing the same torque pressure as level flight. To avoid engine over-boost the Flight/Division leader maintains a constant torque pressure throughout the descent by minor reduction of MAP as it increases. The Flight/Division leader normally will not descend or climb faster than 500 feet per minute.

BASIC FORMATION

The basic formation is the two aircraft Section, composed of a Section Leader and a Wingman. Two Sections form a Division. The Senior Section Leader is the Division Leader. Three aircraft may also form a Division, the third aircraft being the Second Section leader. Parade and Free Cruise are the formations generally flown. Free Cruise will normally be flown for long distance flights, or when a period of prolonged maneuvering is expected.

Parade Formation

Parade formation (figure 4-6) will be flown with aircraft joined on a 45 degree bearing aft of the leader's wing, with nose to tail clearance and slightly stepped down. Sections and divisions may be formed with the heavy side either to the right or left of the Leader. Section integrity shall be maintained at all times except when the lead is changed. The Second Section Leader (No. 3) shall leave a vacant space between the Division Leader (No. 1) and himself as though the First Section Wingman (No. 2) were actually occupying the space.

Note

A reference that may be utilized to assist in establishing a 45 degree bearing will be the aligning of the propeller warning line on the fuselage with the oil cooler door. The "DANGER" visible at the bottom of the nacelle will aid in maintaining step down.

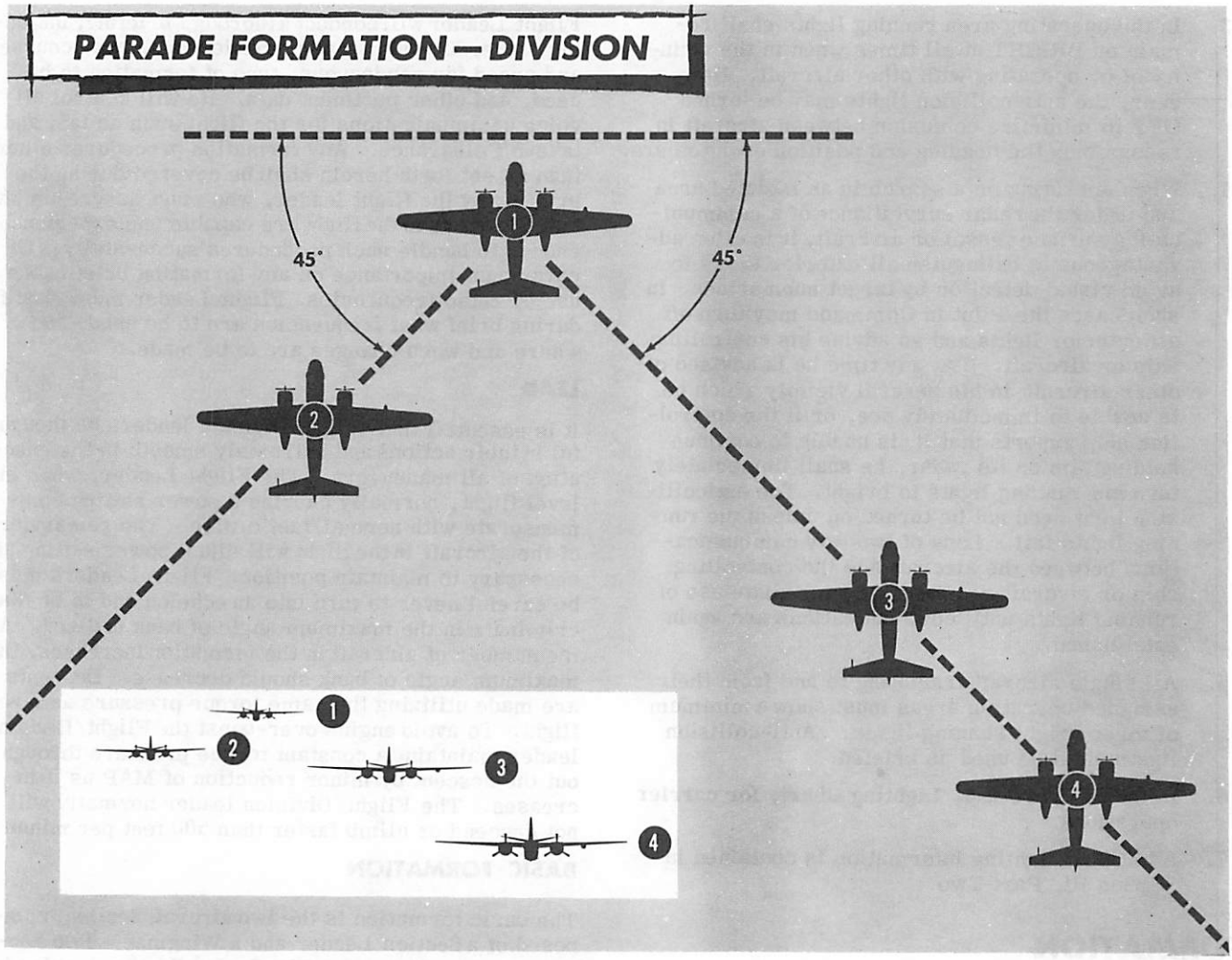


Figure 4-6

SAD1-9

DIAMOND FORMATION

Diamond formation in the S-2D/E is not authorized.

COLUMN FORMATION

Column formation (figure 4-7) shall be flown on a 180° relative bearing from the leader with nose to tail clearance and step down.

Free Cruise Formation

Free Cruise formation (figure 4-8) will be flown with aircraft joined on a 60 degree bearing aft of the leader's wing, with approximately double the nose to tail clearance and step down used in Parade formation. Relative position will be maintained by small throttle adjustments and by varying the radious of turns in relation to the Leader's turn. Sections and Divisions may be formed with the heavy side either to the right or left of the leader. Section integrity shall be maintained at all times except when the lead is changed. The Second Section Leader (No. 3) shall leave a vacant space between the Division Leader (No. 1) and himself to allow the First Section Wingman (No. 2) ample room to slide as necessary in turns.

MULTI-DIVISION FORMATION

Flights composed of two or more Divisions fly Parade or Free Cruise. In Parade, each successive Division Leader will fly step down on a 45 degree bearing aft of the leader but will leave sufficient interval for safe maneuvering between his Division and the preceding aircraft on the bearing. When in a balanced Parade of Divisions, the Division on the left will reverse the basic Division Formation to balance the appearance of the formation. When returning to an echelon of Divisions, the Third Division Leader must drop back and cross to the right side of number two Division.

The individual Division in an echelon of Divisions may be balanced, heavy side away from the leader. In Free Cruise, each successive Division Leader will fly on a 60 degree bearing aft of the leader, stepped down, and will leave room to slide to the inside during any turns. Divisions will balance as in Parade Formation. A column of Sections (figure 4-9) presents a good appearance and is easy for wingmen to fly, as the need for excessive power during turns is minimized.

BASIC MANEUVERS

Rendezvous

Rendezvous may be accomplished under either the Running rendezvous, the Circular rendezvous, or the Carrier rendezvous. The leader should turn his anticollision light ON or drop his tailhook, for identification.

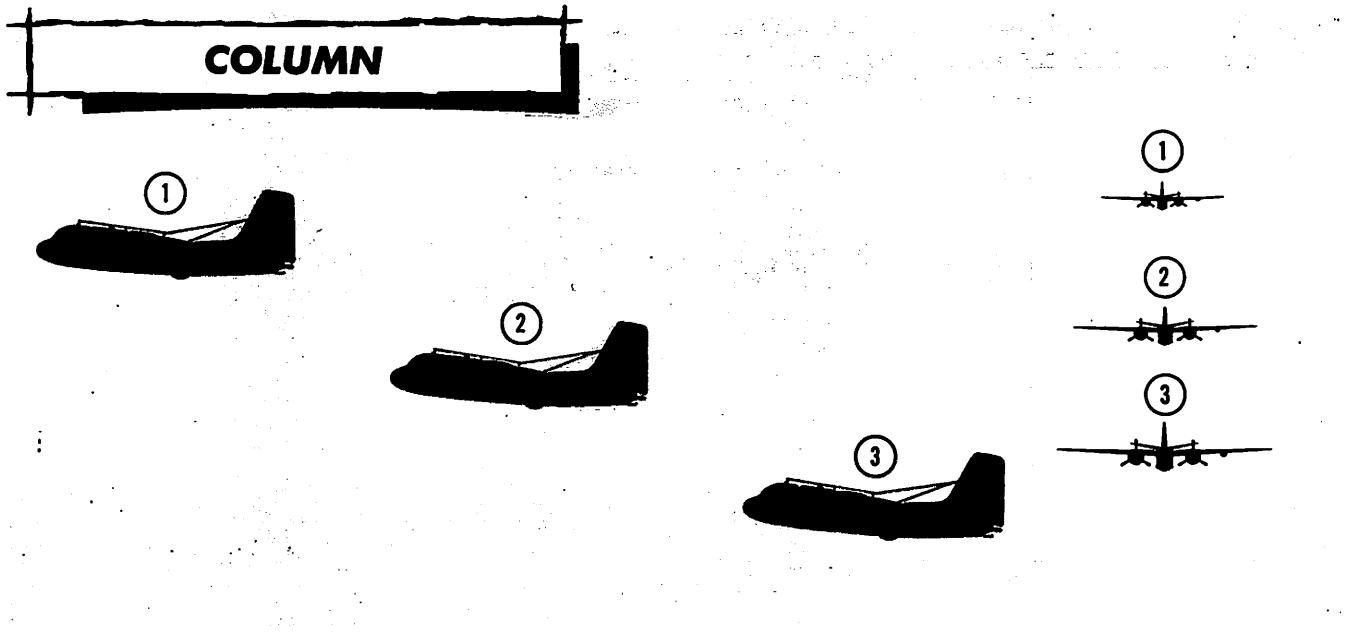


Figure 4-7

When effecting a rendezvous, keep the aircraft ahead in constant view. Keep the nose of the aircraft slightly ahead of the Leader's with speed equal to or slightly in excess of the Leader's. As the joining aircraft approaches the Leader he should insure that he is aft of the Leader's beam. To avoid overshooting, excess speed must be reduced before reaching the wing position. The joining aircraft should abort his rendezvous as necessary, by leveling his wings, sighting the aircraft ahead, and moving to the outside of the formation.

During rendezvous, only enough step down should be used to insure separation of the aircraft ahead. If one plane is "sucked" during rendezvous, the pilot shall abort the maneuver and move to the outside of the Leader. All relative motion should be stopped just prior to joining up in the inside wing position. A crossunder may then be made to the outside. Any aircraft which aborted the rendezvous to the outside will join the formation at the end after all the other aircraft within the Division have joined.

RUNNING RENDEZVOUS

The running rendezvous is based on the Leader departing on heading at a reasonable speed, and succeeding aircraft utilizing a speed differential to catch him. Care must be taken to avoid overrunning the Leader. If overrunning, clear to the side until speed is under control and keep the Leader in sight. Call when joined.

CIRCULAR RENDEZVOUS

The circular rendezvous is usually used when joining up at a prebriefed point. The Leader establishes the orbit, and the joining aircraft reaching the rendezvous area enters the circle to join on the Leader slightly abaft his beam. The secret of this rendezvous is to reach a good starting point in the circle, concentric with the Leader, then slide into the position utilizing a constant bearing from the Leader. This keeps the joining aircraft slightly behind the Leader's wing. When approaching the rendezvous at too acute an angle, the wings must be leveled to clear the leader while passing to the outside of the circle. When in position report to the Flight Leader.

CARRIER RENDEZVOUS

The carrier rendezvous is normally used after take off to join a flight quickly prior to taking departure on the mission. The Leader allows approximately 30 seconds for each aircraft expected to join, makes a standard rate 180° left turn and holds his heading. The joining aircraft commences a slightly greater than standard rate turn when the Leader bears 45° to the left of center, seeking the same type of bearing on the Leader as used in the circular rendezvous. With a slight speed advantage and slightly converging courses, the joining aircraft is then flown up the desired bearing to near the rendezvous position. The same rules governing acute angles of closure in the circular rendezvous are also applicable here. Keep the Leader in sight and report when in position.

Practice Breakup And Rendezvous

For practice breakup and rendezvous the flight will be in an echelon with the break away from the echelon. The Leader will signal "I am breaking" by rocking his Ailerons lightly and quickly then commence his break away from the echelon utilizing a 30-45° angle of bank for 180°. The remaining aircraft in the flight will break utilizing the same angle of bank as the leader with a 3 - 5 second interval. When all aircraft are in column, the last aircraft will so signal the Leader. The

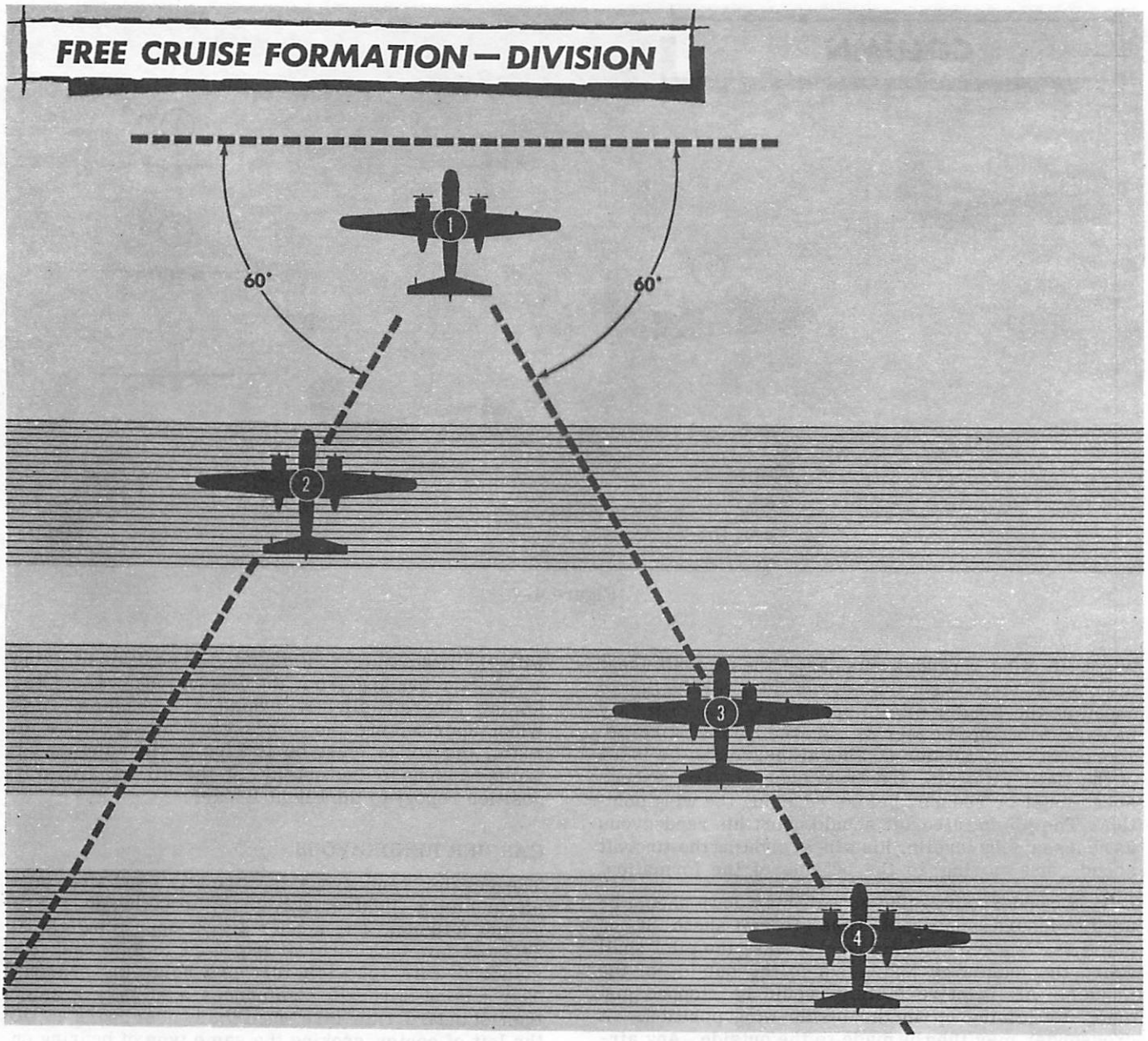


Figure 4-8

Leader will then commence a 15° angle of bank turn for 180°. The remaining aircraft in the flight will commence a normal carrier rendezvous.

Crossunder

The method of moving aircraft from one side of the formation to the other is through the use of the crossunder (figure 4-10); however, the rules to be followed differ with those used by aircraft with 360° visibility. Rules to be adhered to are:

1. Square corners shall be used in executing all crossunders. The Wingman should reduce power slightly and slide back, achieving nose to tail clearance on the leader prior to making any movement to crossunder.
2. All changes of formation shall be directed by the Leader on the radio, and acknowledged by the aircraft required to change position. The aircraft reaching a new position reports completion to the Leader.

Turns

In Parade formation, the Leader should limit his bank to 30°. This allows him sufficient latitude in maneuvering around the ship. Aircraft on the inside of the turn will rotate around the Leader's longitudinal axis, maintaining the same relative position and picture as in level flight. Due to a shorter radius of turn than the leader, a very slight reduction in power is necessary. Aircraft on the outside of the turn will rotate

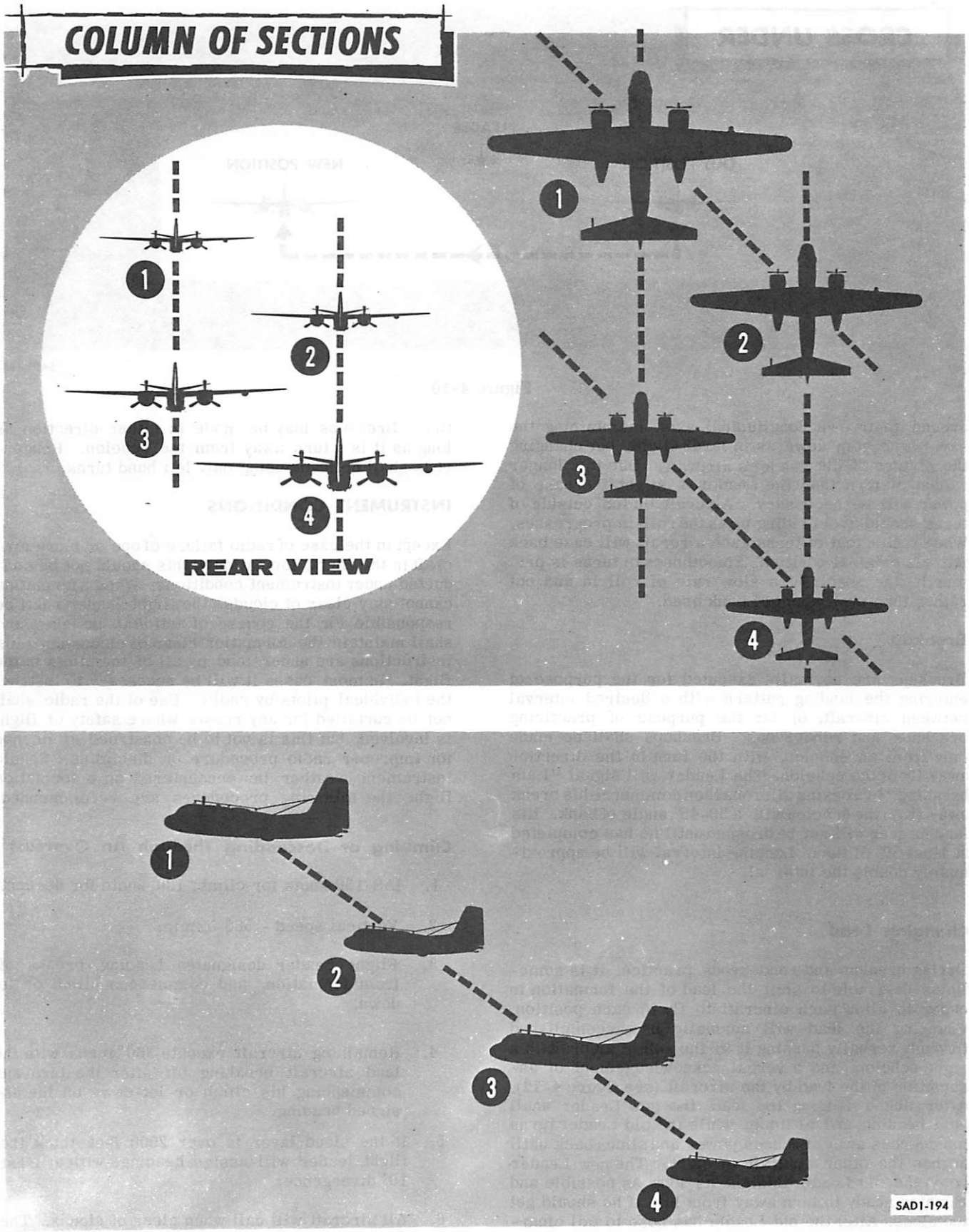


Figure 4-9

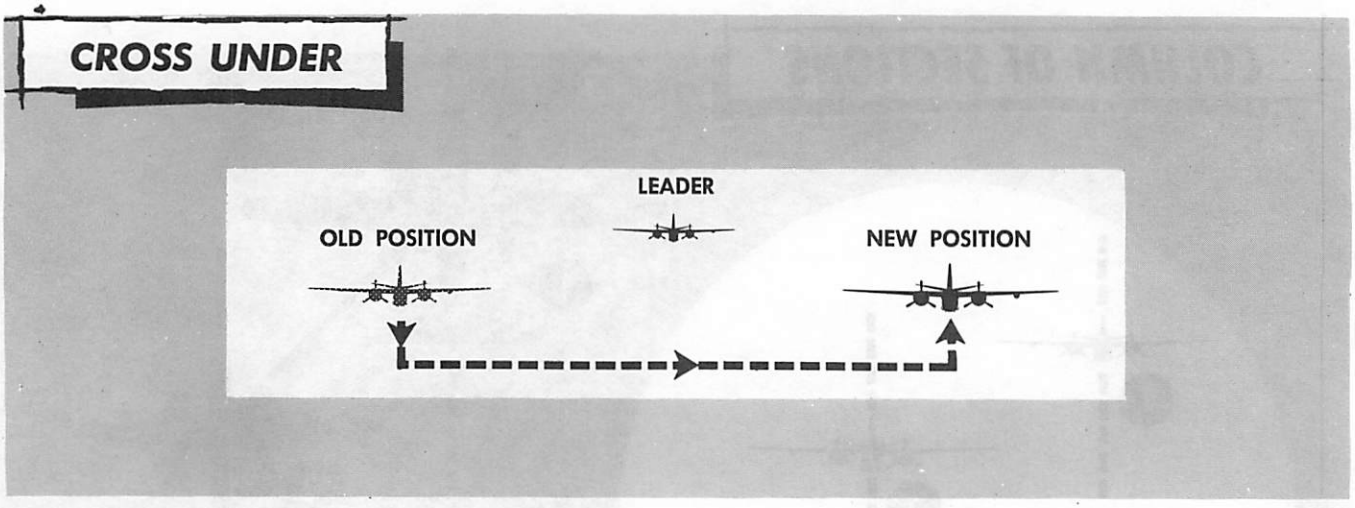


Figure 4-10

around their own longitudinal axis, maintaining the same true step down as in level flight, but changing the picture of the Leader's aircraft. Due to a longer radius of turn than the Leader, a slight increase of power will be necessary. Aircraft on the outside of turns should avoid riding up as the roll-in progresses. When rolling out of turns each aircraft will ease back into his original position. Smoothness in turns is primarily the result of a slow rate of roll in and out rather than the amount of bank used.

Breakup

Breakups are normally executed for the purpose of entering the landing pattern with a desired interval between aircraft, or for the purpose of practicing breakups and rendezvous. Breakups shall be made only from an echelon, with the turn in the direction away from the echelon. The Leader will signal "I am breaking" by rocking ailerons then commence his break away from the echelon with a 30-45° angle of bank. His landing gear will not be dropped until he has completed at least 30° of turn. Landing interval will be approximately double the interval.

Changing Lead

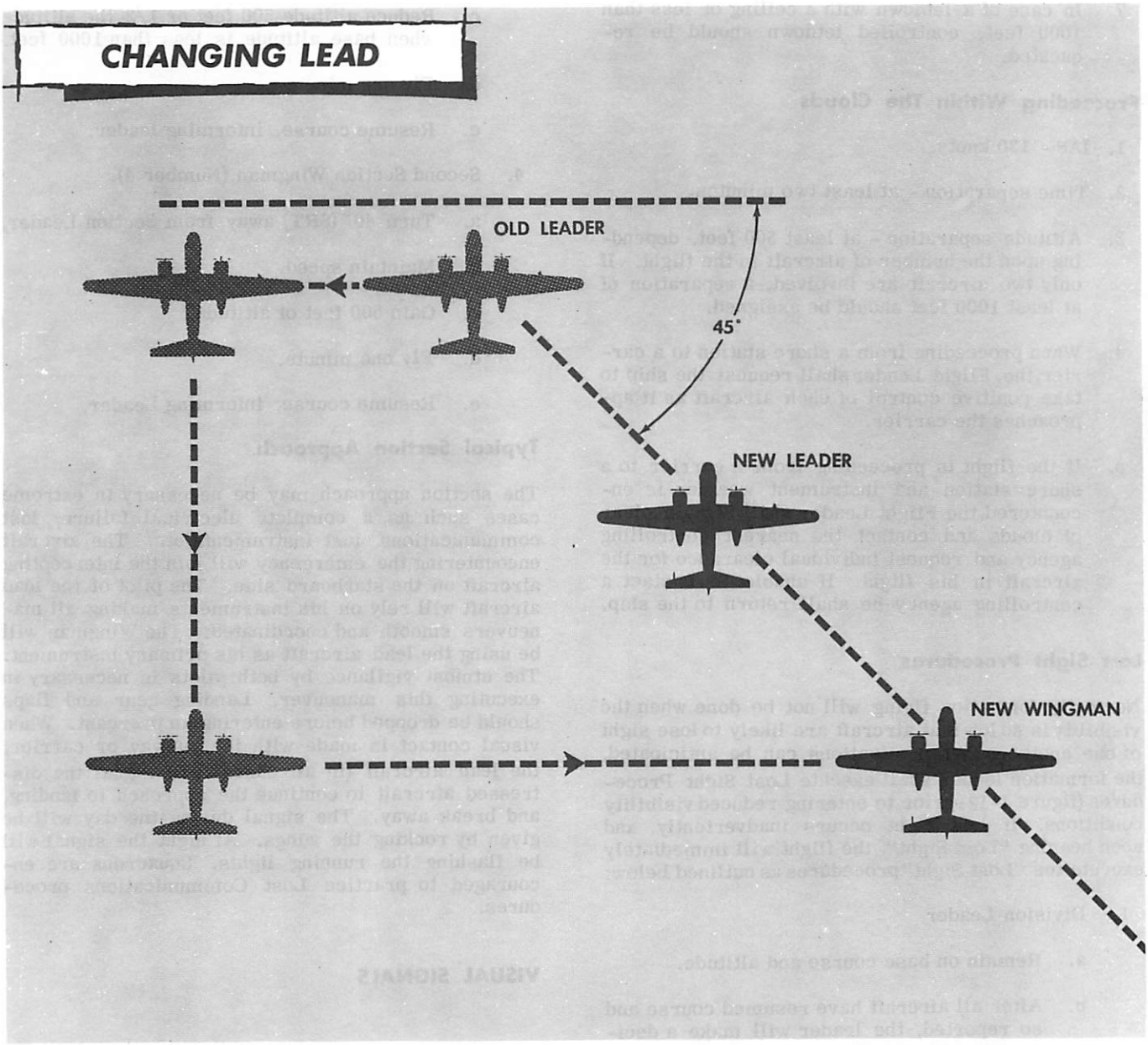
During breakup and rendezvous practice, it is sometimes desirable to shift the lead of the formation in order to allow each aircraft to fly in each position. Changing the lead will normally be accomplished through verbally passing it to the other aircraft in a right echelon, and a verbal acknowledgement of assumption of the lead by the aircraft (see figure 4-12). After acknowledging the lead, the new Leader shall hold heading and altitude, while the old Leader turns ten degrees away, reduces power and slides back until he has the other aircraft in sight. The new Leader holds the old Leader in sight as long as possible and remains ready to turn away from him if he should get too close. After the old Leader has nose to tail clearance on the last aircraft, he flies into position and reports completion to the new Leader. The new Leader may then continue the breakup and rendezvous practice. Breakups may be made in either direction as long as it is a turn away from the echelon. Rendezvous shall be made using only left hand turns.

INSTRUMENT CONDITIONS

Except in the case of radio failure of one or more aircraft in the flight, formation flights should not be conducted under instrument conditions. When a formation cannot stay clear of clouds, the flight leader shall be responsible for the course of action to be taken and shall maintain the formation clear of clouds until his instructions are understood by all of the pilots in the flight. In most cases it will be necessary to instruct the individual pilots by radio. Use of the radio shall not be curtailed for any reason where safety of flight is involved, but this is not to be construed as license for improper radio procedure or discipline. Should instrument weather be encountered on a formation flight, the following procedures are recommended.

Climbing or Descending Through An Overcast

1. IAS-130 knots for climb; 130 knots for descent.
2. Vertical speed - 500 ft/min.
3. Flight Leader designates heading, breaks off from formation, and commences climb or let down.
4. Remaining aircraft execute 360° turns with the lead aircraft breaking off after the turn and commencing his climb or let-down on the assigned heading.
5. If the cloud layer is over 2000 feet thick the flight leader will assign headings with at least 10° divergence.
6. All aircraft will call when clear of clouds. The flight leader will commence rendezvous at least 1000 feet clear of cloud tops and at least 500 feet clear of bases.


CHANGING LEAD
OLD LEADER
45°
NEW LEADER
NEW WINGMAN


OLD LEADER
NEW LEADER
NEW WINGMAN
SAD1-6

Figure 4-11

7. In case of a letdown with a ceiling of less than 1000 feet, controlled letdown should be requested.

Proceeding Within The Clouds

1. IAS - 130 knots.
2. Time separation - at least two minutes.
3. Altitude separation - at least 500 feet, depending upon the number of aircraft in the flight. If only two aircraft are involved, a separation of at least 1000 feet should be assigned.
4. When proceeding from a shore station to a carrier, the Flight Leader shall request the ship to take positive control of each aircraft as it approaches the carrier.
5. If the flight is proceeding from a carrier to a shore station and instrument weather is encountered, the Flight Leader shall remain clear of clouds and contact the nearest controlling agency and request individual clearance for the aircraft in his flight. If unable to contact a controlling agency he shall return to the ship.

Lost Sight Procedures

Normally formation flying will not be done when the visibility is so low that aircraft are likely to lose sight of one another. When situations can be anticipated, the formation leader shall execute Lost Sight Procedures (figure 4-12) prior to entering reduced visibility conditions. If lost sight occurs inadvertently, and upon hearing "Lost Sight", the flight will immediately execute the "Lost Sight" procedures as outlined below:

1. Division Leader
   a. Remain on base course and altitude.
   b. After all aircraft have resumed course and so reported, the leader will make a decision to either rejoin in the clear, or have aircraft proceed independently.
2. Division Wingman (Number 2).
   a. Turn 20° (SRT) away from Leader.
   b. Maintain speed.
   c. Gain 500 feet of altitude.
   d. Fly one minute.
   e. Resume course, informing Leader.
3. Second Section Leader (Number 3).
   a. Turn 20° (1/2 SRT) away from Leader.
   b. Maintain speed.
   c. Reduce altitude 500 feet or 1/2 the altitude when base altitude is less than 1000 feet.
   d. Fly one minute.
   e. Resume course, informing leader.
4. Second Section Wingman (Number 4).
   a. Turn 40° (SRT) away from Section Leader.
   b. Maintain speed.
   c. Gain 500 feet of altitude.
   d. Fly one minute.
   e. Resume course, informing Leader.

Typical Section Approach

The section approach may be necessary in extreme cases such as a complete electrical failure, lost communications, lost instruments etc. The aircraft encountering the emergency will join the intercepting aircraft on the starboard side. The pilot of the lead aircraft will rely on his instruments making all maneuvers smooth and coordinated. The Wingman will be using the lead aircraft as his primary instrument. The utmost vigilance by both pilots is necessary in executing this maneuver. Landing gear and flaps should be dropped before entering an overcast. When visual contact is made with the runway or carrier, the lead aircraft (in all cases) will signal the distressed aircraft to continue the approach to landing, and break away. The signal during the day will be given by rocking the wings. At night the signal will be flashing the running lights. Squadrons are encouraged to practice Lost Communications procedures.

VISUAL SIGNALS

Formation without two way radio communications should be limited to that necessary to assist lost aircraft in returning to base. In such cases the standard visual signals prescribed in NWP-41(B) shall be applied. All pilots should remain alert for these, since no acknowledgement is normally required. These standard signals should be reviewed by the Flight Leader prior to take-off. The most commonly used visual signals are listed below:

1. Wing dip - Wingman cross under in direction of dip.
2. Double wing dip - Section cross under in direction of dip.
3. Series of shallow zooms - Join up on me.
4. Fishtailing rudder - Form column.

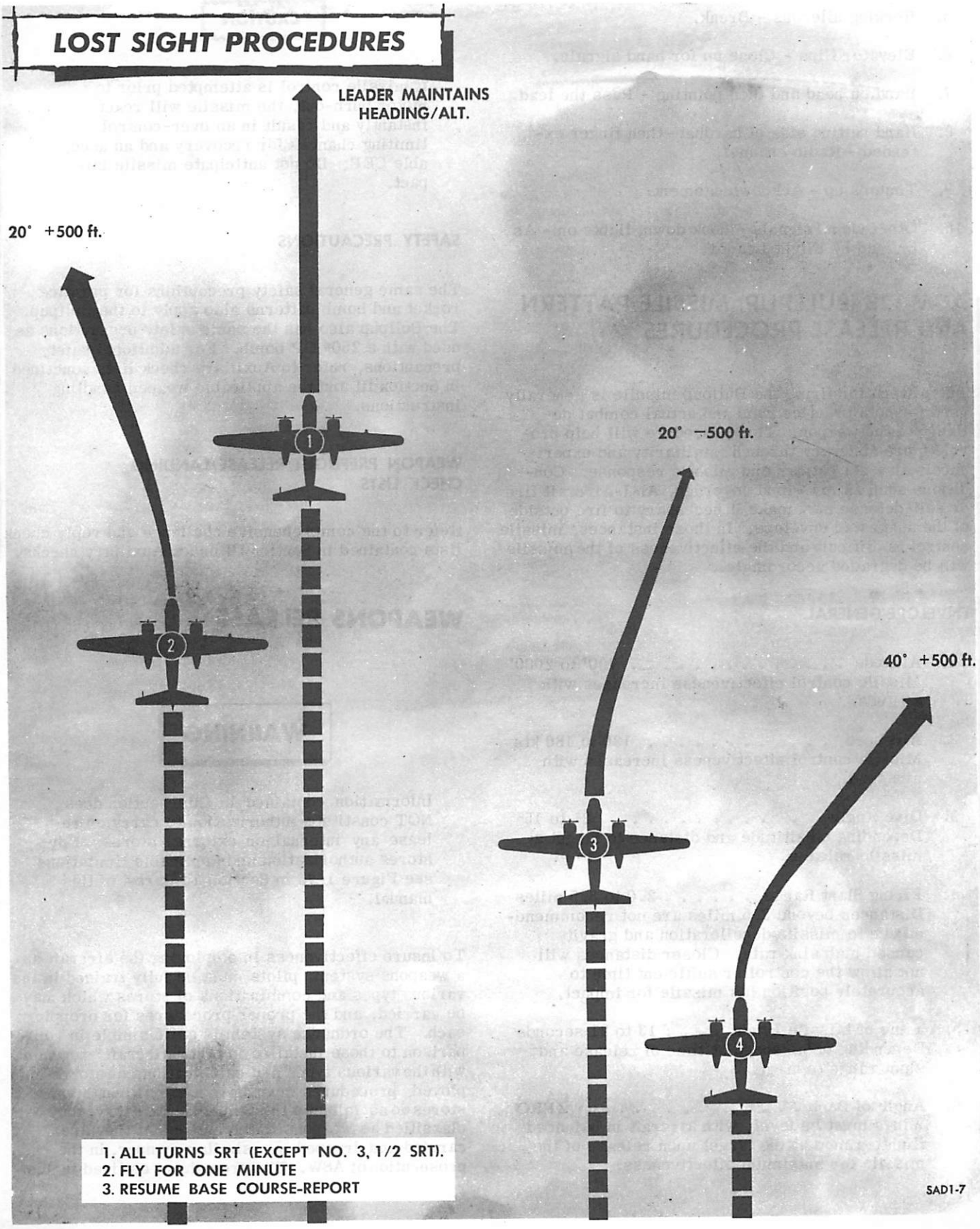

LOST SIGHT PROCEDURES
LEADER MAINTAINS HEADING/ALT.
20° +500 ft.
20° −500 ft.
40° +500 ft.
1
2
3
4
1. ALL TURNS SRT (EXCEPT NO. 3, 1/2 SRT).
2. FLY FOR ONE MINUTE
3. RESUME BASE COURSE-REPORT
SAD1-7

Figure 4-12

5. Rocking ailerons - Break.
6. Elevator flips - Close up for hand signals.
7. Hand on head and then pointing - Pass the lead.
8. Hand patting side of hardhat - then finger extended - Radio channel.
9. Thumbs up - Acknowledgement.
10. Other visual signals - hook down, lights on - As briefed by Flight Leader.

AGM-12B (BULLPUP) MISSILE PATTERN AND RELEASE PROCEDURES

The pattern for firing the Bullpup missile is generally used for both practice runs and actual combat delivery of the weapon. This procedure will help provide more accuracy through familiarity and experience with a set pattern and missile response. Conditions such as low cloud coverage, Anti-Aircraft fire or self-defense may make it necessary to fire outside of the suggested envelope. In those instances, missile control is difficult and the effectiveness of the missile will be degraded accordingly.

ENVELOPE-GENERAL

1. Altitude . . . . . 700' to 2000'
   Missile control effectiveness increases with altitude.
2. Airspeed . . . . . 130 to 180 kts
   Missile control effectiveness increases with airspeed.
3. Dive Angle . . . . . 2° to 15°
   Depending on altitude and distance to target at missile release.
4. Firing Slant Range . . . . . 2.0 to 3.5 miles
   Distances beyond 3.5 miles are not recommended due to missile decelleration and gravity caused high sink rate. Closer distances will not allow the controller sufficient time to accurately position his missile for impact.
5. Time of Missile Flight . . . . 13 to 21 seconds
   Depending on airspeed at time of release and slant range to target.
6. Angle of Bank . . . . . ZERO
   Wings must be level, with aircraft in balanced flight, aimed at the target upon release of the missile for maximum effectiveness.

CAUTION

If missile control is attempted prior to motor burn-out, the missile will react instantly and result in an over-control limiting chances for recovery and an acceptable CEP. Do not anticipate missile impact.

SAFETY PRECAUTIONS

The same general safety precautions for practice rocket and bomb patterns also apply to the Bullpup. The Bullpup also has the same safety precautions as used with a 250# GP bomb. For additional safety precautions, refer to Auxiliary check lists contained in Section III and the applicable weapon handling instructions.

WEAPON PREFLIGHT/RELEASE/LANDING CHECK LISTS

Refer to the comprehensive challenge and reply check lists contained in Section III under Auxiliary checks.

WEAPONS RELEASE

WARNING

Information contained in this section does NOT constitute authorization to carry or release any internal or external stores. For stores authorization and applicable limitations see Figure 1-75 in Section 1, Part 4 of this manual.

To insure effectiveness in employing the aircraft as a weapons system, pilots must be fully trained in the various types and combinations of stores which may be carried, and the proper procedures for dropping each. The ordnance system is quite simple in comparison to those installed in other aircraft, however, with the various types and combinations of stores employed, procedures must be exact. Although some stores do not fall into the Ordnance category, they are classified as weapons in the sense that they are carried and dropped in a similar manner, in the prosecution of ASW. The procedures outlined in this

section include only those concerning the dropping of stores, and not the rules and techniques of delivery. In all release procedures listed below it should be understood that the appropriate Armament circuit breakers except for SEARCH LT TRANS RECT are IN at all times.

Note

Armament Systems explanations and illustrations are contained in Section VIII.

WING STORES SELECTED RELEASE

For single or multiple stores release:

1. ARM MASTER . . . . . ON
2. STATION SELECT . . . . . "T"
   For desired stations, note status lights ON for each station selected.
3. FUSE ARMING . . . . . BOTH or TAIL
4. STORE RELEASE . . . . . SELECT
5. "T" BUTTON . . . . . DEPRESS
   Pilot's or co-pilot's

Note

Stores may be dropped regardless of the position of the Fuse Arming switch. If safe release is desired the Fuse Arming Switch must be in the SAFE position.

WING/TORPEDO BAY STORES INTERVALOMETER RELEASE

For multiple release of MK 54 Depth Bombs in train:

1. ARM MASTER . . . . . ON
2. STATION SELECT . . . . . "T"
   Select stations desired. Note status lights ON for each station selected.
3. AERO 65A SAFETY INTERLOCK . . UNLOCK
   Number 3 operator's console
   (Torpedo bay stores only)
4. FUSE ARMING . . . . . BOTH or TAIL
5. STORE RELEASE . . . . . INTERVAL
6. DB INTERVALOMETER . . . STA AS REQ'D
7. TORPEDO BAY DOORS . . . . . AS REQ'D
8. "T" BUTTON . . . . . DEPRESS
   Pilot's or co-pilot's AND HOLD

Note

Stores may be dropped regardless of the position of the Fuse Arming Switch. If safe release is desired the Fuse Arming Switch must be in the SAFE position.

ROCKET FIRING

1. ARM MASTER . . . . . ON
2. ROCKET SELECTOR . . . . . APPROPRIATE STATION (S)
3. CAMERA-ROCKET NR6 . . . . . NR6
4. STEP-NO STEP SWITCH . . . . AS REQUIRED
5. FUSE ARMING . . . . . SAFE
6. "R" BUTTON . . . . . DEPRESS
   Pilot only.

TORPEDO BAY STORES RELEASE (EXCEPT MK 57 OR MK 101, NEW

1. ARM MASTER . . . . . ON
2. STATION SELECT 7 and 8 . . . . . "T"
   Note status light ON.
3. AERO 65A SAFETY INTERLOCK . . UNLOCK
   Number 3 operator's console
4. FUSE ARMING . . . . . AS REQUIRED

Note

SAFE, TAIL, or BOTH as tactical situation dictates.

5. STORE RELEASE . . . . . SELECT
6. TORP BAY DOORS . . . . . OPEN
   Note OPEN light ON.
7. "T" BUTTON . . . . . DEPRESS
   Pilot's or co-pilot's
8. TORP BAY DOORS . . . . . CLOSE
   Note OPEN light OUT.

Note

Stores may be dropped regardless of the position of the Fuse Arming Switch. If safe release is desired the Fuse Arming Switch must be in the SAFE position.

TORPEDO BAY MK 44 OR MK 46 RELEASE (APPLICABLE TO S-2E/G WITH AFC 516 INCORPORATED)

1. ARM MASTER . . . . . ON
2. STATION SELECT 7 and 8 . . . . . "T"
   Note status light ON
3. AERO 65A SAFETY INTERLOCK . . .UNLOCK
   Number 3 Operator's console
4. FUSE ARMING . . . . . BOTH
5. SRCH DEPTH/ISD SWITCH . . . . . SELECT
   (Torpedo Depth Control)

Note

Insure that selected positions of SRCH DEPTH/ISD and CEIL/FL switches reflect type of stores carried (MK 44 or MK 46).

6. CEIL/FL SWITCH . . . . . .SELECT
   (Torpedo Depth Control)
7. READY (GREEN) LIGHT . . . . . ON
   (Torpedo Depth Control)

Note

The amber FAIL light may come on prior to the READY light and will remain on until the proper search depth selection is set in the torpedo.

8. STORE RELEASE . . . . . SELECT
9. TORP BAY DOORS . . . . . OPEN
   Note OPEN light ON
10. "T" BUTTON . . . . . .DEPRESS
    Pilot's or Co-pilot's
11. TORP BAY DOORS . . . . . .CLOSE
    Note OPEN light OUT

TORPEDO BAY MK 57 OR MK 101 RELEASE

Refer to applicable NAVAIR Special Weapons Check List.

SONOBUOY RELEASE

1. ARM MASTER . . . . . ON
2. SONO MASTER . . . . . ON
3. SONO DROP SELECTOR . . . . . .SELECT DESIRED BUOY
   Placarded SONO RELEASE in S-2E/G.
   Check CHUTE FULL light ON.
4. GROUP SWITCH . . . . GROUP I or GROUP II
5. SONOBUOY INTERVALOMETER. . . . SINGLE or SPACED
   If SPACED is selected, set Distance switch to D1 or D2, and Doppler Mode switch to DOPPLER or MANUAL. If MANUAL is selected set desired Ground Speed.
6. "T" BUTTON . . . . . .DEPRESS
   Pilot's or co-pilot's

SUS RELEASE (APPLICABLE TO S-2D/E AIRCRAFT ONLY)

1. ARM MASTER . . . . . ON
2. MK 15 DISP
   or
   CHUTE SELECTOR . . . . .OUTB'D, BOTH or INB'D
3. NOT READY LIGHTS . . . . . OUT
4. "C" BUTTON . . . . . .DEPRESS
   Pilot's or co-pilot's
5. ROUNDS REMAINING . . . . . .DECREASE

MARINE MARKER RELEASE

1. SONO MASTER . . . . . .HOLD/OFF
   Only if sonobuoys are not to be released with Markers.
2. ARM MASTER . . . . . ON
3. MAR MK SWITCH . . . . . ON
4. NUMBER 4 OPERATOR (S-2D/E) . . LEFT OR RIGHT
   Only if releasing single markers. Observe NOT READY lights are OUT.
5. NUMBER 3 OPERATOR (S-2G) . . . . LEFT OR RIGHT
   Only if releasing single markers. Observe NOT READY lights are OUT.
6. "T" BUTTON . . . . . .DEPRESS
   Pilot's or co-pilot's. Number 3/ or 4 Operator's RELEASE button will release single marker if depressed.
7. NUMBER 4 OPERATOR (S-2D/E) . .OBSERVE
   (Observe NOT READY lights flash, and ROUNDS REMAINING counter decreases).

NEW

8. NUMBER 3 OPERATOR (S-2G). . . . OBSERVE (Observe NOT READY lights flash, and ROUNDS REMAINING counter decreases).

JETTISON PROCEDURE

Refer to Section V, Stores Jettison for the procedures to be used in jettisoning all wing and torpedo bay stores, including ASW camera pod. For special weapons jettison procedures, refer to applicable NAVAIR Special Weapons Check List.

PRACTICE ROCKET AND BOMB PATTERNS

Practice rocket and bomb flights are designed to teach new pilots the proper methods for firing rockets and dropping bombs. They are frequently scheduled as a refresher, requalification, or competitive exercise for more experienced pilots. They may be conducted on any suitable target with any reasonable number of aircraft up to eight, but with not less than two aircraft.

SAFETY PRECAUTIONS

The briefing prior to practice rocket and bomb flights should cover the following safety items concerning dangers involved in:

1. Handling live ordnance.
2. Proper loading/arming and de-arming procedures.
3. Flying over populated areas.
4. Making dives to steep and abrupt pull-outs.
5. Ricocheting rockets.
6. Possibility of sympathetic firing of rockets induced by high intensity electro-magnetic radiation.

PROCEDURE

1. Load rockets in arming area as briefed. Proceed to assigned target area and set up rocket pattern in accordance with target instructions, normally left hand race track pattern at pattern altitude dependent upon the type rocket/rocket head being employed, 2100 RPM, and 130 KIAS. First run will normally be dummy.
2. Call pushing over into 15° glide (maximum 20°) and receive acknowledgement from target control if required. Co-pilot call off each 100-foot loss of altitude.
3. The following altitudes will be observed for the ZUNI rocket with the MK-24 MOD-0/MK-32 MOD-0 head and the 2.75-inch rocket with the M-151 head:

	ZUNI MK-24 MOD-0	ZUNI MK-32 MOD-0	2.75-inch M-151
Pattern altitude	2800	2300	2500
Minimum firing altitude	2000	1500	1700
Minimum recovery altitude	1600	1100	1300

Note

To obtain maximum training, the Zuni and the 2.75-inch rockets with inert heads should be fired at the same altitude required for explosive heads.

4. Fire singles or pairs as briefed, and effect a smooth recovery within minimum altitude limits. Climb back to pattern altitude on all runs including the final run, insuring that the position of the aircraft ahead is known visually. Turn the ARM MASTER switch OFF.
5. Repeat runs as briefed.

SEARCHLIGHT PROCEDURES

The searchlight is used at night in the identification of contacts and in attacking surfaced enemy submarines. The procedures listed below may be used in actual operations or during searchlight practice.

SAFETY PRECAUTIONS

The briefing prior to a night flight where searchlight use is anticipated, should cover the following items concerning flight safety:

1. Pattern and exterior lighting during searchlight practice.
2. Instrument flying and the use of the AFCS.
3. Cockpit lighting during the searchlight run.
4. Use of the blackout curtain.
5. Searchlight malfunctions.
6. Minimum and maximum periods of arcing and cooling requirements.

PROCEDURE

1. Proceed to the assigned search or target area as briefed. Prior to departing, the searchlight may be tested in accordance with local tactical or area restrictions.
2. Prior to operating the searchlight, complete the following:
   a. LOW ALTITUDE CHECK LIST COMPLETE Prior to descent below 500 feet AGL.
   b. CIRCUIT BREAKERS..... IN SEARCHLT AC PWR, SEARCHLT CONTROL, SEARCHLT TRIGGER and SEARCH LT TRANS RECT.
   c. AMPLIFIER SWITCH..... START Allow a minimum of 1 minute for warm-up, after which searchlight response to the control may be checked using the Searchlight Indicator.
   d. BLACKOUT CURTAIN..... INSTALL
   e. INSTRUMENT LIGHTS.....BRIGHT The pilot will fly strictly on instruments using the AFCS if available. If the lights are not bright when the searchlight is arced, he may not have sufficient reference to them for safe flight. The cockpit floodlights may also be used. The pilot should also be satisfied that the instruments are operating normally.
   f. EXTERIOR LIGHTS.....AS REQUIRED Operational flights may require all lights OUT. Practice pattern work with other aircraft require wing and tail lights BRIGHT and anti-collision lights ON.
3. Practice searchlight runs should be commenced 10 miles or more from the target with a call "Turning Inbound". Operational runs frequently offer much shorter run-in distances. The run-in should be made at 300 feet AGL and 140 KIAS. Normal radar intercept procedures should be employed. Approaching 2 miles the co-pilot should center the searchlight control in azimuth and set in a 5 degree depression. At 1-1/2 miles the co-pilot will call "Lighting off" and:
   a. TRIGGER SWITCH..... DEPRESS The light requires 2 seconds to reach full intensity. If the light flickers or goes OFF on the first strike of the arc, release the trigger switch. After 5 seconds depress the trigger switch again. If a bad flickering persists, the light is defective and should not be used until the malfunction is corrected.

CAUTION

Extensive damage to the searchlight will result from continued operation when any of the following occur: doughnut-shaped beam, pulsation of the light at approximately 2 second intervals, or a yellow or orange colored beam.

4. As the Number 3 Operator continues to vector the pilot to the intercept, the co-pilot makes a slow, systematic sweep of the area with the light. Upon target acquisition with the searchlight beam, the co-pilot reports "On target" and commences vectoring the pilot as necessary to place the aircraft directly over the target, if possible. The Number 4 Operator starts his elapsed time clock when the co-pilot calls "Lighting off", and reports the elapsed time in seconds, as directed.

5. Avoid overheating the light. The light may be illuminated for a maximum period of 1 minute followed by a period of 4 minutes for cooling purposes. After a maximum of six cycles, allow 30 minutes cooling period. The minimum period for illumination is 20 seconds except when a malfunction requires a shorter period. If the illumination period is less than 1 minute, the cooling period may be reduced to equal 4 times the illumination period.

WARNING

Do not hold the arc in 0 to +5° elevation longer than 5 seconds due to the possibility of a dome fire.

6. After target acquisition the run may be continued to an attack, to a photo run, or discontinued as applicable. For practice runs, holding the target in the beam for 5 seconds is considered successful. When the run is completed, the co-pilot will release trigger switch and call "Off target".

7. In a practice pattern the pilot will normally turn outbound for another run and climb to a briefed altitude.

8. When all runs are completed, and no further use of the searchlight is anticipated, pull out the SEARCHLT TRANS RECT circuit breaker. Upon completion of the flight, the number of times the searchlight was arced should be entered on the Yellow Sheet.

ASW NIGHT PHOTO PROCEDURES

Night photographs are normally taken following radar run-in to the target and searchlight illumination. The procedures listed below will be used for safe night photo operations, in both the operational and training situations.

SAFETY PRECAUTIONS

Photoflash cartridges are loaded with loose pyrotechnic composition which is easily ignited by sparks, shock or friction. When ignited, the cartridges explode with extreme violence and heat. They contain Black Powder and must be handled with greater care than ordinary pyrotechnic materials. The cartridges cases should not be hammered, forced or cut. The photo pod itself is designed to present the minimum amount of airfoil drag in an emergency such as a single engine. However, the inherent instability and explosive characteristics of the cartridge precludes landing with cartridges when any greater than normal possibility of a crash landing exists. They may be salvoed or the pod may be jettisoned, as required. Pilots should always fly night photo runs strictly on instruments, with the instrument lights bright, and the blackout curtain installed on the co-pilot's side window.

IN-FLIGHT CHECK LIST

After the aircraft is airborne, the readiness condition for the photo pod will be determined by the mission. For normal operation, all armament (except AERO-6A), searchlight and camera pod circuit breakers should be checked IN. When clear of populated areas:

1. CAMERA-ROCKET RACK #6 ..... CAMERA
2. CAMERA POD AND TEST CIRCUIT BREAKER ..... IN
3. ARM MASTER ..... ON
4. READY SWITCH ..... ON
5. FLARE FAILURE ..... PRESS TO TEST
   Light should illuminate. If it does not illuminate when depressed, it indicates a burned out lamp which must be replaced in order to complete the check. If the light illuminates prior to being depressed, the cartridge containers are not secure in the ejector and the pod is unusable.
6. OPERATE LIGHT ..... PRESS TO TEST
   Light should illuminate.
7. ARM MASTER ..... OFF
8. READY SWITCH ..... OFF

ATTACK RUN CHECK LIST

For photo pod operation the following should be completed when heading inbound to a contact, using 300 feet AGL and 140 KIAS:

1. CIRCUIT BREAKERS ..... IN
2. SALVO SWITCH ..... OFF
3. ARM MASTER ..... ON
4. READY SWITCH ..... ON
5. FLARE FAILURE ..... OUT
6. OPERATE LIGHT ..... OUT

At 1-1/2 miles the searchlight will be arced to assist in visual identification. Upon target acquisition with the searchlight, the co-pilot will vector the pilot directly toward the target to be in level flight for the photo run. At 1/4 mile the co-pilot will continue as follows:

7. S/L TRIGGER ..... RELEASE
8. B BUTTON ..... DEPRESS
9. OPERATE LIGHT ..... ON
   Should illuminate to indicate depressing the B button cycled the programmer. Cartridges should start illuminating in approximately 1 second. At 140 KIAS there will be enough time for 4 pictures and 4 cartridges.
10. B BUTTON ..... RELEASE
11. ARM MASTER ..... OFF
12. READY SWITCH ..... OFF

If more than one run is to be made, only items 11 and 12 above need to be completed to maintain the photo pod in a safe condition until the next run is commenced.

LANDING CHECK LIST

Upon completion of the final run or prior to landing, the following should be checked:

1. ARM MASTER . . . . . OFF
2. READY SWITCH . . . . . OFF
3. CIRCUIT BREAKERS . . . . . OUT
   CAMERA POD TEST AND CAMERA POD
4. CAMERA-ROCKET RACK #6. . . . . CAMERA
5. SALVO SWITCH . . . . . OFF

SALVO

In the event of an emergency or malfunction where it is not desirable to land with cartridges remaining in the ejector, the cartridges will be salvoed as follows:

1. CIRCUIT BREAKER . . . . . IN
   Requires only CAMERA POD.
2. ARM MASTER . . . . . ON
3. SALVO SWITCH. . . . . ON

WARNING

- Loads of M112 photoflash cartridges may not be salvoed except under emergency flight conditions.
- Unused cartridges will be fired in groups of six per second and will ignite. Care should be exercised to avoid creating undue hazard to other aircraft, surface units, or personnel and property on land areas.

JETTISON

If it is considered unsafe to land with the photo pod still attached, it may be released in the normal manner, or jettisoned with other stores immediately, as follows:

1. JETTISON. . . . . PULL

Note

To jettison wing stores, appropriate primers must be installed and electrical power available.

ASW MANEUVERING SAFETY PRECAUTIONS

Tactical operations in the contact area requires each pilot to display a high degree of proficiency in maneuvering his aircraft at low altitudes and steep angles of bank. The enthusiasm generated in the contact area may frequently lead a pilot to operate his aircraft in an unsafe or dangerous manner. To provide safety during ASW maneuvers, the following precautions shall be observed:

ALTITUDE MINIMUMS

1. DAY . . . . . 100 FEET
2. NIGHT OR IFR . . . . . 300 FEET

IN CLOVERLEAF

1. MAXIMUM NUMBER OF AIRCRAFT 2
2. MAXIMUM ANGLE OF BANK . . . . . 45°
3. AVOID WINGOVER TYPE TURNS.

FCLP AND CLP

The Delta and Charlie Patterns described are essentially the same as those flown during carrier launching and landing operations. The Bravo Pattern described is for carrier operations only. Noted differences are those made necessary due to terrain and local restrictions. Minor modifications, when required, will be thoroughly covered in the Flight Leader or LSO briefing; and will be identified as specific deviations from the Charlie and Delta Patterns to be flown about the ship. The airspeeds for FCLP and CLP are identical and are included later in this section. Figures 4-13 through 4-15 are diagrams of the patterns to be flown during FCLP and CLP.

DELTA PATTERN

The Delta Pattern (figure 4-13) for FCLP and CLP will be a standard left hand racetrack pattern at 1000 feet above the surface or higher as assigned. It is normally oriented into the wind (runway). The upwind leg shall be commenced abeam and close aboard the ship and extend ahead for two minutes. The upwind turn shall be a standard rate turn. The downwind turn shall be made so as to allow the aircraft to be straight and level at the start of the upwind leg. Entry into the Charlie Pattern shall commence at the port abeam position letting down to the break. (A 500 foot break altitude will be used.) Deviations from the normal entry to the Charlie Pattern may be made during daylight operations to allow getting an aircraft to the ramp expeditiously.

CHARLIE PATTERN

The Charlie Pattern (figure 4-14) is oriented to the ship or runway in the same manner as the Delta pattern; however the altitude for OLS, FCLP and CLP is 300 feet above the landing area.

BRAVO PATTERN

The BRAVO Pattern shall be flown at Charlie Pattern altitude in a racetrack pattern, close aboard the port side, based on the base recovery course. Pattern airspeed shall be 120 KIAS, 2/3 flaps with gear and hook up. Aircraft in the pattern shall maintain landing interval. Entry into the Bravo Pattern shall be made only from the Charlie Pattern; aircraft receiving the signal "BRAVO" shall raise the gear and transition to 120 KIAS, 2/3 flaps. Entry into the Charlie Pattern from the Bravo Pattern shall be initiated on signal simultaeously by ALL, maintaining suitable interval. NEW

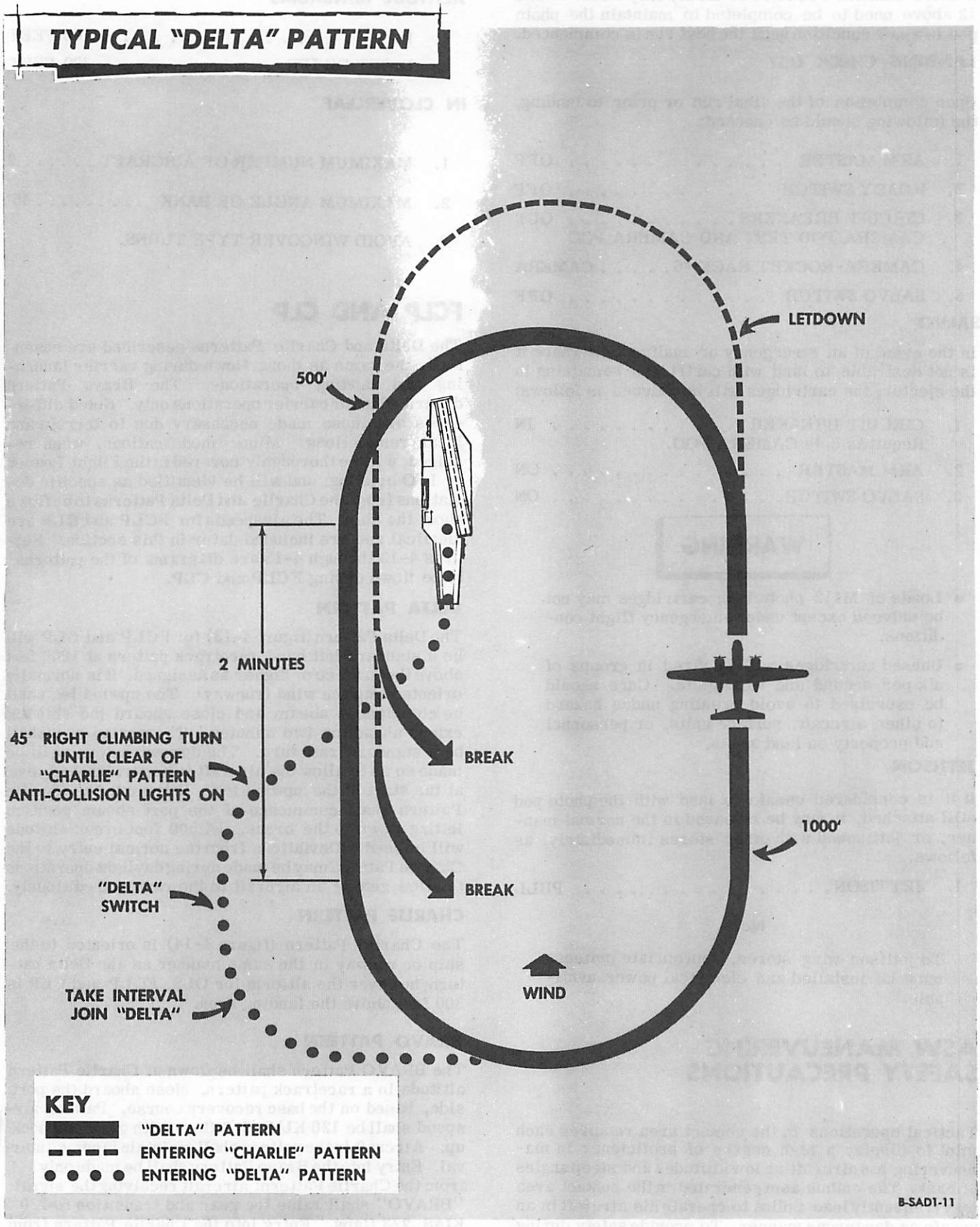

TYPICAL "DELTA" PATTERN
LETDOWN
500'
2 MINUTES
45° RIGHT CLIMBING TURN UNTIL CLEAR OF "CHARLIE" PATTERN ANTI-COLLISION LIGHTS ON
BREAK
BREAK
1000'
"DELTA" SWITCH
TAKE INTERVAL JOIN "DELTA"
WIND
KEY
"DELTA" PATTERN
ENTERING "CHARLIE" PATTERN
ENTERING "DELTA" PATTERN
B-SAD1-11

Figure 4-13

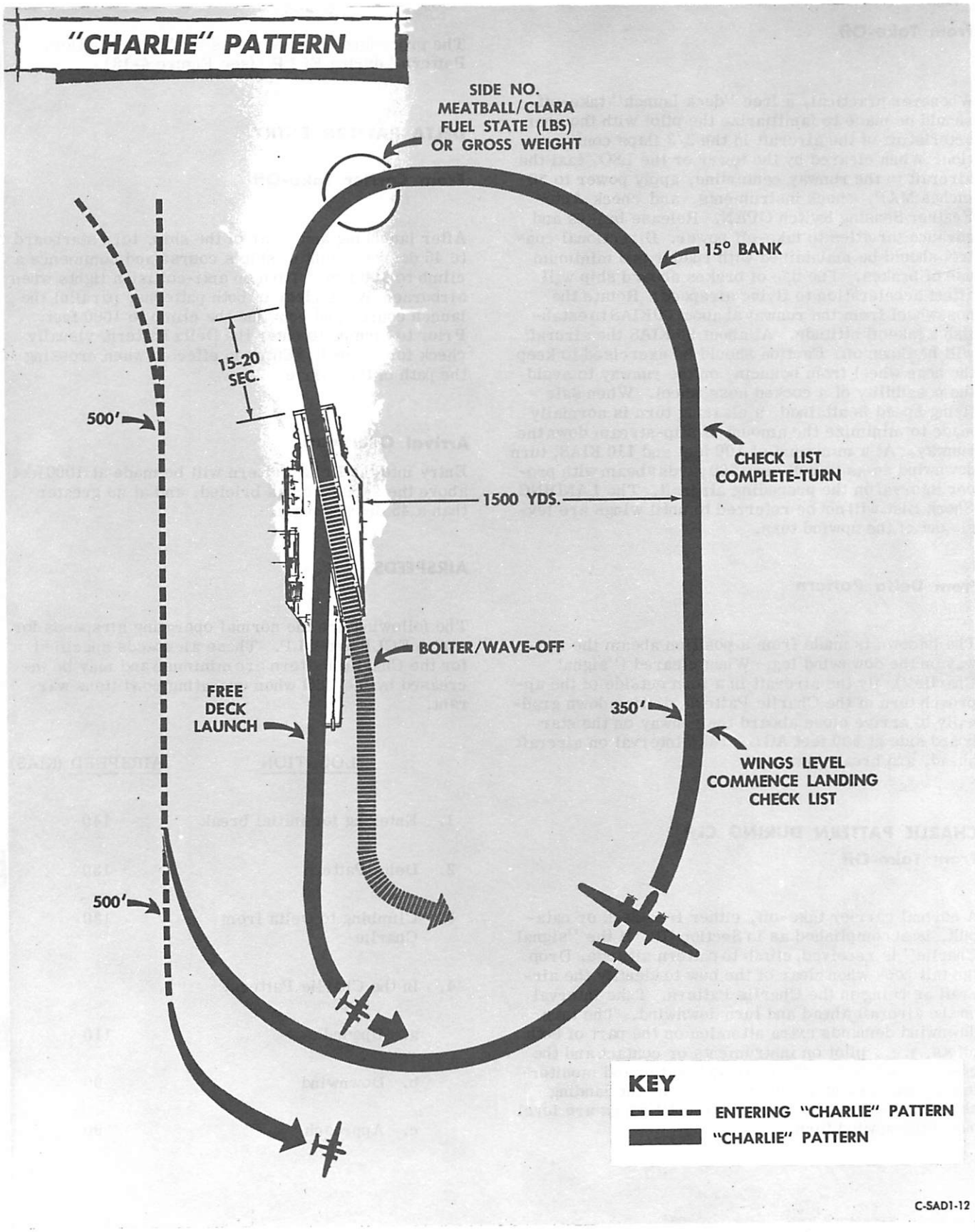

"CHARLIE" PATTERN
SIDE NO.
MEATBALL/CLARA
FUEL STATE (LBS)
OR GROSS WEIGHT
15° BANK
15-20
SEC.
500'
CHECK LIST
COMPLETE-TURN
1500 YDS.
BOLTER/WAVE-OFF
FREE
DECK
LAUNCH
350'
WINGS LEVEL
COMMENCE LANDING
CHECK LIST
500'
KEY
ENTERING "CHARLIE" PATTERN
"CHARLIE" PATTERN
C-SAD1-12

Figure 4-14

CHARLIE PATTERN ENTRY DURING FCLP

From Take-Off

Whenever practical, a free "deck launch" take-off should be made to familiarize the pilot with the characteristics of the aircraft in the 2/3 flaps configuration. When cleared by the tower or the LSO, taxi the aircraft to the runway centerline, apply power to 30 inches MAP, check instruments, and check Auto Feather Sensing Switch OPEN. Release brakes and advance throttles to take-off power. Directional control should be maintained with rudder and minimum use of brakes. The use of brakes aboard ship will affect acceleration to flying airspeed. Rotate the nosewheel from the runway at about 60 KIAS to establish a takeoff attitude. At about 90 KIAS the aircraft will be flown off. Caution should be exercised to keep the nose wheel from bouncing on the runway to avoid the possibility of a cocked nose wheel. When safe flying speed is attained, a clearing turn is normally made to minimize the amount of slip-stream down the runway. At a minimum of 100 feet and 110 KIAS, turn downwind so as to roll out 1500 yards abeam with proper interval on the preceding aircraft. The LANDING Check List will not be referred to until wings are level, out of the upwind turn.

From Delta Pattern

The letdown is made from a position abeam the runway on the downwind leg. When cleared ("signal Charlie"), fly the aircraft in a turn outside of the approach turn of the Charlie Pattern, letting down gradually to arrive close aboard the runway on the starboard side at 500 feet AGL. Take interval on aircraft ahead, and break downwind.

CHARLIE PATTERN DURING CLP

From Take-Off

A normal carrier take-off, either free deck or catapult, is accomplished as in Section III. If the "signal Charlie" is received, climb to pattern altitude. Drop the tail hook when clear of the bow to identify the aircraft as being in the Charlie Pattern. Take interval on the aircraft ahead and turn downwind. The turn downwind demands extra attention on the part of both pilots, i.e., pilot on instruments or contact and the co-pilot looking for other aircraft ahead and monitoring the instruments. For this reason, the landing check list will not be referred to until wings are level out of the upwind turn.

From Delta Pattern

The procedure is the same as in "From the Delta Pattern" during FCLP, (see Figure 4-13). NEW

DELTA PATTERN ENTRY

From Carrier Take-Off

After launching and clear of the ship, turn starboard to 45 degrees right of ship's course and commence a climb to 300 feet. Turn on anti-collision lights when airborne. When clear of both patterns, parallel the launch course and continue the climb to 1000 feet. Prior to turning to enter the Delta Pattern, visually check for aircraft. Entry is effected when crossing the path of the carrier.

Arrival Overhead

Entry into the Delta Pattern will be made at 1000 feet above the surface or as briefed, and at no greater than a 45 degree angle.

AIRSPEEDS

The following are the normal operating airspeeds for use in FCLP and CLP. These airspeeds specified for the Charlie Pattern are minimum and may be increased by the LSO when operating conditions warrant.

	LOCATION	AIRSPEED (KIAS)	
1.	Entering for initial break	140	
2.	Delta Pattern	130	NEW
3.	Climbing to Delta from Charlie	130	
4.	In the Charlie Pattern:		
	a. Upwind	110	NEW
	b. Downwind	90	
	c. Approach	90	

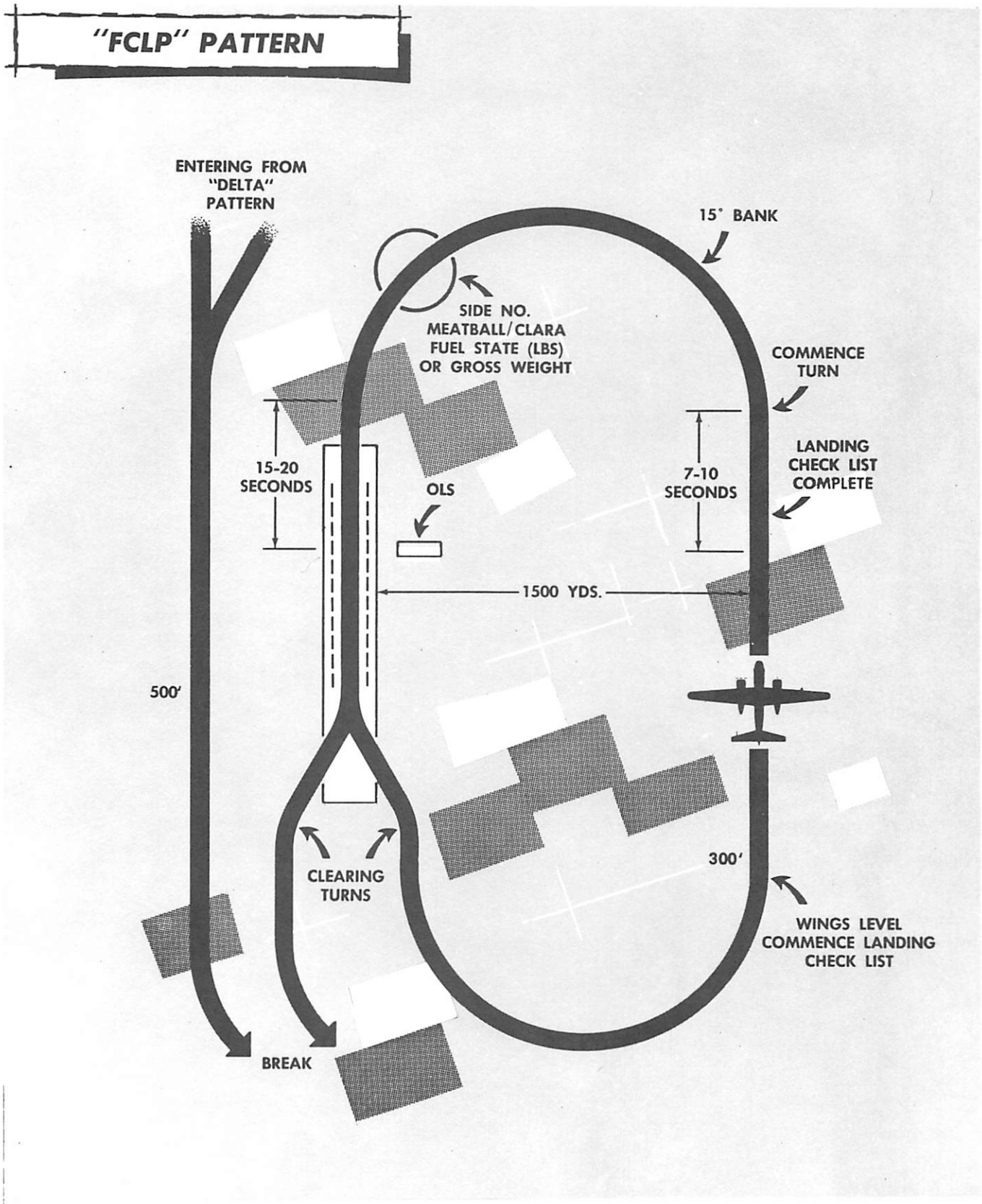

"FCLP" PATTERN
ENTERING FROM "DELTA" PATTERN
15° BANK
SIDE NO. MEATBALL/CLARA FUEL STATE (LBS) OR GROSS WEIGHT
COMMENCE TURN
15-20 SECONDS
7-10 SECONDS
LANDING CHECK LIST COMPLETE
OLS
1500 YDS.
500'
300'
CLEARING TURNS
WINGS LEVEL COMMENCE LANDING CHECK LIST
BREAK
D-SAD1-10

Figure 4-15

section V

EMERGENCY PROCEDURES



D-SAD1-66

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SCOPE

There are many types of emergency situations which may be encountered in the S-2 series. The emergency situations and procedures outlined in this section cover the common types of emergencies encountered; however, the procedures used in each actual emergency encountered must result from consideration of the complete situation in which encountered. Compounded emergencies may require some departure from a portion of the normal corrective procedures set forth below for any specific emergency, in order to follow the least hazardous plan. Due to the many and varied types of equipment installed, pilots and aircrewmen must be thoroughly trained in the correct application of the proper procedures.

The emergency procedures check lists in this Section consist of Memory Items and Challenge and Reply Items. The pilot shall complete the Memory Items listed in order, then the co-pilot shall read both the Challenge and the Reply and monitor proper compliance prior to proceeding to the next item.

SIMULATED EMERGENCY TRAINING

Simulated emergency training is necessary to develop fully qualified flight crews. The simulated emergencies must be reasonable, applicable, and must not create a condition hazardous to flight safety not normally encountered in an actual emergency. Therefore, emergencies shall be practiced in such a manner as to allow sufficient latitude to insure safe recovery. The rules set forth below shall be adhered to when practicing emergencies.

1. During familiarization or transition flights involving scheduled inflight emergency training which might affect control of the aircraft, no person shall be embarked in the aircraft other than the pilots under instruction and the qualified Instructor Pilot/CAPC. Included herein are stalls and simulated single engine landings.

2. During operational and training flights other than in (1) above, simulated single engine landings are authorized with crewmembers on board provided an Instructor Pilot/CAPC is occupying either the pilot or co-pilot seat.

3. Simulated systems failures shall not be unreasonably compounded. System failure will not be simulated in conjunction with simulated engine failure training unless such system failure is normally associated with engine failure.

4. No-flap landings may be practiced provided an Instructor Pilot/CAPC is occupying either the Pilot or co-pilot seat. If no flap touch and go or FCLP landings are made, the flaps shall be lowered to at least 1/3 down prior to becoming airborne again.

5. An Instructor Pilot/CAPC shall demonstrate as necessary all emergency training maneuvers to a pilot under instruction and insure his knowledge of these maneuvers prior to his performing the particular maneuver.

6. Simulated engine failure during takeoff may be accomplished at a minimum altitude of 300 feet above terrain by retarding one throttle to 15" MAP providing the safe single engine airspeed (100 KIAS) has been attained. The simulated emergency will not be intentionally compounded.

7. Simulating a failed engine by pulling the mixture control to IDLE CUT OFF, or actually feathering an engine for emergency training shall not be practiced below 4000 feet above the terrain.

8. Simulating an engine failure shall not be initiated by turning off the fuel selector or by closing the emergency fuel/oil shut-off switch.

9. One throttle may be retarded to 15" MAP to accomplish simulated single engine landings; however, the simulated failed engine must be set to FULL INCREASE RPM to complete the landing approach.

10. During simulated single engine approaches as described above, practice single engine wave offs may be practiced only if executed prior to descending below 300 feet above terrain. Any wave off taken from a lower altitude during such practice approaches shall be made utilizing both engines. Any time during a simulated single engine approach the pilot feels the safety of his aircraft is being jeopardized, or becoming marginal, he shall execute a normal wave off using both engines, and proceed in the safest manner available to him at that time.

11. Simulated single engine training shall not be practiced:
    a. At less than 100 knots IAS.
    b. Under other than VFR conditions.
    c. When any actual flight emergency exists.
    d. During no flap landings.
    e. During touch and go landings except when both engines are available and operating normally for the succeeding take-off.
    f. During carrier landings.

GROUND EMERGENCIES

The following covers only those emergencies which pertain to ground operation. Most other malfunctions or emergencies which are peculiar to flight

are not covered here since they may normally be corrected, if occurring on the ground, by stopping the engines.

ENGINE FIRE ON DECK

When a fire develops during the start procedure, continue cranking the engine in order to blow out the fire. If the engine won't start and the lineman signals for the engine to be cut, or an engine fire develops while taxiing, secure the engines as follows:

1. MIXTURES . . . . . IDLE CUT OFF
2. AUX PUMPS . . . . . OFF
3. FUEL SELECTORS . . . . . OFF
4. MAGS . . . . . OFF
5. EVACUATE AIRCRAFT

CAUTION

Do not attempt a restart until the cause of the fire is determined and corrected.

Crew Duties Shall Be As Follows:

1. PILOT - Notify the crew of the situation, secure the engine as shown above and order others to evacuate if deemed necessary.
2. COPILOT - Observe all ground crew activity and signals. When fire is in starboard engine keep pilot informed of progress. Assist the pilot as directed.

NEW

3. NUMBER 3 OPERATOR - Clear the loose gear from the passageway. Fold Aisle Console.
4. NUMBER 4 OPERATOR - Leave the seat and push it Full Forward. Stand by the main entrance door. Unlock it, but don't open it, for it provides a good shield from the flames.

Evacuation order is: Number 4 Operator, Number 3 Operator, Copilot, and Pilot.

WING SPREAD MALFUNCTION

NEW NEW NEW NEW NEW

During start, if inadvertent wing spread is experienced execute the following:

1. Ensure the Fold/Spread lever is in the FOLD position.

If the Wings continue to spread:

2. Secure the engine(s).

During the initial spread-fold-spread check the pilot can note both wings returning to the folded position. If during that check or any time later during the spread cycle a malfunction is detected, the plane director will immediately give the wing fold signal. The pilot shall execute the following:

NEW NEW NEW NEW NEW NEW NEW

1. Ensure the Fold/Spread lever is in the FOLD position.

If the Wings continue to spread:

2. Turn off generators.

CAUTION

To deactivate the 3000 PSI hydraulic system, if external DC power is still being applied, the engines must be cut or external DC power disconnected.

The director will signal "Thumbs Up" and "Fold Wings" when FOLD has been selected manually in the wheel well.

3. Turn on generators.

JAMMED CONTROLS — GROUND

In the event that any jamming or binding of flight or engine controls is experienced on the ground, proceed as follows:

1. Maintain the controls in the jammed or binding condition and return to the flight line.
2. Have maintenance troubleshooters investigate the cause.
3. Do not shut down the engines until the troubleshooters' investigation is completed.
4. DOWN the aircraft and report the discrepancies on the Yellow Sheet.

HOT BRAKES

The possibility of encountering a hot brake condition always exists. For this reason it is necessary that all personnel in the flight crews, as well as ground personnel, be thoroughly familiar with the following procedures:

1. ON LANDING ROLLOUT - Complete the landing and clear the runway. Notify the tower and request assistance or directions to a designated "Hot Brake Area".
2. WHILE TAXIING - Notify the tower and request assistance or directions to a designated "Hot Brake Area".
3. IN THE LINE AREA - Stop the aircraft. Allow the prop wash of the running engines to aid in cooling the wheels. Use caution when exiting the aircraft.

WARNING

Do not use CO_2 or water on hot brakes. Use only approved dry chemical extinguishing agents in the event of brake fire.

LOSS OF BRAKES

If there is any indication of a loss of normal braking action while taxiing, attempt to stop the aircraft with manual braking (heavy pressure on brake pedals). Insure that the co-pilot is not attempting to use the brakes simultaneously as this may center the shuttle valve and give no braking action. Set the emergency brake. Do not attempt to taxi further. Shut down both engines after assistance has been requested by radio, and complete the GROUND SECURE Check List. Station one person outside to direct traffic around the aircraft as necessary. Loss of brakes shall be signalled by:

1. Dropping tail hook.
2. Navigation lights - ON.
3. Radio transmission to PRI-FLY-TOWER.

TAKE-OFF EMERGENCIES

When an emergency occurs on takeoff every consideration should be given the possibility of aborting the takeoff in order to avoid increasing the hazard involved.

ENGINE FAILURE ON TAKE-OFF

If an engine fails on take-off the decision to abort or continue the take-off must be dependent on length of remaining runway, airspeed, gross weight, availability of abort gear, and density altitude.

Before Becoming Airborne Ashore

If the failure occurs before the aircraft becomes airborne from a runway, proceed as follows:

1. THROTTLES . . . . . CLOSED
2. NOSE WHEEL . . . . . LOWER TO RUNWAY
3. BRAKES . . . . . AS REQUIRED
4. FLAPS . . . . . UP
5. Notify tower of situation and intentions.
6. HOOK . . . . . DOWN
   Aim for the center of the wire.

If committed to abort with insufficient runway and no arresting gear, continue as follows:

7. MIXTURES . . . . . IDLE CUT OFF
8. EMERGENCY FUEL/OIL/HYD . . . . . CLOSE
9. MASTER IGNITION . . . . . OFF
10. EMERGENCY BRAKE. . . . . AS REQUIRED

If still unable to stop the aircraft prior to running into obstructions, continue as follows:

11. LANDING GEAR . . . . . RETRACT
    Pull Landing Gear Solenoid Override and place handle in the UP position. Ground looping the aircraft may sometimes be an effective alternate if slow enough.

When stopped, secure the cockpit (time permitting) and evacuate the aircraft.

Airborne Ashore or Free Deck Launch at Sea

Note

Lateral (roll) and directional control of the aircraft can be maintained with full power on the operating engine only if airspeed is maintained above 90 KIAS (see Figure 5-1). Should this control be lost, airspeed must be increased and/or power on the operating engine reduced in order to regain it. The ability to maintain altitude or to climb depends upon gross weight and density altitude (see Section XI, Figures 11-33 through 11-35).

If the failure occurs immediately after the aircraft becomes airborne, but too late to abort the take-off, or too late during a free deck launch at sea, proceed as follows:

CONTINUE STRAIGHT AHEAD - LOWER LIVE ENGINE WING (APPROX. 5°) - MAINTAIN 100 KIAS MINIMUM.

1. LANDING GEAR. . . . . UP
2. Check to see that automatic feathering is taking place. If not, determine the failed engine and feather it. If unable to feather, set PROP control to FULL DECREASE RPM.
3. FLAPS. 1/3
4. Jettison stores and dump fuel as necessary.

WARNING

If unable to climb or maintain altitude, the pilot must be prepared to execute a controlled ditching/crash landing rather than risk a fatal stall/spin crash in a futile effort to save his aircraft.

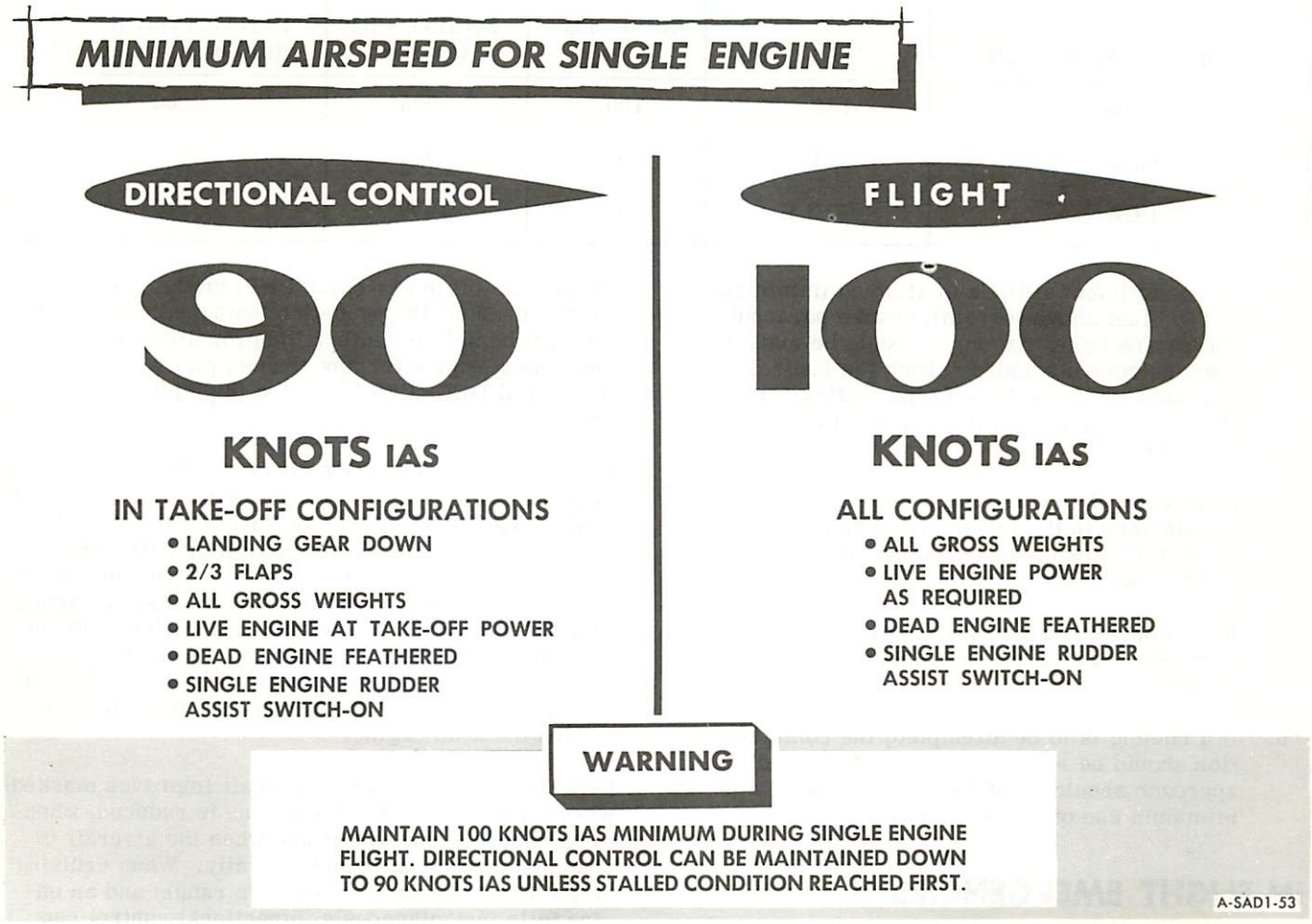


Figure 5-1

5. Accelerate to 110 KIAS, raise flaps to full UP and accelerate to 120 KIAS (see Section XI, Figures 11-33 through 11-35).
6. When flight conditions are no longer critical, secure failed engine using the IN FLIGHT SECURE Check List.

WARNING

NEW

The propeller may continue to rotate after propeller feather until the mixture is secured causing increased drag and moderate airframe buffet.

7. Land as soon as possible.

WARNING

Do not attempt to restart a failed engine where internal damage and/or fire is the suspected cause.

Note

Primary consideration should be given to diverting to an available shore station rather than attempting a single engine carrier landing.

JAMMED CONTROLS — TAKE-OFF

In the event that any jamming or binding of flight or engine controls is experienced on take-off, every consideration should be given to the possibility of aborting the take-off in order to avoid increasing the hazard involved. If it occurs too late to abort the take-off, or during flight, proceed as follows:

1. Attempt to climb out straight ahead.
2. Keep the movement of flight controls to the minimum necessary to maintain control.
3. Adjust power as necessary.
4. Alert the appropriate controlling agency of the nature of the emergency and your intentions. Set IFF/SIF to EMERGENCY.
5. Maintain the aircraft in the configuration in which the emergency occurred.

LANDING GEAR POSITION	WING FLAPS	AIRSPEED (KIAS)	ENGINE BHP (approx)	PEDAL FORCE (LB) (Rudder Assist OFF)
DOWN	1/3	100	925	80
DOWN	2/3	90	975	100
DOWN	FULL	90	1050	150

6. When sufficient altitude is attained (minimum of 6000 feet above terrain), ensure parachute straps are tight. Attempts should be made to free the controls and/or check the control characteristics in the present configuration. Check AFCS and Co-pilot's control column disconnect.

7. If the control characteristics are found to be satisfactory in the landing configuration, the Pilot in Command may elect to land or bailout at his discretion.

8. If the control characteristics are found to be unsatisfactory, a landing should not be attempted.

9. If a landing is to be attempted, the configuration should be established at altitude, and the approach should be of the type requiring a minimum use of flight controls.

IN-FLIGHT EMERGENCIES

Note

- If at any time during flight, the Number 3 Operator senses any indication of an impending emergency situation, he should automatically retract the radome and MAD boom, if extended, regardless of indicated airspeed.

- Feathering the starboard propeller before the radome/Mad boom is fully retracted will halt radome/Mad boom movement until the AC bus tie switch is set to ON.

FLIGHT CHARACTERISTICS UNDER SINGLE ENGINE OPERATION

Automatic feathering devices provided for both engines are controlled by the automatic feathering arming switch located on the left side of the overhead console. The rapid feathering accomplished by this installation (6 second cycle) during an engine failure decreases the usual abrupt yaw and roll tendencies considerably. In addition, the hydraulically operated rudder trimmer, controlled by the single engine rudder assist switch is incorporated to provide single engine directional control under critical conditions such as low airspeeds and high asymmetric power. The aircraft can be controlled, using rudder and trimmer, down to a speed of 90 KIAS with the flaps in take-off position, landing gear down, take-off power (1525 BHP) on the live engine, and the dead engine propeller feathered. Should the pilot not be able to feather the propeller on a malfunctioning engine for any reason, place the prop control in full DECREASE position (high pitch) to reduce drag.

Under the above conditions it is possible to maintain straight flight using full rudder (single-engine rudder assist switch ON) and partial lateral control to lower the live engine wing approximately five degrees to counteract yaw and roll. With the rudder and lateral trim set for take-off, the forces required are approximately 160 pounds on the rudder and 10 pounds on the control wheel. If engine failure is instantaneous, the aircraft can still be satisfactorily controlled, although the aircraft will yaw and roll momentarily toward the dead engine.

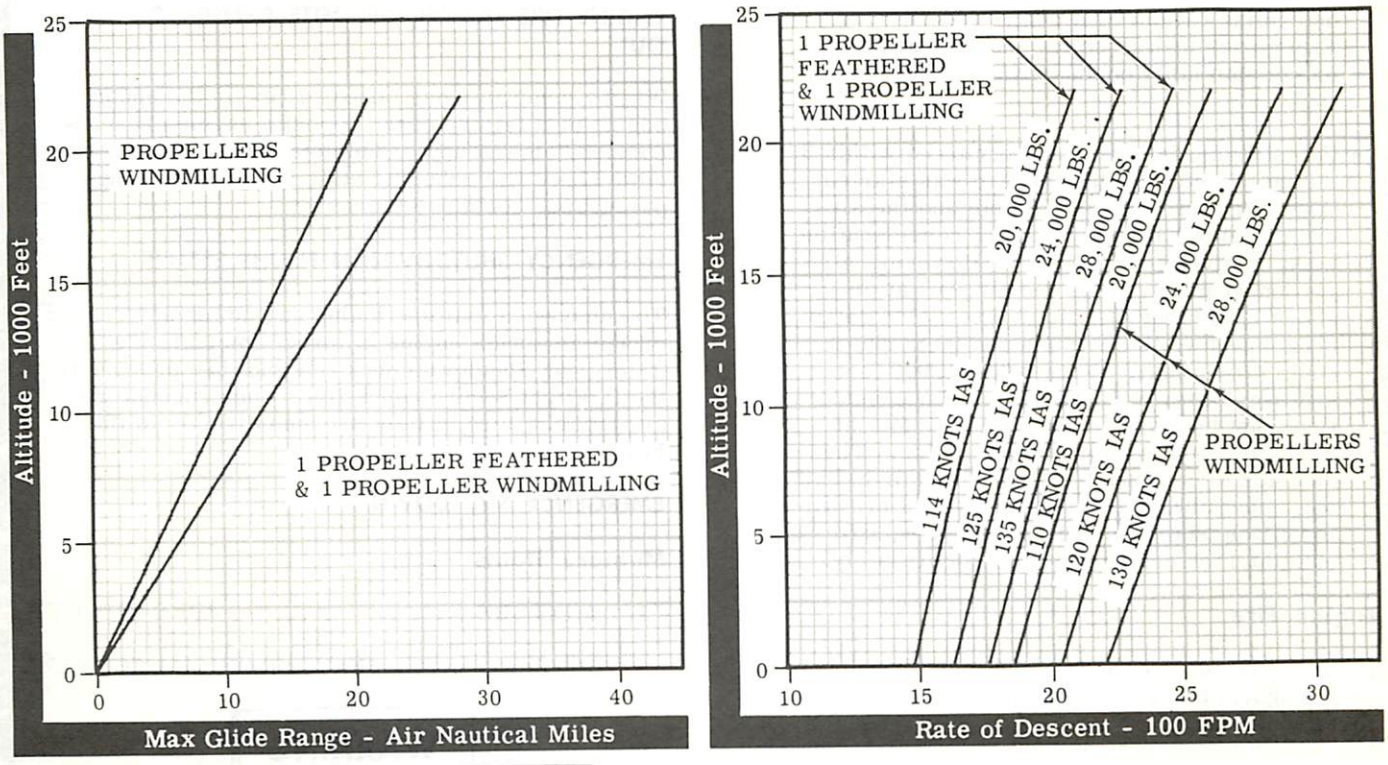
Directional control of the aircraft improves markedly when the power on the live engine is reduced, when the airspeed is increased and when the aircraft is trimmed directionally and laterally. When cruising at 130 KIAS (speed for maximum range) and an engine fails instantaneously, directional control can easily be maintained with the single engine rudder assist switch OFF. After feathering the propeller of the dead engine (single engine rudder assist switch still OFF), the aircraft can be trimmed with hands and feet off the controls down to 120 KIAS with normal rated power on the live engine and the wing down five degrees into the live engine.

The single engine rudder assist switch will be set ON (rudder trimmer operative) for all take-offs, landings and low speed flights. However, it is possible to make single engine landings with the single engine rudder assist switch OFF (rudder trimmer inoperative). Utilization of the rudder trimmer reduces pedal forces and increases directional control. In the table above, with landing gear down and flaps full DOWN at 90 KIAS, the pedal force would only be approximately 150 pounds with rudder assist OFF.

GLIDE DISTANCE

The glide distance charts (figure 5-2) provide the pilot with a no-wind mileage that he may attain with both engines windmilling or with one propeller feathered from a given altitude using a recommended airspeed. This airspeed will provide engine (windmilling) speed capable of keeping electrical and hydraulic power available. This glide information is useful in cases where a prepared landing site is available and distance is the prime consideration to gain a better position for a ditching or bailout close

MAXIMUM GLIDE DISTANCE



MODEL: S-2D/E
DATE: FEB. 1966
DATA BASIS: ESTIMATED

NOTE

1. BOTH ENGINES ARE INOPERATIVE WITH GEAR AND FLAPS UP.
2. AIRSPEEDS SHOWN ARE FOR MAXIMUM GLIDE RANGE.
3. GLIDE RANGES ARE VALID FOR ALL WEIGHTS.

B-SAD1-54

Figure 5-2

to ship or land. It is seldom useful at sea, however, where time prior to ditching becomes the prime consideration.

Note

If time airborne is more important than distance to be travelled, maintain 105 KIAS with 1/3 flaps.

FIRE IN FLIGHT

An inflight fire is one of the most serious emergencies a flight crew may encounter. Fires may range from major to minor in types, sizes and the amount of danger involved. Correct evaluation and positive action is required to minimize the danger and produce the most successful results. The pilot should expect a compound emergency. The possibility exists that in addition to the loss of the associated engine, the pilot may experience loss of all hydraulic and electrical systems. Under these conditions the rudder assist will be inoperative, the rudder trim will be inoperative and the possibility of split flaps will exist. It is extremely important that the pilot take immediate steps to either land the aircraft or bailout under these conditions.

WARNING

- Altitude and time are the prime factors that determine bailout or a controlled ditching. Experience with fires has shown that after one minute most engine fires are beyond control.

- Catastrophic failures have occurred within 3 minutes from the time the fire was started. When the fire is uncontrollable and the aircraft is above 1,000 feet AGL, consideration must be given to bailing out. However, all personnel must egress the aircraft at or above 1,000 feet AGL. Any excessive delay occasioned while crewmen don their chutes could prove fatal. When below 1,000 feet and over water or suitable terrain, consideration must be given to reducing altitude immediately to allow for quick ditching. The decision to continue flight, to ditch or to bail out, must always be made in light of prevailing circumstances. If fire continues, bail out, ditch or emergency land immediately.

Engine Fire

The following smoke signals and their probable causes should be thoroughly understood by all pilots:

1. A thin black smoke from exhaust stacks indicates improper combustion, probably due to an overrich carburetor setting.
2. Puffs of black smoke coming from exhaust stacks indicate detonation or backfiring.
3. Thin grey smoke coming from cowl flaps indicates exhaust stack or cylinder head failure.
4. Puffs of white smoke coming from exhaust stacks indicate oil combusting in a cylinder, probably due to a swallowed valve or similar malfunction.
5. A large volume of dense black smoke from any area aft of cowl flaps indicates an oil fire in the accessory section, probably due to a broken oil line.
6. Black smoke with orange yellow flame from any area aft of the cowl flaps indicates a fuel fire in the accessory section, probably due to a broken fuel line.

If a fire warning light comes on and the engine malfunctions cannot be determined by a visual check of the engine instruments, the Pilot-in-Command must use sound judgment in making the decision to feather or not to feather. Factors such as terrain, proximity of landing areas, distance to base, etc., must be considered. If the light remains on and circumstances permit, serious consideration must be given to feathering. In any case, when a fire warning light comes on, land at the nearest suitable airfield and have the engine inspected. When an engine fire occurs inflight complete the EMERGENCY SHUTDOWN CHECKLIST.

ENGINE FIRE/FAILURE OPPOSITE GENERATOR OUT

When a generator has failed, a fire in the opposite engine or a failure of the opposite engine presents a compond emergency. Complete the emergency shutdown check list adhering strictly to the warning paragraphs contained therein.

EMERGENCY SHUTDOWN/IN FLIGHT SECURE

To shutdown a malfunctioning engine for any reason except an abrupt engine failure. Complete the Emergency Shutdown check list and then proceed to the In Flight Secure check list. Upon encountering an engine failure inflight proceed directly to the In Flight Secure check list.

EMERGENCY SHUTDOWN

Memory Items

1. MIXTURE . . . . . IDLE CUT OFF
2. PROP . . . . . FEATHER/FULL DECREASE

WARNING

If opposite generator is functioning, feather propeller. With opposite generator failed, do not feather. Retard prop to full decrease RPM.

3. EMERGENCY SWITCHES . . . . AS REQUIRED (CLOSE for engine fire if prop is feathered.)
4. FUEL SELECTOR . . . . . AS REQUIRED (OFF for engine fire with opposite generator failed.)

IN FLIGHT SECURE

Memory Items

1. RUDDER ASSIST . . . . . ON
2. PROP(S) . . . . . FULL INCREASE
3. THROTTLE(S) . . . . . AS REQUIRED
4. MIXTURE(S) . . . . . RICH
5. WHEELS . . . . . UP
6. FLAPS . . . . . AS REQUIRED
7. JETTISON . . . . . AS REQUIRED

Reduce weight (ordnance and fuel) as necessary for safe single engine flight.

WARNING

- Be certain fire does not exist before initiating fuel dumping.
- If fire continues bailout, ditch or emergency land immediately.
- If engine shutdown is for engine fire and the fire is extinguished or internal engine damage is suspect do not attempt to restart the engine. Land at the nearest suitable airport and investigate.
- When an engine is secured with the opposite generator out, all electrical power will be lost after landing when the propeller ceases to rotate above generator cutout speed. Thus the aircraft will be without lighting and communications after landing.
- If one generator has failed and the AC BUS TIE switch has been set to ON, it is possible to feather the propeller of the operating engine supplying power to the aircraft. If this occurs, all electrical power will be lost and it will be impossible to unfeather the propeller.

Upon engine failure, analyze the following five indications to determine definitely which engine has failed before proceeding to the challenge and reply items.

1. Heavy pressure on one rudder pedal indicate the operating engine.
2. Swerve of the aircraft will be toward the fai engine.
3. Loss of torque pressure.
4. Visual indications of structural damage or engine fire.

Challenge and Reply

1. AUTO FEATHER . . . . . AS REQUIRED (ARMED for engine failure if opposite generator is functioning).
2. THROTTLE . . . . . CLOSED
3. PROP . . . . . FEATHER/FULL DECREASE

WARNING

If opposite generator is functioning and autofeather has not occurred, feather prop. With opposite generator failed, retard prop to full decrease RPM.

CAUTION

If the feather button does not pop out at the completion of a feather cycle, manually pull the feather button to the neutral position and check the AC loadmeter for an indication of feathering pump cutout. If the feathering pump does not cut out after a practice feathering, the engine oil will be pumped into the crankcase in 20 seconds and will prevent unfeathering.

4. MIXTURE . . . . . IDLE CUT-OFF
5. EMERGENCY FUEL/OIL/HYD . AS REQUIRED (CLOSE if feather is accomplished. For engine fire opposite generator failed, only close the emergency hydraulic switch.)
6. COWL FLAPS/OIL COOLERS . AS REQUIRED (OPEN for engine fire.)
7. AUX PUMP . . . . . OFF
8. FUEL SELECTOR . . . . . OFF
9. MAG . . . . . OFF
10. AUTO FEATHER . . . . . OFF
11. GENERATOR . . . . . AS REQUIRED
12. AC BUS TIE . . . . . AS REQUIRED

WARNING

WARNING
ACTUATION OF THE AC BUS TIE SWITCH COULD CAUSE AN INADVERTENT FEATHERING OF THE OPERATING ENGINE PROPELLER AS A RESULT OF A MALFUNCTION IN THE FEATHERING SYSTEM UNLESS THE AUTO PROP FEATHER AND OPERATING ENGINE PROP FEATHER CIRCUIT BREAKERS ARE OUT.

Crossfeed should be used to balance fuel on extended single engine flights.

IN FLIGHT RESTART

If it is absolutely necessary to obtain partial power from an engine that has been secured, proceed as follows:

1. MIXTURE . . . . . IDLE CUT OFF
2. THROTTLE . . . . . CLOSED
3. PROP . . . . . FULL DECREASE
4. FUEL SELECTOR . . . . . DIRECT
5. AUX PUMPS . . . . . ON

6. EMERG FUEL/OIL/HYD . . . . . OPEN
7. MAG . . . . . BOTH
8. FEATHER BUTTON . . . PULL TO 800 RPM
9. MIXTURE . . . . . RICH
10. WARM UP . . . 1500/18" TO 100° CYL TEMP
11. COWL FLAPS/OIL COOLER . . AS REQUIRED
12. GENERATOR . . . . . ON
13. BUS TIE . . . . . NORMAL
14. POST TAKE-OFF CHECK LIST . . . . CHECK

Fuselage Fire

1. Use hand extinguisher mounted at aft side of main entrance door.
2. Land as soon as possible.

Wing Fire

1. If the fire occurs in the nacelle area execute the EMERGENCY SHUTDOWN Check List.
2. If the fire occurs outboard of the nacelle area turn OFF all electrical equipment to that wing.
3. Slip the aircraft away from the fire as necessary.
4. If the fire is extinguished land as soon as possible. If the fire persists, bailout or ditch as applicable.

Electrical Fire

The probability of electrical fire is minimized by circuit breakers and fuses which function to de-energize malfunctioning circuits.

ELECTRICAL FIRE ISOLATION

If an electrical fire does occur and cannot be visually isolated, proceed as follows:

1. GENERATORS . . . . . OFF
2. CIRCUIT BREAKERS . . . . . PULL
   Except 1 amp Klixon breakers which release only by overloading.
3. FUSES . . . . . REMOVE
4. NON ESSENTIAL EQUIPMENT . . . . . OFF

Note

Isolation is determined by turning ON each generator, electrical and electronic component in turn, and checking for recurrence of the fire, smoke or smell indication. After isolation remove all power from the failed component, extinguish any fire or smoldering, as necessary, and re-energize other components and systems available.

WHEN FIRE IS UNCONTROLLABLE

When an electrical fire cannot be isolated and it persists, an emergency landing, ditching, or bail out should be executed as applicable. This will depend on the intensity and amount of smoke, and the general circumstances under which the aircraft is operating. When an electrical fire is uncontrollable, proceed as follows:

1. REQUIRED COMM/IFF . . . . . ON
2. GENERATORS . . . . . ON
   If one generator fails, switch AC BUS TIE to ON. If a TR fails, use DC BUS TIE.
3. MAKE REPORT
   Report emergency, position and intended plan of action to any available station.
4. BAIL OUT, DITCH or LAND IMMEDIATELY.

EMERGENCY DESCENT

An emergency descent may be made in either a clean configuration or with gear and flaps extended, depending on the circumstance. A more rapid rate of descent may be attained in the clean configuration. However, if structural damage, turbulent air, or fire not contained within the cowling is a consideration, the low airspeed maximum drag (full increase RPM) configuration is recommended.

WARNING

If an engine fire is uncontrollable, with flames sweeping past the nacelle, the wheels and flaps should not be lowered until just before landing. Do not lower wheels unless landing on a prepared surface. Be extra cautious when lowering flaps due to the increased possibility of a split flap condition.

HEATER FIRE

The heater is protected by several thermal switches and a low fuel pressure switch which either prevents heater operation or automatically secures the heater when a malfunction occurs. However, should a heater fire occur, proceed as follows:

1. Turn Heater START-OFF-ON Switch to OFF. If fire is extinguished do not attempt to restart heater.

2. If fire persists, the cockpit heater circuit breaker, located on the DC Junction box, should be pulled. Use the hand-held extinguisher mounted at the aft side of the main entrance door to extinguish the fire. Ready access to the heater area is prevented by installed electronic equipment; however, discharging the fire extinguisher pointing forward and upward in the vicinity of the co-pilots left rudder pedal should be most effective. To purge cockpit of CO_2 fumes and smoke, open overhead hatches when fire is extinguished.

3. If raw fuel is being fed to the heater through heater fuel lines and steps 1 or 2 above do not correct the malfunction, ensure that the starboard aux pump is off and secure the starboard engine.

4. When a heater fire cannot be extinguished and has become uncontrollable, an emergency landing, ditching or bailout should be executed as rapidly as possible. The loss of control wheel and rudder pedal functions may result and the danger of an explosion of the windshield washing fluid or fuel vapors in the nose section cannot be disregarded. Emergency land, ditch, or bail out immediately.

SMOKE/FUMES REMOVAL

Removal of smoke/fumes from inside the aircraft may be accomplished in two ways:

- Open the pilots' overhead hatches. This is probably more expeditious, however, consideration must be given to the effects on the pilots as this method may increase the smoke in the cockpit.
- Open the torpedo bay doors and the internal access panel to the torpedo bay.

WARNING

Flames in either nacelle area may be drawn into the crew compartment through the wing leading edge during smoke/fumes removal.

MAGNETIC CHIP DETECTOR ILLUMINATION

In the event a sump warning light illuminates in flight, the following procedure will be utilized:

1. Fly the aircraft. Instantaneous action may not be required.

2. Check engine instruments for abnormal indications.

3. If any abnormal conditions are present, secure the engine using the EMERGENCY SHUTDOWN Check List.

4. If abnormal indications are not present continue to monitor engine instruments or secure the engine at the discretion of the Pilot-in-Command.

5. Land at the nearest suitable airport. The Pilot-in-Command will consider weather and available facilities and utilize his best judgment as to choice of landing field.

DOUBLE ENGINE FAILURE

The possibility of a double engine failure is extremely remote. If it does occur it may be caused by carburetor icing or contaminated fuel. When double engine failure occurs, proceed as follows:

1. Establish a glide.
   a. For maximum time airborne, maintain 105 KIAS with 1/3 flaps.
   b. For maximum distance see Figure 5-2 (110-135 KIAS).
   c. For minimum drag, set unfeathered propeller(s) to full DECREASE.
2. Execute BAILOUT or DITCHING Check Lists at discretion of Pilot in Command.
3. If DITCHING is elected and carburetor icing is suspected, attempt to restart an engine (time permitting) as follows:
   a. MIXTURE . . . . . IDLE CUT OFF
   b. THROTTLE. . . . . CLOSED
   c. PROP . . . . . FULL DECREASE
   d. CARB AIR . . . . . ALTERNATE
   e. PRIMER . . . . . STEADY
   Left or right engine as desired.
   f. If one engine is restarted, set power to maintain single engine flight and attempt to restart the other engine.

Note

If partial fuel stoppage occurs as a result of ice or carburetor malfunctioning, the primer may be used to supplement the carburetor. Primer flow alone will support approximately 23 inches Hg MAP at 2000 to 2300 RPM. Adjust throttle for smooth running mixture.

WARNING

Do not attempt to restart a failed engine where internal damage and/or fire is the suspected cause.

4. If unable to restart either engine continue with the DITCHING procedure.

WARNING

Do not jeopardize a safe ditching by too many attempts to restart.

ENGINE OVERSPEED

When an overspeed condition exists, immediate closing of the throttle is mandatory. If control of the RPM cannot be regained the engine must be secured. Partial power may be obtained from an engine with an inoperative propeller governor by reducing air-speed to 110 knots and using the throttle to keep RPM below 2800.

PROPELLER FAILURES

1. Runaway Propeller.
   A propeller has runaway if the RPM, after initial surge above 2800 RPM continues to increase beyond the governing range. Reduce power immediately and secure that engine using the EMERGENCY SHUTDOWN Check List.

2. Propeller Governor Linkage Failure.
   If linkage failure occurs between the prop control lever and the governor, the governor is internally spring loaded to operate the propeller at 2270-2500 RPM. Direct control of engine speed is not possible, but the engine is still operable.

3. Propeller Dome/Governor Failure.
   Failure in the governor or prop dome resulting in an ungoverned propeller will allow the propeller to go to full low pitch. After initial surge, if RPM reduces to 2800 RPM or below, power is available as a fixed-pitch propeller. Proceed as follows:

   a. Retard throttle and prop control lever.

   b. Reduce airspeed to 110 KIAS.

CAUTION

Feathering of the propeller is not recommended.

THROTTLE ROD/LINKAGE FAILURE

Throttle rod/linkage failure is evidenced by inability to move the throttle or no change in MAP when throttle is moved. In the event of throttle rod/linkage failure, the butterfly valve in the carburetor will automatically go to a cruise power setting. The actual setting will depend upon airspeed (ram air pressure) at the time of failure. Consideration should be given to feathering the affected engine prior to landing.

FUEL SYSTEM EMERGENCY OPERATION

Fuel Feed

Fuel can be cross-fed from one tank to the opposite engine to supply both engines from one tank (figure 1-20). One engine cannot, however, be fed from both tanks at the same time. To shut off the fuel supply to either engine, set the individual engine emergency FUEL and OIL shutoff switch to CLOSE.

WARNING

Prior to cross-feed selection, the FUEL BOOST pump switches should be set to ON and left ON to maintain constant fuel pressure during cross-feed operation.

Fuel Leak

A fuel leak may be evidenced by the smell of gasoline in the cockpit, a rapid drop in fuel quantity or a drop in fuel pressure, even through the engine continues to operate normally. The first concern of the crew must be to guard against the outbreak of an engine fire. The greatest danger is that the crew develops a false sense of security because no fire exists at the time the fuel pressure drop is noticed, nor after several hours of flight. However, when the throttle is retarded an engine fire or explosion may occur. Actually a fuel leak may have existed, but the cooling and dispersing effect of the air flow through the engine nacelle at cruising speed has prevented the start of a fire. If the throttle is retarded, the airspeed will drop and the airflow may be reduced enough to permit ignition of the leaking fuel. Any change in the airflow pattern, such as feathering the propeller or entering a climb may start a fire if a fuel leak exists. Increasing power is less likely to start a fire since airspeed will be increased. There is still a possibility of fire due to the exhaust heat and flame pattern changing enough to outweigh the increase in cooling airflow. It must be the objective of the crew to eliminate the fuel before any change is made to the airflow or exhaust pattern. The most effective means of doing this is by moving the mixture control to IDLE CUT OFF prior to any throttle reduction, propeller feathering, or other engine shut down procedure. An additional advantage of moving the mixture control to IDLE CUT OFF is that it provides the most rapid means of eliminating exhaust flames and reducing exhaust heat. Possible courses of action are:

1. If power is not necessary to sustain flight or reach a safe destination, use the EMERGENCY SHUTDOWN Check List. NEW

2. If power is necessary to sustain flight or reach a safe destination, maintain the affected engine in operation at or above cruising speed watching for fire. Before power reduction for entrance to the landing pattern, cut the affected engine using the EMERGENCY SHUTDOWN Check List and make a single engine landing. Do not reduce airspeed until the affected engine is shut down. NEW

NEW NEW NEW NEW

WARNING

If fuel fumes are detected in the cockpit after the heater has been started, turn the heater switch "OFF" and do not attempt to restart. Pull the cabin heater circuit breaker located at the DC junction box. If raw fuel is being fed to the heater after the heater has been turned OFF and the circuit breaker pulled, insure the starboard aux pump is off and secure the starboard engine.

Fuel Quantity Increase

Any increase in indicated fuel quantity, prior to take-off or during any portion of the flight, may be caused by missing fuel caps or the first symptom of a collapsing fuel cell. The most probable cause is an obstruction in the Ram Air Vent System resulting in the fuel cells being sucked from their retaining snaps, causing a fuel level rise around the fuel quantity probe. The probability of this condition occurring in both fuel tank systems simultaneously is remote. Whenever an increase in fuel quantity is noted in either fuel tank system, select fuel for both engines from the fuel tank having the normal fuel quantity indication. Land at the nearest suitable field and investigate the cause.

Note

Abnormal conditions of this nature are more readily discovered during periodic checks of fuel state. The importance of a Fuel Log cannot be overemphasized.

When either LONG RANGE or MAXIMUM ENDURANCE becomes a controlling factor for safe return, two engine operation will provide the best performance at all gross weights. Optimum engine operation during these situations should be determined through the use of the appropriate Specific Range charts in Section XI Part 7, or the Pilot's Pocket Check List.

EMERGENCY JETTISON

Emergency jettison is the means of reducing excess weight, drag and hazard during emergencies. It must be considered in the following situations:

1. Weight and Drag Reduction.
   The most rapid means of reducing weight and drag in order to maintain safe flight during single engine operation is by pulling the JETTISON handle, which releases wing and torpedo bay stores.

Note

- Approximately 50 pounds pull on the jettison handle is required to jettison torpedo bay stores.
- To jettison torpedo bay stores unarmed, the torpedo bay doors must be open and the FUSE ARMING switch to SAFE.
- To jettison wing stores, appropriate primers must be installed and electrical power available.

Additional rapid weight reduction is effected through the use of the fuel dump system.

2. Fire in Flight.
   An engine or nacelle fire requires that the engine be secured, which may also require consideration of weight and drag reduction. Fuselage and wing fires outboard of the nacelle require jettisoning only those explosive or pyrotechnic stores which may be affected by the fire. Wing store jettisoning is dependent upon electrical power; therefore, when in doubt, jettison wing stores.

3. Ignited Stores.
   Photo-flash cartridges and marine markers generate sufficient heat to initiate serious fires or explosions. Any indications of either of these being ignited while still in the dispenser warrants immediate jettisoning of the entire dispenser load or photo pod.

WARNING

Photo-flash cartridges contain black powder and magnesium.

4. Ditching Or Forced-Landing Imminent.
   Aside from the reduction of weight and drag considered above, jettisoning of explosive or pyrotechnic stores and fuel must also be considered, time permitting, because of the additional hazard of their being ignited after crash landing ashore or in the water.

5. Deferred Landing Emergency.
   Jettison must be considered when an existing malfunction will require emergency procedures to accomplish the landing at the termination of the flight. Intentional gear up or partial gear up landings, and barricade arrestments are similar to ditchings and forced landings in that structural damage is always incurred to some degree. Explosive or pyrotechnic stores and fuel, which may be activated or spread during structural damage, must be jettisoned prior to commencing the emergency landing. In most cases sufficient time is available to thoroughly and systematically clear the aircraft of such stores and fuel, including possible missile hazards within the aircraft.

Note

Information concerning designated ordnance jettison areas should be obtained through tower control personnel.

WING STORES JETTISON

JETTISON HANDLE . . . . . PULL
All wing store stations will jettison SAFE.

TORP BAY STORES JETTISON

1. FUZE ARMING . . . . . SAFE
2. TORP BAY DOORS . . . . . OPEN
3. AERO 65A SAFETY INTERLOCK . . . . . EMER UNLOCK
   No. 3 operator's console
4. JETTISON HANDLE . . . . . PULL
   Must be pulled twice to jettison dual stores from the torpedo bay.

All stores may be jettisoned using the normal stores drop procedures contained in Section IV, when time permits. For Special Weapons jettison procedures, refer to Applicable NAVAIR Special Weapons Check List.

SONOBUOY JETTISON

To rapidly jettison sonobuoys, turn on ARM master and SONO master, then hold the "T" pickle while rotating the DROP selector switch. The GROUP switch on the sonobuoy intervalometer must then be switched and the procedure repeated to jettison sonobuoys from the other nacelle.

Note

If either propeller is feathered or a generator secured, AC BUS tie must be selected to drop sonobuoys normally or by the above method.

NEW NEW

FUEL JETTISON

The emergency jettisoning of fuel is required only when it is necessary to reduce gross weight in order to maintain safe flight during single engine operation. The critical time at which fuel jettisoning must be considered is in the event of engine failure on takeoff or during low altitude operations. When fuel must be jettisoned, proceed as follows:

1. FUEL DUMP . . . . . DUMP
   Approximately 1200 pounds will be jettisoned in 1 minute. Fuel will be jettisoned until a total of approximately 780 pounds remain. (See Section XI, Figure 11-33 through 11-35).

When a positive rate of climb can be maintained, set the FUEL DUMP switch to OFF. If fuel requirements for transit to base or a divert field must be considered, they may be determined through the use of the appropriate Cruise Control charts in Section XI, Parts 7 and 8. If fuel requirements need not be considered, or if remaining fuel is insufficient for the transit, continued fuel jettisoning will improve the flight characteristics of the aircraft for a safe single engine landing or ditching.

ELECTRICAL SYSTEM EMERGENCY OPERATION

AC Generator Failure

A failure in either generator system will be indicated by its respective generator and T/R warning lights coming on, and a zero load indication on the AC loadmeter. If the failure was caused by an over-voltage, under-voltage or under-frequency condition, attempt to restore generator operation by setting the ac generator switch momentarily to the OFF-RESET position, and then to ON. If the generator fails to come on the line after two attempts, place the generator switch to the OFF-RESET position, set the AC BUS TIE switch to the ON position, and pull the CSD disconnect for the failed generator.

WARNING

- A generator failure may result in a fire at the generator location if the CSD is not disconnected.
- If generator failure occurs, the flight should be aborted immediately unless the operational necessity of the mission dictates otherwise.
- With one generator inoperative, do not arm the automatic feathering system.

Note

DC and AC electrical loads essential to safety of flight are powered by the DC and AC essential busses, and will not become deenergized if either AC generator fails.

Loss of one generator in the air does not eliminate the prop feathering motor to opposite engine if the AC BUS TIE switch has been set to ON.

WARNING

If one generator has failed and the AC BUS TIE switch has been set to ON, it is possible to feather the operating engine supplying generator power to aircraft. If this occurs, all electrical power will be lost and it will be impossible to unfeather the propeller.

WARNING

Rudder assist will not be available when all electrical power is lost.

Transformer-Rectifier Failure

Illumination of a transformer-rectifier warning light without the associated generator warning light may indicate failure of the transformer-rectifier or the associated generator. Failure of the generator light to illuminate could be due to a malfunctioning supervisory panel. In either case the associated generator switch shall be cycled off and back on. If the generator warning light illuminates and the generator can be reset the transformer-rectifier is the only malfunctioning component. If

warning light will go ON, indicating loss of the associated transformer-rectifier output. Placing the DC BUS TIE switch to the associated FAIL position, T/R #1 FAIL or T/R #2 FAIL will connect the DC busses, restoring power on the dead bus, and the WARNING light will remain ON.

Note

No. 1 and No. 2 monitor busses will not be energized when the DC BUS TIE switch is in either TR #1 FAIL or TR #2 FAIL.

Constant Speed Drive Failure

If the CSD fails or malfunctions it may be disconnected from its engine driven gear box. The indications of malfunctioning which warrant disconnecting the CSD from the engine during flight are as follows:

1. Illumination of the CSD warning light. With or without the loss of its associated generator.

2. Loss of Generator. If a generator cannot be placed back on the line after two attempts to RESET.

3. Disconnect CSD at any temperature above 165 degrees C. The CSD will operate continuously between 120 degrees C and 150 degrees C without serious damage, or up to 10 minutes between 150 degrees C and 165 degrees C.

4.5 to 27° C (40-80° F)	105° C
Above 27° C (80° F)	120° C

If only one engine or generator remains available, the CSD may be operated continuously between 120° C and 150° C without serious damage, or up to 10 minutes between 150° C and 165° C. Any temperature above 165° C requires disconnecting. These temperature limits are independent of ambient air temperature.

4. Excessive high frequency (frequency meter needle in high end of range) together with normal voltage.

5. Wildly fluctuating frequency that persists with normal voltage.

Note

- If any of the above malfunctions occur while the aircraft is on deck, the engine should be shut down instead of disconnecting the CSD.

- When the frequency is at the extreme low end of the meter scale and the voltage is low, the CSD may be in full minimum speed ratio condition. Although this is not normal, it does not in itself warrant disconnecting the CSD but it must be corrected prior to the next flight.

CONSTANT SPEED DRIVE DISCONNECT

To disconnect the Constant Speed Drive, pull the emergency disconnect handle, set the AC BUS TIE switch to the ON position, and set the generator switch to the OFF-RESET position. The disconnect should be made by pulling the handle through its full travel with a positive and forceful motion. Once a CSD is disconnected, normal operation cannot be restored in flight. To ensure the CSD has actually been disconnected the following items may aid as a check for this determination.

1. Illumination of CSD warning light.

2. Illumination of generator and T/R warning lights.

3. Drop in the CSD temperature.

4. Rise of 3 to 5 psi torque pressure.

Note

If no indications of CSD disconnect are noted, consideration should be given to securing the engine, using the EMERGENCY SHUTDOWN CHECK LIST.

Instrument Power Failure

1. Electrical Powered Instruments. When a power failure occurs in the circuits of certain instruments, the indicators will freeze in the position they were in when power was interrupted, and thus give false readings. These instruments are as follows:

   a. Fuel Quantity.

   b. Hydraulic Pressure.

   c. Oil Pressure.

   d. Fuel Pressure.

   e. Torque Pressure.

2. Non-electrical Powered Instruments. Flight operation without electrical power will be limited to the use of the following instruments:

   a. Standby Compass.

   b. Airspeed Indicator.

   c. Turn and Slip Indicator.

   d. Rate of Climb Indicator.

   e. Altimeter.

   f. Manifold Pressure Gauge.

   g. Tachometer.

   h. Clock.

Instrument Lights Failure

In the event of instrument lights failure, select instrument panel floodlights as an alternate source of lighting.

HYDRAULIC SYSTEM EMERGENCY OPERATION

Landing Gear Malfunctions

If the landing gear cycles slowly proceed as follows:

1. Place the Landing Gear Selector Handle in the DOWN position.
2. Check Landing Gear Emergency Control in the NORMAL position.
3. Depress Landing Gear Dump Valve Reset Button to insure proper seating.
4. Place Landing Gear Selector Handle in the UP position. The gear should cycle normally. If not, proceed as follows:
5. Return Landing Gear Selector Handle to DOWN prior to a complete cycle.
6. Leave landing gear DOWN and return for scheduled landing as appropriate due to fuel considerations.

If any of the landing gear does not indicate UP after retraction but the doors are fully CLOSED continue the mission if no other evidence of malfunction is apparent. If the doors are NOT fully closed, proceed as follows:

7. Return the Landing Gear Selector Handle to DOWN and do not recycle.
8. Land as soon as practicable.
9. If the landing gear does not extend, return to base and execute procedure for emergency extension.

Note

If any of the three landing gear fail to extend with the Landing Gear Handle DOWN, it may be caused by a leaking shuttle valve allowing normal system pressure to return to the reservoir.

Landing Gear Emergency Operation

1. Landing Gear selector handle DOWN.
2. Set Landing Gear Emergency control handle to DOWN.
3. Supply hydraulic pressure by pumping hand pump.

CAUTION

When demonstrating the use of the landing gear emergency system do NOT reset and raise gear until it is DOWN and LOCKED to prevent damage to the main landing gear doors and possible jamming of the gear. Ensure Landing Gear Handle corresponds with the position of the gear before returning to the normal position.

Nose Gear Emergency Extension

There are at least five general situations under which the nose landing gear fails to extend. Condition One covers the procedures for extending the nose gear should a hydraulic failure occur. Condition Two covers the procedures for releasing a jammed nose gear resulting from gear retraction with a cocked nose gear. Conditions Three through Five cover the procedures for extending the nose gear should a mechanical linkage failure be present.

CONDITION ONE (HYDRAULIC FAILURE)

Should nose landing gear fail to extend normally, proceed as follows:

1. Make visual check of nose gear.
2. Check hydraulic pressure and hydraulic fluid level.

Note

If a hydraulic failure is not present, proceed to Condition Two.

3. Place Landing Gear selector handle to DOWN.
4. Place Emergency Hydraulic Landing Gear selector handle to DOWN.
5. Insert emergency hydraulic pump handle into emergency hydraulic pump socket and pump handle back and forth to produce pressure. If not successful in fully extending nose gear, recheck fluid level and refill emergency hydraulic reservoir if necessary, and pump the handle again.

CONDITION TWO (JAMMED NOSE GEAR)

1. Place Landing Gear selector handle to DOWN.
2. Open aft (No. 1) access door in deck of pilot's compartment. In those aircraft not configured with doors, use an axe or knife and cut out cockpit floor in area indicated. (See Figure 5-3, detail A.)
3. Sight through access door. If nose wheel doors are open and nose gear is jammed, as might exist with a cocked nose gear, cycle the normal landing gear selector handle. Move handle slowly to UP until main gear starts to retract,

then quickly move the handle to DOWN. Repeat this cycling until the nose gear is broken loose and lowered unless conditions necessitate an emergency landing.

4. If nose gear extension failure is not due to the nose wheel being jammed, proceed to Condition Three.

CONDITION THREE (BROKEN LINKAGE)

Failure of the nose gear to extend has apparently not been due to a hydraulic failure nor a jammed nose gear. It can now be assumed that a mechanical linkage failure in the nose wheel well exists; proceed as follows:

1. Place Landing Gear selector handle to DOWN.
2. Place Emergency Hydraulic Landing Gear selector handle to DOWN.
3. Insert emergency hydraulic hand pump handle into emergency hydraulic pump fitting and pump handle back and forth to produce pressure. Ensure that the emergency dump valve is actuated (reset button extended).
4. Sight through aft (No. 1) access door. If gear is up and doors are closed, the failure is probably of the nose gear door actuating cylinder piston rod end terminal. The uplock roller and nose gear door crank will be as shown in Figure 5-3, detail B. If doors and gear are not in this configuration, proceed to Condition Four.
5. Use the hydraulic hand pump handle as a tool. Insert it forward of the door crank and pry the crank to rotate it aft and down as far as it will go. This should open the nose gear doors and release the uplock J-hook from the uplocked position, allowing the gear to extend. Positive positioning is necessary as the gear uplock is released by the last few degrees of crank travel.

CONDITION FOUR (UPLOCK LINK FAILURE)

1. Complete steps 1 through 4 of Condition Three.
2. Sight through aft (No. 1) access door. If doors are open, gear is up, and the uplock roller is up in the locked position as shown in Figure 5-3, detail C, the failure is probably of the uplock link which connects the door crank to the uplock roller. If not in this configuration, proceed to Condition Five.
3. Use hydraulic hand pump handle to force the uplock roller down as far as it will go; then pry it aft in the "L" shaped uplock roller guide as far as it will go. This should release the uplock J-hook and allow the gear to extend under normal or emergency hydraulic pressure.

CONDITION FIVE (J-HOOK PUSH ROD FAILURE)

1. Complete steps 1 through 4 of Condition Three.
2. Sight through aft (No. 1) access door. If gear is up, doors are open, and the uplock roller is down and aft in the unlocked position as shown in Figure 5-3, detail D, the failure is probably of the J-hook push rod which connects the uplock roller to the J-hook.
3. Observe through the access door and through the "L" shaped uplock roller guide, the position of the failed J-hook push rod. (See Figure 5-3, detail E.)
4. To ensure that the failed rod does not fall down and jam the J-hook during subsequent steps, insert a pencil or similar object through the roller guide under the failed rod and through to the opposite side. (See Figure 5-3, detail F.)
5. Place Landing Gear selector handle to UP. Leave it in this position until nose gear has been released from J-hook (step 7).
6. Cycle Emergency Gear selector handle between DOWN and NORMAL until hydraulic pressure is dissipated. Place handle in DOWN position.

WARNING

- Do not reset the Landing Gear Dump Valve.
- When moving the J-hook in step 7, push only on upper portion of J-hook which is above the roller assembly of the nose strut as indicated in Figure 5-3, detail F. Bodily injury will result if this precaution is not taken.

7. Locate the J-hook (Figure 5-3, detail F) through the forward (No. 2) access door or cutout area. With the left hand, or appropriate prying device, move the J-hook aft to unlock the nose gear and allow it to partially extend.
8. When the nose gear has been unlocked, place Landing Gear selector handle to DOWN.
9. If it should be necessary to raise the landing gear, ensure that the Landing Gear selector handle is DOWN, the emergency selector handle is in the NORMAL position, and the dump valve is reset. The landing gear may now be raised.

Note

The nose gear may not fully retract.

Wing Flaps Emergency Operation

1. Set Wing Flap Emergency control lever to DOWN.

Note

If electrical power is not available, the Wing Flaps Solenoid Override Button must be depressed to allow movement of the Wing Flaps Emergency Control lever.

NOSE GEAR EMERGENCY EXTENSION

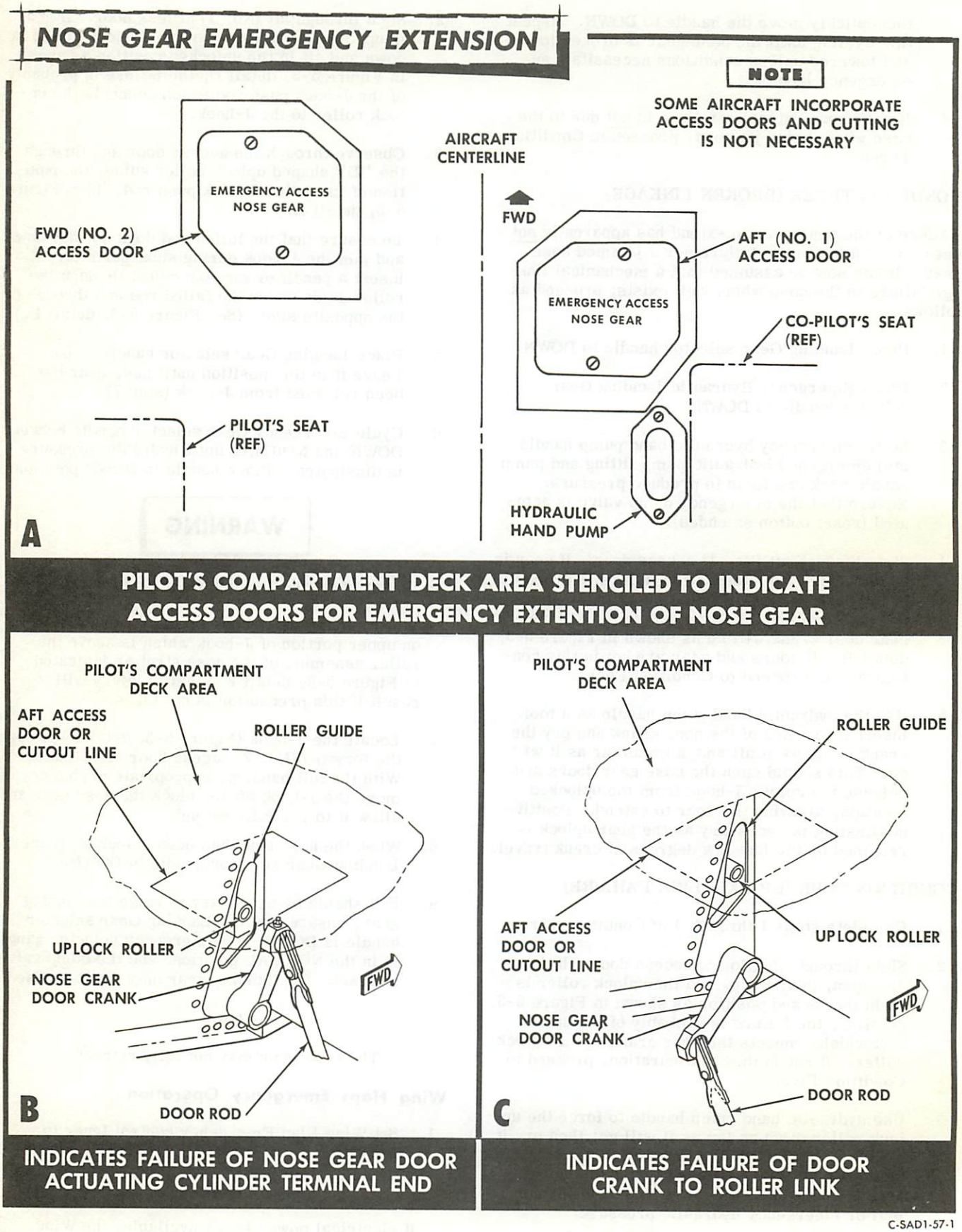


Figure 5-3 (Sheet 1)

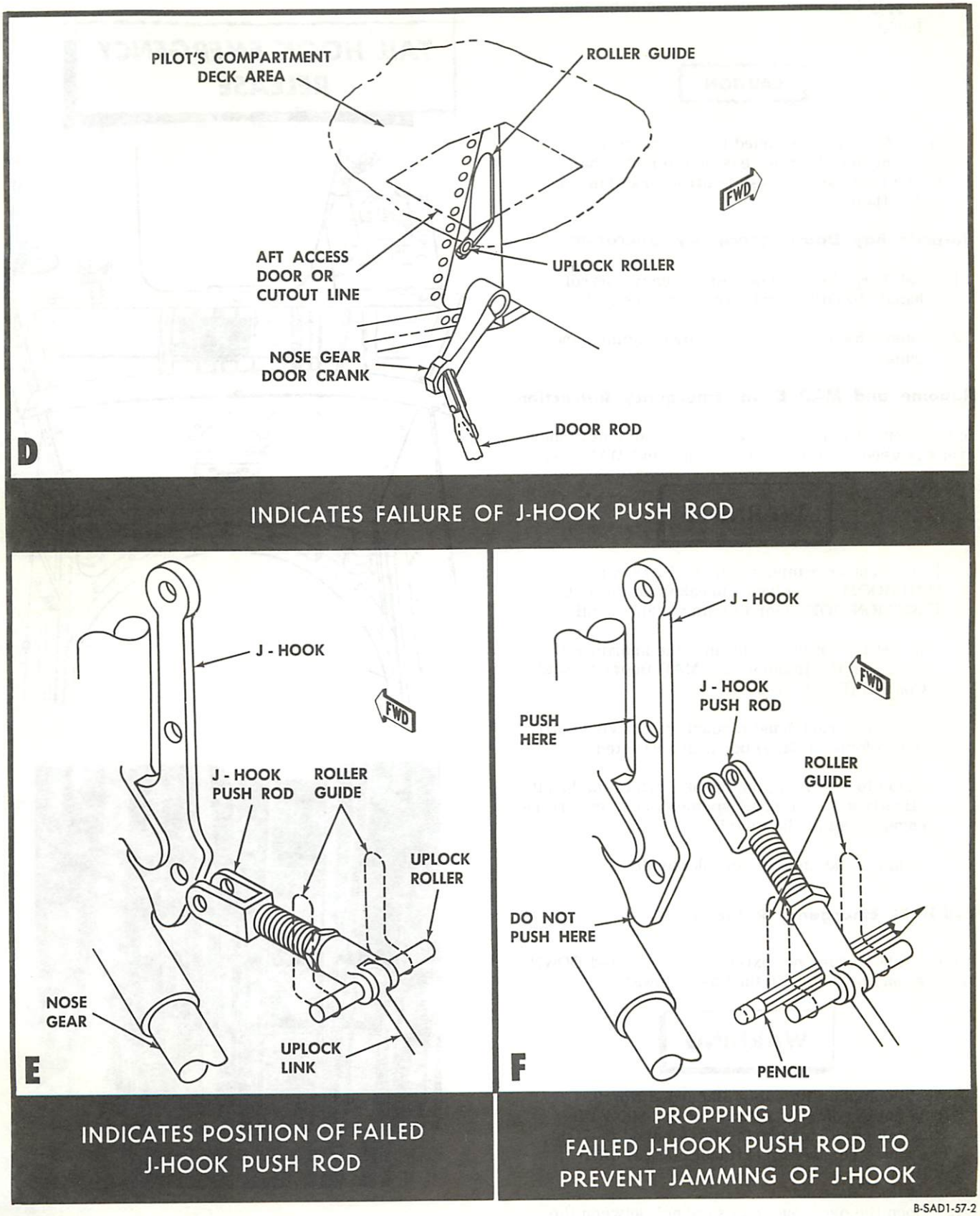


Figure 5-3 (Sheet 2)

2. Supply hydraulic pressure by pumping hand pump.

CAUTION

When flaps are extended by the emergency system, speeds in excess of 130 KIAS shall be avoided due to possible structural damage to the flaps.

Torpedo Bay Doors Emergency Operation

1. Set Torpedo Bay Door Emergency control handle to OPEN or CLOSED as desired.
2. Supply hydraulic pressure by pumping hand pump.

Radome and MAD Boom Emergency Retraction

In the event of normal system failure an emergency crank is used to retract the radome and MAD boom.

WARNING

To prevent arm injury pull the RADOME or MAD BOOM ACT circuit breaker on the D-C JUNCTION BOX prior to using crank handle.

1. Insert the crank handle into the appropriate fitting on the Radome and MAD Boom Manual Control (Figure 1-36).
2. Turn the crank handle counterclockwise until the radome or MAD boom is retracted.
3. Prior to removing the crank, rotate the handle slightly until the shaft springs out to ensure re-engagement of the clutch.
4. Remove and stow the crank handle.

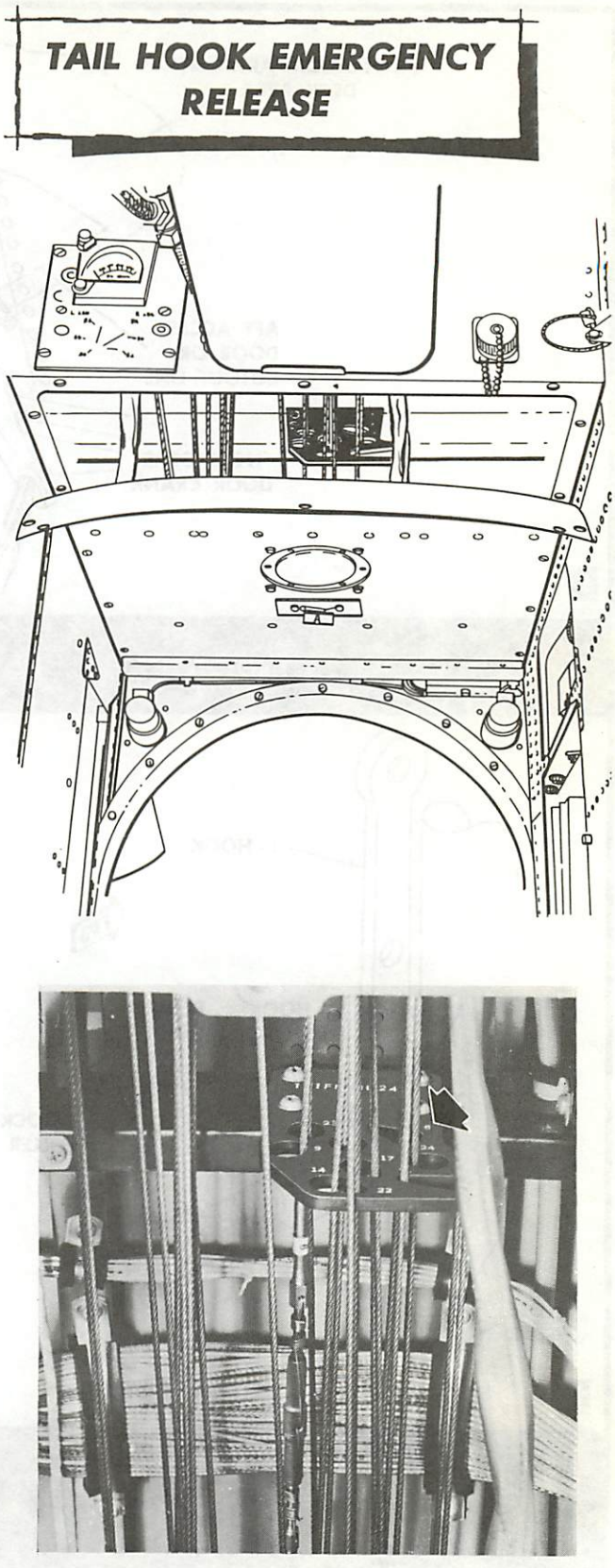
Tail Hook Emergency Release

If the tail hook does not extend when selected DOWN, release may be accomplished as follows:

WARNING

Avoid contact with cable placarded No. 9. This cable controls release of the MK 4 life raft, which, if inadvertently released in flight, can cause serious directional control difficulties.

1. Open the overhead access panel between the cockpit and operators' compartment.
2. Locate cable No. 6 (identified by placarded number on fairlead shown in Figure 5-4).



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Figure 5-4

3. Pull cable No. 6 aft, then forward.

If the tail hook fails to extend, proceed as follows:

4. Pull the outboard cable No. 6 (identified by placarded numbers on fairlead) of the two cables adjacent to the overhead dome light in the electronics compartment.

Note

Tension must be maintained on cable No. 6 to keep the hook in the down position.

WARNING

A lanyard or similar device shall be used to maintain tension on cable No. 6.

FLIGHT CONTROL SYSTEM EMERGENCY OPERATION

WARNING

If a hydraulic failure occurs while the rudder trimmer is engaged, set the Single Engine Rudder Assist switch to OFF. If a hydraulic failure occurs while the Rudder Assist switch is OFF, the trimmer cannot be operated. Leave the Single Engine Rudder Assist switch set to OFF.

Rudder Trimmer Failure

Adverse yawing of the aircraft will usually indicate failure of an engine, but may be caused by rudder trimmer malfunction. Ensure that the adverse yawing is not due to engine failure before proceeding with the following steps:

1. Check RUDDER TRIM position indicator to determine whether rudder trimmer position agrees with indicator.
2. If rudder trimmer position and RUDDER TRIM position indicator do not agree, turn Single Engine Rudder Assist switch OFF.
3. Check rudder response by a light application of rudder pedal force.
4. If control response is normal the rudder trimmer failure should be determined to have been caused by a hydraulic system malfunction. In this case the flight should be terminated and the landing should be made with the SINGLE ENGINE RUDDER ASSIST switch OFF.
5. If control response is not normal (such as no response or rudder reversal), the rudder trimmer failure should be determined to have been caused by linkage failure. In this case adjust throttles as necessary to reduce the yaw, and maintain adequate airspeed above safe single engine airspeed (100 KIAS).
6. Climb to 6000 feet above terrain and check the control characteristics in the landing configuration.
7. If the control characteristics are found to be satisfactory, the Pilot in Command may elect to land or bailout at his discretion. If the control characteristics are found to be unsatisfactory, a landing should not be attempted.

Runaway Elevator Trim Tabs

If the normal elevator trim tabs control malfunctions, it should be deactivated by either depressing the ELEV TABS EMERG STOP button or activating the elevator Trim Tabs STANDBY switch. Re-activation of the normal elevator trim tabs control on the yoke should be done in the air by pulling out and re-setting the applicable circuit breakers.

Note

The above procedure is applicable with or without AFCS engaged.

Jammed Controls-Airborne

The procedures to be followed in the event of jammed controls on the ground and in flight are contained in this Section under Ground Emergencies and Take-Off Emergencies.

AFCS Disengage

In the event of AFCS malfunction, it may be disengaged using any one of the following:

1. Engage Standby Switch - STANDBY
2. Pilot's "A" button - DEPRESS
3. Co-Pilot's "A" button - DEPRESS
4. Left generator switch - OFF
5. D.C. BUS TIE - T/R #1 FAIL (AFC No. 409 INCORP)
6. D.C. BUS TIE - T/R #2 FAIL (AFC No. 409 NOT INCORP)
7. Elevator Trim Taps STANDBY - ACTUATE
8. ELEV TABS EMERG STOP button - DEPRESS
9. Either AFC circuit breaker - PULL
10. Pilot's VGI gang bar circuit breaker - PULL

LOST PLANE PROCEDURES

The primary requirements when lost are as follows:

1. CONFESS
2. COMMUNICATE

3. CLIMB
4. CONSERVE
5. COMPLY with procedures outlined in the En-route Supplement.
6. Know any peculiar local area/ship procedures.

LOST COMMUNICATIONS PROCEDURE

There are many times in which loss of two way radio communications does not necessarily constitute an emergency, but places definite restrictions on the continued safe operation of the aircraft. The most pressing situations which may develop within this category are emergencies encountered during IFR flight after communications failure. For Lost Communications Procedures refer to NWP-41A, the En-route Supplement, and Figure 5-5.

BAILOUT

The final decision to execute a bailout must be made by the pilot in Command of the aircraft. The pilot must, however, consider all factors in making his decision. The decision must be adhered to once it is made. All crewmembers bailout through the starboard main entrance door, and must clear aircraft above 1000 feet AGL. NEW

Check Lists

When the decision to bailout is made by the pilot, each individual will be expected to do the following: (See figure 5-6).

PILOT

1. Make decision!! Adhere to it!!
2. Notify crew "Prepare to bail out"...Receive acknowledgement.
3. Trim aircraft - Engage AFCS. Slow to 120 KIAS.
4. Order crew "Bail Out."
5. Unstrap - Disconnect headset - Disconnect exposure suit blower hose. Stow arm rest.
6. Tighten parachute harness. Move aft.
7. Bail out last.

CO-PILOT

1. Acknowledge "Prepare to bail out."
2. Turn on emergency IFF - Send MAYDAY - Give position and intentions.
3. After AFCS engaged - Raise and stow folding console.
4. When ordered to "Bail Out" - Unstrap - Disconnect headset - Disconnect exposure suit blower hose - Stow arm rest.
5. Tighten parachute harness - Move Aft.
6. Bail out after Number 3 Operator.

NUMBER 3 OPERATOR

1. Acknowledge "Prepare to bail out."
2. Time permitting, obtain fix.
3. Radome up - MAD boom in.
4. Unstrap - Disconnect exposure suit blower hose - Stow arm rest.
5. Tighten parachute harness - Clear aisle of loose gear, fold aisle console.
6. Acknowledge order "Bail Out." Disconnect headset. Alert #4 operator to jettison door and bail out.
7. Bail out after Number 4 Operator.

NUMBER 4 OPERATOR

1. Acknowledge "Prepare to bail out."
2. If applicable, transmit on MCJR - Send MAYDAY - Give position and intentions. NEW
3. Unstrap - Disconnect exposure suit blower hose - Stow arm rest.
4. Tighten parachute harness - Disconnect headset - Leave seat full forward.

Note

Seat will not move forward when in the full aft full reclined position.

5. Assume position in step well and await signal from #3 operator to exit.
6. Jettison door and bail out first.

Leaving The Aircraft

For a successful bail out and safe descent to the ground, the following instructions are recommended:

1. Assume squatting position at the main entrance hatch. Roll forward out of door. Do not dive.
2. When clear of aircraft, straighten body, and open the chute with a firm pull of the D ring with the right hand.

CARRIER EMERGENCY SIGNALS

VISUAL SIGNALS TO SHIP, FROM AIRCRAFT WITH RADIO FAILURE

PILOT'S DESIRES OR INTENTIONS	VISUAL SIGNAL
I desire immediate landing.	Fly up the side of the ship, low and close aboard, rocking wings, in a landing configuration with hook DOWN. Navigation lights BRIGHT and STEADY with anti-collision light ON. If turning final in the VFR pattern or approaching final on a CCA, momentarily turn on the taxi light, if available.
I desire to land but can wait for the next recovery.	Fly up the port side of the ship with landing gear UP, hook down, navigation lights BRIGHT AND STEADY and anti-collision light OFF while abeam the ship.
I am proceeding to the BINGO field.	Fly up the port side of the ship, rocking wings, with landing gear and hook UP, navigation lights BRIGHT and STEADY, and anti-collision light ON. If fuel state and the nature of the emergency permit, continue making passes until joined by a wingman. Upon reaching BINGO fuel state, proceed alone, setting IFF to EMERGENCY when departing.

NOTES

1. Requirement of gear down and rocking wings, as the signal of immediate landing, is not required when considered unsafe by pilot due to the nature of the emergency.
   Example: Loss of an engine.
2. At night, aircraft flying without lights close aboard the port side of the ship are considered to have an emergency requiring an immediate landing.

VISUAL SIGNALS TO AIRCRAFT, FROM SHIP UNDER EMCON OR LOST COMMUNICATIONS CONDITIONS

COMMAND/ADVISORY	SIGNAL		
	OLS	**Aldis Lamp	Blinker
*BINGO—Proceed to alternate landing field.	Flashing cut and wave off lights.	Flashing red light.	M, M — — , — —
CHARLIE—Cleared to land aboard.	N/A	Steady green light.	C — • — •
DELTA—Delay in landing. Enter DELTA pattern and maintains visual contact with the ship.	Flashing landing area lights	Steady red light.	D — • •
Closed deck. Do not land.	Landing area lights off. (Night only)	N/A	N/A
Do not land. Ditch or bailout/eject in the vicinity of the ship.	N/A	Z — — • •	Z — — • •
LSO has control of the aircraft on final approach at approximately 1½ miles.	Steady (3 sec.) cut lights.	N/A	N/A
Lower hook.	N/A	H • • • •	H • • • •
Lower wheels.	N/A	W • — —	W • — —
Lower flaps.	N/A	F • • — •	F • • — •
Jettison disposable fuel tank.	N/A	G — — •	G — — •
Jettison ordnance.	N/A	Q — — • —	Q — — • —

*Signal is given only when ordered by the Air Officer
**Aldis lamps may be located on the LSO platform, in the tower, or on the signal bridge.

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Figure 5-5 (Sheet 1)

DAY COMMUNICATIONS EMERGENCIES

EMERGENCY	CARQUALS	DEPLOYED
Loss of LSO radios.	Discontinue landings. Advise Air Officer to initiate DELTA or BINGO instructions, as appropriate.	Primary Fly notify aircraft in pattern that LSO radio is out, and transmit "wave off" if LSO uses wave off lights.
Loss of all ship's radios.	Discontinue landings. Use visual signals on OLS or from LSO platform to DELTA or BINGO, as appropriate.	Continue landings at the discretion of the OTC. Use visual signals from the LSO platform for pattern control.
Loss of aircraft radios.	With receivers: 1. Pilot will be given landing instructions and aircraft will remain aboard when arrested. 2. Primary Fly will transmit BINGO fuel states each time the aircraft commences approach. Pilot will acknowledge by rocking wings. 3. If unable to get aboard, pilot will BINGO, when fuel state dictates. Another aircraft should be designated as an escort. With no receiver, aircraft will be diverted.	With or without receiver, make normal approach and landing.

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Figure 5-5 (Sheet 2)

In The Air

1. Sit well back in harness after the chute opens.
2. To stop chute from oscillating, pull risers gently on the side of the swing. Repeat procedures until swinging is checked.
3. Slipping the chute is a method of controlling the direction of travel. Pull down riser on side that you desire to move.

CAUTION

Do not slip chute when close to ground because rate of descent increases when slipping. Use extreme care to avoid collapsing chute while still airborne.

Preparation For Landing

1. Sit well back in harness.
2. Keep legs together with knees slightly bent. Allow the body to fall in a relaxed condition.
3. Grasp lift webs on each side above the head.
4. Do not attempt to stand erect. Do not stiffen body.

Water Landing

1. Sit well back in harness.
2. Attach PK-2 lanyard to pararaft fitting on life preserver and remove pararaft from seat pack.
3. Unfasten leg and chest straps, fold arms across chest.
4. Wait until in the water, get out of harness.
5. Swim into wind to get clear of parachute and inflate life preserver.

Tree Landing

1. Keep legs together.
2. Cover face with hands.
3. Shroud lines and canopy will break fall.

NIGHT COMMUNICATIONS EMERGENCIES

EMERGENCY	CARQUALS	DEPLOYED
Loss of LSO radios.	Discontinue landings. Give DELTA or BINGO instructions, as appropriate.	The LSO will inform CCA, via sound-powered phone, of the radio failure. The LSO will accept control of each aircraft from CCA, via sound-powered phone, as the aircraft reaches approximate meat ball acquisition position. At this time CCA will transmit to the pilot of each aircraft that the LSO has assumed control of the approach.
Loss of all ship's radios.	Discontinue landings. The flight leader of each unit airborne will organize a flight of his unit members and proceed to divert field.	Continue final landings, or BINGO at the discretion of the OTC. Use standard visual signals on the OLS, or from the LSO platform, or from Primary Fly as appropriate.
Loss of aircraft radios.	WITH RECEIVERS: 1. Pilot will be given landing instructions and aircraft will remain aboard when arrested. 2. Primary Fly will transmit BINGO fuel state each time the aircraft commences approach. Pilot will acknowledge by rocking wings. 3. If unable to get aboard, pilot will BINGO when fuel state dictates. Another aircraft should be designated as an escort. With no receiver, aircraft shall be diverted.	WITH ESCORT: 1. Lead pilot calls "Meat ball" and receives normal reply from the LSO. 2. After receiving acknowledgment, lead pilot blinks his NAV lights, breaks off to the left, then parallels the final bearing, allowing the no-radio aircraft to continue the approach visually. 3. Lead pilot is in a position to be rejoined by the no-radio aircraft in the event of a bolter or wave off. WITHOUT ESCORT: 1. Pilot makes the approach with lights as indicated in VISUAL SIGNALS TO SHIP, FROM AIRCRAFT WITH RADIO FAILURE (Sheet 1). 2. Pilot squawks the appropriate mode on IFF. 3. LSO will acknowledge positive control of the no-radio aircraft by the "cut" light signal or with green Aldis lamp, as desired. An aircraft with transmitter only receives the same acknowledgment as the no-radio aircraft. 4. Pilot will execute his own wave off without one of the above acknowledgments. WITHOUT ESCORT OR EXTERNAL LIGHTS: 1. Pilot will squawk the appropriate mode on IFF and commence a normal approach, but will not land without visual acknowledgment by the LSO. 2. If visual acknowledgment is not received, pilot will wave off, fly by the port side for identification, execute a normal wave off/bolter pattern, expect priority in the pattern and visual acknowledgment on the glide slope. 3. "CUT" lights and the green Aldis lamp, when used as an acknowledgment signal, shall be given as near the normal meat ball reporting position as possible, but shall not be given until the preceding aircraft has passed the LSO.
Complete electrical failure.		1. If the carrier can be sighted and a safe decent and landing approach made; fuel permitting, orbit keeping the carrier in sight and descend so as to be at the ship during the scheduled recovery and/or descend and fly by ship giving appropriate emergency signal (See Sheet 1). 2. If the carrier cannot be located the pilot should DR navigate to the pre-briefed "emergency sector/radial" and establish a left-hand triangular pattern. If not joined by or unable to join on any escort aircraft, upon reaching BINGO fuel, divert to BINGO Field if available. 3. If no BINGO Field is available, commence DR descent/penetration to ship at approximate approach time, weather and common sense permitting. If after descent, ship is not sighted, commence square search if practical. 4. If the carrier or potential rescue ship is not sighted, or if the aircraft/weather combination precludes a descent, take DR heading to nearest land. If land is reached, orbit in left-hand triangles at recommended ejection/bail-out altitude and continue watching for escort; when fuel nears exhaustion make controlled ejection/bail-out.

SAD1-218-3

Figure 5-5 (Sheet 3)

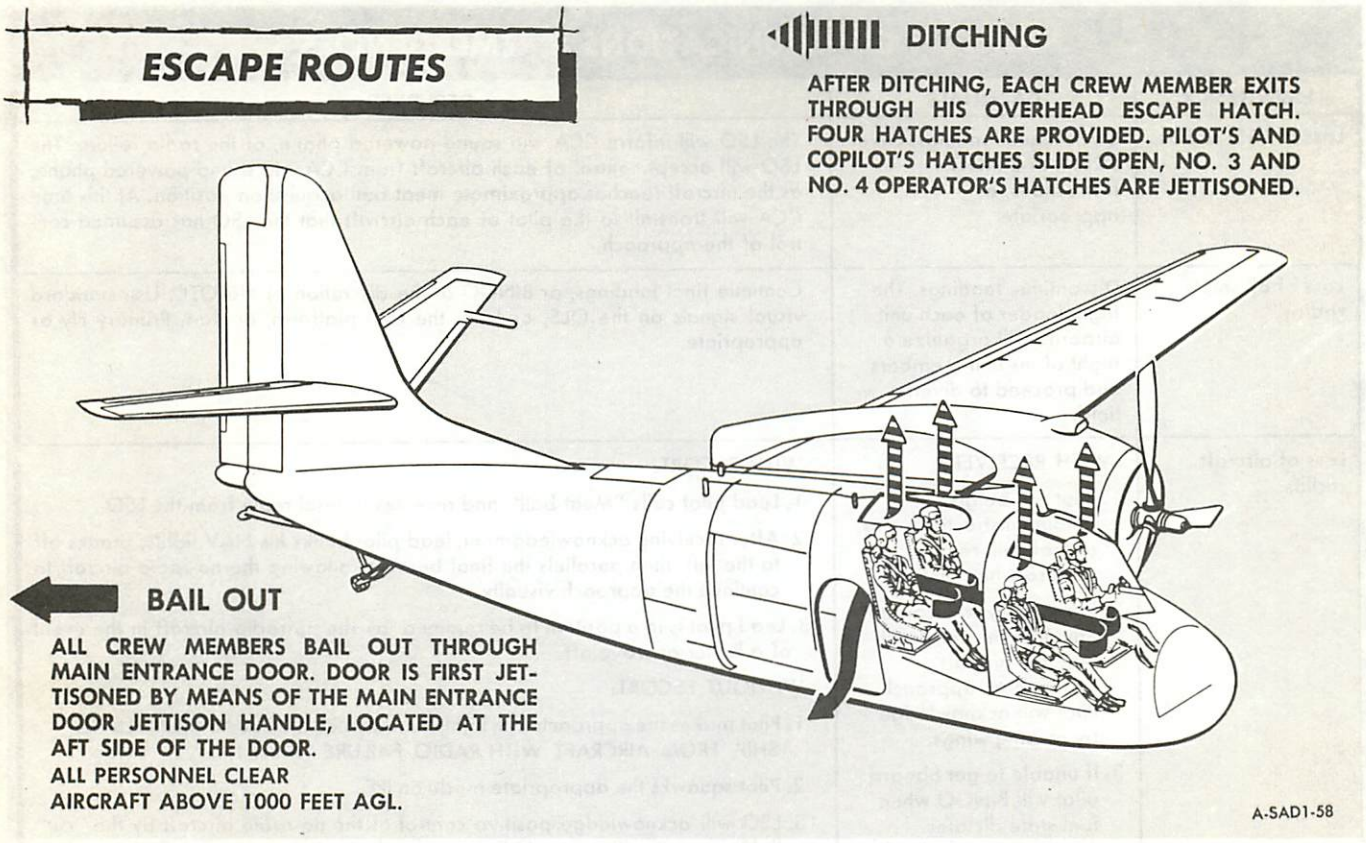


Figure 5-6

4. Remain in harness if landing takes place after dark. Wait until you can see the ground.
5. Use shroud lines to form a line for descent.

High Wind Impact

1. If wind is very strong, use procedure for water landing and slip free of chute on impact.
2. In moderate wind deflate the chute by pulling in bottom risers or shroud lines to spill air out of chute.

LANDING EMERGENCIES

When an emergency occurs during the landing approach, complete the landing if the emergency permits.

SINGLE ENGINE LANDINGS

When it is necessary to make a landing with only one engine refer to the applicable procedures listed below.

Field Landing

1. Inform the tower and complete the PRELANDING Check List (Figure 3-6).

CAUTION

Single engine landings should be made on the runway with the least crosswind component. If the crosswind component on the available runway appears excessive, consideration should be given to making an arrested landing if possible.

2. Utilize the normal pattern altitudes as near as possible. Commence the LANDING Check List.
3. The 180 degree position should be approximately 1-1/2 times wider than in the normal pattern to allow a comfortable approach turn. Commence the approach turn with 1/3 flaps and landing gear UP for best wave off characteristics. Fly at a minimum airspeed of 110 KIAS.
4. Approximately halfway through the approach turn, when the approach appears that it will be successful, extend the landing gear and 2/3 flaps. Complete the LANDING Check List. Continue the approach at a minimum airspeed of 105 KIAS until on the final approach. Check gear DOWN and LOCKED, and inform the tower.
5. On the final approach maintain a minimum of 100 KIAS until over the end of the runway

Reduce power as necessary and fly the aircraft onto the runway maintaining balanced flight.

6. On the completion of the roll-out, clear the runway if possible, and stop the aircraft. Do not attempt to taxi on one engine.

Carrier Landing

Note

- Primary consideration should be given to diverting to an available shore station rather than attempting a single engine carrier landing.
- If it is determined that a successful wave-off/bolter cannot be made, the barricade shall be rigged. Refer to Section XI, Figures 11-33 and 11-34.

1. Inform the ship and complete the PRELANDING Check List (Figure 3-6), when given "Signal Charlie".
2. Make a 180 degree approach utilizing the normal altitudes as near as possible. Commence the LANDING Check List.
3. The 180 degree position should be approximately 1-1/2 times wider than in the normal pattern to allow a comfortable approach turn. Commence the approach turn with 1/3 flaps and landing gear UP to best wave off characteristics. Fly at 110 KIAS.
4. Approximately half way through the approach turn, when the approach appears successful, extend the landing gear and 2/3 flaps. Complete the LANDING Check List. Continue the approach at 105 KIAS until on the final approach. Check gear DOWN and LOCKED.

Note

If operating in Hot Weather conditions, aircraft performance may be so limited that the use of more than 1/3 flaps may seriously compromise aircraft wave-off/bolter capability.

5. Upon Meatball acquisition or LSO pickup, correct flight path as indicated. The LSO will then give speed, attitude and power corrections during the remainder of the approach.
6. Upon receiving the Cut signal, maintain the aircraft in balanced flight to the deck. In the event no cut is received, fly the aircraft as indicated by meatball right down to arresting gear engagement.

CAUTION

Be prepared to correct for the out of trim condition when the cut is taken.

7. If a Wave Off or Bolter results, execute it in the normal manner, except - be cautious in power application due to unsymmetrical configuration.

Barricade Arrestment

When an aircraft has a broken hook or hook point, broken nose strut, insufficient fuel to divert to shore, or is otherwise committed to landing aboard, a barricade will be rigged. The following are considerations to insure a successful barricade engagement and subsequent barricade arrestment.

1. Fly the pattern and altitudes as for a normal carrier pass except when a single engine carrier landing is involved.
2. Nose gear should be on the deck prior to entering the barricade to ensure a good engagement. Off-center distance is limited to (10) feet so particular care must be paid to achieving good lineup.
3. Rely on LSO for talkdown and/or "cut" transmissions. On some installations the barricade stanchion may obscure the Optical Landing System (O. L. S) late in the approach.
4. Secure both engines upon barrier or barricade engagement.
5. Lower hook as pendant engagement will assist the barricade to stop the aircraft, help insure the aircraft is on the deck and minimize damage incurred from the barricade.
6. Jettison stores if possible; they won't hamper successful barricade engagement but may possibly be torn loose and present a hazard to flight deck personnel.
7. Fly a normal approach; on speed, on centerline and centered meatball.

Note

The barricade shall normally be used when an aircraft must be landed gear up or partial gear up.

FIELD ARRESTMENTS

Field Arresting Gear

There are several types of field arresting gear. These types include the anchor chain cable, water squeezer, and Morest-type equipment. All of these types require engagement of the arresting hook in a cable pendant rigged across the runway. Location of the pendant in relation to the runway will classify the gear as follows:

1. Midfield gear. Located near the halfway point of the runway. Usually requires prior notification in order to rig for arrestment in the direction desired.

2. Abort gear. Located 1500 to 2500 feet short of the upwind end of the duty runway and usually will be rigged for immediate use.

3. Overrun gear. Located shortly past the upwind end of the duty runway. Usually will be rigged for immediate use.

Some fields will have all of these types of gear, others none. For this reason, it is imperative that all pilots be aware of the type, location, and compatibility of the gear in use with the aircraft, and the policy of the local air station with regard to which gear is rigged for use and when.

The approximate maximum permissible engaging speed, gross weight, and off-center engagement distance for field arrestment of aircraft are listed in Figure 5-7.

WARNING

- Under no circumstances should pilot decision to abort a takeoff be delayed because of knowledge that an emergency arresting gear is available at the end of the runway. Decision to abort should be based on the usual parameters of remaining runway and distance required for stopping, using wheel brakes. The arresting gear will then serve as an assist to stop the aircraft from rolling off the runway onto unprepared surfaces.
- If off center just prior to engaging arresting gear, do not attempt to go for center of runway. Continue straight ahead parallel to centerline.

As various modifications to the basic types of arresting gear are made, exact speeds will vary accordingly. Certain Aircraft Service Changes may also affect engaging speed and weight limitations.

Severe damage to the aircraft is usually sustained if an engagement is made in the wrong direction into the chain gear.

In general, the arresting gear is engaged on the centerline at as slow a speed as possible. Burn down to 1500 pounds or less fuel remaining. While burning down, make practice passes to accurately locate the arresting gear. Engagement should be made with the feet off the brakes, shoulder harness locked, and with the aircraft in a 3-point attitude. After engaging the gear, good common sense and existing conditions now dictate whether to keep the engine running or to shut it down and abandon the aircraft. In an emergency situation, first determine the extent of the emergency by whatever means are possible (instruments, other aircraft, LSO, RDO, tower or other ground personnel). Next, determine the most advantageous arresting gear available and the type of arrestment to be made under the conditions which prevail. Whenever deliberate field arrestment is intended, notify control tower personnel as much in advance as possible and state estimated landing time in minutes. If gear is not rigged, it will probably require 10 to 20 minutes to prepare it for use. If foaming of the runway or area of arrestment is required or desired, it should be requested by the pilot at this time.

Short Field Arrestments

If at any time prior to landing, it is known that a directional control problem exists or a minimum rollout is desired, a short field arrestment should be made and the assistance of an LSO requested. He should be stationed near the touchdown point and equipped with a radio. Inform the LSO of the desired touchdown point. A constant glide slope approach to touchdown is permitted (mirror or Fresnel Lens Landing Aid utilized) with touchdown on centerline at or just prior to the arresting wire with the hook extended. The hook should be lowered while airborne and a positive hook-down check should be made, if possible. If midfield gear or Morest type is available, it should be used. If neither are available, use abort gear. Use an approach speed commensurate with the emergency experienced. Landing approach power will be maintained until arrestment is assured or a waveoff is taken. Be prepared for a waveoff if the gear is missed. After engaging the gear, retard the throttle to IDLE or secure engine and abandon aircraft, depending on existing conditions.

Long Field Arrestments

The long field arrestment is used when a stopping problem exists with insufficient runway remaining (i.e., aborted take-offs, icy or wet runways, loss of brakes after touchdown, etc). Lower the hook, allowing sufficient time for it to extend fully prior to engagement. Do not lower the hook too early and weaken the hook point. Line up the aircraft on the runway centerline. Inform the control tower of your intentions to engage the arresting gear, so that aircraft landing behind you may be waved off. If no directional control problem exists (crosswind, brakes out, etc.), secure the engine.

Aborted Takeoff

Where an aircraft takeoff must be aborted, a roll-in type engagement of all arresting gear is recommended to prevent overrun. The aircraft is cleared up to the maximum takeoff gross weight specified in the Aborted Takeoff column of Figure 5-7. Additionally, the data provided in the Long Field Landing column may be used for light weight aborted takeoff, where applicable.

Note

The taxi light may be of use in locating arresting/abort gear at night.

Field Barrier

If a field barrier is available, the aircraft should be in a three point attitude and the engines secured.

FIELD ARRESTMENT DATA

ARRESTING GEAR	SHORT FIELD LANDING		LONG FIELD LANDING		ABORTED TAKE-OFF		MAXIMUM OFF-CENTER ENGAGE-MENT (FEET)
	AIRCRAFT GROSS WEIGHT (f)	MAXIMUM ENGAGING SPEED (KNOTS)	AIRCRAFT GROSS WEIGHT	MAXIMUM ENGAGING SPEED (KNOTS)	AIRCRAFT GROSS WEIGHT	MAXIMUM ENGAGING SPEED (KNOTS)	
M-2	24,150	108 (a)	24,800	106 (a)	29,150	98 (a)	20
E-14-1	24,150	127 (b)	24,800	127 (b)	29,150	134 (a)	35
E-27	24,150	126 (b)	24,800	126 (b)	29,150	140 (a)	20
E-15 200′ SPAN	24,150	113(b)	24,800	113(b)	29,150	124(a)	20
E-15 300′ SPAN	24,150	137 (b)	24,800	137 (b)	29,150	146 (a)	40
M-21	24,150	123 (a)	24,800	123 (a)	29,150	110 (a)	10
E-28	24,150	129 (b)	24,800	129 (b)	29,150	131 (a)	40
E-5 (STD CHAIN)	24,150	136 (b)	24,800	136 (b)	29,150	150 (d)	(e)
E-5-1 (STD CHAIN)	24,150	136 (b)	24,800	136 (b)	29,150	150 (a)	(e)
E-5 (HVY CHAIN)	24,150	131 (b)	24,800	131 (b)	29,150	147 (a)	(e)
E-5-1 (HVY CHAIN)	24,150	131 (b)	24,800	131 (b)	29,150	147 (a)	(e)
BAK-6	24,150	160 (d)	24,800	160 (d)	29,150	160 (d)	15
BAK-9	24,150	160 (d)	24,800	160 (d)	29,150	160 (d)	30
BAK-12	24,150	160 (d)	24,800	160 (d)	29,150	160 (d)	50

NOTES

(a) Maximum engaging speed limited by aircraft arresting hook strength.
(b) Maximum engaging speed limited by aircraft limit horizontal drag load factor (mass item limit "G").
(c) Maximum engaging speed limited by aircraft landing gear strength.
(d) Maximum engaging speed limited by arresting gear capacity.
(e) Off-center engagement may not exceed 25% of the runway span.
(f) Recommended approach airspeed for 24,150 pounds is 100 CAS knots.
(g) 3.0 Degree glide slope setting.

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Figure 5-7

Main Gear Up or Partial Main Gear Up Landing

When a main gear up or partial main gear up landing is anticipated the Short Field Arresting Gear, usually found near the landing end of the runway, should be used. Foam should be used in conjunction with the Short Field Arresting Gear. A no gear landing should be elected in preference to a one main mount landing, when the choice still exists.

Approaches To Planned Field Arrestments

Approaches to planned field arrestments should be the normal landing approach to insure touchdown in the area just short of the foam and or Emergency Arresting Gear, as directed by the tower to fit the situation. In cases of partial gear up or gear up landings, appropriate propeller should be feathered in the final stage of the landing transition, prior to the time at which it is likely to strike the runway surface. The starboard engine should normally be feathered due to the danger of its propeller blades cutting through the cabin or impact if still turning.

Nose Gear Unlocked

In the event both main gear lock down, but the nose gear will not, a normal unarrested landing should be made, with foam spread in the area where the nose is to be lowered to the runway, after the aircraft has slowed considerably. In this case lowering the nose should be done prior to losing elevator control in order to avoid dropping it onto the runway. The feathering of the starboard engine first is also applicable in this case. In all cases where time is available, full preparation and thorough planning must be completed by all personnel involved, to insure maximum safety throughout the evolution.

GEAR UP AND PARTIAL GEAR UP LANDINGS

The following paragraphs set forth the procedures to be followed in those cases where the aircraft is to be landed with the landing gear in other than the normal position. It also includes procedures for landing when the radome or MAD boom are not able to be completely retracted. In such cases there will normally be sufficient time to pre-plan and prepare for the landing.

Intentional Gear Up Landing

When the emergency procedure for extending the landing gear fails, the landing shall be with all landing gear UP on a runway where arresting gear and foam have been prepared as follows:

WARNING

Do not use arresting gear if Fosdick has not been removed.

1. Notify the tower as early as possible to allow rigging arresting gear and foaming the runway as applicable.
2. The desired foam area is 2500 to 3000 feet long and 20 to 25 feet wide, commencing 2000 feet from the approach end or as appropriate, due to the location of the arresting gear. Time permitting, the width of the foamed area should be increased 40-50 feet. NEW NEW
3. Burn down or dump fuel prior to commencing the approach.
4. Make a normal approach, hook down.
5. On command from pilot, prior to touchdown, co-pilot feather the starboard engine. Select AC BUS TIE. Just prior to touchdown, place both mixture controls in the IDLE CUT-OFF position and depress the port feather button. Pull master ignition switch to OFF, close Emergency fuel, Oil, and Hydraulic Switches and set Fuel Selectors to OFF if time allows.
6. Pilot land the aircraft short of the arresting gear or foamed area, on the center line of the foamed area. Do not balloon when the starboard propeller is feathered.
7. After the aircraft has stopped, evacuate the aircraft through the main entrance door unless conditions required evacuation through overhead hatches.

One Main Gear Up Landing

If unable to get both main gear up for an intentional gear up landing, proceed as follows:

1. Make same preparations as listed through step 4 in Intentional Gear Up Landing above. Make the approach to touch down on the side of the runway opposite to the raised gear unless arresting gear is available. If arresting gear is available use center of the runway.
2. Feather the engine on the side of the retracted landing gear on touchdown.
3. Co-pilot secure both engines as in step 5 above.
4. When arresting gear is not available, pilot should maintain wings level as long as possible. When some part of the aircraft on the gear up side i.e., wheel doors, prop tips, or wing tip contacts the runway, a gentle swerve will commence. Apply full opposite rudder and brake to aid in reducing swerve. The aircraft will probably leave the runway on the gear up side.

Nose Gear Up Landing

WARNING

Do not use arresting gear in this case. Severe back injuries may result from high impact forces encountered when the nose hits the runway.

When a nose wheel failure cannot be corrected the landing should be made on a runway which has a foamed surface prepared in the area where the nose wheel is to be lowered into the runway. Proceed as follows:

NEW NEW

1. The desired foam area is 2500 to 3000 feet long and 20 to 25 feet wide, commencing 2000 feet from the approach end or as appropriate due to the location of the arresting gear. Time permitting the width of the foamed area should be increased to 40-50 feet.
2. Make a normal approach and touchdown.

NEW

3. On pilot's command, co-pilot feather starboard prop, raise flaps, and secure both engines as in Intentional Gear Up Landing paragraph, this section.
4. Do not use brakes.
5. Lower nose onto first part of foamed area. Do not let the nose fall through.

Unsafe Main Gear Indication

When the wheels position indicator gives an UNSAFE main gear indication, proceed as follows:

1. Visually check the main mount drag braces for complete landing gear extension and hydraulic leaks.
2. Check hydraulic pressure for normal indications.
3. If both checks give positive visual indications, tap the wheels position indicator for possible sticking.
4. If the gear extended normally and the checks above give positive indications, it may be reasonably assumed that the wheels position indicator or an associated micro switch is malfunctioning and the main landing gear is actually DOWN and LOCKED.
5. When any of the checks, other than the wheels position indicator, substantiate the possibility of an unsafe landing gear condition, execute the procedures for Landing Gear Emergency Operation.
6. After informing the tower of the situation and your intentions and jettisoning any external stores desired, a normal landing may be made.
7. During the landing rollout be prepared to execute the procedure for an Intentional Gear Up Landing as applicable.
8. Upon completion of a successful landing rollout, do not turn off the runway until main landing gear ground locks have been installed, or an inspection reveals that the position indicator micro switch has malfunctioned.

Unsafe Nose Gear Indication

When both main gear lock down, but the nose gear indicates UNSAFE, proceed as follows:

1. Visually check the nose gear drag brace by sighting in the port nacelle mirror, for over-center locking. Visual checks may also be made by other aircraft, tower personnel, LSO or a radio equipped Runway Watch.
2. Check hydraulic pressure for normal indications.
3. If both checks give positive indications, tap the wheels position indicator to check for possible sticking.
4. If the gear extended normally and the checks above give positive indications, it may be reasonably assumed that the wheels position indicator or its associated micro switch is malfunctioning and the nose gear is actually DOWN and locked.
5. When any of the checks other than the wheels position indicator substantiate the possibility of an UNSAFE nose gear condition, execute the procedure for Landing Gear Emergency Operation.
6. After informing the tower of the situation and your intentions and jettisoning any external stores desired, a normal landing may be made.
7. Test the nose gear by gently lowering it to the runway while sufficient airspeed remains to maintain elevator control. If the gear begins to retract, take-off and execute the procedures in Nose Gear Up Landing paragraph, this section.
8. If the gear supports the aircraft, roll straight ahead with minimum use of brakes. Upon completion of a successful landing rollout, do not turn off the runway until a nose gear ground lock has been installed.

Nose Wheel Cocked

Anytime the nose wheel is allowed to skip on the deck during takeoff, the possibility of a cocked nose wheel condition exists. Although it will usually realign itself on contact with the deck during the landing, the following are the procedures to be followed when a cocked nose wheel occurs:

REALIGNMENT

CAUTION

Do not retract landing gear when a cocked nose wheel is known to exist.

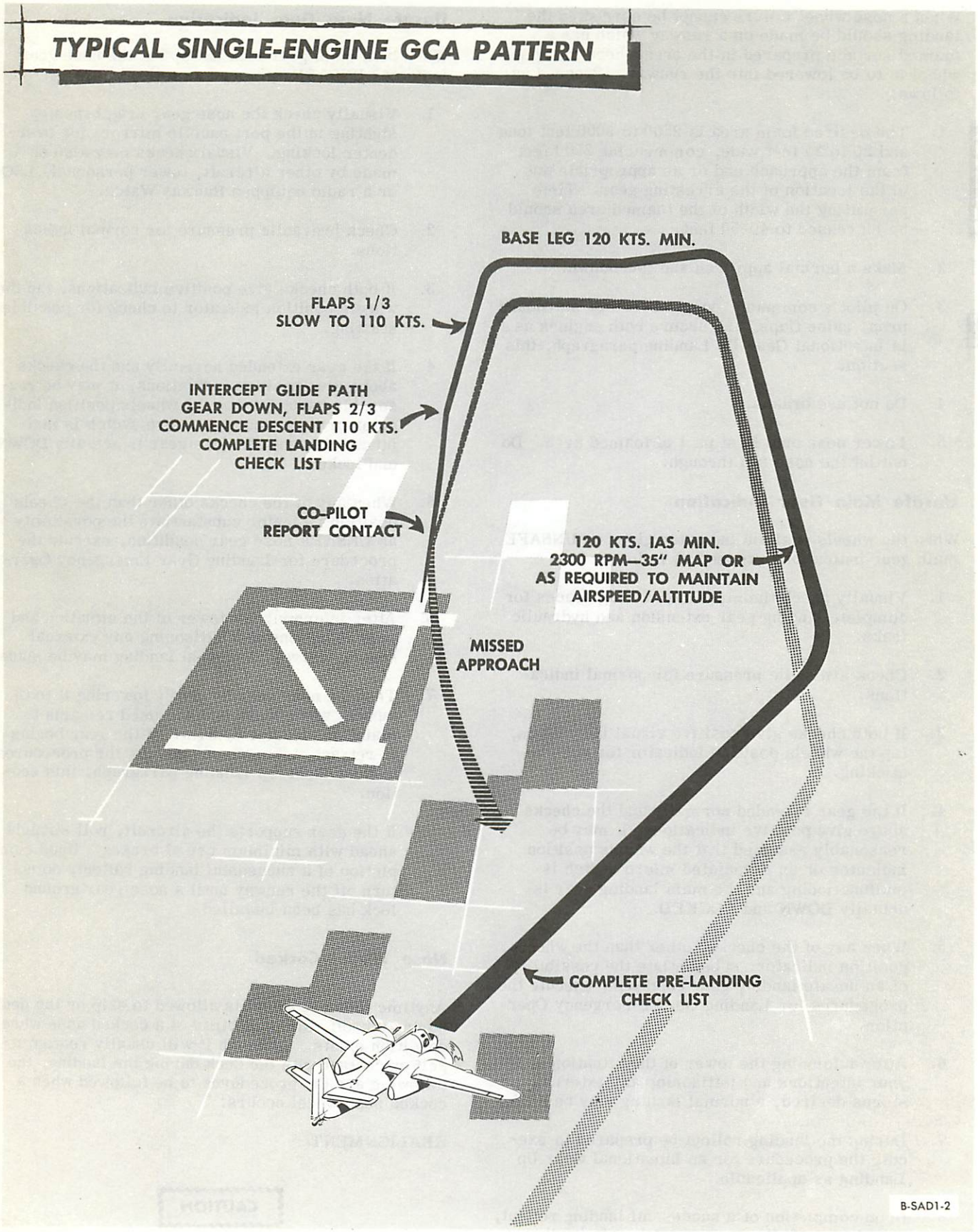

TYPICAL SINGLE-ENGINE GCA PATTERN
BASE LEG 120 KTS. MIN.
FLAPS 1/3
SLOW TO 110 KTS.
INTERCEPT GLIDE PATH
GEAR DOWN, FLAPS 2/3
COMMENCE DESCENT 110 KTS.
COMPLETE LANDING
CHECK LIST
CO-PILOT
REPORT CONTACT
120 KTS. IAS MIN.
2300 RPM—35" MAP OR
AS REQUIRED TO MAINTAIN
AIRSPEED/ALTITUDE
MISSED
APPROACH
COMPLETE PRE-LANDING
CHECK LIST
B-SAD1-2

Figure 5-8

TYPICAL SINGLE-ENGINE INSTRUMENT APPROACH

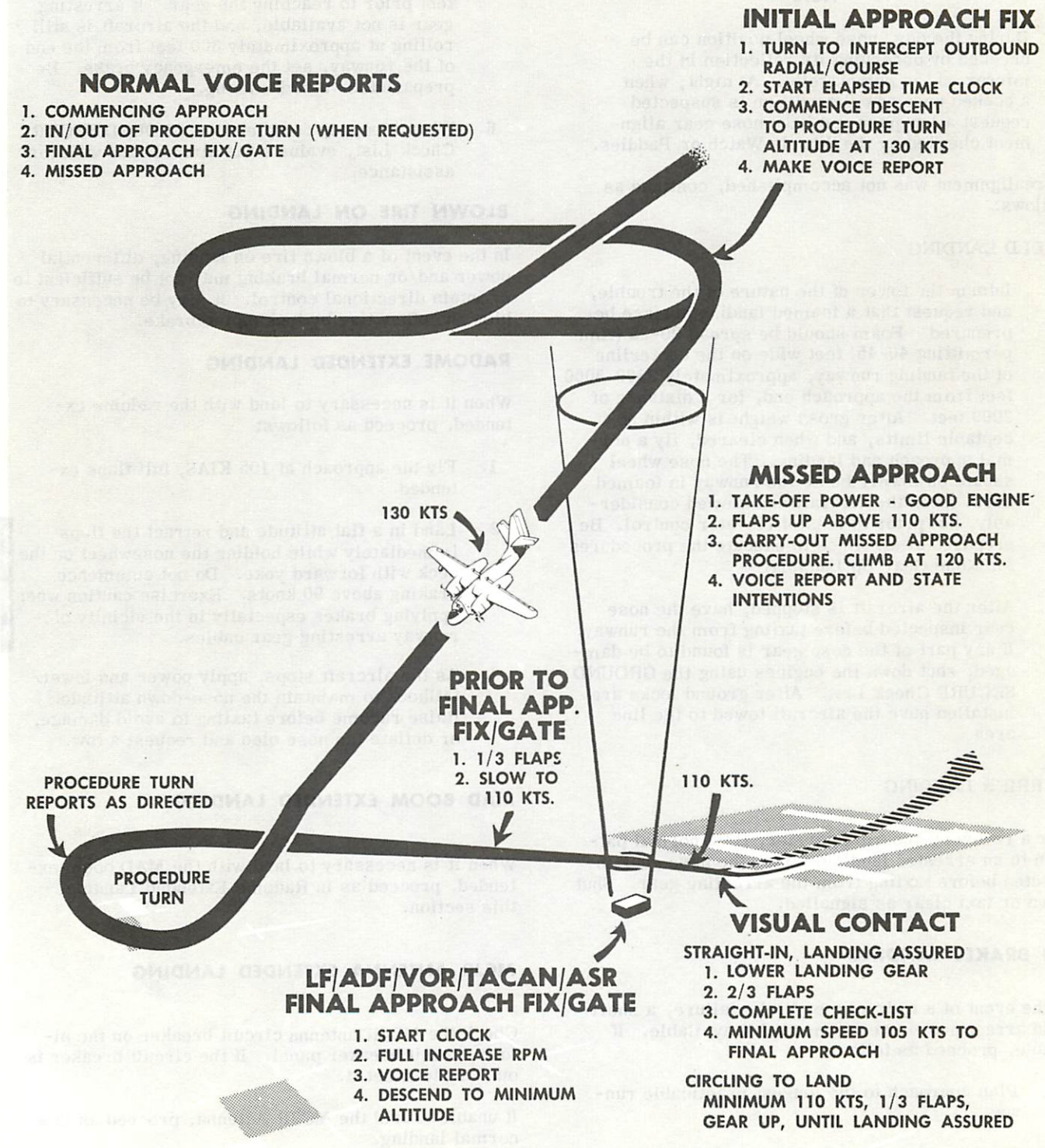


Figure 5-9

Fly a normal pattern and touchdown. Lower the nose wheel gently to the runway. Only a momentary skip or touchdown of the nose wheel is necessary to effect its realignment. If it realigns itself, complete the landing.

Note

During the day, nose wheel position can be checked by observing its reflection in the mirror on the port nacelle. At night, when a cocked nose wheel condition is suspected request a low pass and have nose gear alignment checked by the Wheels Watch or Paddles.

If realignment was not accomplished, continue as follows:

FIELD LANDING

1. Inform the tower of the nature of the trouble, and request that a foamed landing surface be prepared. Foam should be spread 20-25 (time permitting 40-45) feet wide on the centerline of the landing runway, approximately 2500-3000 feet from the approach end, for a distance of 2000 feet. After gross weight is within acceptable limits, and when cleared, fly a normal approach and landing. The nose wheel should be lowered onto the runway in foamed area, after the aircraft has slowed considerably, but prior to loss of elevator control. Be prepared at all times to execute the procedures for Nose Gear Up Landing.

2. After the aircraft is stopped, have the nose gear inspected before taxiing from the runway. If any part of the nose gear is found to be damaged, shut down the engines using the GROUND SECURE Check List. After ground locks are installed have the aircraft towed to the line area.

CARRIER LANDING

For a recovery aboard a carrier, fly a normal pattern to an arrested landing. Have the nose gear inspected before taxiing from the arresting gear. Shut down or taxi clear as signalled.

NO BRAKES LANDING

In the event of a hydraulic or brake failure, a short field arrestment is recommended if available. If unable, proceed as follows:

1. Plan approach to the longest practicable runway.

2. Execute normal landing with touchdown within the first 500 feet of runway.

3. After touchdown, when directional control is assured, secure both engines with mixture controls.

4. Make maximum use of aerodynamic braking. Lower nose wheel onto the runway. Maintain directional control with rudder, raise the flaps.

5. If arresting gear is available for a long field arrestment, drop the hook approximately 1000 feet prior to reaching the gear. If arresting gear is not available, and the aircraft is still rolling at approximately 300 feet from the end of the runway, set the emergency brake. Be prepared for a sudden stop.

6. When stopped, complete the GROUND SECURE Check List, evaluate the aircraft and wait for assistance.

BLOWN TIRE ON LANDING

In the event of a blown tire on landing, differential power and/or normal braking may not be sufficient to maintain directional control. It may be necessary to blow the other tire by locking the brake.

RADOME EXTENDED LANDING

When it is necessary to land with the radome extended, proceed as follows:

1. Fly the approach at 105 KIAS, full flaps extended.

2. Land in a flat attitude and retract the flaps immediately while holding the nosewheel on the deck with forward yoke. Do not commence braking above 90 knots. Exercise caution when applying brakes especially in the vicinity of runway arresting gear cables.

3. As the aircraft stops, apply power and lower tailhook to maintain the nose-down attitude. Raise radome before taxiing to avoid damage, or deflate the nose oleo and request a tow.

MAD BOOM EXTENDED LANDING

When it is necessary to land with the MAD boom extended, proceed as in Radome Extended Landing, this section.

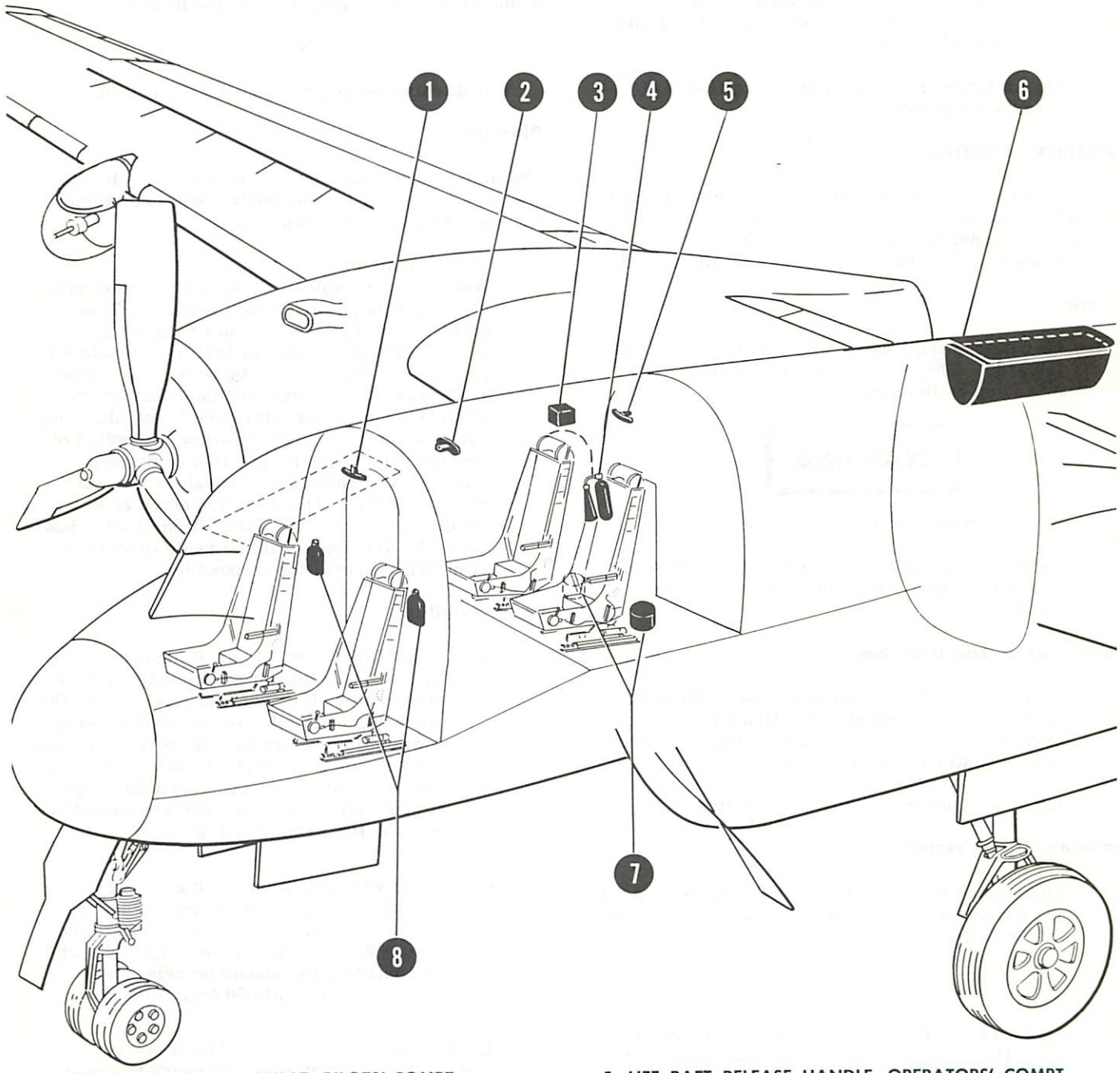
MCJR ANTENNA EXTENDED LANDING

Check the MCJR antenna circuit breaker on the pilot's circuit breaker panel. If the circuit breaker is out, try to reset it.

If unable to fold the MCJR Antenna, proceed as in a normal landing.

Prior to making an arrested landing aboard ship, consideration should be given to a touch-and-go landing. This is to preclude damage caused by travel of the broken antenna pieces through the propeller arc.

MISCELLANEOUS EMERGENCY EQUIPMENT



1. LIFE RAFT RELEASE HANDLE—PILOTS' COMPT.
2. LIFE RAFT RELEASE HANDLE—OPERATORS' COMPT. (S-2E BUNO. 153562 AND SUBSQ. AND AIRCRAFT INCORP. AFC NO. 463).
3. FIRST AID KIT
4. PORTABLE FIRE EXTINGUISHER
5. LIFE RAFT RELEASE HANDLE—OPERATORS' COMPT. (BUNO. 147531-153561 NOT INCORP. AFC NO. 463)
6. LIFE RAFT
7. FOOD CONTAINERS
8. CANTEENS

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Figure 5-10

COLLISION WITH BIRDS

NEW When large numbers of flocking birds are on or near the duty runway, the following rules should be followed:

1. When the danger of collision with birds exists or is anticipated, the WINDSHIELD HEAT CONT. switch should be set to LOW for 1 minute, then set to HIGH.

2. Do not take-off on a runway where flocks of birds are roosting.

FORCED LANDING

The procedures for ditching over land are similar to those for a water landing. There are, however, certain additional considerations for the pilot to keep in mind when attempting to ditch an aircraft on land.

Flaps

1. Do not drop flaps until sure of making the landing area. They can be used to "balloon" over obstacles on final approach.

WARNING

Never try to stretch a glide.

2. Landing gear should always be UP unless assured of making a runway or a known hard surface.

Selecting A Landing Area

1. Adequate size to accommodate the aircraft free of obstacles and smooth. Cultivated fields are most desirable. Avoid swamps, boggy ground, shallow water and forests if possible.

2. Land into the wind as near as possible.

Landing The Aircraft

1. The landing should be made at the slowest speed commensurate with complete control. Aircraft should be flown until it comes to a complete stop.

2. Avoid trees. If landing into trees is unavoidable, fly into them. Do not attempt to land on the tops.

3. Feather starboard propeller, if possible, before touchdown if landing into obstructions, or wheels up.

4. Ditching over land at night should be avoided if at all possible.

DITCHING

The S-2 Series Aircraft has been successfully ditched at sea under varying conditions. The success of these ditchings was the result of crewmembers carrying out the correct ditching procedures. In all ditchings pilots must maintain flying speed until impact and maintain attitude as long as possible thereafter.

Note

For ditching escape routes, see figure 5-6.

Planning

The time to learn the correct procedures is before their use is required. The basic conditions which must be considered in ditching are:

1. Power Available.
Whenever the choice exists, a ditching should be made with power on both engines. This condition would usually result from being lost at sea, having insufficient fuel to return to the carrier or land base, or being forced to ditch as the result of an uncontrollable fire at low altitude. The major advantage in ditching with power on is that it usually allows selection of the time, place, and a low rate of descent. There is no requirement to feather the starboard propeller prior to water entry as in ditchings on land. However, if one engine has failed the ditching should be made in as near symmetrical condition as possible.

2. Visibility.

   a. Under IFR conditions or at night the ditching must be made on instruments, power on or power off. Since no reference to the surface is available, the aircraft must be flown into the water in a fixed attitude which will combine safe control speed, nose attitude, and rate of descent. All ditchings without reference to the surface should be made at 105 KIAS with 1/3 flaps.

   b. Under VFR conditions with both engines operating, the pilot may elect to use 90 KIAS and full flaps with a slow rate of descent. When in doubt, the IFR/Night ditching configuration should be selected for use during the final 500 feet of descent.

3. Location of coastline or surface vessels.
When a ditching becomes necessary while near a coastline or in the vicinity of surface vessels, and sufficient altitude is available, the ditching should be made as near to them as possible in order to improve the rescue situation. Lights from both may assist in a safer night ditching when they can be used for reference. Wind and sea conditions may limit the pilot in approaching coastlines and vessels, since continued movement toward them may give adverse landing direction and impact speed.

4. Altitude Available.
Ditchings which are commenced from altitudes of 500 feet or less do not allow time for completion of any more than the minimum preparation. Above 500 feet time will usually allow completion of the Ditching Check Lists. At much higher altitudes the pilot may have the choice of using best glide speeds between 115 and 135 KIAS to select his ditching area, such as near surface vessels or close to coastlines. (Refer to Figure 5-2 for Maximum Glide Distance charts.) This may not be possible under IFR conditions or at night.

5. Wind and Sea State.
In light to moderate sea states the ditching should be planned for an into-the-wind touchdown, time and visibility permitting. In moderate to heavy sea states the ditching should be planned parallel to the swells, with touchdown on the crest.

Check Lists

PILOT

1. Advise crew "Prepare to ditch."
2. Observe sea state and wind direction.
3. Open and lock overhead hatch - Disconnect exposure suit blower hose.
4. Jettison.
5. Gear up.
6. Flaps as required.
7. Hook down.
8. Shoulder straps locked and tight.
9. Warn crew "Standby for touchdown."
10. Feather starboard prop (over land).
11. Shield face with right arm.
12. After aircraft stops - Disconnect headset - Exit through overhead hatch.
13. Take PK-2 raft - Canteen - Flashlight.

COPILOT

1. Acknowledge "Prepare to ditch."
2. Lock and tighten shoulder straps - Disconnect exposure suit blower hose.
3. Turn on emergency IFF - send MAYDAY - Give position and intentions.
4. Open and lock overhead hatch.
5. Raise seat - Rudder pedals full forward - Seat Aft.
6. Assist pilot with Check List.
7. Stow folding console.
8. On "Standby for touchdown" disconnect headset - Shield face.
9. After stopped, pull raft "T" handle.
10. Exit through overhead hatch - Take PK-2 - Canteen.

NUMBER 3 OPERATOR

1. Acknowledge "Prepare to ditch."
2. Lock and tighten shoulder straps - Disconnect exposure suit blower hose.
3. Time permitting, obtain fix.
4. Radome UP - MAD boom IN.
5. Move seat to full up and back.
6. On "Standby for touchdown" disconnect headset - Jettison hatch.
7. Shield face.
8. After full stop, pull raft "T" handle.
9. Exit through overhead hatch - Take PK-2.

NUMBER 4 OPERATOR

1. Acknowledge "Prepare to ditch."
2. Lock and tighten shoulder straps - Disconnect exposure suit blower hose.
3. If applicable, transmit on MCJR - Send MAYDAY - Give position and intentions. NEW
4. Move seat to full up and back.
5. On "Standby for touchdown" disconnect headset - Jettison hatch.
6. Shield face.
7. After full stop pull raft "T" handle.
8. Exit through overhead hatch - Take PK-2.

Note

- After evacuation, each crewmember should check all other crewmembers and assist them as necessary.
- The life raft submersion actuator will not actuate in fresh water.

Water Entry

The first indication of contact with the water may be felt through the airframe when the hook first makes water contact. It is essential that an attempt be made to control the attitude of the aircraft throughout the ditching until all motion stops.

WARNING

Do not unstrap until all motion stops. The possibility of injury and disorientation requires that evacuation not be attempted until the aircraft comes to a complete stop.

DOWNED AIRCRAFT

Whenever a downed aircraft is observed the most important considerations are to maintain visual contact with survivors, alert rescue facilities as quickly as possible, and to give any assistance available at the scene until rescue is effected.

MAINTAINING VISUAL CONTACT

The most effective means of maintaining visual contact is by flying in a left hand circular pattern around the survivors at approximately 500 feet of altitude, visually observing any dye markers, rafts, smoke signals, or other indications available. The S-2D/E is usually equipped with other aids which will greatly assist in marking survivor positions when, as the only aircraft on the scene, it is necessary to alert a passing ship, or climb to altitude to establish radio/IFF contact with other units or stations in order to alert rescue facilities. These other aids are:

1. The Marine Markers (Smoke Float Lights) may be employed near or around the area if no danger of igniting fuel is present. If fuel danger is present, the smoke lights may be set at a safe distance around the scene.

2. Any sonobuoy may be dropped near survivors to establish one way surface to air communications, and OTPI homing aid to the scene.

3. The Aldis lamp or aircraft lights may be used to send simple messages or instructions to the survivors.

4. When carried in the torpedo bay, the AR-4 four-man life raft may be dropped as needed.

ALERTING RESCUE FACILITIES

When other aircraft are on the scene to assist, they should be instructed to climb to sufficient altitude for radio, radar, IFF effectiveness. Emergency IFF and Guard Channel should be employed (unless under positive control on another frequency). "Crash, Crash, Crash" should be broadcast, then the following information should be relayed:

1. Position in geographic coordinates or true bearing and distance from a known position.

2. Number and condition of survivors.

3. Identity of survivors or downed aircraft, including parent ship or base.

4. Type of emergency equipment in use or needed.

5. Action already taken and assistance needed.

6. Condition of weather and sea, or availability of adjacent landing area if over land.

7. Estimate of time available on station, based on Prudent Limit of Endurance.

If only one aircraft is on the scene it should complete the applicable portions of paragraph above; then climb to altitude around survivors, in order to make contact with rescue facilities.

When any ship is within sight of the on-scene aircraft, it should be contacted for assistance. Contact may be made on the HF frequency available for international distress. If unable to establish radio communications, contact may be made using the Aldis lamp. If still unable to communicate, the aircraft should circle the vessel at least once, then fly across its bow at low altitude while changing propeller pitch, indicating that assistance is needed in the direction indicated by the aircraft heading. A vessel unable to comply should hoist the International Signal Flag NOVEMBER, or, indicate by radio or light.

Aircraft on the scene must be constantly aware of the dangers of not properly flying their own aircraft, and of the fuel requirements for returning for their own safe landing.

section VI

ALL WEATHER OPERATION



TABLE OF CONTENTS

Turbulence and Thunderstorms 6-1
Cold Weather Operation 6-2
Tropic Operation 6-7
Desert Operation 6-7

TURBULENCE AND THUNDERSTORMS

CAUTION

Flying in thunderstorms should be avoided. However, many routine flight operations may result in a certain amount of thunderstorm flying, since it is often impossible to detect individual storms or to find clear areas between them.

BEFORE TAKE-OFF

Before take-off perform the following:

1. Study weather situation to determine thunderstorm areas and prepare a flight plan which will require least exposure to possible storms.
2. Check proper operation of flight instruments, navigation equipment, pitot heaters, instrument panel lights, and de-icing and anti-icing equipment before attempting flight in or near areas of known thunderstorm activity.

APPROACHING A STORM

If the storn cannot be seen, its proximity may be detected by radio crash static or by radar. Prepare the aircraft as follows before entering turbulent air:

1. Adjust power settings, as necessary, for safe penetration speed of 135 to 160 KIAS.
2. Trim aircraft.
3. Turn pitot heat, windshield anti-icing, and propeller de-icing switches ON, and windshield wipers on as required.
4. Check instruments for desired settings.
5. Turn on flight compartment and instrument lights, as required to minimize blinding effects of lightning.

FLIGHT IN A STORM

When flight in a storm is unavoidable, perform the following:

1. Maintain power setting and level flight attitude established before entering storm. Airspeed will then remain constant regardless of airspeed indicator readings.
2. Maintain heading. Do not make turns unless absolutely necessary.
3. Use elevator control only as necessary to maintain attitude to minimize stresses on aircraft.

4. The altimeter may be unreliable because of differential barometric pressures within the storm and may show a gain or loss of several thousand feet.

COLD WEATHER OPERATION

ICING

There are four common types of icing which may be encountered. The temperatures at which they can be anticipated are:

Type	Temperature in Centigrade
1. Clear	+2° to -10°
2. Rime	0°
3. Crystalline	below -10°
4. Carburetor	below +10°C (Carb Air Temp)

Wing and Tail

When icing occurs on the leading edge of the wing and tail, allow it to form up to 1/4 inch before activating the de-icer boots. The ice is then more readily cracked and will be blown off. The timing cycle is once every 60 seconds.

Propeller

The propeller de-icing heaters have FAST and SLOW cycles. The SLOW cycle applies heat for 60 seconds and shuts OFF for 180 seconds. The FAST cycle applies heat for 20 seconds and shuts OFF for 60 seconds. The FAST cycle is used to remove heavy rapid forming ice and the SLOW cycle is used for removing lighter, slower forming ice. If difficulty is encountered in removing propeller ice, fluctuating the RMP will usually throw the ice from the blades.

Carburetor

Regulate the ALTERNATE AIR as necessary to maintain a CARB AIR TEMP between +10° and +38° centigrade. During cold weather cruise or under icing conditions maintain temperature between +20° and +25° centigrade. If the lower limit of the continuous operating limits cannot be maintained, it is recommended that full ALTERNATE air be applied. This gives better engine efficiency at low OAT and provides a dry source of air for temperatures in the freezing range. If difficulty is encountered in removing carburetor ice, then, as an emergency measure a back and forward movement of the throttles may help.

Take-off with alternate air operating is not recommended above -20°C OAT unless actual icing conditions exist. Below -20° OAT, icing conditions are rarely encountered; however, below -30°C OAT, alternate air may be necessary for satisfactory engine operation. Backfire characteristics and similar considerations will require discretion in the use of alternate air for take-off.

CAUTION

For each 6°C that CARB AIR TEMP exceeds 38°C, the max allowable manifold pressure should be reduced by 1 in. Hg.

Pitot Heat

The pitot heat should be used any time icing or visible moisture is encountered.

Windshield Heat

Selection of HIGH on windshield heat permits maximum heating of the windshield panels. The LOW position is used first to reduce thermal shock in extreme cold temperatures. The windshield washing system may also be used to remove ice if the tank contains anti-icing fluid. It is also possible to melt ice on the windshield by turning on the heater and opening the windshield defrost located behind the wheel warning indicator on the pilots glare shield. As a last resort the Aldis lamp may be used by placing it against the windshield. This will sometimes produce a small hole in the ice for forward visibility.

Windshield Defroster

The windshield defroster control which is located above the center instrument panel on the glare shield, can be set to OFF, to ON or to any desired intermediate position. For maximum defrosting, close the two (2) air outlets located on either side of the control.

OIL PREHEAT/DILUTION

MIL-L-22851A Type II NATO 0128 dispersant oil shall be used at all temperatures. When temperatures below -4° C (+25° F) are expected, MIL-L-22851A Type II NATO 0128 dispersant oil shall be preheated or diluted. If preheat is not available, use oil dilution in accordance with NAVAIRSYSCOM Instruction 10350.1 and superseding instructions. NEW

Note

- A manually operated valve in each nacelle must be opened prior to electric oil dilution switch operation.
- The introduction of gasoline into the engine oil system tends to loosen carbon and sludge deposits within the system. This carbon and sludge may collect in the engine oil strainer in sufficient quantity to clog the strainer, and still not be apparent on visual inspection. Therefore, when gasoline is used to dilute engine oil during cold weather operation, the strainer must be removed, disassembled, inspected, and all screens and filters cleaned within 1 to 2 hours after the first oil dilution of the season. This inspection and cleaning must be repeated at short intervals until sludge and carbon no longer collect.

BEFORE ENTERING AIRCRAFT

Before entering aircraft perform the following:

1. If oil dilution was not accomplished at the last shutdown, preheat if required.

2. Apply heat to power section and accessory section until oil will flow from Y drain and propeller can be pulled through with comparative ease. Apply heat particularly to oil Y drain valve, oil lines, and oil tank sump. Do not apply heat directly to oil tanks.

CAUTION

Never consider pre-heating adequate until fluid oil will flow from the Y drain and the propellers can be pulled through with comparative ease. Do not attempt to start engine if oil flow cannot be obtained from Y drain.

3. Remove ice, snow, and frost from wing and tail surfaces with a stiff broom. Pay particular attention to aileron and empennage control surface leading edges. To remove ice, apply sufficient heat to loosen ice particles and remove them with a stiff brush. Alcohol and other sprays used for this purpose have proven unsatisfactory. When removing ice with heat, do not melt ice completely, as water may get into control surface bearings and freeze. The best way to remove ice on propeller blades is by direct application of heat. The same applies for shock struts.

4. Remove any ice present at fuel tank vent, crankcase breathers, and pitot tube. Carefully inspect all openings.

WARNING

Ice or snow in the vent line can stop the flow of fuel, causing engine failure and possible collapsing of the fuel tanks. Frozen crankcase breathers may cause engine failure in flight.

5. Drain engine fuel strainers and fuel tank drain cocks. Check for flow from the fuel tank sumps. If there is no flow, apply more heat and drain frozen condensate.

6. Check oil tank drains for freedom of flow. If oil does not flow, apply more heat and drain frozen condensate.

7. Clean shock struts of dirt and ice with a rag soaked in hydraulic fluid and check for hydraulic leaks and proper inflation.

8. Clean snow and ice off antennas before take-off.

9. Check that windshield is clear before take-off.

ENGINE STARTING

Start the engines as follows:

1. Remove engine covers and ground heaters prior to starting engines.

2. Use normal Engine Starting procedure in Section III, Part I.

3. Prime engine. In extremely cold weather, steady priming is necessary. Priming may be needed for some time after starting to maintain smooth engine operation.

4. Move mixture control to RICH only after engine is running smoothly on primer.

Note

Colder temperatures require a more closed throttle as against warm temperatures which require a more open throttle.

CAUTION

If there is no oil pressure after 20 seconds of operation, immediately stop engine and investigate.

5. Keep carburetor air control switch on DIRECT until the engine is running smoothly.

ENGINE WARMUP

Warm-up the engines as follows:

1. Use firmly anchored wheel chocks for engine run-up. Insure that no personnel, ground installations or other planes are in the prop wash.

2. Set throttles to maintain 1200 RPM until oil temperatures, pressures, and cylinder head temperatures are within desired limits.

3. In extremely low temperatures, use carburetor heat immediately after engine has started to improve fuel vaporization, to prevent spark plug fouling, and to prevent ice formation in induction system.

4. Adjust cowl flaps to maintain normal cylinder head temperatures. Check cylinder head temperatures. Excessive temperatures may be reached at take-off power if cowl flaps are fully closed.

CAUTION

The oil supply of an engine in which the oil has been diluted should be checked after a thorough warm-up.

TAXI

Taxi the aircraft as follows:

1. When taxiing, use same precautions in regard to prop wash as during engine warm-up.

2. Use sufficient engine power while taxiing to keep engine warm and prevent it from dying out.
3. In loose snow, hold control wheel well back and keep momentum. Avoid abrupt turns and use a minimum of differential braking to prevent a wheel from digging in.

CAUTION

In deep snow, the nose wheel takes the full thrust of the engines. Raising the elevators will relieve the pressure, but excessive gunning of engines will result in damage to the nose strut.

4. Watch for frost formation. Although not particularly dangerous during flight, frost can cause trouble during take-off.
5. If deep, heavy snow interferes with the take-off run but permits taxiing, roll slowly up and down the runway before attempting actual take-off. In slush or deep snow, moisture may get into the brake drums and freeze when the aircraft is stopped for engine run-up. Do not stop in deep snow. Watch out for obstacles hidden by freshly fallen snow.

CAUTION

Operation of aircraft on ice is hazardous and should be attempted only when the mission is absolutely necessary. Due caution must be exercised when taxiing on ice. Since the aircraft is not equipped with nose wheel steering, directional control must be maintained by the use of differential power and wheel brakes at taxi speeds and with differential power, brakes, and rudder at speeds above rudder effectiveness. The aircraft should be equipped with ice tires prior to operation on ice.

BEFORE TAKE-OFF

Before take-off perform the following:

1. Carefully check surface controls and trim tabs for proper operation.
2. Cycle wing flaps to insure proper operation.
3. After engine oil temperatures and pressures are up to normal, operate propeller control as described under Propeller Check and Propeller Automatic Feather Check paragraphs, Section III.

CAUTION

During the propeller automatic feather check, failure of the manual feathering push-button to move to depressed position at ambient temperatures of -29°C (-20°F) and below, may indicate congealed oil inside propeller dome. If this condition is suspected, abort flight and preheat propeller domes. Take-off should be performed within one hour after preheat is removed.

4. Turn pitot heat switch ON for take-off.
5. Cycle de-icing boots to ensure proper operation.

TAKE-OFF

During take-off perform the following:

1. If full power is not obtained, abort take-off immediately.
2. Do not take off with overdiluted oil. It is safe to take-off immediately without the normal warm-up, provided there has been a rise in all temperatures, oil pressure is steady, and engine is running smoothly.
3. Use the normal take-off attitude. When taking off in snow, take-off ground roll will be increased. If heavy snow drifts are present, ensure the runway is cleared before attempting to take-off.
4. These procedures do not apply if operational necessity requires a take-off with frost or snow on wings. Under these conditions do not make a pulled take-off but take-off in flying position. Watch air speed and do not try to climb too rapidly. Do not make steep turns with iced wings and tail surfaces.

WARNING

Do not attempt to take-off with snow or ice on the wings unless required by operational necessity, as loss of lift and stalling may result. Loose snow may not blow off.

5. After take-off from a snow or slush covered field operate landing gear, wing flaps, and torpedo bay doors through a complete cycle two or three times to prevent freezing.

DURING FLIGHT

During flight perform the following:

1. Alternate air should be used whenever conditions are such that carburetor ice may form. Alternate air should be applied before ice formation, to prevent its developing, rather than after ice has already formed. It is advisable that alternate air be used to improve fuel vaporization and fuel consumption when cruising during cold weather. As detonation may occur at high power settings when full alternate air is used, the alternate air temperature should be regulated to maintain temperature between +10°C (50°F) and +38°C (100°F).

CAUTION

- Prior to applying carburetor ALTERNATE air, place the mixture control lever to RICH to prevent engine damage.
- When operating cowl flaps with carburetor alternate air in use, closely monitor the resultant changes in CAT to avoid excessively high or low temperatures.

Note

If partial fuel stoppage occurs as a result of ice or carburetor malfunctioning, the primer may be used to supplement the carburetor. Primer flow alone will support approximately 23 inches Hg MAP at 2000 to 2300 RPM. Adjust throttle for smooth running mixture.

2. Check all instruments.

3. Turn on anti-icing systems as necessary to prevent formation of ice on windshields, propellers and pitot heads.

CAUTION

The pneumatic de-icing boots should not be activated until at least 1/4-inch of ice has formed on the airfoil surfaces. After the ice has formed, cycle the boots until all the residual ice is removed.

4. Avoid long glides at low power settings when temperature is low, to prevent excessive engine cooling.

5. If torque pressure indications are sluggish during power changes, the possibility of torque pressure line heater malfunction exists. Check the TORQUE LINE HTR circuit breaker on the D.C. JUNCTION BOX.

6. Stiffening of controls may indicate congealing of lubricant or freezing of moisture in control hinges. Get into a warmer layer of air or move the control frequently to prevent freezing.

7. Congealed oil in the propeller dome may prevent propeller feathering during extreme cold weather. Cycle the propeller controls between 1600 and 2300 RPM periodically to prevent the oil from congealing. If propeller feathering is required, it may be necessary to hold the FEATHER button IN until the feathering cycle is completed.

8. Failure of airspeed indicators may result from freezing of its pitot head or static line. Use pitot heater and cabin heater as allowable.

CAUTION

- If pilot's airspeed indicator fails due to pitot icing, loss of airspeed sense to AFCS airspeed compensator in pilot's pitot pressure system will occur. (Refer to Section IV, Automatic Flight Control System Flight Check.)
- If copilot's airspeed indicator fails due to icing, loss of airspeed sense to Airspeed Transmitter APA-57B in copilot's pitot pressure system will occur. (Refer to Target Position Computer Group AN/ASA-31, Navigational Function, in Supplemental NATOPS Flight Manual NAVWEPS 01-85SAD-1A).

APPROACH AND LANDING

The danger of encountering heavy icing conditions are most hazardous during an approach and landing. The aircraft will be in the landing configuration with many unprotected surfaces submitted to possible heavy icing. A rapid increase of weight may be gained and a serious distortion of the airfoil may result thereby increasing stall speeds and a deterioration of handling characteristics should be expected. A most judicious use of the copilot is imperative in handling the icing problem due to the fact that the pilot is concentrating on the approach and ensuing landing. During the approach perform the following:

Note

Windshield heat may be turned to LOW during inclement weather or at night to prevent fogging. During icing conditions, turn windshield heat to HIGH to prevent rapid accumulation of ice.

WARNING

Approaches and landings with de-icer boots on should be flown at higher speeds than normal due to a corresponding increase in stall speed.

1. Keep cowl flaps closed in prolonged glides or approaches.
2. Lower landing gear and flaps and use enough power to maintain cylinder head temperature above 100°C (212°F).

Note

If desired, extend landing gear and partial flaps before making approach, to check operation while enough altitude remains for emergency procedure. This will also permit use of more engine power, reducing possibility of carburetor icing.

3. Use carburetor air heat while landing so that if rapid acceleration is necessary, heat will be available for fuel vaporation regardless of low

cylinder head temperature. However, if full power is needed to go around, keep carburetor air temperatures below 38°C (100°F) and be prepared to reduce or shut off carburetor heat. Before making final approach, make certain that engines will maintain power while altitude is still adequate.

Note

If the presence of impact ice, snow, etc. is suspected in the carburetor air intakes, leave the alternate air ON for landing. If there is no reason to believe that any form of ice is present in the carburetor intake ducts, select DIRECT one at a time as a precautionary measure.

4. Pump brake pedals several times during approach to insure circulation of sluggish fluid.
5. Land a heavily iced aircraft as an overloaded aircraft. Make approach at a speed higher than normal, depending upon amount of icing.
6. Use brakes sparingly and not until absolutely necessary after landing on an icy runway.
7. Turn off anti-icing systems after landing.

LANDING ON SLIPPERY RUNWAYS

Wet Runway

Fly a normal approach to the landing.

CAUTION

When landing on a wet surface runway, the early portion of the roll is the most critical because the aircraft has a hydroplaning tendency until speed has dissipated. If brakes are used during this period, this condition will tend to be aggravated, resulting in a severe yaw. It is virtually impossible to determine when one wheel has stopped rotating on a wet runway; therefore, the best assurance against blowing a tire is light application of the brakes, with equal pressure being applied to both brakes. If the aircraft starts to yaw, the pilot should release both brakes, and after the aircraft stabilizes use the rudder and only a light application of brakes.

AFTER TOUCHDOWN

1. Raise the flaps.
2. Ease the nose to the runway prior to applying brakes.
3. After the nose wheel contacts the runway, use light, even application of brakes.
4. Maintain directional control by use of rudder and differential power. Use brakes and differential power after the rudder becomes ineffective.

Icy Runway

Fly a normal approach to the landing.

WARNING

Landing an aircraft on an icy runway is hazardous and should be attempted only when the mission is absolutely necessary. Application of brakes without skidding the tires on ice is very difficult due to the sensitive hydraulic actuated power brakes. Sensing wheel skid is also very difficult for the pilot. Landing on ice-covered runways should not be attempted unless the wind is within 10 degrees of runway heading. Runway lengths required to bring the aircraft to a stop will be greater. The aircraft may be equipped with ice tires prior to operation on ice.

AFTER TOUCHDOWN

1. Ease the nose to the runway prior to applying brakes.
2. After the nose wheel contacts the runway, use light, even application of brakes.
3. Maintain directional control by use of rudder and differential power. Use brakes and differential power after the rudder becomes ineffective.

PARKING

When parking on ice, after having gone through slush, or when temperature varies between freezing and thawing, place a double layer of paper, fabric, grass, straw, green boughs, or other insulation material under wheels to prevent their freezing to the surface.

ENGINE SHUTDOWN

When ready to stop engines, perform the following:

1. If engine preheat equipment is not available and outside air temperature is expected to fall below -4°C (+25°F) before engines are started, dilute MIL-L-22851 oil. Refer to NAVAIRSYSCOM Instruction 10350.1 (series) for dilution percentages to use for expected air temperatures. Use Oil Dilution Time Table to determine dilution times.
2. Cool engines by idling at 1000 RPM with cowl flaps and oil cooler doors open until oil temperatures drop to 40°C (104°F).
3. Have ground crew break lock wire and open manual shut-off valve in oil dilution fuel line of each engine.

Note

One engine oil system is diluted at a time. Open only shut-off valve for system to be diluted.

4. Operate engines between 1000 and 1200 RPM for oil dilution. Maintain oil temperature below 50°C (122°F) and oil pressure above 15 psi during this procedure.

5. Hold oil dilution switch ON for period of time determined by anticipated temperature shown in Oil Dilution Time Table and check for slight rise in fuel pressure indicating auxiliary fuel pump is operating.

CAUTION

Explosive hazard is generated by over dilution. Be sure that fire equipment is available when starting engines.

6. Before the last minute of dilution, increase RPM to 1500, press propeller feathering buttons and wait for a drop of approximately 300 to 400 RPM. Pull buttons out. Repeat procedure twice, allowing engines to regain full speed each time after feathering buttons are pulled out. This supplies diluted oil to the propeller dome and feathering lines.

7. Operate propeller pitch control levers through two complete cycles.

8. Secure engines using Ground Secure Check List.

9. Open oil tank sump and Y drain and remove any water condensate from the system before it freezes.

10. Close manual shut-off valves in oil dilution lines and secure with lock wire.

11. Clean all dirt and ice from shock struts.

12. Release brakes. If left on, formation of ice may lock wheels.

13. Install protective covers.

14. Drain oil tank sumps, Y drains, and fuel drains of condensate approximately 30 minutes after stopping engine.

OIL DILUTION TIME TABLE

ANTICIPATED TEMPERATURE	PER CENT FUEL	DILUTION TIME (MINUTES)
– 7°C (+20°F)	4.3	2
–13°C (+ 9°F)	8.0	3
–18°C (0°F)	11.9	4
–24°C (–11°F)	15.7	5
–31°C (–23°F)	19.6	6
–37°C (–34°F)	23.6	7

A-SAD1-77

TROPIC OPERATION

BEFORE ENTERING AIRCRAFT

Before entering aircraft check seals at rudder, aileron and elevator leading edges for freedom from fungi.

ON ENTERING AIRCRAFT

On entering aircraft, warm electrical instruments with an external source of heat until all moisture is eliminated, as necessary.

BEFORE LEAVING AIRCRAFT

As soon as engines have cooled, install weather covers to keep out moisture and inhibit corrosion and growth of fungi.

DESERT OPERATION

BEFORE ENTERING AIRCRAFT

Before entering aircraft perform the following:

1. Operate all movable surfaces and inspect for freedom from sand and dust.

2. Wipe struts free of dust and sand, using cloth moistened with hydraulic fluid.

3. Check tires for blisters or other signs of deterioration.

4. In sandy country, check for cleanliness of fuel and oil system filters.

ENGINE WARM-UP

Conduct warm-up and ground tests in minimum time. Head aircraft into wind for better cooling, but avoid sand ingestion.

CAUTION

For each 6°C rise in carburetor air temperature above 38°C, reduce limiting manifold pressure 1-inch Hg for the operating rpm to prevent detonation.

TAKE-OFF

Before take-off perform the following:

1. Keep in mind that excessive heat requires a longer take-off run than ordinary temperatures.

2. Avoid taking off in wake of another aircraft if ground is sandy and dusty.

LANDING

Remember that the aircraft will sink faster in excessive heat than in moderate temperature.

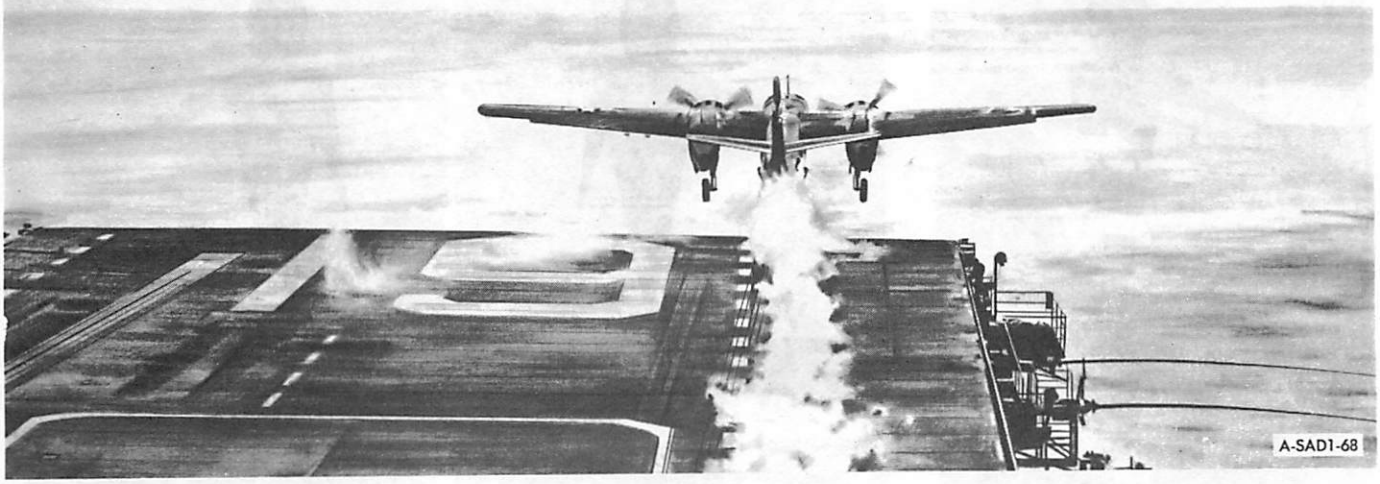
BEFORE LEAVING AIRCRAFT

Before leaving aircraft proceed as follows:

1. As soon as engines have cooled, install weather covers and pitot covers.
2. Exercise care to prevent sand or dust from entering fuel and oil tanks during servicing.
3. Clean sand and dust from all hinge points or movable surfaces.
4. Cover windshield and all windows to prevent pitting.
5. If blowing sand is not a hazard, keep doors and hatches open to permit air circulation.

section VII

COMMUNICATIONS PROCEDURES



GENERAL

THE FOLLOWING PUBLICATIONS CONTAIN COMMUNICATION PROCEDURES THAT ARE APPLICABLE TO THE S-2 AIRCRAFT:

1. NWP-41(B)-Standard U.S. Navy Taxi Signals, Light Signals for Land Base Operation, and Shipboard Communications Procedures (Normal and Emergency).
2. FLIP IFR SUPPLEMENT and FLIP PLANNING Section II - Lost Plane/Lost Communications Procedures while under FAA control.
3. CVA/CVS NATOPS Manual.

VISUAL SIGNALS

1. The hand signals shown in Figure 7-1 shall be used for visually checking the controls.
2. For visual troubleshooter signals, use "DEMOT".

AD - one finger

AE - two fingers

AM - three fingers

AO - four fingers

AT - five fingers

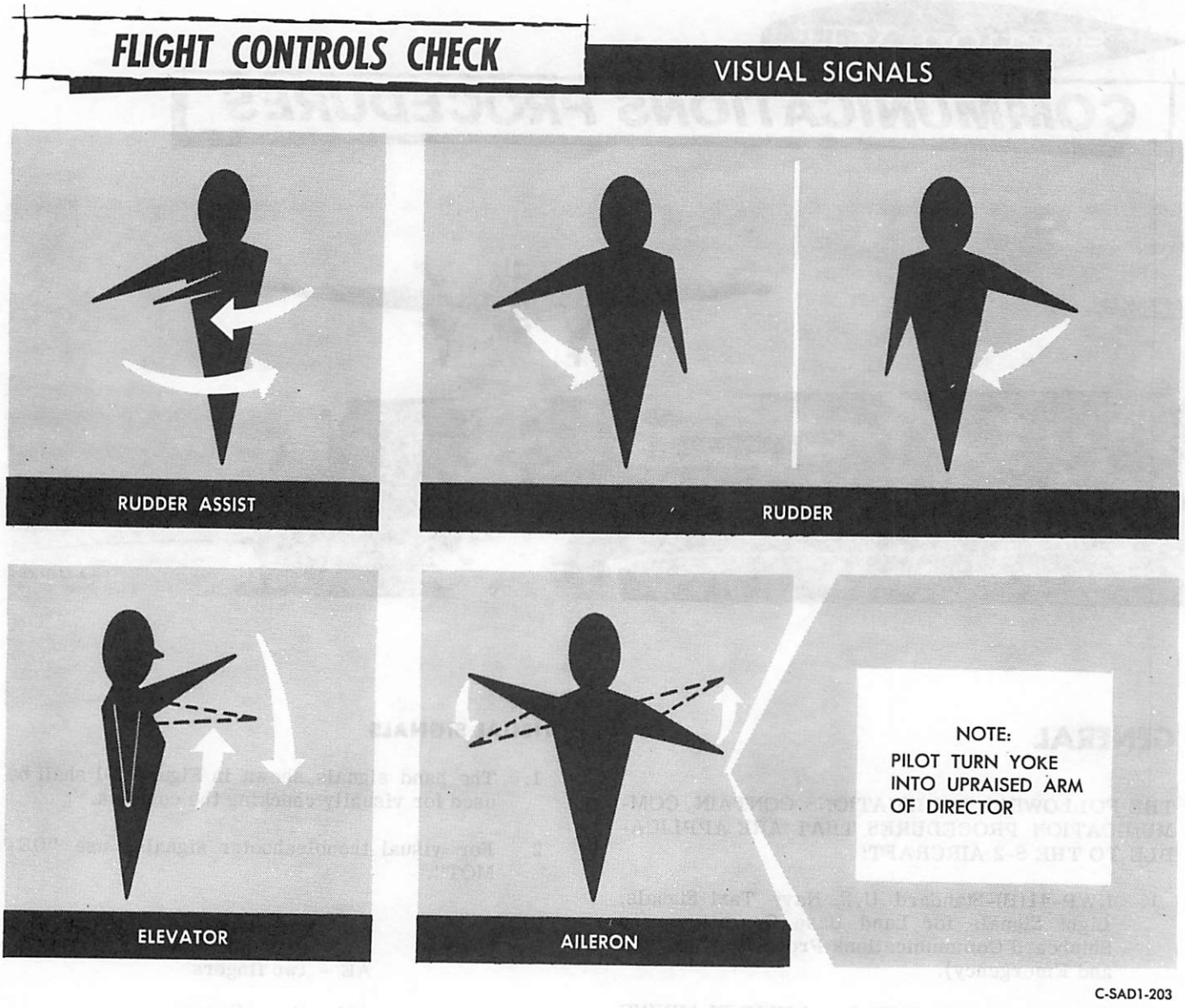

FLIGHT CONTROLS CHECK
VISUAL SIGNALS
RUDDER ASSIST
RUDDER
ELEVATOR
AILERON
NOTE:
PILOT TURN YOKE
INTO UPRAISED ARM
OF DIRECTOR
C-SAD1-203

Figure 7-1

section VIII

WEAPON SYSTEMS

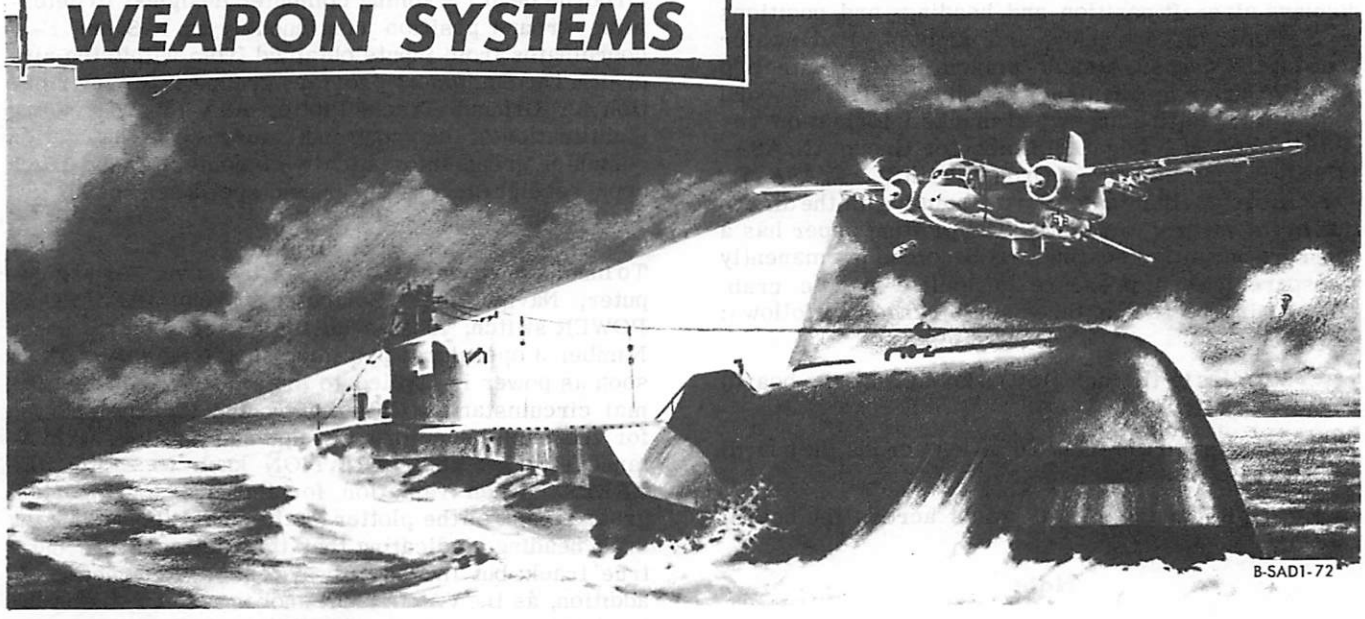


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WARNING

Information contained in this section does NOT constitute authorization to carry or release any internal or external stores. For stores authorization and applicable limitations see Figure 1-75 in Section I, Part 4 of this manual.

WEAPONS

To insure effectiveness in employing the aircraft as a weapons system, pilots must be fully trained in the various types and combinations of stores which may be carried, and the proper procedures for dropping each. The ordnance system is quite simple in comparison to those installed in other aircraft, however, with the various types and combinations of stores employed, procedures must be exact. Although some stores do not fall into the Ordnance category, they are classified as weapons in the sense that they are carried and dropped in a similar manner, in the prosecution of ASW. The procedures outlined in Section IV include only those concerning the dropping of stores, and not the rules and techniques of delivery.

PLOTTING BOARD GROUP GTP-4

The Plotting Board Group (figure 8-1) is a navigational device supplying the pilot with visual, tactical, and navigational information during a maneuver. The plotting board traces N-S and E-W ground track information to plot the position and display the heading of the aircraft and the positions of the targets. The group consists of three major components; Tactical Display Plotting Board ASA-13, Remote Plotter Control ASA-13, and Local Plotter Control ASA-13.

TACTICAL DISPLAY PLOTTING BOARD

The Tactical Display Plotting Board ASA-13 on the center instrument panel in the Pilots' compartment displays aircraft position and heading, and positions of the targets, sonobuoy, and Signals, Underwater Sound (SUS) drops. A cable-driven CRAB, controlled by servo drive mechanisms travels across the board beneath the plotting paper and marks information received from the Navigation Computer Group AN/ASA-13 and Target Computer Group (JULIE) AN/ASA-31. The crab is an illuminated arrow pointing in the direction of the aircraft heading. The plotting paper has a pressure-sensitive coating that becomes permanently transparent when pressure is applied by the crab. The plotting board has three scale ranges as follows:

1. 20 miles to the inch (180 miles across the board)
2. 4 miles to the inch (36 miles across the board)
3. 1 mile to the inch (9 miles across the board)

Note

These scales are located on the front of ASA-31 Programmer. Each one lights when depressed to indicate scale.

The scale factor is chosen and displayed when the respective pushbutton is depressed.

PLOTTING BOARD GROUP CONTROLS

The Remote Plotter Control ASA-13 on the Number 3 Operator's console (figure 8-1), controls the operation of the plotting board from a remote position. The control determines the plotting board operating mode and controls non-JULIE target data insertion. The MODE and FUNCTION switches control the plotting board. These pushbuttons, having integral indicator lamps select the desired scale factor for the plotting board display.

The Local Plotter-Control ASA-13 on the diagonal console in the pilot's compartment, controls operation of the plotting board from the pilots' position. This control unit contains four switches: MODE, MARK, SLEW, and TARGET. The MODE, MARK and SLEW switches control operation of the plotting board. The TARGET switch is a pushbutton having an integral indicator lamp that extinguishes when the pushbutton is depressed, indicating acknowledgement of insertion of target data. The CRAB ILLUM control varies brightness of the crab heading arrow projected on the plotting board.

TARGET POSITION COMPUTER AN/ASA-31

Refer to Supplemental NATOPS Flight Manual, NAVAIR 01-85SAD-1A.

NAVIGATION COMPUTER GROUP (S-2D)

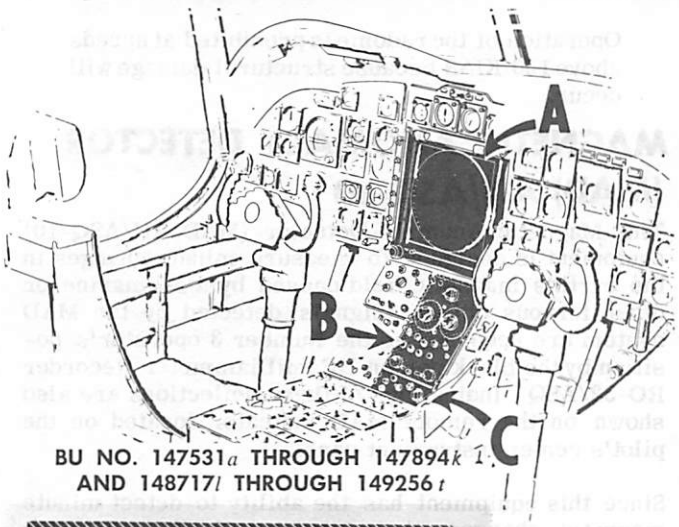
The Navigation Computer Group AN/ASA-13 is an airborne dead reckoning computer designed to determine ground position continuously in N-S and E-W coordinates from inputs obtained from within the aircraft. The equipment provides ground track information for Ground Track Plotter ASA-13 and heading stabilization of the radar indicators. The navigation computer group automatically computes ground track upon receipt of doppler ground speed, airspeed, and wind information.

To insure maximum accuracy of the navigational computer, Navigational Computer Group AN/ASA-13 POWER switch, located on the CP-381 control in the Number 3 operator's position, should be set to ON as soon as power is applied to the aircraft. Under normal circumstances, 20 minutes are thereby allowed for the equipment to warm up and stabilize. Simultaneously, set the VARIATION knob to ZERO DEGREES. When variation for the area is inserted, ground track on the plotter is affected without changing crab heading, indicating that the plotter draws out a true track; but the bug always points magnetic. In addition, as the VARIATION knob is rotated, the radar heading marker supplies TRUE bearings when correct variation for area is set in. Since the system is not capable of absolute accuracy, it builds up a small navigational error in terms of distance traveled. Navigational accuracy may be improved by taking advantage of every check point to update the plot. TACAN ranges and bearings, sonobuoy equipment, OTPI, and other associated equipment may be used to improve the navigational plot.

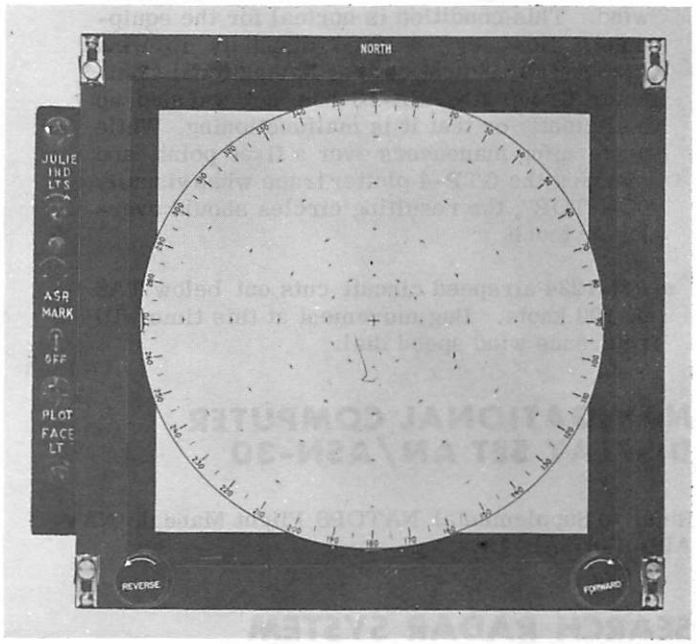
Navigational Computer Group AN/ASA-13 wind readout in flight fluctuates both in wind speed and direction. Normal fluctuation is approximately ± 15 degrees and ± 5 knots in level flight. Occasionally, erratic wind readouts may be noted. Should this condition persist it is advisable to turn the XMTG-STBY switch on Doppler Control Indicator APN-122 to STBY and insert the last stable wind indication into the Computer Group manually. When operating without the Doppler radar inputs, the Computer Group integrates true airspeed and wind speed inserted manually by the operator and the doppler must be left in STBY.

Aircraft relays disconnect the Doppler inputs from the Computer Group when the aircraft is banked in excess of 6 ± 2 degrees, to prevent spurious Doppler information from affecting the ground track plot during turns. The MF-1 compass control ROLL-STAB switch must be in ON position for this to occur. A remote memory light, mounted above the MAD recorder, goes on when the Doppler radar goes into memory mode for any reason. At this time, the Number 3 operator should insure that wind readout on the Computer Group control panel is the same as it has been for the preceding few minutes. If it is not, the operator should manually position the wind direction and speed knobs. As a further aid, the face of the memory light is constructed of plastic so the operator may mark the wind indication, using a pencil, on the face of the light during periods of valid wind information.

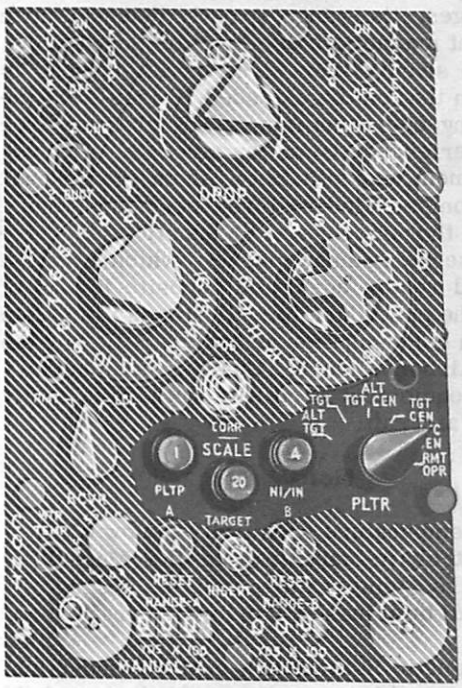
PLOTTING BOARD GROUP CONTROLS S-2D AIRCRAFT



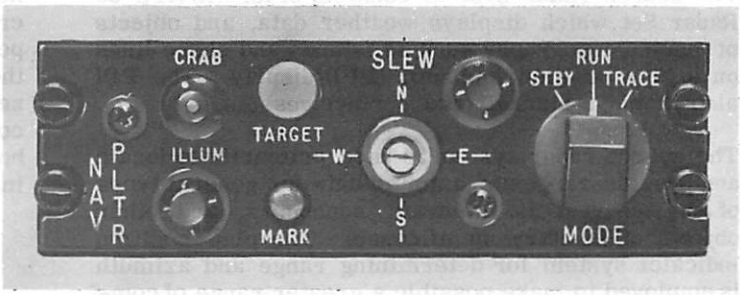
BU NO. 147531*a* THROUGH 147894*k* AND 148717*l* THROUGH 149256*t*



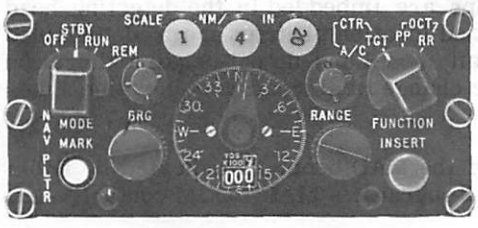
A TACTICAL DISPLAY PLOTTING BOARD ASA-13



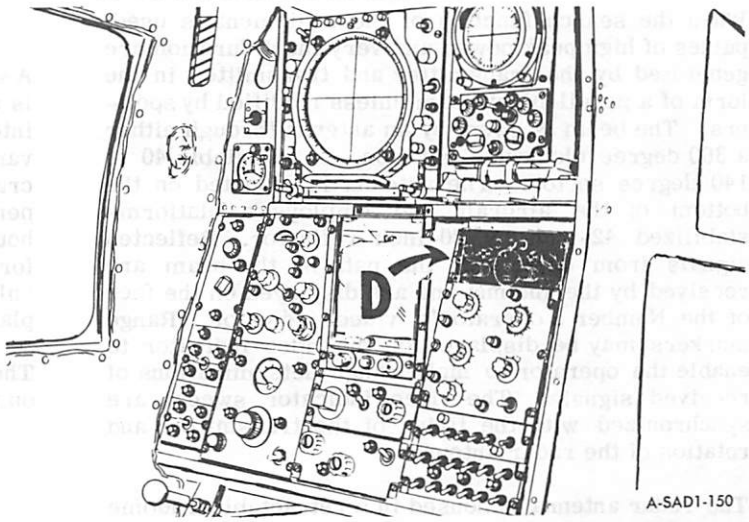
B ELECTRONIC COMMAND SIGNALS PROGRAMMER ASA-31



C LOCAL PLOTTER CONTROL ASA-13



D PLOTTING BOARD CONTROL ASA-13 (REMOTE)



A-SAD1-150

Figure 8-1

Note

- The wind readout is a system-derived wind and may disagree with the observed or tower wind. This condition is normal for the equipment. However, a large disparity in wind readout is an indication that Navigational Computer Group AN/ASA-13 has not warmed up sufficiently or that it is malfunctioning. While performing maneuvers over a fixed point, and marking the GTP-4 plotter trace when visually "ON-TOP", the resulting circles should overlap or touch.

- AM-1234 airspeed circuit cuts out below TAS of 100 knots. Bug movement at this time will reference wind speed dial.

NAVIGATIONAL COMPUTER DISPLAY SET AN/ASN-30

Refer to Supplemental NATOPS Flight Manual, NAVAIR 01-85SAD-1A.

SEARCH RADAR SYSTEM AN/APS-88

The search radar system consists of an AN/APS-88 Radar Set which displays weather data, and objects of marine topography such as islands and shore lines on a plan position indicator (PPI) display. The PPI also displays aircraft and surface vessels.

The search radar system is used primarily to locate and provide range and azimuth data for general types of surface vessels, aircraft, sonobuoys, and other objects of military significance. The plan position indicator system for determining range and azimuth is employed to make possible a greater range of combat usefulness.

When the search function of the equipment is used, pulses of high peak power and very short duration are generated by the transmitter and transmitted in the form of a pencil-point beam unless modified by spoilers. The beam is swept by an antenna through either a 360 degree clockwise rotation, or a variable 40 to 140 degree sector. The antenna is mounted on the bottom of the aircraft and employs a platform-stabilized 42-inch by 20-inch reflector. Reflected signals from objects in the path of the beam are received by the antenna and are displayed on the face of the Number 3 operator's video indicator. Range markers may be displayed on the video indicator to enable the operator to make range determinations of received signals. The video indicator sweeps are synchronized with the firing of the transmitter and rotation of the radar antenna.

The radar antenna is housed in a retractable radome located beneath the aircraft. This radome is controlled by a switch located on the Number 3 operator's console. The position of the radome is indicated by lights on the Number 3 operator's RADOME control panel.

CAUTION

Operation of the radome is prohibited at speeds above 150 KIAS because structural damage will occur.

MAGNETIC ANOMALY DETECTOR (MAD) AN/ASQ-10

The Magnetic Anomaly Detector (MAD AN/ASQ-10) equipment is designed to measure minute changes in the earth's magnetic field caused by a submarine or other ferrous object. Signals detected by the MAD system are recorded at the Number 3 operator's position by the black pen on DC milliammeter Recorder RO-32/ASQ. Indications of these deflections are also shown on the remote MAD indicator located on the pilot's center instrument panel.

Since this equipment has the ability to detect minute magnetic changes, the range greatly depends upon both the ambient magnetic noise level of the installation and of the search area. The detecting head is placed in a boom that can be extended 16 feet aft of the aircraft allowing operation in an area relatively free of magnetic interference from the aircraft. The remaining permanent magnetic noise from the aircraft is effectively compensated by three permanent magnets located in the empennage. Magnetic fields are created by these permanent magnets which create a permanent field vector equal and opposite to that of the aircraft. The procedure for adjustments is called zero trim perm compensation and is controlled by the compensating Airborne Magnet Charger, a unit of airborne support equipment used with but not normally installed in the aircraft.

Note

Due to the temperature sensitivity (below 0°C) of the electrolytic capacitor in the Magnet Charger, the temperature of the Magnet Charger shall be at least 0°C prior to operation.

A secondary magnetic disturbance, magnetic induction, is caused by the earth's magnetic field inducing a field into ferrous portions of the aircraft. This field will vary depending upon the heading and altitude of the aircraft. To compensate for this induced magnetism, permalloy strips are imbedded in the detecting head housing. Size and location of strips are predetermined for each aircraft model and do not require alteration unless a major change in aircraft configuration takes place.

The position of the MAD boom is indicated by lights on the Number 3 operator's MAD BOOM control panel.

CAUTION

Operation of the MAD Boom is prohibited at speeds above 150 KIAS because structural damage will occur.

An operator cannot differentiate between submerged and surfaced objects. The following characteristics must be understood to effectively utilize the system:

1. The equipment is passive and requires no radiated energy from either aircraft or object.
2. Detection range is dependent on the distance between aircraft and target.
3. Measurement is not directional. Horizontal sweep width average is 1200 to 1600 feet.
4. Vertical detection range is approximately 1000 feet. Detection capability decreases rapidly when the target and aircraft separation is over 600 feet.

   The amount of noise generated within the aircraft and changes in the magnetic environment of the aircraft directly affect the indications on the MAD recorder. The pilot and crew must handle aircraft and equipment to smoothly minimize these effects. Major considerations are:

   a. The actuation of any DC electrical equipment produces a noise which may mask or be mistaken for signal. Therefore minimize their use during MAD tactics. Of particular note is the signal of the trim tab motor which closely resembles a submarine signal. The pilot should reduce use of tab to the absolute minimum during MAD tactics.

   b. Both initial arcing and stopping of the searchlight produce a signal. Co-pilot must time these actions so as to give the MAD operator these signals at times of low probability of contact.

   c. MAD equipment should be oriented on each flight, preferably in the area in which the equipment will be operated. If the MAD equipment becomes noisy during a flight, it may be necessary to reorient. Reorientation may be necessary several times during a flight.

SUBMARINE DETECTING SET AN/ASR-3

NEW Submarine Detecting Set (Sniffer) AN/ASR-3, and S-2D/E without AFC 516 incorp., detects and measures changes in concentrations of condensation nuclei in the airstream outside the aircraft.

Note

Condensation nuclei are ionized particles contributed by exhaust fumes and other sources.

This equipment continuously draws air samples from the outside of the aircraft through a probe located on the nose of the aircraft. Inside the aircraft, the submarine detector humidifies the sample, then supersaturates it by sudden expansion. This sudden expansion causes cloud droplets to form on any nuclei in the air sample being tested. The equipment then detects and measures the comparative density of these droplets by means of a lamp, and photomultiplier tube. The output is amplified, detected and fed to:

1. Particle level indicator and detecting set control.
2. ICS of pilot, co-pilot and Number 3 operator.
3. Recorder RO-32/ASQ.

ASR MARK SWITCH

An ASR mark switch, located on the plotting board, is supplied to disconnect Submarine Detecting Set AN/ASR-3 from the plotting board. When the particle detector locates a large amount of condensation nuclei, the information supplied to the plotting board is erratic and cannot be deciphered. When this condition arises, placing the switch OFF will disconnect the plotting board ASR inputs and the information detected by the particle detector will be supplied to the arbitrary scale meter and ICS system.

REFER TO SUPPLEMENTAL NATOPS FLIGHT MANUAL, NAVWEPS 01-85SAD-1A FOR INFORMATION ON THE FOLLOWING EQUIPMENT:

SONOBUOY RADIO RECEIVER SET

AUXILIARY SONO CONTROL

JULIE RECORDER GROUP AN/ASA-26

JEZEBEL INDICATOR GROUP

MULTI-CHANNEL JEZEBEL RELAY SYSTEM (MCJR)

DIRECTION FINDER SET (ECM)

SONAR COMPUTER-RECORDER GROUP (DIFAR) AN/AQA-7(V)

NEW

ON TOP POSITION INDICATOR (OTPI)

The On Top Position Indicator System (OTPI) supplies navigational information to the No. 1 needle of the Bearing-Distance-Heading-Indicator (BDHI). On aircraft BuNo. 147531a through 147894k the OTPI system operates in conjunction with Sonobuoy Radio Receiver Set (ASW) AN/ARR-58. Sonobuoy r-f signals are supplied to the channel D receiver via the AN/ARA-25 antenna. The channel D receiver detects and amplifies the r-f signal. Audio output from the channel D receiver is supplied to Amplifier AM-1777/ARA-25. The amplifier converts audio output to servo voltage which is supplied to the transmitting servo unit in antenna ARA-25. The output voltage from the transmitting servo is supplied to the receiver servo in the BDHI which causes the No. 1 pointer to deflect.

On aircraft BuNo. 147895k and subsequent, the OTPI Receiver R1047/A obtains r-f signals from the sonobuoy via the AN/ARA-25 antenna. This signal is detected and amplified by the receiver and supplied to Amplifier AM-1777/ARA-25. The amplifier routes this signal voltage to servos in the AN/ARA-25 antenna system. The voltage in the AN/ARA-25 antenna supplies servo voltage to the No. 1 pointer of the BDHI.

OTPI CONTROLS

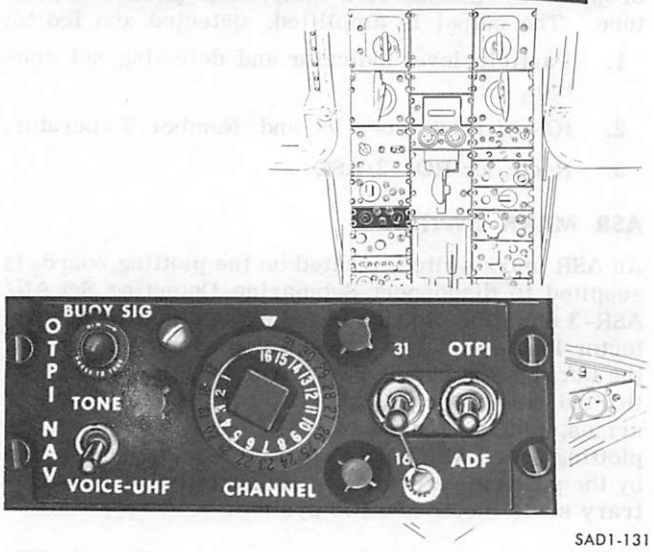


Figure 8-2

Note

Unreliable bearing information is obtained with torpedo bay doors open. Optimum reception is gained with torpedo bay doors closed and the aircraft in normal flight attitude.

The OTPI Control Panel is located on the pilot's overhead console. (See figure 8-2.)

OTPI ADF SWITCH

The OTPI-ADF switch is a two-position toggle switch that selects the source of navigational information supplied to the No. 1 pointer of the BDHI. When the switch is placed in the OTPI position navigational information is supplied to the BDHI from the OTPI Receiver (in aircraft BuNo. 147895k and subsequent) or from the channel D receiver of the AN/ARR-58 system (in aircraft BuNo. 147531a through 147894k). When the OTPI-ADF switch is placed in the ADF position information is supplied to the BDHI from Direction Finder Set AN/ARN-59. When this switch and the OFF-T/R-T/R+G-ADF switch, on UHF Control ARC-52 are both in the ADF position, navigational information is supplied to the BDHI from Radio Set AN/ARC-52. An interlock controlled by the AN/ARC-52 system is provided to prevent the receiver section of AN/ARC-52 from being used with the OTPI Receiver system when the transmitter of the AN/ARC-52 is being keyed.

Note

The UHF/DF takes precedence over the LF/ADF.

TONE/VOICE — UHF SWITCH

The TONE/VOICE-UHF switch is a two-position toggle switch. When placed in the TONE position it keys the AN/ARC-52 transmitter with a 1020 CPS tone for homing purposes.

CHANNEL SELECTOR SWITCH

The CHANNEL selector switch BuNo. 147895k *and* subsequent is a double stack 16 position rotary switch. This switch tunes the OTPI Receiver to one of the output frequencies of the sonobuoys. The receiver is designed to operate on 31 frequencies but on aircraft BuNo. 147531 through 152379 only the first 16 are used. On aircraft BuNo. 152798 and subsequent, all 31 frequencies are used.

31-16 SWITCH

The 31-16 switch is a two-position toggle switch. When placed in the 16 position the OTPI Receiver may be used on channels 1 through 16. When placed in the 31 position the OTPI Receiver may be used on channels 17 through 31, on aircraft BuNo. 147531 through 152379 only the first 16 channels are used, therefore the switch is safety-wired in the 16 position.

BUOY SIGNAL LIGHT (S-2E/G) NEW

The signal light is a press-to-test light, placarded BUOY SIG, located on the upper left corner of the OTPI Control Panel. The light indicates an output of (0.25 volt, 100 cps) from the detector threshold circuit, which keys a relay in the OTPI Receiver. The keying of this relay applies a 400-cycle note to the ICS system when OTPI switch on the ICS panel is selected.

ENERGIZE EQUIPMENT

Energize the OTPI Receiver by placing the OTPI-ADF switch to OTPI position.

DEENERGIZE EQUIPMENT

Deenergize the OTPI Receiver by placing the OTPI-ADF switch in ADF position.

ARMAMENT SYSTEM

WARNING

Information contained in this section does NOT constitute authorization to carry or release any internal or external stores. For stores authorization and applicable limitations see Figure 1-75 in Section I, Part 4 of this manual.

The aircraft is capable of carrying a variety of stores. Depth bombs or torpedoes may be carried in the torpedo bay and various combinations of depth bombs, torpedoes and rockets may be carried externally on

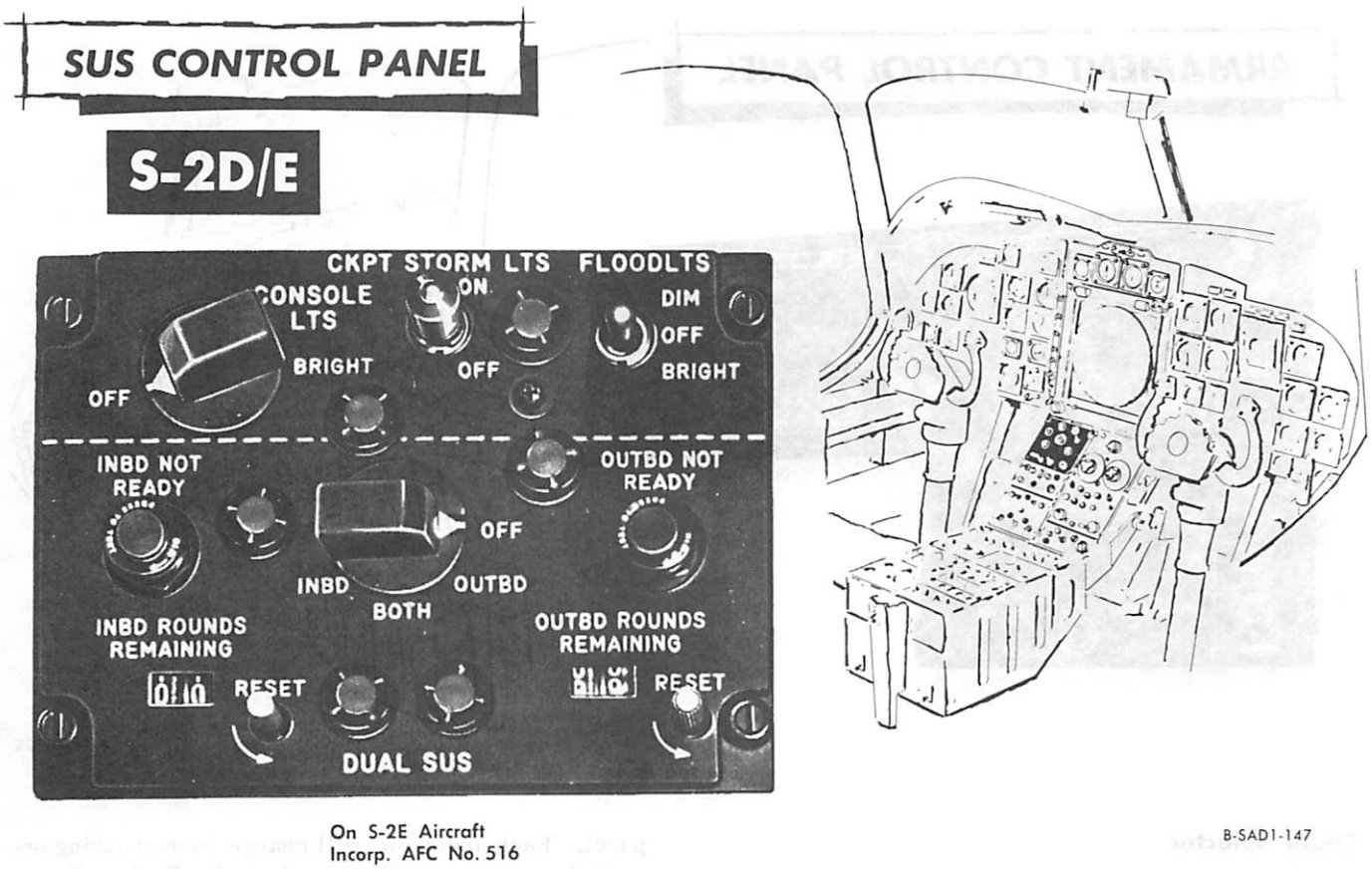


Figure 8-3

six wing mounted Aero 15 C/D type combination bomb rack and rocket launchers. Signals underwater sound, sonobuoys, and marine markers are also provided for on the aircraft. (Refer to Section IV for In-flight Procedures.)

TORPEDO BAY STORES INSTALLATION

For multiple stores installations, the torpedo bay can accommodate either single or dual stores.

NEW SUS DUAL DISPENSER (S-2D/E ONLY)

A dual SUS dispenser is located on the right hand side of the electronics compartment, slightly aft of the main distribution panel. The dispenser has a loading capacity of 27 signals, 13 in the outboard chute and 14 in the inboard chute. Storage for an additional 35 signals, used for in-flight reloading, is also provided. Eight signals are stored in a stowage box located on the center shelf in the center of the aircraft slightly aft of the dispenser. The remaining 27 signals are stored in the stowage unit on the floor aft of the dispenser. The dual dispenser is electrically controlled and hydraulically operated. The control panel for the dispenser is located on the pilot's diagonal console and is combined with the console lights control switches into one panel. (See figure 8-3.) Discharge of signals from the dispenser are controlled by the switches on the control panel and the pilot's and co-pilot's C pushbutton on the flight control wheels. Signals may be released from the inboard chute, the outboard chute or both. As a signal is released from the chute an indication of the remaining rounds appears on a counter on the control panel. If a signal is not ready for discharge a light will appear on the control panel warning the pilot of this condition.

Note

To ensure proper unloading of the SUS storage racks, open rack just enough to remove one SUS at a time.

WARNING

Ensure that the SUS storage doors are properly secured prior to landing.

SIGNALS UNDERWATER SOUND (SUS) CONTROL PANEL (S-2D/E ONLY) NEW

The DUAL SUS control panel (figure 8-3) is located on the pilot's diagonal console. The control panel consists of two press-to-test lights placarded INBD NOT READY and OUTBD NOT READY; two remaining rounds counters placarded INBD ROUNDS REMAINING and OUTBD ROUNDS REMAINING; two manually operated reset knobs placarded RESET; and a chute selector knob placarded INBD, BOTH, OUTBD and OFF.

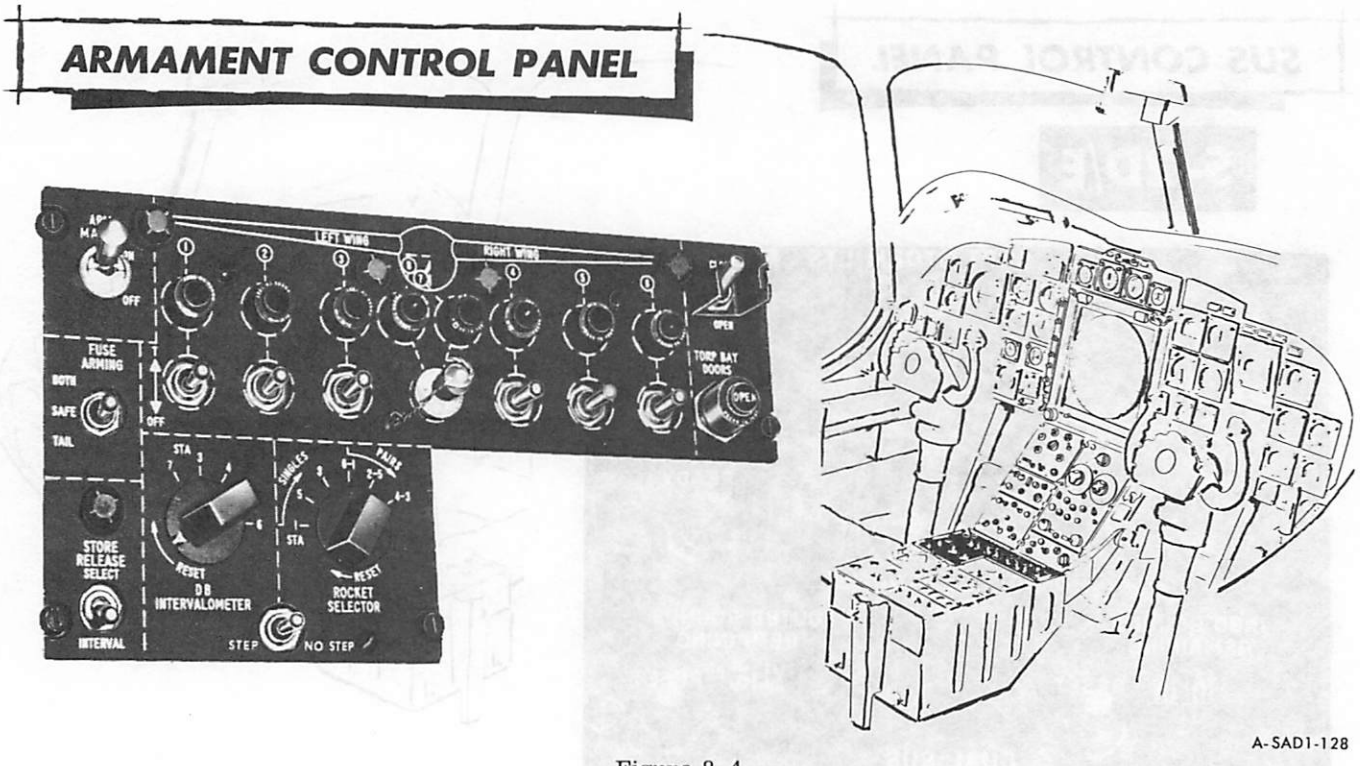


Figure 8-4

Chute Selector

The chute selector is located in the center of the control panel and is placarded INBD, BOTH, OUTBD and OFF. With the selector in the OUTBD position, a SUS will be released from the outboard chute each time the pilot or co-pilot depresses the C pushbutton on the flight control wheel. The same thing will occur with the inboard chute or both chutes when the selector is placed in INBD or BOTH position.

Reset Knobs

Two knobs placarded RESET are located on the lower portion of the control panel. One knob will reset the inboard counter and the other will reset the outboard counter to indicate the actual number of signals loaded in the respective chute.

SUS INDICATORS (S-2D/E)

Not Ready Lights

Two press-to-test lights, placarded INBD NOT READY and OUTBD NOT READY, are located on the left and right side of the control panel. The light will go on for a short duration (1-2 seconds) during release. The light will remain on if signal is not in proper position, system malfunction or if chute is empty. The light will extinguish when a SUS is in position and ready to be ejected.

Rounds Remaining Indicators

Two rounds remaining indicators, placarded INBD ROUNDS REMAINING and OUTBD ROUNDS REMAINING, are located on the lower portion of the control panel. Each indicator will change in decreasing sequence whenever an SUS is released. Each indicator can be reset to the actual number of signals loaded by turning the reset knob.

ARMAMENT CONTROL PANEL

The armament control panel (figure 8-4) located on the folding console contains the following controls and indicators used to monitor the aircraft armament system; an ARM MASTER switch, a TORPEDO BAY DOORS switch and indicator light, a DB INTERVALOMETER switch, a STORE RELEASE switch, a FUSE ARMING switch, a ROCKET SELECTOR switch, a STEP-NO STEP switch, seven store station selector switches and eight store status indicator lights.

Arm Master Switch

The various switches on the armament control panel (figure 8-4) are inoperative until the ARM MASTER switch is in ON position. During normal flight, placing the ARM MASTER switch in ON position enables stores to be released or rockets to be fired provided the circuit breakers behind the co-pilot are depressed. When the landing gear handle is placed in DOWN position the ARM MASTER switch is bypassed and stores cannot be normally released. The ARMAMENT SAFETY DISABLE switch, located in the nose wheel well, enables the armament bus to be energized for testing purposes when the aircraft is on the ground. When power is removed from the aircraft or the ARM MASTER switch is placed in the OFF position the armament safety disable circuit becomes de-energized.

Station Select Switches

Seven two-position toggle switches are used to select wing and torpedo bay stores for release. Six switches

are numbered 1 through 6 from left to right representing wing stations. The seventh is a lever-lock switch numbered 7 and 8, representing the two positions in the torpedo bay.

The switches are set aft to the off position and set forward to the "T" position. With the ARM MASTER switch in the ON position, setting a Station Select switch to the "T" position arms the "T" buttons on both pilots' yokes for release of the associated stores rack. Station Select switches are not required for firing rockets.

Stores Status Lights

Eight press-to-test Stores Status lights, forward of their corresponding Station Select switches, indicate the status of wing and torpedo bay stores when the ARM MASTER switch is ON and the associated Station Select switch is in the "T" position. When the light is ON it indicates the store is on the station, and the store rack is cocked. The lights are extinguished when the store is released or jettisoned.

Note

With the Aero 65A bomb rack (Single Stores Configuration), only the No. 7 stores status light will illuminate when torpedo bay station select switch is placed to T. The Aero 65A bomb rack and MK-8 bomb shackle must be installed in torpedo bay in order to have both the No. 7 and 8 stores status lights illuminated.

Torpedo Bay Doors Switch

Prior to dropping stores from the torpedo bay, the doors must be fully opened to actuate a limit switch and complete the release circuitry. The TORP BAY DOORS OPEN light will be on when the doors are fully open and will remain on until the doors are fully closed.

Fuse Arming Switch

The fuse arming switch can be set to TAIL, SAFE, or BOTH. Setting the switch to BOTH energizes the nose and tail arming solenoids in the torpedo bay bomb racks and in each wing station. Stores released in this condition will detonate. In the SAFE position the nose and tail arming solenoids are deenergized permitting release of all stores, except rockets in a safe or unarmed position.

CAUTION

Leave FUSE ARMING switch in the SAFE position unless ready to release stores.

Rocket Selector Switch

The rotary type rocket selector switch is a stepping switch that provides means of automatically firing rockets in a given sequence, either individually or in pairs. The individual rocket firing sequence is 1, 5, 3, 6, 2 and 4. When fired in pairs the firing order is position 6-1, 2-5, and 4-3.

STEP - NO STEP Switch

On aircraft incorporating AFC 437, the STEP-NO STEP switch is a two-position toggle switch which permits selection of automatic or manual operation of the rocket selector switch. When this switch is in STEP position, the rocket selector switch operates automatically. For multiple rocket pod loading, the switch will be in the NO STEP position, and the rocket selector switch will remain on the station selected and will require manual stepping to the next station.

DB Intervalometer Switch

The depth bomb intervalometer switch placarded DB INTERVALOMETER, is numbered STA 7, 3, 4, 1, and 6. These numbers represent their respective store stations. The switch is set at STA 7 position when carrying MK-54 depth bombs at store stations 1, 3, 4, and 6. With the STORE RELEASE switch in the INTERVAL position and the required store station switches in the T position, the stepping switch will be energized by pressing and holding either pilots' control wheel T buttons. The action of the delay circuit is advanced on each off pulse to release the remaining bombs at 0.2-second intervals.

Note

The DB INTERVALOMETER is not intended to provide for selection between bombs and torpedoes, but to function as an automatic stepping switch for timed sequence release of the MK-54 depth bomb.

Store Release Switch

The store release switch is a two-position toggle switch, placarded STORE RELEASE. The store release switch can be placed in either the SELECT or INTERVAL position. To release those stores selected by the store station switches, place the store release switch in the SELECT position and place the desired store station switches in the T position. Press T button, on either pilots' flight control wheel, to release the stores. In the INTERVAL position, with the DB INTERVALOMETER switch set at its required position, and the required store station switches placed in the T position, the depth bomb intervalometer delay circuit will be energized to release the first depth bomb upon pressing the T button. Subsequent releases will be spaced 0.2-second apart until the T button is released. The store station switches must be in their respective T positions to release depth bomb or torpedoes when the store release switch is in the INTERVAL or SELECT position.

Store Station Switches

Six two-position toggle switches and one lever-lock switch (No. 7 switch) placarded T-OFF, indicate their respective wing and torpedo bay store locations. These switches must be in their respective T positions to release depth bombs or torpedoes for single or multiple drops. There are eight red press-to-test store status indicator lights, six representing their respective wing positions, the other two lights represent the torpedo bay for carrying single or dual stores. The indicators lights will go on when their respective store station switches are set to T position. When the store is released at each store station, the respective store stations indicator light will go out.

DCU-77/A CONTROL PANEL



BuNo. 147531a through 147894k and 1487171 through 149256t

BuNo. 147895k, 149257t, and Subsequent

SAD1-157

Figure 8-5

DCU-77/A CONTROL PANEL

The DCU-77/A control panel (figure 8-5) is located on the pilot's folding console. The panel provides for the monitor and control of the MK 101 Mod 0 depth bomb and the MK-57 Special Store. For more detailed information on the DCU-77, refer to Supplemental Manual Special Stores, NAVAIR 01-85SAD-13.

AERO 65A SAFETY INTERLOCK CONTROL PANEL

NEW On S-2E/G aircraft BuNo. 153571, and subsequent, and S-2D/E/G aircraft with AFC No. 425 incorporated, the Aero 65A Safety Interlock Control Panel is located on the Number 3 operator's console (figure 8-6). This panel provides control of the operation of the In-Flight Operable Bomb Rack Lock (IFOBRL). The bomb rack lock is intended to prevent unintentional release of special weapons MK-57 or MK-101 and requires that two crewmembers agree that the release of these weapons is warranted. With STORE RELEASE switch at SELECT, the 7/8 store station switch at T position, the tropedo bay doors fully open (TORP BAY DOORS OPEN indicator lamp lit), and appropriate circuit breakers in, the release circuit is armed. If AERO 65 UNLOCK - OFF - LOCK switch is set to the LOCK position, the LOCK-ON lamp should light and the COCKED lamp will light, if all circuits are armed. Depressing the pilot's or co-pilot's T pushbutton will not release the weapons and lights will remain on. Positioning the UNLOCK-OFF-LOCK switch to UNLOCK the COCKED lamp remains on the LOCK lamp should go out, and the READY lamp should light 3 to 5 seconds later. Depressing either the pilot's or co-pilot's (T) pushbutton will release the weapons and the COCKED lamp should go out.

Note

If LOCK - ON lamp does not go out and the READY lamp does not light, placing the EMER UNLOCK switch to EMER UNLOCK position will mechanically disconnect the Aero 65A safety interlock by explosive squib. LOCK ON lamp should go out and the READY lamp should light.

ARMAMENT RELEASE BUTTONS

NEW NEW NEW Armament release buttons are contained in the inboard side of the pilot's and co-pilot's control wheel. The T pushbutton releases the internal and external stores. The R button, for rocket firing, is located on the pilot's control wheel only. On S-2D/E aircraft, the C pushbutton releases the SUS (on S-2G aircraft, the C pushbutton is inoperative).

RING AND BEAD TYPE ROCKET SIGHT

The ring and bead type sight consists of an orange-colored sighting pattern painted on the inside of the pilot's windshield and a bead mounted on the fuselage forward of the pilot's windshield.

EMERGENCY STORE RELEASE SYSTEM

A combined wing stores jettison system and torpedo bay stores emergency release system is provided. The emergency release system will always jettison wing stores in the SAFE or unarmed condition. Release of the torpedo bay stores is dependent upon the position of the FUSE ARMING switch and will be dropped in the unarmed condition only if the switch is in the SAFE position. Release of wing stores is

AERO 65A SAFETY INTERLOCK CONTROL PANEL

S-2E/G aircraft BU No. 153571 and subsequent, and S-2D/E aircraft with AFC No. 425 incorporated.

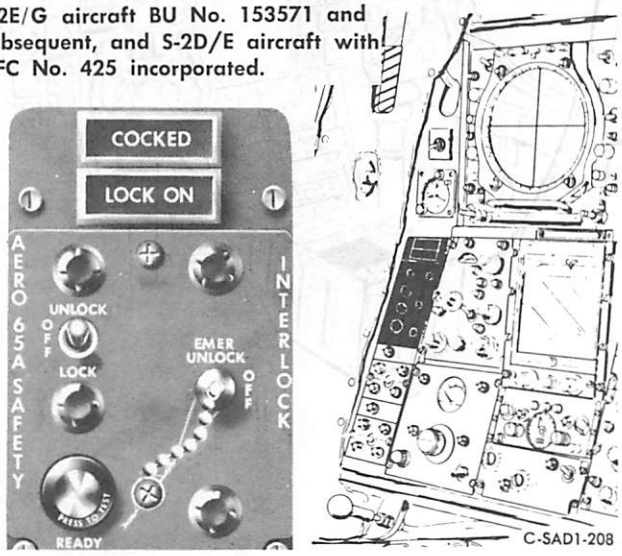


Figure 8-6

electrically accomplished with the same manual emergency release control used for emergency release of torpedo bay stores. If the torpedo bay doors are closed, the emergency release handle will only jettison wing mounted stores.

The jettison circuit is controlled by an air ground safety switch on the main landing gear shrink strut. The jettison circuit is operative until the weight of the aircraft on the wheels operates the air ground safety switch. The jettison circuit is ground tested by holding the JETTISON SAFETY OVERRIDE switch, located in the nose wheel well, in the ON position.

Note

The individual Aero 15C/D launcher must be armed with an appropriate primer and have electrical power available to jettison wing stores.

STORES JETTISON HANDLE

A stores JETTISON handle, placarded WING STORES AND MANUAL BOMB BAY, is next to the right hand forward corner of the pilot's diagonal console (figure 1-4). The handle is pulled to jettison wing and torpedo bay stores, and the ASW Camera Pod. It will not jettison SUS or Marine Markers, and is electrically disabled when the weight of the aircraft is on the landing gear. A mechanical interlock prevents torpedo bay stores from being released when the torpedo bay doors are not fully opened. On S-2E/G aircraft BuNo. 153571 and subsequent and S-2D/G aircraft incorporating AFC No. 425, the inflight operable bomb rack lock must be in the unlock position in order to jettison. In the event of lock mechanism malfunction, energize emergency unlock.

WARNING

When the weight of the aircraft is on the landing gear with the torpedo bay doors open, torpedo bay stores will be released if the stores JETTISON handle is pulled.

TORPEDO DEPTH CONTROL PANEL (S-2E AND S-2G WITH AFC 516 INCORPORATED)

The torpedo depth control panel (Figure 8-6A) is located on the pilot's folding console. It enables the pilot or co-pilot to preset several operating parameters into the MK 44/46 torpedos prior to their launch.

Note

Information covering switch/indicator operation will be furnished when available.

SONOBUOY RELEASE SYSTEM

The sonobuoy release system consists of switches, indicators, electrical circuits, and sonobuoy launchers. Sonobuoys may be released singly or in pairs, with a controllable timed sequence between the pair. The lower two sonobuoy launchers (number 15 and 16 in each nacelle) may also be used to carry MK-58 marine markers.

On Aircraft BuNo. 147531a through 147894k and 1487171 through 149256t, the sonobuoy release system consists of the pilots' control wheel T pushbutton, Sonobuoy Intervalometer, and Electronic Command Signals Programmer ASA-31. On Aircraft BuNo. 147895k, 149257t and subsequent, the sonobuoy release system consists of the pilots' control wheel "T" pushbutton, Sonobuoy Intervalometer and Sono Release Panel. (See figure 8-7).

SONOBUOY INTERVALOMETER

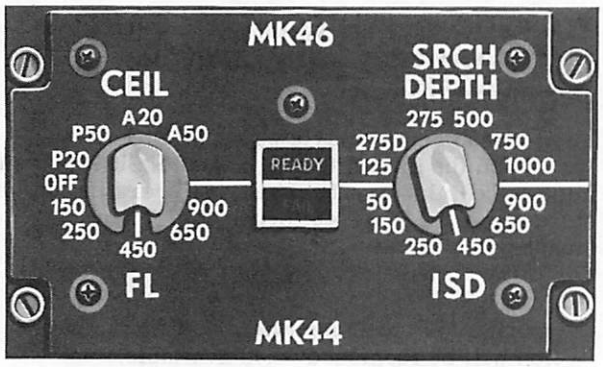
The switches located on the Sonobuoy Intervalometer panel (figure 8-7) on the pilots' folding console are the SINGLE-SPACED mode switch, GROUP switch, DISTANCE switch, DOPPLER-MANUAL mode switch and manual GROUND-SPEED knob and indicator.

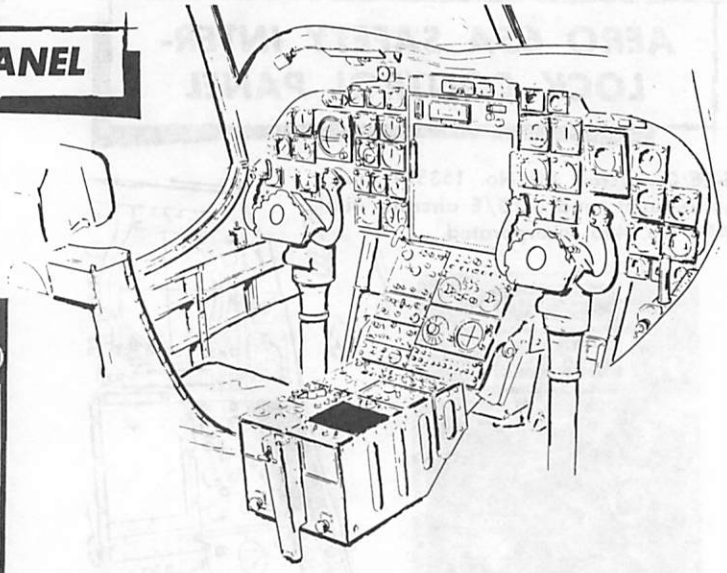
Single-Spaced Mode Switch

The SINGLE-SPACED mode switch is a two position toggle switch placarded SINGLE and SPACED. One sonobuoy will be released each time the pilots' "T"

TORPEDO DEPTH CONTROL PANEL

On S-2G and S-2E Aircraft
Incorp. AFC No. 516





SADI MAR-3

Figure 8-6A

pushbutton is depressed when the switch is in the SINGLE position. Two sonobuoys will be released in a timed sequence, each time the pilots' "T" push-button is depressed when the switch is in the SPACED position. The time sequence between a pair of sonobuoys is controlled by the DISTANCE switch and ground speed.

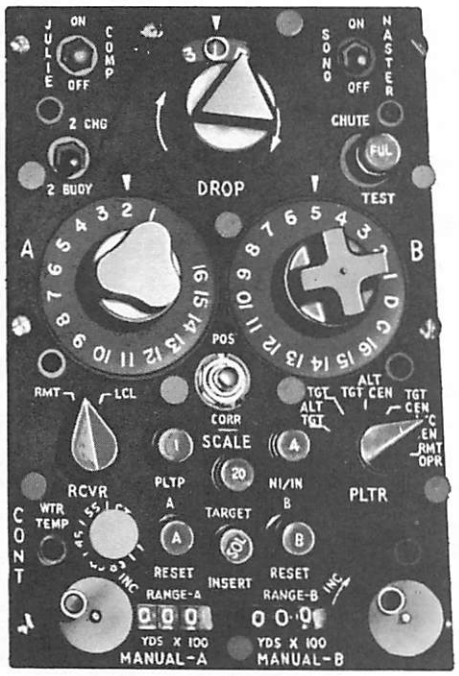
Group Switch

The GROUP switch is a two position toggle switch placarded GROUP I-GROUP II. This switch selects nacelle from which the sonobuoys will be released. With the switch in the GROUP I position sonobuoys will be released from the left nacelle. With the switch in the GROUP II position sonobuoys will be released from the right nacelle.

Distance Switch

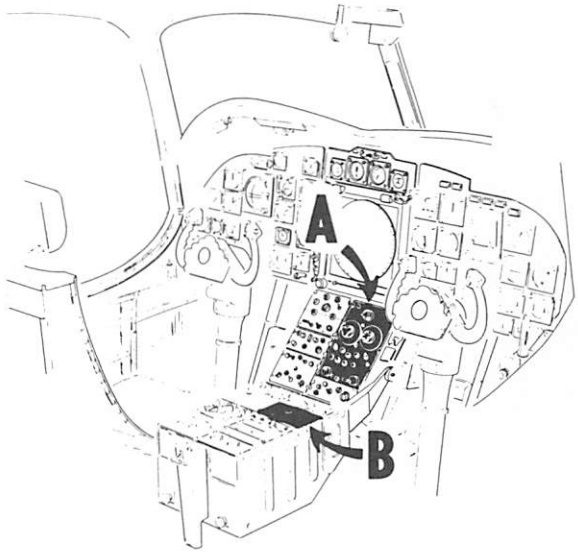
The DISTANCE switch is a three-position switch placarded D1, D2, and D3. The switch is used to manually select the value of time separation when dropping sonobuoys in pairs. Ground speed information from the Doppler Radar is utilized by the distance circuit to determine the proper time sequence.

SONOBUOY RELEASE SYSTEM

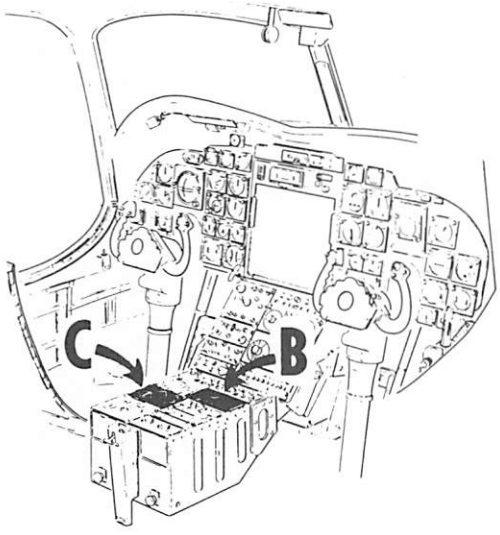


A

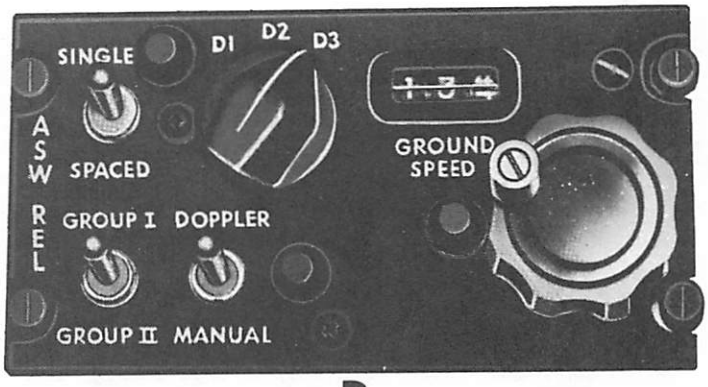
ELECTRONIC COMMAND SIGNALS PROGRAMMER ASA-31



S-2D



S-2E

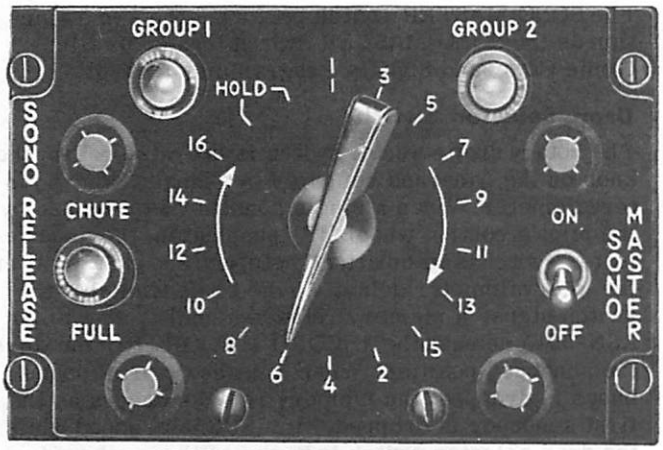


B

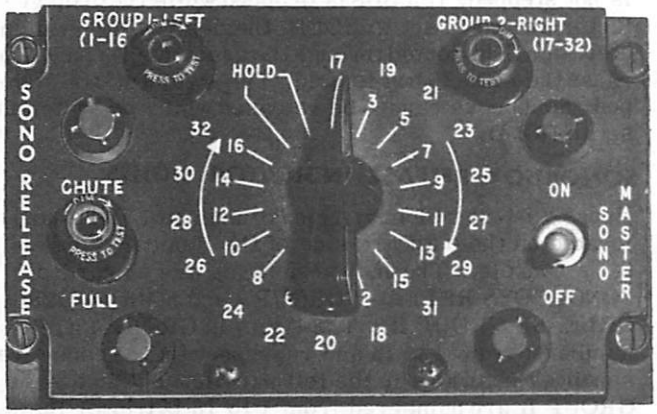
SONOBUOY INTERVALOMETER

B-SAD1-148-1

Figure 8-7 (Sheet 1)



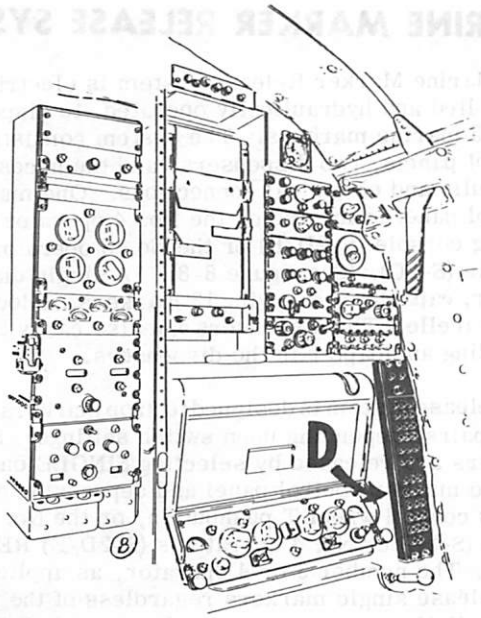
BU NO. 147531 THROUGH 152379
NOT INCORPORATING AFC NO. 440

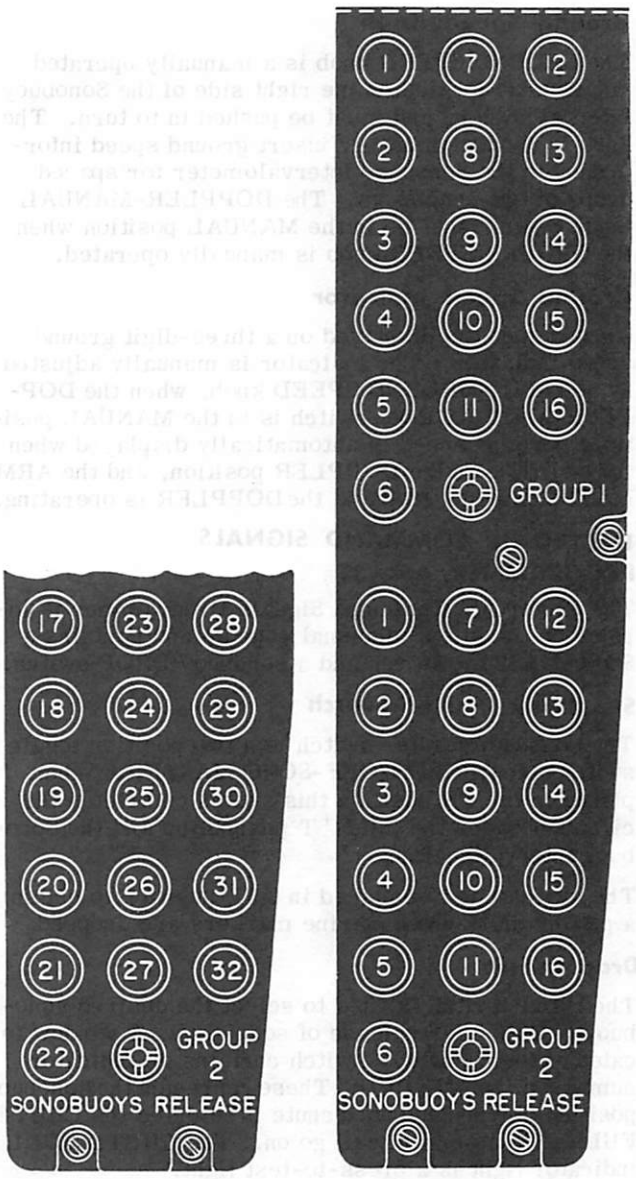


BU NO. 152798 AND SUBSEQUENT
AND AIRCRAFT INCORPORATING AFC NO. 440

C

SONO RELEASE PANEL





BU NO. 152798
AND SUBSEQUENT
ALL AIRCRAFT
INCORPORATING
AFC NO. 440

BU NO. 147531
THROUGH 152379
NOT INCORPORATING
AFC NO. 440

D

SONOBUOY RELEASE
INDICATOR LIGHTS

C-SAD1-148-2

Figure 8-7 (Sheet 2)

Doppler-Manual Mode Switch

The DOPPLER-MANUAL mode switch is a two position toggle switch placarded DOPPLER and MANUAL. When the switch is in the DOPPLER position ground speed information is electronically monitored. When the switch is in the MANUAL position ground speed information must be manually set in by use of the GROUND SPEED knob.

Ground Speed Knob

The GROUND SPEED knob is a manually operated rotary knob located on the right side of the Sonobuoy Intervalometer, and must be pushed in to turn. The knob is used to manually insert ground speed information to the Sonobuoy Intervalometer for spaced drops of two sonobuoys. The DOPPLER-MANUAL mode switch must be in the MANUAL position when the GROUND SPEED knob is manually operated.

Ground Speed Indicator

Ground speed is displayed on a three-digit ground speed indicator. The indicator is manually adjusted by use of the GROUND SPEED knob, when the DOPPLER-MANUAL mode switch is in the MANUAL position. Ground speed is automatically displayed when the switch is in the DOPPLER position, and the ARM MASTER switch is on and the DOPPLER is operating.

ELECTRONIC COMMAND SIGNALS PROGRAMMER ASA-31

The Electronic Command Signals Programmer is located on the pilots' diagonal console and contains a SONO MASTER switch and a sonobuoy DROP switch.

Sonobuoy Master Switch

The sonobuoy master switch is a two position toggle switch placarded ON-OFF-SONO MASTER. When placed in the ON position this switch completes the circuit between the pilots' T pushbutton and the Sonobuoy Intervalometer.

The switch must be placed in OFF position to obtain a plotter mark when marine markers are dropped.

Drop Switch

The DROP switch is used to select the desired sonobuoy launcher for release of sonobuoys. A window located above the DROP switch contains an indicator numbered from 1 to 16. These represent the sonobuoy positions. When a loaded chute is selected the CHUTE FULL indicator light will go on. The CHUTE FULL indicator light is a press-to-test light.

SONO RELEASE PANEL

The sono release panel (figure 8-7) is located in the pilots' folding console and is used, in conjunction with sonobuoy intervalometer TD-278/A and the pilot's control wheel "T" pushbutton, to control sonobuoy release from aircraft BUNO 149257t, and subsequent. The controls on the sono release panel are the SONO MASTER switch and the drop selector switch. When a loaded chute is selected, a CHUTE FULL indicator light on the Sono Release Panel will go on. A GROUP I or GROUP II indicator light will also go on to indicate the nacelle from which the sonobuoys will be released as determined by the GROUP switch on Sonobuoy Intervalometer TD-278/A.

Sono Master Switch

The SONO MASTER switch performs the same function as the SONO MASTER switch located on Electronic Command Signals Programmer ASA-31.

Drop Selector Switch

The rotary drop selector switch is operated both by the knob on the panel and remotely by signals from the intervalometer. When a single sonobuoy is released by the pilot's control wheel "T" pushbutton, the drop selector switch is automatically stepped one position after the intervalometer delay. At the same time that the switch steps, a memory release signal is sent to the ASN-30 to release the RECORD MEMORY bar and store the sonobuoy position. When a spaced pair of sonobuoys is dropped, the memory release occurs as the first sonobuoy is dropped. If a SUS is dropped while the drop selector switch is in one of the numbered positions, no signal is sent to the ASN-30 and the switch is not stepped. If a SUS is dropped while the drop selector switch is set to HOLD, the delayed intervalometer signal is routed through the sono release panel to cause the ASN-30 bug to hold. The switch is not stepped. Sonobuoys cannot be released while the switch is set to HOLD.

SONOBUOY RELEASE INDICATOR LIGHTS

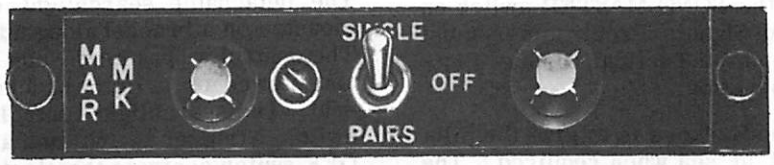
Press-to-test sonobuoy release indicator lights are located on the outboard side of the Number 4 operator's console. The indicator lights are placarded SONOBUOYS RELEASE GROUP I and SONOBUOYS RELEASE GROUP II. The lights in GROUP I are numbered from 1 to 16 and represent their respective sonobuoy positions in the left nacelle. The lights in GROUP II are numbered from 1 to 16 (Aircraft BuNo. 147531 through 152379) or 17 to 32 (Aircraft BuNo. 152789 and subsequent) and represent their respective position in the right nacelle. The lights are extinguished when the sonobuoy chutes are loaded and will go on when their respective sonobuoys are released.

MARINE MARKER RELEASE SYSTEM

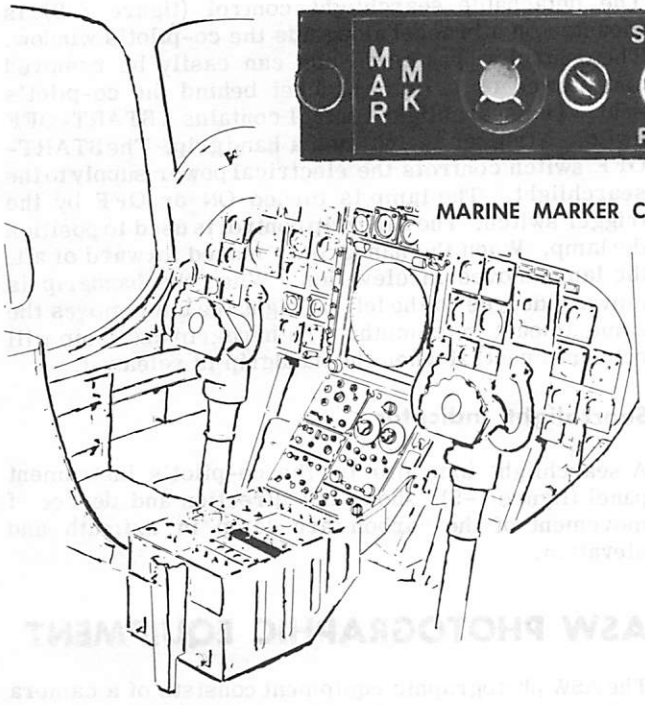
The Marine Marker Release System is electrically controlled and hydraulically operated, to dispense the MK-25 marine markers. The system consists of two control panels, two dispensers, and the necessary hydraulic and electrical connections. One marker control panel is located on the No. 4 operator's folding console (S-2D/E) or the No. 3 operator's console (S-2G). (See figure 8-8). A single dispenser, capable of carrying 13 markers, is located in each nacelle. The dispensers can also carry SUS by installing an adapter in the dispensers. NEW

The release system is designed to drop markers singly or in pairs, depending upon switch settings. Single markers are released by selecting SINGLE on pilot's marine marker control panel and depressing either pilot's control wheel T pushbutton, or the No. 3 operator's (S-2G) or No. 4 operator's (S-2D/E) RELEASE button. The number 3 or 4 operator, as applicable, can release single markers regardless of the position of the pilot's marine marker selector switch provided the master arm switch is ON. Pairs of markers can be released only from the pilots' position. Sonobuoys, NEW

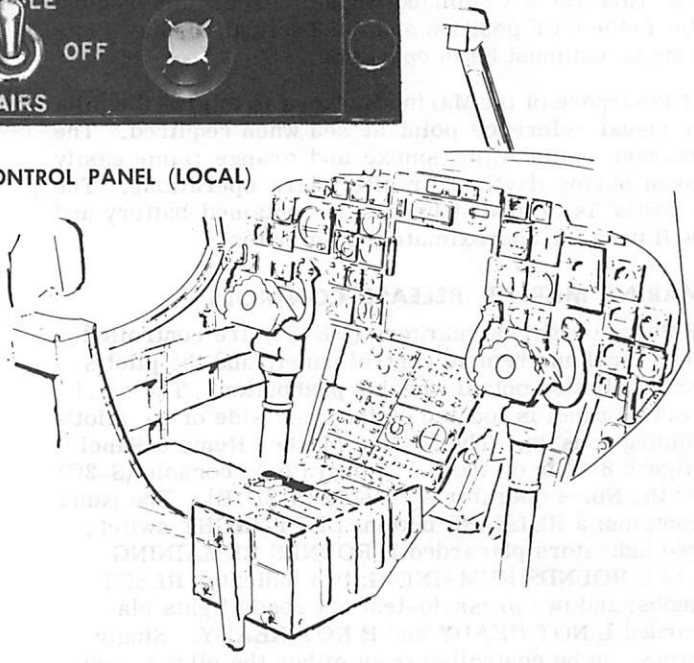
MARINE MARKER RELEASE SYSTEM



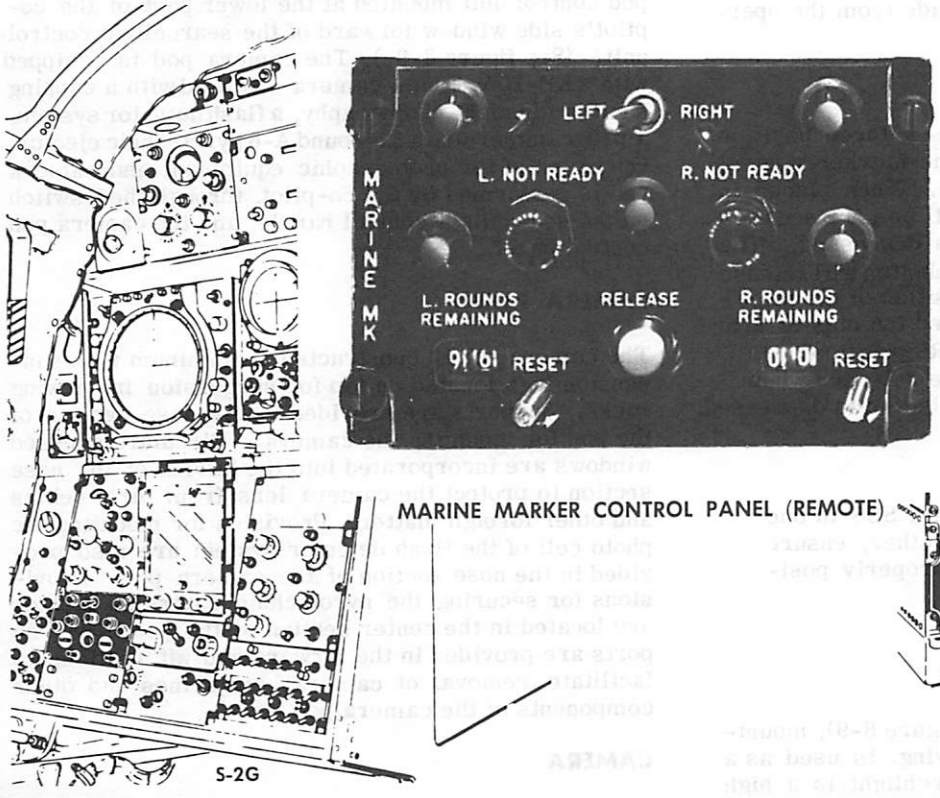
MARINE MARKER CONTROL PANEL (LOCAL)



BU NO. 147531*a* THROUGH 147894*k*
AND 148717*l* THROUGH 149256*t*



BU NO. 147895*k*, 149257*t*, AND SUBSEQUENT



MARINE MARKER CONTROL PANEL (REMOTE)

Figure 8-8

weapons, and markers may be released simultaneously or any combination thereof depending upon the selection made by the pilot. When marine markers are dropped, a ballistically corrected signal is plotted by the Tactical Display Plotting Board. When sonobuoys and markers are released simultaneously the plotting board will plot only the sonobuoy release. To receive a marker plot the SONO MASTER switch on the Electronic Command Signals Programmer must be in the OFF position and the Tactical Display Plotting Board must be in operation.

The purpose of the Marine Markers is to give the pilot a visual reference point at sea when required. The marker emits white smoke and orange flame easily seen during daytime or after dark operations. The marker is activated by a self contained battery and will burn for approximately 15 minutes.

MARINE MARKER RELEASE CONTROLS

NEW NEW NEW NEW NEW

Release of marine markers (MK-25) are controlled by a local and remote control panel, and the pilot's or co-pilot's control wheel T pushbutton. The local control panel is located on the right side of the pilot's folding console. The Marine Marker Remote Panel (figure 8-8) in on the No. 3 operator's console (S-2G) or the No. 4 operator's console (S-2D/E). The panel contains: a RELEASE button; LEFT-RIGHT switch; two indicators placarded L ROUNDS REMAINING and R ROUNDS REMAINING; two indicator RESET knobs; and two press-to-test not ready lights placarded L NOT READY and R NOT READY. Single drops can be controlled from either the pilot's position or the operator's position. Drops in pairs can be selected only from the pilot's position. Selection of LEFT or RIGHT dispenser is made from the operator's position.

Single-Off-Pairs Switch

NEW

The SINGLE-OFF-PAIRS switch is a three position toggle switch located on the Marine Marker control panel on the pilots' folding console. When placed in the SINGLE position one marker will be released each time either pilots' T pushbutton is depressed. The Number 4 Operator's RELEASE pushbutton will release a single store regardless of the position of the pilot's SINGLE-PAIRS-OFF switch provided the master arm switch is ON. When placed in PAIRS position one marker from each dispenser will be released when either pilot's or co-pilot's release button is depressed.

Note

When the dispenser is loaded with SUS in one nacelle and smoke lights in the other, ensure LEFT-RIGHT switch has been properly positioned.

SEARCHLIGHT

A remotely controlled searchlight (figure 8-9), mounted on the leading edge of the right wing, is used as a target identifying device. The searchlight is a high intensity carbon arc lamp having a minimum rating of 70 million candlepower. The carbon arc lamp, located within the searchlight housing, can be remotely positioned 55 degrees in azimuth (27.5 degrees either side of center) and 50 degrees in elevation (45 degrees below center and 5 degrees above center).

SEARCHLIGHT CONTROL

The detachable searchlight control (figure 8-9) is mounted on a bracket alongside the co-pilot's window. The control when not in use can easily be removed and stowed on a floor bracket behind the co-pilot's seat. The searchlight control contains a START-OFF switch, a trigger switch, and a handgrip. The START-OFF switch controls the electrical power supply to the searchlight. The lamp is turned ON or OFF by the trigger switch. The handgrip control is used to position the lamp. When the handgrip is moved forward or aft, the lamp moves in elevation. When the handgrip is moved 1 degree to the left or right the lamp moves the same amount in azimuth. The handgrip and lamp will return to neutral when the handgrip is released.

Searchlight Indicator

A searchlight indicator on the co-pilot's instrument panel (figure 1-5), shows the direction and degree of movement of the carbon arc lamp in azimuth and elevation.

ASW PHOTOGRAPHIC EQUIPMENT

The ASW photographic equipment consists of a camera pod mounted on the right outboard AERO 15C combination bomb rack and rocket launcher, and a camera pod control unit mounted at the lower part of the co-pilot's side window forward of the searchlight control unit. (See figure 8-9.) The camera pod is equipped with a KB-10A, 70mm camera modified with a capping shutter for night photography, a flash detector system, a programmer and a 52-round A-6 pyrotechnic ejector. Operation of the photographic equipment and camera pod is performed by the co-pilot, through the B switch on the searchlight control handle, and the camera pod control panel.

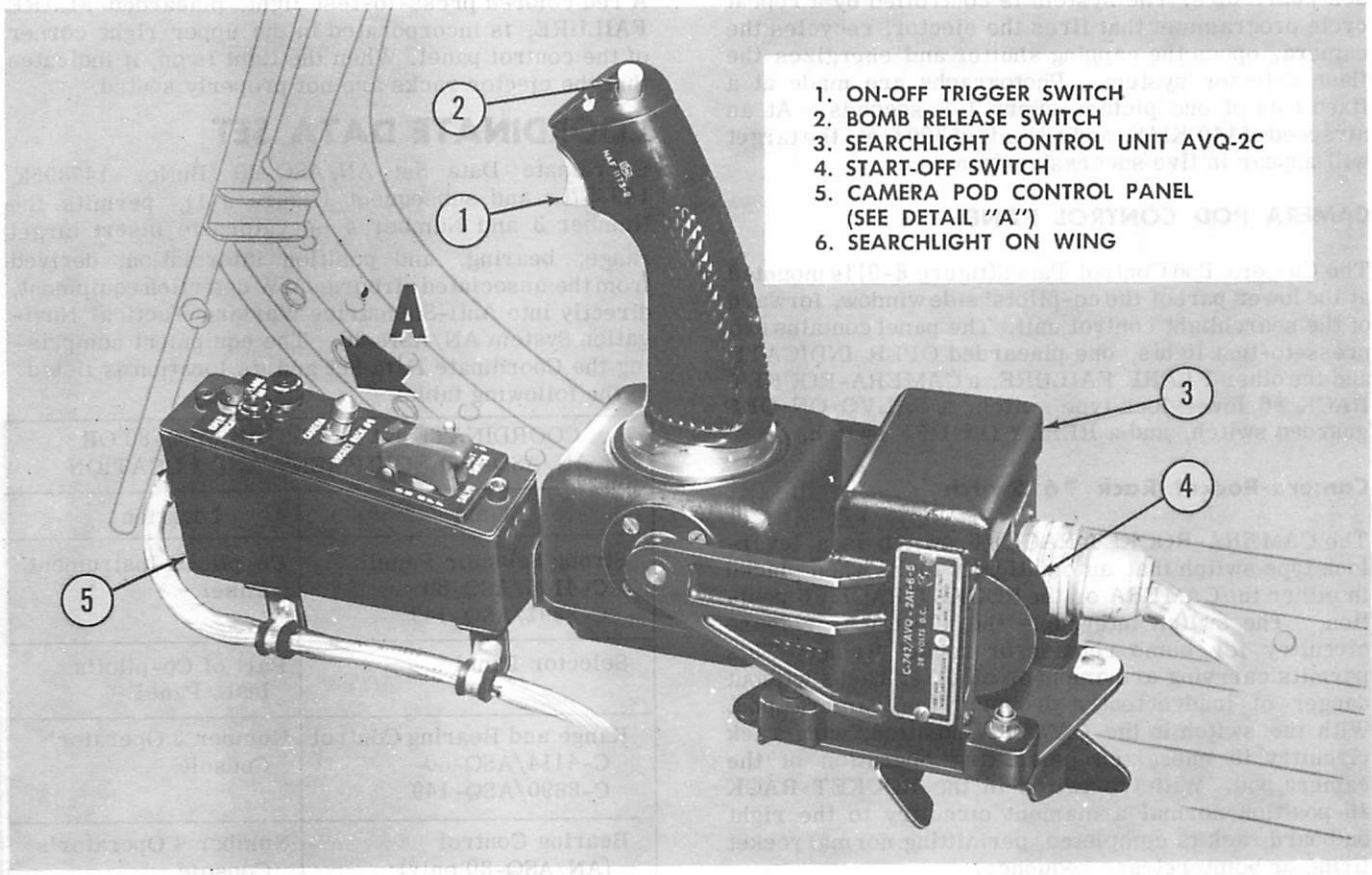
CAMERA POD

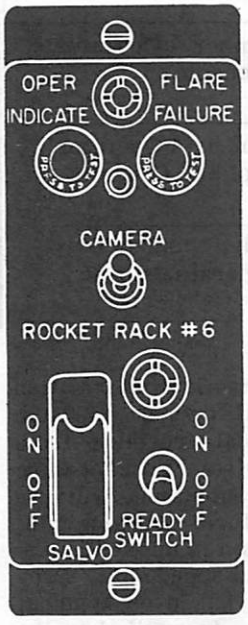
The camera pod is constructed of aluminum with suspension lugs located on top for suspension from wing racks. Supports are provided in the nose section of the pod for mounting the camera. Circular recessed windows are incorporated into the fairing of the nose section to protect the camera lens from dirt, debris and other foreign matter. Provision for mounting the photo cell of the flash detector system are also provided in the nose section of the camera pod. Provisions for securing the pyrotechnic cartridge ejector are located in the center section of the pod. Access ports are provided in the forward and aft sections to facilitate removal of camera, magazines and other components of the camera pod.

CAMERA

The camera is equipped with a 3 inch, f2.8 lens having an angle of view of 41°6' at an altitude of 300 feet, a

SEARCHLIGHT AND CAMERA POD CONTROLS





DETAIL A

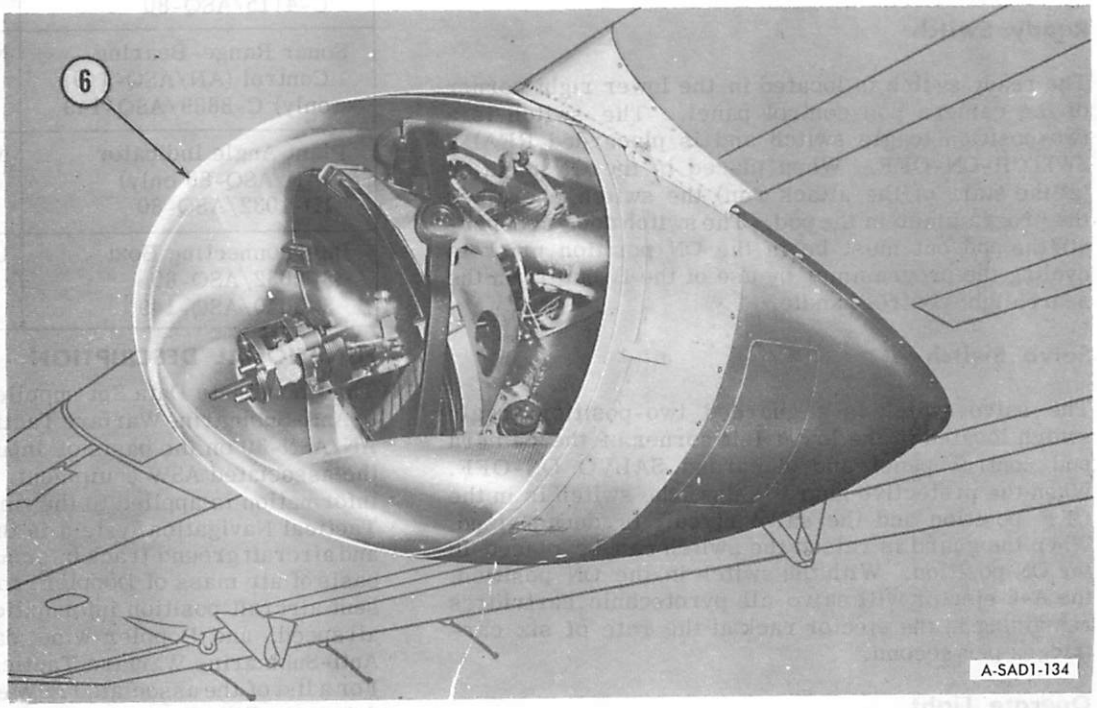


Figure 8-9

field of view measuring 1555 feet on the flight line, 291 feet across the flight line at the near edge and 1370 feet across the flight line at the far edge. Illumination for night photography is provided by a one second fuse delay cartridge. The system is controlled by a repeat cycle programmer that fires the ejector, recycles the camera, opens the capping shutter and energizes the flash detector system. Photographs are made at a fixed rate of one picture every 1.2 seconds. At an airspeed of 140 KIAS, and altitude of 300 feet, the target will appear in five successive frames.

CAMERA POD CONTROL PANEL

The Camera Pod Control Panel (figure 8-9) is mounted at the lower part of the co-pilots' side window, forward of the searchlight control unit. The panel contains two press-to-test lights, one placarded OPER INDICATE and the other FLARE FAILURE, a CAMERA-ROCKET RACK #6 lever-lock type switch, a SALVO ON-OFF guarded switch, and a READY ON-OFF switch.

Camera-Rocket Rack #6 Switch

The CAMERA-ROCKET RACK #6 switch is a lever-lock type switch that automatically locks when placed in either the CAMERA or the ROCKET RACK #6 position. The switch interrupts the electrical release circuitry for bomb release or rocket firing. This permits carrying armament on all other racks without danger of inadvertently dropping the camera pod. With the switch in the CAMERA position, wing rack circuitry is energized permitting operation of the camera pod. With the switch in the ROCKET RACK #6 position normal armament circuitry to the right outboard rack is completed, permitting normal rocket firing or bomb release sequence.

Ready Switch

The ready switch is located in the lower right corner of the camera pod control panel. The switch is a two-position toggle switch and is placarded READY SWITCH-ON-OFF. When placed in the ON position (at the start of the attack run) the switch energizes the programmer in the pod. The switch does not operate the pod but must be in the ON position prior to cycling the programmer by use of the B button on the searchlight control handle.

Salvo Switch

The salvo switch is a guarded two-position toggle switch located in the lower left corner of the camera pod control panel and placarded SALVO ON-OFF. When the protective guard is down the switch is in the OFF position and the salvo circuit is deenergized. When the guard is raised the switch can be placed in the ON position. With the switch in the ON position, the A-6 ejector will salvo all pyrotechnic cartridges remaining in the ejector rack at the rate of six cartridges per second.

Operate Light

An amber colored press-to-test light, placarded OPER INDICATE, is incorporated in the upper left corner of the control panel. When the light is on, it indicates that the photographic system is operating correctly.

Flare Failure Light

A red colored press-to-test light, placarded FLARE FAILURE, is incorporated in the upper right corner of the control panel. When the light is on, it indicates that the ejector racks are not properly seated.

COORDINATE DATA SET

Coordinate Data Set AN/ASQ-80 (BuNo. 147895k, 149257t, and subsequent (figure 9-1), permits the Number 3 and Number 4 operators to insert target range, bearing, and position information, derived from the associated airborne ASW detection equipment, directly into Anti-Submarine Warfare Tactical Navigation System AN/ASN-30. The equipment comprising the Coordinate Data Set and its location is listed in the following table.

COORDINATE DATA SET AN/ASQ-80 OR AN/ASQ-149 EQUIPMENT AND LOCATION	
Name	Location
Strobe Selector Panel: C-4116/ASQ-80 C-8891/ASQ-149	Co-pilot's Instrument Panel
Selector Panel	Part of Co-pilot's Inst. Panel
Range and Bearing Control C-4114/ASQ-80 C-8890/ASQ-149	Number 3 Operator's Console
Bearing Control (AN/ASQ-80 only) C-4115/ASQ-80	Number 4 Operator's Console
Sonar Range-Bearing Control (AN/ASQ-149 only) C-8889/ASQ-149	Number 4 Operator's Console
Plant Angle Indicator (AN/ASQ-80 only) ID-1032/ASQ-80	Number 4 Operator's Folding Console
Interconnecting Box: J-2032/ASQ-80 J-3040/ASQ-149	Under Number 4 Operator's Seat

NEW NEW NEW NEW NEW NEW NEW NEW NEW

FUNCTIONAL DESCRIPTION

The Coordinate Data Set supplies tactical information to Anti-Submarine Warfare Tactical Navigation System AN/ASN-30 on the basis of input data received from the associated ASW equipment. Distance and bearing information is applied to the Anti-Submarine Warfare Tactical Navigation System in the form of analog data, and aircraft ground track information is applied on the basis of air mass of Doppler ground speed data. Present aircraft position information, based on heading, airspeed, and Doppler wind data, is applied to the Anti-Submarine Warfare Tactical Navigation System. For a list of the associated ASW equipment that supplies data to the Coordinate Data Set, refer to the Associated ASW Equipment, Location and Use table in the Supplemental NATOPS Flight Manual NAVAIR 01-85SAD-1A, Section IX.

COORDINATE DATA SET IN-FLIGHT OPERATION

Operation of the Coordinate Data Set, AN/ASQ-80 includes the following functions: MAD, ASR (MAN, OFF or AUTO), SEARCH RADAR, ECM, JEZEBEL, and JULIE. Coordinate Data Set, AN/ASQ-149, has the following functions: MAD, SEARCH RADAR, ECM, and DIFAR/CASS. A reject function is also included which permits the co-pilot to reject unwanted data transmitted by the Number 3 and Number 4 operators. Refer to Section IX, Flight Crew Coordination for further information on the Coordinate Data Set and for the complete Coordinate Data Set in-flight operation.

AGM-12B BULLPUP MISSILE SYSTEM

The AGM-12B Missile System incorporated into designated S-2E aircraft provides an up-to-date, stand-off, ASW and conventional attack weapon. The missile is remotely controlled through the use of a proportional control unit operated by the co-pilot. In aircraft equipped with Bullpup, the proportional control stick and the missile control panel replaces the searchlight control and the camera pod control panel. They can be interchanged in about 45 minutes by one man. The system incorporates a reinforced wing and modified wing racks, strengthened by bracing firing stations 1 and 6 from stations 2 and 5. This removes bomb racks 2 and 5 from service. An Aero 5A-1 launcher is fitted to the Aero 15D bomb and rocket rack and the missile control panel; and the proportional control (figure 8-10) completes the assembly. The missile armament circuit breaker panel is located below the co-pilots armament circuit breaker panel.

BULLPUP CONTROL PANEL

Power Switch

The power switch, placarded OFF, READY, is a two-position toggle switch used with the Fuze Function Control Set. In the OFF position input power is disconnected from all circuits. In the READY position, primary power is supplied to all circuits provided weight is off the wheels. The HV indicator lights to indicate system readiness.

Fuze Option Selector Switch

This five-position rotary switch, placarded OFF, E, F, G, H, is used to select the options for charging preset DC fuzes. The OFF position removes the DC voltage from the fuzes.

Launcher Selector Switch

This two position toggle switch, placarded PORT-STRBD is used to select the port or starboard missile launcher. Safe is selected with the switch in the center position.

Weapon Arming Switch

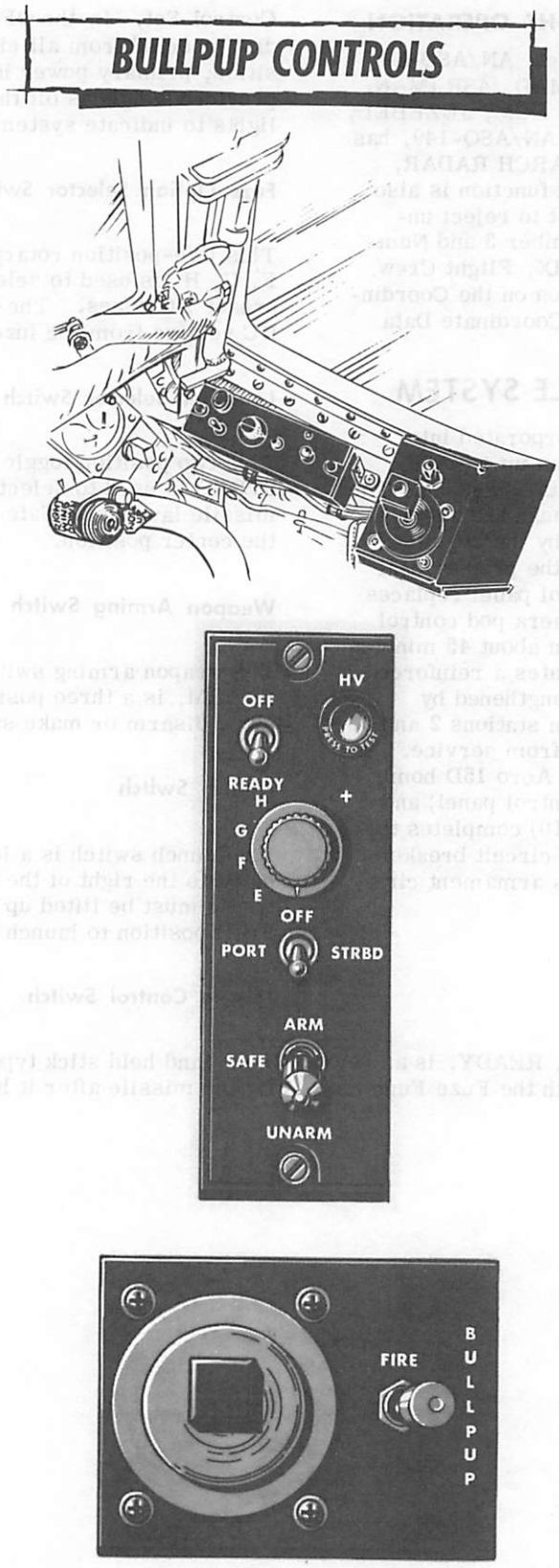
The weapon arming switch, placarded ARM, SAFE, UNARM, is a three position toggle switch used to arm, disarm or make safe the bullpup missile.

Launch Switch

The launch switch is a lever lock toggle switch, located to the right of the missile control switch. The toggle must be lifted up and pushed forward to the FIRE position to launch the missile.

Missile Control Switch

This hand held stick type control is used to guide or fly the missile after it has been launched.



S-2E AIRCRAFT INCORPORATING AFC NO. 491

SAD1-230

Figure 8-10

section IX

FLIGHT CREW COORDINATION



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*See Supplemental NATOPS Flight Manual NAVAIR 01-85SAD-1A

WARNING

Information contained in this section does NOT constitute authorization to carry or release any internal or external stores. For stores authorization and applicable limitations see Figure 1-75 in Section I, Part 4 of this manual.

SCOPE

This section establishes the general procedures for properly manning the aircraft, energizing, operating and deenergizing equipment in the S-2D/E/G. They shall be the standards for the Number 3 and Number 4 Operators and apply to both shore and carrier based operations. NEW

BRIEFING

PERSONAL FLYING EQUIPMENT

Flight crewmembers shall report when directed to the assigned briefing room in flight gear. Those items normally donned just prior to manning aircraft shall not be required to be worn during the briefing, but

should be readily available for immediate use. Personal flying equipment requirements are set forth in Section II.

BRIEFING PROCEDURE

All flight crewmembers shall attend scheduled preflight briefings in order to: verify aircraft assignments; collect the various extra equipment and spares required; check the personal flying equipment requirements; obtain the most current intelligence available; and to receive a briefing on the specific procedures anticipated for the mission. See Section III for the Briefing outline.

PRE-FLIGHT

AIRCRAFT ASSIGNMENT AND CUSTODY

The crewmembers shall be immediately available to the Pilot in Command to assist in the review and completion of the Yellow Sheet as outlined in Section III, Part One of this manual. They should make specific inquiry as to the status of all the installed ASW equipment.

PRE-FLIGHT INSPECTION

The senior qualified crewmember shall insure that the following preflight inspections are completed, as briefed by the Pilot in Command.

Exterior

Conduct as outlined in Section III.

In addition to the preceding checks, perform the following:

1. Check sono chutes and record buoys loaded; and sono antennas and insulators for cleanliness and security.
2. Check marine marker dispenser for loading.
3. Check torpedo bay for type and numbers of stores.
4. Check ASR-3 water level and circuit breakers ON (S-2D/E without AFC 517 incorp.). NEW
5. Check nose section clear of tools and foreign objects. Close nose section and check secured.
6. Check Doppler antenna for cleanliness.

Interior

1. Check parachutes - one for each crewmember.
2. On S-2D/E, check SUS dispenser for load, and stowage of spare SUS. NEW
3. Check all equipment for installation, proper security and circuit breakers ON.
4. Check for additional MAD, JULIE, JEZEBEL or DIFAR recorder paper and Plotter Film. NEW
5. Check and load tape recorder as required. NEW
6. MAD amplifier S-1602 switch in NORMAL position.
7. Check to ensure all equipment OFF.

PRE-TAXI

The crewmember will man aircraft upon completion of the pre-flight inspection and prepare for the taxi and take-off phase as follows:

1. Secure all loose gear such as navigation kits, camera, etc.
2. Adjust parachute for proper fit.
3. Fasten lap belt and shoulder harness.
4. Check indication of radome UP and MAD boom IN and switch in corresponding position.
5. MCJR antenna UP and switch in corresponding position.
6. Don helmet and make ICS check.
7. Make AC generator checks.
8. Energize equipment as directed by pilot.

WARNING

Do not energize AN/AQA-3/-4/or -7(V) in the presence of combustible fumes. NEW

9. MAD Power - ON.
   FUNCTION - HTR REG.
10. Report ready to taxi when challenged. Example: "Number 4, Ready for taxi".

PRE-TAKE-OFF

1. Check for loose gear and stow.
2. Check landing gear dump valve - DEPRESSED.
3. Check hatches closed and locked, radome UP and MAD boom IN.
4. AQH-4(V) - POWER STANDBY (S-2D/E). NEW
5. AQH-7(V) POWER switch (on recorder) - ON. (S-2G). NEW

WARNING

Do not turn on AQH-7(V) RECORD switch until after fume check is complete. NEW

6. Lock shoulder harness. NEW
7. Report ready for take-off when challenged. Example: "Number 3, Ready". NEW

POST-TAKE-OFF

WARNING

- Do not place AQA-4(V) to ON position until after fumes check is complete.
- Do not place AQA-7(V) RECORD switch ON until after fume check is complete. NEW

1. Check for landing gear retracted, fuel fumes, and both nacelles for leaks and security.
2. Number 3 Operator request permission to lower radome and to extend MAD boom. Example: "Pilot, Number 3, Request permission to lower radome and extend MAD boom". When granted permission and upon extension of boom and lowering of radome give the following information to the pilot:
   a. "Boom going out, Radome going down".
   b. "Boom indicates out, radome indicates down, time of both in__ seconds."
3. Report equipment operating normally or abnormally by the use of brevity code as soon as possible.

Note

- If at any time during flight, the Number 3 Operator senses any indication of an impending emergency situation, he should automatically retract the radome and MAD boom regardless of Indicated Airspeed.
- Inhalation of ozone fumes generated by operation of JEZEBEL recorder can cause a degradation of aircrew effectiveness in performing the tactical mission. It is advisable to periodically vent the aircraft utilizing procedures outlined in Section V, Smoke and Fumes Removal paragraph.

COORDINATE DATA SET AN/ASQ-80 OR AN/ASQ-149

IN-FLIGHT OPERATION

Operation of the Coordinate Data Set AN/ASQ-80 includes the following functions: MAD, ASR (MAN, OFF or AUTO), SEARCH RADAR, ECM, JEZEBEL, and JULIE. Coordinate Data Set, AN/ASQ-149 has the functions: MAD, SEARCH RADAR, ECM and DIFAR/CASS. A reject function is also included which permits the co-pilot to reject unwanted data transmitted by the Number 3 and Number 4 operators. To insure that each function is operating properly, the following in-flight check must be performed by the flight crew.

MAD Function

Check MAD function as follows:

NUMBER 3 OPERATOR

1. Upon obtaining MAD contact, depress DATA XMIT-MAD pushbutton light on Range and Bearing Control. Observe that DATA XMIT-MAD pushbutton light goes on.

CO-PILOT

2. Observe that MAD pushbutton light on selector panel goes on.
3. Observe that movement of bug on Display Unit PT-457/ASN-30 stops and that BUG HOLD pushbar light on Control-Indicator C-3823/ASN-30 starts flashing.
4. Mark bug position on Display Unit with grease pencil.
5. Depress REL pushbar on Control-Indicator. Observe that bug returns to present aircraft position.
6. Depress MAD pushbutton light on selector panel. Observe that MAD pushbutton light goes out.

NUMBER 3 OPERATOR

7. Observe that DATA XMIT-MAD pushbutton light on Range and Bearing Control goes out.

ASR Function—Manual Operation (AN/ASQ-80)

Check manual ASR function as follows:

NUMBER 3 OPERATOR

1. Set ASR-AUTO-MAN switch on Range and Bearing Control to MAN.

NUMBER 3 OPERATOR AND CO-PILOT

2. Upon identification of target, perform procedures described in steps 2 through 7 of MAD function paragraph, except that Number 3 operator depresses DATA XMIT-ASR pushbutton light and co-pilot depresses ASR pushbutton light.

ASR Function—Automatic Operation (AN/ASQ-80)

Check automatic ASR function as follows:

NUMBER 3 OPERATOR

1. Set ASR-AUTO-MAN switch on Range and Bearing Control to AUTO.

Note

Upon acquisition of target, ASR system automatically initiates ASR function, eliminating necessity for Number 3 operator to depress DATA XMIT-ASR pushbutton.

NUMBER 3 OPERATOR AND CO-PILOT

2. Perform procedures described in steps 2 through 7 of MAD Function paragraph, except that Number 3 operator depresses DATA XMIT-ASR pushbutton light and co-pilot depresses ASR pushbutton light.

Note

In MAD or ASR operation, co-pilot can extinguish MAD or ASR pushbutton light by depressing either MAD or ASR pushbutton light on selector panel. All MAD and ASR lights are maintained on common holding relay in Interconnecting Box J-2032/ASQ-80.

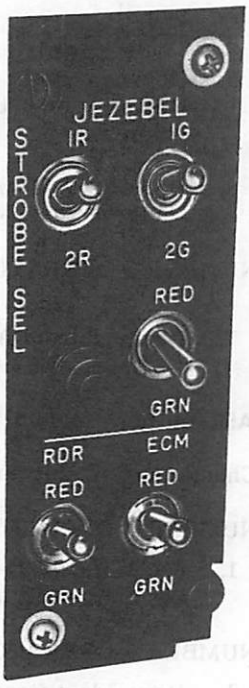
COORDINATE DATA SET AN/ASQ-80

LOCATION OF CONTROLS

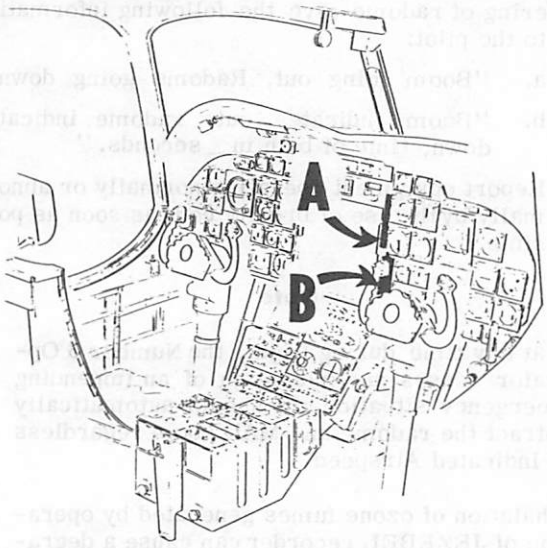
S-2D/E

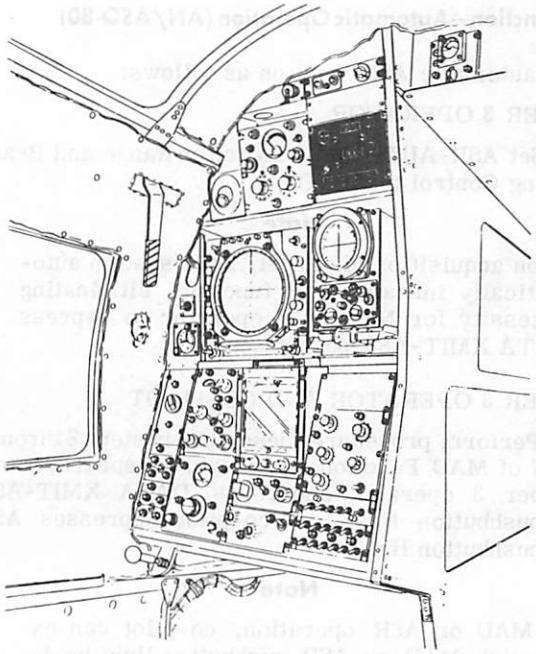


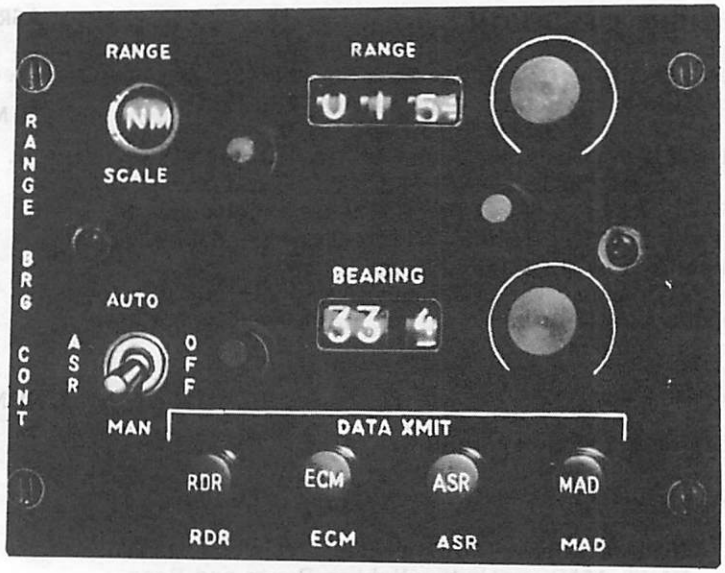
A
SELECTOR PANEL



B
STROBE SELECTOR CONTROL ASQ-80



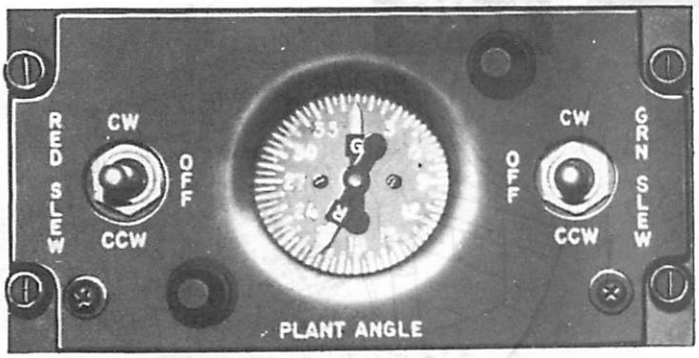




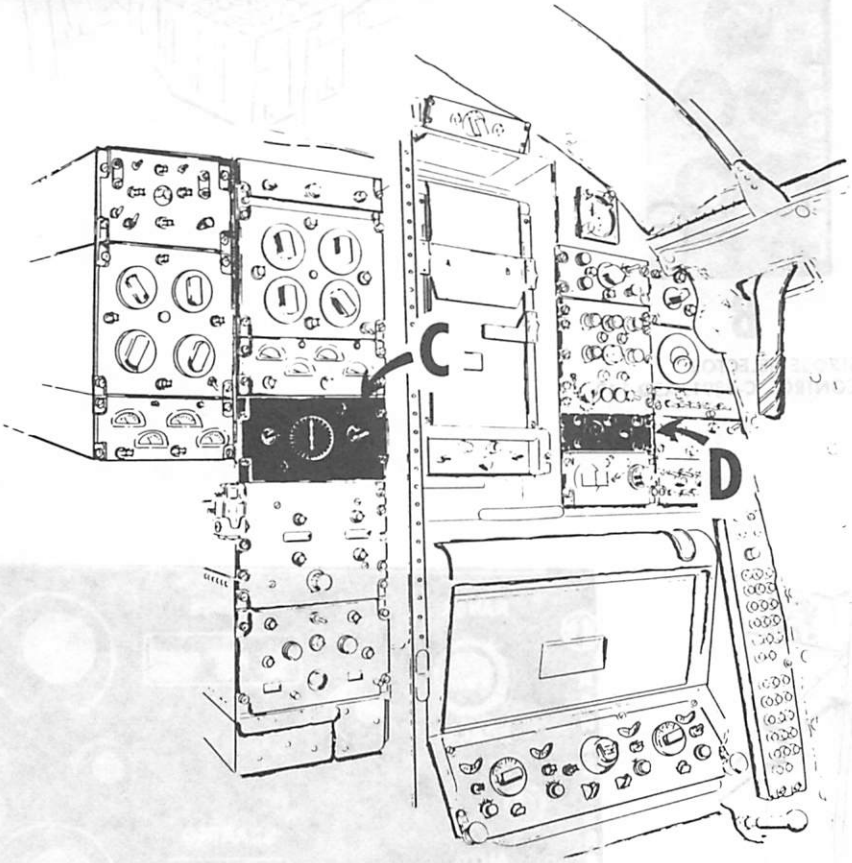
RANGE AND BEARING CONTROL ASQ-80

A-SAD1-111-1

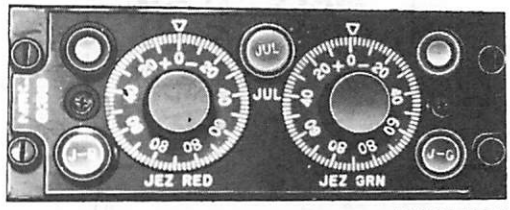
Figure 9-1 (Sheet 1)



C PLANT ANGLE INDICATOR ASQ-80



BEARING CONTROL ASQ-80 D



B-SADI-111-2

Figure 9-1 (Sheet 2)

COORDINATE DATA SET AN/ASQ-149

LOCATION OF CONTROLS



A

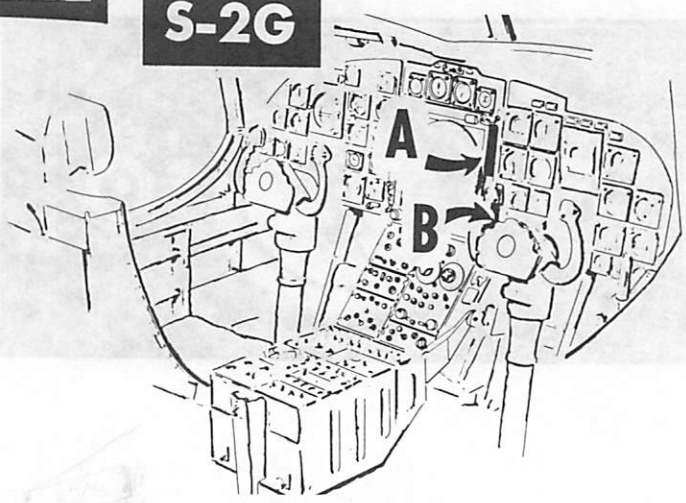
SELECTOR PANEL

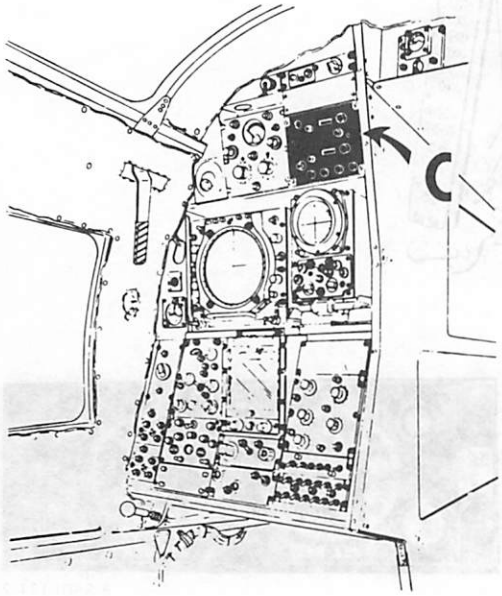


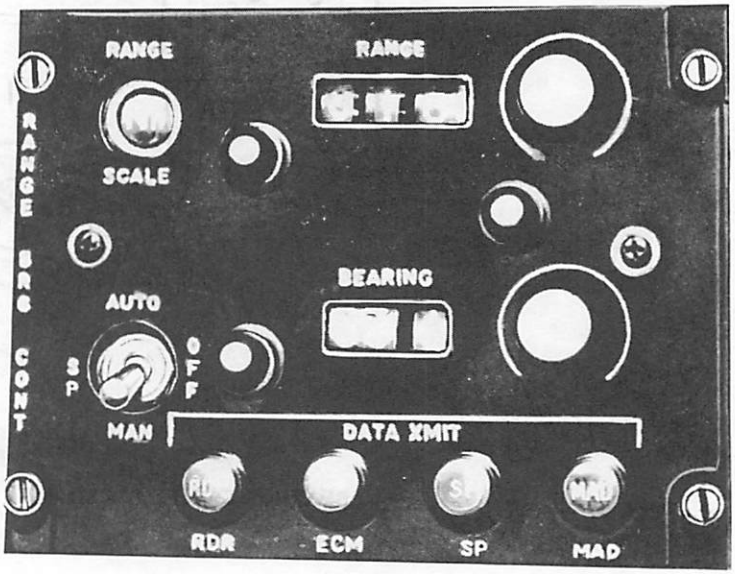
B

STROBE SELECTOR CONTROL C-8891/ASQ-149

S-2G





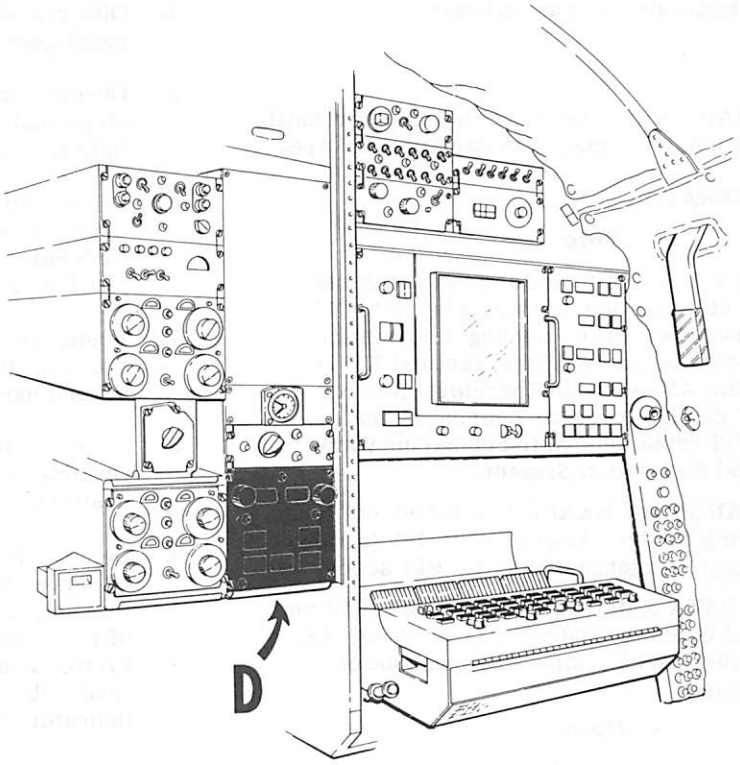


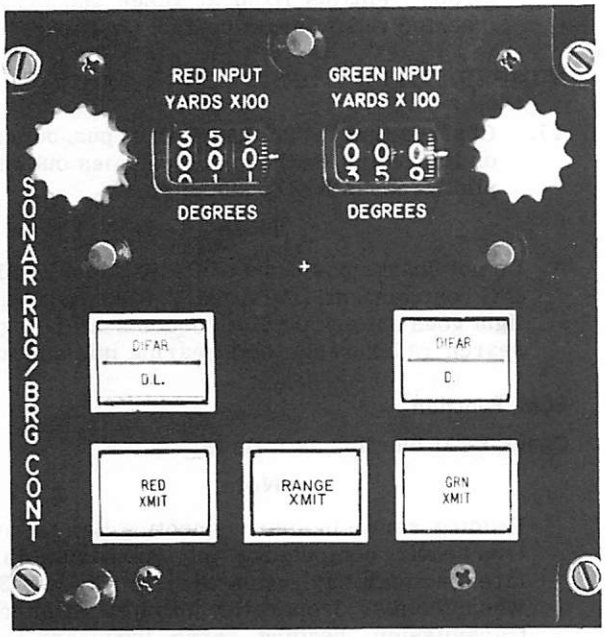
C

RANGE AND BEARING CONTROL C-8890/ASQ-149

SAD1 MAR-4-1

Figure 9-1A (Sheet 1)





SONAR RANGE—BEARING CONTROL C-8889/ASQ-149

SAD1 MAR-4-2

Figure 9-1A (Sheet 2)

Search Radar Function

Check search radar function as follows:

CO-PILOT

1. Adjust VAR control on Control-Indicator until VAR dial indicates magnetic variation for area.

NUMBER 3 OPERATOR

Note

If VAR dial is correctly set, and the radar set on N or S stabilization mode, Radar Set AN/APS-88A receives true heading information from Anti-Submarine Warfare Tactical Navigation System AN/ASN-30. Therefore, Number 3 operator can insert radar bearing indicated on Radar PPI scope into Anti-Submarine Warfare Tactical Navigation System.

2. Rotate RANGE and BEARING controls on Range and Bearing Control ASQ-80/ASQ-149 to range and bearing of target search radar PPI scope.

3. Depress DATA XMIT-RDR pushbutton light on Range and Bearing Control ASQ-80/ASQ-149. Observe that DATA XMIT-RDR pushbutton light goes on.

Note

Maximum radar range that can be inserted into Anti-Submarine Warfare Tactical Navigation System for each of the five navigational-tactical scales is as follows:

Aircraft BuNo. 147895, 149257 through 151685 not Incorporating AVC No. 244:

SCALE	UNITS	MAXIMUM RANGE
7.5	Yards X 100	14,900 yards
15	Yards X 100	29,500 yards
30	Nautical miles and tenths	29.5 nautical miles
75	Nautical miles	73 nautical miles
300	Nautical miles	295 nautical miles

Aircraft BuNo. 152332 and subsequent and all Aircraft Incorporating AVC No. 244:

SCALE	UNITS	MAXIMUM RANGE
7.5	Nautical miles and tenths	7.5 nautical miles
15	Nautical miles and tenths	14.7 nautical miles
30	Nautical miles and tenths	29.5 nautical miles
75	Nautical miles	73 nautical miles
300	Nautical miles	295 nautical miles

CO-PILOT

4. Observe that RDR pushbutton light on selector panel goes on.

5. Observe that movement of bug on Display Unit stops and that BUG HOLD pushbar on Control-Indicator starts flashing.

6. Select red or green strobe for displaying radar target contact position by placing RDR-RED-GRN selector switch on Strobe Selector Control panel ASQ-80 to appropriate position.

7. Position-Correct appropriate strobe to bug position (so that red or green marker symbol is superimposed over bug symbol).

8. Depress REL pushbar on Control-Indicator. Observe that bug returns to present aircraft position.

9. Depress RDR pushbutton light on selector panel. Observe that RDR pushbutton light goes out and that selected strobe adjusts to range and bearing of radar target contact position (selected target symbol indicates over radar target contact position). Observe also that ACC light on Control-Indicator goes on.

10. Depress REL pushbutton on Control-Indicator. Observe that ACC light goes out and that selected strobe remains fixed at range and bearing of inserted radar target contact position.

NUMBER 3 OPERATOR

11. Observe that DATA XMIT-RDR pushbutton light on Range and Bearing Control goes out when co-pilot presses REL pushbutton.

Note

Do not change positions of RANGE and BEARING controls until DATA XMIT-RDR pushbutton light goes out or co-pilot requests up-dating of search radar range and bearing information.

ECM Function

Check ECM function as follows:

Note

Heading servo in Interconnecting Box follows true heading computed by Anti-Submarine Warfare Tactical Navigation System AN/ASN-30. When Number 3 operator initiates ECM data transmission, heading servo locks and true heading remains fixed at this value. ECM relative bearing indicated on Receiver-Indicator ALD-2 is then added to fixed true heading value for positioning strobe on Display Unit of Anti-Submarine Warfare Tactical Navigation System.

NUMBER 3 OPERATOR

1. Rotate BEARING control to bearing indicated on Receiver-Indicator.

2. Depress DATA XMIT-ECM pushbutton light on Range and Bearing Control. Observe that DATA XMIT-ECM pushbutton light goes on.

CO-PILOT

3. Observe that ECM pushbutton light on selector panel goes on.

4. Observe that movement of bug on Display Unit stops and that BUG HOLD pushbar on Control-Indicator starts flashing.

5. Select red or green strobe to display ECM target contact position by placing ECM-RED-GRN selector switch on Strobe Selector Control panel to appropriate position.

6. Position-correct appropriate strobe to bug position (so that red or green marker symbol is superimposed over bug symbol).

7. Depress REL pushbar on Control-Indicator. Observe that bug returns to present aircraft position.

8. Depress ECM pushbutton light on selector panel. Observe that ECM pushbutton light goes out and that selected strobe rotates to represent inserted bearing. Observe also that ACC light on Control-Indicator goes on.

Note

Since ECM function does not include range data, selected strobe must be run out manually in range for adequate display.

9. Depress REL pushbutton on Control-Indicator. Observe that ACC light goes out and that selected strobe remains fixed at inserted ECM bearing.

10. Observe that DATA XMIT-ECM pushbutton light on Range and Bearing Control goes out when co-pilot depresses REL pushbutton.

Note

Do not change position of BEARING control until DATA XMIT-ECM pushbutton light goes out or co-pilot requests updating of ECM bearing information.

In aircraft equipped with AN/ALD-2B (BuNo. 151638dd and subsequent) inserts are accomplished by rotating the bezel on the Receiver-Indicator to the desired signal bearing and depressing ECM button on the Coordinate Data Set.

NEW **Jezebel Function (AN/ASQ-80)**

Check JEZEBEL function as follows:

CO-PILOT

1. To initiate JEZEBEL function, select red strobe to display JEZEBEL bearing line on Display Unit, by setting RED-GRN selector switch on Strobe Selector Control panel to desired position. Observe that appropriate J-R pushbutton light on selector panel starts flashing. Select a memory on MEMORY SET dial, and depress RECORD MEMORY pushbar. Select proper settings on Intervalometer to release spaced buoys.

NUMBER 4 OPERATOR

2. Observe that J-R pushbutton light on Bearing Control starts flashing, indicating that co-pilot has initiated JEZEBEL solution and that red strobe on Display Unit will be used to display JEZEBEL bearing line.

Note

Flashing J-R light also indicates to Number 4 operator and co-pilot that selected red ground track servo in Interconnecting Box is following aircraft ground track. Red pointer on Bearing Indicator should indicate ground track of aircraft.

CO-PILOT

3. While flying tactical path, release sonobuoys Number 1 and Number 2: then observe that J-R light on selector panel goes out. Selected red ground track servo in Interconnecting Box locks. Continue flying a tactical pattern and release sonobuoys Number 3 and Number 4.

4. Push in and rotate MEMORY SET control on Control-Indicator to number at which bug position was stored at time of sonobuoy Number 1 plant.

5. Position-correct red marker to bug position. Repeat step 4, using memory number for second plant position memory. Position-Correct (green marker) to memory position.

NUMBER 4 OPERATOR

6. Determine Codar angle from sonobuoy plant Number 1 as display on Signal Data Recorder.

7. Rotate RED bearing dial on Bearing Control to bearing indicated by the Signal Data Recorder Codar angle.

8. Depress J-R pushbutton light on Bearing Control. Observe that J-R pushbutton light goes on.

Note

Bearing at which red and green ground track servos in Interconnecting Box have locked are indicated by R and G dual pointers on PLANT ANGLE Indicator PLANT ANGLE dial. (Readout is for reference only.) Ground track servos are normally driven to follow aircraft ground track when JEZEBEL plant sequency is initiated. Servos are locked when first pair of sonobuoys are released. If aircraft is to make

Codar bearing determination relative to another sonobuoy plant, red or green ground track servo can be driven to known plant angle by manually slewing red or green servo. Manual slewing is accomplished by momentarily setting RED SLEW or GRN SLEW switch on Bearing Indicator to CW or CCW. Switch is then held until appropriate R or G pointer on PLANT ANGLE indicator dial indicates required plant angle.

CO-PILOT

9. Select JEZEBEL bearing by depressing J-R pushbutton light on selector panel. Observe that J-R pushbutton light goes out and light on Control-Indicator goes on. Observe also that red strobe rotates to position representing one of two possible JEZEBEL bearing lines.

10. Set 1R-2R selector switch on Strobe Selector Control panel to appropriate position for displaying second possible bearing.

Note

- Convention has been established that 1R or 1G position of each switch displays JEZEBEL bearing to right of line between first and second sonobuoys, and 2R or 2G position displays bearing to left of line.

- Since JEZEBEL function does not transmit range data, red strobe must be run out manually in range for adequate display.

11. Depress REL pushbutton on Control-Indicator panel. Observe that selected strobe remains fixed at inserted JEZEBEL bearing.

NUMBER 4 OPERATOR

12. Observe that J-R pushbutton light on Bearing Control goes out.

Note

Do not change position of RED bearing dial until J-R pushbutton light goes out or co-pilot requests updating of JEZEBEL bearing information.

CO-PILOT AND NUMBER 4 OPERATOR

13. If co-pilot wishes to resolve ambiguity, co-pilot and Number 4 operator should repeat procedures described in steps 6 through 10, using second sonobuoy plant green strobe and associated pushbutton lights and switches.

Julie Function (AN/ASQ-80)

Check JULIE function as follows:

CO-PILOT

1. At start of JULIE tactical solution, inform Number 4 operator over interphone whether circular or elliptical JULIE solution is to be used.

NUMBER 4 OPERATOR

2. When JULIE ranges are available and range cursors on Recorder RO-114A/ASA-26 are set, depress JUL pushbutton light on Bearing Control. Observe that JUL pushbutton light goes on.

Note

Number 4 operator should not move cursors until JUL light goes out unless directed to by the co-pilot.

CO-PILOT

3. Observe that JUL pushbutton light on selector panel goes on.

4. Select JULIE range information for display by depressing JUL pushbutton light on selector panel. Observe that JUL pushbutton light goes out and that light on Control-Indicator goes on. Observe also that red and green strobes adjust to JULIE target ranges inserted by Number 4 operator.

5. Depress REL pushbutton on Control-Indicator. Observe that light goes out and that red and green strobes remain fixed at JULIE target ranges.

NUMBER 4 OPERATOR

6. Observe that JUL pushbutton light on Bearing Control goes out.

Reject Function (AN/ASQ-80)

Check reject function as follows:

NUMBER 3 OPERATOR

1. Set ASR-AUTO-MAN switch on Range and Bearing Control to MAN.

Note

As previously described, when data is transmitted by Number 3 or Number 4 operator, appropriate pushbutton light on selector panel goes on to indicate type of data transmitted. If more than one type of data is transmitted at same time, appropriate pushbutton lights on selector panel go on simultaneously. Since only one type of data can be accepted at a time, accepting and releasing desired data causes only appropriate light for accepted data to go out; pushbutton lights for other data do not go out. Remaining data can then be used as required, one type at a time, by accepting and releasing desired data. Exception, however, occurs in JEZEBEL operation, when JEZEBEL data displayed by depressing J-R pushbutton light on selector panel need not be released before data is displayed by depressing J-G pushbutton light, and vice versa.

2. Have Number 3 or Number 4 operator transmit data by depressing data transmission pushbutton light or lights. Observe that appropriate pushbutton light or lights on selector panel go on.

3. Depress REJ pushbutton light. Observe that pushbutton light or lights on selector panel (depressed in step 2) go out.

NUMBER 3 OR NUMBER 4 OPERATOR

4. Observe that previously depressed data transmission pushbutton light or lights go out.

TROUBLESHOOTING

1. No power to equipment

   a. Check DATA AC and DATA DC circuit breakers behind pilot.

   b. Check AC and DC fuses in interconnecting box under Number 4 operator's seat.

2. Unable to insert RDR/ECM or rotate Jezebel Plant Angle Indicator.

   a. Check DATA AC circuit breaker behind pilot.

DIFAR FUNCTIONS (AN/ASQ-149)

SONAR BEARINGS

NUMBER 4 OPERATOR

1. On SONAR Range-Bearing Control, depress RED and GREEN DIFAR-DL pushbutton to illuminate DL.

Co-Pilot

2. Check that red and green DL lamps on Strobe Selector Control come on.

NUMBER 4 OPERATOR

3. On Directional Listening Control C-8246/AQA-7, set a bearing of 090°.

4. On SONAR Range-Bearing Control, depress RED and GREEN XMIT pushbutton light.

Co-Pilot

5. Observe D-R and D-G pushbutton lights on Selector Panel come on.

6. Depress D-R and D-G pushbutton lights on Selector Panel. Observe that D-R and D-G pushbutton lights go out.

7. Observe that the DATA ACCEPT lamp on the ASN-30 Control-Indicator comes ON, and that red strobe and green storbe both display bearings of 90°.

NUMBER 4 OPERATOR

8. On SONAR Range-Bearing Control, adjust red and green bearings to 270°.

9. Depress both red and green DIFAR-DL pushbutton lights on SONAR Range-Bearing Control to illuminate DIFAR.

Co-Pilot

10. On Strobe Selector Control, observe that the red and green DIFAR lamps come on.

11. On ASN-30 Tactical Display Unit, observe that the red strobe and green strobe both display bearings of 270°.

12. On ASN-30 Control Indicator, set VAR to 10° East and observe that the red and green strobes display a bearing of 280°.

13. Depress REL button on ASN-30 Control-Indicator.

SONAR RANGE

NUMBER 4 OPERATOR

1. On SONAR Range-Bearing Control, adjust red and green range indicators to a selected range (yards).

2. Depress RANGE XMIT switch/indicator on SONAR Range-Bearing Control.

3. Observe that the RANGE XMIT switch/indicator on SONAR Range-Bearing Control comes on.

Co-Pilot

1. Observe CAS pushbutton light on Selector Panel comes ON.

2. Depress CAS pushbutton light on Selector Panel.

3. Observe CAS pushbutton light on Selector Panel goes out.

4. Observe DATA ACCEPT lamp on ASN-30 Control-Indicator comes on.

5. Observe red and green strobes on ASN-30 Control-Indicator both read range set to step 1 above.

6. Press REL bar on ASN-30 Control-Indicator.

Reject Function (AN/ASQ-149)

NUMBER 3 OPERATOR

1. Set SP AUTO-MAN switch on Range-Bearing Control to MAN.

2. Depress ECM, RDR, MAD and SP DATA XMIT pushbutton lights on Range-Bearing Control and observe that lights come on.

NUMBER 4 OPERATOR

3. Depress RED and GREEN XMIT switch/indicator on SONAR Range-Bearing Control and observe that lights come on.

Co-Pilot

4. Observe that ECM, RDR, MAD, SP, D-G and D-R pushbutton lights on Selector Panel come on.

5. Observe that movement of bug on ASN-30 Display Unit stops and that BUG HOLD pushbutton light on ASN-30 Control-Indicator starts flashing.

6. Press REJ pushbutton light on Selector Panel.

7. Observe that all lamps on Selector Panel go out except REJ lamp.

8. Press REL bar on ASN-30 Control-Indicator to release bug.

NUMBER 3 OPERATOR

9. Observe that ECM, RDR, MAD and SP pushbutton lights on Range-Bearing Control go out.

NUMBER 4 OPERATOR

10. Observe that RED and GREEN XMIT lights on SONAR Range-Bearing Control go out.

NUMBER 3 OPERATORS EQUIPMENT

REFER TO SUPPLEMENTAL NATOPS FLIGHT MANUAL, NAVAIR 01-85SAD-1A FOR INFORMATION ON THE FOLLOWING EQUIPMENT:

DIRECTION FINDER GROUP (ECM)

NUMBER 3 OPERATORS CONSOLE

Refer to figure 9-2 for the Number 3 operator's consoles.

SEARCH RADAR AN/APS-88

1. Before energizing radar set, position controls and switches as follows: (Set figures 9-3 and 9-4.)

RADAR SET CONTROL APS-88

1. DUMMY LOAD-ANT Switch - DUMMY LOAD
2. Function Switch - OFF
3. RANGE Switch - As Required
4. RCVR Switch - OFF
5. AFC-MAN Switch - MAN
6. STC Knob - OFF
7. LINEAR GAIN/COAC - Turn Counterclockwise to Limit
8. MAN TUNE Knob - Centered

ANTENNA CONTROL APS-88

1. Antenna SCAN Switch - STOP
2. STAB-OUT Switch - OUT
3. ANT. HEADING Knob
   a. Coarse - 0 Degrees
   b. Fine - 0 Degrees
4. SELECTOR WIDTH Knob - 40 Degrees
5. TILT Knob - 0 Degrees

INDICATORS APS-88

1. RANGE 3-30 - Centered
2. VIDEO GAIN - Fully Counterclockwise
3. HDG MKR INT - Fully Counterclockwise
4. RANGE MKR INT - Fully Counterclockwise
5. SONOBUOY A & B VIDEOGAIN - Fully Counterclockwise.
6. INT Control - Fully Counterclockwise
7. BEARING Switch - N (North Stabilized)
8. FTC Switch - OFF

ENERGIZING EQUIPMENT

Use the following procedure each time it becomes necessary to energize the Search Radar AN/APS-88 equipment. See figure 9-4.

1. Turn function knob to STBY. The standby indicator light will go on. After three minutes, the low voltage relay will close and the dummy load indicator light will go on.
2. Place Function switch to SEARCH.
3. Place RCVR switch to MAG. Test meter should indicate .6 ± .2.
4. Place AFC-MAN switch on Radar Set Control to MAN position. Turn RCVR switch in sequence to RCVR 1, RCVR 2; adjust MAN TUNE knob for maximum meter reading on each position. (Reading should be: RCVR 1 & 2 - .6 ± .1.)
5. Place AFC-MAN switch to AFC. Turn RCVR switch, in sequence, to RCVR 1, RCVR 2, AFC 1 and AFC 2. (Reading should be .6 ± .1 in all positions.)
6. Place ANTENNA SCAN switch to position 6 on antenna control box.
7. On the indicator, adjust INT control until sweep is barely visible.
8. On the Radar Set Control, place RANGE switch to the desired range.
9. On the Indicator, adjust RANGE MKR INT control to desired range marker brilliance.
10. Adjust HDG MKR INT control to desired brilliance.
11. On the Radar Indicator, adjust VIDEO GAIN fully clockwise.
12. Place function switch to STBY.
13. Request permission to lower radome. When granted, place RADAR ANT UP/DOWN switch (see figure 9-2) to "DOWN" position and give the following report, "Radome going down." Start elapsed time clock. When the Radome "DOWN" indicator illuminates, report "Radome indicates down." Report elapsed time in seconds. Time should be 21 ± 4 seconds. NEW NEW NEW
14. Place DUMMY LOAD-ANT switch to ANT position.

15. Place function switch to SEARCH. Antenna is now radiating RF energy.
16. On the Radar Set Control, adjust LINEAR COAC control for optimum target presentation.
17. On the Antenna Control Box, adjust TILT control for optimum target presentation.
18. Place STAB-OUT switch on the Antenna Control Box to the STAB position.

Note

Aircraft should be in straight and level flight before STAB OUT switch is placed in the STAB position.

CAUTION

The foregoing is a recommended turn-on procedure; once the equipment is energized, the controls may be utilized as desired. The Function Switch will be in the STBY position any time the dummy Load Switch is used and prior to changing ranges.

BEAM PROPOGATION

The radar signal may be radiated as either a fan or pencil beam. The fan beam is available when a "spoiler" is fastened on the front of the antenna reflector. The pencil beam is available with the spoiler removed. Both beam widths are 2.5 degrees. The fan beam vertical sweep is 18 degrees, allowing large area, even coverage, but with reduced target return. The pencil beam vertical sweep is 5 degrees, allowing small area, high return, or long-range search. In pencil beam operation the antenna tilt becomes more critical.

RADAR PROCEDURES

In conducting radar search, the aircraft is primarily a radar platform. The primary consideration on control of the aircraft is steadiness in flight with maneuvers held to a minimum and conducted smoothly and slowly. Search legs should be oriented down wind insofar as possible to minimize the effect of sea return. During the radar search phase and upon contact investigation, the crewmembers will use the following voice reports and procedures.

1. The Number 3 operator will conduct the search utilizing either continuous scan or sector scan as directed by the Pilot in Command. He shall maintain a constant surveillance of the PPI scope during this phase. The use of sector scan to evaluate possible contacts is to be avoided.

CAUTION

The antenna should be kept in continuous rotation whenever the sweep is visible on the scope.

2. Once a target contact has been established, the Number 3 operator has the capability to insert target range and bearing information on the cockpit plotter by means of the Plotting Board Control, AN/ASA-13 or the Range and Bearing Control AN/ASQ-80/AN/ASQ-149.

Contact Evaluation

Each radar contact must be reported to the pilot. He shall report all contacts to the Pilot in Command immediately utilizing the brevity code to indicate his evaluation. For example: "Pilot, Number 3 (appropriate brevity code evaluation) two seven zero/ten". Accuracy of contact evaluation will depend on the experience of the operator. The following factors should be considered:

1. The size of the Blip.
2. The continuous or intermittent appearance of the Blip.
3. Relative motion of the Blip.

Radar Target Investigation

1. The Number 3 operator will report all contacts, giving bearing and range. He will immediately evaluate contact as good or poor and may change this evaluation at any time he feels it is warranted. He will then give a vector to the pilot to close on contact. In giving this vector he should anticipate the advance in a turn, thereby leading the target. The Pilot will acknowledge all reported contacts and advise the Number 3 operator of his intentions.
2. Upon completion of the turn and when the aircraft is steady on heading the Pilot will report "Steady on (heading in degrees)". At this point the Number 3 operator will acknowledge attainment of the vector and report contacts bearing and range. Example: "Roger, (appropriate brevity code) ahead nine".
3. Vectors to the target are the responsibility of the Number 3 operator. He will be relieved of this responsibility on searchlight runs when the co-pilot holds the target visually. A relative movement (collision) course should be determined as soon as possible. A collision course will be determined as follows:
   a. Upon pilot's attainment of the vector, position cursor over target. Note range and observe drift for a period of closure. Compute collision course by formula:

$$\frac{\text{range at start}}{\text{distance traveled}} \text{ X degrees of drift}$$

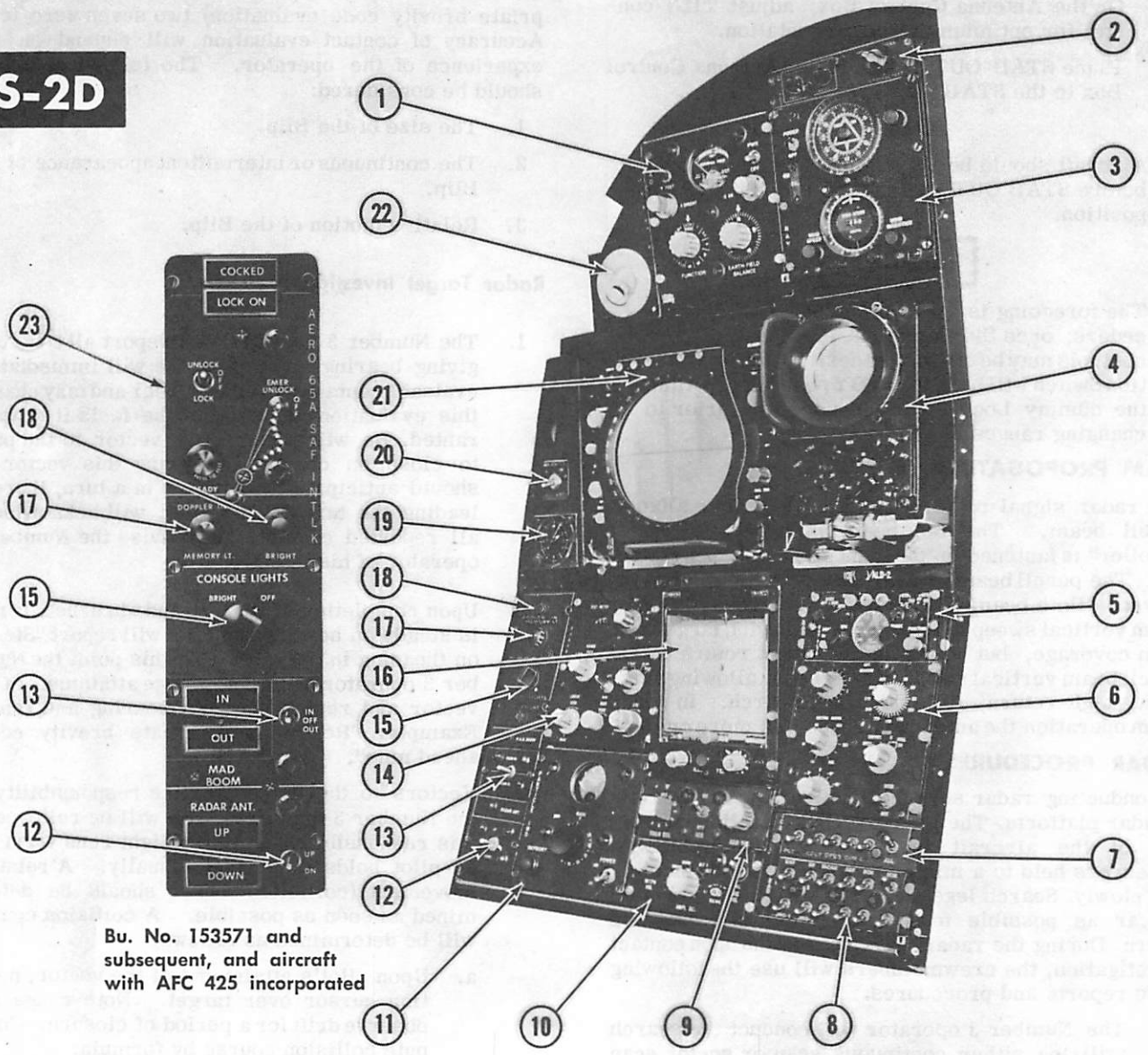
= heading correction for collision course

   b. Vector pilot to computed heading.
   c. Reposition cursor over target. Target should now track down the cursor. Easy turns can be utilized for corrections to insure that target remains under cursor.
4. Turns are requested and executed as follows:
   a. "Left" or "Right" indicates a standard rate of turn and is usually given when a turn of more than ten degrees is required. "Easy Left" or "Easy Right" should be used to slow fast turns as the target nears the centerline,

NO. 3 OPERATOR'S CONSOLE

TYPICAL

S-2D



Bu. No. 153571 and subsequent, and aircraft with AFC 425 incorporated

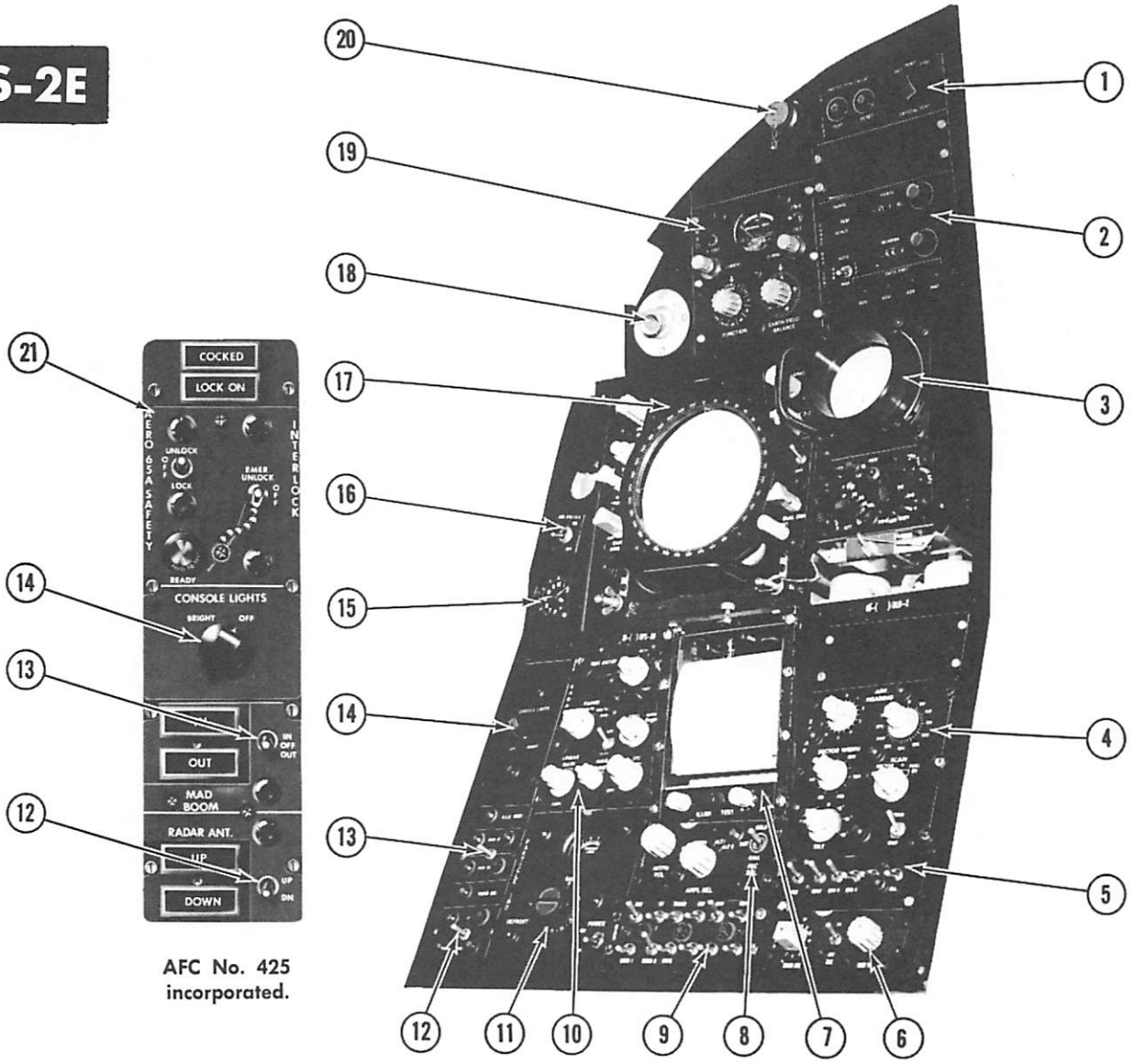
1. MAD SET CONTROL ASQ-10
2. ECM CRYSTAL CHECKER ALD-2 OR ALD-2B
3. NAVIGATION COMPUTER ASA-13A
4. ECM RECEIVER-INDICATOR ALD-2 OR ALD-2B
5. REMOTE PLOTTER CONTROL ASA-13
6. ANTENNA CONTROL BOX APS-88
7. ICS SELECTOR PANEL AIC-14
8. RECEIVER SELECTOR PANEL AIC-14
9. TRANSMITTER SELECTOR PANEL AIC-14
10. INTERPHONE CONTROL PANEL AIC-14
11. PARTICLE INDICATOR CONTROL ASR-3
12. RADOME CONTROL SWITCH
13. MAD BOOM SWITCH
14. RADAR CONTROL APS-88 OR APS-88A
15. CONSOLE LIGHTS CONTROL
16. MAD RECORDER ASQ-10
17. DOPPLER MEMORY LIGHT RHEOSTAT
18. DOPPLER MEMORY LIGHT
19. ELAPSED TIME CLOCK
20. AUXILIARY STATION ICS SWITCH
21. AZIMUTH-RANGE INDICATOR APS-88
22. HEATING AND VENTILATION FACE OUTLET
23. AERO 65A SAFETY INTERLOCK CONTROL PANEL

E-SAD1-169-1

Figure 9-2 (Sheet 1)

TYPICAL

S-2E



AFC No. 425 incorporated.

1. ECM CRYSTAL CHECKER ALD-2 OR ALD-2B
2. RANGE AND BEARING CONTROL ASQ-80
3. ECM RECEIVER-INDICATOR ALD-2 OR ALD-2B
4. ANTENNA CONTROL BOX APS-88
5. ICS SELECTOR PANEL AIC-14
6. TRANSMITTER SELECTOR PANEL AIC-14
7. MAD RECORDER ASQ-10
8. INTERPHONE CONTROL PANEL AIC-14
9. RECEIVER SELECTOR PANEL AIC-14
10. RADAR CONTROL APS-88
*11. PARTICLE INDICATOR CONTROL ASR-3
12. RADOME CONTROL SWITCH
13. MAD BOOM SWITCH
14. CONSOLE LIGHTS CONTROL
15. ELAPSED TIME CLOCK
16. AUXILIARY STATION ICS SWITCH
17. AZIMUTH RANGE INDICATOR CONTROL APS-88 OR APS-88A
18. HEATING AND VENTILATION FACE OUTLET
19. MAD SET CONTROL ASQ-10
20. UTILITY RECEPTACLE
21. AERO 65A SAFETY INTERLOCK CONTROL PANEL

* Not Used on S-2E Aircraft Incorporating AFC 517

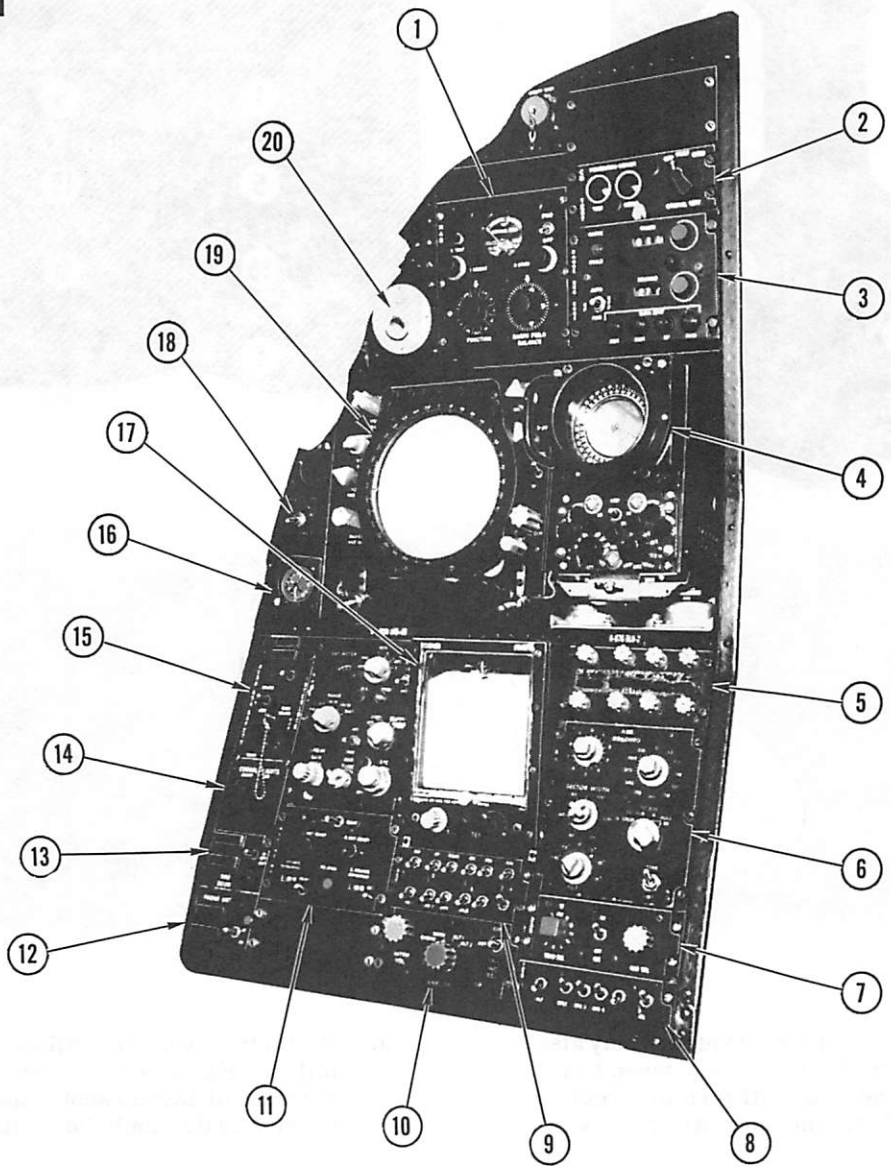
F-SAD1-169-2

Figure 9-2 (Sheet 2)

NO. 3 OPERATOR'S CONSOLE

TYPICAL

S-2G



1. MAD SET CONTROL ASQ-10
2. ECM CRYSTAL CHECKER ALD-2 OR ALD-2B
3. RANGE AND BEARING CONTROL ASQ-149
4. ECM RECEIVER-INDICATOR ALD-2 OR ALD-2B
5. SPARE FUSE PANEL
6. ANTENNA CONTROL BOX APS-88
7. TRANSMITTER SELECTOR PANEL AIC-14
8. ICS SELECTOR PANEL
9. RECEIVER SELECTOR PANEL AIC-14
10. INTERPHONE CONTROL PANEL AIC-14
11. MARINE MARKER REMOTE CONTROL PANEL
12. RADOME CONTROL SWITCH
13. MAD BOOM SWITCH
14. CONSOLE LIGHTS CONTROL
15. AERO 65A SAFETY INTERLOCK CONTROL PANEL
16. ELAPSED TIME CLOCK
17. MAD RECORDER ASQ-10
18. AUXILIARY STATION ICS SWITCH
19. AZIMUTH-RANGE INDICATOR APS-88 OR APS-88A
20. HEATING AND VENTILATION FACE OUTLET

SAD1 MAR-5

Figure 9-2 (Sheet 3)

SEARCH RADAR CIRCUIT BREAKERS

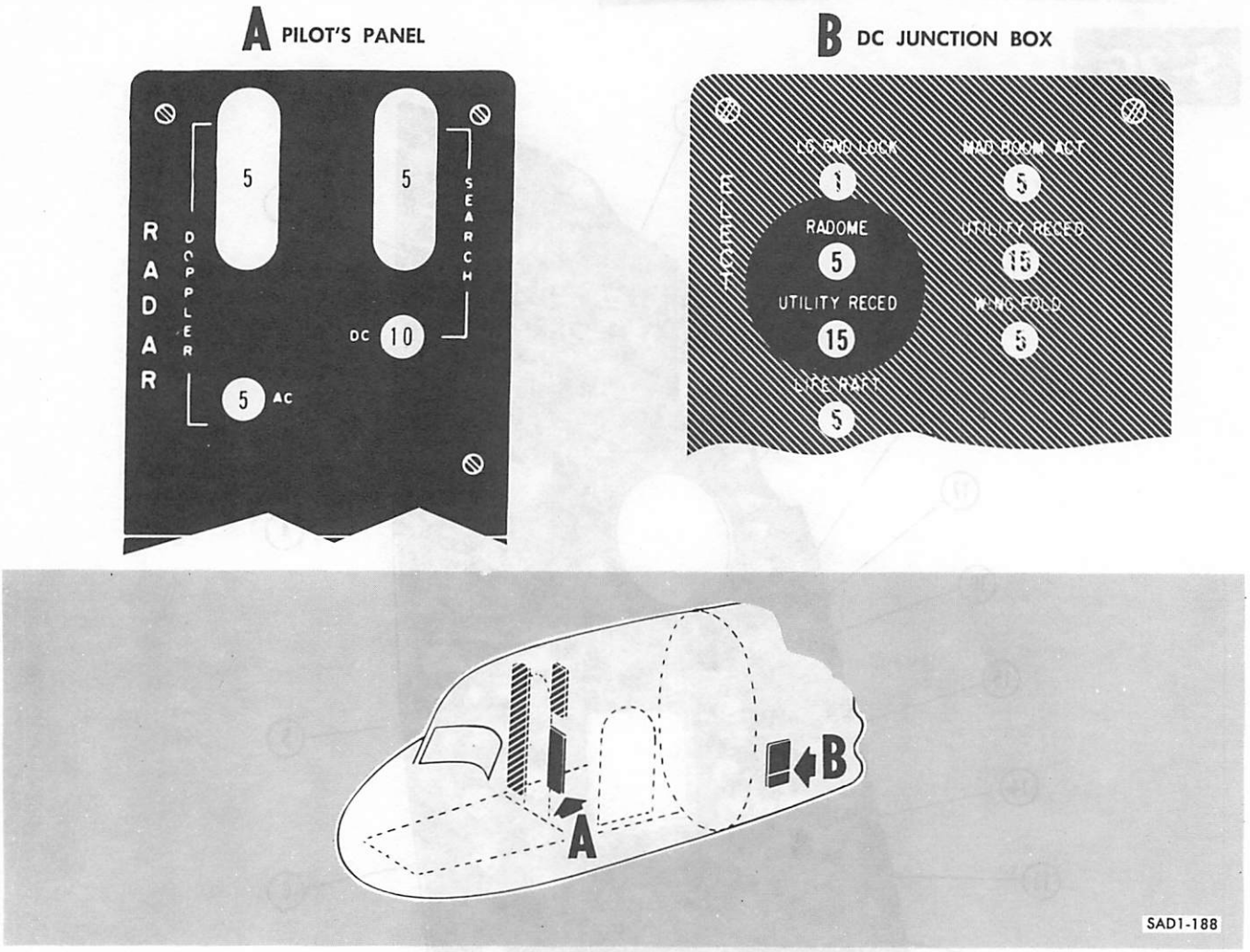


Figure 9-3

within 10 degrees. This rate of turn may also be requested by "Right to one seven five". In this case the pilot will turn in direction indicated and fly heading as requested.

b. "Easy Left" or "Easy Right" indicates a half standard rate of turn and is usually given when a turn of less than ten degrees is required. The pilot will continue this turn until given "Steady on" by the Number 3 operator.

c. "Hard Left" or "Hard Right" indicates a greater than standard rate of turn is required. The pilot will continue this turn until given "Steady on" by the Number 3 operator.

5. Bearing and range reports will normally be given as frequently as indicated below and when requested by the pilot.

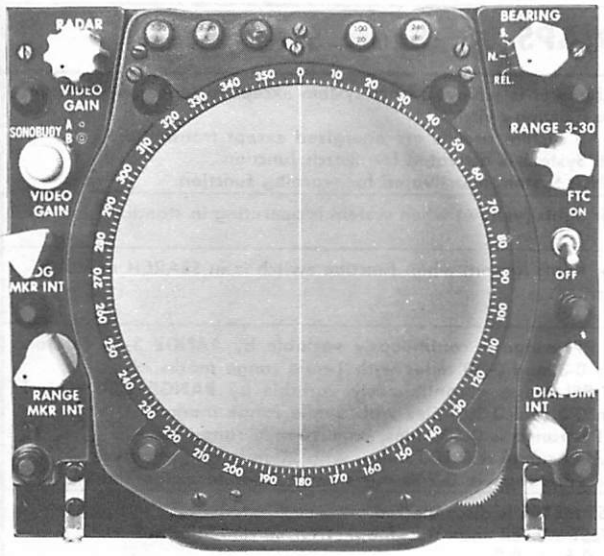
a. Contacts beyond ten miles given every five miles. Example: "(appropriate brevity evaluation) ahead twenty" and "(appropriate brevity evaluation) ahead fifteen".

b. Contacts beyond two miles but less than ten miles shall be given every two miles in same manner as above.

c. Contacts less than two miles will be given every quarter mile in same manner as above.

6. Lost contacts must be reported to the pilot immediately. The pilot must be immediately notified of any radar malfunction, probable cause and whether of temporary nature. This report is most urgent when operating in coastal areas or in the vicinity of surface targets, (ships, islands, etc).

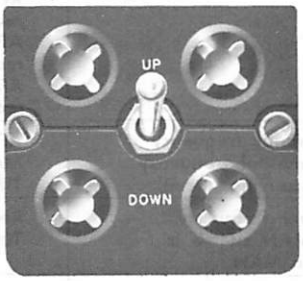
SEARCH RADAR



A Indicator APS 88







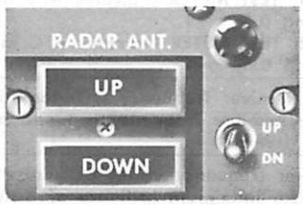
D

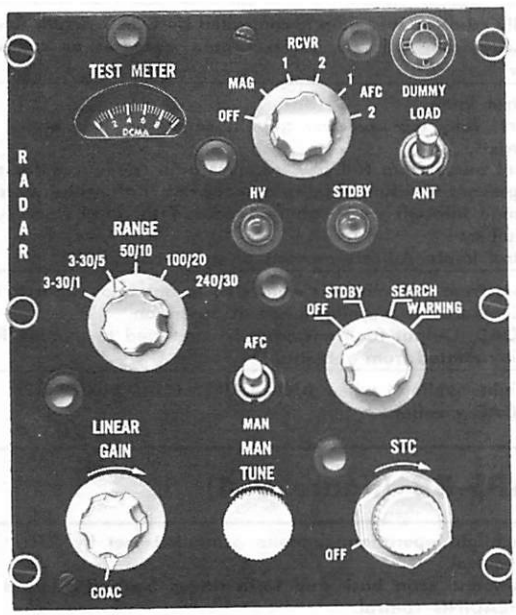
Radome Actuating Switch and Position Indicator

S-2D aircraft and S-2E Bu No. 149257t through 152355kk without AFC 425 incorporated.

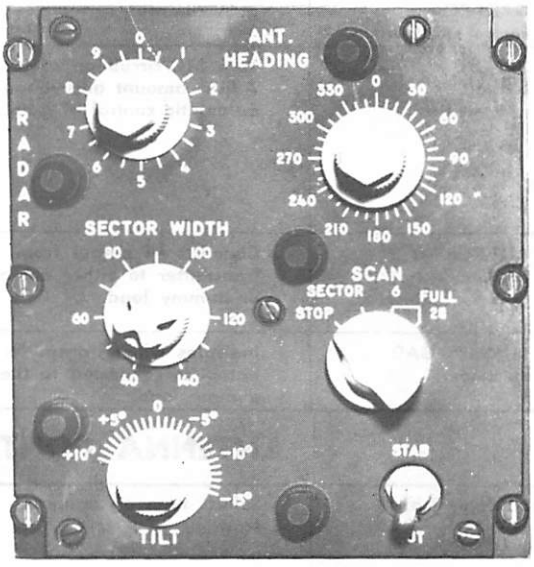
D

Bu No. 151673hh, 15236kk and subsequent and S-2E aircraft with AFC 425 incorporated.





B Radar Set Control APS-88



C Antenna Control Box APS-88

B-SAD1-116

Figure 9-4

APS-88 OPERATING CONTROLS AND INDICATORS

NAME	PURPOSE	SETTINGS AND FUNCTIONAL INDICATIONS
RADAR SET CONTROL C-2719/APS-88 (figure 9-4)		
Function switch	Energizes system and selects system function.	OFF: All power is removed from system except for panel illumination and fuse function switch. STDBY: All system circuits are energized except transmitter. SEARCH: System is activated for search function. WARNING: System is activated for warning function.
STDBY indicator	Indicates when system is in standby function.	Indicator lights (yellow) when system is operating in standby function.
HV indicator	Indicates when high voltage power supply is energized and transmitter is operating.	Indicator lights (green) when function switch is in SEARCH or WARNING position.
RANGE switch	Selects range for PPI display (in conjunction with RANGE 3-30 control, located on indicator, for short range).	3-30/1: PPI range is continuously variable by RANGE 3-30 control, between 0-3 and 0-30 miles with 1-mile range marks. 3-30/5: PPI range is continuously variable by RANGE 3-30 control between 0-3 and 0-30 miles with 5-mile range marks. 50/10: PPI range is 0-50 miles, with 10-mile range marks. 100/20: PPI range is 0-100 miles, with 20-mile range marks. 240/30: PPI range is 0-240 miles, with 30-mile range marks.
Test meter switch	Indicates meter circuit selected by switch.	OFF: TEST METER is disconnected. MAG: TEST METER indicates magnetron current; normal reading 0.6 ± 0.2. RCVR-1: TEST METER indicates mixer 1 crystal current; normal reading 0.6 ± .1. RCVR-2: TEST METER indicates mixer 2 crystal current; normal reading 0.6 ± .1. AFC-1: TEST METER indicates AFC mixer 1 crystal current; normal reading 0.6 ± .1. AFC-2: TEST METER indicates AFC mixer 2 crystal current; normal reading 0.6 ± .1.
AFC-MAN switch	Selects automatic frequency control or manual frequency control of receiving circuit.	AFC: Receiver frequency is automatically tuned. MAN: Receiver frequency is tuned manually by use of the MAN TUNE control.
MAN TUNE control	Tunes receiver frequency when AFC-MAN switch is positioned to MAN.	Receiver frequency varies as knob is rotated. Tune for maximum brillance of distant targets.
LINEAR GAIN-COAC control and switch	Selects type of receiver gain control.	Control fully ccw: receiver gain is controlled by COAC circuit. Control rotated away from full ccw: receiver gain increases as control is rotated cw.
STC-OFF controls and switch	Turn STC circuit on or off. Adjust amount and range of automatic control of gain.	Small control knob: OFF: Control fully ccw; receiver gain is same for close and distant targets. STC: Control away from full ccw; receiver gain is reduced for close targets to prevent sea-cluttered display near center of indicator screen. Adjusts range through which gain is reduced to approximately 40 miles at full cw. Large control knob: Adjusts amount of gain reduction.
ANT-DUMMY LOAD switch	Connects r-f output from transmitter to either antenna or dummy load.	ANT: Output from transmitter is connected to antenna; radar is fully operative in search or warning mode of operation. DUMMY LOAD: Output for transmitter is connected to dummy load; no power is radiated from antenna.
DUMMY LOAD indicator	Indicates when transmitter output is connected to the dummy load.	Indicator lights (yellow) when ANT-DUMMY LOAD switch is in DUMMY LOAD position.
ANTENNA CONTROL C-2718/APS-88 (figure 9-4)		
SCAN switch	Selects type of antenna scan.	STOP: Searchlight operation; antenna azimuth is set by ANT. HEADING control. SECTOR: Antenna scan back and forth across bearing selected by ANT. HEADING control. FULL-6: Antenna rotates continuously 360 degrees at 6 rpm. FULL-28: Antenna rotates continuously at 28 rpm.

A-SAD1-173 -1

Figure 9-5 (Sheet 1)

ANTENNA CONTROL C-2718/APS-88 (figure 9-4) (cont)

NAME	PURPOSE	SETTINGS AND FUNCTIONAL INDICATIONS
ANT. HEADING control	Controls antenna heading when SCAN switch is positioned to STOP or SECTOR.	Coarse and fine calibrations indicate antenna heading; heading is with respect to aircraft heading, or true north, depending on whether BEARING switch is positioned to REL, or N or S, respectively.
SECTOR WIDTH control	Controls width of scanned sector when SCAN switch is positioned to SECTOR.	Scanned sector width adjustable from 40 to 140 degrees.
STAB-OUT switch	Selects stabilized or unstabilized operation of antenna with respect to vertical.	STAB: Antenna reflector is stabilized so that it rotates about axis perpendicular to earth's surface.
TILT control	Controls elevation (or depression) of antenna beam.	Antenna may be tilted between 10 degrees up and 15 degrees down by rotating the TILT control. The TILT control is calibrated in degrees.
AZIMUTH-RANGE INDICATOR IP-483/APS-88 (figure 9-4)		
INT. control	Adjusts intensity of indicator display.	Adjust for most readable display; should be set near point of barely visible sweep trace with receiver gain at minimum.
RANGE MKR. INT. control	Turns on and adjusts range marks.	As control is rotated away from full ccw, the switch closes applying range marks to the display; adjust control for optimum range-mark brilliance.
HDG. MKR. INT. control	Adjusts intensity of heading marker.	Adjust control for optimum heading marker brilliance.
RADAR VIDEO GAIN Late models	Adjusts scope video.	Rotate cw to increase gain.
*SONOBUOY A VIDEO GAIN control and switch	Turns on and adjusts A sonobuoy video.	As control is rotated away from full ccw, the switch closes applying A sonobuoy video to the display; adjust control for optimum sonobuoy video brilliance.
*SONOBUOY B VIDEO GAIN control and switch	Turns on and adjusts B sonobuoy video.	As control is rotated away from full ccw, the switch closes applying B sonobuoy video to the display; adjust control for optimum sonobuoy video brilliance.
FOCUS control (on early serial numbers only)	Adjusts focus of entire indicator display.	Adjust display for proper brilliance first; then adjust FOCUS control for maximum sharpness.
BEARING switch	Selects true north, true south, or aircraft heading for indicator azimuth reference.	REL: Radar targets are displayed on indicator relative to aircraft heading; dead-ahead targets are displayed at zero azimuth; targets to the right, at 90 degrees; targets astern, 180 degrees; and targets to the left at 270 degrees. N: Radar targets are displayed on indicator relative to true north; targets to the north are displayed at zero degrees; targets to the east, at 90 degrees; targets to the south at 180 degrees; and targets to the west, at 270 degrees. S: Operation is the same as in N except indicator display is rotated 180 degrees.
Range-indicator	To indicate range of PPI display.	3-30/1 lighted: PPI range is from 0-3 to 0-30 miles, with 1-mile range marks. 3-30/5 lighted: PPI range is from 0-3 to 0-30 miles, with 5-mile range marks. 50/10 lighted: PPI range is 50 miles, with 10-mile range marks. 100/20 lighted: PPI range is 100 miles, with 20-mile range marks. 240/30 lighted: PPI range is 240 miles, with 30-mile range marks.
RANGE 3-30 control	Sets range of display when RANGE switch is in 3-30/1 or 3-30/5 position.	At extreme ccw position, displayed range is 3 miles, increasing with cw rotation to a maximum of 30 miles.
FTC switch	Useful in separating targets and reducing clutter.	Up: FTC on; closer edge of large targets is displayed brightly; remainder of target is dim; smaller targets within large targets are brought out.
Cursor edgelight dimmer switch	Dims lighting of cursor.	Clockwise: Dimmer Counterclockwise: Brighter
Cursor	Aids in finding azimuth to target.	Rotate to overlay target; read azimuth at end of cursor hairline.
Cursor control knob	Rotates cursor.	
Azimuth ring	Provides azimuth calibration of indicator display.	Azimuth under cursor hairline is indicated by azimuth ring reading at outer end of hairline.

* These controls are inoperative (stacked dual pot on later aircraft)

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Figure 9-5 (Sheet 2)

RATE OF CLOSURE TABLE

GROUND SPEED IN KNOTS

MILES RANGE	180	172	167	156	150	144	138	133	128	124
	TIME ETA TO DATUM									
1	20"	21"	22"	23"	24"	25"	26"	27"	28"	29"
2	40"	42"	44"	46"	48"	50"	52"	54"	56"	58"
3	1'	1'03"	1'06"	1'09"	1'12"	1'15"	1'18"	1'21"	1'24"	1'27"
4	1'20"	1'24"	1'28"	1'32"	1'36"	1'40"	1'44"	1'48"	1'52"	1'56"
5	1'40"	1'45"	1'50"	1'55"	2'00"	2'05"	2'10"	2'15"	2'20"	2'25"
6	2'00"	2'06"	2'12"	2'18"	2'24"	2'30"	2'36"	2'42"	2'48"	2'54"
7	2'20"	2'27"	2'34"	2'41"	2'48"	2'55"	3'02"	3'09"	3'16"	3'23"
8	2'40"	2'48"	2'56"	3'04"	3'12"	3'20"	3'28"	3'36"	3'44"	3'52"
9	3'00"	3'09"	3'18"	3'27"	3'36"	3'45"	3'54"	4'03"	4'12"	4'21"
10	3'20"	3'30"	3'40"	3'50"	4'00"	4'10"	4'20"	4'30"	4'40"	4'50"
11	3'40"	3'51"	4'02"	4'13"	4'24"	4'35"	4'46"	4'57"	5'08"	5'19"
12	4'00"	4'12"	4'24"	4'36"	4'48"	5'00"	5'12"	5'24"	5'36"	5'48"
13	4'20"	4'33"	4'46"	4'59"	5'12"	5'25"	5'38"	5'51"	6'04"	6'17"
14	4'40"	4'54"	5'08"	5'22"	5'36"	5'50"	6'04"	6'18"	6'32"	6'46"
15	5'00"	5'15"	5'30"	5'45"	6'00"	6'15"	6'30"	6'45"	7'00"	7'15"
16	5'20"	5'36"	5'52"	6'08"	6'24"	6'40"	6'56"	7'12"	7'28"	7'44"
17	5'40"	5'57"	6'14"	6'31"	6'48"	7'05"	7'22"	7'39"	7'56"	8'13"
18	6'00"	6'18"	6'36"	6'54"	7'12"	7'30"	7'48"	8'06"	8'24"	8'42"
19	6'20"	6'39"	6'58"	7'17"	7'36"	7'55"	8'14"	8'33"	8'52"	9'11"
20	6'40"	7'00"	7'20"	7'40"	8'00"	8'20"	8'40"	9'00"	9'20"	9'40"

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Figure 9-6

WARNING

When operating at low altitudes with restricted visibility, the safety of the aircraft and crew may depend on a prompt report.

7. The ETA over DATUM must also be given when closing a contact. Since every contact is a possible submarine and may submerge at any time, an accurate method of determining the point of submergence must be used. Normally, determination of ETA's during homing runs will be the responsibility of the co-pilot and/or the crewmember not operating the radar. The most accurate means of determining ETA over DATUM is by means of the Mk 8 Computer. However, other methods for estimating ETA over DATUM are available to the Number 3 operator. One reliable method is to compute the rate of closure to the contact. When the target disappears, divide the miles remaining by the rate of closure. The Rate of Closure table shown in figure 9-6 will simplify the computations. There are many ways to use the table. The following method is recommended:

   a. When on heading and speed is stabilized, start the elapsed time clock and note the target range.

   b. When the target disappears, note the elapsed time. Enter the extreme left column of the chart (miles range) at the number of miles the target was actually tracked; continue to the right to a time which is closest to the elapsed time. This establishes the rate of closure and the rate of closure for this particular run. The remaining computations on this run will be in this vertical column.

c. The next step is to enter the "Miles Range" column with the original miles to target as determined in step a; move right to the rate of closure column established in step b. This time is the total time to the target. Report the ETA to DATUM to the pilot.

d. When the total time to target has elapsed, as shown by the elapsed time clock, report "Mark on top", to the pilot or mark Plotter by means of MARK button.

8. A secondary method of determining ETA over DATUM, without the aid of an elapsed time. clock, that gives excellent and accurate results is to count the number of sweeps on the radar scope per closing mile to the radar contact. This method can also be used to establish an accurate time to "On-Top" because the antenna scan rate of the equipment is a known factor, i.e. Low scan rate is 6 RPM; fast scan rate is 28 RPM for APS-88 radar equipment. An example of this method is:

a. When closing a radar contact, two miles elapse during nine sweeps, six miles of run-in remain. The ETA to "On Top" would be 27 sweeps.

b. Determine number of sweeps from formula:

Number of sweeps To "On-Top", =

$$\frac{\text{Number of Sweeps}}{\text{Miles measured}} \times \text{Miles remaining}$$

9. Normally all runs will be completed to "On-Top" position in an attempt to acquire a MAD contact.

10. The Number 3 operator will give position on top as follows. "Standby to mark on top" followed by "Mark on top". This report completes the investigative run-in and the Pilot in Command will inform crewmembers of his intention at this point.

Elapsed Time Clock ETA Procedures

1. When the aircraft is steady on the inbound heading and when the first available accurate range check can be made the Number 3 operator will give this report. "Standby to mark time". As the leading edge of the contact touches the range marker he will announce "Mark time" followed by a bearing and range report. The co-pilot and Number 4 operator will start their elapsed time clocks at this signal.

2. The Number 3 operator will continue to give range checks as the homing run is continued with the following report. "Standby to mark eight (or appropriate range)". Once again as the leading edge of the target touches the range marker he will announce "Mark (appropriate brevity code evaluation) ahead eight". Computation of ETA can now be made and relayed to the pilot. As additional range checks are made, ETAs will be checked and corrected as necessary.

OPTIMUM RADAR OPERATION

1. Sector scan at short ranges (3 miles) may assist in holding the target.

2. On long-range search, if all targets are clear and uncongested on the PPI indicator, the "LINEAR-GAIN-COAC" switch may be set to "LINEAR" and by adjusting the "LINEAR GAIN" control, a clearer presentation can be obtained.

3. The FTC feature may be used at times to obtain sharper presentations. With the FTC switch in the ON position the leading edge of the large targets will be displayed brightly; the remainder of the target will be dim, thereby providing a high definition search pattern. Smaller targets within the large target will be brought out.

4. The STC feature may be used to combat the effects of sea return. Position the STC switch ON and adjust the inner and outer controls as required to obtain best "PPI" display. Over adjustment may result in loss of target returns as well as sea return.

5. Manual receiver crystal tuning may be used and is selected by placing AFC-MAN to MAN and adjusting MAN TUNING for best return.

6. Antenna stabilization will be lost in maneuvers in excess of ±25 degrees in roll and/or ±15 degrees in pitch.

Note

Aircraft should be in straight and level flight before STAB-OUT switch is placed in the STAB position.

7. The RCVR switch should be left in MAG position during normal operation. This enables the operator to monitor MAG current constantly for malfunction.

8. The TILT control should be adjusted from time to time to acquire optimum target return. Vary TILT control until signals appearing on indicator achieve highest definition.

9. The selection of short range weather display may be selected by placing FUNCTION switch to WARNING. The short range PPI display in WARNING function resembles that obtained in search except that surface features underlying weather returns are not displayed as clearly, because of reduced definition of the surface targets. Since the definition is reduced in order to gain in sensitivity, the display of insubstantial storm-front, squall line or precipation targets improves. This affords a quick means of determining whether a target is a weather formation or not. The weather return can usually be identified by its blurred and fuzzy edge and the fact that, except in extremely dense and stormy concentrations, the weather display is not as brilliant. The Warning Function is used to scan areas for the purpose of small target pick-up and is desirable for snorkel detection since this function provides for maximum sensitivity to small targets.

ALTERNATE MODES OF OPERATION

1. Use MAN TUNE if AFC function is inoperative.

2. Use REL. stabilization if NORTH stabilization fails.

3. Use LINEAR GAIN control if COAC circuit is inoperative.

DEENERGIZING EQUIPMENT

Deenergize APS-88 equipment as follows:

1. Place function switch to STBY.
2. Place DUMMY LOAD-ANT. switch to DUMMY LOAD.
3. Place the STAB-OUT switch to the OUT position.
4. Retract Radome.
   a. Request permission to raise radome. Example: "Pilot, Number 3, Request permission to raise radome".
   b. When granted place RADAR ANT UP/DOWN (figure 9-4) switch to UP position and give the following report "Radome coming up". Start elapsed time clock.
   c. When the RADOME UP indicator lights report "Radome indicates up". Give elapsed time in seconds. Time should be 21 ± 4 seconds.
5. Place BEARING switch to the REL position and the ANTENNA HEADING CONTROL to 0 degrees. Place the SCAN switch to STOP.
6. Place all other controls fully counterclockwise and to the OFF position.

TROUBLESHOOTING

For the Radar Troubleshooting procedures, refer to figure 9-7.

MAGNETIC ANOMALY DETECTOR (MAD) AN/ASQ-10

The Magnetic Anomaly Detector (MAD) AN/ASQ-10 equipment is designed to measure minute changes in the earth's magnetic field caused by a submarine or other ferrous object. Signals detected by the MAD system are recorded at the Number 3 operator's position by DC milliammeter Magnetic Distortion Recorder RO-32/ASQ. Indications of these deflections are also shown on the MAD indicator located on the pilot's center instrument panel S-2D Aircraft, co-pilot's instrument panel in the S-2E. Refer to figure 9-9 for all of the Number 3 operator's MAD controls.

ENERGIZING EQUIPMENT

1. Before energizing MAD equipment, position switch S-1602 located on AM-1967 front panel to the NORMAL position. The AM-1967 is located behind the Number 3 operator's seat.
2. When power is available, place FUNCTION switch to HTR REG position.
3. Place the PWR-OFF switch to PWR and check HTR REG on RESIDUAL FIELD meter.

RADAR TROUBLESHOOTING

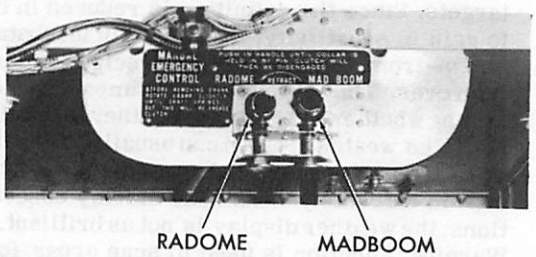
INDICATIONS	POSSIBLE REMEDY
1. FAILURE OF THE STANDBY WARNING LIGHT	Check ganged radar circuit breakers behind pilot seat.
2. NO RANGE MARKS.	Adjust the intensity of the range markers.
3. UNABLE TO OBTAIN TARGETS GAIN OPERATING NORMALLY.	Recheck turn-on procedures.
4. NO TARGETS OR WEAK TARGETS	Check all 1/4 inch cables leading into the synchronizer which is located on the top shelf in the rear of the electronics compartment. Check video cables located on rear of the indicator for tightness.
5. FAILURE OF RADOME TO ACTUATE.  RADOME MADBOOM	Check the circuit breaker marked "RADOME" located in the electronics compartment on the top of the DC junction box. Crank radome manually by means of hand crank located in electronics compartment. **WARNING** Before attempting to manually operate radome PULL the RADOME CIRCUIT BREAKER.
6. TEST METER SWEEPS IN AFC 1 AND AFC 2 POSITIONS. PRESENTATION IS SPOKED.	Place AFC-MAN to the MAN position and MAN TUNE.
7. NORTH STABILIZATION INOPERATIVE.	S-2D — Check CP-381/ASA-13A ON-OFF switch and place ON. S-2E — Check AN/ASN-30 in STBY or RUN position. Check 5 AMP fast blow fuse on J box below NO. 4 operator's seat.
8. LOSS OF HIGH VOLTAGE AFTER A NORMAL PERIOD OF OPERATION	Execute TURN-OFF and TURN-ON procedures.
9. UNBALANCED SECTOR SCAN Aircraft BUNO 153564 and subsequent	Adjust APS-88A sector width BALANCE CONT located in aft electronics compartment bulkhead.

Figure 9-7

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4. When RESIDUAL FIELD meter pointer indicates between voltage check lines, rotate FUNCTION switch to B+ position.

5. Equipment is energized and ready for further operation when RESIDUAL FIELD meter pointer indicates between voltage lines.

6. When airborne; request permission to extend MAD boom. Example: "Pilot number three request permission to extend boom." When permission is granted, start elapsed time clock and press and hold spring-loaded boom switch until the boom position indicator indicates boom "OUT". During extension of boom report "Boom going out." After extension of boom report "Boom indicates out" and give elapsed time in seconds. Time should be 13 ± 3 seconds.

NEW NEW NEW

IN-FLIGHT ADJUSTMENTS

Perform in-flight adjustments as follows:

1. Place the FUNCTION switch to the I SERVO position and adjust INNER SPIKES on AM-1967 for RESIDUAL FIELD meter indications within voltage check lines. Pen deflection should be less than three (3) major divisions, peak-to-peak.

2. Place the FUNCTION switch to the 0 SERVO position and adjust OUTER SPIKES on AM-1967 for RESIDUAL FIELD meter indications within voltage check lines. Pen deflection should be less than 2.5 major divisions, peak-to-peak.

3. If conditions warrant gain adjustment (very jittery or sluggish pen movement or noise MAD), proceed as follows:

   a. Function switch - I SERVO/0 SERVO

   b. MAD recorder - ON

   c. Turn appropriate gain control clockwise for minimum pen deflection, then readjust gain control counterclockwise, to give 20 percent increase in pen deflection over minimum level received.

   d. Repeat step (c) for other SERVO.

4. Place the FUNCTION switch to the EFB position, turn EARTH FIELD BALANCE control slowly clockwise until needle dips to minimum and starts to rise. When first rise occurs back off EARTH FIELD BALANCE two clicks counterclockwise (this assures polarity of signal being consistent in pen deflection). Needle should indicate in center of CANCELLED region of the Residual Field meter.

5. While the equipment is warming up, the operator may adjust the RO-32 Recorder. Adjustments are as follows:

   a. Recorder function switch to the "R" position. Adjust the red pen for zero reading on chart paper using upper left screw adjustments.

   b. Place recorder function switch to "+" position. Adjust red pen four major divisions to the right using the lower left screwdriver adjustment.

   c. Place recorder function switch to "-" position. Adjust red pen deflection four major divisions to the left using the lower left screwdriver adjustment.

   d. Place the recorder function switch to the "B" position. Adjust the black pen for zero reading on chart paper using upper right screwdriver adjustment.

   e. Place the recorder function switch to "+" position. Adjust the black pen four major divisions to the right using the lower right screwdriver adjustment.

   f. Place the recorder function switch to "-" position. Adjust black pen deflection four major divisions to the left using the lower right screwdriver adjustment.

   g. When MAD is ready for use, place the recorder function switch to the OPR position.

6. The orient check and adjustment will be performed as follows: Place the FUNCTION switch to the OR position and alternately adjust I ORIENT and 0 ORIENT controls for a minimum black pen deflection on RO-32. Signal should not exceed 3 minor divisions peak-to-peak. Lock both ORIENT controls when adjustment is completed.

7. The sensitivity check will be performed by placing the FUNCTION switch through all sensitivity positions, 50 through 1, depressing the γ TEST button on each position. In each case, the primary deflection should be 2.5 ± 0.5 major divisions to the right, from the center position, except the 2.5 (FUNCTION switch) which should read 5.0 ± 0.5 major divisions. High magnetic noise may produce faulty results when this check is made on low-numbered positions (1,2.5 and 5).

Note

If initial pen deflection is to the left, it indicates overcancelling of earth field's balance.

8. If any of these checks fail to produce satisfactory results, except the low-numbered positions carefully repeat check. If checks are still unsatisfactory refer to Troubleshooting Procedures figure 9-11.

MAD OPERATION

Submarine signals usually have a definite character that makes possible the recognition of a valid signal, in some cases even when the magnitude of the signal is the same as that of the background noise.

The type of signal recorded depends upon the magnetic dip angle, the magnetic condition of the submarine, and the headings of the submarine and aircraft. A more detailed treatment of this subject may be found in NAVAIR 00-80T-55, titled Magnetic Airborne Detection Procedures and Techniques.

Rules For Mad Operation

There are several rules for the MAD operator to bear in mind to make identification of contacts easier.

Rule 1. The first peak of a true submarine signal will not break sharply from the center line but will begin gradually.

Rule 2. The duration of a submarine signal will usually not be less than 1 second nor more than 7 seconds for altitudes of 100 to 1,000 feet.

Rule 3. A true submarine contact will never have more than 5 peaks and rarely less than 2.

Rule 4. Under conditions of normal noise level, the trace of the submarine signal will be free from irregularities (very weak signals may waver slightly).

Rules to enable MAD operator to increase probability of target detection:

Rule 1. The MAD equipment will be oriented on every flight. If possible, orient on East or West headings at altitudes and conditions under which the flight is to be conducted. The operator can determine the need for orientation of equipment by noting excessive noise signals on RO-32 recorder tape at low numbered sense positions.

Rule 2. The closer the aircraft to the target, the greater the detection possibility. The ability of the MAD equipment to detect targets is inversely proportional to the cube of the distance. (Generally, detection capability is reduced by a factor of 3 for an increase in altitude of 1.)

Rule 3. The MAD equipment will be operated at maximum sensitivity to increase the possibility of detection. Final determination of excessive noise will be left to the judgement of the MAD operator.

Note

On Position 1, maximum acceptable noise level is two major divisions peak to peak.

Mad Trace

Refer to figure 9-10 for a typical MAD trace and symbols.

EQUIPMENT OPERATION

Use the most sensitive setting consistent with ambient magnetic noise on Recorder RO-32. At the beginning and end of each MAD tape the following information is to be inserted.

1. Confidential.
2. Pilot's name.
3. MAD operator's name.
4. The date and time flight was made.
5. The BuNo of the aircraft.
6. The event number when applicable.

The MAD operator will adjust the equipment, as required, and monitor the MAD trace during all localization phases and as directed by the pilot. The following information will be inserted upon the MAD tape during each contact and periodically when no contacts are indicated.

1. The aircraft's heading.
2. The aircraft's altitude in feet.
3. The time either local or Greenwich Mean Time.
4. The sensitivity setting each time it is changed and as indicated above.
5. Mark trace when Marine Marker is released. In addition to the above, aircraft maneuvers, the use of trim tabs, and actuation of associated equipments which may cause MAD indicators to deflect should be marked on the trace.

The MAD operator will report all MAD contacts to the pilot utilizing the appropriate brevity code. The operator will evaluate the contact as being good, possible or poor. The urgency of reporting MAD contacts requires that it be made promptly even to the point of breaking in on ICS or radio transmissions.

Orientation of the MAD equipment will be made at the beginning of each flight and will be checked at least every thirty minutes or as necessary, during flight.

ALTERNATE MODES OF OPERATION

1. In the event the RO-32 paper is expended and none is available the used paper may be reversed and installed in the recorder.
2. Should the chart drive become inoperative the operator may use the pens deflection as an indication of contact or the cockpit remote indicator may be used for contact indication.

MAD COMPENSATION PROCEDURE

Normally compensating is done by selected qualified squadron members, however, the aircrewman can determine the need for compensation by doing the following:

On-Off Power Status of Equipment Check List

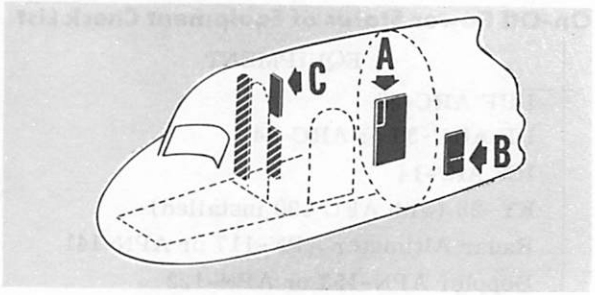
EQUIPMENT	STATUS
UHF ARC-52	ON, Transmit only with MAD operator knowledge
HF ARC-39 or ARC-94	ON, Transmit only with MAD operator knowledge
ICS AIC-14	ON
KY-28 (with AFC 490 installed)	OFF
Radar Altimeter APN-117 or APN-141	ON
Doppler APN-153 or APN-122	ON
UHF ADF ARA-25 or ARA-25A	ON
LF ADF ARN-59	ON
Navigation Plotter ASN-30 (S-2E/G)	ON
NEW Coordinate Data Set ASQ-80 or ASQ-149	ON
T-692/ASA True Airspeed Transducer (S-2E/G)	ON
TACAN ARN-21D or ARN-52	ON, Transmit
Navigation Computer ASA-13A (S-2D)	ON
Marker Beacon ARN-12 or 32	ON
IFF APX-6B (APX-72, with AFC 500 installed)	ON
SIF APA-89	ON
Radar APS-88	STBY, Radar antenna UP
Plotter OA-1768/ASA-13 (S-2D)	A/C CTR, RUN
Sono Receiver ARR-52 or 58, or 75	ON
Jezebel AQA-4(v) (S-2D/E)	STANDBY
NEW DIFAR AQA-7(V) (S-2G)	ON
Julie ASA-26A (S-2D/E)	ON
Julie Target Computer ASA-31 (S-2D)	ON
Sniffer ASR-3 (S-2D/E without AFC 517 incorp.)	ON
ECM ALD-2 or 2B	ON
Searchlight AVQ-2C	STBY
Tape Recorder UNH-6 (S-2D/E without AFC 517 incorp.)	JULIE/ICS
NEW Tape Recorder AQH-5(V) (S-2E/G with AFC 517 incorp.)	STBY (STBY light ON), Fuze Indicator on Transport OUT
Anti-collision lights	ON and rotating
Exterior lights	ON steady (Flasher-coder OFF)
Interior lights	RED ON
Arm Master	ON
Sono Master	OFF
Roll Stab (MF-1)	ON
Compass MF-1	MAG
Windshield Heat	ON, LOW
Prop De-icer	OFF
Wing and Tail De-icer	OFF
Console lights	ON, BRIGHT
AFCS MH-67	STBY
OTPI R-1047A/A	ON
MCJR AKT-19	STBY

Pre-Compensation Check

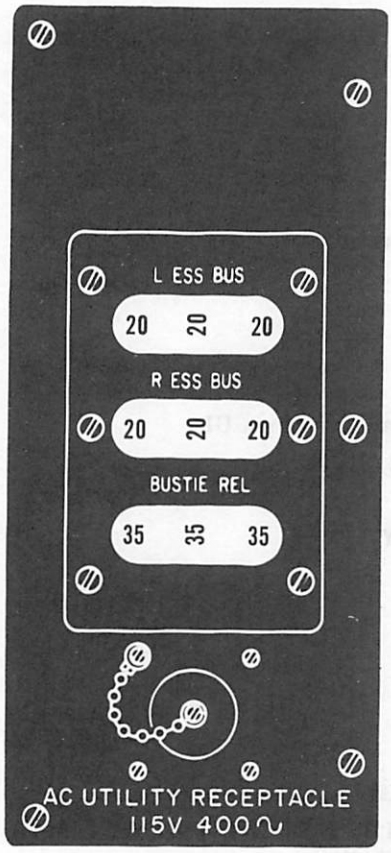
The following steps indicate whether the equipment should be or can be compensated.

1. A magnetically quiet area which may require flying at an altitude of eight to ten thousand feet.
2. Straight and level flight, for optimum results recorder pen deflection should not exceed one minor division peak to peak with Function Control in ORIENT. Re-orient if equipment noise is more than three minor divisions peak to peak.

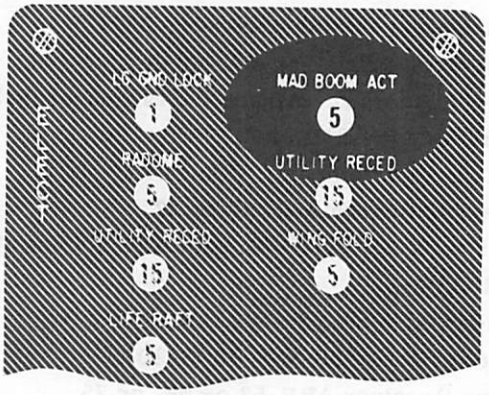
MAD CIRCUIT BREAKERS



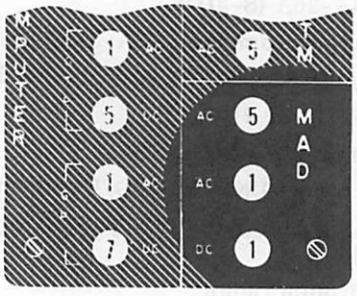
A MAIN DISTRIBUTION PANEL



B DC JUNCTION BOX



C PILOT'S PANEL



A-SAD1-190

Figure 9-8

3. After re-orienting, with FUNCTION switch on 2.5 and level flight, noise should not exceed five minor divisions peak to peak.

4. If equipment noise exceeds limits, and spikes and gain adjust and re-orienting will not correct it, equipment cannot be compensated. Check for equipment fault.

5. With the FUNCTION switch on 2.5 fly a series of three rolls on an East or West heading and three yaws on an East or West heading. When the maneuver noise signal is less than 10 minor divisions peak to peak, the equipment is ready for operation; more requires compensation of the aircraft.

Compensation

The recommended compensation procedure is a relatively simple and effective tune-to-zero method which can normally be completed in less than 1/2 hour. The Permanent Magnet Compensator TS-1391A consists of a small hand held unit that is connected to a test receptacle at the No. 3 operator station (passageway, left-receptacle with cap). Insure that all Avionic equipment is ON that are normally used during ASW operations. The recommended compensation maneuvers are:

1. Continuous ROLLS of plus and minus ten degrees, of seven seconds duration.
2. Continuous YAWS of plus and minus five degrees, of seven seconds duration.

TS-1391A CONTROLS

TS-1391A has a six-position switch labeled PERM MAGNET COMP CONTROL which selects one of the three

MAGNETIC ANOMALY DETECTOR (MAD) AN/ASQ-10

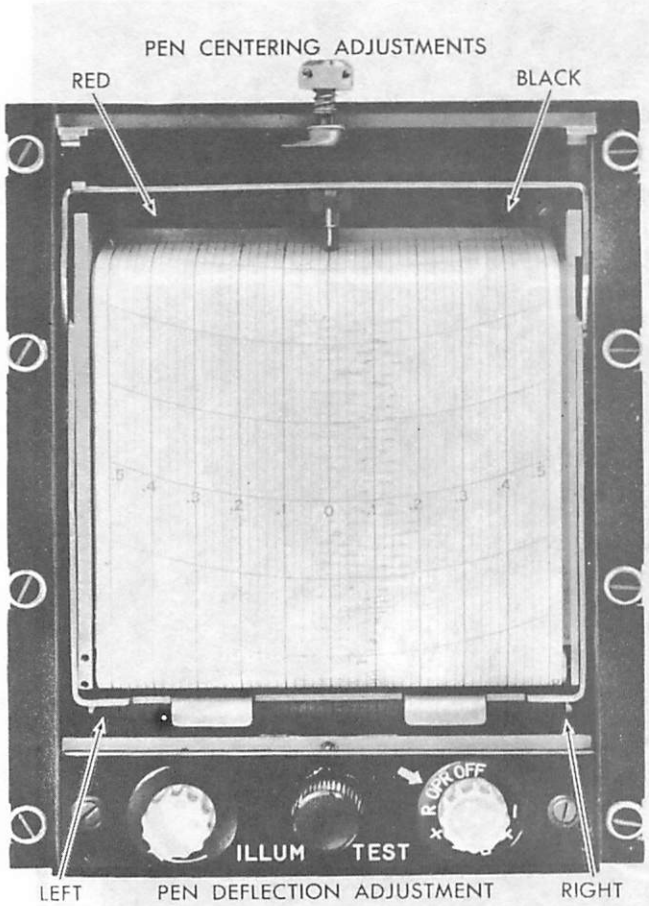
All S-2D aircraft and S-2E Bu No. 149257 thru 152355 not incorporating AFC No. 425

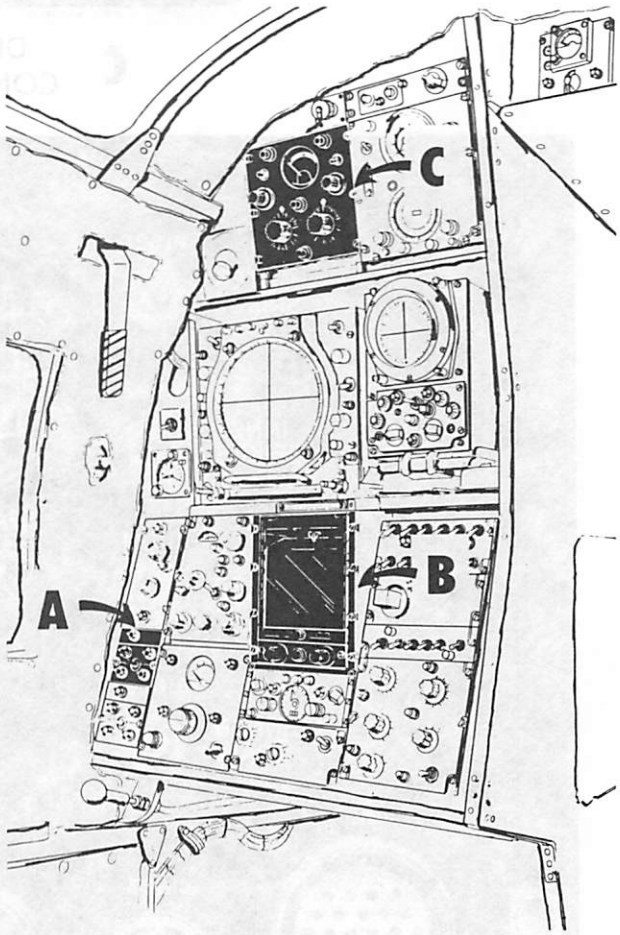


Bu No. 151673, 152356 and subsequent and all S-2E aircraft incorporating AFC No. 425



A MAD BOOM SWITCH AND INDICATOR LIGHTS

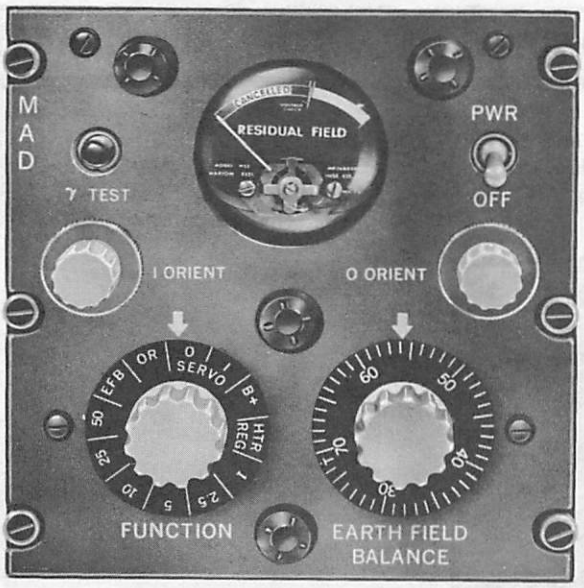




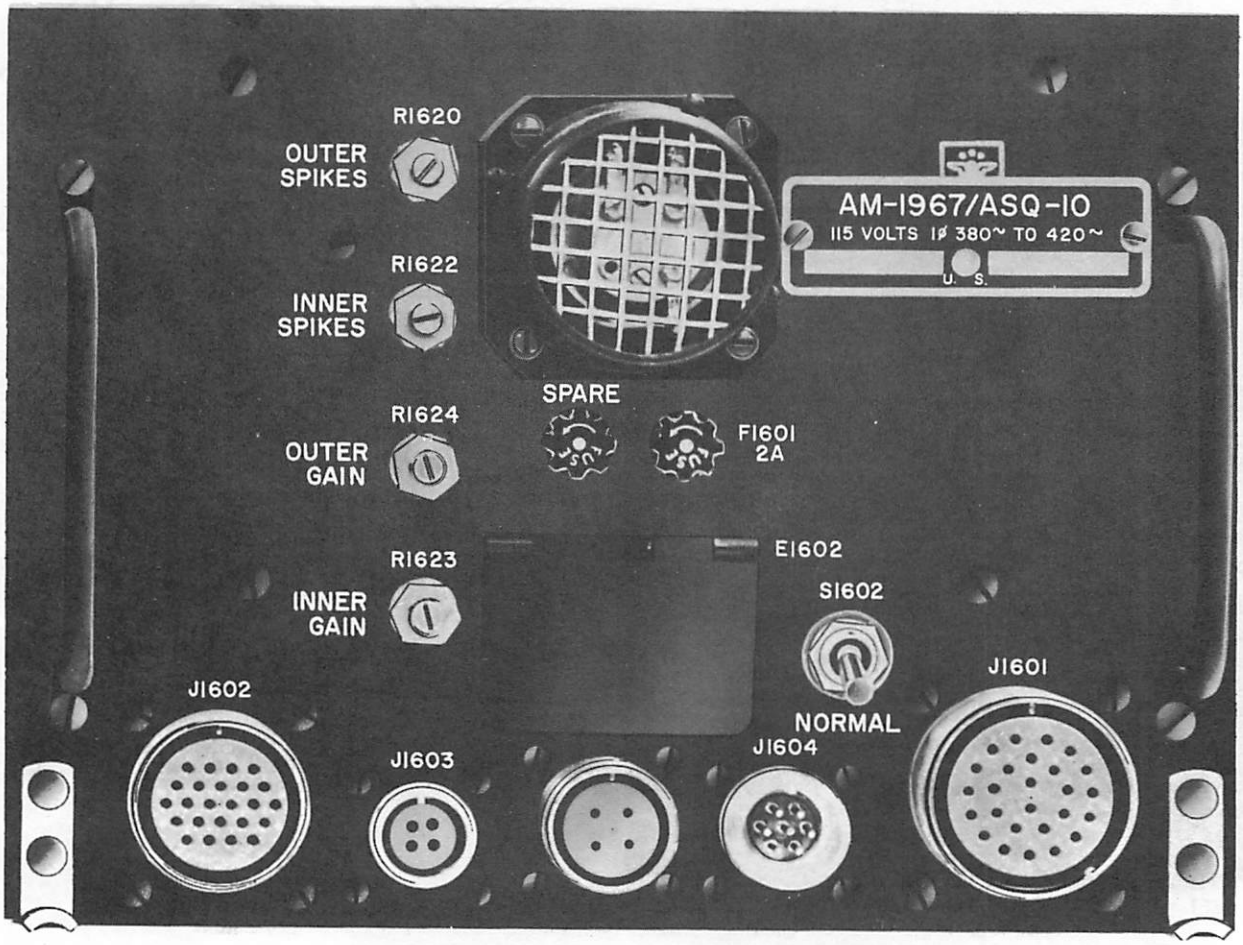
B MAGNETIC DISTORTION RECORDER

B-SAD1-145-1

Figure 9-9 (Sheet 1)



C DETECTING SET CONTROL ASQ-10



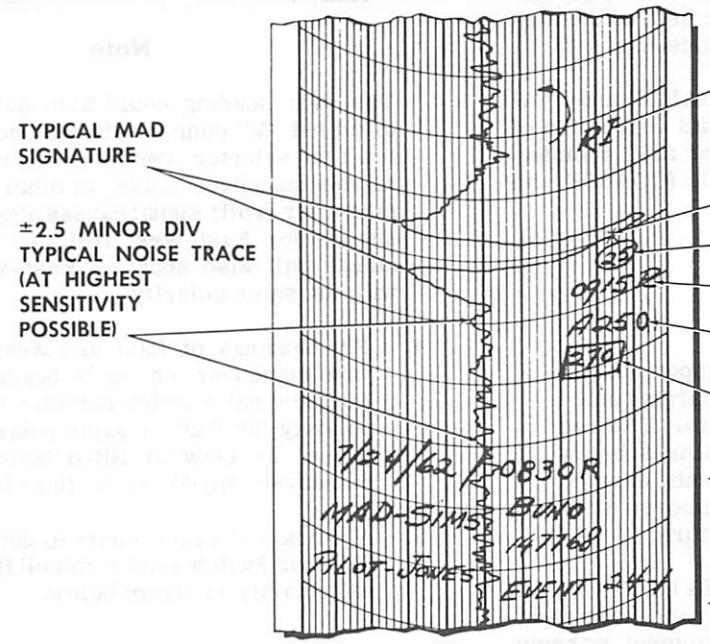
AMPLIFIER ASQ-10, FRONT PANEL

Location: Behind 3rd operators seat

B-SAD1-145-2

Figure 9-9 (Sheet 2)

TYPICAL MAD TRACE AND SYMBOLS



MAD TAPE SYMBOLS (OPERATION)

320	Aircraft magnetic heading. The square can be use to denote heading and the actual angular value can be entered. For cardinal heading, the letter N, E, S, or W may be placed in the square.
(5)	Sensitivity setting. The circle indicates sensitivity and the actual setting can be indicated by the numerical value inserted.
1327Z	TIME: The time should be indicated local or Zulu.
γ	GAMMA Test Signal: The GAMMA indicates the test signal.
	TURN: The direction of the turn and the angular change in heading can be indicated by a circular arrow. The examples show a 90, 180, and 270 degree turn to port.
160K	Airspeed in knots.
A250	Altitude. The altitude can be indicated by the letter A and the actual value in feet units by the number following. The example shows altitude 250 feet.
	Yaw maneuvers. To indicate a series of yaw maneuvers this symbol can be marked on the chart just prior to commencing the maneuver group.
	Roll maneuvers. To indicate a series of roll maneuvers this symbol can be marked on the chart just prior to commencing the maneuver group.
	Pitch maneuvers. To indicate a series of pitch maneuvers this symbol can be marked on the chart just prior to commencing the maneuver group.
RI RO	Roll maneuver.—To indicate Roll IN (RI) and Roll Out (RO) aircraft maneuver.
(15)	Indicates 1500 yd MAD Trapping circle. Arrow indicates direction of turn. (Number will change with turn diameter)
L	Longitudinal Change
T	Transverse Change
V	Vertical
HI	Hi Charge Button
LO	Lo Charge Button
=	Straight and level flight

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Figure 9-10

permanent magnet coils (Vertical, Transverse, or Longitudinal) and also selects the polarity of the pulse. The six position switch is labeled -V, +V, -T, +T, -L, +L. The letters correspond to Vertical, Transverse and Longitudinal indicating the field of the aircraft affected by the compensating procedure.

Two pushbuttons are labeled HIGH CHARGE and LOW CHARGE. The HIGH is used for initial correction of high amplitude noise and the LOW for final compensation of the maneuver noise signal. (COARSE and FINE adjustments.)

CAUTION

The TS-1391A Compensator is equipped with an electrolytic capacitor for pulse charging of the compensator magnets. This capacitor, if stored for extended periods at temperatures below freezing, may become inoperative until warmed up. The Compensator must be removed after use and stored at normal temperature.

Signal polarity is Positive PEN DEFLECTION TO RIGHT for right wing down on roll, and nose right on yaw maneuvers. After initial equipment warmup and pre-compensation check, the highest usable sensitivity setting should result in less than two major divisions peak to peak of noise level.

Note

If large maneuver noise signals are initially evidenced, use the following procedures substituting the HIGH CHARGE pushbutton until sufficient reduction of signals to complete compensation with the LOW CHARGE pushbutton.

1. Fly headings of North and South and execute a series of ±10° rolls on each heading. Note the polarity of signal with right wing down. Set the selector switch to "T" (Traverse) of opposite polarity of signal read. Momentarily press and release the HIGH or LOW charge buttons to reduce the maneuver noise signal to essentially zero. (If signal is large use HIGH CHARGE; if signal is small use LOW CHARGE).

Note

If the signal becomes reversed by just a small amount, an extra click may be required to increase this reversed signal. The function switch is then placed in the opposite polarity position and low charge button momentarily pressed to bring the signal to zero. For the transverse adjustment one heading either North or South should be sufficient.

2. Fly headings of East and West and execute a series of ±10° rolls on each heading. Set the function selector switch to "V" of opposite polarity to maneuver noise signal noted. Momentary press and release of the HIGH or LOW buttons to reduce the roll signal to zero as in step 1 above.

3. After completing step 2 reverse heading and complete a series of ±10° rolls to recheck that "V" & "T" compensation is within allowable limits.

Note

The west heading could also have been used to adjust "V" compensation by setting the "V" function selector switch to the same polarity as the maneuver noise. In other words a "V" maneuver (roll) signal causes opposite polarity signals for East-West roll. A "T" maneuver signal will also show on East-West roll but with the same polarity.

4. Fly headings of East and West and execute ±5° yaw maneuver on each heading. Set the "L" Longitudinal function selector switch to opposite polarity for East or same polarity for West and press the LOW or HIGH button to reduce the maneuver signal as in the above paragraphs.

5. A quick reference chart to determine Function Selector Switch setting to null the maneuver signal polarity is shown below.

+L	-L	+T	-T	+V	-V
-Yaw	+Yaw	-N Roll	+N Roll		
		-S Roll	+S Roll		
		-E Roll	+E Roll	-E Roll	+E Roll
		+W Roll	+E Roll	+W Roll	-W Roll

6. Summarizing the above procedure:

   a. N or S Roll; compensate T

   b. E or W Roll; compensate V

   c. E or W Yaw; compensate L

7. The compensation maneuvers recommended are those that will give best results at locations with magnetic dip angles of 30 to 70 degrees.

Crewman's Mad Tape Evaluation Instruction

1. Practice maneuvers must be accomplished prior to starting analysis of evaluation tape.

2. Flight should be made over a magnetically quiet area which may require an altitude of at least 8,000 ft.

3. Tapes should be of minimum length and contain only the required information.

4. MAD noise level should not exceed five minor divisions peak to peak on a straight and level flight with FUNCTION switch on 2.5. Two minor divisions peak to peak or less of recorded signal is optimum.

Note

Do not change position of FUNCTION switch while making test tape.

5. All maneuvers, test signals, headings, altitudes, etc. are to be noted on tape using the symbols shown in figure 9-10.

6. Insure that all Avionic equipment is ON that is normally used in an ASW operation.

7. The following flight maneuvers are required for the equipment evaluation.

   a. Fly straight and level on any heading for four minutes minimum and insert four Gamma test signals at regular intervals.

   b. Fly the aircraft on a North or South heading, hold on course within 2 degrees and perform six rolls of plus and minus 10 degrees at seven second intervals. Indicate rolls by ⊖.

   c. Fly straight and level for fifteen seconds. Indicate by =.

   d. On same heading, perform six yaws of plus or minus five degrees at 7 to 10 second intervals. Indicate yaws by +.

   e. Upon completion of this maneuver change heading to East or West. Perform same maneuvers as outlined in steps b, c, and d.

   f. While changing heading to East or West, stop the recorder chart paper. Mark chart paper as indicated in steps b, c, and d.

   g. The next maneuver will be a 720 degree standard rate turn. The operator will mark the MAD paper as the aircraft passes through each cardinal heading.

   h. Insert the following information on Mad paper.

      (1) Altitude

      (2) Sense

      (3) Tape Speed

      (4) Model A/C - BuNo.

      (5) Date

      (6) Pilot

      (7) MAD operator

DEENERGIZING EQUIPMENT

1. Place the RO-32 TEST control to the OFF position if AN/ASR-3 equipment is not in operation. (S-2D/E aircraft without AFC 517 incorp.). NEW

2. Place FUNCTION control switch to HTR REG position.

3. Request permission to bring in the MAD boom. Example: "Pilot, Number three requests permission to bring in the MAD boom". When permission is granted, start elapsed time clock push boom switch to the "IN" position and report "Boom coming in." When the boom "IN" light illuminates, report "Boom indicates in" and give elapsed time in seconds. Time should be 13 ± 3 seconds.

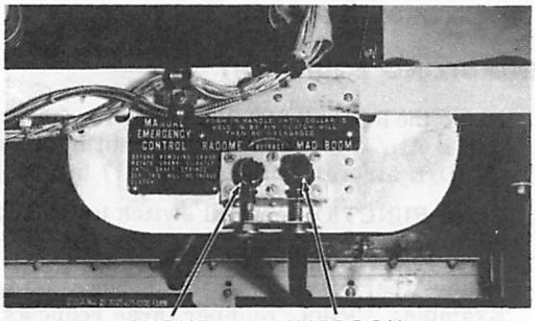
4. After completion of the landing and taxiing, place the power switch to the OFF position.

5. Remove the chart paper from the recorder for post flight evaluation.

TROUBLESHOOTING

For the MAD troubleshooting procedures, refer to figure 9-11.

MAD TROUBLESHOOTING

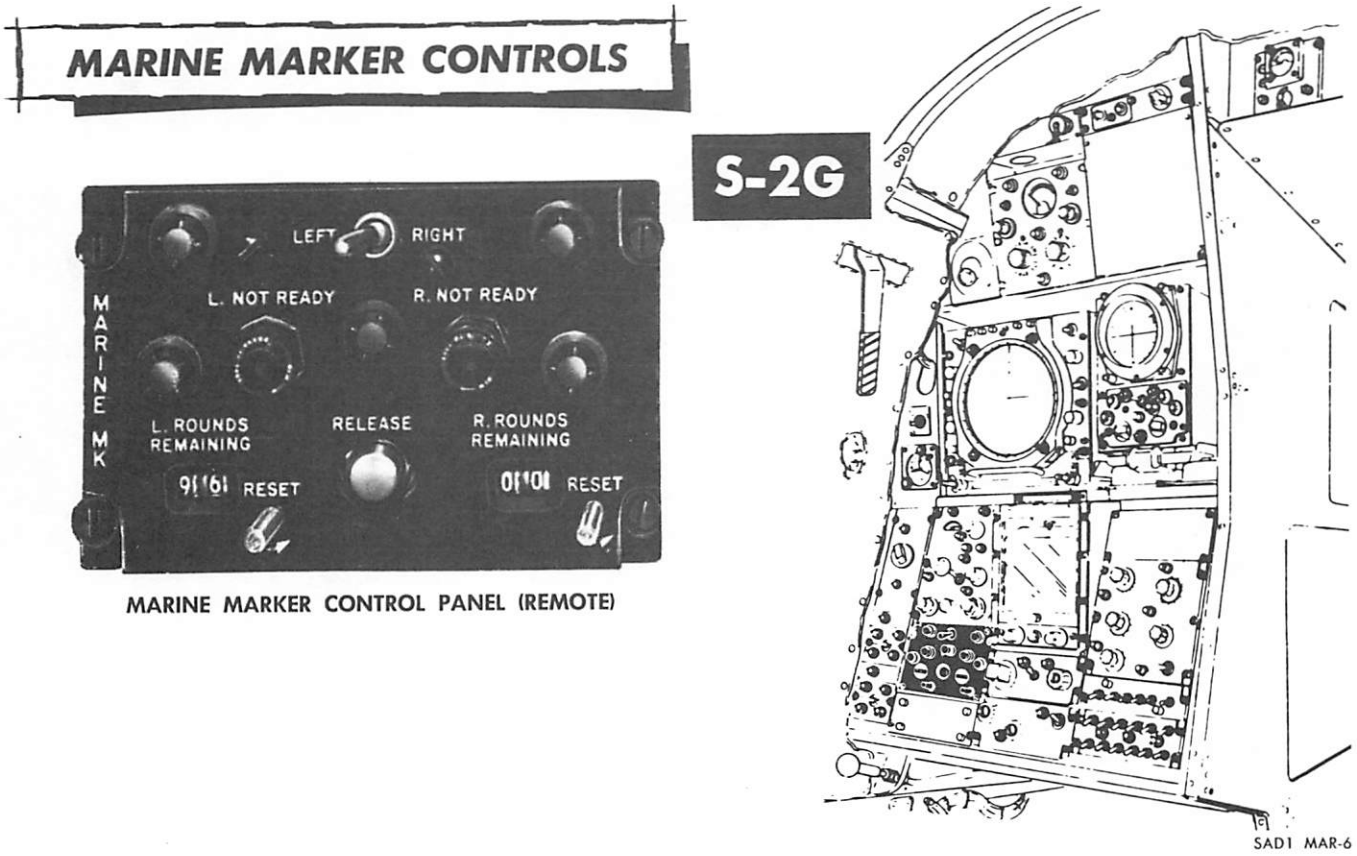
INDICATIONS	POSSIBLE REMEDY
1. NO POWER TO EQUIPMENT.	Check 115 V AC 2 AMP fuse F-1601 on AM 1967 located behind the number 3 operator's seat. Check the two AC and one DC circuit breaker located behind the Pilot's seat.
2. MAD BOOM INOPERATIVE.  RADOME MADBOOM	Check MAD boom circuit breaker located in the electronics compartment. **NOTE** Switch to extend MAD Boom is a spring loaded switch and must be held in the OUT position until the BOOM light indicates OUT. **WARNING** To avoid injury, if MAD Boom is to be operated manually, pull MAD Boom circuit breaker.
3. RO-32 CHART DRIVE INOPERATIVE.	Check fuses in RO-32 located under chart drive.
4. RO-32 CHART PAPER JAMMED OR EXPENDED.	Remove chart drive by lifting cover and pulling handle forward. To load paper follow diagram etched on side of chart drive. To clear jam, tear off roll and reload.
5. FAULTY OR INTERMITTENT OPERATION.	Check cable connectors on front of Amplifier AM-1967.
6. NOISY OPERATION (EXCESSIVE PEN WANDER).	Check pen gains. See PRE-COMPENSATING CHECK in this section. **NOTE** Compensate only if excessive noise is noted during aircraft maneuvers.
7. NOISY OPERATION (PEN JITTER).	Check attenuation, MAD boom extension, orientation, pen gains.
8. EITHER PEN DOES NOT WRITE.	Press down on pen and move to start ink flow. Replace pen.

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Figure 9-11

MARINE MARKER RELEASE SYSTEM (S-2G)

Controls for the S-2G marine marker release system are situated on a remote control panel at the Number 3 operator's console. (See figure 9-2, Sheet 3.) For information describing the control panel, refer to MARINE MARKER RELEASE SYSTEM CONTROLS in Section IX, Number 4 Operator's Equipment.



MARINE MARKER CONTROL PANEL (REMOTE)

Figure 9-11A

SUBMARINE DETECTING SET AN/ASR-3

NEW

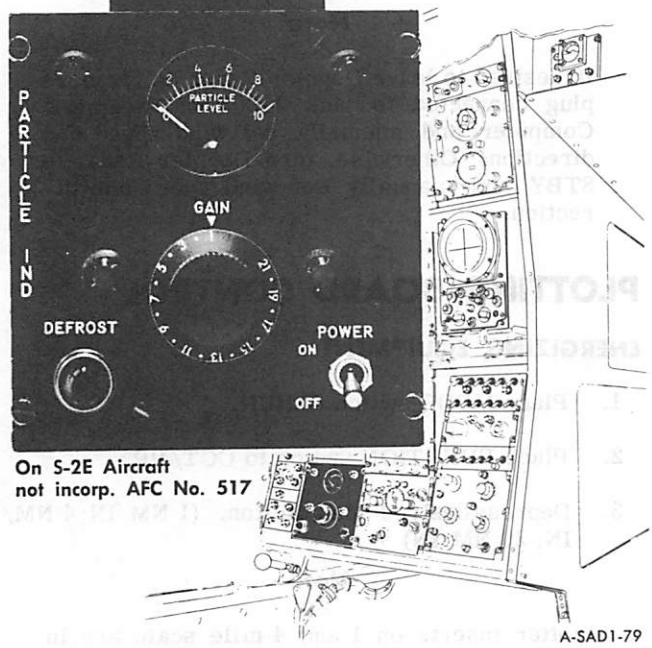
Submarine Detecting Set AN/ASR-3 (figure 9-12) (S-2D/E without AFC 517 incorp.) is passive search equipment used to detect submarine exhaust trails. An audible signal warns the Number 3 operator, pilot, and co-pilot of any detected trails. A particle level indicator is located on the pilot's side of the main instrument panel and on the Number 3 operator's control console. Provision is made to mark trails on Ground Track Plotter ASA-13A or Tactical Display Unit PT-437/ASN-30.

ENERGIZING EQUIPMENT

1. Check that GAIN control on Detecting Set Control ASR-3 is at position 1.
2. Set POWER switch on Detecting Set Control ASR-3 to ON.
3. Adjust GAIN control until PARTICLE LEVEL meter indicates 1/3 scale.

SUBMARINE DETECTING SET AN/ASR-3

S-2D/E



On S-2E Aircraft not incorp. AFC No. 517

Figure 9-12

Note

Under foggy, smoky or dusty conditions, particle level meter may read higher than 1/3 scale at GAIN setting of 1. Equipment is totally energized when PARTICLE LEVEL meters show indication. If ambient temperature is above 7°C (45°F), equipment energizes in 15 to 45 seconds. If ambient temperature is less than 7°C (45°F) equipment energizes in less than 20 minutes. At this time, red DEFROST light will be lit. Proper indications cannot be obtained until DEFROST light goes out. After DEFROST light goes out allow 1 minute for warm-up period.

4. Energize RO-32/ASQ TEST control and observe red pen deflection.
5. Set pen as directed in AN/ASQ-10 In-Flight Adjustments paragraph, this section.

OPERATING INSTRUCTIONS

1. Operate at lowest gain setting which gives a meter deflection of 1/3 full scale. Any abnormal variation in condensation nuclei content of the atmosphere will be indicated by a marked variation in the PARTICLE LEVEL meters. This feature will be used to determine nuclei condensation layers.
2. Layer determination can be found by having the pilot start climbing from minimum safe altitude. The pilot will inform the crewmember when climb is begun. The Number 3 operator will mark the trace as pilot reports passing each hundred feet. Example reports: "Number Three, pilot commencing climb from three hundred feet" and "Passing four hundred" etc. During this climb if a layer is present, the entry will be indicated by the RED pen on RO-32/ASQ deflecting to the right and a similar movement of Particle Level meters will occur. As the climb continues out of the layer, the red pen will deflect back to the left. Pilot should then place aircraft at optimum search altitude in accordance with Carrier Air ASW Tactical Reference Manual.
3. The operator shall report any deflections of the pen to the right, to the pilot. Example: "Pilot, Number three, in trail." As the aircraft passes through the trail the red pen and PARTICLE LEVEL meter will deflect back to the left. Example: "Pilot, Number three, out of the trail."

DEENERGIZING EQUIPMENT

1. Place GAIN control to position 1.
2. Place POWER switch OFF.
3. Place RO-32/ASQ TEST control to OFF.

TROUBLESHOOTING

1. No power to equipment.
   a. Check circuit breaker behind pilot's seat.
   b. Check circuit breaker on main distribution panel in electronics compartment.
2. Red DEFROST light on.
   a. Wait for heaters to bring system up to operating temperatures, lights will then go out.
3. No red pen operation on RO-32/ASQ.
   a. Refer to ASQ-10 troubleshooting procedures (figure 9-11).

NAVIGATION COMPUTER AN/ASA-13

ENERGIZING EQUIPMENT

Refer to figure 9-13 for Navigation Computer and Plotting Board Controls.

1. Place POWER-OFF switch on CP-381 to the POWER position. Allow 15 minutes warm-up.
2. Align zero on VARIATION dial with pointer.

3. Set WIND DIRECTION to 000 degrees.
4. Set WIND SPEED to 0 knots.

Note

Operator can manually insert wind speed and direction only when DOPPLER is in STBY and inputs are not being received.

OPERATION

1. When doppler signal is not being received set in wind direction and velocity as directed by the pilot.
2. When doppler signals are being received monitor WIND readout dial and record reading on MEM light cover with pencil. (See figure 9-14.)

Note

With MF-1 Roll-Stab switch ON, the Memory Light will illuminate when aircraft banks in excess of 6 degrees. Also Memory Light will illuminate if Doppler System goes into memory operation.

3. Suggestions for Optimum ASA-13 Operation:
   a. If doppler signals are not being received: update WIND information every 1/2 hour by FLYING MANEUVERS over a fixed point.
   b. When variation is set in the AN/ASA-13, the radar presentation becomes a TRUE plot and all bearing information is TRUE. The Plotting Board "crab" will track TRUE and indicate (point) MAGNETIC.

ALTERNATE MODES OF OPERATION

If Doppler Radar AN/APN-122 is inoperative, manually set in known wind direction and velocity.

DEENERGIZING EQUIPMENT

Place Power switch to OFF

TROUBLESHOOTING

1. No power to equipment, GTP-4 crab not moving.
   a. Check circuit breakers behind pilots seat.
   b. Check fuses on front of AM-1234B. (Spare fuses located on front of AM-1234B, port side of passageway, forward of Number 3 operator's console.)
   c. Check the Main Circuit breakers ON.
2. GTP-4 crab not referencing ground track.
   a. Check TAS dial (front of AM-1234B). Above 100 knots this should correlate with pilot and co-pilot IAS indicators.
   b. Set variation on ASA-13 to 0.
3. Navigation Computer CP-381 ASA-13 does not indicate normally with Doppler radar inputs.
   a. Check fuses in Navigation Computer and AM-1234B/ASA-13.
4. GTP-4 crab not illuminated.
   a. Check fuses in plotter bezel.

Note

If desired to leave Doppler Radar on, remove plug connected to jack J1003 on Navigation Computer and manually set wind speed and direction. Otherwise, turn Doppler Radar to STBY and manually set wind speed and direction.

PLOTTING BOARD CONTROL

ENERGIZING EQUIPMENT

1. Place MODE switch to RUN.
2. Place FUNCTION switch to OCT/PP.
3. Depress desired scale button. (1 NM/IN; 4 NM/IN; 20 NM/IN)

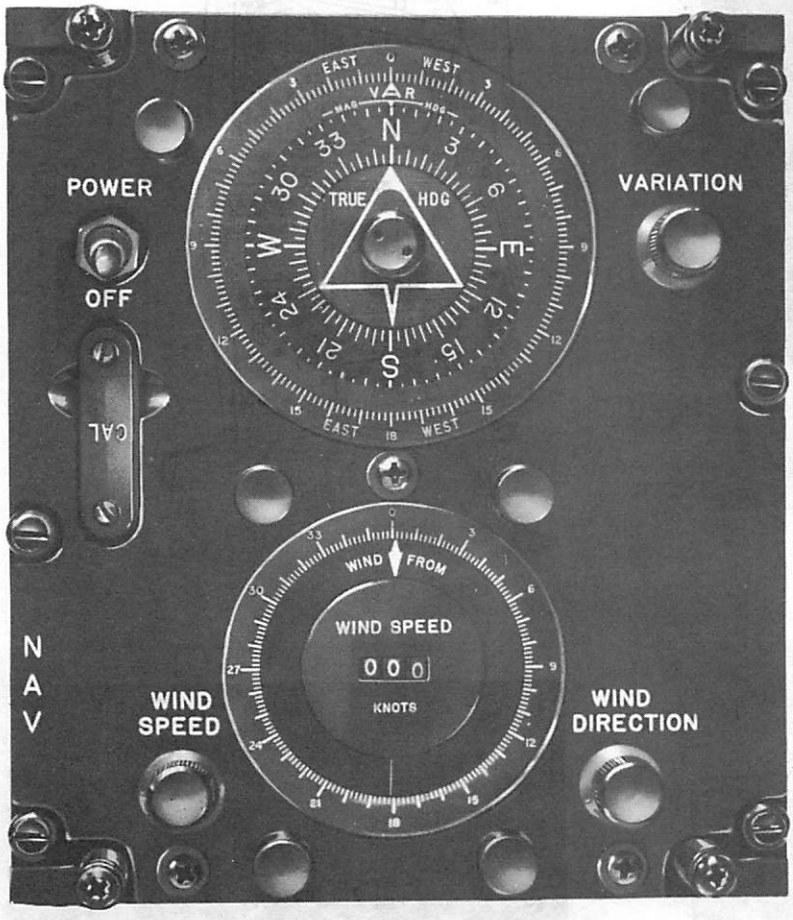
Note

Plotter inserts on 1 and 4 mile scale are in hundreds of yards as indicated on range counter dial. Plotter inserts on 20 mile scale are in miles. The Number 3 Operator may transmit target information to the plotter ONLY when PLTR switch on the programmer is in the RMT OPR position. (See figure 8-1.)

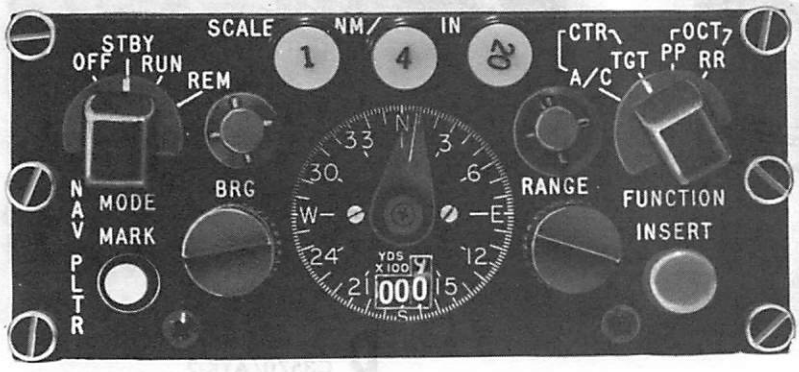
CALIBRATION CHECK

1. Set RANGE dial to 6000 yards.
2. Depress 1 NM/IN scale pushbutton. It will light.
3. Set bearing dial to 000 degrees using BRG control.
4. Place FUNCTION switch to AC/CTR position.
5. Depress INSERT button. Plotter crab will now be at center of plotter board ±1/16 inch.
6. Place FUNCTION switch to OCT/PP position.
7. Depress INSERT button. Plotter crab will move to third bezel mark North, mark a circle and return to the center of plotter. Circle must touch or encircle bezel mark.
8. Repeat steps (4) through (7) with bearing dial settings of 90 degrees, 180 degrees and 270 degrees.
9. Repeat steps (3) through (8) with the 4NM/IN SCALE selected and a range of 24,000 yards.

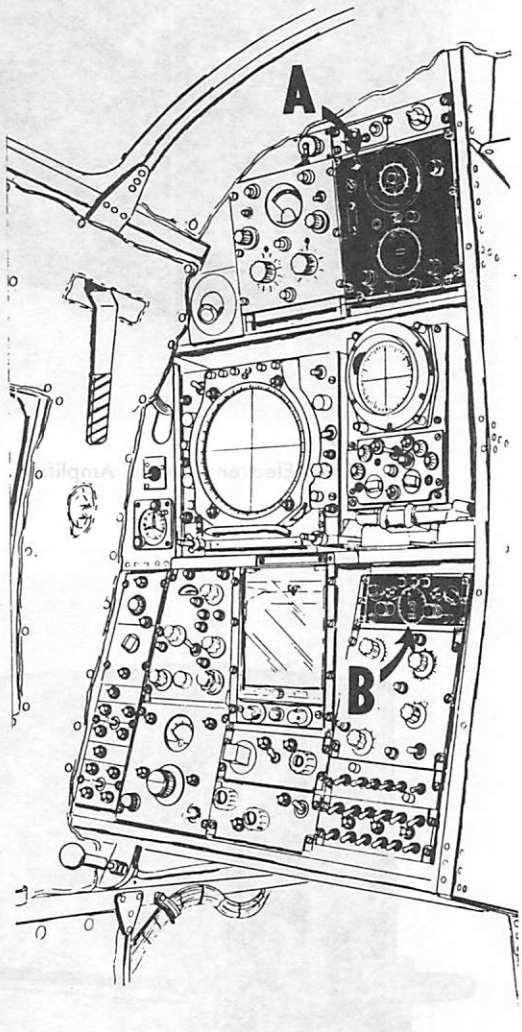
NAVIGATION COMPUTER AND PLOTTING BOARD CONTROL



A Navigation Computer ASA-13A

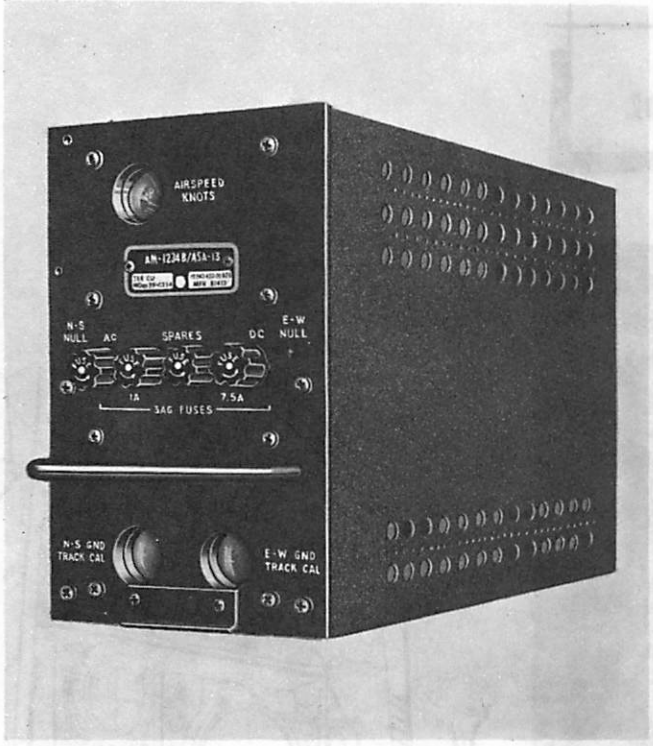


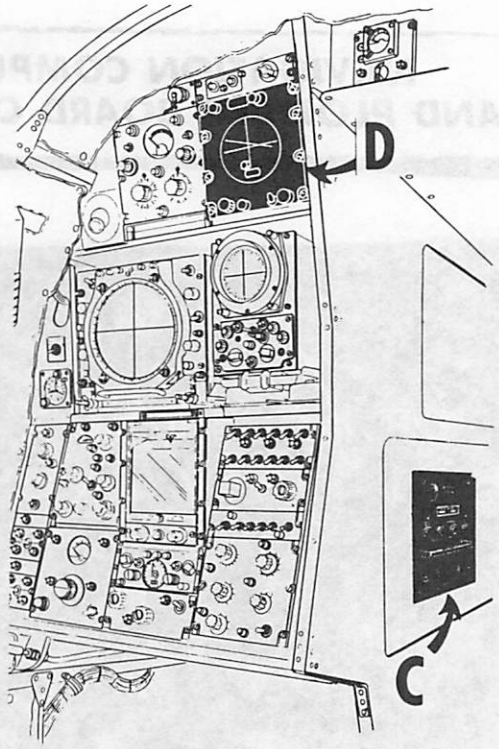
B Plotting Board Control ASA-13 (Remote)



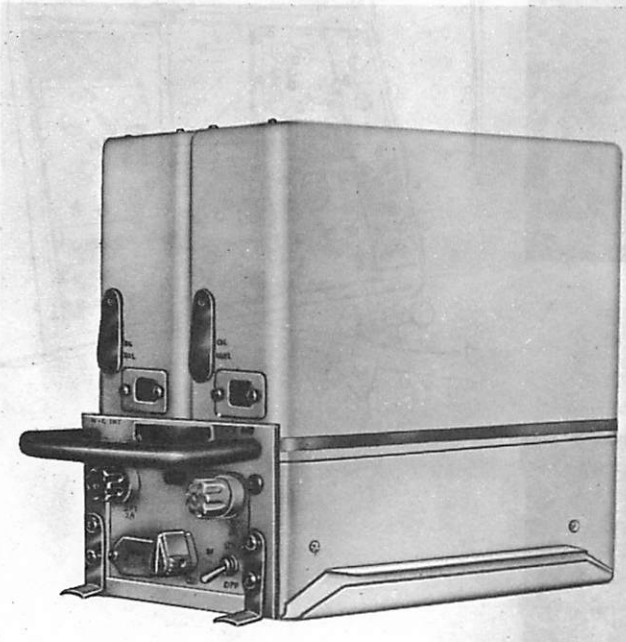
A-SAD1-152-1

Figure 9-13 (Sheet 1)

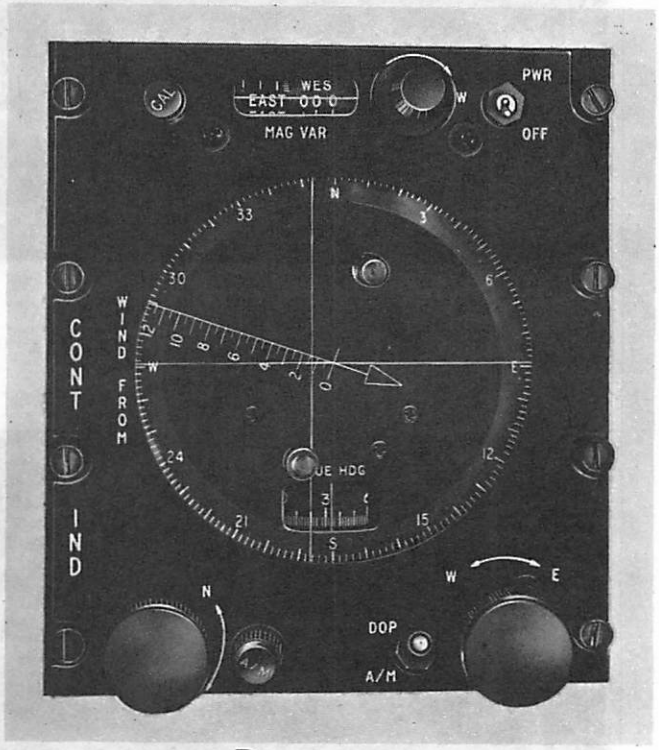




C Electronic Control Amplifier



C CP592/AYK-2



D C3570/AYK-2

B-SAD1-152-2

Figure 9-13 (Sheet 2)

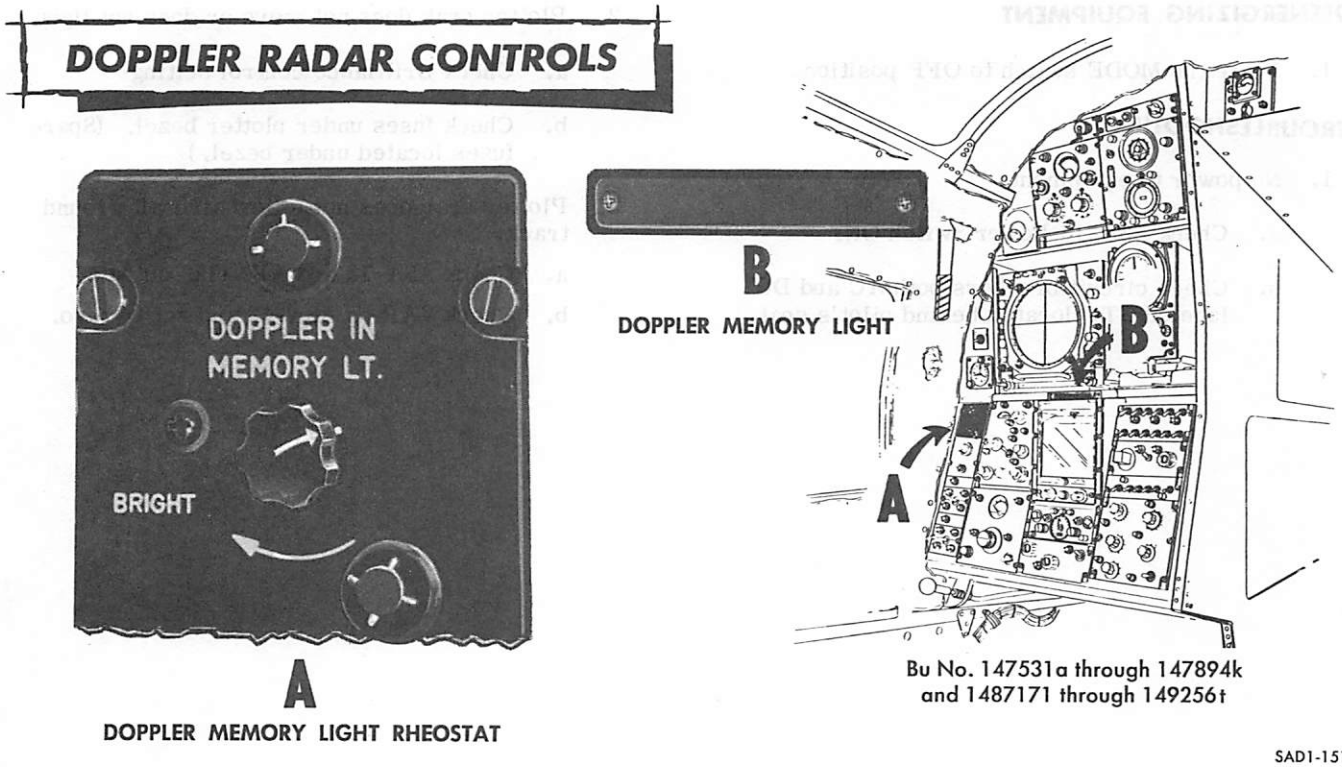


Figure 9-14

OPERATION

Note

Do not change scales unless directed by co-pilot.

Radar Targets

1. Set MODE switch to RUN.
2. Set RANGE counter to target range.
3. Set BEARING dial to target bearing.
4. Place Function Knob to OCT/PP (off course target-present position).
5. Press INSERT button. It will light. Crab on plotter will leave aircraft ground track, move to inserted target location, mark a circle, and return to ground track. Co-pilots TARGET button on C-2403 will light. When co-pilot depresses TARGET button, it will extinguish and lighted C-2404 INS button will go out.
6. Place MODE switch to REM to give control back to co-pilot.

Marking Contacts

A MAD or ASR target may be marked on the plotter by depressing the MARK button.

ECM Targets

1. Set MODE switch to RUN; co-pilots PLTR switch to RMT OPR.
2. Set BEARING dial to bearing of ECM contact.

Note

Operator must convert ECM Relative bearing to a MAGNETIC bearing before inserting.

3. Set RANGE counter to a range which will place marked target near plotter edge.

CAUTION

Information inserted at ranges which cause crab to go to limits, will not be marked and may cause erroneous ground track.

4. Depress MARK button.
5. Depress INSERT button.
6. Co-pilot may now draw a bearing line on plotter face with grease pencil from aircraft position to inserted ECM contact.

DEENERGIZING EQUIPMENT

1. Place the MODE switch to OFF position.

TROUBLESHOOTING

1. No power to equipment.
   a. Check ASA-13 Power Switch ON.
   b. Check circuit breakers both AC and DC labeled GTP located behind pilot's seat.
2. Plotter crab does not move or does not light.
   a. Check Brilliance control setting.
   b. Check fuses under plotter bezel. (Spare fuses located under bezel.)
3. Plotter crab does not follow aircraft ground track.
   a. Check ASA-13 and APN-122 outputs.
   b. Check VAR on ASA-13 and set to zero.

NUMBER 4 OPERATORS EQUIPMENT

REFER TO SUPPLEMENTAL NATOPS FLIGHT MANUAL, NAVAIR 01-85SAD-1A FOR INFORMATION ON THE FOLLOWING EQUIPMENT:

Jezebel Indicator Group

Sonobuoy Receiving Set

Multi-Channel Jezebel Relay System (MCJR)

Recorder Group

Target Position Computer

Navigational Computer Display Set AN/ASN-30

NEW **Sonar Computer-Recorder Group (DIFAR) AN/AQA-7(V)**

NUMBER 4 OPERATOR'S CONSOLE

Refer to figure 9-15 for the Number 4 operator's consoles.

NEW SOUND RECORDER AN/UNH-6

(S-2D/E WITHOUT APC 517 INCORP.)

CONTROLS AND INDICATORS

See Figure 9-16.

Record-Standby Switch

Two RECORD-STBY switches are provided in the aircraft. One switch is located on the Number 4 operator's RECORDER control panel and the other is located on the pilot's instrument panel. Power is applied to the recorder when the function switch on the RECORDER panel is placed in any position except OFF. The recorder is now in Standby position.

Channel Selector Switch

The CHANNEL SELECTOR switch, located on the RO-28 Sound Recorder selects channel A or B for monitoring by the RECORDING LEVEL meter of the dual-channel sound recorder. See figure 9-16.

Function Selector Switch

The function selector switch located on the Number 4 operator's RECORDER control panel is placarded OFF - JULIE/ICS - JEZ/AB - JEZ/CD - JEZ/BD. The switch controls power input to the recorder and operates the recorder in conjunction with JULIE and ICS systems. Power is not applied to the recorder when the function switch is in the OFF position. The recorder is placed in Standby when the function switch is placed in JULIE/ICS or any of the other positions.

Julie Override Pushbutton

The JULIE OVERRIDE pushbutton is located on the RECORDER panel on the Number 4 operator's console. The override pushbutton is used only during calibration of Recorder ASA-26. It prevents the Sound Recorder AN/UNH-6 from operating during Recorder ASA-26 calibration. When the pushbutton is depressed the sound recorder is disconnected from Recorder ASA-26, and a light goes on inside the pushbutton. Depressing the pushbutton a second time causes the light to extinguish and reconnects the sound recorder to Recorder ASA-26.

Transport On Indicator

The TRANSPORT ON indicator is located on the RECORDER control panel on the Number 4 operator's console. The light goes on when the tape transport is operative.

5 Minute Reel End Warning Indicator

The 5 MIN REEL END WARN indicator is located on the Recorder control panel on the Number 4 operator's console. The light goes on when the tape has approximately 5 minutes running time remaining and extinguishes when the tape is depleted.

ENERGIZING EQUIPMENT

Note

Check the condition of tape on reels in the UNH-6 Recorder.

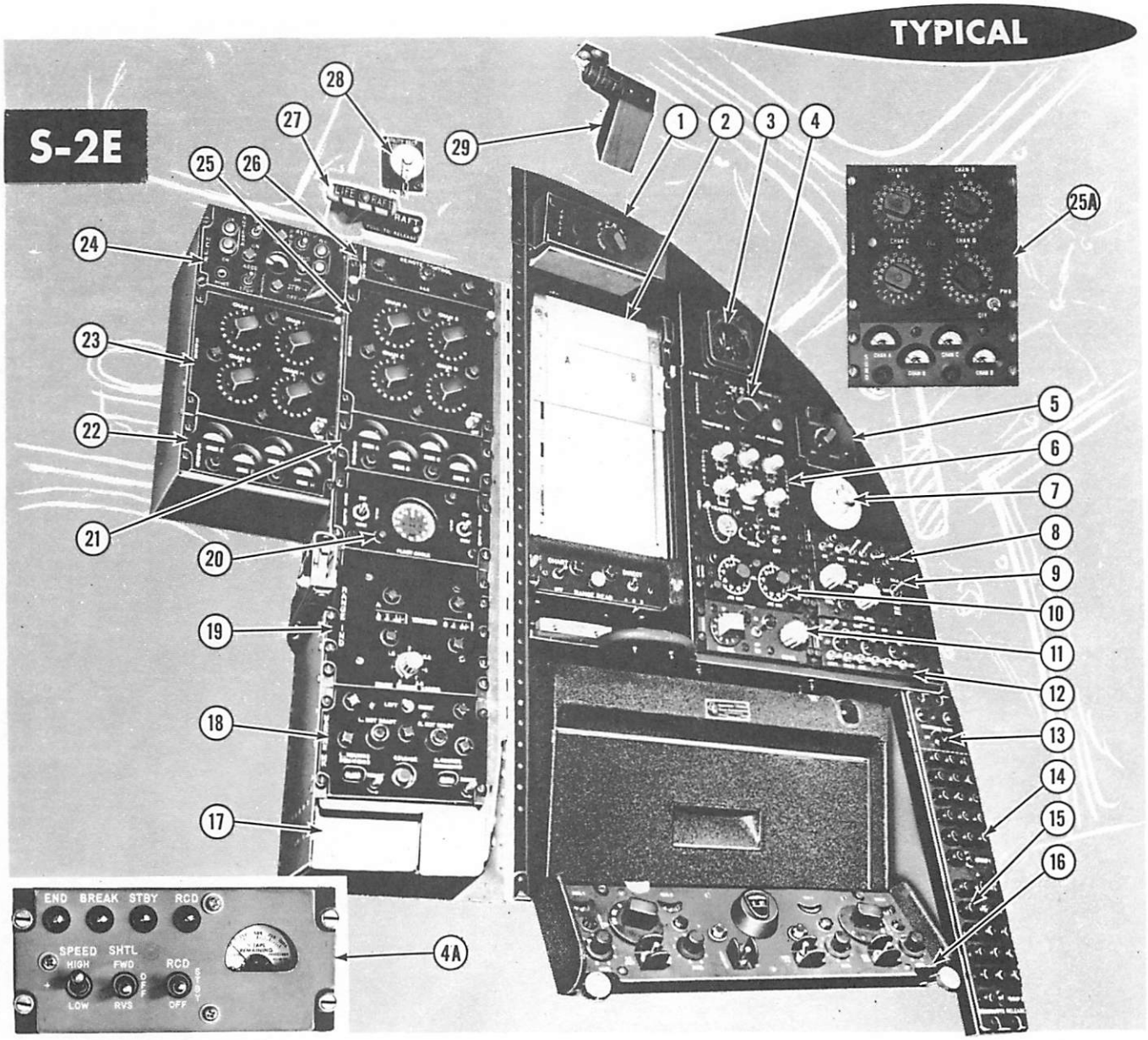
1. Place the POWER ON-OFF switch on the UNH-6 to the OFF position.
2. Place the RECORD-STANDBY switch on the UNH-6 to the STANDBY position.
3. Place power switch to POWER, wait 20 seconds, then turn the RECORD - STANDBY switch to RECORD and observe the tape movement.
4. Turn CHANNEL SELECTOR to CHANNEL "A" and check the RECORDING LEVEL for an average reading of zero.
5. If indications are incorrect set "A" adjustment for the correct reading.
6. Repeat steps 1. through 3. for CHANNEL B.
7. Place power switch to OFF.
8. Place the RECORD-STANDBY switch on the Number 4 operator's RECORDER control panel to STANDBY.
9. Check the pilot's RECORD-STANDBY switch in the STANDBY position.



1. COMPUTER CONTROL ASA-31
2. JULIE RECORDER ASA-26
3. ELAPSED TIME CLOCK
4. RECORDER CONTROL UNH-6
5. JULIE SELECTOR CONTROL
6. CONSOLE LIGHTS CONTROL
7. JULIE RECORDER CONTROL ASA-26
8. HEATING AND VENTILATING CONTROL
9. ICS SELECTOR PANEL AIC-14
10. TRANSMITTER SELECTOR PANEL AIC-14
11. RECEIVER SELECTOR PANEL AIC-14
12. INTERPHONE CONTROL PANEL AIC-14
13. JULIE RECORDER ILLUMINATION SWITCH
14. GROUP I SONOBUOY RELEASE INDICATOR LIGHTS
15. GROUP II SONOBUOY RELEASE INDICATOR LIGHTS
16. JEZEBEL SIGNAL DATA RECORDER AQA-3, 3A,-4(V)
17. ASH TRAY
18. MARINE MARKER REMOTE CONTROL PANEL
19. JULIE RANGE INDICATOR ASA-26
20. SONO MONITOR PANEL ARR-52
21. RADIO SET CONTROL ARR-52
22. SONOBUOY INDICATOR CONTROL
23. AUXILIARY FOLDING CONSOLE
24. UTILITY RECEPTACLE
25. JULIE RECORDER ILLUMINATING LIGHT
26. SONO RADIO SET CONTROL, ARR-58 CHAN B & D
27. SONO RADIO SET CONTROL, ARR-58 CHAN A & C
28. SONO MONITOR PANEL, ARR-58
29. MK 4 LIFE RAFT RELEASE HANDLE (AFC NO. 463 INCORP.)

B-SAD1-170-1

Figure 9-15 (Sheet 1)



1. JULIE SELECTOR CONTROL
2. JULIE RECORDER ASA-26
3. ELAPSED TIME CLOCK
4. RECORDER CONTROL UNH-6

4A. TAPE RECORDER CONTROL PANEL AQH-5 (AIRCRAFT INCORP. AFC NO. 517)

5. CONSOLE LIGHTS CONTROL
6. JULIE RECORDER CONTROL ASA-26
7. HEATING AND VENTILATION OUTLET
8. ICS SELECTOR PANEL AIC-14
9. INTERPHONE CONTROL PANEL AIC-14
10. JEZEBEL BEARING CONTROL ASQ-80
11. TRANSMITTER SELECTOR PANEL AIC-14
12. RECEIVER SELECTOR PANEL AIC-14
13. JULIE RECORDER ILLUMINATION CONTROL
14. GROUP I SONOBUOY RELEASE INDICATOR LIGHTS
15. GROUP II SONOBUOY RELEASE INDICATOR LIGHTS
16. JEZEBEL SIGNAL DATA RECORDER, AQA-4(V)
17. ASH TRAY
18. MARINE MARKER REMOTE CONTROL PANEL
19. JULIE RANGE INDICATOR ASA-26
20. BEARING INDICATOR ASQ-80
21. SONO MONITOR PANEL ARR-52
22. SONO NO. 2 MONITOR PANEL ARR-52 (AIRCRAFT INCORP. AFC NO. 417 OR 449)
23. SONO NO. 2 RADIO SET CONTROL ARR-52 (AIRCRAFT INCORP. AFC NO. 417 OR 449)
24. MCJR CONTROL INDICATOR PANEL (AIRCRAFT INCORP. AFC NO. 417,449 AND 484
25. SONO RADIO SET CONTROL ARR-52

25A. SONO RADIO SET CONTROL ARR-52A (BUNO 152798 AND SUBSQ. AND AIRCRAFT INCORP. AFC NO. 440)

26. SONOBUOY CONTROL INDICATOR LIGHT
27. MK 4 LIFE RAFT RELEASE HANDLE (BUNO. 153562 AND SUBSQ. AND AIRCRAFT INCORP. AFC NO. 463)
28. UTILITY RECEPTACLE
29. JULIE RECORDER ILLUMINATING LIGHT

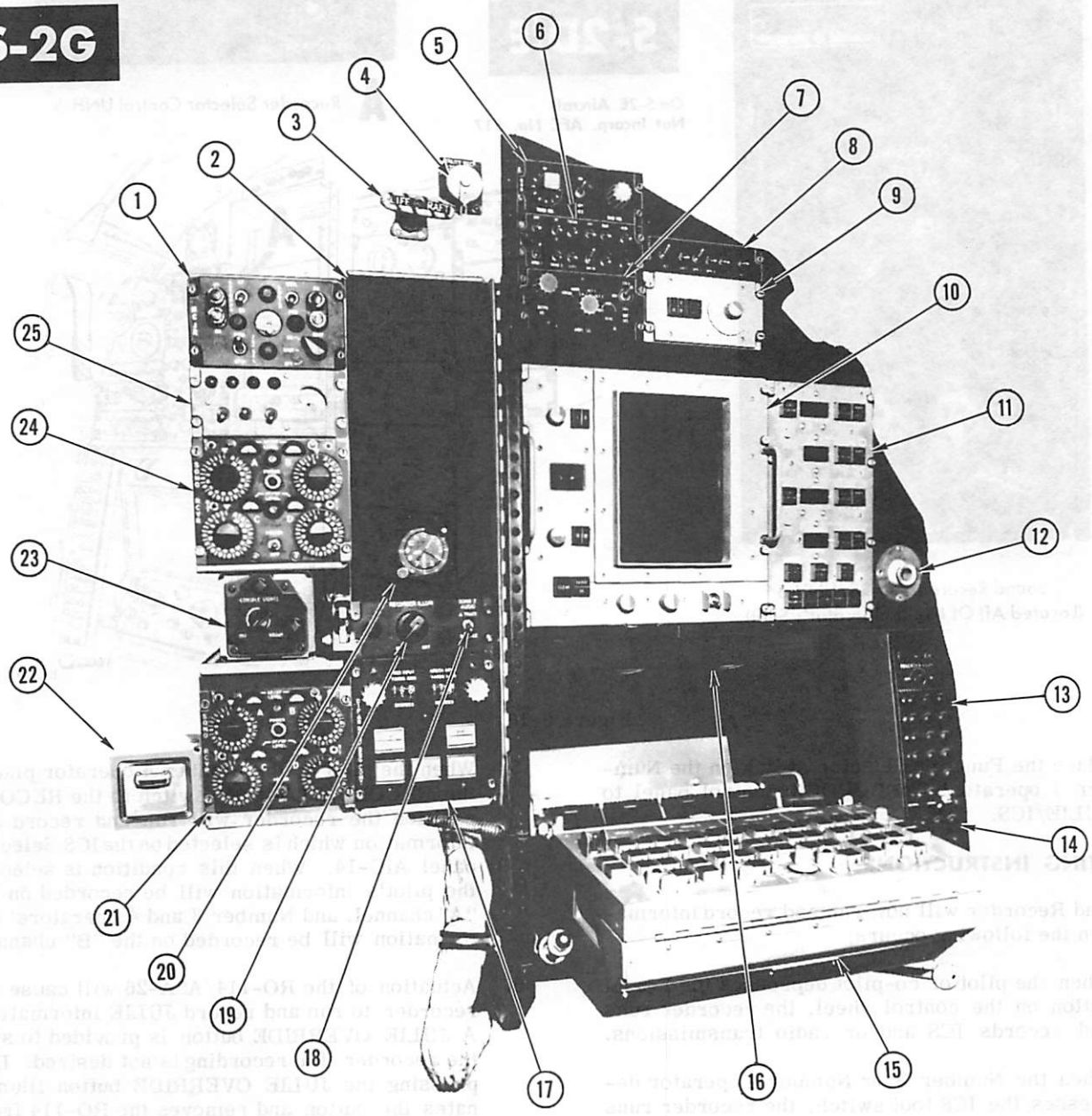
E-SAD1-170-2

Figure 9-15 (Sheet 2)

NO. 4 OPERATOR'S CONSOLE

TYPICAL

S-2G



1. MCJR CONTROL INDICATOR
2. BLANK PANEL (PROVISIONS FOR CASS GENERATOR CONTROL)
3. MK4 LIFE RAFT RELEASE HANDLE
4. UTILITY RECEPTACLE
5. TRANSMITTER SELECTOR PANEL AIC-14
6. RECEIVER SELECTOR PANEL AIC-14
7. INTERPHONE CONTROL PANEL AIC-14
8. ICS SELECTOR PANEL AIC-14
9. DIRECTIONAL LISTENING CONTROL AQA–7(V)
10. BEARING FREQUENCY INDICATOR AQA-7(V)
11. BEARING FREQUENCY INDICATOR CONTROL PANEL AQA-7(V)
12. HEATING AND VENTILATION OUTLET
13. GROUP I SONOBUOY RELEASE INDICATOR LIGHTS
14. GROUP II SONOBUOY RELEASE INDICATOR LIGHTS
15. SIGNAL DATA RECORDER AQA-7(V)
16. RECORDER ILLUMINATION LIGHTS
17. SONAR RANGE BEARING CONTROL ASQ-149
18. SONO 2 AUDIO SWITCH
19. RECORDER ILLUMINATION SWITCH
20. ELAPSED TIME CLOCK
21. SONO NO. 2 RADIO SET CONTROL ARR-75
22. ASH TRAY
23. CONSOLE LIGHTS CONTROL
24. SONO NO. 1 RADIO SET CONTROL ARR-75
25. TAPE RECORDER REMOTE CONTROL PANEL AQH-5(V)

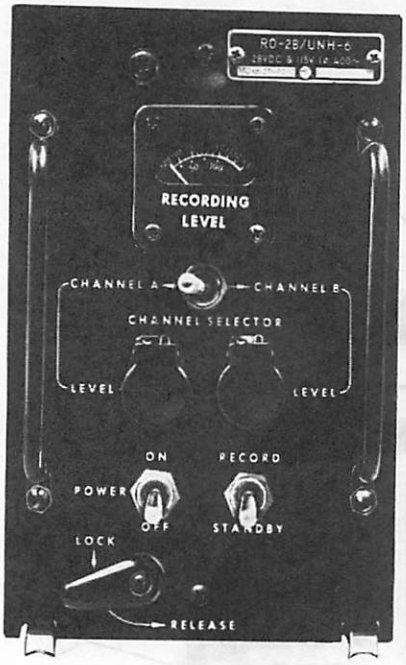
SAD1 MAR-7

Figure 9-15 (Sheet 3)

SOUND RECORDER CONTROLS

S-2D/E

On S-2E Aircraft
Not Incorp. AFC No. 517



Sound Recorder RO-28/UNH-6
(Located Aft Of No. 3 Operator's Seat)



A Recorder Selector Control UNH-6

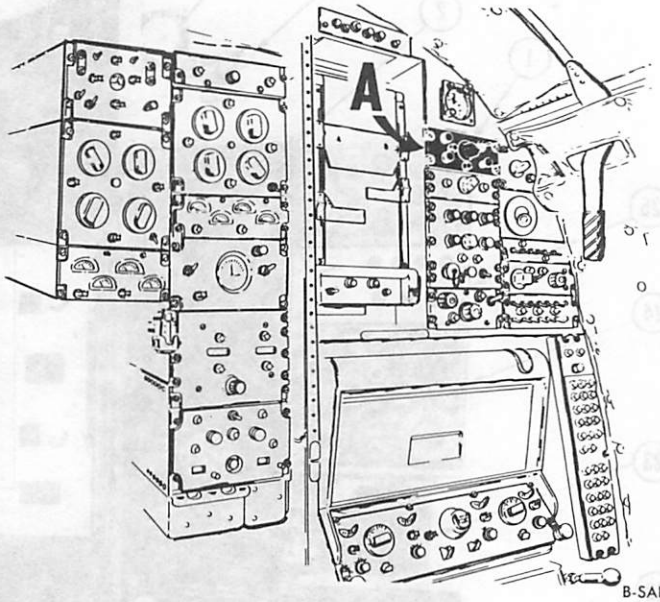


Figure 9-16

10. Place the Function Selector switch on the Number 4 operator's RECORDER control panel to JULIE/ICS.

OPERATING INSTRUCTIONS

The Sound Recorder will now run and record information when the following occurs:

1. When the pilot or co-pilot depresses the I or M button on the control wheel, the recorder runs and records ICS and/or radio transmissions.

2. When the Number 3 or Number 4 operator depresses the ICS foot switch, the recorder runs and records ICS transmissions.

3. When the Number 3 or Number 4 operator depresses the RADIO foot switch, the recorder runs and records radio transmissions.

Note

If the TRAN SEL switch on the RAD/ICS control box is in the ICS position, ICS will be recorded.

4. When any member of the crew places the COLD/HOT/CALL switch to the HOT position, the recorder runs and records ICS transmissions. The recorder will continue to run until the switch is placed to the COLD position.

5. When the pilot or the Number 4 operator places the RECORD/STANDBY switch to the RECORD position the recorder will run and record any information which is selected on the ICS Selector panel AIC-14. When this condition is selected the pilot's information will be recorded on the "A" channel, and Number 3 and 4 operators' information will be recorded on the "B" channel.

6. Actuation of the RO-114/ASA-26 will cause the recorder to run and record JULIE information. A JULIE OVERRIDE button is provided to stop the recorder if a recording is not desired. Depressing the JULIE OVERRIDE button illuminates the button and removes the RO-114 from the recorder circuit. The RO-114 may be restored to the recorder circuit by depressing the JULIE OVERRIDE button a second time and the light will extinguish.

Note

During all record cycles of operation a TRANSPORT ON light is illuminated at the Number 4 operator's position. This indicates that the recorder is running. In addition the end of tape warning is installed at the Number 4 operator's position and will illuminate when approximately five minutes of recording time remains and extinguishes when the tape is depleted.

TROUBLESHOOTING

1. No power to UNH-6.
   a. Check circuit breakers located behind pilot's seat.
2. Tape drive inoperative.
   a. Check 0.5 amp AC and 3 amp DC fuse located inside UNH-6.
3. Recorder inoperative.
   a. Check 0.5 amp AC and 3 amp DC fuse inside UNH-6.

LOADING AND UNLOADING

When loading, remove equipment from case and place full reel on supply side (forward) Thread recorder as indicated by arrows on equipment. When reel is completely used remove reel from take up side. If not completely used, unthread, and turn recorder by hand until all tape is on take up reel.

DEENERGIZING EQUIPMENT

1. Place function selector switch at Number 4 Operator's position OFF.
2. Remove tape takeup reel for post-flight analysis.

TAPE RECORDER SYSTEM AN/AQH-5(V)

Tape Recorder System AN/AQH-5(V) (S-2G and S-2E with AFC 517 incorp.) is used to record ASW sonic signals from the sonobuoy receivers (ARR-52 or ARR-75) and voice communication from the ICS. The system is comprised of a fourteen-track, two-speed magnetic tape transport/power supply mounted by quick attach-detach fasteners on a shelf behind the Number 3 operator's seat, and a remote control panel on the Number 4 operator's console. (See figure 9-16A.) Recording tape speeds are 1-7/8 and 15 inch per second (ips), providing approximately eight-hours recording time at the lower speed and approximately one-hour at the higher speed. Tape speed in the rewind and fast forward (shuttle) mode is 60 ips which takes approximately fifteen minutes to rewind or shuttle forward a 4600 foot reel of recording tape. The recorder includes an end-of-tape sensor and a tape remaining counter. End-of-tape sensing is accomplished with a photo electric sensor circuit operating in conjunction with reflective foil tabs affixed to each end of the tape. The transport stops automatically at each end of the tape when the reflective tab is sensed and will also stop if the tape either breaks or has completely run off the reel. 28 volt DC power to the recorder is furnished from the No. 2 monitor bus through a 7-ampere REC circuit breaker on the pilot's circuit panel.

TAPE RECORDER (REMOTE) CONTROL PANEL

The tape recorder (remote) control panel (figure 9-16A) provides the Number 4 operator with all the necessary operating controls and indicators for the tape transport. Individual controls and indicators located on control panel are discussed in the subsequent paragraphs.

Record Switch

The record (RCD) switch is a three-position toggle switch placarded RCD, STBY, and OFF. When the switch is placed in RCD, power is supplied to the system and the record mode is activated. The STBY position places the transport in a ready (standby) status. Power is removed from the tape recorder system when the switch is in the OFF position.

Shuttle Switch

The shuttle (SHTL) switch selects either fast forward (FWD) or reverse (RVS) operation. In use the switch commands the transport to run in the selected direction at high speed (60 ips). The transport will automatically stop before the tape runs off the reel by the end-of-tape sensing circuit. Placing the switch to OFF stops the shuttle at any selected point on the tape.

Speed Switch

The speed switch is placarded HIGH and LOW and selects either high speed (15 ips) or low speed (1-7/8 ips) transport operation.

Record Indicator Light

The record (RCD) indicator light is illuminated whenever the transport is operating in the record mode.

Standby Indicator Light

The standby (STBY) indicator light is illuminated whenever the transport is held in standby status.

Break And End Indicator Light

The BREAK and END indicator lights illuminate whenever the photo electric sensing circuit detects a broken tape or an end-of-tape (EOT) reflective tab. If either of the two conditions exist, the transport will automatically stop.

Note

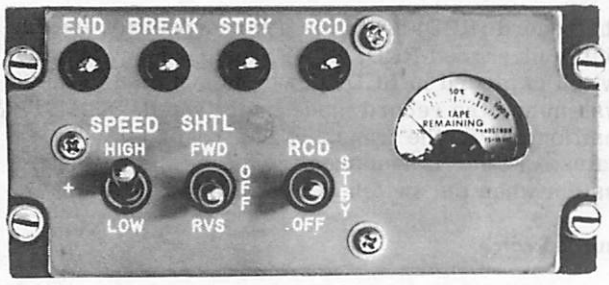
In the case of a broken tape, both BREAK and END indicator lights will come on.

Tape Remaining Indicator

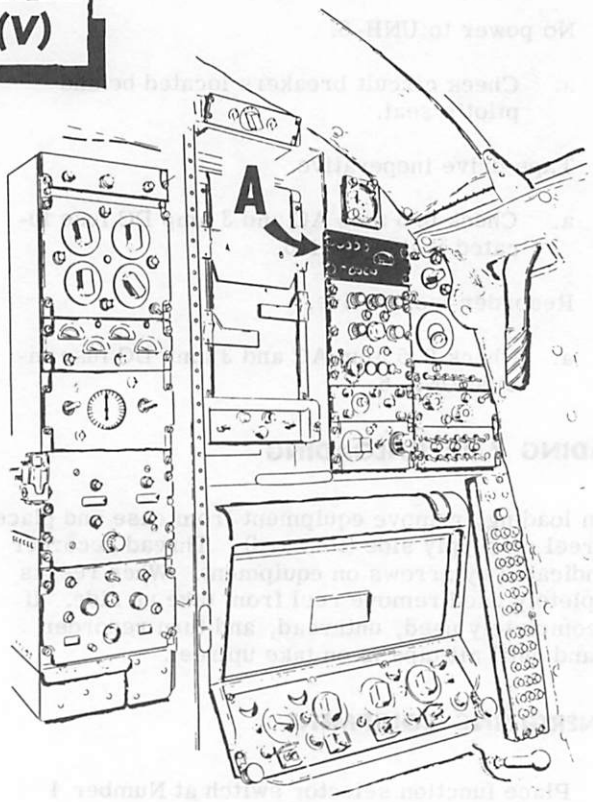
The tape remaining indicator registers the percentage of tape remaining on the supply reel. The

TAPE RECORDER CONTROLS AQH-5(V)

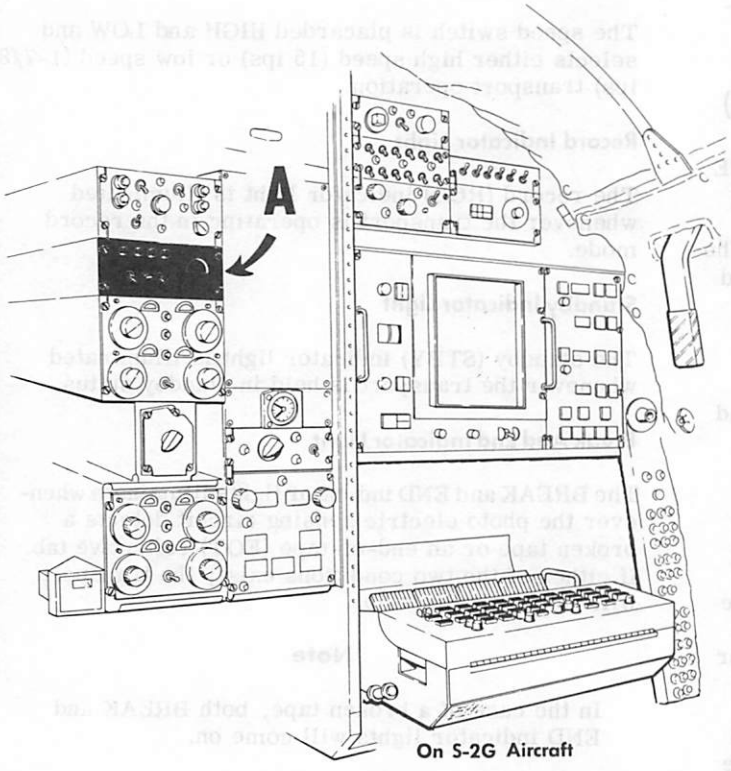
S-2E/G



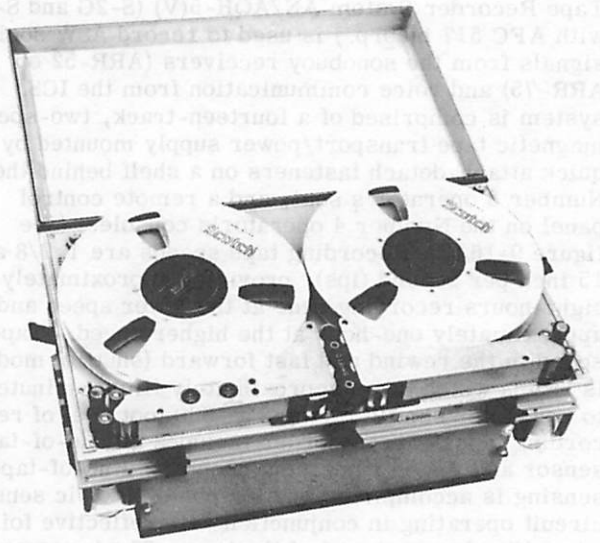
A Tape Recorder Remote Control C-8895/AQH-5(V)



On S-2E Aircraft
Incorp. AFC No. 517



On S-2G Aircraft



Tape Transport RO-4131(P)/AQH-5(V)
(Located Aft of No. 3. Operator's Seat)

SAD1 MAR-8

Figure 9-16A

indicator is divided into 5 percent graduations from EMPTY to 100%.

TAPE TRANSPORT INDICATORS

The indicators situated on the tape transport are two ELAPSED TIME meters which indicate total system operating time and capstan (total tape travel) time. Additional indicators include: a POWER-ON indicator light; a SPEED LOCK indicator light; and on some models, a fuze/indicator. The POWER-ON light illuminates during all operating conditions. Illumination of the SPEED LOCK light indicates that the transport's capstan is rotating within its proper speed range. The fuze/indicator will illuminate only when the transport/power supply fuze is defective.

Note

A spare 10-ampere fuze is stowed in a SPARE fuzeholder on the right-hand corner of the transport deck.

ENERGIZING EQUIPMENT

The following procedure includes a pre-flight functional check of the tape recorder's mechanical drive and control system. Playback or monitoring of recordings cannot be made on the aircraft, since no playback electronics are provided. Recordings shall be verified during bench checkout of the transport prior to installation in the aircraft.

1. Load a full reel of tape on the transport.
2. On remote control panel, preset control switches as follows:
   a. REC switch - OFF
   b. SHTL switch - OFF
   c. SPEED - LOW
3. Place REC switch to STBY. Observe that the transport does not run and STBY indicator light (on control panel) is on. Observe transport to check that the POWER-ON light is on and the SPEED LOCK light is out.
4. Place REC switch to REC. Observe that the transport reels rotate at low speed and REC indicator light is on, and STBY indicator light is out.
5. Place SPEED switch to HIGH. Observe that the transport reels rotate at high speed.
6. Place REC switch to STBY and SHTL switch to FWD. Observe that the transport is rotating at shuttle speed (60 ips) and the TAPE REMAINING indicator reading decreases.
7. Place SHTL switch to REV and observe that the transport is rewinding at shuttle speed and the TAPE REMAINING indicator reading increases.
8. Place SHTL switch to FWD and allow tape to run past the end-of-tape reflective tab or runs off the supply reel onto takeup reel. Observe that either or both END and BREAK indicator lights come on.

OPERATING INSTRUCTIONS

Note

Check tape transport to insure recording tape is properly threaded and that the tape reels are locked.

CAUTION

The cover lid should be installed on the transport during operation to prevent possibility of foreign object damage. In addition, the lid acts as a shield against RF interference.

1. RECORD MODE. The record mode is placed in operation when the REC switch on the remote control panel is positioned to REC with the SPEED switch selected to desired speed. Audio signals from the sonobuoy receivers (if selected) and Number 4 operator's ICS will be recorded. Pilot's ICS is recorded together with Number 4 operator's ICS when the RECORD-STANDBY switch on the pilot's instrument panel is placed in RECORD.

Note

High speed operation (15 ips) should be used when recording DIFAR bearing information in order to effectively record the high frequency signal.

2. SHUTTLE MODE. To shuttle tape (fast forward or reverse), place SHTL switch on remote control panel to desired position (FWD or RVS). The transport will shift into high speed operation in the direction of rotation selected. To stop shuttle, place SHTL switch to OFF. When shuttle is switched OFF, the transport will revert back to the previous selected operating mode. If transport stops automatically by end-of-tape sensors and complete takeup or rewind is desired, place SHTL switch to OFF momentarily; then back to FWD until reel is depleted.
3. STANDBY MODE. This mode is operative when the REC switch on the remote control panel is positioned to STBY. The transport will assume a power-on ("standby") condition

with the tape reels disengaged under brake tension. Illumination of the STBY indicator light on remote control panel provides visual indication that the mode is activated. The transport is released from the standby mode when the REC switch is repositioned to either REC or OFF.

4. END-OF-TAPE STOPPAGE. If tape stops automatically by the end-of-tape (EOT) sensor and complete takeup is desired, operation can be restored by placing the SHTL switch to FWD until tape runs off the supply reel onto the takeup reel. If rewind (reverse) operation is desired after EOT stoppage, place SHTL to RVS until tape runs off takeup onto supply reel.

Note

If shuttle operation can not be obtained after EOT stoppage, momentarily place SHTL switch in direction opposite to the one desired and allow to shuttle for an instant; then, reset SHTL switch to desired direction and complete the shuttle.

5. TAPE BREAKAGE. If recording tape should break during operation and tape splicing is not feasible, operation can be resumed by wrapping the broken end off the supply reel around the remaining spool of tape on the takeup reel. Place REC switch OFF when re-threading tape.

DEENERGIZING EQUIPMENT

1. Place REC switch to OFF.

TROUBLESHOOTING

1. No power to equipment

   a. Check REC switch on remote control panel for REC or STBY position.

   b. Check circuit breaker placarded REC on lower portion of pilot's circuit breaker panel.

   c. Check 10-amp power fuze on deck of transport. A spare fuze is provided in a SPARE FUZE holder located on top right corner of transport deck. On some models, a defective power fuze is indicated by illumination of fuze holder cap.

2. Mechanical noise generating from transport during record operation.

Note

To isolate source of noise to the tape feed circuit (tape, reels, guides, etc.), place REC switch to STBY. If noise is still audible, proceed to check the probable causes listed below.

   a. Investigate for possible entry of foreign objects. Make sure that transport lid is not binding against reel(s).

   b. Check for proper tape threading and movement. Tape should pass smoothly through its complete path to the takeup reel and be free of curls.

   c. Check tape reel(s) to ensure that they are firmly seated on hub and are locked in place.

LOADING AND UNLOADING

Note

Loading and unloading of tape reels should be accomplished with power OFF the equipment to relieve the brake tension from the reel hubs.

1. Open lid on transport.

2. Hold supply reel hub stationary and loosen inner knob of hub.

3. Place a full reel of degaussed tape onto hub. Note that aligning pin on hub mates with one of the alignment slots on reel. Hold reel stationary and turn inner knob of hub clockwise until snug.

4. Place an empty takeup reel on takeup hub and lock in place in same manner used for the supply reel.

5. Reel out a leader of tape from supply reel and thread over supply reel idler, around capstan, over takeup reel idler, and onto takeup reel. Wind at least 3-complete turns of leader around reel to ensure positive grip. (A threading diagram is shown in figure 9-16B.)

Note

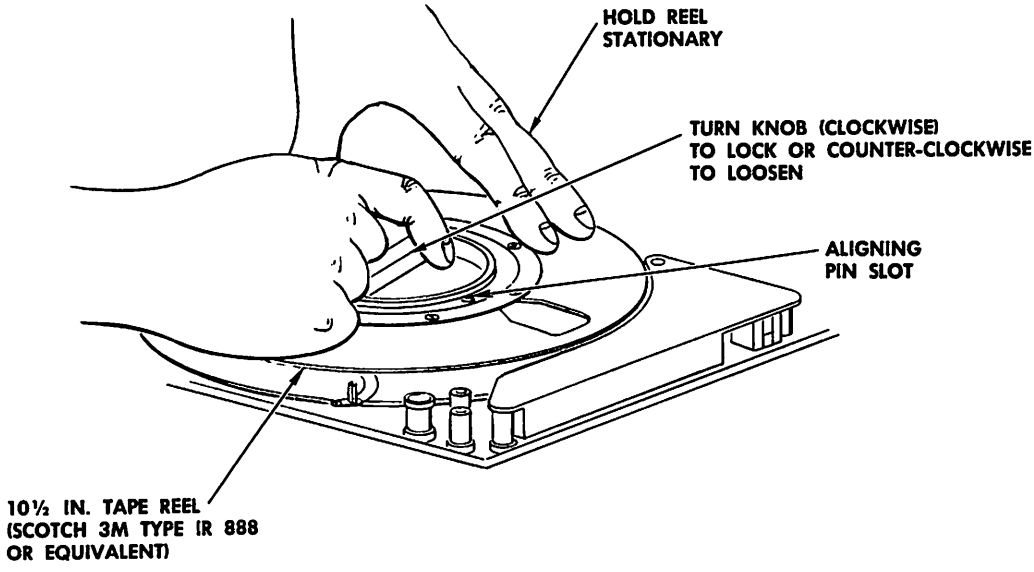
- Make sure that tape passes through slot in reel potentiometer arm so that the tape remaining indicator on control panel functions.
- Failure to provide proper wrap-around of tape leader around takeup reel (minimum of 3 turns) will cause the transport to operate in reverse direction. The unit is designed to operate in direction in which reel tension is the greatest.

6. Rotate both reels manually in opposite directions to takeup as much slack in tape as possible.

7. Takeup remaining slack in tape by placing REC switch on remote control panel to STBY. The reel motors will now supply takeup and hold-back torque.

THREADING TAPE RECORDER AN/AQH-5(V)

S-2G and S-2E Incorp. AFC-517



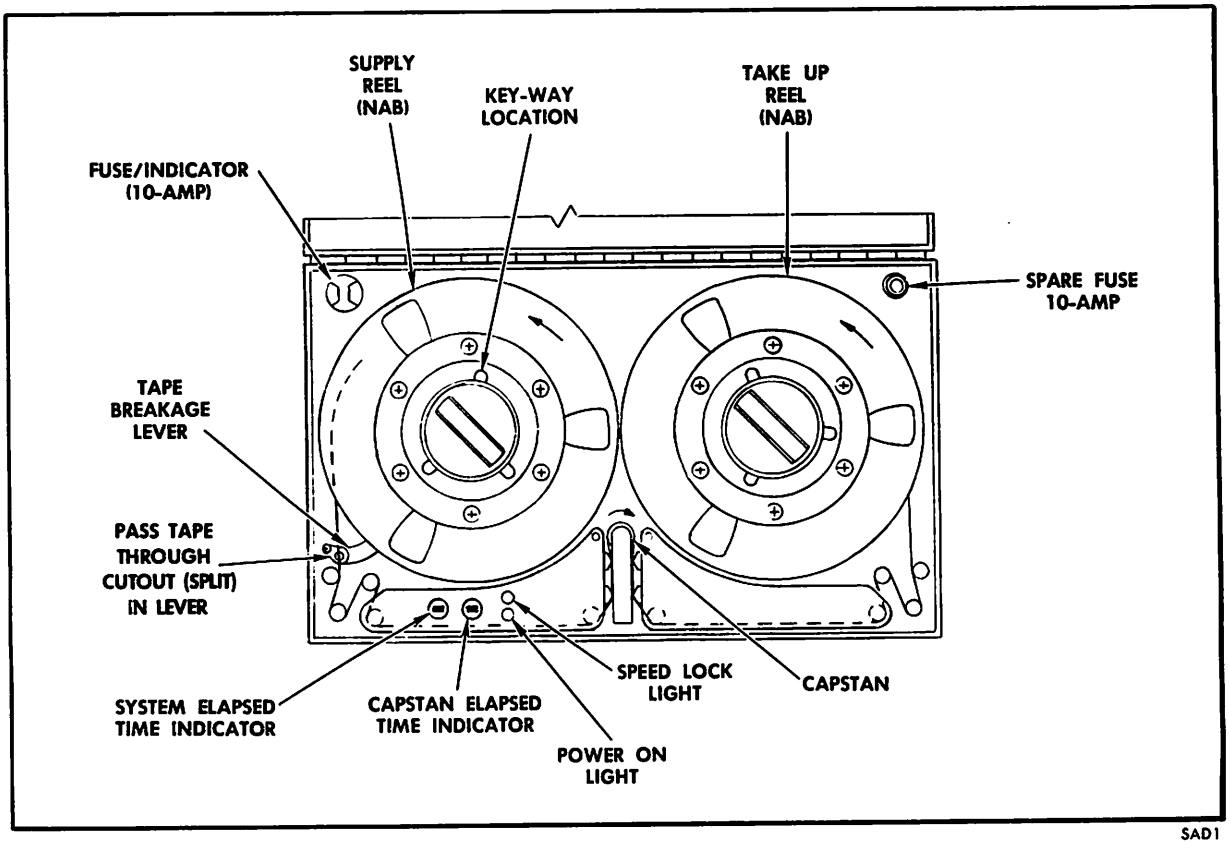


Figure 9-16B

NEW NEW NEW

8. Check path of tape to ensure proper threading and freedom of curls.

9. On remote control panel, place REC switch to REC and allow reels to rotate a few revolutions to ensure proper operation. Stop transport by placing REC switch to OFF or STBY.

10. Reinstall lid on transport.

MARINE MARKER RELEASE SYSTEM

CONTROLS

See figure 9-17.

Release Pushbutton

The RELEASE pushbutton is located on the MARINE MK control panel located on the Number 4 Operator's console. The RELEASE button serves the same function as the pilots' "T" pushbutton for the release of single markers.

Left-Right Switch

The LEFT-RIGHT switch is a two-position toggle switch located on the MARINE MK control panel on the Number 4 Operator's console. When placed in the desired position, single markers will be selected for a drop from either the left or right dispenser.

Indicators

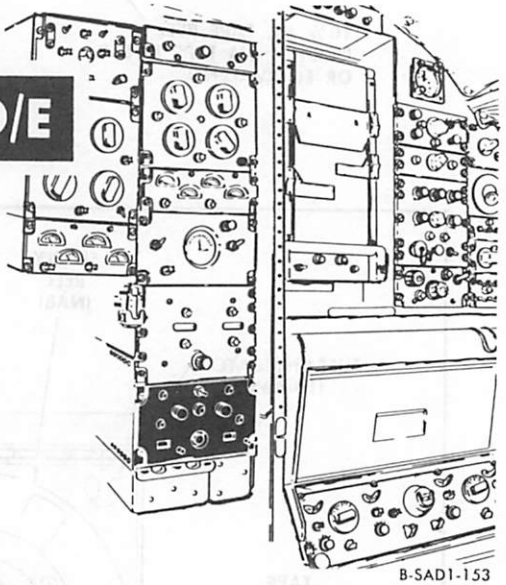
Two ROUNDS REMAINING indicators, placarded L and R ROUNDS REMAINING, are located on the MARINE MK control panel on the Number 4 operator's folding console. Either indicator will decrease by one digit each time a marker is released. Both indicators incorporate manual RESET knobs so the indicators may be reset to the actual amount of markers loaded in each dispenser.

MARINE MARKER CONTROLS

S-2D/E



MARINE MARKER CONTROL PANEL (REMOTE)



B-SAD1-153

Figure 9-17

Not Ready Lights

Two press to test NOT READY lights placarded L and R are located on the MARINE MK control panel on the Number 4 operator's folding console. The lights represent their associated dispenser. Normal indications of the light will be a rapid flash indicating that a marker has been released and another marker has dropped into position. The light will remain on if a malfunction occurs, if the dispenser is empty, or if the next marker is not in the ready position.

SUS RELEASE SYSTEM

1. Loading procedure.
   a. Open vertical access door and load 13 signals, nose forward, in outboard side of dispenser. Pull up outboard follower after loading each signal.
   b. Load 14 signals in inboard side. Pull up inboard follower until follower arm rests on top of signal.
   c. Open top access door and insert signal into outboard chute. Pull up follower so that fingers rest on top of signal.
   d. Insert signal into inboard chute and pull up follower arm so that fingers rest on top of signal.
   e. Close and secure vertical access door and top access door.
   f. Have pilot reset Dual SUS control panel.
2. Unloading procedure.

   Unload dispenser in reverse order to loading procedure.

SUS STOWAGE SYSTEM

See figures 9-19 and 9-20.

1. Tray unloading procedure.
   a. Press retainer assembly latch pins against spring tension and pull out retainer assembly.
   b. Pull out handle slowly (2 to 3 inches) and remove signal-allow handle to return fully.
   c. Repeat step (b) for remaining signals.
   d. Push in latch retainer assembly.



1. HANDLE
2. PAWL LEVER
3. SUS
4. RETAINER ASSEMBLY
5. LOCK PIN

SAD1-219

Figure 9-18



SAD1-220

Figure 9-19

WARNING

- Pin locks at retainer assembly must be checked to determine if they are fully engaged in side structure of stowage unit. Failure to engage pins properly may result in failure of the retainer assembly and signals falling out of stowage unit causing injury to personnel or damage to equipment during maneuvers or arrested landings.
- If there are any remaining signals in the tray, pull out handle slowly to snub up signals.

2. Tray loading procedure.
   a. Press retainer assembly latch pins against spring tension and pull out retainer assembly.
   b. Install one signal, nose pointed outboard, into retainer assembly.
   c. Release pawl lever and manually push signal against follower.
   d. Repeat steps b and c for remaining eight signals.
   e. With nine signals installed in tray, push in and latch retainer assembly.
   f. Pull out handle slowly to snub up signals.
   g. Repeat steps a through f to load remaining two trays.

CAUTION

Insure that eight signals are loaded in the stowage box. When unloading the stowage box insure that all eight signals are removed in order to prevent excessive movement during flight.

HF TRANSCEIVER AN/ARC-39

CHANNEL TUNING AND PRESETTING

1. Pull out the local-remote lever in the center of the CHANNEL selector knob of the radio set control to transfer channel selection control to the receiver-transmitter.
2. Apply power to the radio set by rotating the VOL control on the radio set control clockwise.
3. Lock the ANT FINE, ANT TAP, PA LOAD, and TUNING controls on the front of the receiver-transmitter by turning their LOCK knobs fully clockwise, then select any channel with the LOCAL SELECTOR knob on the front panel. These two steps ensure that the retuner will reset all tuned circuits.
4. Select the channel corresponding to the highest frequency crystal in the low band (channels 1 through 6) by rotating the LOCAL SELECTOR knob. Unlock the ANT FINE, ANT TAP, PA LOAD, and TUNING controls by rotating their LOCK knobs counterclockwise.
5. Rotate the TUNING control to the center-of-noise peak as heard in the headset. If two noise peaks are heard, select the lower-frequency peak. Check that the TUNING dial reading for this peak agrees with the channel frequency.
6. Rotate the CH. 1-6 knob of the coaxial REC ANT control until the signal or noise heard through the earphones is at a maximum. Then readjust the TUNING control to center it on the noise peak.
7. Lock the TUNING control, set the PA LOAD control to 1, and set the G-K-A meter switch to G.
8. Press the microphone switch and keep it pressed during steps 9 through 11. Note the panel meter reading. The meter, which now indicates the power amplifier grid current, should read between 80 and 200.
9. Turn the G-K-A meter switch to K. The meter should now indicate less than 40 ma. If neither of these readings is obtained, the most probable causes of trouble are: either one of the two crystals is wrong in frequency, or the transmitter and receiver crystals are interchanged.
10. Set the PA LOAD and ANT FINE controls to 5. Rotate the ANT TAP control to the position which shows a rise in the meter reading. Leave the ANT TAP control in this position. Then adjust the ANT FINE control for a maximum reading, keeping the meter reading under 100 by simultaneously adjusting the PA LOAD control. If the ANT FINE control comes up against either end stop before a maximum is reached, try an adjacent position on either side of the one originally selected on the ANT TAP control and repeat this step.
11. When the peak has been found with the ANT FINE control, rotate the PA LOAD control until a meter reading of 100 is secured. If it is not possible to load up to 100 ma on some channels, use the maximum loading obtainable. This should be at least 80.

Note

The ANT FINE control must always be tuned for maximum meter reading; it should never be used as a loading control.

12. Turn the G-K-A meter switch to A and note that a reading is obtained. Lock the PA LOAD, ANT FINE and the ANT TAP controls.
13. Release the microphone switch. The transmitter and receiver circuits are now aligned to the highest channel frequency in the low band and resonated with the antenna. No further adjustment of the REC ANT trimmer is required to any other channel in the low band.
14. Check that all controls are locked, then select the remaining channels in the low band in turn with the LOCAL SELECTOR switch and at each channel, repeat steps 3 through 14, omitting step 6 of this procedure.
15. With the low-band channels present, select the channel corresponding to the highest frequency crystal in the high band (channels 7 through 12) by rotating the LOCAL SELECTOR switch. Unlock all controls.
16. Repeat step 5 of this procedure. Then rotate the CH. 7-12 knob of the coaxial REC ANT control until the signal or noise heard through the earphones is at a maximum.
17. Repeat steps 8 through 14 of this procedure. The transmitter and receiver circuits are now aligned to the highest channel frequency in the high band and resonated with the antenna. No further adjustments of the REC ANT trimmer is required for any other channel in the high band.
18. Lock all controls, then select the remaining channels in the high band in turn with the LOCAL SELECTOR switch and at each channel repeat steps 8 through 14 of this procedure.
19. The channel selecting mechanism is now preset. To check the channel selection and tuning, select each channel in turn with the LOCAL SELECTOR switch and note the meter readings for each of the three meter switch positions with the microphone switch depressed. G should read from 80 to 200. K should read 100, and A should read from 1 to 200.

CAUTION

If any control was left unlocked during channel selection, it will be necessary to reset that control as described in steps 3 through 15 of this procedure.

20. Restore control of channel selection to the radio set control (cockpit) by pushing in the local-remote lever on the CHANNEL selector knob.

BOTH OPERATORS

INTERCOMMUNICATIONS SYSTEM AN/AIC-14

ENERGIZING EQUIPMENT

1. Push in the five DC circuit breakers labeled ICS behind pilot's seat. Refer to figure 9-20 for all intercommunication controls.

Transmitter Selector Panel

1. Place ICS ON-OFF switch to the ON position.
2. Set TRAN SEL to the ICS position.
3. Adjust RAD VOL for comfortable level of radio reception.

Interphone Control

1. Adjust INTPH VOL for comfortable level of ICS volume.
2. Place AMPL SEL to the NORM position.
3. Place MIC SEL to the COLD position.

Receiver Selector Panel

This control allows operator to select the receiver audios he desires to monitor.

AUX Station ICS

This switch (figure 9-21) located on Number 3 Operators Console, allows communication to the radar compartment (Hell Hole), electronic compartment and nose station (external). It is utilized primarily for ground maintenance.

ICS Operation

Plug microphone and headphone cords into Jack Assembly U-61/U of coiled cord CX-4622/AR located at seat position.

1. Place ICS ALL station selector switch to ON position. Depress ICS (left) foot MIC switch and talk into microphone. The operator will be heard at all stations.
2. Place ICS ALL station select switch to OFF position. Select ON for the station the operator desires to communicate with. Depress ICS MIC foot switch and talk into microphone. The operator will be heard at selected stations.
3. HOT, COLD and CALL MIC operation.
   a. When COLD MIC is selected the microphone can be keyed only by ICS foot MIC switch.
   b. When HOT MIC is selected the microphone is keyed continually (except when the ALL station selector is in the ON position).
   c. When CALL MIC is selected the ICS will override all interphone controls and be heard at all stations.

VOX Operation

An ICS VOX feature has been incorporated in the Interphone Control Panel AIC-14. This is a voice-operated circuit (VOX), that allows use of HOT mike without background audio feeding the ICS system.

Note

When utilizing the VOX control ensure the control is properly positioned in conjunction with the VOL control, as improper positioning will give intermittent and voice-clipped operation.

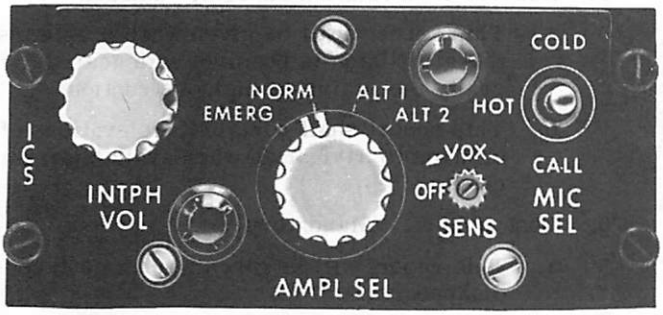
RADIO OPERATION

1. The desired transmitter may be selected by use of TRAN SEL switch.
   a. ICS selects interphone system.
   b. The Number 1 position selects the UHF transmitter.
   c. The Number 2 position selects the HF transmitter.
   d. The Number 3 position selects MCJR. (Aircraft Incorporating AFC 484)
2. When using the radio, select the receiver audio on Receiver Selector panel which corresponds to the transmitter selection. To key the transmitter depress the RADIO (right) MIC foot switch.
3. The crewmember will use this mode of operation only with the permission of the pilot.

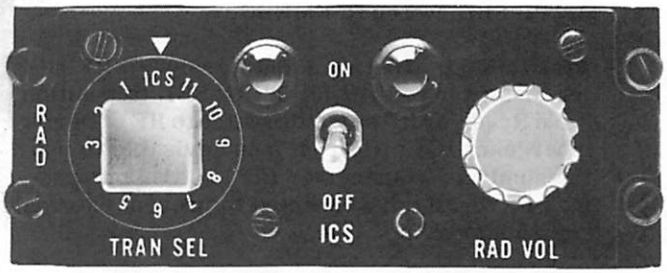
ALTERNATE MODES OF OPERATION

1. When ICS becomes inoperative, generally it is within the isolation amplifier. In this case select the ALT 1 position with AMP SEL switch located on interphone control. If ICS is restored, the malfunction is within the isolation amplifier. ALT 1 will then be necessary for ICS operation. The isolation amplifier is now bypassed.
2. When ALT 1 does not restore the ICS, select ALT 2 on the AMP SEL switch located on interphone control. If this restores ICS, then the interphone amplifier is defective and the ALT 2 selection should be used for ICS operation. The interphone amplifier is now bypassed.

INTERCOMMUNICATION SET CONTROLS



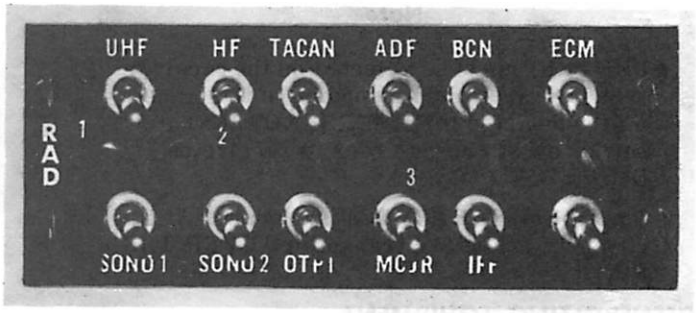
A INTERPHONE CONTROL AIC-14



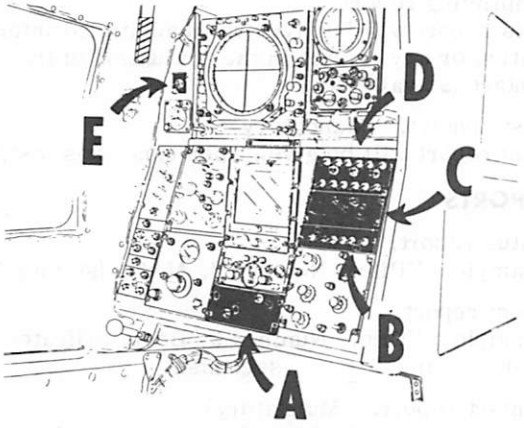
C TRANSMITTER SELECTOR PANEL AIC-14



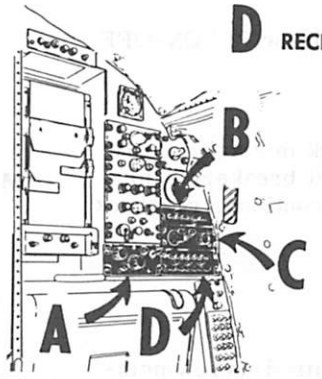
B ICS SELECTOR PANEL AIC-14



D RECEIVER SELECTOR PANEL AIC-14



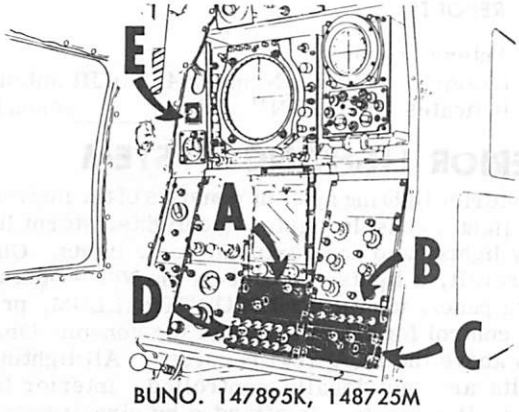
BUNO. 147531A THROUGH 147894K
AND 148717L THROUGH 148724L



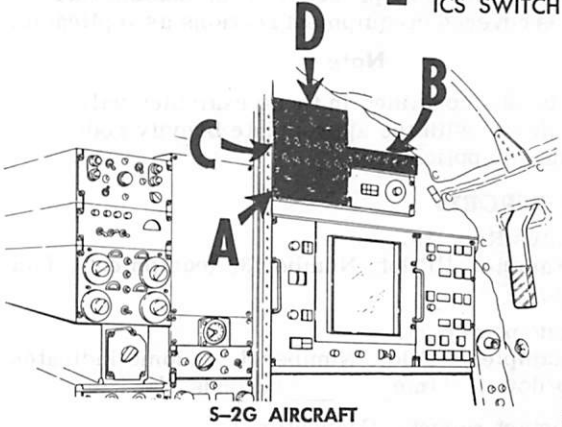
PANELS A AND C ARE INTERCHANGED
IN AIRCRAFT
BUNO. 147895K, 148725M
AND SUBSEQUENT



E AUXILIARY STATION ICS SWITCH



BUNO. 147895K, 148725M
AND SUBSEQUENT



S-2G AIRCRAFT

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Figure 9-20

3. The EMERG position will provide communication for the crewmembers should the ALT 1 and ALT 2 selections fail to restore ICS operation.

EMERGENCY ICS PROCEDURE

1. AMPL SEL switch to EMERG.
2. TRAN SEL to position 1 and Receiver UHF selector switch to UHF (or TRAN SEL to position 2 and Receiver HF selector switch to HF). During emergency ICS operation it is advisable to use the number 2 transceiver (HF) as the antenna may be readily disconnected to prevent external transmissions.
3. Depress RADIO (right) foot MIC switch to key transmitter.

Note

- UHF or HF must be selected on the receiver selector panel (corresponding to the transmitter selected for EMERGENCY ICS) at each crew station in order to receive on EMERGENCY ICS.
- During EMERGENCY ICS procedures ALL communications are transmitted OVER THE AIR.

DEENERGIZING EQUIPMENT

To deenergize the ICS system place the ICS ON-OFF switch to the OFF position.

TROUBLESHOOTING

When experiencing difficulty, check microphone and headset connections. Check circuit breakers behind the pilot's seat. Should difficulty continue, re-check the turn-on procedure.

ICS REPORTS

There are certain ICS reports required of crewmembers. Some of these are mandatory while others are necessary for optimum crew coordination. The mandatory reports shall take precedence over radio and ICS in progress. The procedures for making these reports is covered in equipment sections as applicable.

Note

The blanks contained in these examples will be filled in with the appropriate brevity code words as applicable.

RADAR REPORTS

1. Status Reports.
   Example: "Pilot, Number 3, (equipment), (status)."
2. Radome report.
   Example: "Pilot, Number 3, radome indicates up/down. Time_____seconds."
3. Contact report. (Mandatory)
   Example: "Pilot, Number 3, (type contact), two seven zero, thirty."
4. Amplifying reports.
   This report will be given when additional information on any change in the evaluation of the contact is available.
5. Hazards to navigation reports. (Mandatory)
   a. This report shall be given when it appears that a collision is possible with nearby aircraft, mountains or high obstructions.
   b. This report shall contain the elevations of hazards to navigation when available from charts.
6. Lost contact. (Mandatory)
   a. This report will be given when a contact disappears.
   b. Example: "Pilot, Number 3, Lost contact" or "Pilot, Number 3, (type contact) became ( ) at six."

ECM REPORTS

1. Status Report.
   Example: "Pilot, Number 3, (equipment), (status)."
2. Contact report. (Mandatory)
   Example: "Pilot, Number 3, ( ) zero nine five."
3. Amplifying report.
   This report will be given when additional information or any change in the evaluation of the contact is available.
4. Lost contact. (Mandatory)
   This report will be given when contact is lost.

MAD REPORTS

1. Status report.
   Example: "Pilot, Number 3, MAD, (status)."
2. Boom report.
   Example: "Pilot, Number 3, Boom indicates in/out. Time_____seconds."
3. Contact report. (Mandatory)
   This report will be given by announcing the brevity code word for MAD contact over the ICS.

MCJR REPORTS

1. Antenna reports.
   Example: "Pilot, Number 4, MCJR antenna indicates UP/DOWN" "Time_____seconds."

INTERIOR LIGHTING SYSTEM

The interior lighting system consists of the instrument panel lights, console lights, floodlights, storm lights, utility lights, and compartment dome lights. On S-2G aircraft, a lights rheostat on the No. 4 operator's folding panel, identified RECORDER ILLUM, provides control for illumination of the console dome lights above the AQA-7(V) recorder. All lighting circuits are individually controlled. Interior lighting circuit protection is afforded by circuit breakers located on the co-pilot's circuit breaker panel in the pilot's compartment, and the DC junction box in the electronics compartment. (See figure 9-21.)

CREW CONSOLE LIGHTING CONTROLS

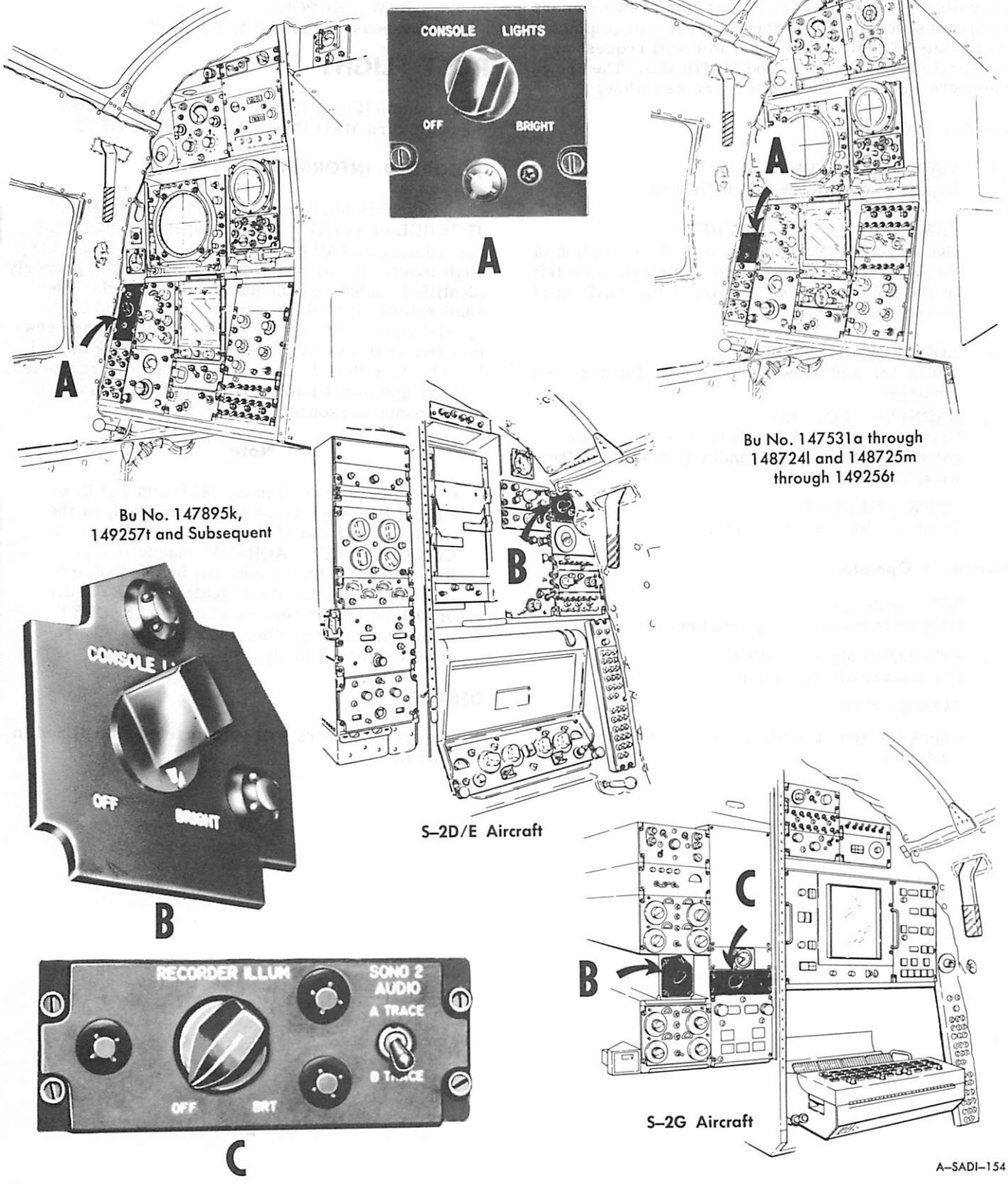


Figure 9-21

PRE-LAND

OPERATORS PRE-LAND CHECK LISTS

When the pilot indicates that a landing is to be made and calls for the Landing Check List, the crewmembers will request permission to deenergize those equipments applicable. The Number 3 operator will request permission to retract radome and MAD boom. The crewmembers Pre-land Check Lists are as follows:

Number 3 Operator

1. MAD BOOM/RADOME - IN/UP
   Report to co-pilot when challenged.
2. ASW EQUIPMENT - SECURED
   Deenergize all equipment with the exception of the MAD PWR-OFF switch, which shall be left in the PWR position to protect the MAD head during landing.
3. LOOSE GEAR - STOWED
   Check for and stow all loose gear for arrested landings.
4. HARNESS - LOCKED
   Crewmembers will LOCK harnesses, check hatches secured, and standby to make the Crew Report.
5. CREW - REPORT
   Respond "Number 3, Ready."

Number 4 Operator

1. MCJR Antenna - UP
   (Report to co-pilot when challenged)
2. ASW EQUIPMENT - SECURED
   Deenergize all equipment.
3. LOOSE GEAR

   Check for and stow all loose gear for arrested landings.
4. HARNESS - LOCKED
   Crewmembers will LOCK harnesses, check hatches secured, and standby to make Crew Report.
5. CREW - REPORT
   Response "Number 4, Ready."

POST FLIGHT

After completion of landing and taxiing, Number 3 operator turn MAD PWR-OFF switch to OFF.

RECORDED INFORMATION

Crewmembers shall turn in all MAD, JULIE and JEZEBEL or DIFAR recorder tapes, magnetic tape recordings, and all operating logs as briefed. They shall insure that all recorded information is properly identified, dated and annotated as required. They shall return all flight folders, packets, and other special equipment carried on the flight. Each crewmember shall assist the pilot in completing the yellow sheet, with full descriptions of all discrepancies, and any additional information which may assist maintenance personnel. NEW

Note

On all operational flights, MAD and JULIE or DIFAR Recorder tapes will be marked, at the beginning and end of the trace, with the word CONFIDENTIAL. AQH-5(V) magnetic tape Recordings of ASW audio will be handled and identified as "classified" material. JEZEBEL or DIFAR grams become classified SECRET if any information other than time marks are annotated accordingly. NEW NEW

DEBRIEF

Flight crewmembers will be debriefed as outlined in Section III.

section X

NATOPS EVALUATION



B-SAD1-195

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CONCEPT

The standard operating procedures prescribed in this manual represent the optimum method of operating N S-2D/E series aircraft. The NATOPS Evaluation is intended to evaluate compliance with NATOPS procedures by observing and grading individuals and units. This evaluation is tailored for compatability with various operational commitments and missions of the Navy. The prime objective of the NATOPS Evaluation Program is to assist the unit Commanding Officer in improving unit readiness and safety through constructive comment. Maximum benefit from the NATOPS Program is achieved only through the vigorous support of the program by Commanding Officers as well as flight crewmembers.

DEFINITIONS

The following terms which are commonly used throughout this section are defined below as to their specific meaning with regard to the NATOPS Evaluation Program.

NATOPS Evaluation

A periodic evaluation of individual flight crewmember standardization consisting of an open book examination, a closed book examination, an oral examination, and a flight evaluation.

NATOPS Re-Evaluation

A partial NATOPS Evaluation administered to a flight crewmember who has been placed in an Unqualified status by receiving an Unqualified grade for any of his ground examinations or the flight evaluation. Only those areas in which an unsatisfactory level was noted need be observed during a re-evaluation.

Evaluee

An individual pilot or aircrewman being evaluated.

Qualified

That degree of standardization demonstrated by a very reliable flight crewmember who has a good knowledge

of standard operating procedures and a thorough understanding of aircraft capabilities and limitations.

Conditionally Qualified

That degree of standardization demonstrated by a flight crewmember who meets the minimum acceptable standards. He is considered safe enough to fly as a pilot in command or to perform normal duties without supervision but more practice is needed to become Qualified.

Unqualified

That degree of standardization demonstrated by a flight crewmember who fails to meet minimum acceptable criteria. He should receive supervised instruction until he has achieved a grade of Qualified or Conditionally Qualified.

Area

A routine of preflight, flight, or postflight.

Sub-Area

A performance sub-division within an area, which is observed and evaluated during an evaluation flight.

Critical Area/Sub-Area

Any area or sub-area which covers items of significant importance to the overall mission requirements, the marginal performance of which would jeopardize safe conduct of the flight.

Emergency

An aircraft component or system failure, or condition which requires instantaneous recognition, analysis, and proper action.

Malfunction

An aircraft component or system failure or condition which requires recognition and analysis, but which permits more deliberate action than that required for an emergency.

Grading Criteria

The standards to be used in determining grades as a result of the performance observed or recorded during the NATOPS Evaluation.

IMPLEMENTATION

The NATOPS Evaluation Program shall be carried out in every unit operating naval aircraft. The various categories of flight crewmembers desiring to attain/retain qualification in the S-2D/E series shall be evaluated initially in accordance with OPNAV Instruction 3510.9 series, and at least once every twelve months thereafter. Unit NATOPS Evaluations will be conducted annually; however, instruction in and observation of and adherence to NATOPS procedures must be on a daily basis within each unit to obtain maximum benefits from the program. The NATOPS Coordinators, Evaluators, and Instructors shall administer the program as outlined in OPNAVINST 3510.9 series. Evaluees who receive a grade of Unqualified on a ground or flight evaluation shall be allowed 30 days in which to complete a re-evaluation. A maximum of 60 days may elapse between the date the initial ground evaluation was commenced and the date the flight evaluation is satisfactorily completed.

GROUND EVALUATION

Prior to commencing the flight evaluation, an evaluee must achieve a minimum grade of Qualified on the open book and closed book examinations. The oral examination may be conducted as part of the flight evaluation. To assure a degree of standardization between units, the NATOPS Instructors may use the bank of questions contained in this section in preparing portions of the written examinations. Additional questions for such examinations will be distributed by the Model Manager to all squadrons.

OPEN BOOK EXAMINATION

Up to 50% of the questions used may be taken from the question bank. The number of questions on the examination will not exceed 40 or be less than 20. The purpose of the open book examination portion of the written examination is to evaluate the pilot's knowledge of appropriate publications and the aircraft. The maximum time for this examination should not exceed 8 hours. The following areas will be covered for both pilots and aircrew:

1. Working knowledge and familiarity with the aircraft, equipment, systems and applicable publications.

2. Areas may include use of charts, graphs, etc., in the computation of such items as maximum ranges, endurance, stalling speeds, take-off distances, and other necessary information which cannot be committed to memory.

CLOSED BOOK EXAMINATION

Up to 50% of the closed book examination may be taken from the question bank and shall include questions concerning normal procedures and aircraft limitations. The number of questions on the examination will not exceed 80 or be less than 40. The following areas will be covered for both pilots and aircrew:

1. Knowledge of the aircraft.

2. All normal procedures and safety precautions incident to operating the aircraft and its equipment.

Areas examined should be those which must necessarily be committed to memory for everyday use in normal operations and for emergency situations.

ORAL EXAMINATION

The questions may be taken from this manual or drawn from the experience of the Instructor/Evaluator. Such questions should be direct and positive and should in no way be opinionated.

Pilot Areas To Be Covered

1. Preflight Inspection
2. Normal Procedures: starting, taxiing, take-off, landing, ground secure
3. Emergencies (Critical)
4. Aircraft Systems: power plants, fuel, hydraulic, electrical, electronics, weapons
5. Malfunctions

Aircrew Areas To Be Covered

1. Safety and Survival
2. Preflight Inspection
3. Aircraft Systems
4. Radar
5. ECM
6. MAD
7. ASR
8. JULIE
9. Tactical Plotter
10. Sonobuoy
11. JEZEBEL

NEW 12. DIFAR

OFT/WST PROCEDURES EVALUATION

An OFT/WST may be used to assist in evaluating the flight crewmember's efficiency in the execution of normal operating procedures and his reaction to emergencies and malfunctions. In areas not served by the OFT/WST facilities, this may be done by placing the flight crewmember in an aircraft and administering appropriate questions.

Simulated OFT Procedures and Conditions

OFT EMERGENCY CONTROLS

1. Circuit Breaker Failure

   Cowl flaps
   Oil cooler doors
   Radar altimeters
   DC instruments
   Torpedo bay doors
   Carburetor air doors
   Rudder trim
   Aileron and elevator
   Prop de-icer
   Right engine feather

2. Equipment Failure

   Prop governor
   Fuel pump
   Engine failure
   Wing flaps
   Landing gear
   Gyro
   Compass
   Electrical system power
   Hydraulic pressure

3. Environment

   Propeller ice
   Carburetor ice
   Airframe ice
   Pitot ice
   Rough air
   Clouds
   Lighting
   Night and day
   Flight noise

4. Engine/Temperature Controls

   (Any temperature/pressure can be selected)

   Cylinder head temperature
   Oil pressure
   Oil temperature
   Fuel quantity
   Magnetic chip detector

Simulated WST Conditions

All systems may be used by crew members, or the WST may be used in a "no pilot" condition.

MAD CONTROLS

Simulation of equipment includes effect of vertical separation of aircraft and target, generally the same limitations as the operational equipment.

1. Size of target (small, medium, large).
2. Target history (low, average, high).
3. Miscellaneous noise.
4. Maneuver noise.
5. Earth field control.

SEARCH RADAR

1. One enemy target (submarine). Submarine can run on surface, snorkel, at depths to 500 feet at speeds of 0 to 30 knots.
2. Three friendly targets, two ships and one aircraft.
3. Friendly targets can be coordinated as desired, with either aircraft position or submarine position.

4. All targets move at speeds set by instructors, ships and land-0-30 knots, aircraft-100-600 knots, all at headings from 0° to 360°.

5. Sea return is controlled by wind velocity and direction.

ECM CONTROLS

1. ECM has available the same targets as the radar, with identical operation.

2. The PRF, PW antenna rotation, and target radiation may be set as desired for either submarine or friendly targets.

3. The frequency range is the same as the present operational equipment.

SONO SYSTEM

1. The Sono system has available a full load of sonos and some smoke lights. The smoke lights may be reset and used as needed without affecting sonobuoys, but sonos can be reset all at once, or one at a time.

2. A scope is used to simulate the visual position of the sonos with relation to the aircraft.

3. Sono error may be simulated. Operational capability is approximately the same as aircraft equipment.

JULIE SYSTEM

This system operates the same as in the aircraft.

JEZEBEL SYSTEM

This system operates the same as in the aircraft.

NEW DIFAR SYSTEM

This system operates the same as in the aircraft.

GRADING INSTRUCTIONS

Examination grades shall be computed on a 4.0 scale and converted to an adjective grade of Qualified or Unqualified.

Open Book Examination

To obtain a grade of Qualified, an evaluee must obtain a minimum score of 3.5.

Closed Book Examination

To obtain a grade of Qualified, an evaluee must obtain a minimum score of 3.3.

Oral Examination and OFT/WST Procedure Evaluation (If conducted)

A grade of Qualified or Unqualified shall be assigned by the Instructor/Evaluator.

FLIGHT EVALUATION

The evaluee must receive an adjective grade of Qualified in written and oral examinations before commencement of the flight evaluation. The evaluation may be accomplished on a scheduled operational or training flight.

The Flight Evaluation is intended to evaluate compliance with approved operating procedures. It is not intended to measure the proficiency and/or ability of those evaluated beyond a point necessary to assure safety of flight.

The number of flights required to complete the flight evaluation should be kept to a minimum; normally one flight. The areas and sub-areas to be observed and graded on an evaluation flight are outlined below with critical areas/sub-areas marked by an asterisk (*). Sub-area grades will be assigned in accordance with the grading criteria. These sub-areas shall be combined to arrive at the overall grade for the flight. Area grades, if desired, shall also be determined in this manner.

PILOT AREAS

A. MISSION PLANNING

Knowledge of publications/charts

Route planning

Plotting board navigation

B. BRIEFING

Mission brief

ASW kit

Kneeboard data card

Personal flight gear

Filing procedure

*C. PREFLIGHT

Yellow sheet

*Aircraft inspection

D. PRE-TAKEOFF PROCEDURES

Cockpit check lists

Engine starting procedures

Taxi

Engine run-up

*E. TAKE-OFF/DEPARTURE

Take-off check list

*Take-off procedure

Departure

*F. BASIC AIRWORK/INSTRUMENTS

G. FORMATION

*Rendezvous

Parade

Free cruise

Passing lead

Visual signals

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*Engine failure

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AIRCREW AREAS

*A. PREFLIGHT

Yellow sheets

*Aircraft inspection

B. PRETAXI

C. PRE-TAKEOFF AND POST-TAKEOFF

Pre-takeoff

Post-takeoff

D. RADAR

Turn on

Operation

Turn off

E. ECM

Turn on

Operate

Turn off

F. MAD

Turn on

Operate

Turn off

G. ASR-3

Turn on

Operate

Turn off

H. JULIE

Turn on

Operate

Turn off

I. TACTICAL PLOTTER SYSTEM

Turn on

Operate

Turn off

J. SONOBUOY

Turn on

Operate

Turn off

K. JEZEBEL

Turn on

Operate

Turn off

L. DIFAR

Turn on

Operate

Turn off

M. TAPE RECORDER

Load/Unload

Turn on

Operate

Turn off

NEW NEW NEW NEW

NEW *N. EMERGENCY DRILLS

*Ditch

*Bailout

NEW O. PRELAND AND POSTFLIGHT

*Preland

Postflight

NEW P. DEBRIEFING

FLIGHT EVALUATION GRADING CRITERIA

Only those sub-areas provided or required will be graded. The grades assigned for a sub-area shall be determined by comparing the degree of adherence to standard operating procedures with adjective grades listed below. Momentary deviations from standard operating procedures should not be considered as unqualifying provided such deviations do not jeopardize flight safety and the evaluee applies prompt corrective action.

PILOT AREA GRADING CRITERIA

MISSION PLANNING

Knowled : Publications/Charts

Qualified	Exhibits thorough knowledge of the contents of and the ability to use applicable publications and charts for all phases of mission planning. Minimum time required. Completes planning with few minor errors. Demonstrates ability to plan the mission in the absence of any assistance from a briefing officer.
Conditionally Qualified	Exhibits ability to use necessary publications and charts, but uses excessive time in planning, due to lack of familiarity with publications and charts. Completes planning with numerous minor errors, but no critical errors.
Unqualified	Exhibits lack of familiarity with and ability to use publications and charts necessary in mission planning. Completes mission planning with numerous errors, some critical.

Route Planning

Qualified	Exhibits thorough route planning to include the following information: Route; special, warning, restricted and prohibited areas; emergency and alternate airfields; weather and winds aloft; NOTAMS; necessity of oxygen; communications; fuel requirements; preparation of navigation data log.
Conditionally Qualified	Same as Qualified, but with discrepancies which do not adversely affect successful completion of mission or jeopardize safety.
Unqualified	Discrepancies which preclude successful completion of the mission or jeopardizes safety.

Plotting Board Navigation

Qualified	Exhibits a thorough knowledge of "DR" navigation and completes navigation data on plotting board with no procedural errors.
Conditionally Qualified	Same as Qualified, except that pilot makes minor procedural errors which do not jeopardize the accomplishment of the mission and/or safety of flight.
Unqualified	Exhibits lack of familiarity and ability to plot navigation data. Completes navigation data with errors which could jeopardize mission and/or safety of flight.

BRIEFING

Mission Brief

Qualified	Thorough briefing, utilizing NATOPS Briefing Guide.
Unqualified	Omissions which affect mission accomplishment and/or jeopardize safety of flight.

ASW Kit

Qualified	Has all required items as prescribed in NATOPS Manual (for applicable missions). Displays excellent knowledge of contents and use of all items.
Conditionally Qualified	Same as Qualified except pilot not thoroughly familiar with the contents and use of items.
Unqualified	Pilot does not have all required items.

Kneeboard Data Card

Qualified	Accurately records all information necessary for accomplishment of mission.
Unqualified	Does not utilize Data Card and/or omits information which would jeopardize the mission and/or safety of flight.

Personal Flight Gear Check

Qualified	Has all required equipment necessary as prescribed. Crew displays thorough knowledge of the contents and use of all items.
Unqualified	Crew does not have all required personal equipment or is not thoroughly familiar with its use.

Filing Procedure

Qualified	Clearance forms completed in accordance with local, OPNAV, and other governing instructions.
Conditionally Qualified	Same as Qualified, but with discrepancies which do not adversely affect successful completion of the mission or jeopardize safety.
Unqualified	Discrepancies which preclude successful completion of the mission or jeopardize safety.

PREFLIGHT (CRITICAL)

Yellow Sheet

Qualified	Pilot checks a minimum of ten (10) previous yellow sheets (when applicable) and notes any comments on the aircraft status board (if available) concerning equipment malfunction. Yellow sheet is properly completed.
Conditionally Qualified	Same as Qualified with exception that questionable pilot or maintenance entries on previous yellow sheets are not clarified. Minor deviation in yellow sheet completion and failure to note any/or all discrepancies recorded on the aircraft status board (if available).
Unqualified	Fails to properly check the last ten yellow sheets. Exhibits an attitude of unconcern.

Aircraft Inspection (Critical)

Qualified	Demonstrates thorough knowledge of the required preflight inspection.
Conditionally Qualified	Same as Qualified, except makes minor omissions which will not jeopardize safety of flight.
Unqualified	Any omission and/or incomplete or inadequate check that would jeopardize safety of flight.

PRE-TAKEOFF PROCEDURES

Cockpit Check Lists

Qualified	Pilot used current PRESTART and PRETAXI check list as prescribed.
Conditionally Qualified	Same as Qualified, but pilot exhibits minor deviations.
Unqualified	Does not use prescribed and current check list. Check list items are omitted or overlooks items which could result in unsafe operation.

Engine Starting Procedures

Qualified	Uses prescribed starting procedure with no omissions.
Conditionally Qualified	Uses prescribed starting procedure, but with minor deviations.
Unqualified	Does not use prescribed starting procedure.

Taxi

Qualified	Taxi is accomplished safely and properly.
Conditionally Qualified	Same as Qualified, except for minor deviations not affecting safety.
Unqualified	Taxies in an unsafe manner.

Engine Run-Up

Qualified	Uses prescribed procedures with no omissions or deviations. Recognizes discrepancies, if any, and takes proper corrective action.
Conditionally Qualified	Same as Qualified, except for minor deviations in procedure and technique, not detrimental to safety.
Unqualified	Fails to recognize discrepancies which could jeopardize safe flight and/or fails to take proper correction action.

TAKE-OFF/DEPARTURE (CRITICAL)

Take-Off Check List

Qualified	Uses check list as prescribed. Makes thorough check with no omissions or deviations. Instructs Co-pilot on duties for take-off.
Conditionally Qualified	Same as Qualified, except some minor deviations and/or omissions.

Unqualified	Does not use current checklist. Any omission and/or deviation or incomplete check which would jeopardize a safe take-off.

Take-Off Procedures (Critical)

Qualified	Lines up properly, checks gauges after turn up prior to roll, exhibits good directional control, smooth take-off, and uses prescribed airspeeds.
Conditionally Qualified	Same as Qualified, except for minor deviations in procedure and technique; execution not detrimental to flight safety.
Unqualified	Any deviation from above standards that jeopardizes a safe take-off.

Departure

Qualified	Pilot contacts appropriate control after take-off. Follows instructions and adheres to prescribed traffic patterns.
Conditionally Qualified	Same as Qualified, except pilot makes minor deviations which do not jeopardize safety of flight.
Unqualified	Pilot makes omissions and deviations from instructions which jeopardize safety of flight.

BASIC AIRWORK/INSTRUMENTS (CRITICAL)

Qualified	Demonstrates thorough knowledge and airmanship ability in the control of the aircraft and performance of all approved procedures during all phases of flight.
Conditionally Qualified	Demonstrates adequate knowledge and airmanship ability in the control of the aircraft and performance of all approved procedures during all phases of flight, without jeopardizing safety of flight.
Unqualified	Demonstrates airmanship ability below the required standards of safety; ignores or violates prescribed procedures and/or aircraft limitations; or demonstrates flight performance below the standards prescribed for a STANDARD Instrument Rating.

FORMATION FLIGHT

Rendezvous (Critical)

Qualified	Executes or facilitates rendezvous expeditiously and in the manner prescribed in NATOPS and brief.
Conditionally Qualified	Executes rendezvous in a manner which indicates adequate knowledge of prescribed procedures. Minor deviations which do not adversely affect rendezvous.
Unqualified	Executes rendezvous in a manner which indicates lack of knowledge of prescribed procedures. Deviations affect safety of flight.

Parade Formation

Qualified	Demonstrates thorough knowledge of correct parade positions. Flies positions smoothly and maintains adequate nose-to-tail, stepdown, and wingtip clearances.

Conditionally Qualified	Demonstrates adequate knowledge of parade positions. Flies positions smoothly, but has tendency to make excessive power and control changes.
Unqualified	Demonstrates definite lack of knowledge of correct parade positions. Flies the positions in an erratic and/or unsafe manner. Does not maintain adequate nose-to-tail, step down, and wing-tip clearance.

Free Cruise Formation

Qualified	Demonstrates thorough knowledge of free cruise procedures. Flies free cruise smoothly and safely.
Conditionally Qualified	Demonstrates adequate knowledge of free cruise procedures. Flies free cruise in a safe manner, but uses excessive power and control changes.
Unqualified	Demonstrates definite lack of knowledge of free cruise procedures. Flies free cruise in an erratic and/or unsafe manner.

Passing Lead

Qualified	Demonstrates thorough knowledge of lead change procedures and smoothly and expeditiously executes the lead change.
Conditionally Qualified	Demonstrates adequate knowledge of lead change procedures. Executes the lead change smoothly, but with some delay due to over-control of power or aircraft.
Unqualified	Demonstrates definite lack of knowledge of lead change procedures. Executes the lead change in an erratic and/or unsafe manner with long delays due to poor aircraft control.

Signals (Visual)

Qualified	Demonstrates thorough knowledge of standard visual formation signals.
Conditionally Qualified	Demonstrates adequate knowledge of standard visual formation signals with minor deviations and delays in receiving and interpretation.
Unqualified	Uses non-standard signals, resulting in confusion and misinterpretation. Displays lack of knowledge of standard formation signals.

CREW LEADING ABILITY

Qualified	Demonstrates complete command of the situation at all times. Keeps his crew advised of all pertinent information. Demands and uses the full capabilities of his crew under all circumstances.
Conditionally Qualified	Demonstrates adequate command of the situation. Keeps crew advised of pertinent information under most conditions. Utilizes his crew adequately enough to perform assigned mission.
Unqualified	Below the standards as outlined for Conditionally Qualified.

COMMUNICATIONS

Voice Reports

Qualified	Pilot uses radios properly. Has thorough knowledge of, and utilizes correct ASW Brevity Code and voice report procedures, with minor errors or omissions. Makes all reports when required, and utilizes prescribed format.
Conditionally Qualified	Has adequate knowledge of and utilizes correct Brevity Code and voice report procedures with minor errors or omissions not jeopardizing the mission. Makes required reports with some deviation in format.
Unqualified	Below the standards as outlined for Conditionally Qualified and/or compromises the Brevity Code.

ICS Procedures

Qualified	Thoroughly knows and utilizes correct ICS procedures during all phases of search and attack.
Conditionally Qualified	Adequately familiar with and uses ICS procedures with few omissions.
Unqualified	Unfamiliar with standard ICS voice procedures.

Light and Hand Signals

Qualified	Demonstrates thorough knowledge of, and ability to use standard light and hand signals.
Conditionally Qualified	Demonstrates adequate knowledge of visual signals.
Unqualified	Shows obvious lack of knowledge concerning interpretation and use of signals. Unfamiliarity causes hesitation and delay to a degree that operations are hampered.

EMERGENCY PROCEDURES (CRITICAL)

Qualified	Properly analyzes the emergency situation and takes appropriate action without deviation, error or omission.
Conditionally Qualified	Properly analyzes the emergency situation and accomplishes all required action safely but not in prescribed sequence.
Unqualified	Not up to standard of Conditionally Qualified.

LANDING (CRITICAL)

Landing Check List

Qualified	Pilot uses prescribed check list. Completes check list with thoroughness, and with no omissions.
Conditionally Qualified	Same as Qualified, except pilot exhibits minor deviations.
Unqualified	Does not use prescribed check list. Check list items are omitted or overlooked.

Pattern

Qualified	Meets all applicable traffic pattern entry requirements. Maintains altitude within ±100 feet of specified entry altitude.

Conditionally Qualified	Meets all applicable traffic pattern entry requirements with minor deviations. Maintains altitude within ±200 feet.
Unqualified	Violates applicable pattern entry requirements and altitude limitations stated above.

Approach To Landing (Runway/Deck) (Critical)

Qualified	Demonstrates ability to smoothly and safely control aircraft in any landing configuration with airspeed control tolerance of ±5 knots. Uses good power control to set up good rate of descent throughout approach. Keeps aircraft in balanced flight.
Conditionally Qualified	Demonstrates adequate ability to control the aircraft in any landing configuration with airspeed control tolerance of ±10 knots. Has some difficulty coordinating good altitude and airspeed control throughout approach. Has some difficulty maintaining balanced flight.
Unqualified	Does not meet the requirements outlined for Conditionally Qualified.

Landing Touchdown/Rollout (Critical)

Qualified	Executes smooth transition to touchdown with aircraft in balanced flight. Maintains excellent control of aircraft after touchdown.
Conditionally Qualified	Executes satisfactory transition to touchdown. Maintains good control of aircraft after touchdown.
Unqualified	Does not meet requirements outlined for Conditionally Qualified.

POST LANDING

Post Landing Check List

Qualified	Pilot uses check list as prescribed. Completes check list with thoroughness, and with no omissions.
Conditionally Qualified	Same as Qualified, except pilot exhibits minor deviations.
Unqualified	Does not use prescribed check list. Check list items are omitted or overlooked.

Taxi/Ground Secure

Qualified	Taxi is accomplished safely and properly. Pilot uses check list as prescribed. Completes check list with thoroughness and with no omissions.
Conditionally Qualified	Same as Qualified, except pilot exhibits minor deviations.
Unqualified	Taxies in unsafe manner. Does not use prescribed check list. Check list items are omitted or overlooked.

Yellow Sheet

Qualified	Properly completes yellow sheet and thoroughly describes all malfunctions of equipment.
Conditionally Qualified	Same as Qualified, except omits minor discrepancies.

Unqualified	Fails to note malfunctions of equipment which could jeopardize safety of flight and/or mission.

DEBRIEF

Debriefing of Aircrew

Qualified	Pilot thoroughly debriefs the aircrew and gives error analysis with appropriate corrective action indicated.
Conditionally Qualified	Omissions and inadequate error analysis. Hesitant and forgetful in presentation.
Unqualified	Inadequate debriefing with major items omitted. No error analysis or corrective action given.

Mission Debriefing

Qualified	Pilot provides through information and chronological order of events occuring during mission to debriefing agency. Completes all forms, analysis, and associated materials required for debriefing without error or omission.
Conditionally Qualified	Same as Qualified with minor deviation and omission not of any consequence to value of mission debriefing. In-flight and debriefing forms completed with minor errors.
Unqualified	Unfamiliar with debriefing requirements. Commits major errors and/or omissions in the completion of in-flight and debriefing forms.

AIRCREW AREA GRADING CRITERIA

PREFLIGHT (CRITICAL)

Previous Yellow Sheets

Qualified	Inspects at least previous ten yellow sheets for completion of work on discrepancies noted.
Unqualified	Makes no attempt to ascertain past aircraft discrepancies.

Aircraft Inspection (Critical)

Qualified	Demonstrates thorough knowledge of aircrewman preflight inspection.
Conditionally Qualified	Demonstrates adequate understanding of aircrewman preflight inspection with minor omissions.
Unqualified	Demonstrates obvious lack of familiarization with aircraft.

PRE-TAXI

Qualified	Demonstrates thorough knowledge of pre-taxi checks. Has properly and safely manned the aircraft.
Conditionally Qualified	Demonstrates adequate knowledge of pre-taxi procedures with minor omissions.
Unqualified	Demonstrates obvious lack of knowledge in pre-taxi procedures. Is not prepared for flight.

PRE-TAKEOFF AND POST TAKEOFF

Pre-Takeoff

Qualified	Demonstrates thorough knowledge of all pre-takeoff checks and is safely harnessed for flight. Responds correctly to check off list.
Conditionally Qualified	Demonstrates adequate knowledge of pre-takeoff checks with minor omissions. Is safely harnessed for flight.
Unqualified	Has no knowledge of pre-takeoff checks and endangers himself by improper use of harness and lap belt. Does not answer check list properly.

Post Takeoff

Qualified	Demonstrates thorough knowledge of aircrew post takeoff procedures.
Conditionally Qualified	Demonstrates adequate understanding of post takeoff procedures with minor omission.
Unqualified	Demonstrates obvious lack of knowledge of post takeoff procedures. Has no knowledge of aircraft emergency procedures. Shows obvious lack of understanding of aircraft systems.

RADAR/ECM/MAD/ASR/JULIE/TACTICAL PLOTTER SYSTEM/SONOBUOY/JEZEBEL DIFAR TAPE RECORDER

Turn On

Qualified	Demonstrates thorough knowledge of turn-on procedures. Demonstrates in-flight troubleshooting procedures as applicable.
Conditionally Qualified	Demonstrates adequate knowledge of turn-on procedures and troubleshooting.
Unqualified	Displays obvious lack of knowledge of turn-on procedures.

Operate

Qualified	Demonstrates thorough knowledge of operating procedures. Demonstrates in-flight troubleshooting capabilities if applicable.
Conditionally Qualified	Demonstrates through knowledge of operating procedures with minor omissions. Demonstrates in-flight troubleshooting capabilities if applicable.
Unqualified	Displays obvious lack of knowledge of operation of equipment. Neglects proper operating procedures. Has no knowledge of troubleshooting procedures.

Turn Off

Qualified	Demonstrates proper turn-off procedures.
Conditionally Qualified	Demonstrates adequate knowledge of turn-off procedures with minor omissions.
Unqualified	Displays obvious lack of knowledge in turn-off procedures.

DIFAR TAPE RECORDER

Turn On

Qualified	Demonstrates thorough knowledge of turn-on procedures. Demonstrates in-flight troubleshooting procedures as applicable.
Conditionally Qualified	Demonstrates adequate knowledge of turn-on procedures and troubleshooting.
Unqualified	Displays obvious lack of knowledge of turn-on procedures.

Operate

Qualified	Demonstrates thorough knowledge of operating procedures. Demonstrates in-flight troubleshooting capabilities if applicable.
Conditionally Qualified	Demonstrates thorough knowledge of operating procedures for DIFAR with minor omissions. Demonstrates in-flight troubleshooting capabilities if applicable.
Unqualified	Displays obvious lack of knowledge of operation of equipment. Neglects proper operating procedures. Has no knowledge of troubleshooting procedures.

Turn Off

Qualified	Demonstrates proper turn-off procedures for DIFAR.
Conditionally Qualified	Demonstrates adequate knowledge of turn-off of DIFAR with minor omissions.
Unqualified	Displays obvious lack of knowledge of turn-off procedures.

TAPE RECORDER

Threading/Unloading

Qualified	Demonstrates ability to thread tape recorder and distinguish between proper and unproper threading. Demonstrates proper unloading of tape reels.
Conditionally Qualified	Demonstrates adequate ability of threading and unloading with minor omissions.
Unqualified	Displays obvious lack of knowledge in threading and unloading tape.

Turn On

Qualified	Demonstrates thorough knowledge of turn-on procedures. Demonstrates in-flight troubleshooting procedures as applicable.
Conditionally Qualified	Demonstrates adequate knowledge of turn-on procedures and troubleshooting.
Unqualified	Displays obvious lack of knowledge of turn-on procedures.

Operate

Qualified	Demonstrates thorough knowledge of operating procedures. Demonstrates in-flight troubleshooting capabilities if applicable. Demonstrates ability to splice broken tapes.
Conditionally Qualified	Demonstrates thorough knowledge of operating procedures with minor omissions. Demonstrates in-flight troubleshooting capabilities if applicable.

Unqualified	Displays obvious lack of knowledge of operation of recorder. Neglects proper operating procedures. Has no knowledge of troubleshooting procedures.

Turn Off

Qualified	Demonstrates proper turn-off procedures for recorder.
Conditionally Qualified	Demonstrates adequate knowledge of turn-off of recorder with minor omissions.
Unqualified	Displays obvious lack of knowledge of turn-off procedures.

EMERGENCY DRILLS (CRITICAL)

Ditch and Bailout (Critical)

Qualified	Demonstrates ability to properly and safely man ditching and bailout stations in adequate time.
Unqualified	Unable to man ditch and bailout stations in the prescribed manner or utilizes excessive time during drills.

PRELAND AND POST FLIGHT

Preland (Critical)

Qualified	Demonstrates thorough knowledge of preland checks and procedures. Is properly harnessed for landing.
Conditionally Qualified	Has an adequate understanding of preland checks and procedures with minor omissions. Is properly harnessed for landing.
Unqualified	Demonstrates a lack of knowledge of preland procedures and checks. Endangers himself or crew by not being properly harnessed or has left loose gear adrift.

Post Flight

Qualified	Demonstrates thorough knowledge of procedures during postflight. Does not endanger himself during deplaning period.
Conditionally Qualified	Demonstrates adequate understanding of post flight procedures with minor omissions. Does not endanger himself during deplaning period.
Unqualified	Shows complete lack of familiarization of postlanding procedures. Endangers himself during deplaning period.

DEBRIEFING

Debrief

Qualified	Performs thorough debrief, utilizing flight data; returns all aids carried during flight.
Unqualified	Does not utilize flight data or does not return aids carried on flight.

FLIGHT EVALUATION GRADE DETERMINATION

The following procedure shall be used in determining the flight evaluation grade: A grade of Unqualified in any critical area/sub-area will result in an overall grade of Unqualified for the flight. Otherwise, flight evaluation (or area) grades shall be determined by assigning the following numerical equivalents to the adjective grade for each sub-area. Only the numerals 0, 2, or 4 will be assigned in sub-areas without interpolation.

Unqualified - 0.0

Conditionally Qualified - 2.0

Qualified - 4.0

To determine the numerical grade for an area and the overall grade for the flight, add all the points assigned to the sub-areas and divide this sum by the number of sub-areas graded. The adjective grade shall then be determined on the basis of the following scale.

0.0 to 2.19 - Unqualified

2.2 to 2.99 - Conditionally Qualified

3.0 to 4.0 - Qualified

EXAMPLE: (Add Sub-area numerical equivalents)

$$\frac{4+2+4+2+4}{5} = \frac{16}{5} = 3.20 \text{ Qualified}$$

FINAL GRADE DETERMINATION

The final NATOPS Evaluation grade shall be the same as the grade assigned to the Flight Evaluation.

RECORDS AND REPORTS

A NATOPS Evaluation Report (OPNAV Form 3510-8) shall be completed for each evaluation and forwarded to the evaluee's Commanding Officer.

This report shall be filed in the individual flight training record and retained therein for 18 months. In addition, an entry shall be made in the pilot/NFO flight log book under "Qualifications and Achievements" as follows:

QUALIFICATION	DATE	SIGNATURE
NATOPS S-2D/E/G (crew position) EVAL.	(Date)	(Authenticating Signature) (Unit which Administered Eval.)

In the case of enlisted crewmembers, an entry shall be made in the Administrative Remarks (page 13) of his Service Record upon satisfactory completion of the NATOPS Evaluation as follows:

(Date) Completed a NATOPS Evaluation in (the S-2D/E/G) as (Flight Crew position) with an overall grade of (Qualified or Conditionally Qualified).

NATOPS EVALUATION QUESTION BANK

The following bank of questions is intended to assist the unit NATOPS Instructor/Evaluator in the preparation of ground examinations and to provide an abbreviated study guide. Additional questions may be obtained from the NATOPS Model Manager.

1. The total usable capacity of one engine oil tank is _____
2. With the auto feathering system ARMED and the throttle position switch activated, a loss of torque pressure which allows closing of the torque pressure-sensing switch will automatically energize the propeller feathering switch after a _____ time-delay.
3. There is a total of _____ fuel cells installed in the S-2D/E/G.
4. Landing on runway 29, wind is 200°/15 knots, gross weight is 23,000 pounds, and a full flap touchdown is planned at 90 knots. Density Alt. is 4,300 ft. What is the ground roll?
5. The pilot's Turn and Slip indicator is powered by _____
6. Constant Speed Drive oil level must be checked within _____ minutes after shutdown.
7. Power for the AC Essential Bus is normally supplied by (the) _____ generator(s).
8. Given a CAS of 150 knots, 10,000 ft. pressure alt. and - 10° C OAT, what is the TAS?
9. The main hydraulic reservoir can normally be refilled in flight. TRUE/FALSE
10. After the engines have been shut down, approximately how many applications of the parking brake can normally be made?
11. Operation of the Rudder Trimmer with the Single-Engine Rudder Assist switch ON is not recommended during double-engine flight above _____ KIAS.
12. At what IAS will the S-2D/E/G stall at 23,000 pounds, 15° bank, landing configuration?
13. The use of the Elevator Trim Tabs STANDBY switch will result in deactivation of the normal elevator trim tab control on the yoke. TRUE/FALSE
14. In order to minimize the adverse effects of engine vibration on the CSD system, the minimum taxi RPM is _____.
15. Provided no engine roughness is encountered during the Magneto check, the normal RPM drop on either the Right or Left positions is limited to _____.
16. What is maximum refusal speed? (Definition)

17. The minimum airspeed for Single-Engine Directional Control in the take-off configuration is _____ KIAS.

18. In the operating range above the minimum single engine control speed of 90 KIAS and below _____KIAS, minimum aircraft drag and optimum performance is obtained with a _____ flap setting.

19. What flight instruments are available when both AC generators are inoperative?

20. What is the torque pressure if the BHP is 600 and the engine RPM is 2,000?

21. The maximum arcing time allowed for the searchlight is _____.

22. When the AFCS is utilized, ALTITUDE HOLD with RADAR ALTITUDE MONITOR is not recommended for overland flying below _____feet AGL.

23. The hourly burnout requirements are accomplished whenever power above _____RPM and _____ PSI torque pressure is used.

24. Given 22 knots wind velocity, 70 degree wind angle, find minimum nose wheel lift off or touchdown speed (KIAS).

25. When altitude control is being accomplished below 1,000 feet by the AFCS barometric altitude control, and the radar altimeter is operating, the AFCS altitude monitor indicator window should display the word _____.

26. The normal mode of operation for the MF-1 Roll Stabilized compass is _____.

27. When flying formation, the leader will signal "I am breaking" by rocking ailerons then commencing his breakaway from the echelon with a _____ degree angle of bank.

28. Given: Navy hot day. One propeller windmilling. 100 knots IAS, gear up, 24,500 lbs gross weight, 1/3 flaps. Find: Single-engine rate-of-climb.

29. The four malfunctions that will cause the CSD light to illuminate are _____.

30. After starting, the throttle should be adjusted to hold approximately _____ RPM on the primer.

31. When used, the Automatic Feathering TEST switch substitutes for _____.

32. List the types of electrical power needed for operation of the Automatic Flight Control System.

33. The minimum safe single-engine airspeed that can be used during simulated single-engine practice is _____ KIAS.

34. During a jettison situation, the Fuel Dump will jettison fuel at the average rate of _____ pounds per minute.

35. The three conditions necessary for a failing engine to feather automatically are: _____

36. What is the ground clearance of the propellers of the S-2D/E?

37. The flaps are designed to blow up at the same time/rate regardless of power setting. TRUE/FALSE

38. The starter primer circuit breaker is located where?

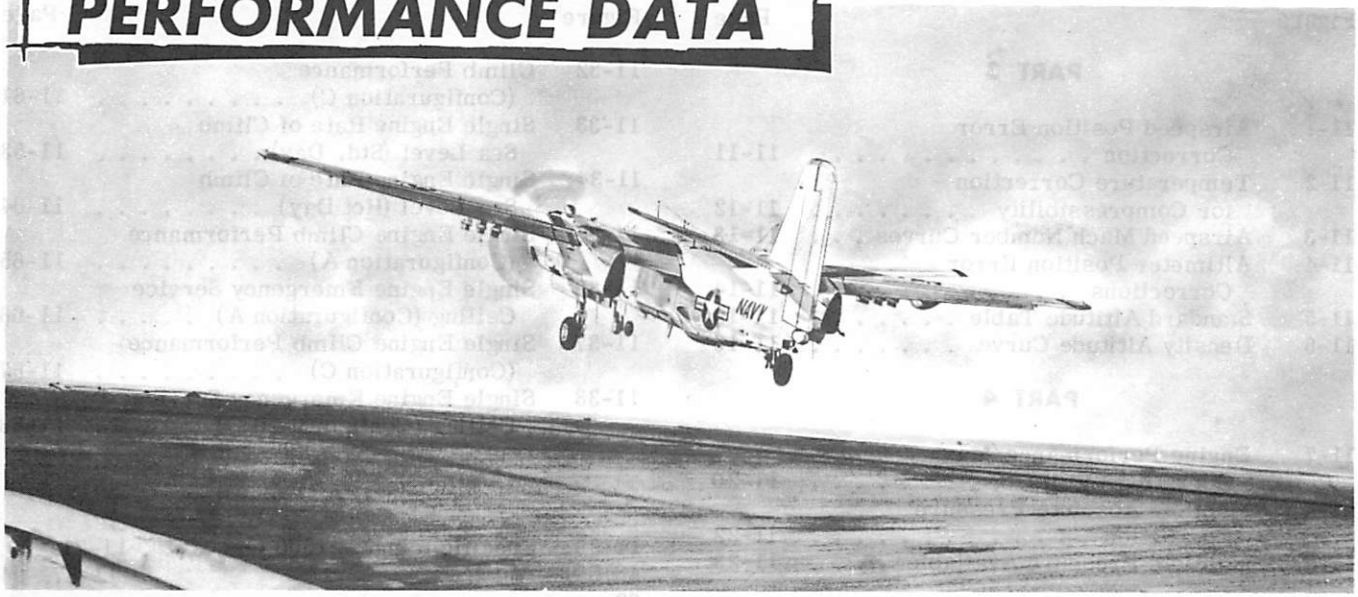
39. The minimum number of gallons of oil for flight is _____hot; _____ cold.

40. The propeller deicing heaters have a fast and slow cycle. What are the two cycles?

NATOPS EVALUATION FORMS

In addition to the NATOPS Evaluation Report, VS Pilot and Aircrew NATOPS Evaluation Worksheets, OPNAV FORM 3510/13 and 3510/13A are provided for use by the Evaluator/Instructor during the evaluation flight. All of the flight areas and sub-areas are listed on the worksheet with space allowed for related notes.

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C-SAD1-71

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part 1
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NEW

PERFORMANCE CHARTS

INTRODUCTION

"NOTE. FUEL COMSUMPTION FLOW RATES AT CRUISE POWER SETTINGS CAN BE APPROXIMATELY TEN PERCENT GREATER THAN INDICATED BY THE PERFORMANCE CHARTS IN THIS SECTION WHEN THE "DASH FOUR" PN 391336-4 CARBURETOR IS INSTALLED."

for a complete mission under any combination of conditions and circumstances. The charts can also be used in enroute planning when a mission objective is changed or when an emergency situation develops. The prediction of aircraft performance is complicated by the fact that variations in operating technique, from pilot to pilot, can result in large variations in aircraft performance. These variations can be reduced by establishing preferred operating procedures and by basing the calculation of performance data on the assumption that these procedures will be followed. Normal, emergency, and special operating procedures have been established, and are provided in Sections III, V, and VI, respectively. These procedures must be precisely followed, if efficient operation - the extra 20 miles of range, or the additional 15 minutes in station that may mean the success of a mission - is to be realized. Performance charts are included for the aircraft's four basic configurations; the configuration type is noted on the top left of each chart.

The charts are based on ICAO standard atmosphere-temperature, 15°C (59°F) at sea level, decreasing uniformly to -56.5°C (-69.7°F) at 36,089 feet - unless otherwise noted. Certain charts contain corrections for nonstandard temperatures. Charts for emergency operating conditions have red borders for rapid identification. All the charts show the performance of the aircraft when recommended operating procedures are followed: they do not contain a conservative factor or "padding." If unusual conditions exist, additional safety factors must be introduced by operating personnel on their own judgment to cope with the existing situation. All charts are based on zero headwind, unless a headwind correction grid is included on the chart.

CHART EXPLANATION

Descriptive explanations and sample problems are included at the beginning of each Part of this Section to illustrate the use of the performance charts. Guide lines on the charts for the sample problems show the path to follow when using the charts.

Sample Guides

Sample guides are included on the top right of each chart. Following the direction of the arrows indicates the manner in which the chart should be read.

FLIGHT PLANNING GUIDE

The following guide is included to illustrate to the pilot the steps in planning a mission when using the charts.

Take-Off/Landing - Part 5. Maximum take-off weight for a given runway and atmospheric conditions can be determined from the Accelerate-Stop Distance, Take-Off Distance and Take-Off Gross Weight Limit charts. Take-off and minimum control speeds are indicated on the take-off charts. The crosswind chart is used to determine whether the take-off speed is recommended for a specific crosswind component. Normal take-off distance or minimum take-off distance can be found from the Take-Off Distance charts in Part 5.

The recommended approach and touchdown speeds are determined from the Landing Speeds chart after the landing weight is established. The crosswind chart is used to determine whether these speeds are recommended for a specific crosswind component. Total landing distance from a 50-foot obstacle and ground roll distance can be determined from the Landing Distance charts.

Climb/Service Ceiling - Part 6. The normal rated power climb charts in this Part are used to find climb rate, time, fuel, and distance to climb from sea level (or from intermediate altitudes) to cruise altitude. Single engine climb capability is determined from the single engine charts of Part 6.

Specific Range - Part 7. The overall mission capabilities can be determined from the Long Range Prediction-Distance and Long Range Prediction-Time charts. After the mission capability is determined,

use the Specific Range charts for cruise control to accomplish the desired mission successfully. Part 3 and Part 4 of the Performance Data can be used to obtain additional cruise data for nonstandard temperatures.

Maximum Endurance - Part 8. Loiter speeds, fuel, and time for maximum endurance are obtained from the charts in this Part. Endurance data can also be determined from the Specific Range charts in Part 7.

Other Charts - Additional charts are included in the Performance Data to supplement the charts in the above flight planning guide and for emergency operation.

AIRCRAFT CONFIGURATIONS

Aircraft performance is affected by aircraft drag and weight. Performance, where appropriate, is presented for four drag configurations. For each drag configuration, performance is given for a range of gross weights. For a given loading, the aircraft weight can be determined as outlined below. Aircraft performance is then obtained from the charts representing the closest drag configuration to the given loading at the correct aircraft weight.

DRAG CONFIGURATIONS

Performance charts are presented, where appropriate, for the following four drag configurations.

CONFIGURATION	EXTERNAL STORES	RADOME AND MAD BOOM
A	None	Retracted
B	None	Extended
C	With Wing Stores (4-MK 43 Torp.)	Retracted
D	With Wing Stores (4-MK 43 Torp.)	Extended

AIRCRAFT WEIGHT

The aircraft gross weight is calculated by adding the weight of the crew, fuel, oil and stores aboard to the aircraft basic weight. The basic weight is the aircraft weight which includes all fixed equipment, trapped oil and trapped fuel.

AIRCRAFT WEIGHT	
Aircraft basic weight	19,400 lb. (approx.)
Oil	No. of Gal. x 7.5 lb.
Crew with parachute	200 lb. each
Store Weight	(See Armament Weight Breakdown Table below)
Fuel	(See Fuel paragraph below)

Note

Refer to Manual of Weight and Balance Data AN 01-1B-40 for the actual basic weight of a particular aircraft.

For reference to weight limitations, see Section I, Part 4.

ARMAMENT WEIGHT BREAKDOWN

The various armament weights are listed in the following table:

part 1
INTRODUCTION

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NEW

INTRODUCTION

This section contains performance data arranged in a sequence (divided into parts 1 through 8) for the purpose of optimum preflight planning. Charts are designed to enable the pilot to determine the capability of the aircraft for take-off, climb, cruise, and landing for a complete mission under any combination of conditions and circumstances. The charts can also be used in enroute planning when a mission objective is changed or when an emergency situation develops. The prediction of aircraft performance is complicated by the fact that variations in operating technique, from pilot to pilot, can result in large variations in aircraft performance. These variations can be reduced by establishing preferred operating procedures and by basing the calculation of performance data on the assumption that these procedures will be followed. Normal, emergency, and special operating procedures have been established, and are provided in Sections III, V, and VI, respectively. These procedures must be precisely followed, if efficient operation - the extra 20 miles of range, or the additional 15 minutes in station that may mean the success of a mission - is to be realized. Performance charts are included for the aircraft's four basic configurations; the configuration type is noted on the top left of each chart.

The charts are based on ICAO standard atmosphere-temperature, 15°C (59°F) at sea level, decreasing uniformly to -56.5°C (-69.7°F) at 36,089 feet - unless otherwise noted. Certain charts contain corrections for nonstandard temperatures. Charts for emergency operating conditions have red borders for rapid identification. All the charts show the performance of the aircraft when recommended operating procedures are followed: they do not contain a conservative factor or "padding." If unusual conditions exist, additional safety factors must be introduced by operating personnel on their own judgment to cope with the existing situation. All charts are based on zero headwind, unless a headwind correction grid is included on the chart.

CHART EXPLANATION

Descriptive explanations and sample problems are included at the beginning of each Part of this Section to illustrate the use of the performance charts. Guide lines on the charts for the sample problems show the path to follow when using the charts.

Sample Guides

Sample guides are included on the top right of each chart. Following the direction of the arrows indicates the manner in which the chart should be read.

FLIGHT PLANNING GUIDE

The following guide is included to illustrate to the pilot the steps in planning a mission when using the charts.

Take-Off/Landing - Part 5. Maximum take-off weight for a given runway and atmospheric conditions can be determined from the Accelerate-Stop Distance, Take-Off Distance and Take-Off Gross Weight Limit charts. Take-off and minimum control speeds are indicated on the take-off charts. The crosswind chart is used to determine whether the take-off speed is recommended for a specific crosswind component. Normal take-off distance or minimum take-off distance can be found from the Take-Off Distance charts in Part 5.

The recommended approach and touchdown speeds are determined from the Landing Speeds chart after the landing weight is established. The crosswind chart is used to determine whether these speeds are recommended for a specific crosswind component. Total landing distance from a 50-foot obstacle and ground roll distance can be determined from the Landing Distance charts.

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Specific Range - Part 7. The overall mission capabilities can be determined from the Long Range Prediction-Distance and Long Range Prediction-Time charts. After the mission capability is determined,

use the Specific Range charts for cruise control to accomplish the desired mission successfully. Part 3 and Part 4 of the Performance Data can be used to obtain additional cruise data for nonstandard temperatures.

Maximum Endurance - Part 8. Loiter speeds, fuel, and time for maximum endurance are obtained from the charts in this Part. Endurance data can also be determined from the Specific Range charts in Part 7.

Other Charts - Additional charts are included in the Performance Data to supplement the charts in the above flight planning guide and for emergency operation.

AIRCRAFT CONFIGURATIONS

Aircraft performance is affected by aircraft drag and weight. Performance, where appropriate, is presented for four drag configurations. For each drag configuration, performance is given for a range of gross weights. For a given loading, the aircraft weight can be determined as outlined below. Aircraft performance is then obtained from the charts representing the closest drag configuration to the given loading at the correct aircraft weight.

DRAG CONFIGURATIONS

Performance charts are presented, where appropriate, for the following four drag configurations.

CONFIGURATION	EXTERNAL STORES	RADOME AND MAD BOOM
A	None	Retracted
B	None	Extended
C	With Wing Stores (4-MK 43 Torp.)	Retracted
D	With Wing Stores (4-MK 43 Torp.)	Extended

AIRCRAFT WEIGHT

The aircraft gross weight is calculated by adding the weight of the crew, fuel, oil and stores aboard to the aircraft basic weight. The basic weight is the aircraft weight which includes all fixed equipment, trapped oil and trapped fuel.

AIRCRAFT WEIGHT	
Aircraft basic weight	19,400 lb. (approx.)
Oil	No. of Gal. x 7.5 lb.
Crew with parachute	200 lb. each
Store Weight	(See Armament Weight Breakdown Table below)
Fuel	(See Fuel paragraph below)

Note

Refer to Manual of Weight and Balance Data AN 01-1B-40 for the actual basic weight of a particular aircraft.

For reference to weight limitations, see Section I, Part 4.

ARMAMENT WEIGHT BREAKDOWN

The various armament weights are listed in the following table:

ARMAMENT WEIGHT BREAKDOWN

STORE	WEIGHT(LB)
Mk 101/102 Special Weapon	1200
Mk 57 Special Weapon or BDU-11E Training Shape	490
Mk 34 Torpedo	1160
Mk 46 Mod 1 Torpedo	600
Mk 44 Torpedo	432
Mk 54 Mod 1 Depth Bomb	350
SSQ-15 Sonobuoy	70
SSQ-47 Sonobuoy	32
SSQ-28 Sonobuoy	20
SSQ-41 Sonobuoy	18
SSQ-23 Sonobuoy	16
SSQ-36 Sonobuoy	18
SSQ-38 Sonobuoy	19
SSQ-49 Sonobuoy	25
SSQ-50 Sonobuoy	40
SSQ-53 Sonobuoy	29
SSQ-57 Sonobuoy	20
Mk 61 Mod O SUS	7
Mk 64 Mod O SUS	7
MK 84 Mod O SUS	7
Mk 57 Mod O SUS	6
Mk 6 Mods 4/5/6 Parachute Flares	30
Mk 24 Mod 3 Parachute Flare	27
Mk 24 Mod 2A Parachute Flare	24
Mk 5 Mods 7/10 Parachute Flare	18
Mk 6 Mod 3 Float Light	16
Mk 58 Mod O Marine Marker	13
Mk 25 Marine Marker	4
LAU-10/A Rocket Pack with 4 Zunis	533
Empty	105
AERO 7D Rocket Pack with 19 2.75" FFAR	431
Empty	70

STORE	WEIGHT(LB)
LAU-3A/A Rocket Pack with 19 2.75" FFAR	416
Empty	55
LAU-32A/A Rocket Pack with 7 2.75" FFAR	170
Empty	40
LAU-60/A Rocket Pack	473
Empty	79
LAU-32B/A Rocket Pack	167
Empty	43
LAU-56/A Rocket Pack	168
Empty	43
AERO 6A, 6A-1, 6A-2 Rocket Pack with 7 2.75" FFAR	155
Empty	25
** AGM-12B with Aero 5A-1 Launcher	670
** Aero 5A-1 Launcher	110
** AGM-12B (Bullpup)	560
Camera Pod with 56 M112 Photo-flash Cartridges	185
Empty	120
A/A 37B-3 PMBR	95
Mk 76 Mods 4/5 Practice Bomb	25
Mk 106 Mods 2/3/4 Practice Bomb	5
MK-124 Practice Bomb	500
AN-M57A-1 GP Bomb with conical fins	289
AN-M64A2 GP Bomb with conical or box fins	585
AN-M65A1 GP Bombs with conical or box fins	1205
AN-M59A1 SAP Bombs with box fins	1035
AN-M81 Fragmentation Bombs	277
AN-M88 Fragmentation Bombs	216
MK81 LDGP Bomb with conical fins	270

D-SAD1-200-1

Table 11-1 (Sheet 1)

ARMAMENT WEIGHT BREAKDOWN CONTINUED

STORE	WEIGHT(LB)	STORE	WEIGHT(LB)
MK82 LDGP Bomb with conical fins	525	Mk 52 Mine Mods 1 thru 6	1175 *
MK77 MOD 1/2 Fire Bomb	520	MK36 Mine (MK27 Para Pack)	1110
MK81 SNAKEYE Bombs	295	MK50 Mine (MK15 Para Pack)	544
MK82 SNAKEYE Bombs	572	MK53 Mine (MK21 Para Pack)	380

* Average weight. Range of weight for 6 mods 1130-1202 lb.

* * S-2E Aircraft incorp. AFC No. 491.

D-SAD1-200-2

Table 11-1 (Sheet 2)

FUEL

The performance data presented herein are based on fuel grade 115/145 (color code: purple), Specification MIL-G-5572, which has a normal density of 6.0 lb/gal. The total usable internal fuel tank capacity is 728 gallons (4368 lbs). The fuel grade and density are indicated by a note at the lower right hand corner of each graph. Range depends on the pounds of fuel available. The fuel gages will register the correct weight of fuel in the main tank, but the normal 6.0 lb/gal conversion factor will be in error.

FUEL TEMPERATURE		FUEL DENSITY
(°C)	(°F)	(lb-gal)
+50	+122	5.64
+40	+104	5.70
+30	+ 86	5.75
+20	+ 68	5.82
+10	+ 50	5.88
0	+ 32	6.00
-10	+ 14	6.06
-20	- 4	6.12
-30	- 22	6.18
-40	- 40	6.24
-50	- 58	6.30

SYMBOLS AND DEFINITIONS

IAS = Indicated Airspeed = Instrument Reading + Instrument Correction

CAS = Calibrated Airspeed = IAS + Position Error Correction

EAS = Equivalent Airspeed = CAS + Compressibility Correction

TAS = True Airspeed = EAS + Density Correction

°C = Temperature in degrees Centigrade

°F = Temperature in degrees Fahrenheit

OAT = Outside Air Temperature

CAT = Carburetor Air Temperature

CHT = Cylinder Head Temperature

PSI = Pounds per Square Inch

BHP = Brake Horsepower

TP = Torque Pressure (psi)

RPM = Revolutions Per Minute

MAP = Manifold Absolute Pressure

Hg = Inches of Mercury

FPM = Feet Per Minute

R/C = Rate of Climb (fpm)

NM/LB = Air Nautical Miles per Pound of Fuel

GW = Aircraft Gross Weight in Pounds

ρ = Atmospheric density in slugs per cubic foot

ρ_o = Standard sea level atmospheric density equal to 0.002378 slugs per cubic foot

σ = Atmospheric Density Ratio equal to ρ/ρ_o

MAXIMUM REFUSAL SPEED - The maximum speed to which the aircraft can be accelerated and still be stopped on the available runway.

TAKE-OFF DISTANCE - The ground run required to accelerate to take-off (lift-off) speed.

TAKE-OFF SPEED - The speed at which the main landing gear leaves the ground.

REFUSAL DISTANCE - The distance required to accelerate to the refusal speed under normal conditions and stop.

GROUND SPEED - True airspeed corrected for wind effect.

part 2

MISSION PLANNING

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Sample Problem No. 1, Anti-Submarine Search 11-8
Sample Problem No. 2, Ferry Range 11-9

Mission planning serves two purposes. First, taking into account all foreseeable conditions, mission planning determines in advance the initial, the intermediate, and the final airspeeds, altitudes, and headings, and the elapsed time and distance for the take-off, the climb, the cruise, the descent, and the landing. Second, mission planning determines the fuel load necessary for the safe accomplishment of a given mission for which armament and distance are known. The charts provide basic data from which detailed mission planning can be determined.

SAMPLE PROBLEM NO. 1, ANTI-SUBMARINE SEARCH

Assume it is desired to afford a main carrier force protection within a 200 nautical mile radius. How much search time on station is available using a long range version (Configuration B) of the aircraft? Assume carrier force remains in its present position and that as an added precautionary measure the aircraft will cruise out and back in the search configuration (Configuration B). All cruise will be conducted at 1500 feet altitude at Long Range CAS.

SOLUTION USING CURVES

The normal fuel allowance for warm up, taxi and take-off is 290 pounds and standard reserve is 10 per cent initial fuel (452 pounds). The initial climb weight is 26,147 pounds minus 290 pounds = 25,857 pounds. From the climb curves, Fast Climb figure 11-31 (sheet 1) the fuel used in climb to 1500 feet is 30 pounds, and climb time 1 minute. Distance remaining in cruise out is 200 nautical miles (radius) minus 2 nautical miles (climb distance) = 198 nautical miles.

The next step requires an assumption as to how much fuel will be used during cruise out. Calculate a cruise out of 198 nautical miles as follows:

a. Trial No. 1 - Assume 600 pounds. The average cruise out weight = 26,147 (turn up) - 290 (warm up) -30 (climb) -600 ÷ 2 = 25,527 pounds.

From figure 11-48 at 25,527 pounds read:
Recommended cruise true airspeed = 139.5 knots
Fuel flow = 530 pounds/hour

Therefore:

$$\text{Cruise out time } \frac{198 \text{ nautical miles}}{139.5 \text{ knots}} = 1.42 \text{ hours}$$

Cruise out fuel 530 pounds/hour x 1.42 hours = 753 pounds

The assumption is incorrect as the assumed 600 pounds is less than the calculated 753 pounds. Consequently for the second trial assume 753 pounds.

b. Trial No. 2 - Assume 753 pounds. The average cruise out weight = 26,147 (turn up) - 290 (warm up) -30 (climb) -753 ÷ 2 = 25,450 pounds.

From figure 11-48 at 25,450 pounds read:
Recommended cruise true airspeed = 138.5 knots
Fuel flow = 520 pounds/hour

Therefore:

$$\text{Cruise out time } \frac{198 \text{ nautical miles}}{138.5 \text{ knots}} = 1.43 \text{ hours}$$

Cruise out fuel 520 pounds/hour x 1.48 hours = 744 pounds

The assumption is correct as the assumed 750 pounds is greater than the calculated 744 pounds. The difference is negligible.

Having determined the cruise out fuel, the next step is to find the fuel used cruising back. Here another assumption must be made. However, it is known that less fuel will be used cruising back than cruising out, due to the lower cruise back weight. Calculate a cruise back of 200 nautical miles assuming 650 pounds as follows:

Average cruise back weight = 26,147 (turn up) - 4518 (total fuel) +452 (reserve) +650 ÷ 2 = 22,406 pounds.

From figure 11-48, at 22,406 pounds read:
Recommended cruise true airspeed = 131 knots
Fuel flow = 440 pounds/hour

Therefore:

Cruise back time $\frac{200}{131}$ nautical miles = 1.53 hours

Cruise back fuel 440 pounds/hour x 1.53 hours = 673 pounds.

The assumption is correct as 650 pounds is sufficiently close to the assumed 673 pounds and does not warrant another trial.

Since it is desired to spend the maximum time on station fly at maximum endurance airspeed. Calculate the search time on station as follows:

Fuel available for search = 4518 (total fuel)
-452 (reserve) -290 (warm up)
-30 (climb) - 744 (cruise out) -673 (cruise back)
= 2329 pounds.
Available search weight = 26,147 (turn up)
-4518 (total fuel) + 452 (reserve) + 673 (cruise back)
-2329 ÷ 2 = 23,918 pounds

From figure 11-48, at 23,918 pounds read:
Maximum endurance true airspeed = 108 knots
Fuel flow = 430 pounds/hour

Therefore:

Maximum search time on station 2329 pounds ÷ 430 pounds/hour = 5.4 hours.

The problem being solved, operating conditions are obtained from figure 11-48. Using the initial cruise weight 26,147 (turn up) - 290 (warm up) - 30 (climb) = 25,827 pounds. The engine settings are 1725 rpm; 30 inches manifold pressure and 215 psi torque pressure. As weight decreases the throttles must be retarded to follow the recommended cruise airspeed.

SAMPLE PROBLEM NO. 2, FERRY RANGE

Assume that it is desired to ferry an intermediate range aircraft with four crew members and partial fuel load (configuration C). The approximate turn-up weight will be 22,463 pounds plus 3126 of fuel = 25,589 pounds. What is the maximum range?

SOLUTION USING CURVES

The normal fuel allowance for warm up, taxi and take-off is 290 pounds. The normal allowance for reserve is 313 pounds, which is 10 percent of the initial fuel load. The fuel available for climb and cruise is 3126 pounds (turn-up) minus 290 pounds (warm-up) minus 313 pounds (reserve) = 2523 pounds. Assume aerological reports indicate flight at 5000 feet to be most desirable, with an effective tail wind of 30 knots. Assume that it is desired to climb at a calibrated airspeed of 120 knots (FAST CLIMB). The initial climb weight at sea level is 25,589 pounds (turn-up) minus 290 pounds (warm-up) = 25,299 pounds. From figure 11-32 (sheet 1) the distance covered in climb to 5000 feet is approximately 7.0 air nautical miles, the fuel used is 75 pounds and time is 3 minutes. The fuel remaining for cruise is 2523 pounds (climb and cruise) minus 75 pounds (climb) = 2448 pounds (no fuel or distance allowance is made for descent).

The initial cruise weight at 5000 feet is 25,299 pounds (initial climb weight) minus 75 pounds (climb) = 25,224 pounds. The final cruise weight is 25,224 pounds (initial cruise weight) minus 2448 pounds (cruise fuel) = 22,776 pounds. From the Long Range Prediction Curves for Distance and Time the following information is obtained:

DISTANCE-(FIGURE 11-60)

Final Cruise Weight (22,776 pounds)	=	1790 nautical miles
Initial Cruise Weight (25,224 pounds)	=	1120 nautical miles
Cruise Distance (no wind)	=	670 nautical miles

TIME-(FIGURE 11-61)

Final Cruise Weight (22,776 pounds)	=	865 minutes or 14.4 hours
Initial Cruise Weight (25,224 pounds)	=	580 minutes or 9.7 hours 285 minutes or 4.7 hours

Total Range = 7 NM (climb) + 670 NM (cruise 0 wind)
+141 NM (4.7 hours x 30 knots) (tail wind)

Total Range = 818 NM

Having determined the range, the initial operating condition for cruise is determined from figure 11-59 at a gross weight of 25,224 pounds; these being, the engine fuel flow 540 pounds/hour, MAP 29 inches Hg, engine speed 1750 rpm and a CAS of 133 knots. As weight decreases the throttles must be retarded to follow recommended cruise airspeed.

part 3

AIRSPEED/TEMPERATURE CORRECTIONS

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AIRSPEED CORRECTIONS

AIRSPEED POSITION ERROR/MACH NUMBER CURVES

To obtain correct aircraft speeds, several corrections must be applied to the airspeed indicator reading. The first correction is made for instrument error. The instruments are built within certain tolerances, but calibration of each individual instrument should be made occasionally. When the instrument reading is corrected for instrument error, the result is indicated airspeed (IAS) or indicated Mach number (IMN). The second correction is for error due to airspeed position error. This correction is obtained from figure 11-1 and, when added to the IAS, provides calibrated airspeed (CAS). The airspeed correction card on the instrument panel combines these first two corrections. The third correction is for effects of compressibility and, when applied to CAS results in equivalent airspeed (EAS). This is useful in engineering work but not necessary in flight operations. Therefore the third correction is combined with the fourth, which is for density (i.e., pressure altitude corrected for OAT). These corrections give the true airspeed (TAS), and are calculated using figure 11-3. Enter at the CAS and move vertically to the proper pressure altitude. Move to the right, parallel to the True Airspeed line, and read TAS for a standard day. If the corrected AT (figure 11-2) is known, move from the CAS-Altitude intersection horizontally to the Sea Level line, then vertically to the Air Temperature, then horizontally to the TAS. Adding effective tail wind (or subtracting the effective head wind) to the TAS provides ground speed. The effective wind is the component of wind velocity along the aircraft flight path.

TEMPERATURE CORRECTIONS FOR COMPRESSIBILITY

The outside air temperature is measured by a resistance bulb exposed to the airstream. When the bulb is moved through the air, the compression of the air causes an increase in the temperature which is approximately 80 per cent of the adiabatic temperature rise. The bulb senses the total temperature, whereas airplane performance is based on the free air temperature. Figure 11-2 is a standard chart which provides the correction (negative) to be added to the indicated air temperature in order to obtain free air temperature.

ALTIMETER POSITION ERROR CORRECTION

This curve (figure 11-4) gives the corrections required to obtain calibrated altimeter reading and is dependent upon IAS corrected for instrument and position errors (figure 11-1).

ALTITUDE TABLES

STANDARD ATMOSPHERE TABLE

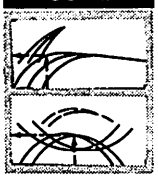
This chart (figure 11-5) presents the conditions of the ICAO standard atmosphere. The values given for $1/\sqrt{\sigma}$ are derived from the density ratios, since $\sigma = \rho/\rho_0$, and are used in determining TAS from CAS: TAS = CAS x $1/\sqrt{\sigma}$. This assumes no compressibility effects on CAS, so that CAS and EAS are considered equal. This assumption is valid because the compressibility effects are negligible at the cruising airspeeds and altitudes shown on the Specific Range Curves.

DENSITY ALTITUDE CHART

The Density Altitude Chart (figure 11-6) shows $\sqrt{\sigma}$ and density altitude when the pressure altitude and ambient temperature are known. This chart is used to find $\sqrt{\sigma}$ on other than Standard Day conditions. To use the chart, enter at the known temperature, move vertically to the known pressure altitude and read the density altitude directly to the left of this point, or $\sqrt{\sigma}$ directly to the right.

AIRSPEED POSITION ERROR CORRECTION

GUIDE



CONFIGURATION ALL
(2) ENGINES OPERATING

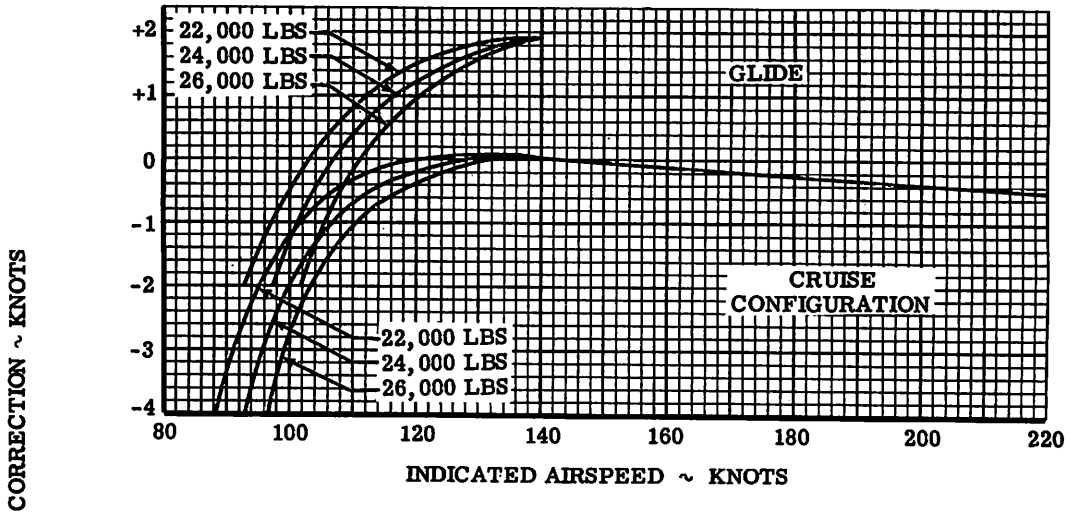
PRODUCTION AIRSPEED SYSTEM

MODEL(S): S-2D/E
DATA AS OF: APRIL 1960
DATA BASIS: GAEC FLIGHT TESTS

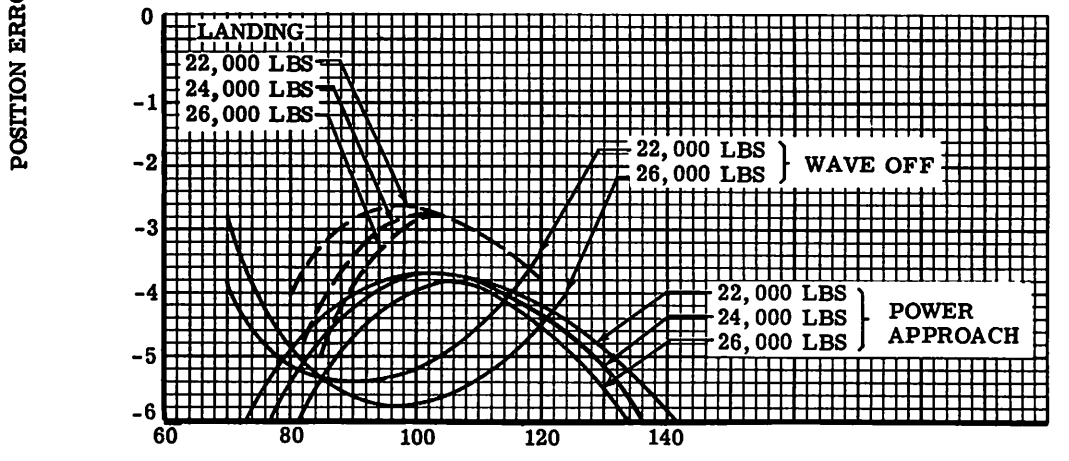
ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL

FLAPS AND GEAR UP



FLAPS AND GEAR DOWN



REMARKS

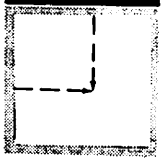
1. Add Corrections Algebraically to Indicated Airspeed (Instrument Reading Corrected for Instrument Error) to Obtain Calibrated Airspeed.

A-SAD1-300

Figure 11-1

TEMPERATURE CORRECTION FOR COMPRESSIBILITY

GUIDE



ICAO STANDARD DAY

CONFIGURATION ALL

PRESSURE ALTITUDE -FT.	CALIBRATED AIRSPEED-KNOTS			
	100	150	200	250
SL	−1°C	−3°C	−4°C	−7°C
5000	−2°C	−3°C	−5°C	−8°C
10000	−2°C	−4°C	−6°C	−9°C
15000	−3°C	−4°C	−7°C	−10°C
20000	−3°C	−5°C	−8°C	−12°C
25000	−3°C	−6°C	−9°C	−14°C
ADD CORRECTION TO INDICATED TEMPERATURE TO OBTAIN APPROXIMATE FREE AIR TEMPERATURE				

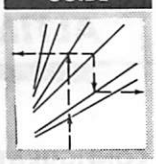
REMARKS

1. Sensing Element: Resistance Bulb.
2. 80% Adiabatic Temperature Rise Assumed.

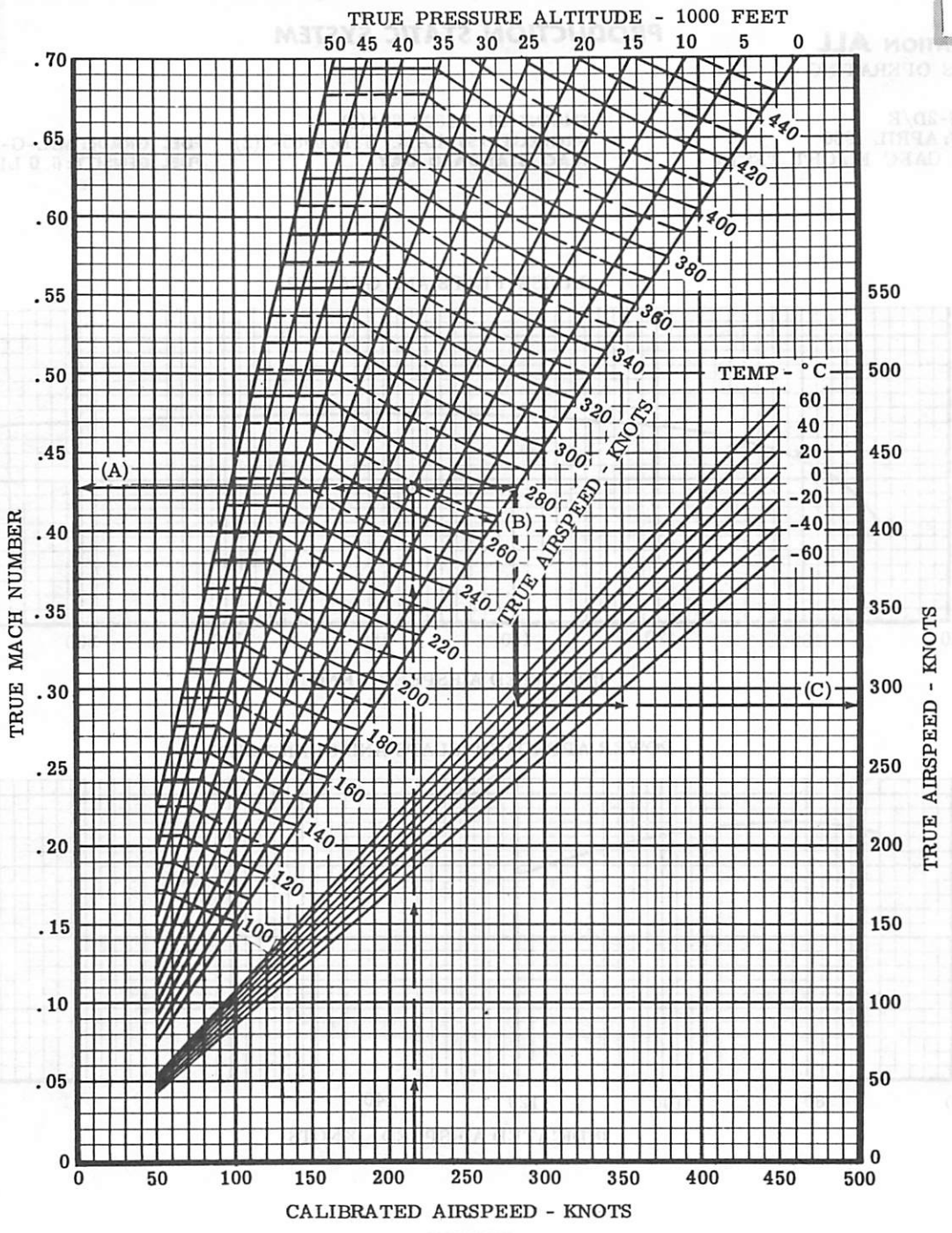
A-SAD1-366

Figure 11-2

GUIDE



AIRSPEED-MACH NUMBER CURVES



EXAMPLE

	CAS	= 215 Knots
	PA	= 15000 Feet
(A)	TMN	= .428
(B)	TAS	= 267 Knots at Standard Temp (-14.7° C)
(C)	TAS	= 290 Knots at temp of 30° C

REMARKS

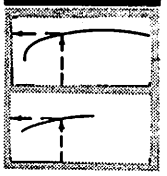
1. Set Altimeter Setting to 29.92 inches HG before Reading Indicated Pressure Altitude.

B-SAD1-302

Figure 11-3

ALTIMETER POSITION ERROR CORRECTION

GUIDE



CONFIGURATION ALL
(2) ENGINES OPERATING

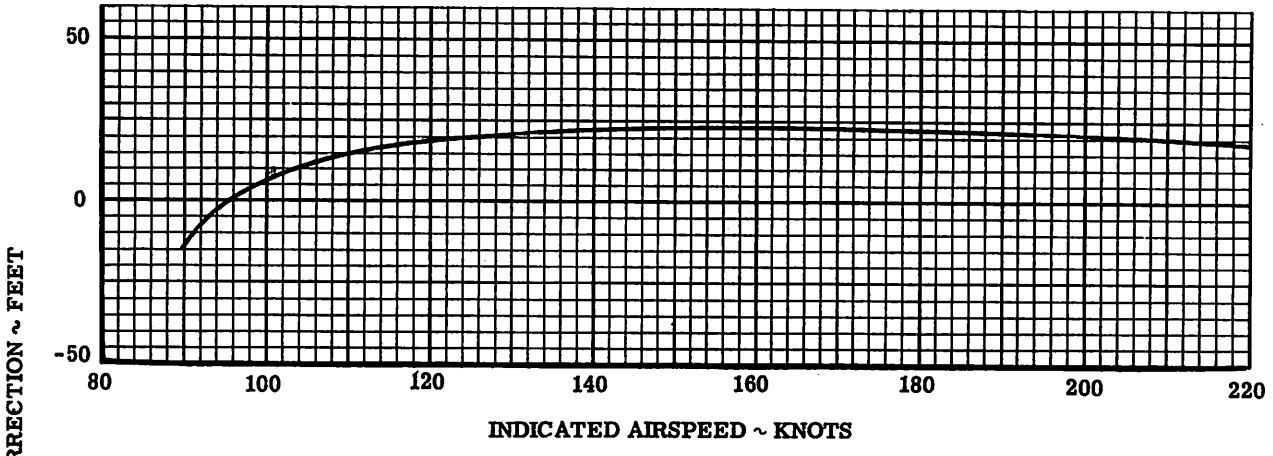
PRODUCTION STATIC SYSTEM

MODEL(S): S-2D/E
DATA AS OF: APRIL 1960
DATA BASIS: GAEC FLIGHT TESTS

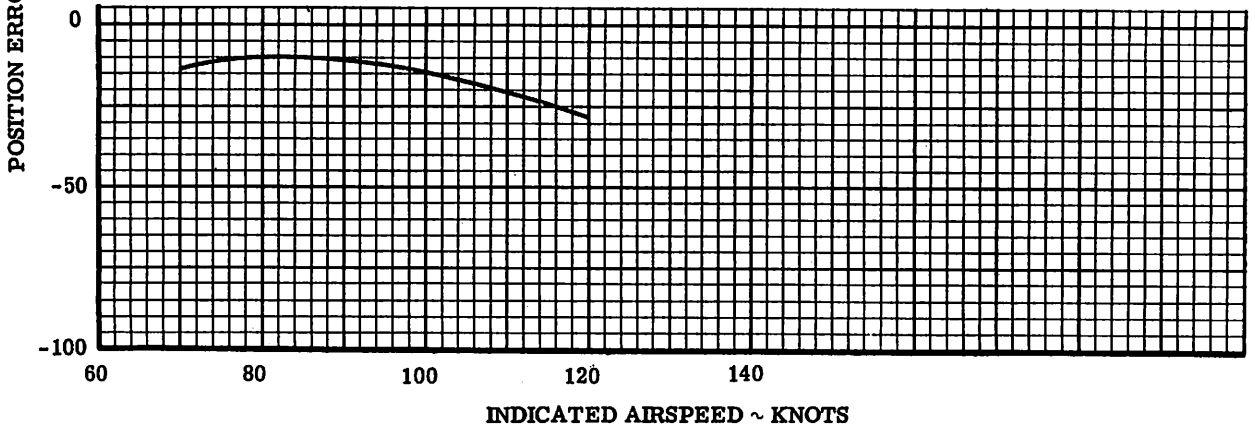
ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL

CRUISE-FLAPS AND GEAR UP



POWER APPROACH-FLAPS AND GEAR DOWN



REMARKS

1. Set Altimeter Setting to 29.92 inches HG before reading Indicated Pressure Altitude.
2. Add Corrections Algebraically to Indicated Pressure Altitude (Instrument Reading Corrected for Instrument Error) to Obtain Calibrated Pressure Altitude.
3. Indicated Airspeed to be Corrected for Instrument Error before using chart.

A-SAD1-301

Figure 11-4

GUIDE

STANDARD ALTITUDE TABLE

STANDARD SEA LEVEL AIR:
T = 15° C.
P = 29.921 IN. OF Hg.

W = .07648 LB/CU. FT. ρ_o = .0023769 SLUGS/CU. FT.
1" OF Hg. = 70.727 LB/SQ. FT. = 0.4912 LB/SQ. IN.
A_o = 1117 FT./SEC. (661.7 KNOTS)
σ = DENSITY RATIO

THIS TABLE IS BASED ON ICAO STANDARD ATMOSPHERE FROM NACA TN NO. 3182

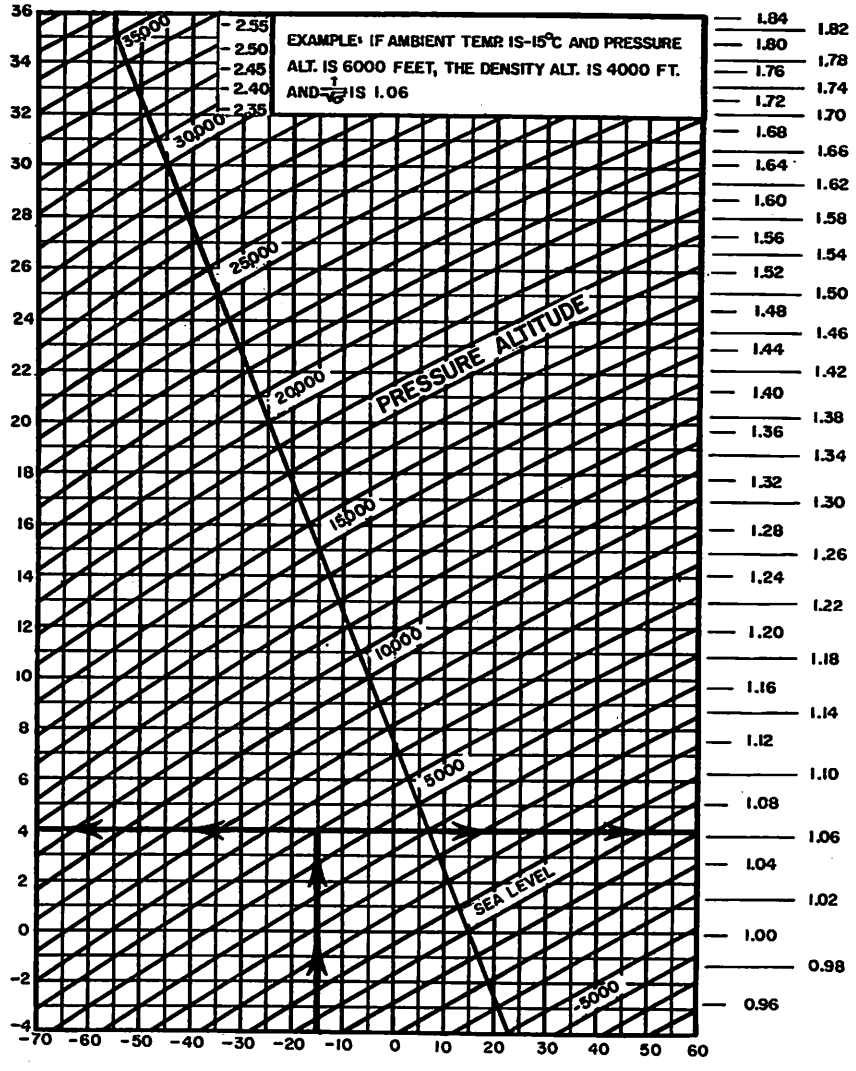
ALTITUDE FEET	DENSITY RATIO ρ/ρ_o	$\frac{1}{\sqrt{\sigma}}$	TEMPERATURE		SPEED OF SOUND		PRESSURE	
			DEG. C	DEG. F	RATIO A/A_o	KNOTS	IN. OF Hg	RATIO P/Po
0	1.0000	1.000	15.0	59.0	1.000	661.7	29.92	1.0000
1000	.9711	1.015	13.0	55.4	.997	659.5	28.86	.9644
2000	.9428	1.030	11.0	51.9	.993	657 2	27.82	.9298
3000	.9151	1.045	9.0	48.3	.990	654.9	26.82	.8962
4000	.8881	1.061	7.1	44.7	.986	652.6	25.84	.8637
5000	.8617	1.077	5.1	41.2	.983	650.3	24.90	.8320
6000	.8359	1.094	3.1	37.6	.979	647.9	23.98	.8014
7000	.8107	1.111	1.1	34.0	.976	645.6	23.09	.7716
8000	.7860	1.128	-0.8	30.5	.972	643.3	22.23	.7428
9000	.7620	1.146	-2.8	26.9	.969	640.9	21.39	.7148
10000	.7385	1.164	-4.8	23.3	.965	638.6	20.58	.6877
11000	.7156	1.182	-6.8	19.8	.961	636.2	19.79	.6614
12000	.6932	1.201	-8.8	16.2	.958	633.9	19.03	.6360
13000	.6713	1.221	-10.8	12.6	.954	631.5	18.29	.6113
14000	.6500	1.240	-12.7	9.1	.951	629.1	17.58	.5875
15000	.6292	1.261	-14.7	5.5	.947	626.7	16.89	.5643
16000	.6090	1.282	-16.7	2.0	.943	624.3	16.22	.5420
17000	.5892	1.303	-18.7	-1.6	.940	621.9	15.57	.5203
18000	.5699	1.325	-20.7	-5.2	.936	619.4	14.94	.4994
19000	.5511	1.347	-22.6	-8.8	.933	617.0	14.34	.4791
20000	.5328	1.370	-24.6	-12.3	.929	614.6	13.75	.4595
21000	.5150	1.394	-26.6	-15.9	.925	612.1	13.18	.4406
22000	.4976	1.418	-28.6	-19.5	.921	609.6	12.64	.4223
23000	.4807	1.442	-30.6	-23.0	.918	607.2	12.11	.4046
24000	.4642	1.468	-32.5	-26.6	.914	604.7	11.60	.3876
25000	.4481	1.494	-34.5	-30.1	.910	602.2	11.11	.3711
26000	.4325	1.521	-36.5	-33.7	.906	599.7	10.63	.3552
27000	.4173	1.548	-38.5	-37.3	.903	597.2	10.17	.3398
28000	.4025	1.576	-40.5	-40.9	.899	594.6	9.725	.3250
29000	.3881	1.605	-42.5	-44.4	.895	592.1	9.297	.3107
30000	.3741	1.635	-44.4	-48.0	.891	589.6	8.885	.2970
31000	.3605	1.665	-46.4	-51.6	.887	587.0	8.488	.2837
32000	.3473	1.697	-48.4	-55.1	.883	584.4	8.106	.2709
33000	.3345	1.729	-50.4	-58.7	.879	581.9	7.737	.2586
34000	.3220	1.762	-52.4	-62.2	.876	579.3	7.382	.2467
35000	.3099	1.796	-54.3	-65.8	.872	576.7	7.041	.2353
36000	.2981	1.832	-56.2	-69.4	.868	574.0	6.712	.2243
37000	.2844	1.875	-56.5	-69.7	.867	573.8	6.397	.2138
38000	.2710	1.921	-56.5	-69.7	.867	573.8	6.097	.2038
39000	.2583	1.968	-56.5	-69.7	.867	573.8	5.811	.1942
40000	.2462	2.016	-56.5	-69.7	.867	573.8	5.538	.1851
41000	.2346	2.065	-56.5	-69.7	.867	573.8	5.278	.1764
42000	.2236	2.115	-56.5	-69.7	.867	573.8	5.030	.1681
43000	.2131	2.166	-56.5	-69.7	.867	573.8	4.794	.1602
44000	.2031	2.219	-56.5	-69.7	.867	573.8	4.569	.1527
45000	.1936	2.273	-56.5	-69.7	.867	573.8	4.355	.1455
46000	.1845	2.328	-56.5	-69.7	.867	573.8	4.151	.1387
47000	.1758	2.385	-56.5	-69.7	.867	573.8	3.956	.1322
48000	.1676	2.443	-56.5	-69.7	.867	573.8	3.770	.1260
49000	.1597	2.502	-56.5	-69.7	.867	573.8	3.593	.1201
50000	.1522	2.563	-56.5	-69.7	.867	573.8	3.425	.1145
51000	.1451	2.625	-56.5	-69.7	.867	573.8	3.264	.1091
52000	.1383	2.689	-56.5	-69.7	.867	573.8	3.111	.1040
53000	.1318	2.755	-56.5	-69.7	.867	573.8	2.965	.0991
54000	.1256	2.822	-56.5	-69.7	.867	573.8	2.826	.0944
55000	.1197	2.890	-56.5	-69.7	.867	573.8	2.693	.0900

A-SAD1-365

Figure 11-5

DENSITY ALTITUDE CURVE

GUIDE



REMARKS

1. Set Altimeter Setting to 29.92 inches Hg before Reading Indicated Pressure Altitude.
2. Correct Indicated OAT°C for compressibility before entering chart.

B-SAD1-304

Figure 11-6

part 4

ENGINE POWER CURVES

TABLE OF CONTENTS

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Engine Performance/Max Operating Limits	11-17
Manifold Absolute Pressure Corrections	11-18
Manifold Pressure Available	11-19

ENGINE POWER CURVES

ENGINE PERFORMANCE/MAX OPERATING LIMITS CURVES

The Engine Performance/Max Operating Limits Curves (figure 11-7, sheets 1 and 2) show the power provided by the engines for various combinations of RPM and MAP and approved engine RPM - MAP limits. The curve is based on no ram and ICAO standard day conditions. For non-standard conditions, apply corrections outlined in the following paragraphs.

The sea level portion of the curve (sheet 1) shows the engine BHP output with various combinations of RPM and MAP. The upper end points of the rpm lines indicate limit values of MAP and BHP for given RPM. The RPM lines should not be extended.

The altitude portion of the curve (sheet 2) shows engine recommended limit power settings at various altitudes. This portion of the curve may be divided into two sections:

1. Partial throttle operation
2. Full throttle operation

On sheet 2, the section of the curve (horizontal lines) to the left of the propeller load limit line and the 145 BMEP limit line shows partial throttle operation. The remaining section of the curve (sloping RPM lines) represents full throttle operation.

One basic difference exists between these two portions of the curve: in the partial throttle portion, the RPM - MAP limits shown are recommended by the engine manufacturer and it is possible (but not recommended) to use the engine controls to exceed these limits; in the full throttle portion, it is impossible to exceed the shown limits since the controls are already at full throttle. The pilot must exercise caution not to exceed the limits shown in order to prolong engine life and to stay within safe operating limits.

In the partial throttle section of the curve, the following items should be noted. From sea level to the critical altitude of the engine (altitude at which full throttle operation starts), a constant power output is obtained with a given rpm by decreasing the MAP as shown. The throttle must be continuously opened while the decreasing MAP schedule is being followed. This decrease in MAP with altitude is necessary because of the standard decrease in temperature with altitude and decreasing back pressure on the exhaust. With any given rpm and MAP, engine power output increases with decreasing temperature. Thus, to maintain a constant power output, the MAP must be reduced. In the above discussion, CAT is assumed to be the same as the standard temperature at any altitude. This is not true for several reasons, some of which are the application of carburetor heat, heat transferred from the engine, and heat generated by the airflow in the carburetor intake scoop.

In the partial throttle portion of the curve (sheet 2), the limit values of MAP are read directly from the given RPM line at the given altitude. The following examples will assist in reading the curve:

PROBLEM NO. 1

Given: 2000 RPM
4000 feet altitude

Find: Limit MAP

Locate the intersection of the 2000 RPM line and the 4000 feet line. It is seen that this intersection is approximately at the 30 inch Hg MAP line. Thus, the limit MAP is 30 inch Hg.

PROBLEM NO. 2

Given: 2300 RPM
5000 feet altitude

Find: Limit MAP

Following the same guidelines outlined in the first problem, we see that at 2300 RPM and at 5000 feet, the limit MAP is approximately 37 inches Hg. Interpolation also may be made between rpm lines. Thus, at 2000 feet, 44 inches Hg may be carried with approximately 2450 RPM.

At any given RPM-attitude combination, it is permissible to operate at a lower value of MAP than shown on the curve. However, MAP should not be reduced excessively since inefficient engine operation results. The following recommended rules should be observed:

1. When increasing power, increase RPM before increasing the MAP.
2. When reducing power, reduce MAP before reducing the RPM.

As stated previously, the throttle must be continuously opened with increasing altitude to maintain a constant power output with a given RPM. When the full throttle position is reached, a further increase in altitude will yield a decrease in power output: at 2500 RPM - FULL throttle at 00 feet the MAP is approximately 46 inches Hg; an increase in altitude to 5000 feet at full throttle yields a MAP of 42 inches Hg. at 2500 RPM. In this region of the curve, the MAP shown at a given RPM and altitude is a physical limit which no amount of engine controls movement will exceed. The above discussion assumes no ram effects.

The effect of ram is to increase the altitude at which full throttle is reached. For instance, it is possible that during flight with a given RPM, at the critical altitude for that RPM (as shown on figure 11-7), the limit MAP will be obtained with less than full throttle because of the ram effect. When this occurs, the horizontal portion of the RPM line should be extended to the right to intersect the nearest extended partial throttle constant MAP line.

As an example, figure 11-7 indicates that at 10,000 feet and 2200 RPM the throttle will be fully advanced and the MAP will be 32.5 inches Hg. Although it is possible that the combination of 10,000 feet, 2200 RPM and 32.5 inches Hg can be obtained with less than full throttle, 32.5 inches Hg is still the limit MAP at that altitude. It can be seen that the extended 2200 RPM line and 32 inches Hg line intersect at 12,500 feet. If the ram effect is such that full throttle is not reached by 12,500 feet, 32 inches Hg is the limit MAP. It is difficult to say at what altitude full throttle will occur. However, once full throttle is applied, MAP and BHP decrease with increasing altitude and constant RPM, as explained above.

MANIFOLD ABSOLUTE PRESSURE CORRECTION CURVE

The limit MAP values shown on the altitude portion of figure 11-7 (sheet 2) are based on CAT being at the standard temperature for the given altitude, indicated on the Standard Altitude Table (figure 11-5). In order to maintain the same BHP output if CAT is above or below standard, the MAP limit should be adjusted up or down, respectively, according to the following information obtained from figure 11-8. The following recommended rules should be observed:

If below 2400 RPM:

1. Increase MAP limit 1/4 inch Hg. for every 6°C of increase in CAT above standard up to 1 inch Hg.
2. Decrease MAP limit 1/4 inch Hg. for every 6°C of decrease in CAT below standard temperature.

If at or above 2400 RPM:

1. Do not increase MAP limits shown on figure 11-7 regardless of temperature.

When CAT is over 38°C (94°F) for all RPM

1. Decrease MAP limit 1 inch Hg. for every 6°C of CAT over 38°C (94°F).

Standard temperature is 15°C at sea level and it decreases approximately 2°C for every 1000 feet of altitude. This information can be obtained from the Standard Altitude Table (figure 11-5) and is graphically shown in figure 11-8.

To use the above corrections, follow the example below:

Given: 5000 feet pressure altitude
17°C CAT
2100 RPM

Find: Limit MAP

To find standard temperature, enter figure 11-6 along the sloping standard temperature line, move up to 5000 feet pressure altitude and then move vertically down to the temperature scale. Standard temperature at 5000 feet pressure altitude is found to be 5°C. In general, the CAT will be from 3 to 5 degrees centigrad above OAT. The reasons for the increase in CAT have been mentioned previously. Thus, CAT is 12°C above standard in this case: the difference between given CAT (17°C) and computed OAT (5°C). From figure 11-7 (Engine Performance/Maximum Operating Limits Curve) at 2100 RPM and 5000 feet, the MAP limit is approximately 31.5 inches Hg. Since CAT is 12° above standard, the MAP limit may be increased 1/2 inch Hg. (when below 2400 RPM, MAP limit is increased 1/4 inch Hg. for every 6°C of increase in CAT above standard). Thus, at 5000 feet pressure altitude, 17°C CAT and 2100 RPM the limit MAP is 32 inches Hg. The MAP correction can also be obtained from figure 11-8. Enter figure 11-8 at the 17° CAT line. Move horizontally to 5000 feet pressure altitude line and then vertically down to the MAP scale and read the MAP correction of +1/2 inch Hg. The plus 1/2 inch Hg. is added to the previously obtained result of 31.5 inches Hg. obtained from figure 11-7.

The effect of water vapor in the atmosphere is to reduce the power output of the engine. Briefly, the three most important causes for the decrease in power are:

1. The carburetor meters fuel at a specific rate with a given airflow to the engine. If a part of the air is displaced by water vapor, the carburetor continues to meter the same amount of fuel, thus effectively enriching the mixture. During takeoff, this enrichment causes a power loss.
2. The engine has a reduced weight of air for a given throttle setting, as part of the intake is water vapor. This result is the same as closing the throttle a slight amount.
3. The water vapor effects the thermal efficiency of the engine.

These effects are of various degrees of importance under varying conditions. With a relative humidity of 80%, OAT of 80°F, a sea level take-off power loss of approximately 10% may result.

MANIFOLD PRESSURE AVAILABLE—STATIC

As can be seen in figure 11-9, the MAP that can be obtained under full throttle at sea level static conditions will not correspond with that shown in figure 11-7 because the latter data does not take into account the carburetor air temperature rise and the carburetor air duct pressure loss.

Using the information contained in figure 11-9, it can be determined whether or not the MAP obtained at take-off is satisfactory. If not, the installation should be checked with particular regard to proper indication of engine speed and possible leaks in MAP line before rejecting the engine.

ENGINE PERFORMANCE/MAX OPERATING LIMITS

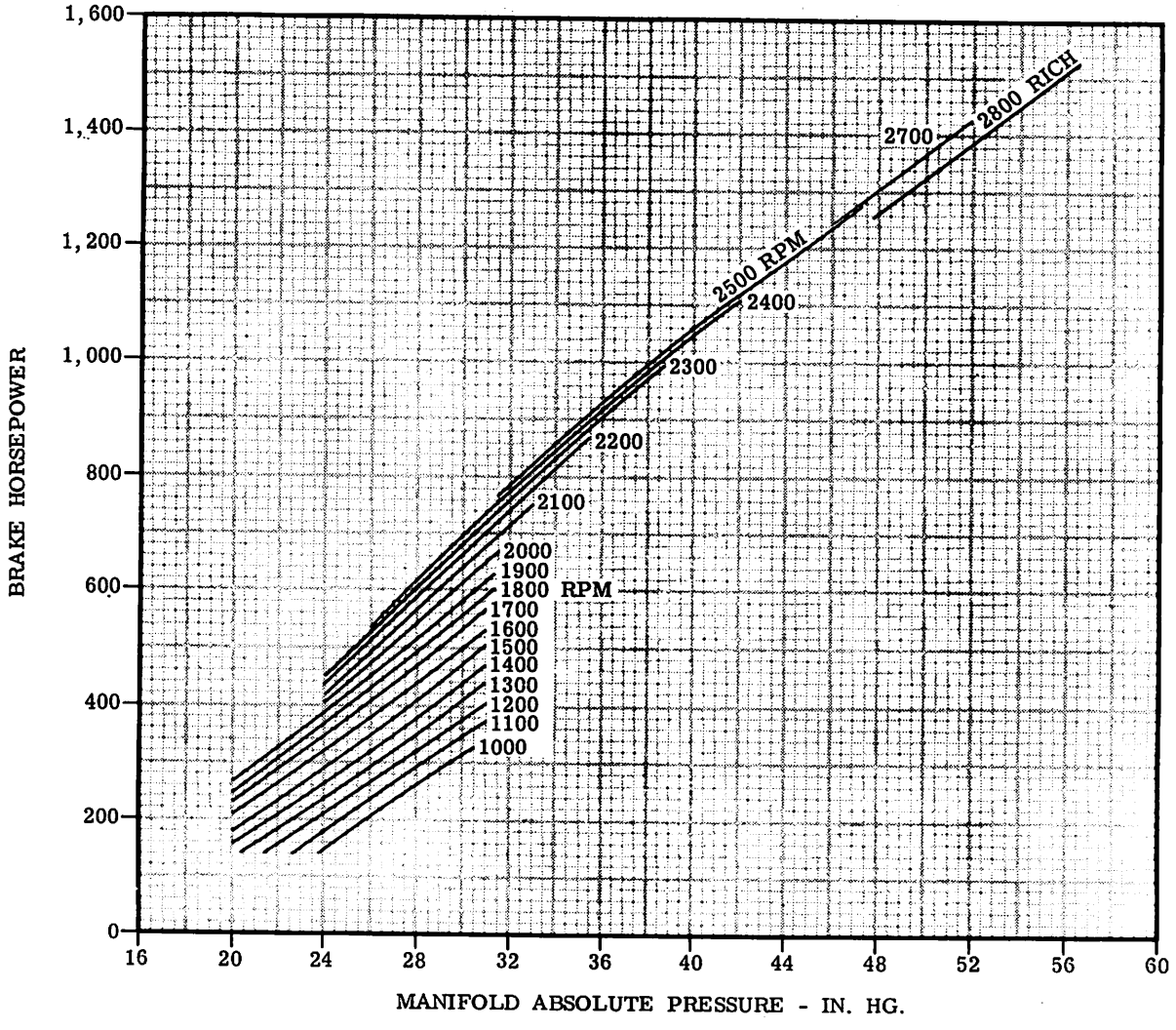
GUIDE

SEA LEVEL PERFORMANCE

MODEL(S): S-2D/E
DATA AS OF: 8 JANUARY 1954
DATA BASIS: WAC ENGINE PERFORMANCE CURVE SP975-B

ICAO STANDARD DAY

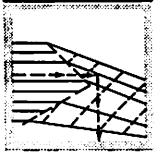
ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)



B-SAD1-306-1

Figure 11-7 (Sheet 1)

GUIDE

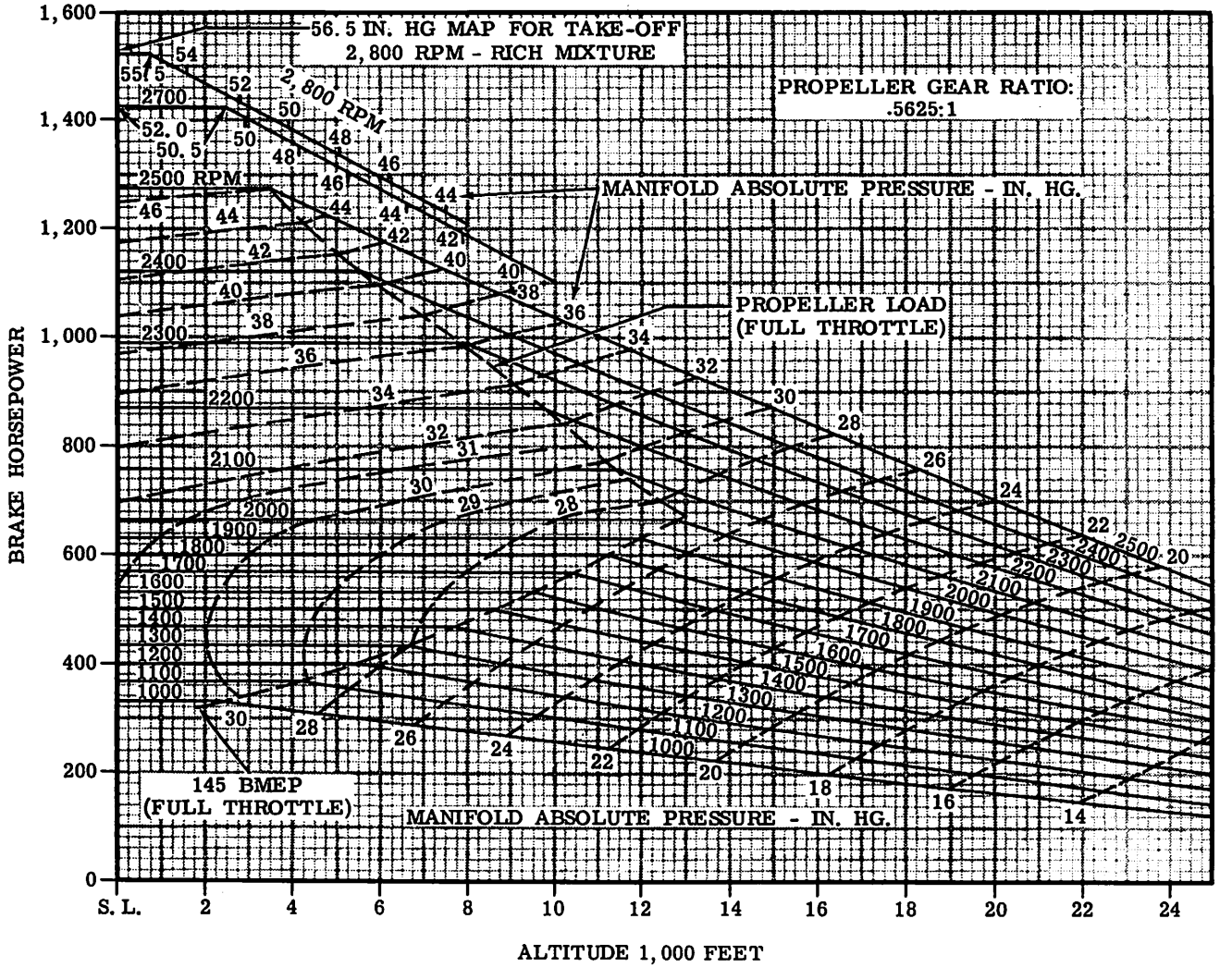


ALTITUDE PERFORMANCE

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

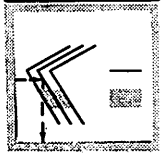
1. All curves are shown with normal mixture strength except take-off RPM (2,800).
2. When using emergency grade 100/130 fuel (color code-green) the sea level power limits are:
   a. Take-off - 1,325 BHP, 2,800 RPM, 50.0 in. HG. with RICH mixture, and 304 psi torque pressure.
   b. Military - 1,275 BHP, 2,700 RPM, 47.5 in. Hg. with RICH mixture, and 304 psi torque pressure.
   c. Continuous Operation - 1,200 BHP, 2,500 RPM, 44.5 in. Hg. with NORMAL mixture, and 308 psi torque pressure.
   d. See Section I, Part 4 for limitations of MAP and Torque Pressure.
3. Ram effect is NOT included in this chart.

B-SAD1-306-2

Figure 11-7 (Sheet 2)

MANIFOLD ABSOLUTE PRESSURE CORRECTION

GUIDE

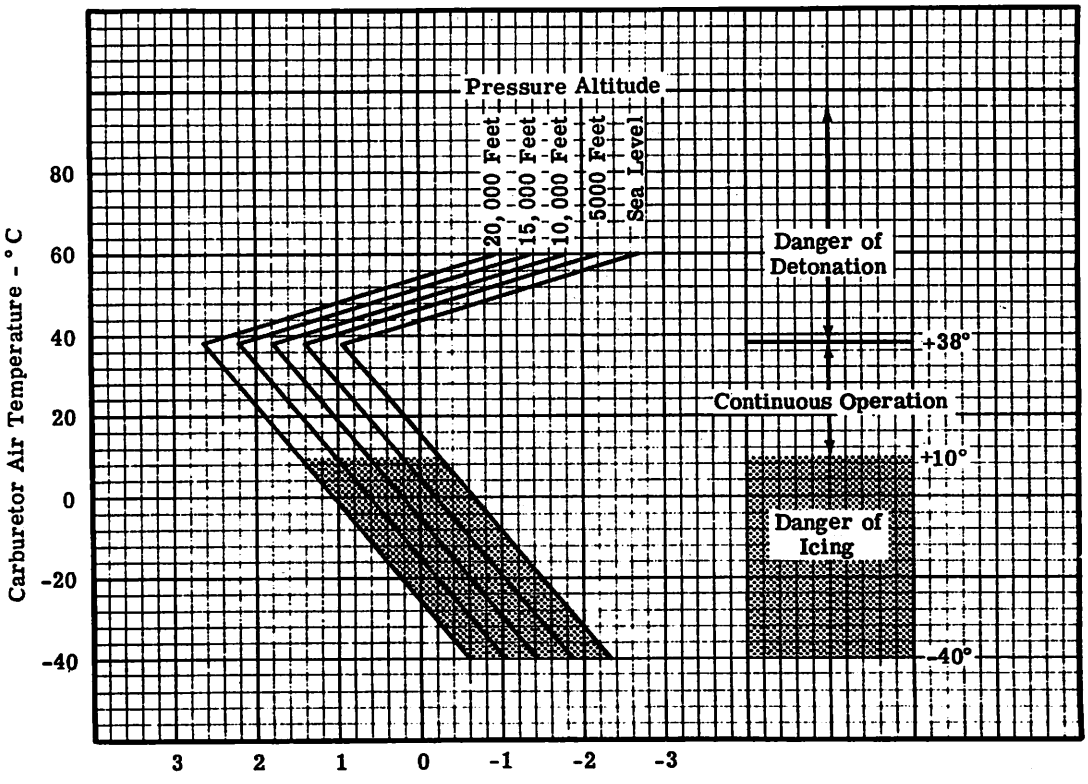


CONFIGURATION ALL

MODEL(S): S-2D/E
DATA AS OF: 1 NOVEMBER 1954
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Add △MAP to Limit MAP as determined from Figure 11-7.
2. Do not increase MAP values shown in Figure 11-7 at or above 2400 RPM
3. Above 38° C Corrected MAP Limits are decreased as shown at all RPM.
4. In Icing Conditions Use Full ALTERNATE Air.

C-SAD1-307

Figure 11-8

GUIDE



MANIFOLD PRESSURE AVAILABLE

CONFIGURATION ALL
STATIC RUNUP CONDITION
FULL THROTTLE, 2800 RPM

MODEL(S): S-2D/E
DATA AS OF:
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL

TRUE BAROMETRIC PRESSURE	FREE AIR TEMPERATURE °C				
	-5	+5	+15	+25	+35
31.00	60.7	59.5	58.5	57.5	56.6
30.50	59.7	58.6	57.5	56.6	55.7
30.00	58.8	57.6	56.7	55.7	54.8
29.50	57.8	56.7	55.7	54.8	53.9
29.00	56.8	55.7	54.7	53.8	52.9

REMARKS

1. Operation above TAKE-OFF MAP - 56.5 in. Hg. or 352 psi Torque Pressure prohibited except when water vapor present in air. For this condition, a correction equal to twice the actual vapor pressure may be added to the allowable TAKE-OFF MAP.
2. Reduce Maximum allowable MAP 1.0 in. HG for each 6°C above 38°C (CAT.).
3. Allow 0.2 in. Hg. MAP for each 10 rpm variation from 2800 rpm.

A-SAD1-308

Figure 11-9

part 5

TAKE-OFF/LANDING

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TAKE-OFF

PSYCHROMETRIC CHART

The Psychrometric Chart (figure 11-10) shows relationships between the following physical quantities: wet and dry bulb temperatures, dew point temperature, relative humidity, vapor pressure, altitude and specific humidity.

These quantities are briefly defined as follows:

Dry Bulb Temperature:

An ordinary OAT gage temperature reading. The dry bulb thermometer is affected primarily by heat.

Wet Bulb Temperature:

The temperature of a thermometer's bulb wrapped in wet cloth and ventilated. Temperature reading depends upon heat and the rate of evaporation.

Dew Point Temperature:

The temperature at which water begins to condense from the atmosphere. Temperature depends upon the amount of water vapor already present in the atmosphere.

Note

- Evaporation is a cooling process. Therefore, if a wet bulb thermometer shows a lower reading than a dry bulb thermometer, water is evaporating from the wet cloth surrounding the wet bulb thermometer. If at a given temperature the atmosphere contains all the water vapor it can hold, no evaporation can take place. In this case, the wet and dry bulb temperature readings will be the same. This point is defined as the dew point temperature.

- If the atmosphere is very dry, evaporation from a wet cloth will be high and the wet bulb temperature lower than that of a dry bulb thermometer. In a dry atmosphere the dew point is lower than the temperature of a wet bulb thermometer.

Vapor Pressure:

Vapor pressure is the pressure of the atmosphere's water vapor. The amount of water vapor determines the degree of vapor pressure.

Specific Humidity:

The pounds of water vapor in the atmosphere per pound of dry air.

Relative Humidity:

The ratio of the ambient vapor pressure to the saturated vapor pressure at the dry bulb temperature. Relative humidity (RH) is the measure of the atmosphere's ability (or lack of it) to absorb water

vapor at a given temperature. For a given specific humidity, the relative humidity varies inversely with the dry bulb temperature.

Figure 11-10 is used in the following manner. Dew point, dry bulb temperature, and barometric pressure or altimeter setting is readily available information for the pilot to use on this chart. With this information, proceed as follows:

Locate the dew point temperature on the curved 100 per cent relative humidity line. Move horizontally to the right to the vapor pressure ordinate and read vapor pressure. Then move to the left until the correct pressure altitude line is reached. Move horizontally to the specific humidity scale and read specific humidity.

If wet and dry bulb temperatures are available as well as pressure altitude, proceed as follows: Enter the chart at the given dry bulb temperature and move vertically to the sloping wet bulb temperature line corresponding to the given altitude. Vapor pressure and specific humidity are obtained by moving horizontally to the right and to the left from this intersection, as explained above. Dew point temperature is obtained by moving horizontally to the left from the wet and dry bulb intersection to the 100 per cent relative humidity line and reading the temperatures given along this curve.

If the dry bulb temperature and relative humidity are known, the dew point temperature, vapor pressure and specific humidity are obtained as explained above, except that the starting point is the intersection of the given dry bulb temperature and relative humidity lines.

TAKE-OFF AND LANDING CROSSWIND CHART

The take-off and landing crosswind chart (figure 11-11) presents headwind and crosswind components in knots for crosswind directions from 0 to 90 degrees in 10- degree increments and wind velocities from 0 to 60 knots in 1- knot increments. The right ordinate is a scale for minimum touchdown or nosewheel lift-off speed in knots. The "Recommended/Not Recommended" line represents the minimum airspeed for various crosswinds at maximum slip angle with maximum or near maximum rudder deflections.

The procedure for using the crosswind chart is identical for both landing and take-off except that the recommended take-off and landing speeds are determined from the take-off and landing distance charts. In figuring a crosswind component and a minimum touchdown or nosewheel lift-off speed the actual wind, which includes the maximum peak gusts, must be converted to a wind angle relative to the direction of landing or take-off.

SAMPLE PROBLEM -

Given Conditions:

26 Knots - Wind Velocity
65 Degrees - Wind Angle

Determine:

Recommended nose wheel lift-off speed and headwind component.

Procedure:

(1) Enter the crosswind chart (figure 11-11) along the 65 degree wind angle until the 26 knot wind velocity is reached (the line from point A to B).

(2) Proceed vertically upward from point B to the recommended minimum nose wheel lift-off speed point C.

(3) Since point C is not in the recommended area of the curve, continue vertically to the recommended minimum, point D.

(4) From this point move horizontally to the right to point E and read a new nose wheel lift-off speed of 89 knots IAS.

(5) To convert the IAS result obtained from this chart to TAS, refer to Part 3 this section, Airspeed/Temperature Corrections paragraphs.

(6) The headwind component is obtained by re-entering the chart at point B and move horizontally to point F; obtaining a headwind component of 11 knots for use in correcting the ground roll distance in figures 11-13, 11-14 and 11-30.

Note

With good technique it is possible to land and takeoff the aircraft above set limits. However, the possibility of encountering difficulty is increased at figures below set limits if poor technique is used.

TAKE-OFF CURVES

Power available for take-off is determined from figure 11-12. Minimum and Normal take-off distances are determined from figure 11-13 and 11-14.

The "Engine Power" paragraphs (Part 4) outlined engine power factors primarily related to conditions other than take-off. Additional information is required to determine the amount to take-off brake horsepower available and its effect on performance. The following paragraphs deal specifically with the considerations related to take-off.

The torquemeter is the primary indicator for power available. The rated power of the engine is 1525 BHP which corresponds to 352 PSI torque pressure at the take-off R.P.M. of 2800. This rating is obtained under standard operating conditions at Sea Level with 56.5 inches of MAP.

Note

The formula for torque pressure in pounds per square inch (PSI) is expressed as follows:

$$\text{Torque Pressure in PSI} = 645 \times \frac{\text{BHP}}{\text{RPM}}$$

Engine power output may be below rated power at 56.5 inches limiting MAP, or 56.5 inches may not be obtainable. At the limiting MAP and a given RPM (and fuel/air ratio), brake horsepower available to the propeller depends upon the following factors:

1. Cylinder Head Temperature
2. Carburetor Air Temperature
3. Specific Humidity
4. Barometric Pressure
5. Accessory Drive Load

The first two items may be partially controlled by the pilot, and so may the last (by minimizing the electrical load). The effects of the first four items, MAP and RPM on take-off brake horsepower are shown in figure 11-12. The effects of non-standard power on take-off distance are indicated in figure 11-13.

For varying atmospheric conditions, figure 11-9 shows the maximum attainable manifold pressure. For altitudes above Sea Level manifold pressure values are shown in figure 11-7 (sheet 1 and 2) for standard day conditions.

For flight planning purposes figure 11-13 entered with an existing gross weight, head wind, field density altitude and BHP available to read the take-off distance. Guide lines are provided to indicate the manner in which the chart is used. Headwind component can be determined from figure 11-11. Power available is obtained from figure 11-12.

The Take-off Power Available Chart, Figure 11-12, is used to determine predicted power (torque pressure) for takeoff and MAP. The predicted torque pressure value should be used for all computations of take-off distance and obstacle clearance.

The Chart allows corrections to be made for pressure altitude, carburetor air temperature, and humidity. A correction scale is included to show the amount by which the MAP limit must be reduced to prevent over-boosting the engine when carburetor air temperature is below standard. In allowing for the effect of humidity, a correction scale is added to include power loss corrections for humidity. The predicted MAP corrected for carburetor air temperature and humidity is used for takeoff. For pre-flight planning the carburetor air temperature is seldom known, and is assumed to be 3° Centigrate above the outside air temperature. The example shown in Figure 11-12 depicts a typical take-off condition and procedure to be used in order to find predicted power (torque pressure).

Given: A) Pressure Altitude = 3000 Ft.
B) OAT = 10°C
CAT = OAT + 3°C = 13°C
C) Dew Point = 65° F

Find: A) MAP = 51.5 inches of Hg.
B) Predicted Power (torque pressure) = 310 PSI

Solution:

Enter the Chart with pressure altitude of 3000 feet (value A) and proceed vertically to the expected CAT of 13° (point B) and read a predicted MAP of 51.5 inches of Hg. Proceed horizontally to the right to the zero dew point base line then follow the humidity correction slopes to the intersection of the dew point (65°F) labeled (C) corrected for altitude point D. Continue horizontally to the right to read predicted power (torque pressure) of 310 PSI. This value is used for take-off computations.

To obtain the ground run distance once having torque pressure, proceed as follows:

SAMPLE PROBLEM:

Given:	A)	temperature	10°C
	B)	pressure altitude	3,000 ft.
	C)	torque pressure	310 psi
	D)	base line	320 psi
	E)	take-off gross weight	27,000 lbs.
	F)	predicted headwind	10 knots
Find:	G)	ground roll distance	1,050 ft.

Enter figure 11-13 at OAT of 10°C value (A) and proceed vertically upward to a pressure altitude of 3000 feet value (B) (runway altimeter reading). From value (B) move horizontally across to intercept the torque pressure at 310 psi (value C). In this grid move parallel to the guide lines until interrupting the base line, value (D). From this point proceed horizontally to the right to the gross weight of 27,000 lb., (value E) and drop straight down to the zero knots headwind line (value F). Parallel the guide lines for headwind correction to 10 knots (value G), then downward to read the ground roll distance of 1,050 feet (value H).

OBSTACLE CLEARANCE

Figure 11-15 is used to determine the number of feet required to clear 50 and 100 foot obstacles after normal take-off from hard surface runways. This data is used for Configuration A and C aircraft with flaps in the 2/3 DOWN position. Use of the chart is illustrated with the following sample problem.

SAMPLE PROBLEM:

Given: 2000 feet Normal Ground Run Distance (Obtained from figure 11-14),
50 foot obstacle to clear

Find: Take-off Distance to Clear Obstacle.

Enter grid with 2000 feet "Normal Ground Run" and move up vertically to the "50 foot Obstacle" line. Proceed horizontally to the left and read as a minimum recommended clearance distance of approximately 2715 feet. The 2715 feet is the horizontal distance from beginning of ground roll to the obstacle.

VELOCITY DURING TAKE-OFF GROUND RUN

Figure 11-16 shows velocities during take-off ground run on a hard surface runway for varying temperatures, gross weights, torque pressures, pressure and density altitudes. The chart is based on Configurations A and C aircraft performance at take-off power, rich mixture setting. The sample problem below is to be used with the dotted lines and arrows printed on the chart.

SAMPLE PROBLEM:

Given: 20 degrees OAT
2000 feet pressure altitude
23,000 pounds Gross Weight
292 psi Torque Pressure
10 knots headwind

Find: Velocity at 1500 feet of Take-Off Ground Run

Given:	A)	runway temperature	20° C OAT
	B)	pressure altitude	2,000 feet
	C)	torque pressure	292 psi
	D)	base line	315 psi
	E)	take-off gross weight	23,000 lbs.
	F)	check point	1,500 ft.
	G)	headwind	10 knots
Find:	H)	velocity	93 IAS

Enter the chart at the runway temperature at 20° C OAT and move up to 2,000 feet pressure altitude line. Proceed horizontally to the torque pressure line to intercept the torque pressure (293 psi) value C. From this point move-up parallel to the guide lines until intercepting the torque pressure base line value D, then horizontally to the right to the take-off gross weight line E. Drop straight down to the "Distance-Feet" grid, mark a point on the top and proceed parallel to the guide lines to the 1,500 feet distance point. Proceed horizontally to the zero knots headwind line, parallel the guide lines to the 10 knots headwind line, and then horizontally to the left to read a speed of 93 knots IAS.

For the same conditions, the pilot will read the following speeds at different distances:

500 feet - 60 knots
750 feet - 72 knots
1000 feet - 80 knots
1500 feet - 93 knots

As the four above results indicate, the chart has the practical use in that the pilot can determine aircraft velocities against fixed runway check markers such as the 500 foot marker, 750 foot marker etc. For more information regarding Take-Off Techniques, refer to Section III of this flight manual.

ACCELERATE—STOP DISTANCE

The accelerate-stop distance charts (figure 11-17, sheets 1 and 2) are used to determine the minimum distance required to accelerate to a given indicated airspeed and then stop the aircraft. In a sense, this is the aircraft refusal distance. The chart is used for configuration A and C aircraft on hard-surface runways (dry), flaps in the 1/3 and 2/3 down position, take-off power, and a rich mixture setting. Also, assumed is maximum braking with a factor of 3 seconds reaction time.

SAMPLE PROBLEM:

Given:	A)	indicated airspeed	90 knots
	B)	take-off gross weight	23,000 lbs.
	C)	runway temperature	20°C OAT
	D)	pressure altitude	2,000 ft.
	E)	intercepting point	
	F)	predicted headwind	10 kts
Find:	G)	Accelerate-Stop Distance	3,500 ft.

Enter the chart at indicated airspeed (A) and proceed horizontally to the take-off gross weight (B). Drop straight down to the "Accelerate-Stop Distance" base line, then move parallel to the guide lines to intercept (E) at given runway temperature value C and pressure altitude value D. Proceed vertically to the zero knots headwind guide lines parallel to the guide lines to the predicted headwing (F) then drop down to read the accelerate stop distance (G).

TAKE-OFF GROSS WEIGHT LIMIT CHARTS

Figures 11-18 and 11-19 present take-off gross weight limits for single engine conditions for Configurations A and C, respectively. Chart data is based on a rate of climb capability of 100 FPM at 120 knots IAS (the best climb speed) with the inoperative engine's propeller feathered, the operative engine at take-off power with cowl flaps and oil cooler doors open. Grids on the chart include the following varying data: temperature, pressure to density altitude conversions, torque pressure scales, and flap conditions (FLAPS UP, FLAPS 1/3, FLAPS 2/3) plotted against limit gross weights. Performance is shown for both gear UP and gear DOWN conditions.

The use of the chart is illustrated by following the directions of the arrows and dotted lines printed on the grids of the charts. For additional information regarding Take-Off Techniques, refer to Section III in this flight manual.

CLIMB-OUT

Figures 11-20 through 11-24 present climb-out flight path performance data for varying gross weights for

Configurations A and C with flaps in the 2/3 DOWN position. Figures 11-20, 11-21, 11-22, 11-23, and 11-24 present climb-out flight path performance data for varying gross weights for Configurations A and C with flaps in the 1/3 DOWN position. The data is based on ICAO Standard Day conditions, with mixtures for both engines in the RICH position, cowl flaps and oil cooler flaps OPEN, and for optimum speeds for the best angle of climb for given gross weights. Separate charts are included for different gross weights: 23,000 pounds, 25,000 pounds, 27,000 pounds, 29,000 pounds, and 31,000 pounds. A different recommended climb speed (knots IAS) is given depending upon the gross weight.

The Climb-Out Flight Path charts are similar in use to the Obstacle Clearance chart (figure 11-15) in that they present distances to clear specific hights above the ground. The Obstacle Clearance chart shows this data in terms of tatal distance from take-off start to over the obstacle. The Climb-Out Flight Path charts differ in that distances given are based from the lift-off point. Also, the range of heights are much greater. Data is shown for Take-Off Power and Normal Rated Power.

Since the use of these charts is the same, only one sample problem is included for figure 11-20 (Sheet 2) (23,000 pounds Gross Weight).

SAMPLE PROBLEM:

Given: 200 foot obstacle
4000 feet field pressure altitude
10 knot headwind
1/3 Flaps DOWN

Find: Clearance Distance (from lift-off)

Enter figure 11-20 (Sheet 2) on the top grid at 200 feet and move to the 4000 foot pressure altitude line. Proceed vertically down to the top of the "Headwind-Knots" grid, allow 10 knots of headwind between the guide lines, and then drop straight down to the bottom of the lower grid. The approximate distance from lift-off is 1800 feet.

For information regarding Take-Off Techniques, refer to Section III of this flight manual.

STALL SPEED

Figures 11-25 through 11-29 present stall speed performance data for varying flap setting conditions and flight attitudes for Configuration A aircraft.

Figure 11-25 shows stall speed data at sea level for glide, cruise, landing and power approach conditions. The arguments of the chart are gross weight versus indicated airspeed in knots. For use of this chart, enter at a given gross weight and move up to the line which is appropriate: glide, cruise, etc. From this point proceed horizontally to the left and read the appropriate knots IAS. The data of this chart was obtained from flight tests.

Figures 11-26 through 11-29 shows stall speed data at sea level plotted against angles of bank. The value of the speed is expressed in knots CAS. To obtain knots IAS from those curves, refer to Part 3 Airspeed/Temperature Corrections paragraphs in this section of the flight manual. To obtain position error correction, figure 11-1 should be entered at the zero bank angle stall speed for a given power and flap setting. The correction obtained at the zero bank angle stall speed is then applied to stall speeds for all bank angles. Since figure 11-1 shows corrections of indicated to calibrated speed versus indicated speed, the sign of the correction obtained must be reversed when applying it to values on the stall speed curves. An example is included below:

SAMPLE PROBLEM:

Given: 25,000 pounds Gross Weight
Power Off
Flaps UP
40 degrees Bank Angle

Find: LAS

Enter figure 11-26 at 0 (zero) and 40 degrees angle of bank and move up to the power-off line. At 0 (zero) degrees you should read 99 knots CAS; at 40 degrees and the power-off line intersection, move horizontally to the left and read a value of 112 knots CAS. With 99 knots CAS, enter the top grid of figure 11-1 and move up to the "Guide Configuration" line corresponding to 25,000 pounds and then proceed horizontally to the left and read an approximate correction of -2 knots. As stated above, reverse the sign of this correction factor. Turning back to the results obtained in figure 11-26 of 99 knots CAS and 112 knots CAS respectively, our correct values are 101 knots IAS and 114 knots IAS.

LANDING GROUND ROLL

The Landing Ground Roll chart (figure 11-30) is used to compute the number of feet it takes to bring the aircraft to a full stop after landing. The chart is based for all configurations, flaps in full DOWN sample problem is included to illustrate the use of the chart:

Given: 2000 feet density altitude
25,000 pounds Gross Weight
15 knots headwind

Find: Landing Ground Roll

Enter figure 11-30 at 2000 feet density altitude and proceed to the right to the 25,000 pounds gross weight line. Proceed vertically down to the top of the bottom grid (Headwind-Knots). From this point parallel the guide lines until the 15 knot headwind line is intersected. Move vertically down and read 1875 feet.

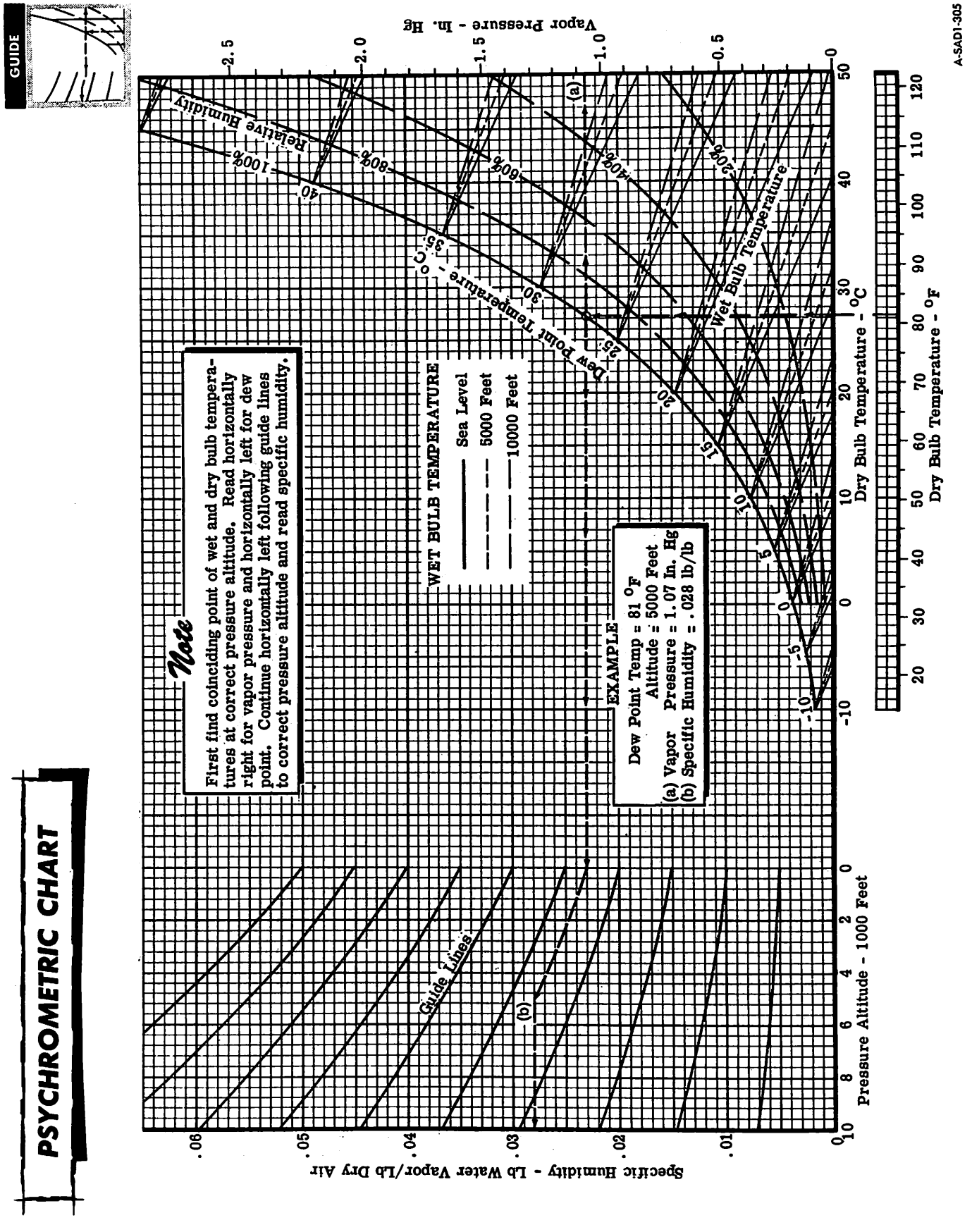

GUIDE
PSYCHROMETRIC CHART
Note
First find coinciding point of wet and dry bulb temperatures at correct pressure altitude. Read horizontally right for vapor pressure and horizontally left for dew point. Continue horizontally left following guide lines to correct pressure altitude and read specific humidity.
WET BULB TEMPERATURE
Sea Level
5000 Feet
10000 Feet
EXAMPLE
Dew Point Temp = 81 °F
Altitude = 5000 Feet
(a) Vapor Pressure = 1.07 In. Hg
(b) Specific Humidity = .028 lb/lb
Relative Humidity
100%
80%
60%
40%
20%
Dew Point Temperature - °C
Wet Bulb Temperature
Guide Lines
(a)
(b)
Vapor Pressure - In. Hg
Specific Humidity - Lb Water Vapor/Lb Dry Air
Pressure Altitude - 1000 Feet
Dry Bulb Temperature - °C
Dry Bulb Temperature - °F
A-SAD1-305

Figure 11-10

TAKE-OFF AND LANDING CROSSWIND CHART

GUIDE

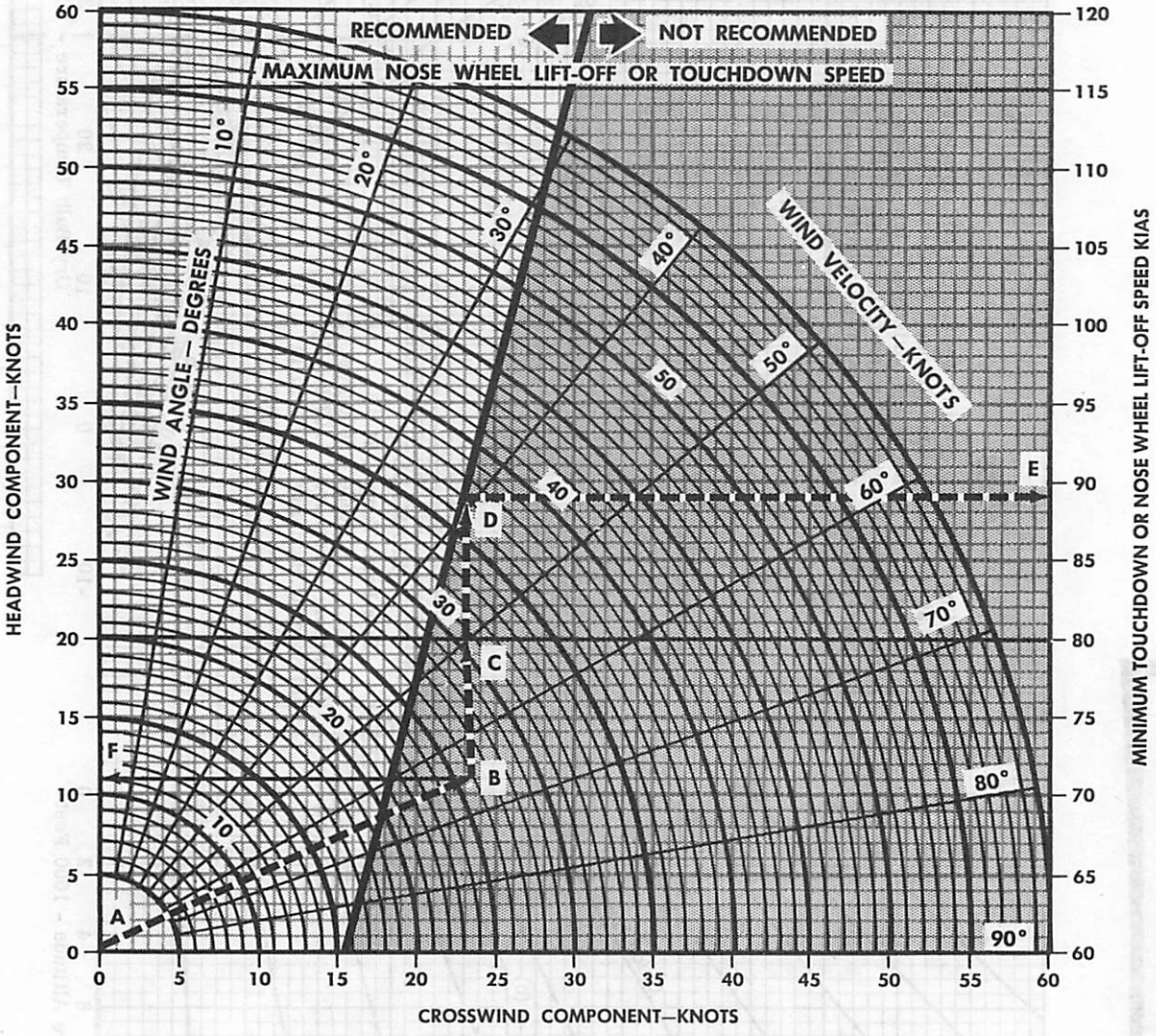


CONFIGURATION A, C

MODEL(S): S-2D/E
DATA AS OF: 18 JUNE 1959
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS:

1. RECOMMENDED MINIMUM NOSE WHEEL LIFT-OFF SPEED IS 80 KIAS
2. CORRECT IAS FOR TEMPERATURE AND PRESSURE TO OBTAIN TAS
3. SEE SECTION III FOR TAKE-OFF/LANDING TECHNIQUE

C-SADI-369

Figure 11-11

TAKE-OFF POWER

CONFIGURATION ALL

MODEL(S): S-2D/E
DATE: 1 MAY 1969
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM, STD., 6985-7(2)
ICAO STANDARD DAY
2800 RPM

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL

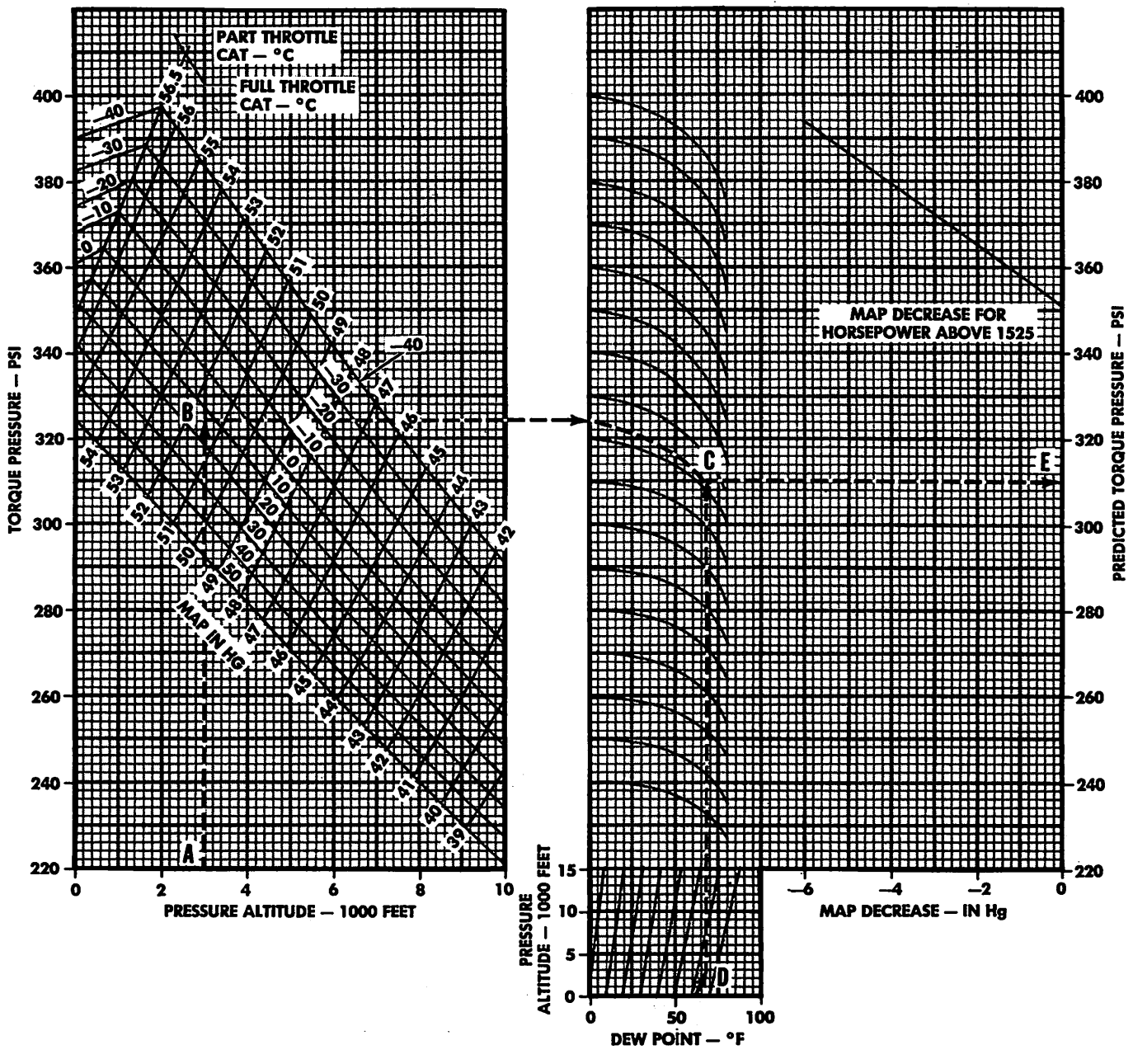


Figure 11-12

TAKE-OFF CURVE

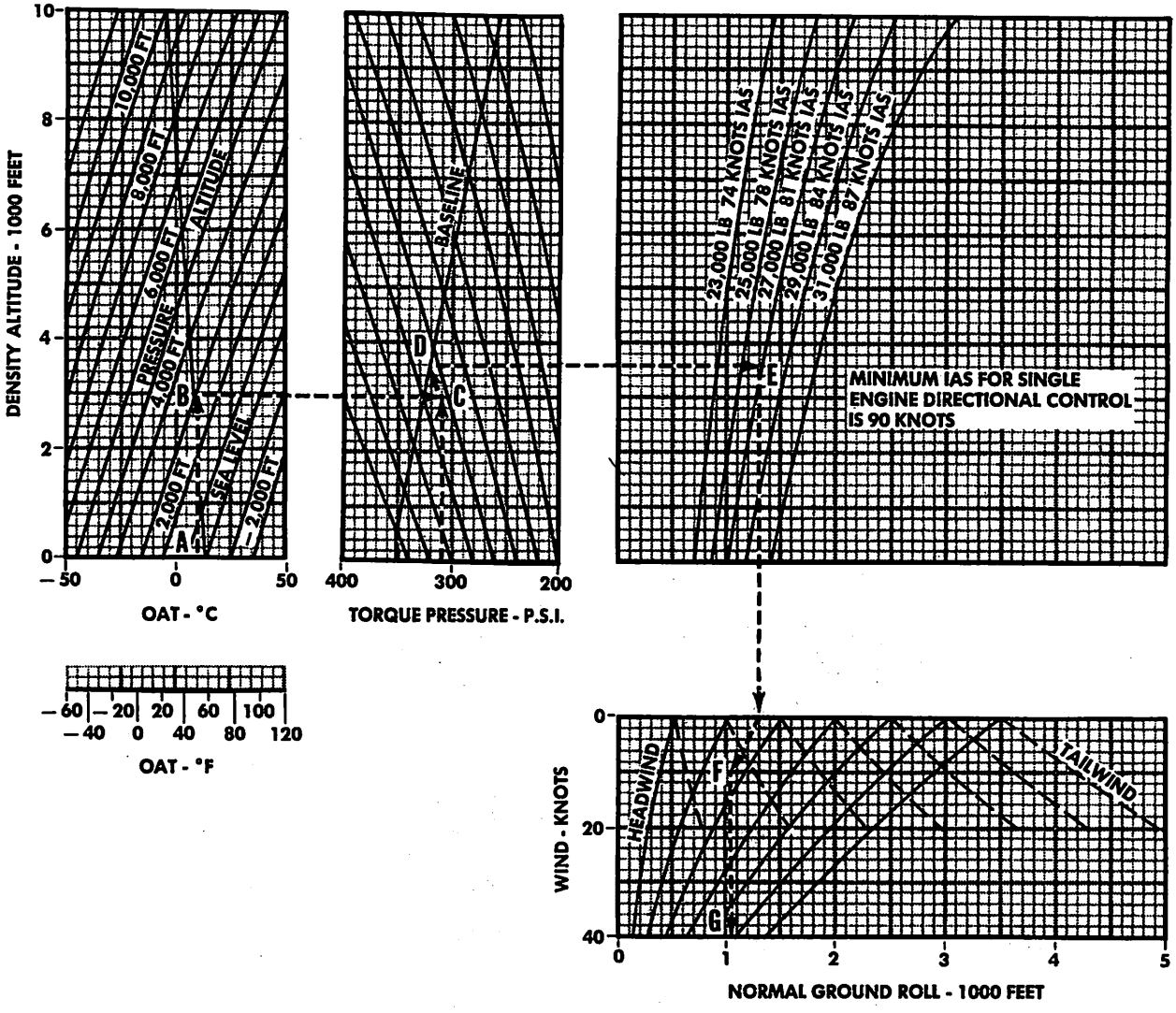
MINIMUM GROUND RUN DISTANCE
HARD SURFACE RUNWAY

CONFIGURATION A, C
FLAPS - 2/3 DOWN

MODEL(S): S-2 D/E
DATA AS OF: 1 MARCH 1969
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. TAKE-OFF POWER
2. RICH MIXTURE SETTING
3. SEE SECTION III FOR TAKE OFF TECHNIQUE
4. STORES ON OR OFF
5. ALLOW 290 LB FUEL FOR WARM UP AND TAKE-OFF

B-SAD1-364

Figure 11-13

TAKE-OFF CURVE

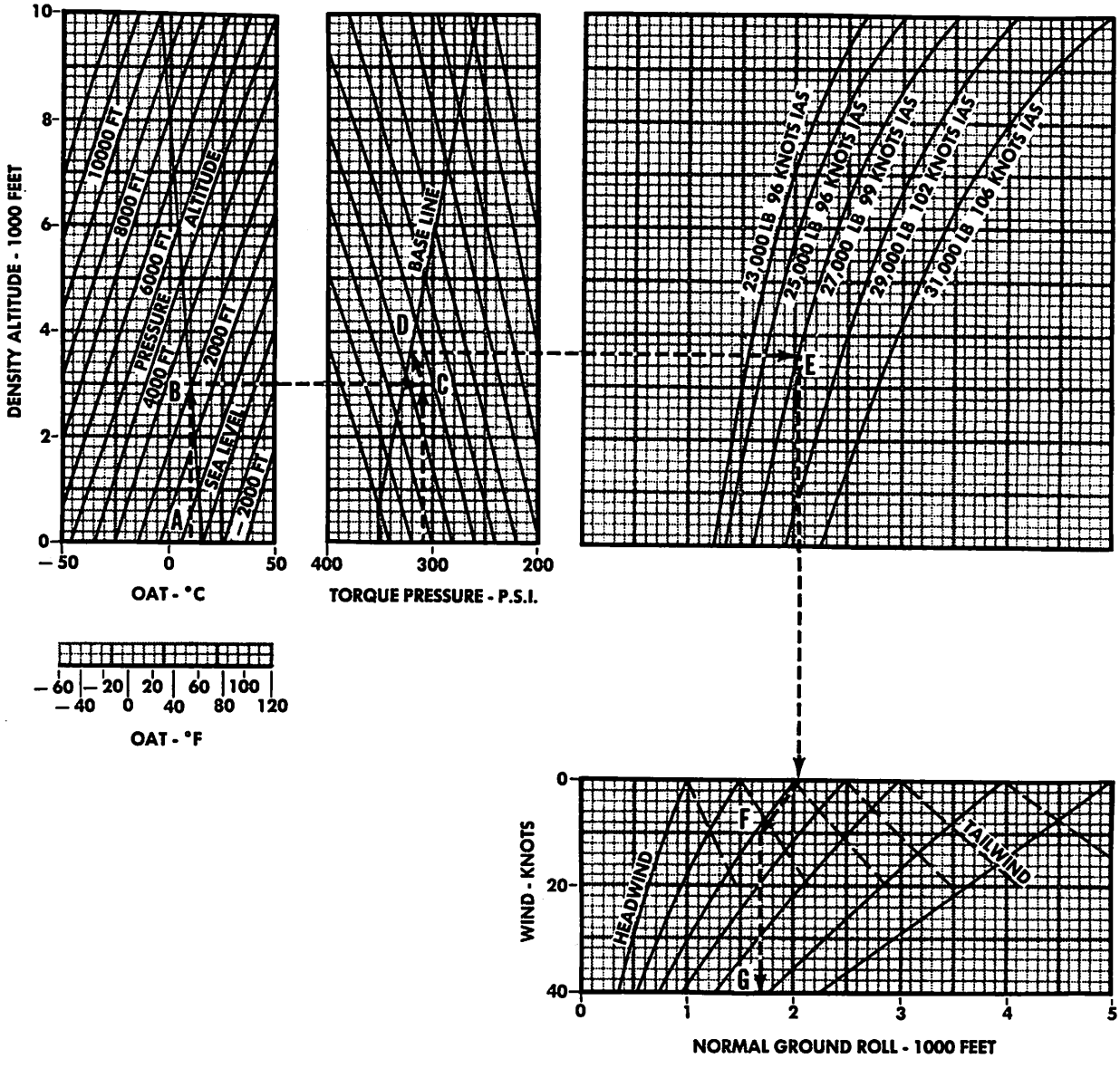
NORMAL GROUND RUN DISTANCE
HARD SURFACE RUNWAY

CONFIGURATION A, C
FLAPS - 1/3 DOWN

MODEL(S): S-2 D/E
DATA AS OF: 1 MARCH 1969
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. TAKE-OFF POWER
2. RICH MIXTURE SETTING
3. SEE SECTION III FOR TAKE OFF TECHNIQUE
4. STORES ON OR OFF
5. ALLOW 290 LB FUEL FOR WARM UP AND TAKE-OFF

C-SAD1-316

Figure 11-14

OBSTACLE CLEARANCE

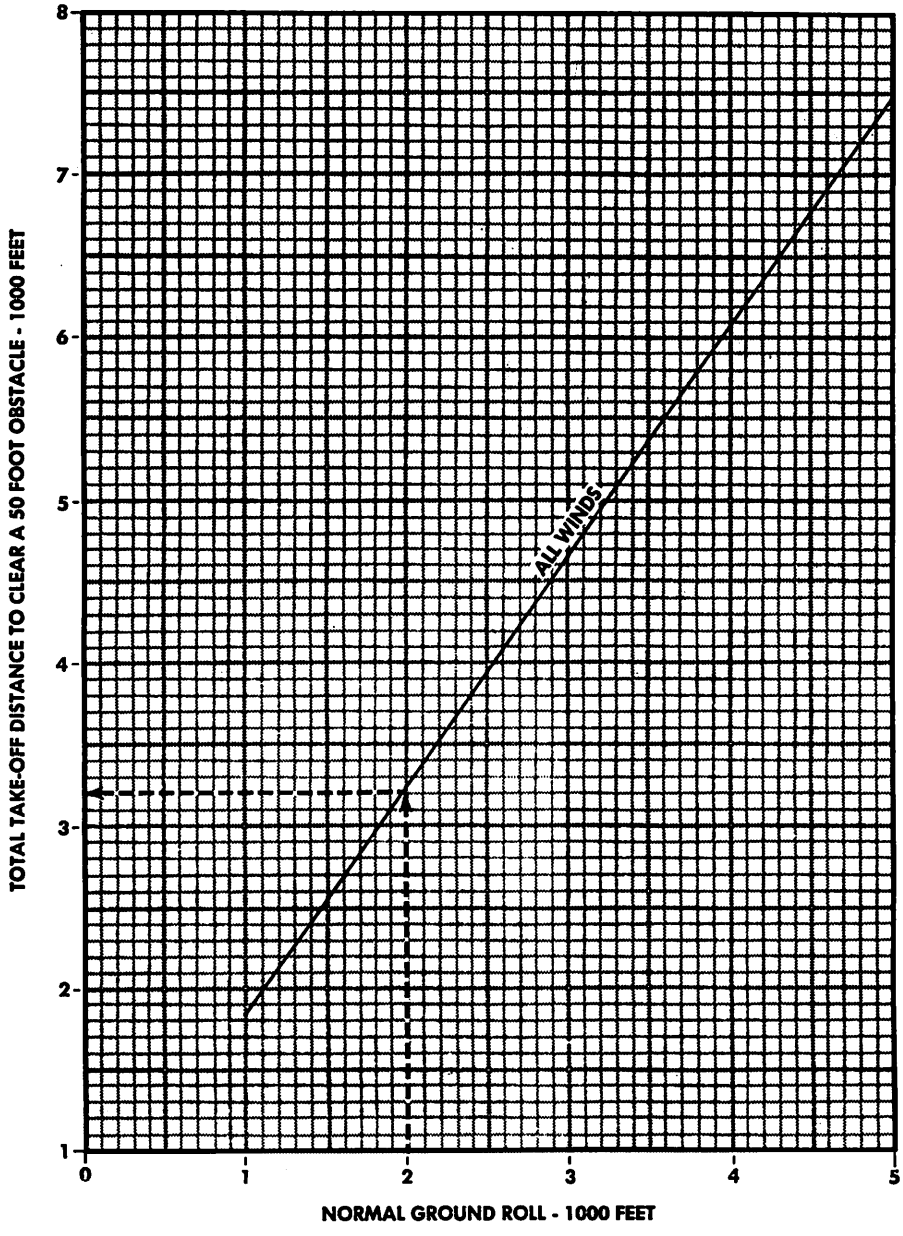
NORMAL TAKE-OFF DISTANCE OVER 50 FT. OBSTACLE HARD SURFACE RUNWAY

CONFIGURATION A, C
FLAPS - 1/3 DOWN

MODEL(S): S-2 D/E
DATA AS OF: 1 MARCH 1969
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. TAKE-OFF DISTANCE OVER OBSTACLE EQUALS TAKE-OFF GROUND RUN PLUS AIR DISTANCE FROM LIFT-OFF TO THE OBSTACLE.
2. MAINTAIN TAKE-OFF POWER UNTIL CLEAR OF THE OBSTACLE THEN REDUCE TO CLIMB POWER AS PER SECTION III FOR TAKE-OFF TECHNIQUE AND CONTINUE NORMAL CLIMB-OUT.

C-SAD1-317

Figure 11-15

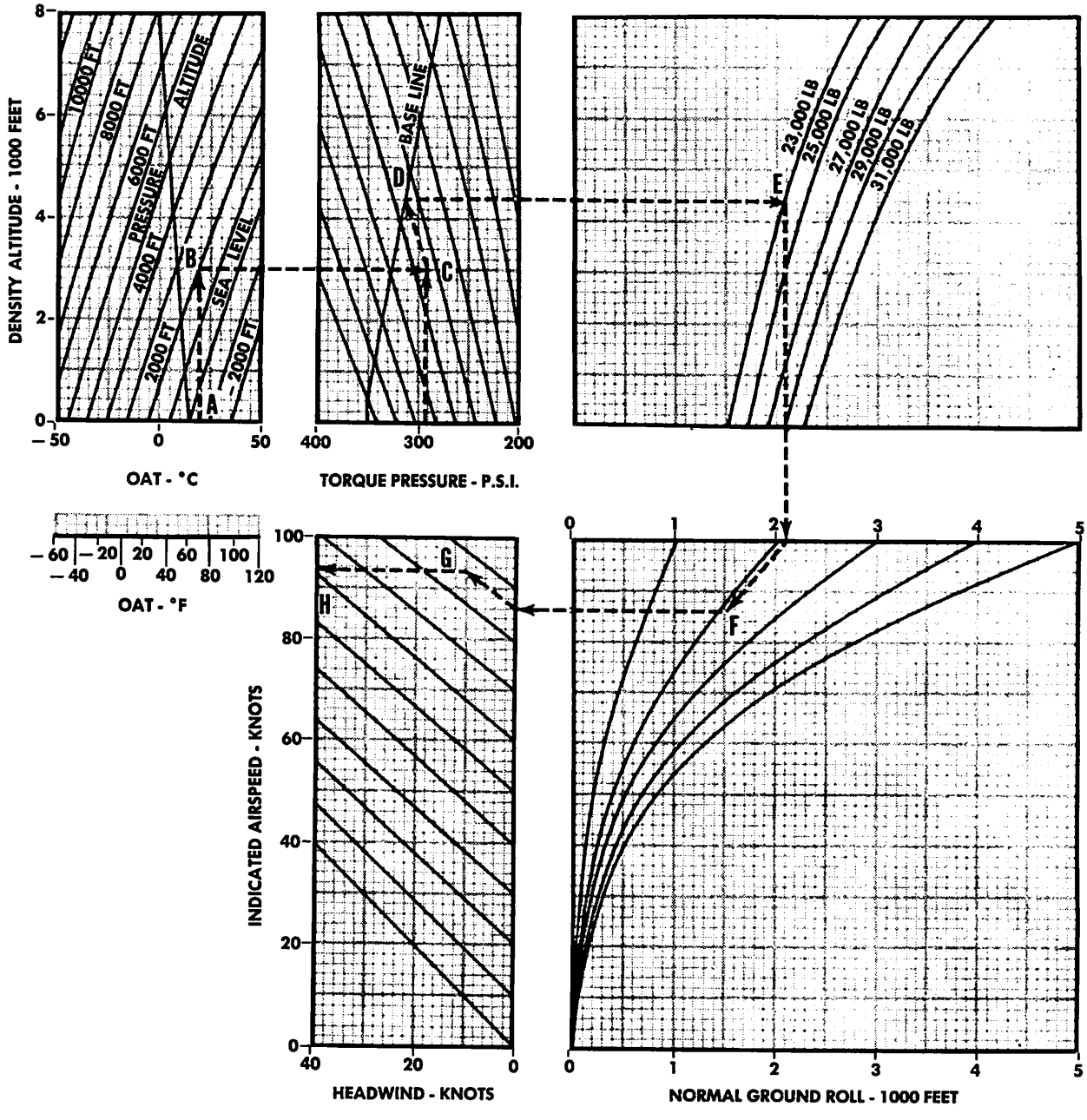
VELOCITY DURING TAKE-OFF GROUND RUN

CONFIGURATION A, C
FLAPS - 1/3 DOWN

MODEL(S): S-2 D/E
DATA AS OF: 1 MARCH 1969
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. TAKE-OFF POWER
2. RICH MIXTURE SETTING
3. SEE SECTION III FOR TAKE OFF TECHNIQUE
4. STORES ON OR OFF
5. ALLOW 290 LB FUEL FOR WARM UP AND TAKE-OFF

B-SAD1-378-1

Figure 11-16 (Sheet 1)

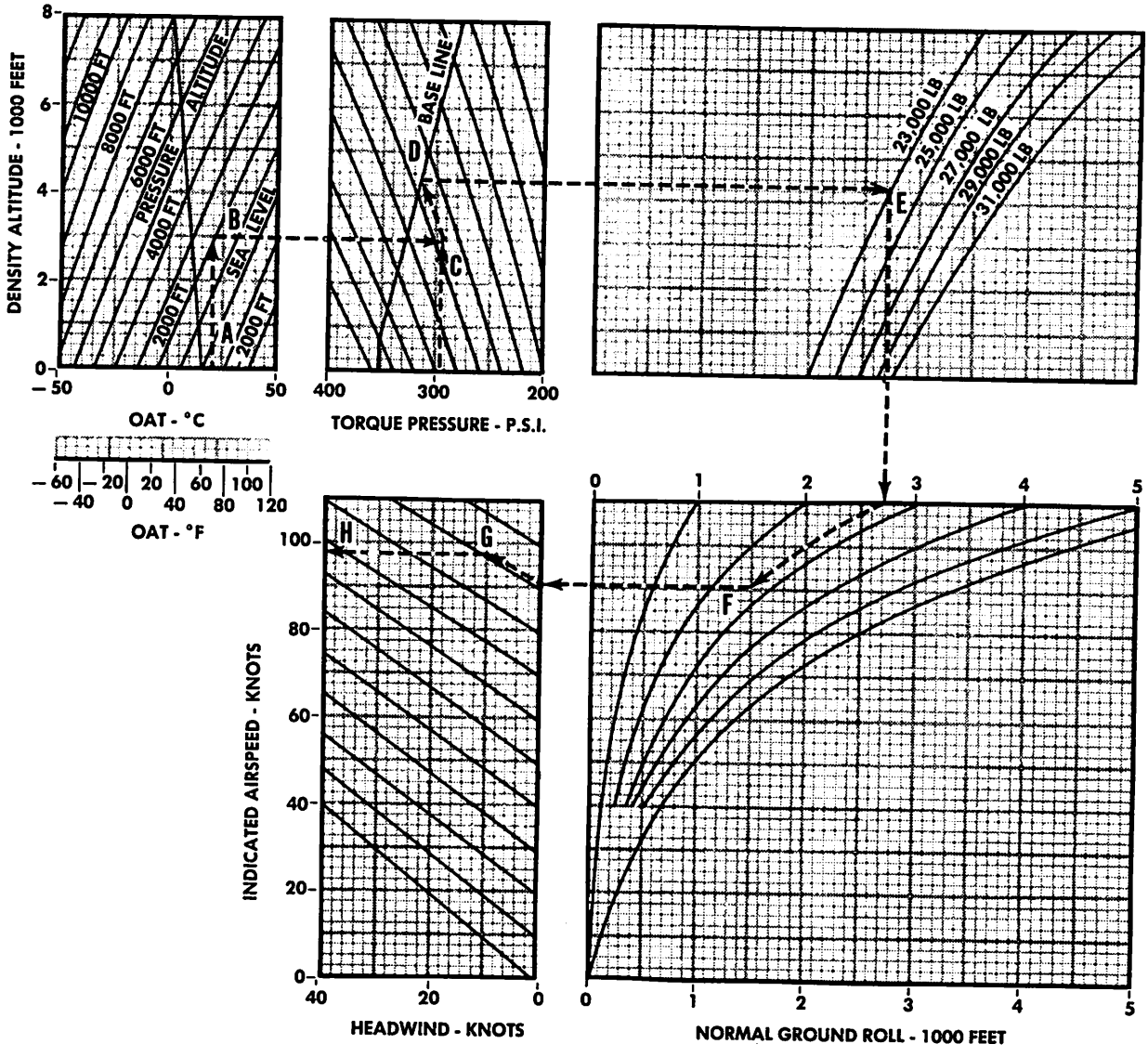
VELOCITY DURING TAKE-OFF GROUND RUN

CONFIGURATION A, C
FLAPS - 2/3 DOWN

MODEL(S): S-2 D/E
DATA AS OF: 1 MARCH 1969
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. TAKE-OFF POWER
2. RICH MIXTURE SETTING
3. SEE SECTION III FOR TAKE OFF TECHNIQUE
4. STORES ON OR OFF
5. ALLOW 290 LB FUEL FOR WARM UP AND TAKE-OFF

B-SAD1-378-2

Figure 11-16 (Sheet 2)

ACCELERATE—STOP DISTANCE

GUIDE

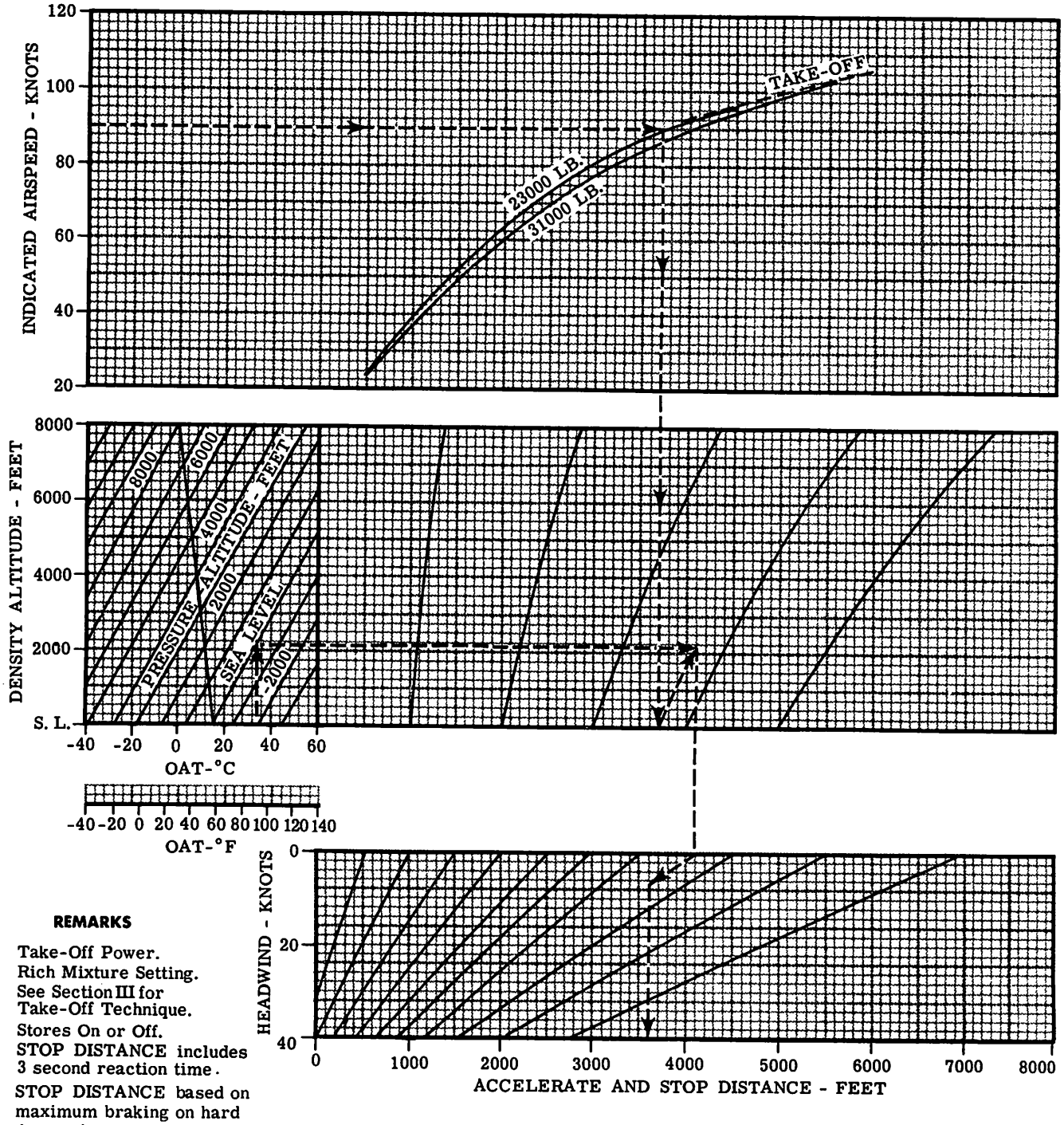
CONFIGURATION A, C
FLAPS - 2/3 DOWN

HARD SURFACE RUNWAY

MODEL(S): S-2D/E
DATA AS OF: APRIL 1963
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Take-Off Power.
2. Rich Mixture Setting.
3. See Section III for Take-Off Technique.
4. Stores On or Off.
5. STOP DISTANCE includes 3 second reaction time.
6. STOP DISTANCE based on maximum braking on hard dry surface.

A-SAD1-379-1

Figure 11-17

ACCELERATE-STOP DISTANCE

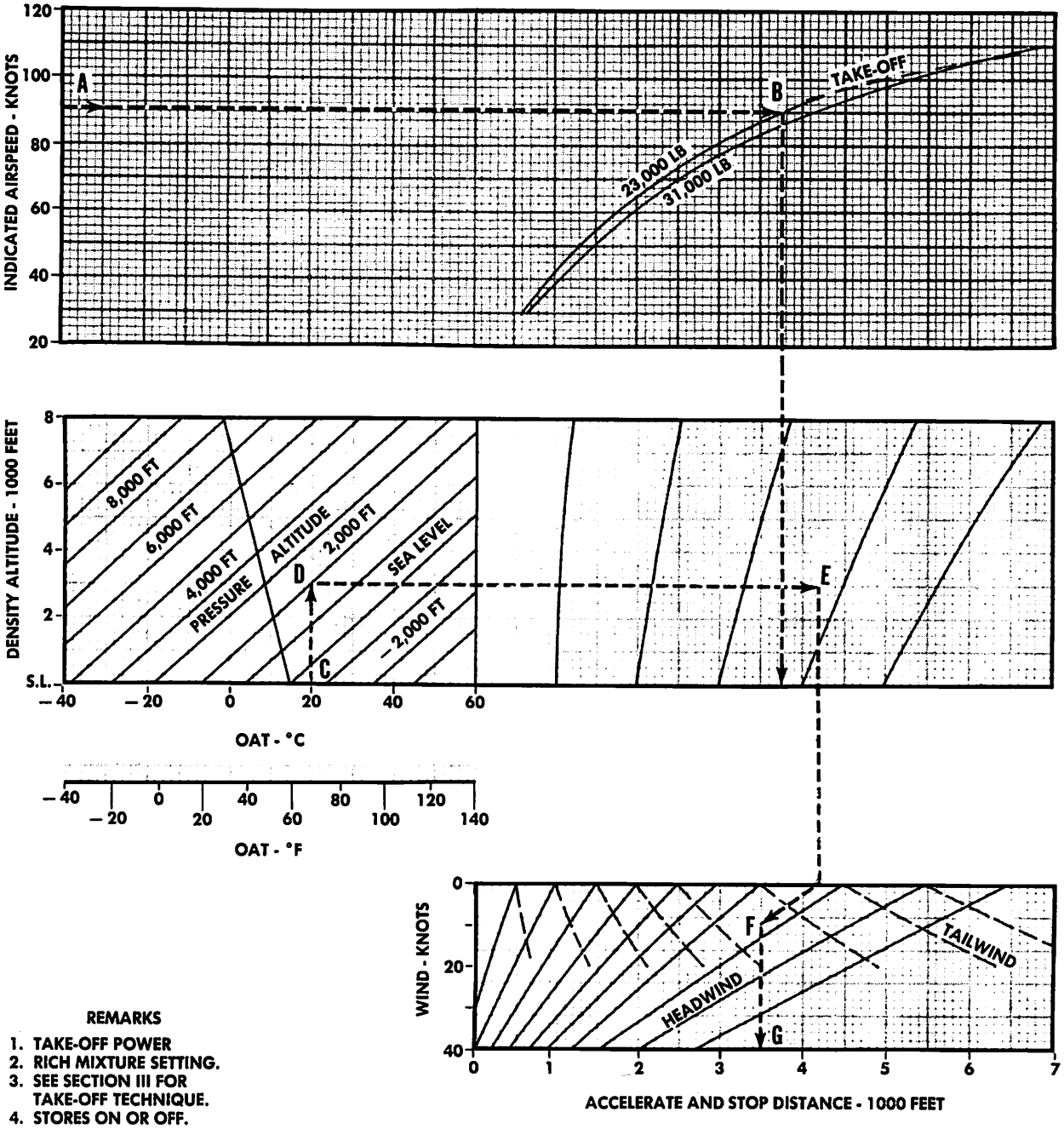
HARD SURFACE RUNWAY

CONFIGURATION A, C
FLAPS - 1/3 DOWN

MODEL(S): S-2 D/E
DATA AS OF: 1 MARCH 1969
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. TAKE-OFF POWER
2. RICH MIXTURE SETTING.
3. SEE SECTION III FOR TAKE-OFF TECHNIQUE.
4. STORES ON OR OFF.
5. STOP DISTANCE INCLUDES 3 SECOND REACTION TIME.
6. STOP DISTANCE BASED ON HARD DRY SURFACE.

SAD1-379-2

Figure 11-18

GUIDE

TAKE-OFF GROSS WEIGHT LIMIT CHART

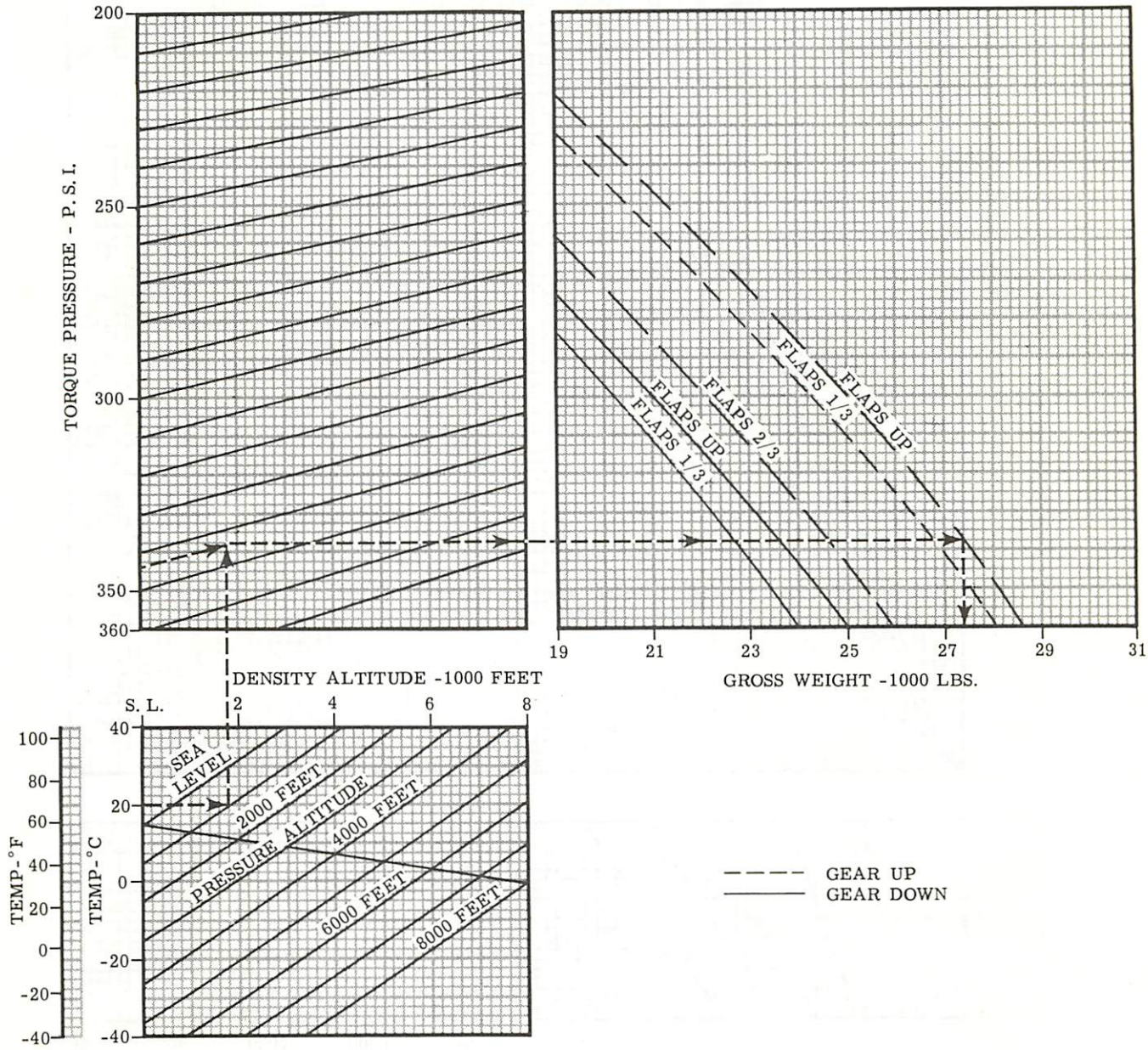
CONFIGURATION C
(4) MK43 TORPEDOES

SINGLE ENGINE

MODEL(S): S-2D/E
DATA AS OF: APRIL 1963
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Limit based on rate-of-climb capability of 100 FPM at 120 KNOTS IAS with inoperative engine's propeller feathered immediately after lift-off.
2. OPERATING ENGINE: Take-Off Power, Cowl Flaps and Oil Cooler Doors Open.
3. INOPERATIVE ENGINE: Propeller feathered, Cowl Flaps and Oil Cooler Doors closed.
4. Emergency Electrical Draw - 17 BHP; 4 psi T.P.
5. See Section III for take-off Technique.

8-SAD1-377

Figure 11-19

CLIMB-OUT FLIGHT PATH

GUIDE

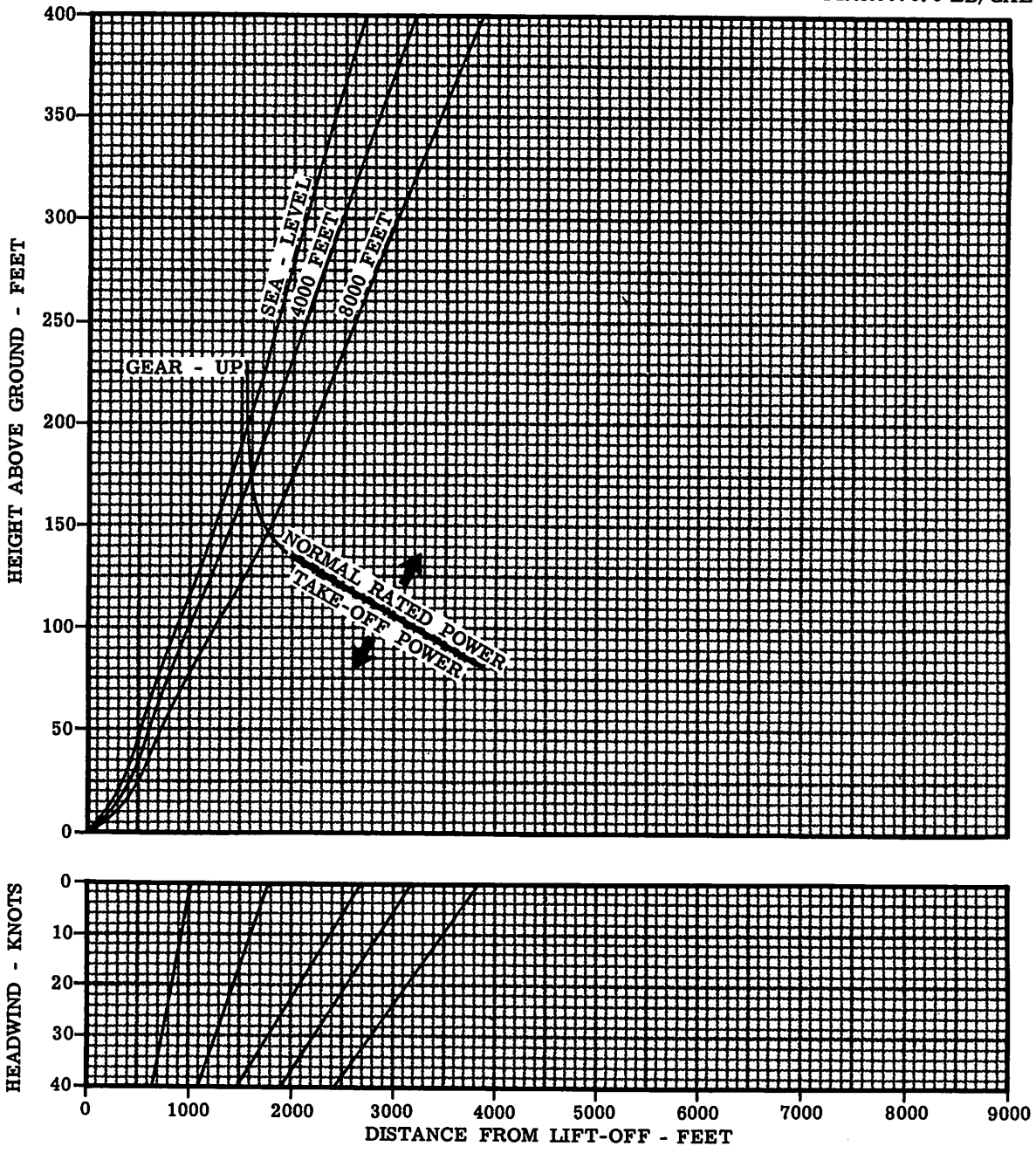


CONFIGURATION A, C
FLAPS - 2/3 DOWN
MODEL(S): S-2D/E
DATA AS OF: FEBRUARY 1963
DATA BASIS: ESTIMATED

GROSS WEIGHT = 23000 LBS.

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Climb Speed - 96 Knots IAS.
2. Two Engines; Mixtures - RICH.
3. Cowl and Oil Cooler Flaps - OPEN.
4. This chart is based on optimum speed for best angle of climb at this weight.
5. See Section III for take-off technique.

B-SAD1-370-1

Figure 11-20 (Sheet 1)

CLIMB-OUT FLIGHT PATH

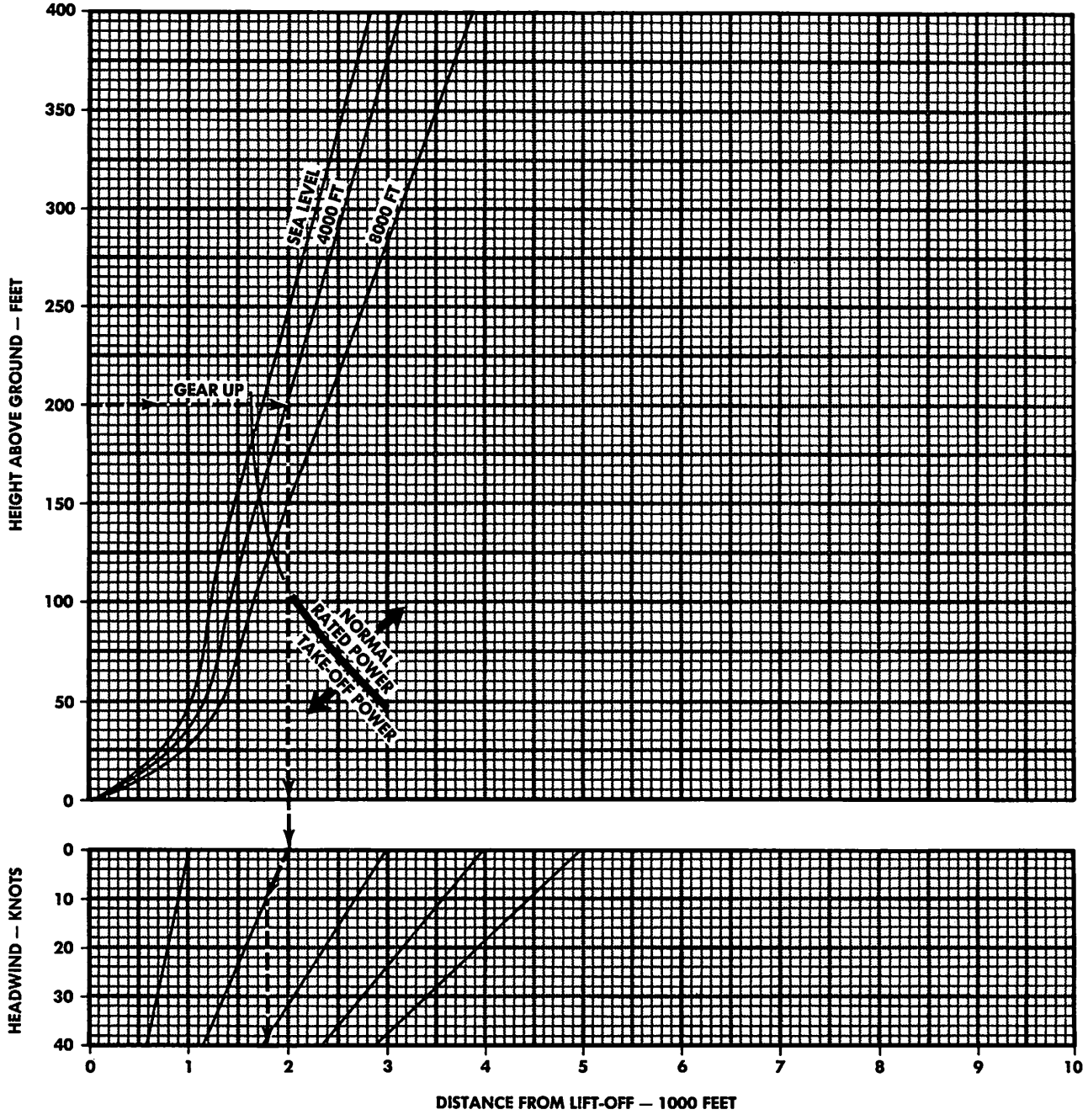
CONFIGURATION: A, C
FLAPS — 1/3 DOWN

GROSS WEIGHT 23,000 POUNDS

MODEL(S): S - 2D/E
DATE: 1 MARCH 1969
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. CLIMB SPEED — 96 KNOTS IAS.
2. TWO ENGINES: MIXTURES — RICH.
3. COWL AND OIL COOLER FLAPS — OPEN.
4. SEE SECTION III FOR TAKE-OFF TECHNIQUE.

SAD1-370-2

Figure 11-20 (Sheet 2)

CLIMB-OUT FLIGHT PATH

GUIDE



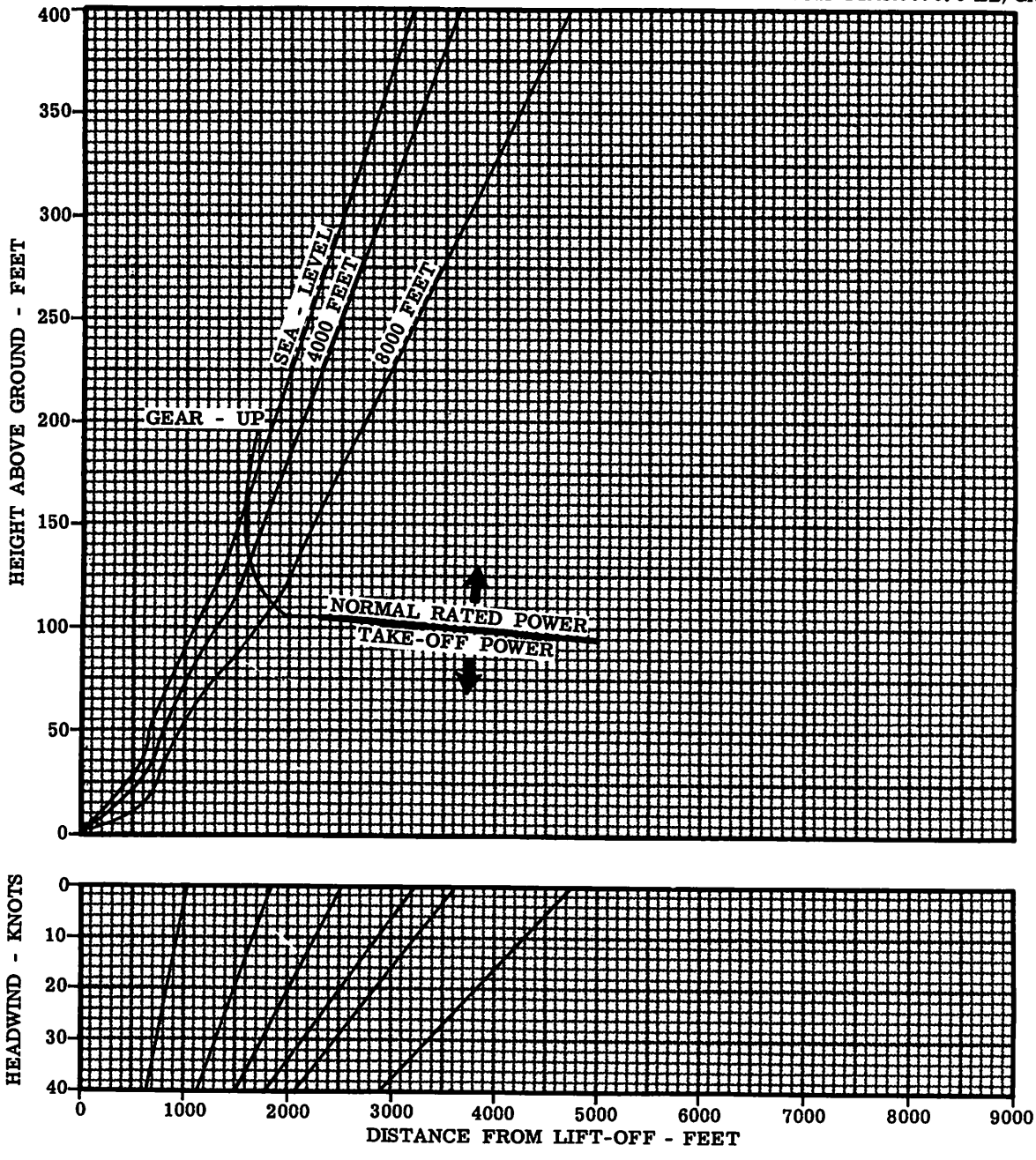
CONFIGURATION A, C
FLAPS - 2/3 DOWN

GROSS WEIGHT = 25000 LBS.

MODEL(S): S-2D/E
DATA AS OF: FEBRUARY 1963
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Climb Speed - 96 Knots IAS.
2. Two Engines; Mixtures - RICH.
3. Cowl and Oil Cooler Flaps - OPEN.
4. This chart is based on optimum speed for best angle of climb at this weight.
5. See Section III for take-off technique.

B-SAD1-371-1

Figure 11-21 (Sheet 1)

CLIMB-OUT FLIGHT PATH

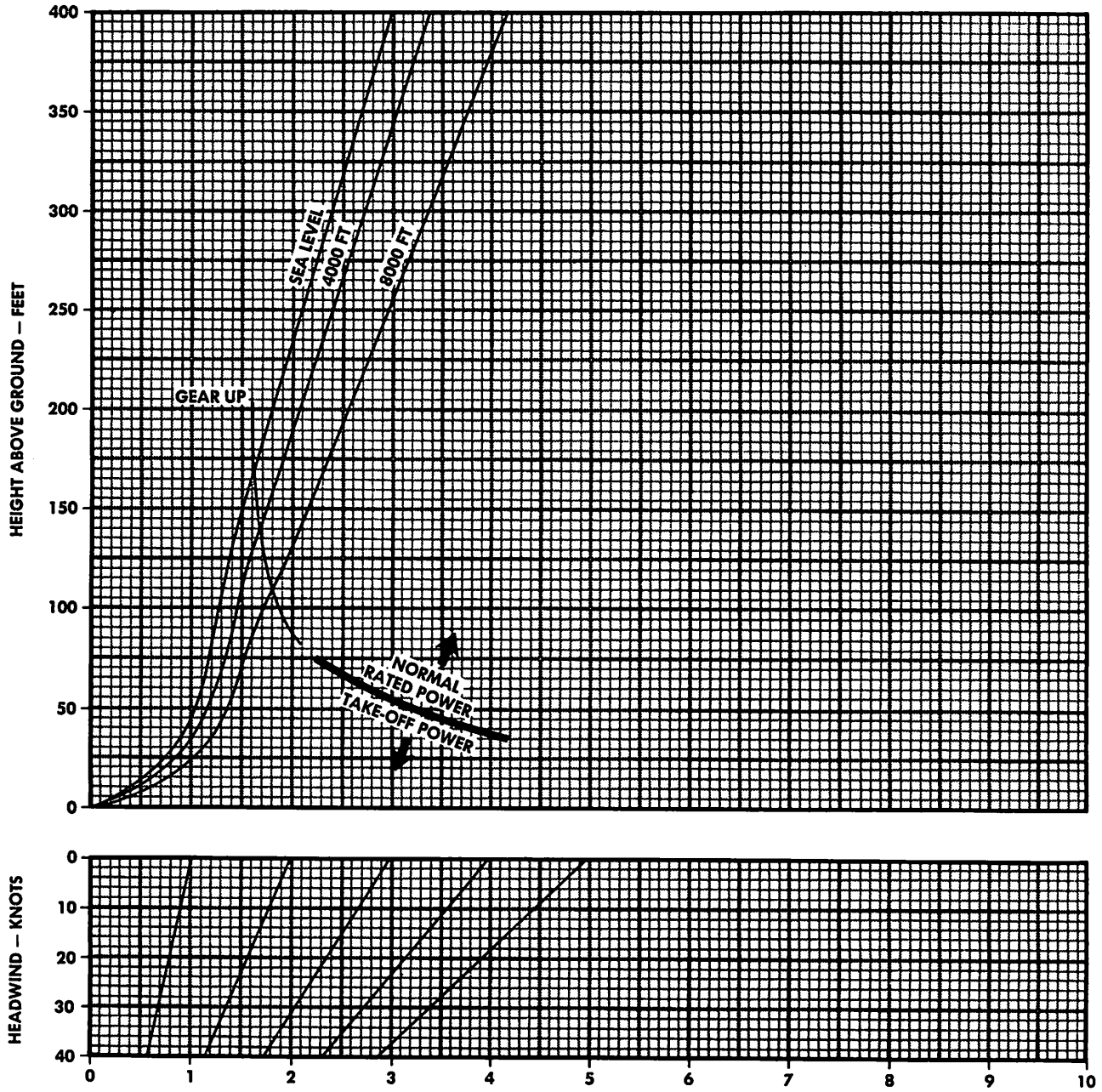
CONFIGURATION: A, C
FLAPS — 1/3 DOWN

GROSS WEIGHT 25,000 POUNDS

MODEL(S): S - 2D/E
DATE: 1 MARCH 1969
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. CLIMB SPEED — 96 KNOTS IAS.
2. TWO ENGINES: MIXTURES — RICH.
3. COWL AND OIL COOLER FLAPS — OPEN.
4. SEE SECTION III FOR TAKE-OFF TECHNIQUE.

SAD1-371-2

Figure 11-21 (Sheet 2)

CLIMB-OUT FLIGHT PATH

GUIDE



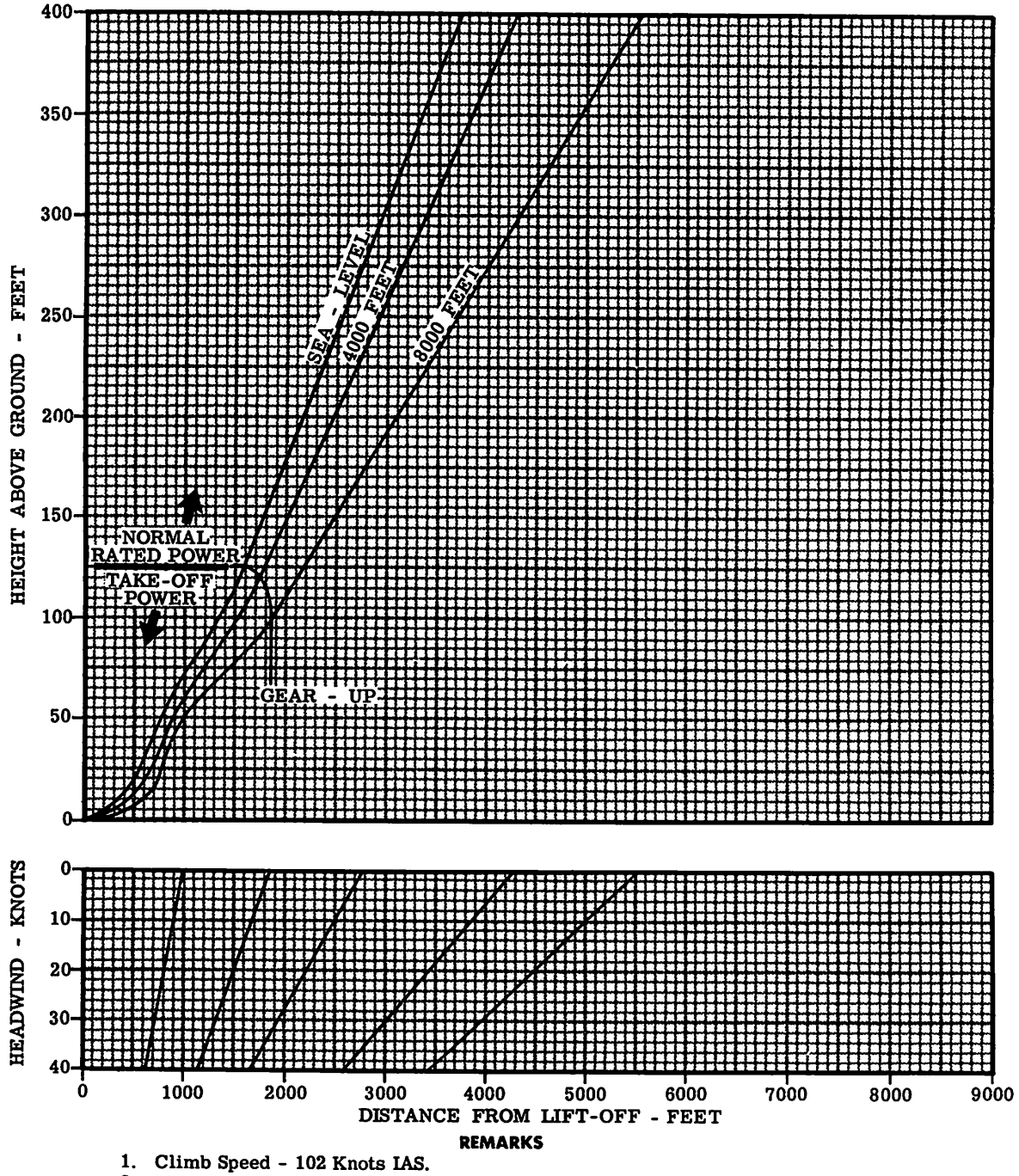
CONFIGURATION A, C
FLAPS - 2/3 DOWN

GROSS WEIGHT = 27000 LBS.

MODEL(S): S-2D/E
DATA AS OF: FEBRUARY 1963
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Climb Speed - 102 Knots IAS.
2. Two Engines; Mixtures - RICH.
3. Cowl and Oil Cooler Flaps - OPEN.
4. This chart is based on optimum speed for best angle of climb at this weight.
5. See Section III for take-off technique.

B-SAD1-372-1

Figure 11-22 (Sheet 1)

CLIMB-OUT FLIGHT PATH

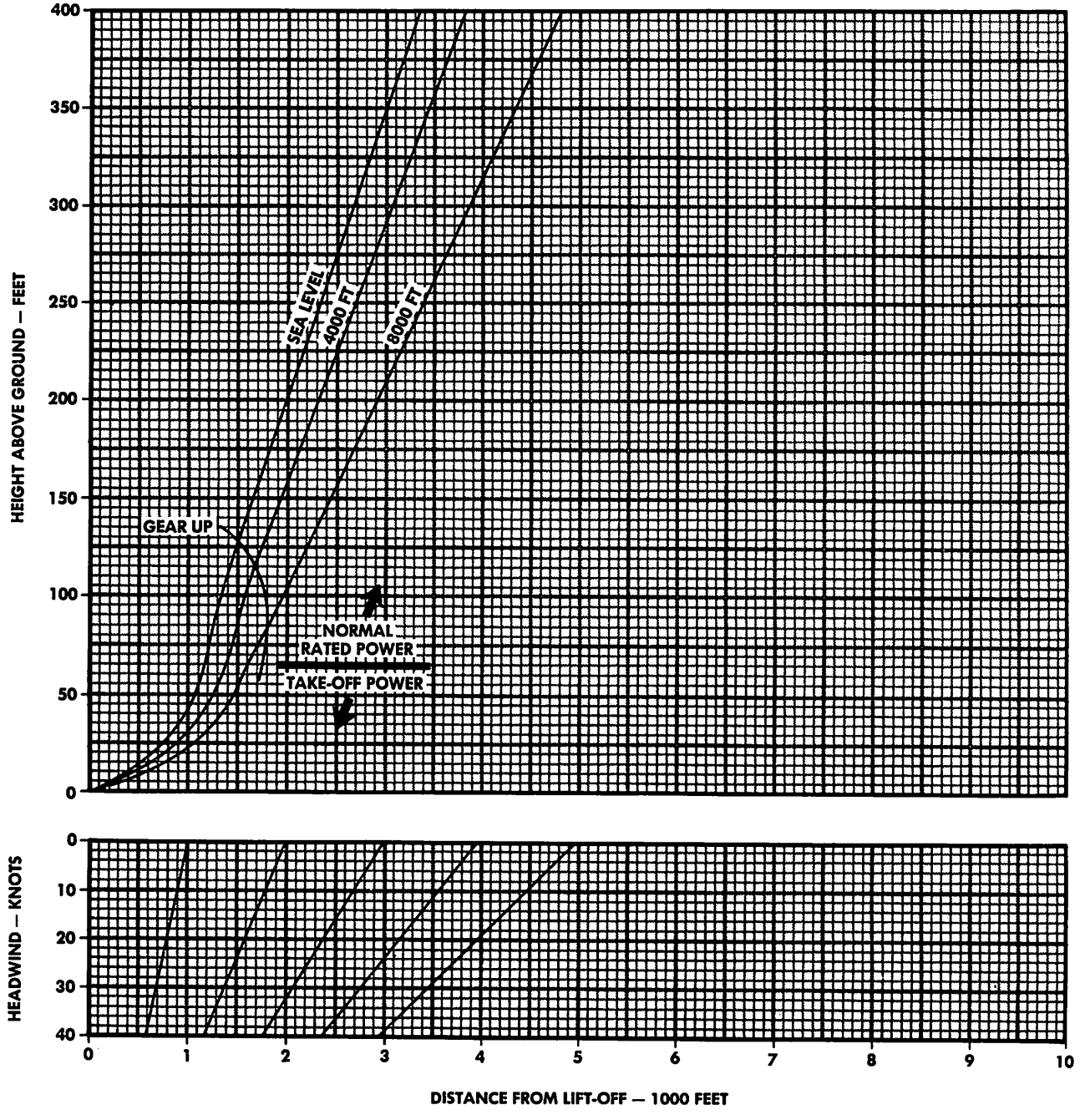
CONFIGURATION: A, C
FLAPS — 1/3 DOWN

MODEL(S): S - 2D/E
DATE: 1 MARCH 1969
DATA BASIS: ESTIMATED

GROSS WEIGHT 27,000 POUNDS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. CLIMB SPEED — 99 KNOTS IAS.
2. TWO ENGINES: MIXTURES — RICH.
3. COWL AND OIL COOLER FLAPS — OPEN.
4. SEE SECTION III FOR TAKE-OFF TECHNIQUE.

SAD1-372-2

Figure 11-22 (Sheet 2)

CLIMB-OUT FLIGHT PATH

GUIDE

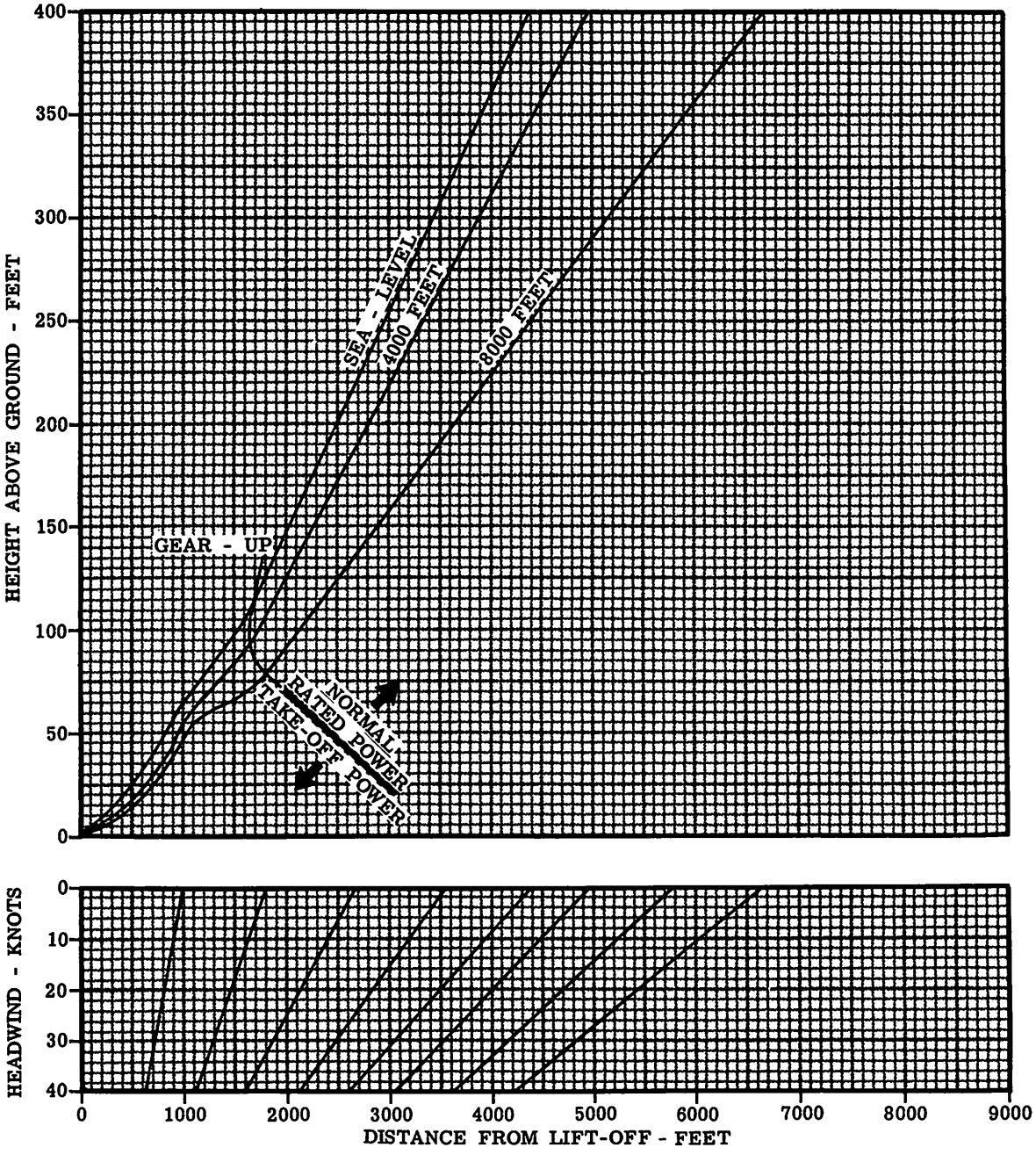


CONFIGURATION A, C
FLAPS - 2/3 DOWN
MODEL(S): S-2D/E
DATA AS OF: FEBRUARY 1963
DATA BASIS: ESTIMATED

GROSS WEIGHT = 29000 LBS.

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Climb Speed - 106 Knots IAS.
2. Two Engines; Mixtures - RICH.
3. Cowl and Oil Cooler Flaps - OPEN.
4. This chart is based on optimum speed for best angle of climb at this weight.
5. See Section III for take-off technique.

B-SAD1-373-1

Figure 11-23 (Sheet 1)

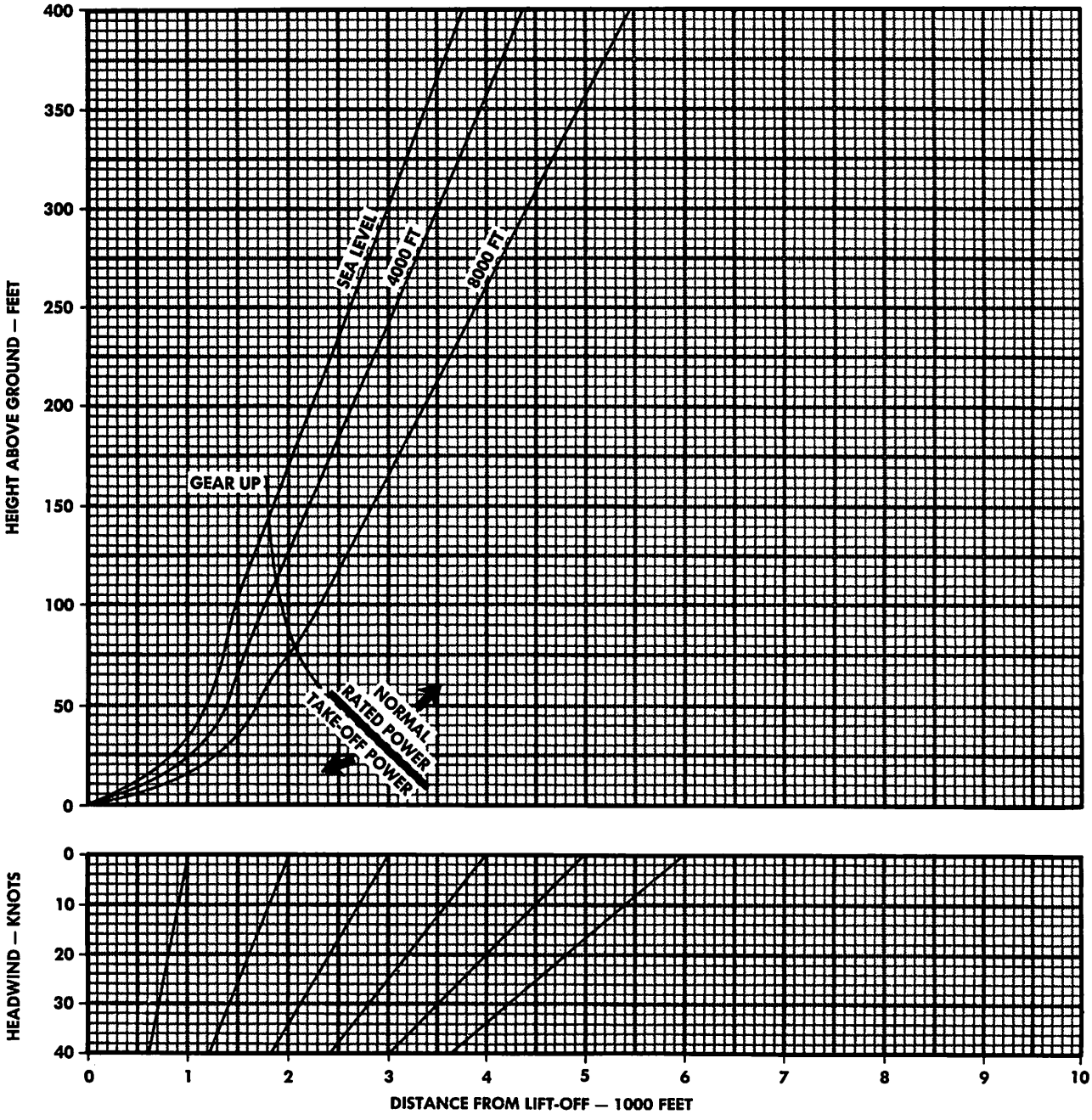
CLIMB-OUT FLIGHT PATH

CONFIGURATION: A, C
FLAPS — 1/3 DOWN
MODEL(S): S - 2D/E
DATE: 1 MARCH 1969
DATA BASIS: ESTIMATED

GROSS WEIGHT 29,000 POUNDS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

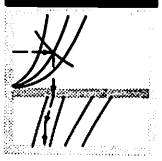
1. CLIMB SPEED — 102 KNOTS IAS.
2. TWO ENGINES: MIXTURES — RICH.
3. COWL AND OIL COOLER FLAPS — OPEN.
4. SEE SECTION III FOR TAKE-OFF TECHNIQUE.

SAD1-373-2

Figure 11-23 (Sheet 2)

CLIMB-OUT FLIGHT PATH

GUIDE

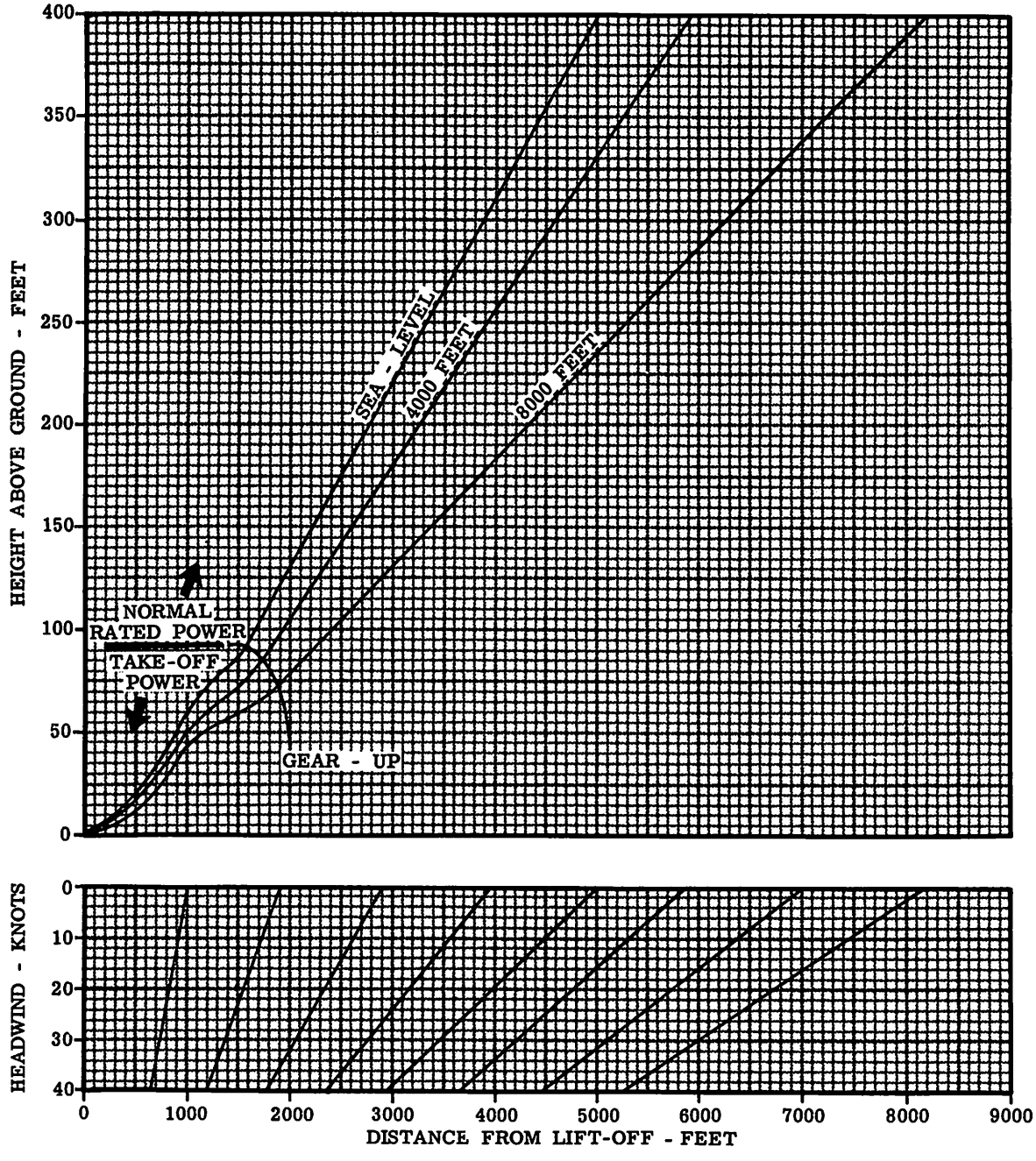


CONFIGURATION A, C
FLAPS - 2/3 DOWN
MODEL(S): S-2D/E
DATA AS OF: FEBRUARY 1963
DATA BASIS: ESTIMATED

GROSS WEIGHT = 31000 LBS.

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Climb Speed - 109 Knots IAS.
2. Two Engines; Mixtures - RICH.
3. Cowl and Oil Cooler Flaps - OPEN.
4. This chart is based on optimum speed for best angle of climb at this weight.
5. See Section III for take-off technique.

B-SAD1-374-1

Figure 11-24 (Sheet 1)

CLIMB-OUT FLIGHT PATH

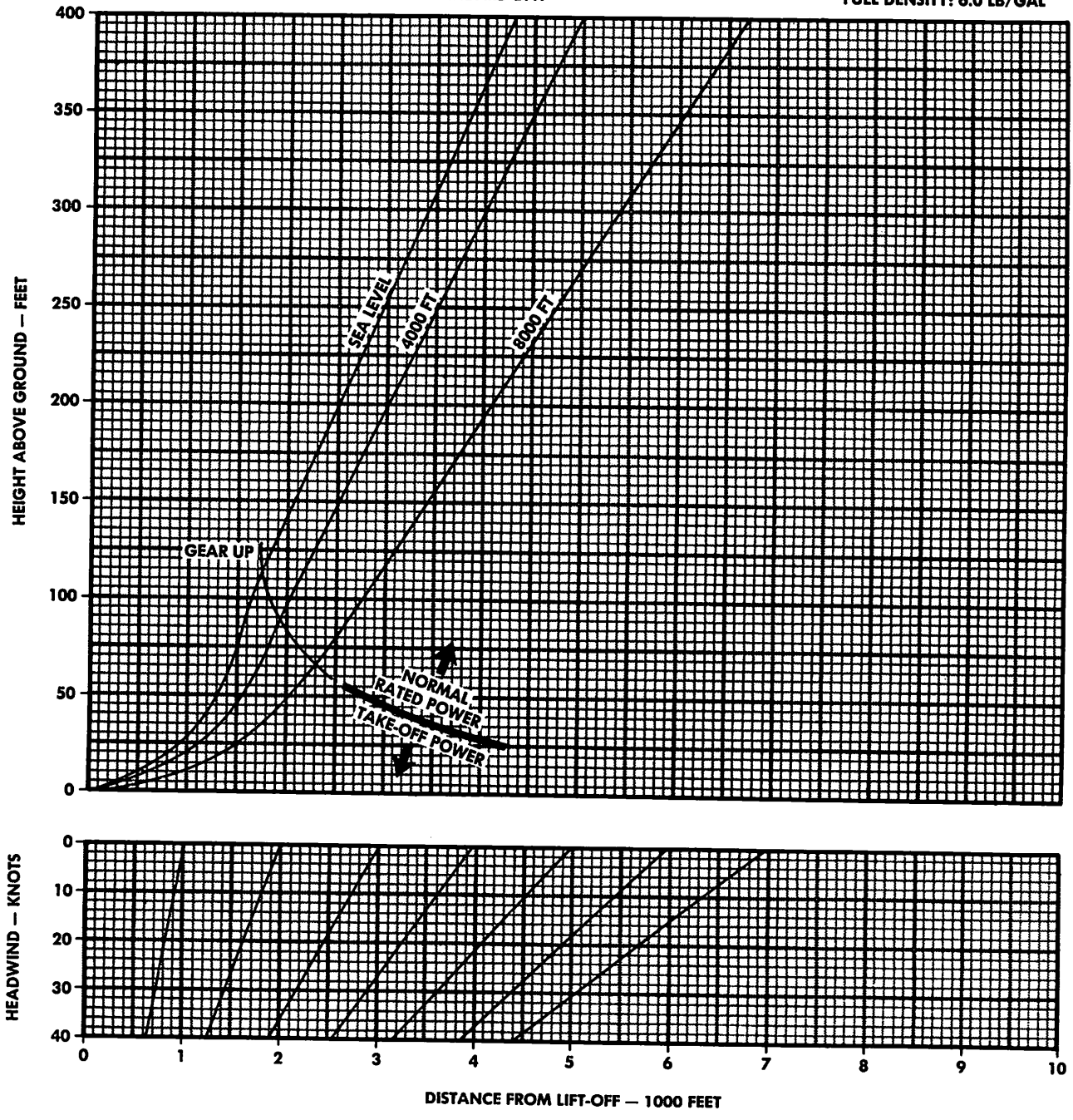
CONFIGURATION: A, C
FLAPS — 1/3 DOWN

GROSS WEIGHT 31,000 POUNDS

MODEL(S): S - 2D/E
DATE: 1 MARCH 1969
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

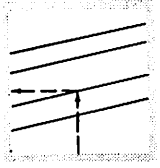
1. CLIMB SPEED — 106 KNOTS IAS.
2. TWO ENGINES: MIXTURES — RICH.
3. COWL AND OIL COOLER FLAPS — OPEN.
4. SEE SECTION III FOR TAKE-OFF TECHNIQUE.

SAD1-374-2

Figure 11-24 (Sheet 2)

STALL SPEED — SEA LEVEL

GUIDE

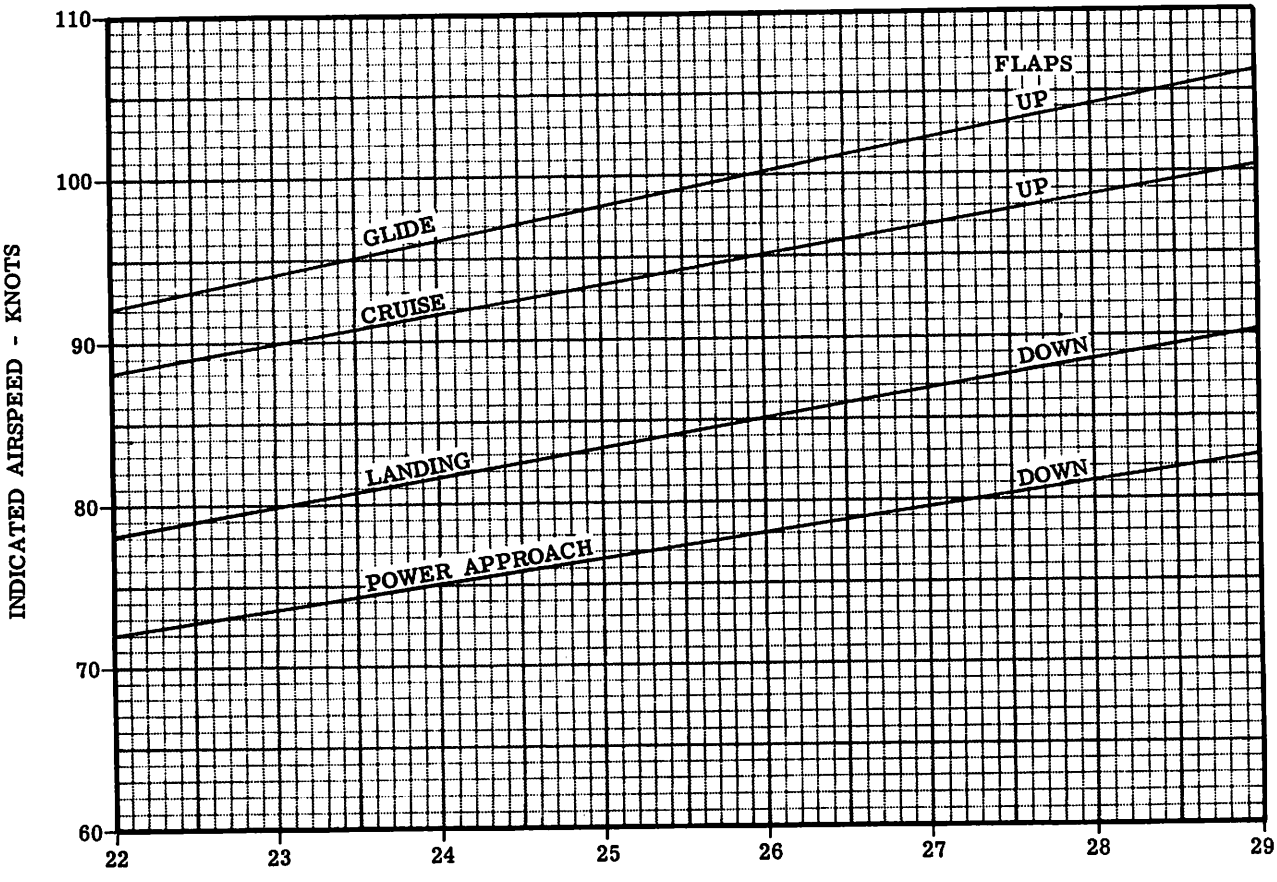


CONFIGURATION A
CLEAN

MODEL(S): S-2D/E
DATA AS OF: MARCH 1960
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



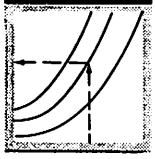
GROSS WEIGHT - 1000 LB.

A-SAD1-309

Figure 11-25

STALL SPEED VS ANGLE OF BANK

GUIDE



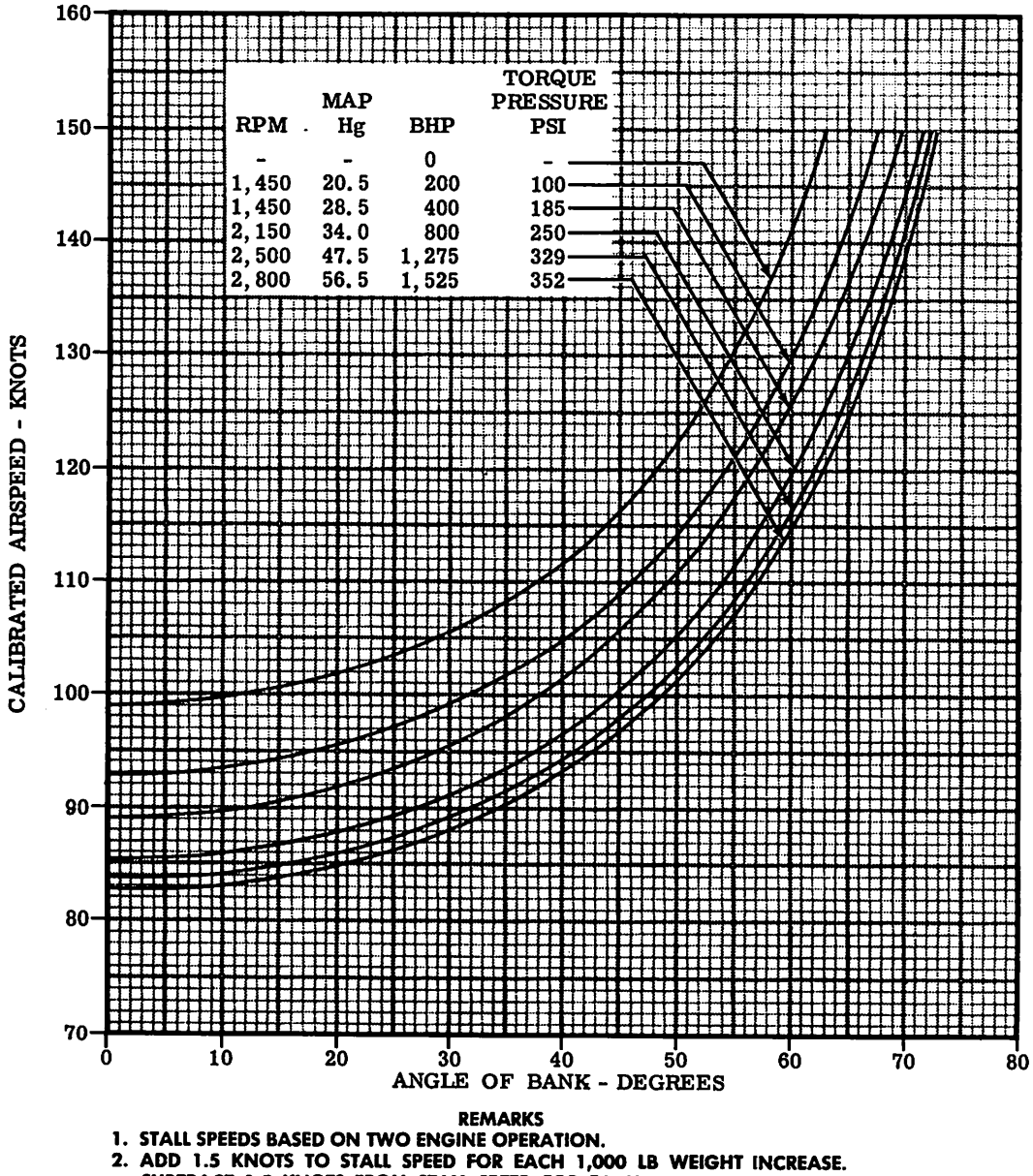
SEA LEVEL

CONFIGURATION A
FLAPS-UP
WT = 25,000 LBS

MODEL(S): S-2D/E
DATA AS OF: OCTOBER 1964
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

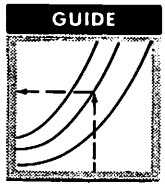
1. STALL SPEEDS BASED ON TWO ENGINE OPERATION.
2. ADD 1.5 KNOTS TO STALL SPEED FOR EACH 1,000 LB WEIGHT INCREASE. SUBTRACT 1.5 KNOTS FROM STALL SPEED FOR EACH 1,000 LB WEIGHT DECREASE.

B-SADI-310

Figure 11-26

STALL SPEED VS ANGLE OF BANK

GUIDE



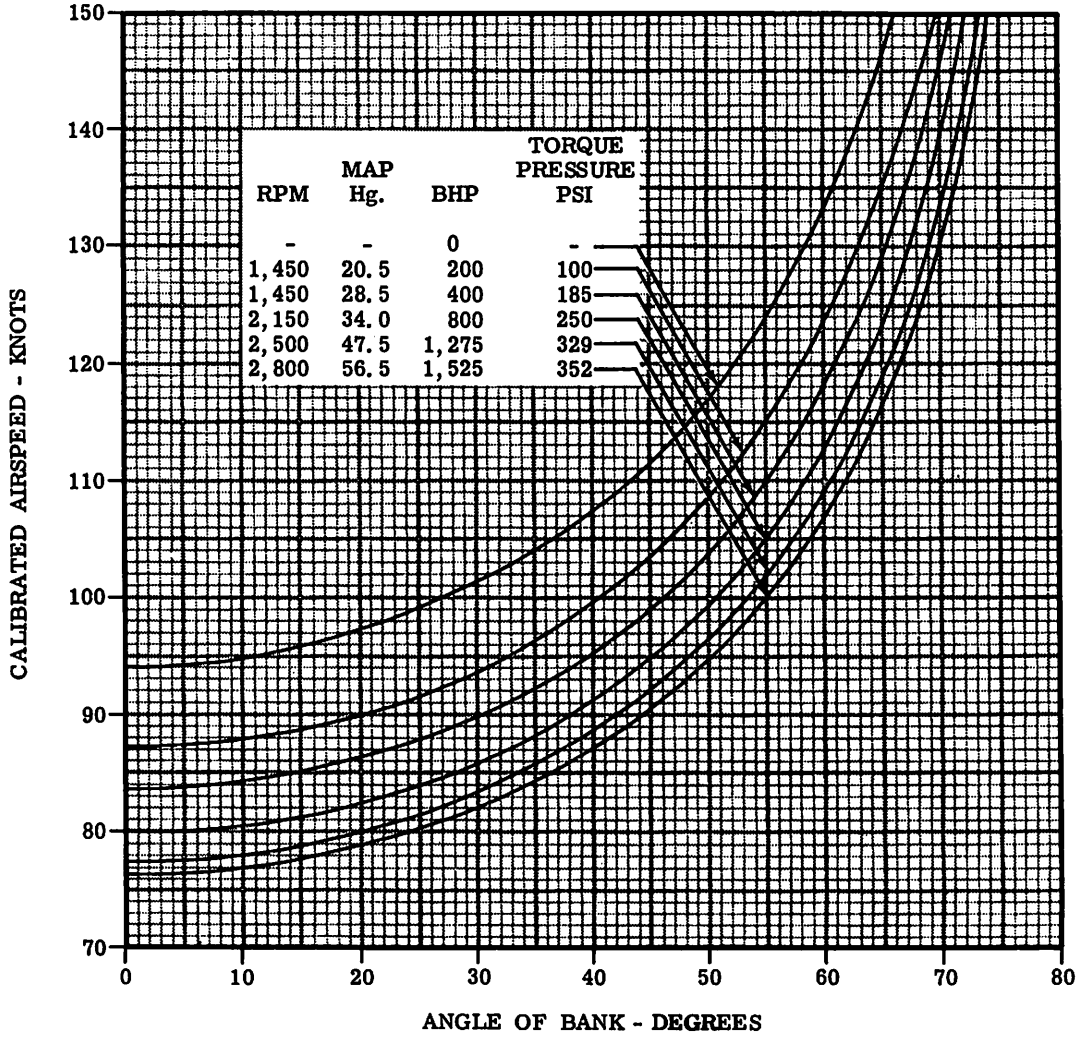
SEA LEVEL

CONFIGURATION A
FLAPS 1/3 DOWN
WT = 25,000 LBS.

MODEL(S): S-2D/E
DATA AS OF: AUGUST 1959
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

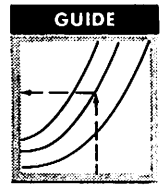
1. **STALL SPEEDS BASED ON TWO ENGINE OPERATION.**
2. **ADD 1.5 KNOTS TO STALL SPEED FOR EACH 1,000 LB WEIGHT INCREASE. SUBTRACT 1.5 KNOTS FROM STALL SPEED FOR EACH 1,000 LB WEIGHT DECREASE.**

8-SADI-311

Figure 11-27

STALL SPEED VS ANGLE OF BANK

GUIDE



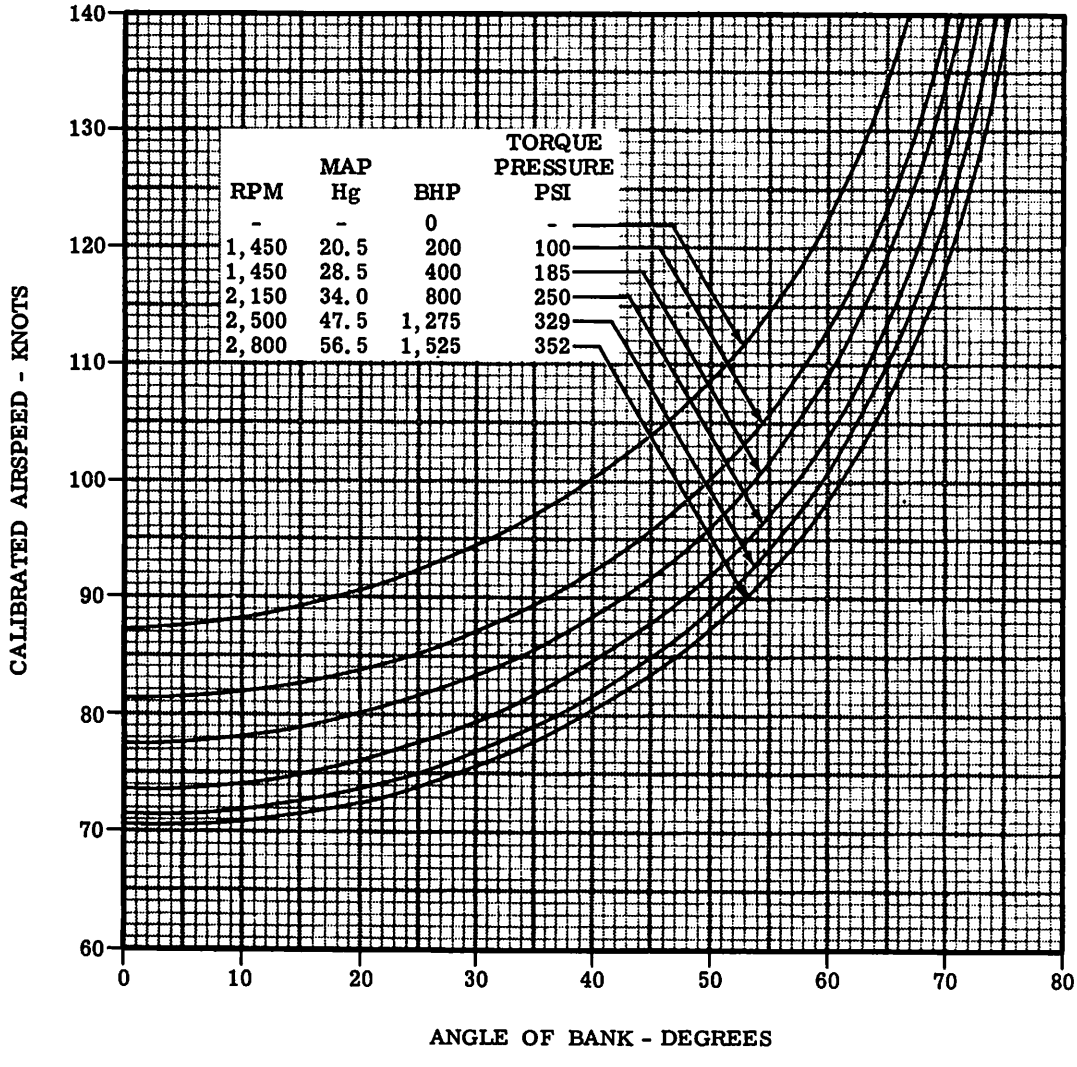
SEA LEVEL

CONFIGURATION A
FLAPS - 2/3 DOWN
WT = 25,000 LBS

MODEL(S): S-2D/E
DATA AS OF: AUGUST 1959
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



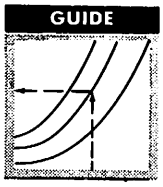
REMARKS

1. STALL SPEEDS BASED ON TWO ENGINE OPERATION.
2. ADD 1.5 KNOTS TO STALL SPEED FOR EACH 1,000 LB WEIGHT INCREASE. SUBTRACT 1.5 KNOTS FROM STALL SPEED FOR EACH 1,000 LB WEIGHT DECREASE.

8-SADI-312

Figure 11-28

STALL SPEED VS ANGLE OF BANK



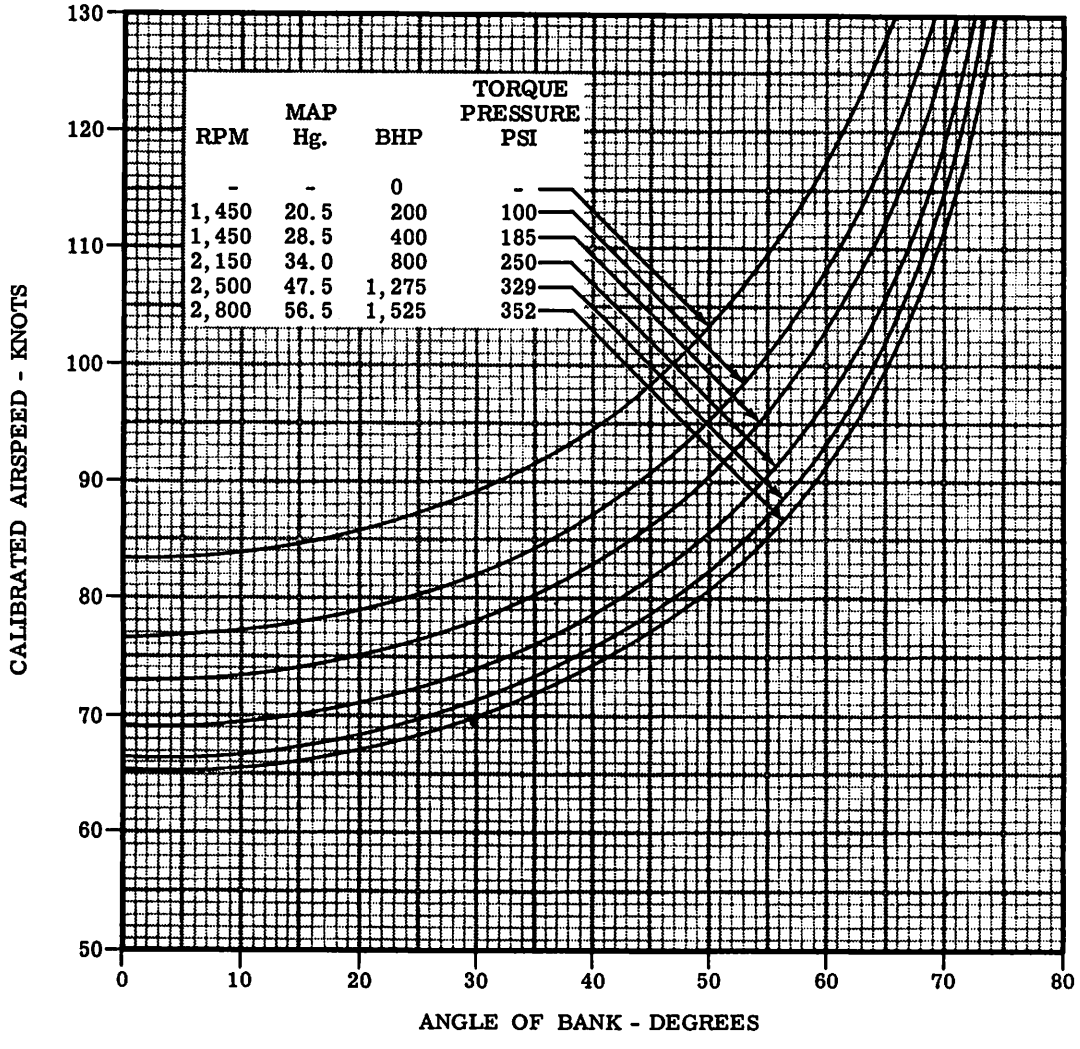
SEA LEVEL

CONFIGURATION A
FLAPS - FULL DOWN
WT = 25,000 LBS.

MODEL(S): S-2D/E
DATA AS OF: AUGUST 1959
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

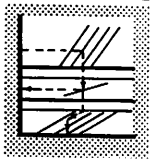
1. **STALL SPEEDS BASED ON TWO ENGINE OPERATION.**
2. **ADD 1.5 KNOTS TO STALL SPEED FOR EACH 1,000 LB WEIGHT INCREASE. SUBTRACT 1.5 KNOTS FROM STALL SPEED FOR EACH 1,000 LB WEIGHT DECREASE.**

8-SADI-313

Figure 11-29

LANDING GROUND ROLL

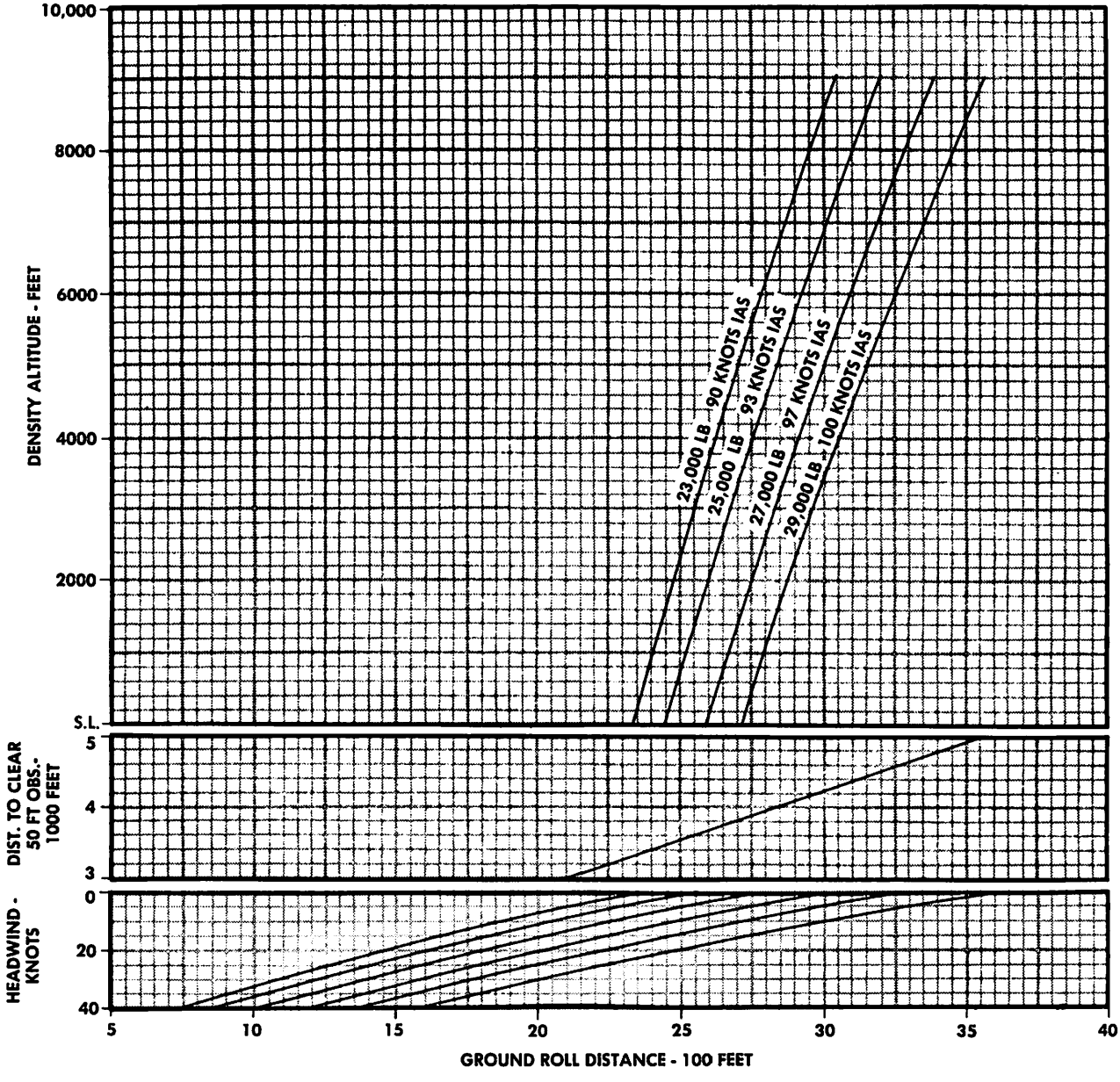
GUIDE



CONFIGURATION ALL
FLAPS - FULL DOWN
HARD SURFACE RUNWAY
MODEL(S): S-2D/E
DATA AS OF: 14 NOVEMBER 1958
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

G.W. - LBS	APPROACH IAS - KTS	TOUCHDOWN IAS - KTS
23,000	99	90
25,000	103	93
27,000	106	97
29,000	110	100

D-SADI-318

Figure 11-30

part 6

CLIMB PERFORMANCE

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CLIMB CHARTS

CLIMB PERFORMANCE—TIME, DISTANCE AND FUEL (FAST AND NORMAL CLIMB)

For Configuration A aircraft, figure 11-31 (sheets 1 and 2) is used to compute the following: time to climb, distance covered in climb, and fuel used in climb. Sheet 1 is presented for Fast Climb (2500 RPM) and sheet 2 for Normal Climb (2300 RPM). For configuration C aircraft, since there is a slight variation in performance, a separate figure is included, figure 11-32 (sheets 1 and 2). Included below is a sample problem and solution based on the data presented in figure 11-31 (sheet 1). A problem for Configuration C, figure 11-32 (sheet 1) is not included since the technique in using both charts is the same.

SAMPLE PROBLEM:

Given: Fast Climb (2500 RPM)
Configuration A
24,900 pounds Gross Weight
5,000 feet cruising altitude

Find: Time, Fuel, and Distance to climb to 10,000 feet cruising altitude

Enter figure 11-33 (sheet 1) at 5000 feet and 24,900 pounds and read the following results on the left side of the chart: time 3.0 minutes, and a distance of approximately 6.8 nautical miles. By keeping parallel to the nearest guide line, proceed from the 5000 feet and 24,900 pounds intersection to the 10,000 feet line. From this point on the 10.000 feet line another set of figures is read: time 7.0 minutes and a distance of 16.0 nautical miles (on the left side of the chart); and a gross weight of 24,800 pounds (vertically below).

The difference between the quantities obtained for 5000 feet and those obtained from the 10,000 feet level are the answers to the time, fuel, and distance consumed in climbing from 5000 to 10,000 feet. Time equals 4 minutes (subtract 3.0 minutes obtained at 5000 feet from 7.0 minutes obtained for 10,000 feet). Fuel consumed is 100 pounds (gross weight change from 24,900 pounds at 5000 feet to 24,800 pounds at 10,000 feet). Distance traveled is 9.2 nautical miles (subtract 6.8 nautical miles obtained from 5000 feet level from the 16.0 nautical miles obtained at 10,000 feet).

EMERGENCY CLIMB

SINGLE ENGINE RATE OF CLIMB — SEA LEVEL

Two Single Engine Rate of Climb - Sea Level charts are included: one for standard day conditions (figure 11-33); the other for hot days (figure 11-34). Both presentations are for Configuration A aircraft only. The data is based on sea level take-off power for aircraft gross weights of 27,000 pounds for a 90-130 knot IAS speed range. In both charts the information shown is for the following varying conditions: propeller windmilling, propeller feathered, gear UP and gear DOWN with flap settings of UP, 1/3, 2/3, and FULL.

The following sample problem is included for understanding chart use:

SAMPLE PROBLEM:

Given: Temperature 90°
Relative Humidity 90%
Propeller Windmilling
Gear UP
IAS 103 knots
Flaps 1/3

Find: Rate of Climb

Since the temperature is 90° with a relative humidity of 90%, the appropriate figure is 11-34 (hot day). Enter figure 11-34 on the top right grid. This is the only grid which satisfies all the given conditions. Move up from the 103 knot IAS line to intersect the 1/3 flaps line. Move horizontally to the left and read a rate of climb of -380 FPM.

The negative 380 FPM rate of climb obtained in the above problem indicates that with heavy aircraft gross weights (approximately 27,000 pounds), it is imperative that the aircraft be brought into an optimized single engine configuration as soon as possible. Refer to Emergency Procedures in Section V, Engine Failure During Take-Off paragraph.

The effect of several items upon aircraft rate of climb are summarized below:

ITEM	PERFORMANCE EFFECT
1. Retract Landing Gear	Decreases rate of descent - 300 FPM
2. Feather Dead Engine if Auto-Feathering Fails	Decreases rate of descent - 400 FPM

Note

Upon completion of the foregoing items, at speeds above 100 knots (CAS) on a standard day altitude can be maintained.

3. Raise flaps from 2/3 to 1/3 and accelerate to 110 knots CAS.	Increases rate of climb - 140 FPM (Standard Day)

Note

The aircraft can maintain altitude at speeds above 100 knots (CAS) on a standard day if the foregoing items have been accomplished while TAKE-OFF POWER is maintained.

4. Drop Stores	Increases rate of climb as follows: Config. A -60 FPM (1 MK-101) Config. C -120 FPM (4 MK 43-1 and 2 MK 44)
5. Start Fuel Dumping	Increases rate of climb - 72 FPM (after dumping duration 1 minute-Standard Day)

WARNING

Be certain fire does not exist before initiating dumping.

For a more detailed account of Single Engine procedures refer to Section V.

SINGLE ENGINE CLIMB PERFORMANCE

Single Engine Climb Performance charts are included for Configuration A (figure 11-35) and for Configuration C (figure 11-37). Similar to the sea level single engine charts (figures 11-33 and 11-34), they are used to determine rates of climb. A major difference is that the data basis is for a Flaps - UP and Gear - UP condition for a 120 knot CAS climb speed which is recommended for the best available rate of climb. The charts are valid only when the inoperative engine is feathered.

The following variables are included in these charts which makes their use more flexible than those based for sea level: a temperature range scale, a pressure altitude - to-density altitude conversion scale, a torque pressure range scale, and several gross weight lines from 23,000 to 31,000 pounds.

The use of these charts is easily understood by following the directions of the dotted guide line and arrows.

SINGLE ENGINE EMERGENCY SERVICE CEILING

Single Engine Emergency Service Ceiling charts available for Configuration A (figure 11-36) and Configuration C (figure 11-38) are based on Flaps - UP/ Gear - UP conditions with a climb speed of 120 knots CAS with the inoperative engine feathered. Each chart contains three similar grids used to determine rate of climb and emergency service ceilings (maintaining a rate of climb of 100 FPM). The three grids are titled Sea Level, Rate of Climb - 100 FPM, and Military Power.

Sample problems are included to illustrate the use of each grid presentation:

SAMPLE PROBLEM NO. 1:

Given: Configuration A
Sea Level
26,400 pounds Gross Weight
Normal Rated Power

Find: Rate of Climb

Enter the lower grid of figure 11-36 at 26,400 pounds and move up vertically to the Normal Rated power line. Proceed horizontally to the left and read a rate of climb of 60 FPM.

SAMPLE PROBLEM No. 2:

Given: Configuration C
Rate of Climb - 100 FPM
25,000 pounds Gross Weight
Take-Off Power

Find: Emergency Service Ceiling at which a climb of 100 FPM can be maintained.

Enter the top right grid of figure 11-38 at 25,000 pounds and move up to the Take-Off power line. Proceed horizontally to the left and read 4,100 feet which is the emergency service ceiling in which a climb rate of 100 FPM can be maintained.

SAMPLE PROBLEM No. 3:

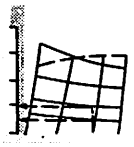
Given: Configuration A
Military Power
5000 feet altitude
26,000 pounds Gross Weight

Find: Rate of Climb

Enter top left grid of figure 11-36 at 5000 feet and move to the right until the 26,000 pounds gross weight point is reached. Proceed vertically to the bottom and read a rate of climb of 50 FPM.

CLIMB PERFORMANCE

GUIDE

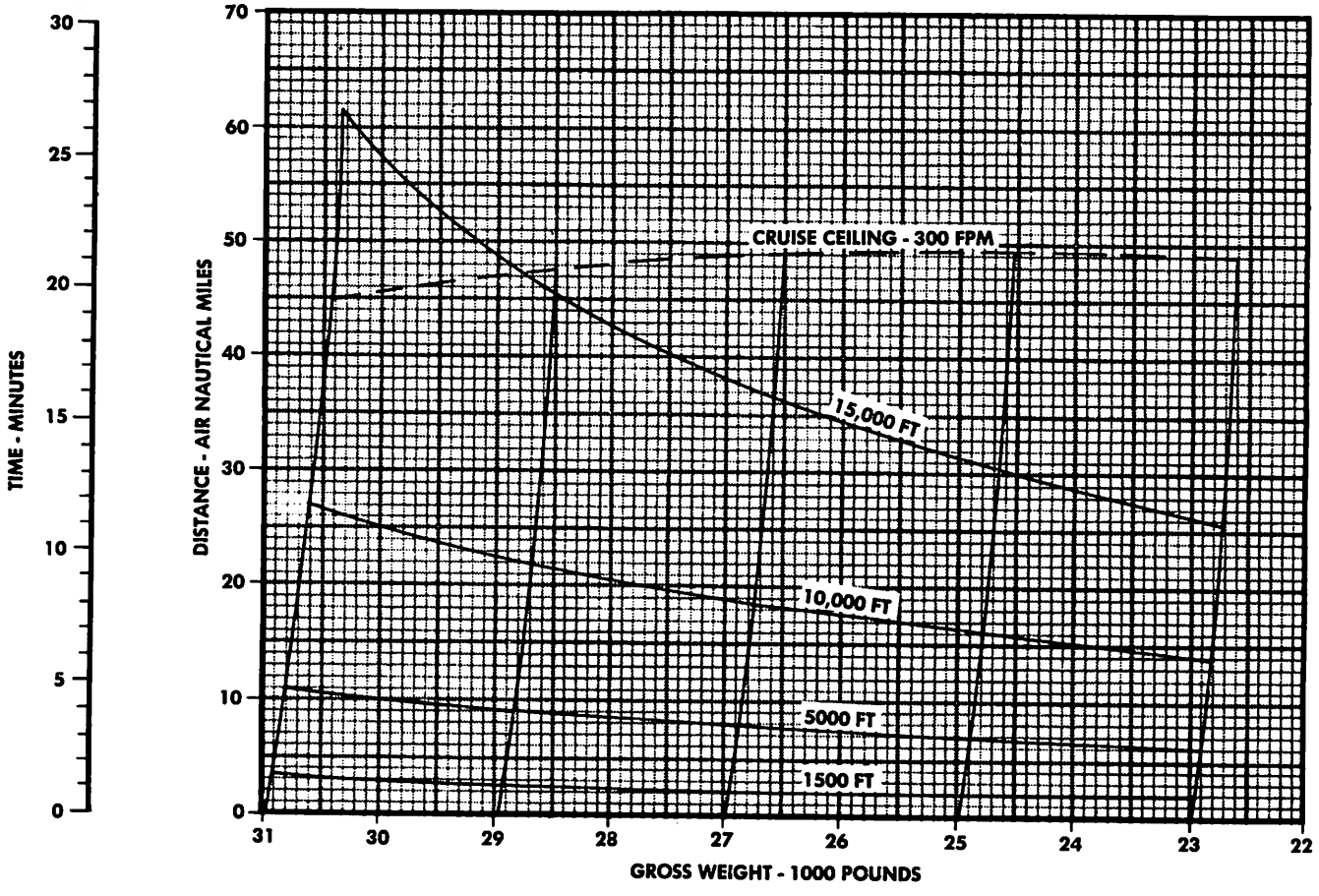


CONFIGURATION A
CLEAN
FLAPS -0°
MODEL(S): S-2D/E
DATA AS OF: September 1965
DATA BASIS: ESTIMATED

FAST CLIMB 2500 RPM
TIME, DISTANCE AND FUEL

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Recommended Climb Speed 120 Knots CAS.
2. Add To Fuel Used 290 LBS. For Warm-Up And Take-Off (10 Minutes At Normal Rated Power).
3. Normal Mixture.

B-SADI-320-1

Figure 11-31 (Sheet 1)

CLIMB PERFORMANCE

GUIDE



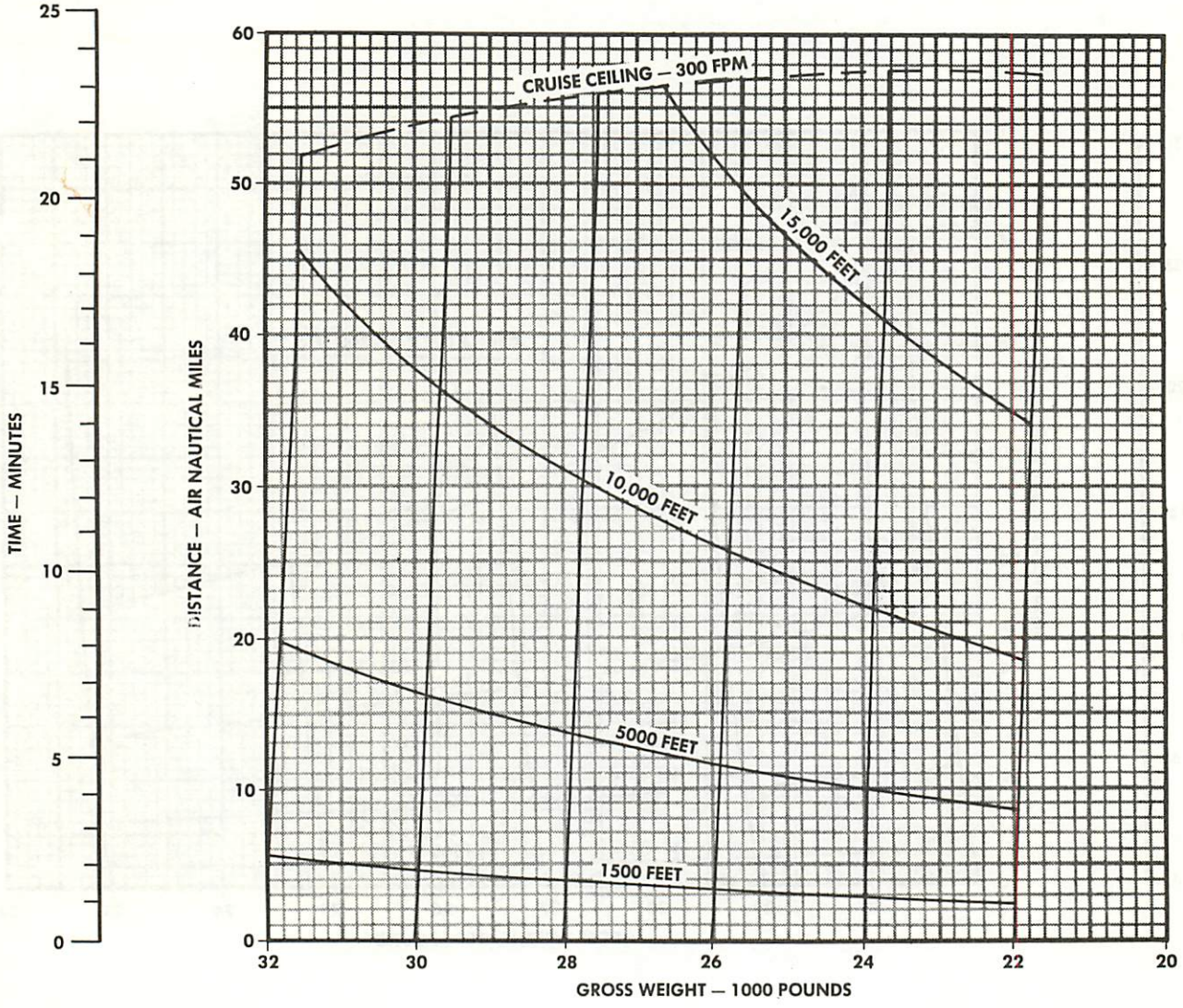
NORMAL CLIMB 2300 RPM
TIME, DISTANCE AND FUEL

CONFIGURATION **A**
CLEAN
FLAPS-0°

MODEL (S): S-2D/E
DATA AS OF: APRIL 1968
DATA BASIS: ESTIMATED

ENGINE(S): R 1820-82A (2)
PROPELLER(S): HAM. STD. 6985-7 (2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G -5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

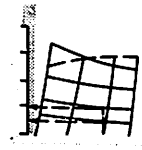
1. CLIMB SPEED 130 KNOTS CAS
2. ADD TO FUEL USED 290 LBS FOR WARM UP AND TAKE-OFF (10 MINUTES AT NORMAL RATED POWER)
3. NORMAL MIXTURE

SADI-320-2

Figure 11-31 (Sheet 2)

CLIMB PERFORMANCE

GUIDE



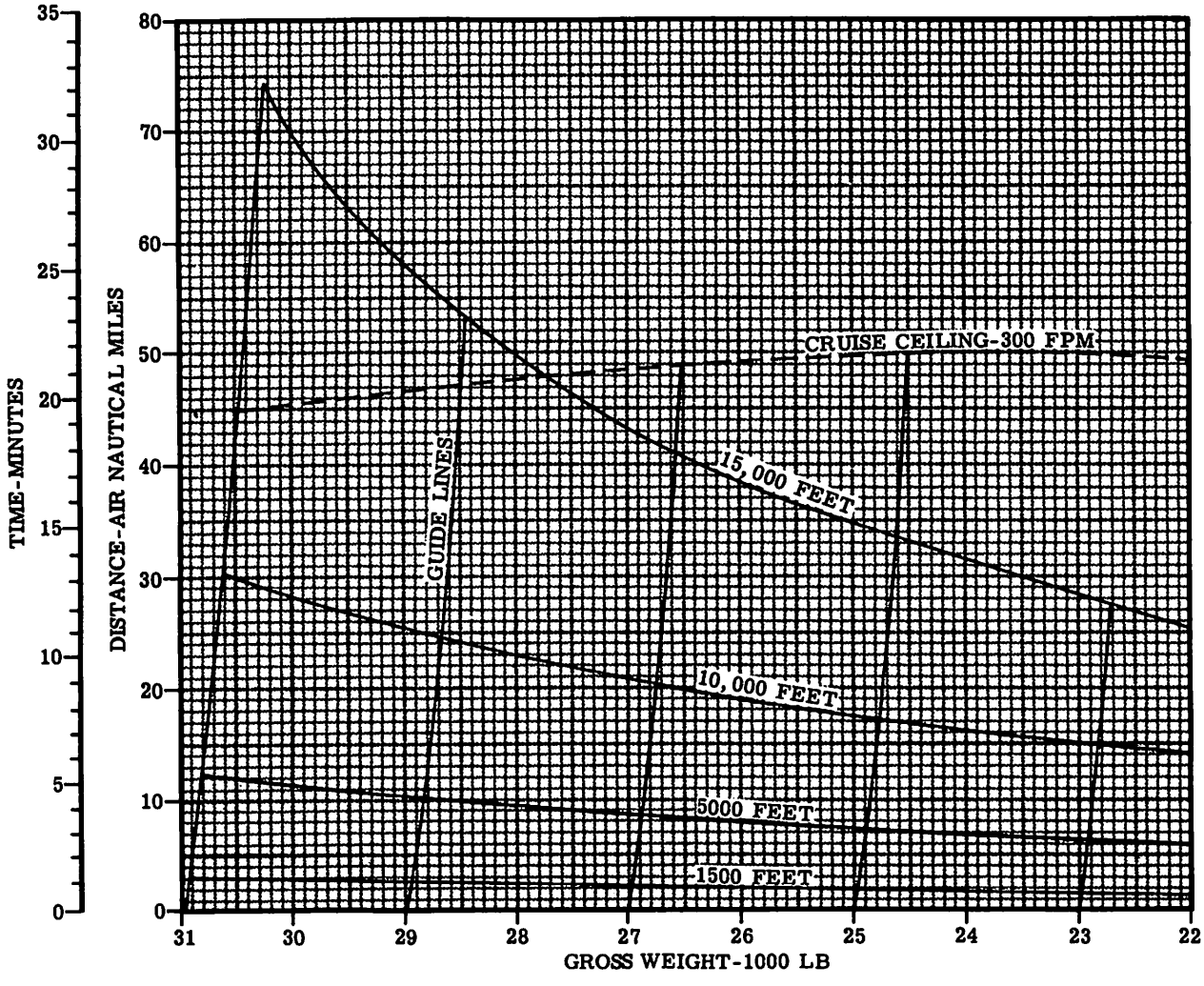
CONFIGURATION C
(4) MK43 TORPEDOES
FLAPS-UP

FAST CLIMB 2500 RPM
TIME, DISTANCE AND FUEL

MODEL(S): S-2D/E
DATA AS OF: JULY 1963
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

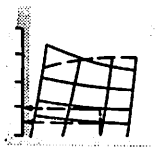
1. Climb Speed 120 Knots CAS.
2. Add to Fuel Used 290 LBS For Warm Up and Take-Off (10 Minutes at Normal Rated Power).
3. Normal Mixture.

B-SADI-375-1

Figure 11-32 (Sheet 1)

CLIMB PERFORMANCE

GUIDE



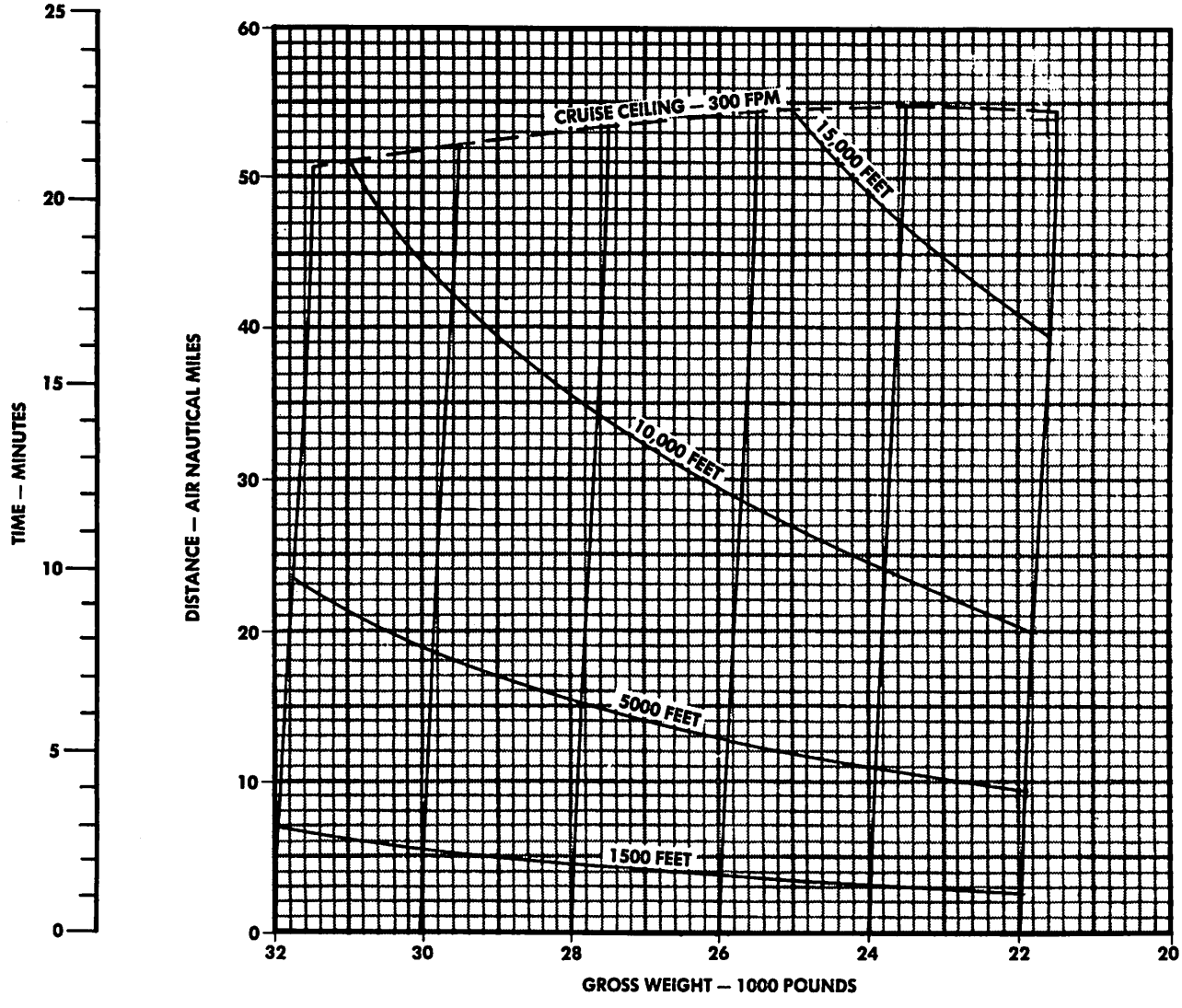
NORMAL CLIMB 2300 RPM
TIME, DISTANCE AND FUEL

CONFIGURATION C
(4) MK 43 TORPEDOES
FLAPS-UP

MODEL (S): S-2D/E
DATA AS OF: APRIL 1968
DATA BASIS: ESTIMATED

ENGINE(S): R 1820-82A (2)
PROPELLER(S): HAM. STD. 6985-7 (2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. CLIMB SPEED 130 KNOTS CAS
2. ADD TO FUEL USED 290 LBS FOR WARM UP AND TAKE-OFF (10 MINUTES AT NORMAL RATED POWER)
3. NORMAL MIXTURE

SADI-375-2

Figure 11-32 (Sheet 2)

GUIDE



SINGLE ENGINE RATE OF CLIMB — SEA LEVEL

CONFIGURATION A
CLEAN

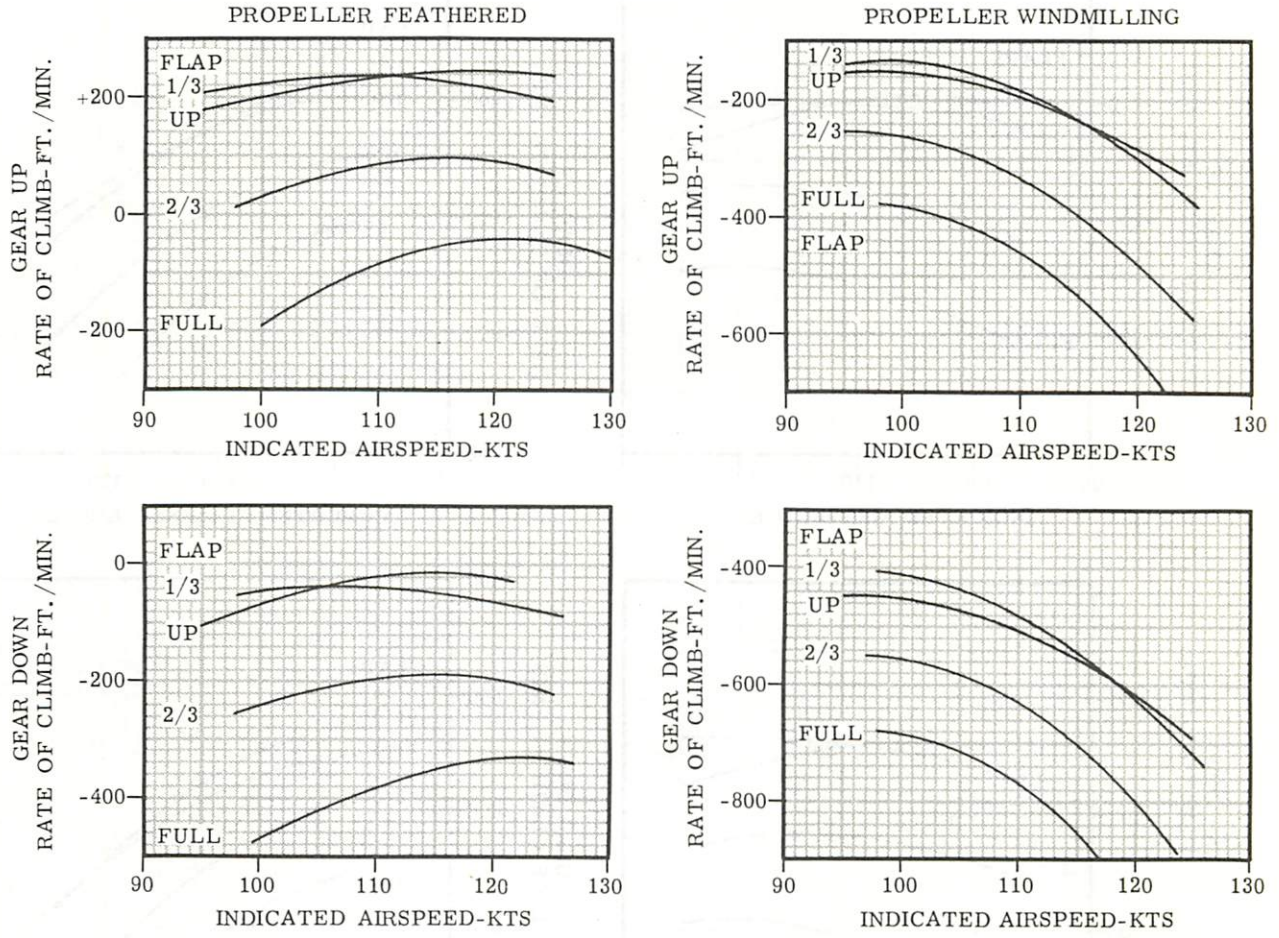
TAKE-OFF POWER
WT. = 27,000 LBS.

ICAO STANDARD DAY

MODEL(S): S-2D/E
DATA AS OF: OCTOBER 1963
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

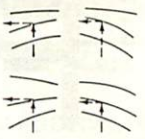
1. OPERATING ENGINE: Take-off Power; Cowl Flaps and Oil Cooler Doors Open.
2. INOPERATIVE ENGINE: Cowl Flaps and Oil Doors Closed.
3. Emergency Electrical Draw-17BHP(4 psi TP).
4. Effect of 1000 pound Decrease in Weight is to Increase Rate of Climb Approximately 60 FPM.

C-SAD1-330

Figure 11-33

SINGLE ENGINE RATE OF CLIMB — SEA LEVEL

GUIDE



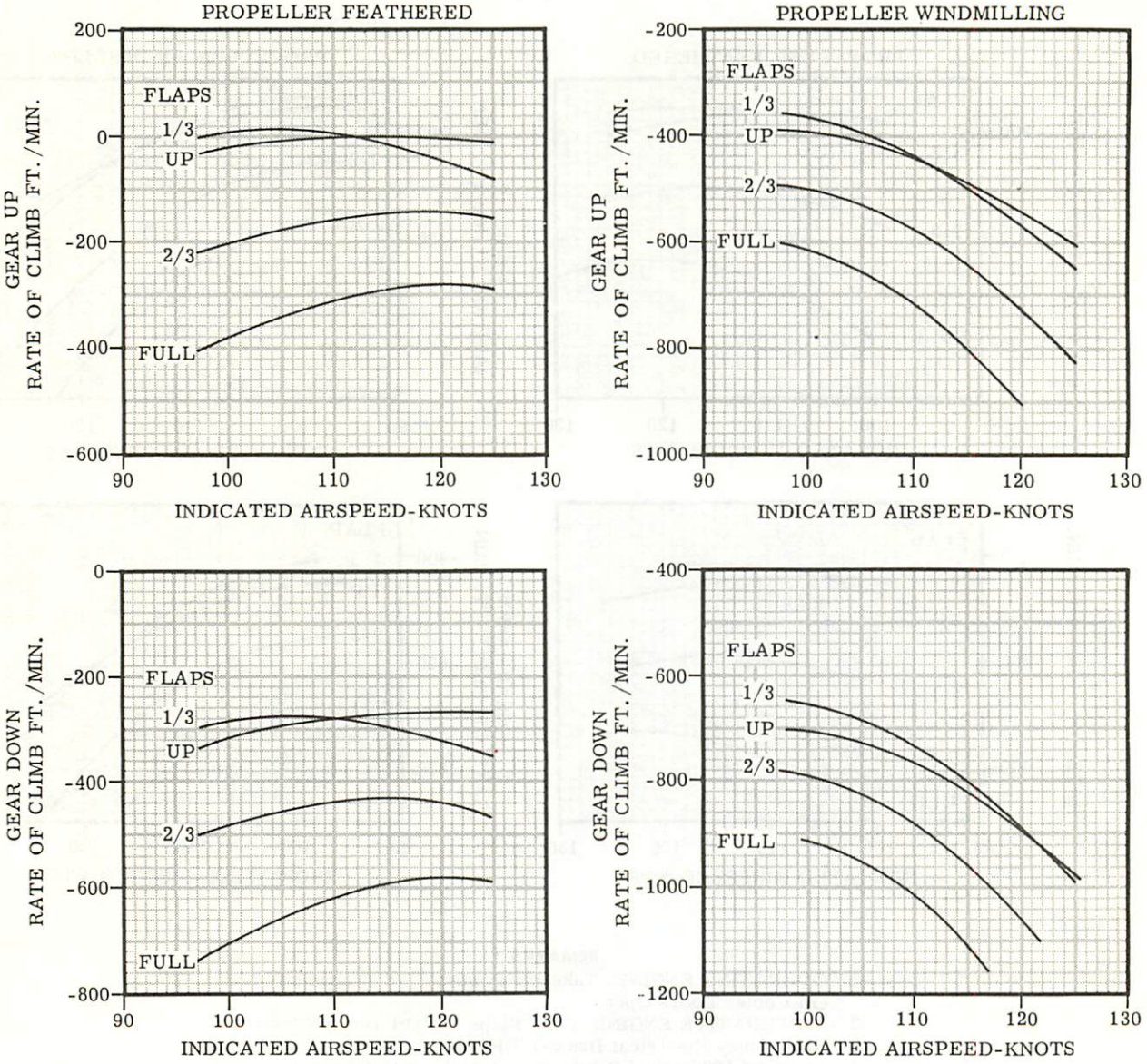
CONFIGURATION A
CLEAN

TAKE-OFF POWER
WT. = 27,000 LBS.
NAVY HOT DAY (90°F - 90% R.H.)

MODEL(S): S-2D/E
DATA AS OF: OCTOBER 1963
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. OPERATING ENGINE: Take-off Power; Cowl Flaps and Oil Cooler Doors Open.
2. INOPERATIVE ENGINE: Cowl Flaps and Oil Doors Closed.
3. Emergency Electrical Draw-17 BHP(4 psi TP).
4. Effect of 1000 pound Decrease in Weight is to Increase Rate of Climb Approximately 60 FPM.

C-SAD1-331

Figure 11-34

GUIDE



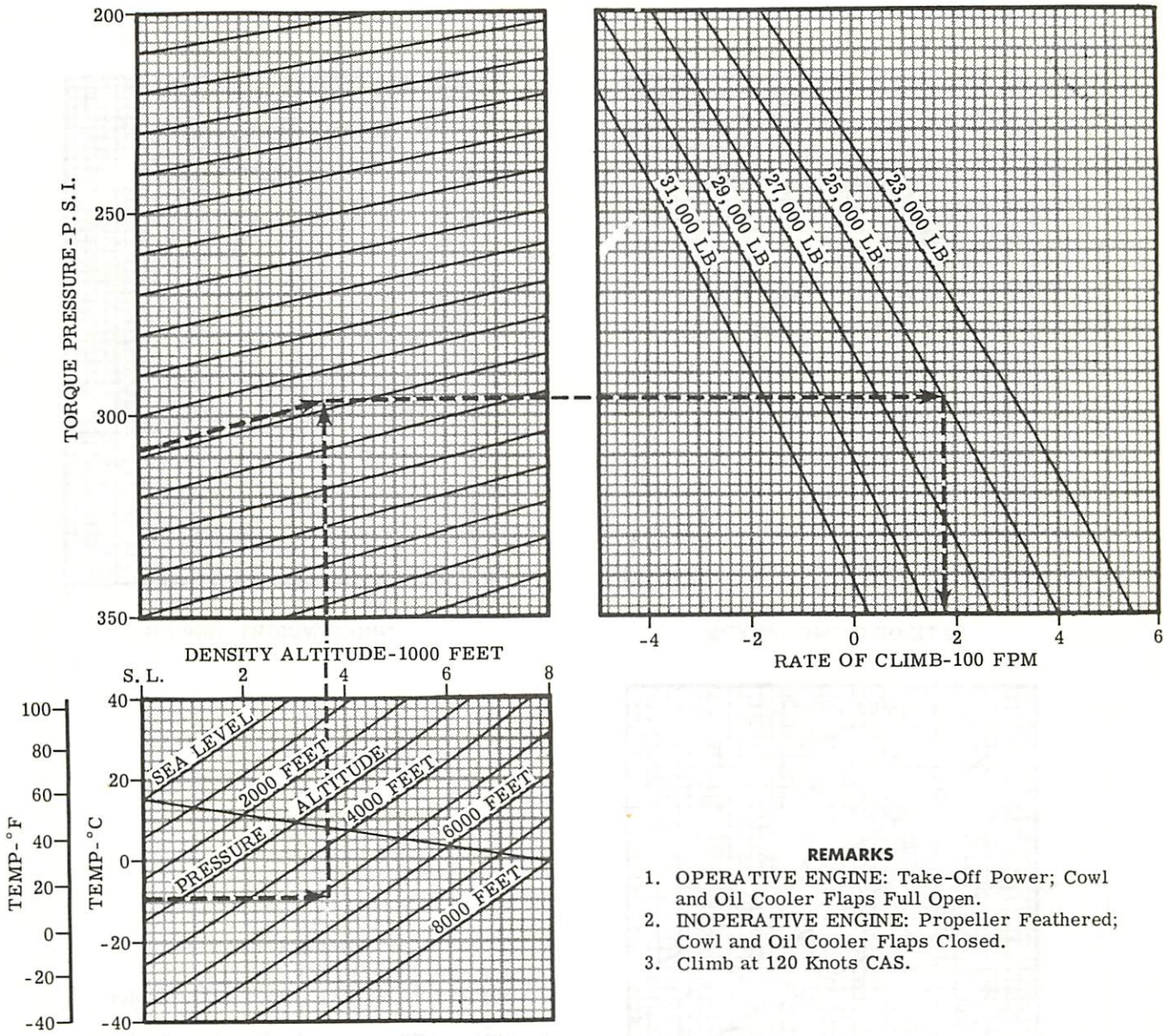
SINGLE ENGINE CLIMB PERFORMANCE

CONFIGURATION A
CLEAN
FLAPS-UP
GEAR-UP

MODEL(S): S-2D/E
DATA AS OF: APRIL 1963
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. OPERATIVE ENGINE: Take-Off Power; Cowl and Oil Cooler Flaps Full Open.
2. INOPERATIVE ENGINE: Propeller Feathered; Cowl and Oil Cooler Flaps Closed.
3. Climb at 120 Knots CAS.

A-SAD1-380

Figure 11-35

SINGLE ENGINE EMERGENCY SERVICE CEILING

GUIDE



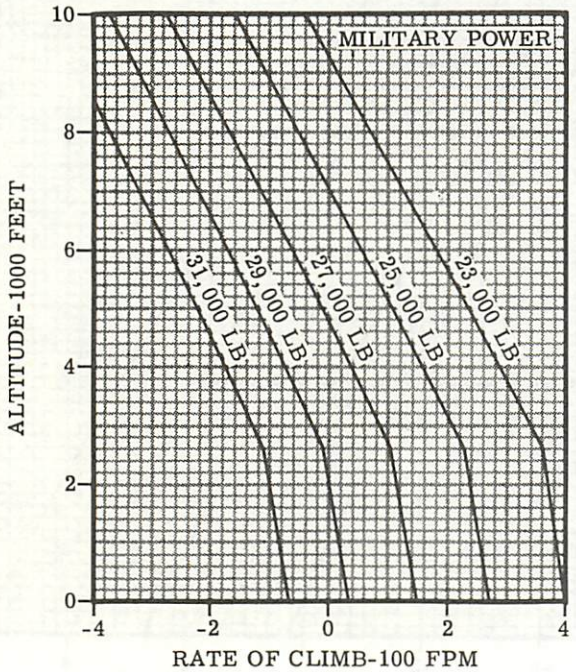
CONFIGURATION A

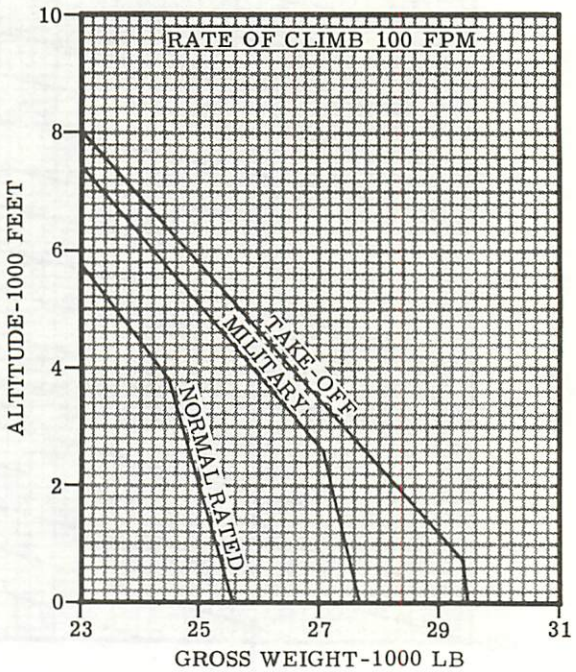
CLEAN
FLAPS-UP
GEAR-UP

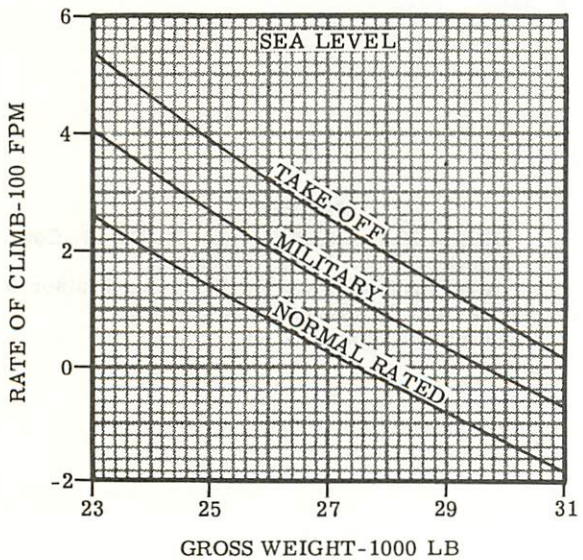
MODEL(S): S-2D/E
DATA AS OF: October 1963
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL







REMARKS

1. Best Climb Speed 120 Knots CAS.
2. OPERATIVE ENGINE: Cowl and Oil Cooler Flaps Open.
3. INOPERATIVE ENGINE: Propeller Feathered, Cowl and Oil Cooler Flaps Closed.
4. Emergency Electrical Draw; 17 BHP (4 psi TP).

B-SAD1-332

Figure 11-36

SINGLE ENGINE CLIMB PERFORMANCE

GUIDE

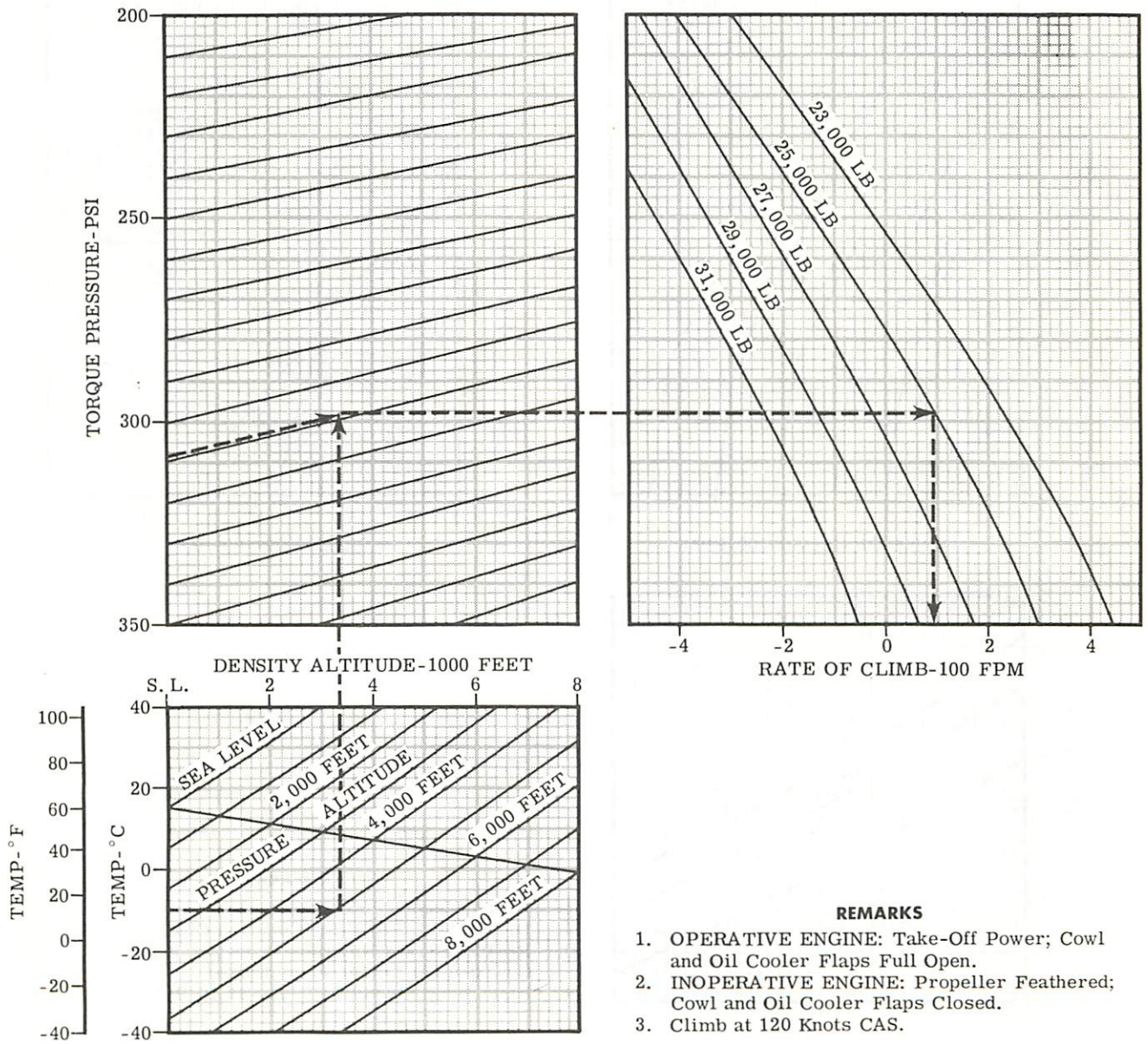


CONFIGURATION C
(4) MK43 TORPEDOES
FLAPS-UP
GEAR-UP

MODEL(S): S-2D/E
DATA AS OF: NOVEMBER 1963
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

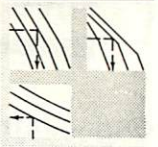
1. OPERATIVE ENGINE: Take-Off Power; Cowl and Oil Cooler Flaps Full Open.
2. INOPERATIVE ENGINE: Propeller Feathered; Cowl and Oil Cooler Flaps Closed.
3. Climb at 120 Knots CAS.

B-SAD1-351

Figure 11-37

SINGLE ENGINE EMERGENCY SERVICE CEILING

GUIDE

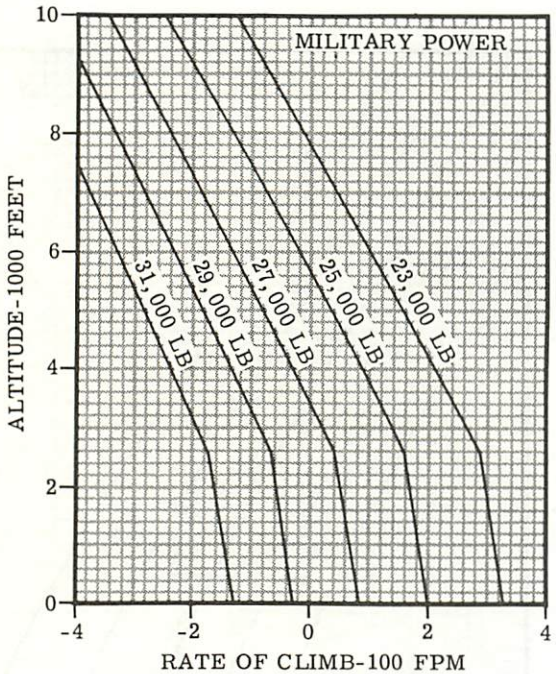


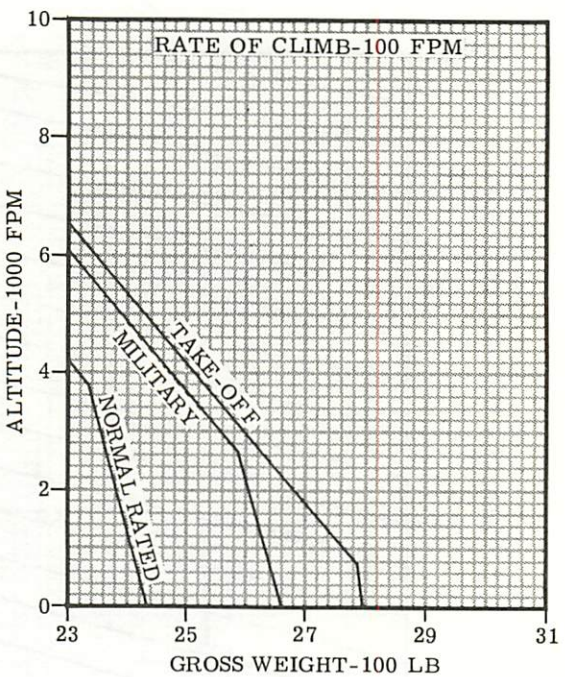
CONFIGURATION C
(4) MK43 TORPEDOES
FLAPS-UP
GEAR-UP

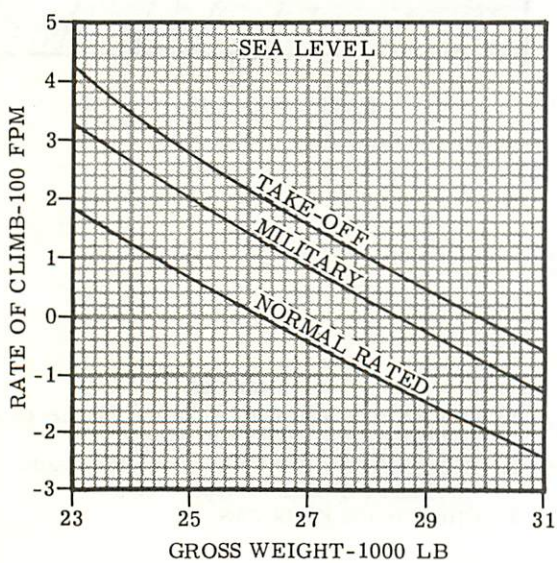
MODEL(S): S-2D/E
DATA AS OF: OCTOBER 1963
DATA BASIS: ESTIMATED

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL







REMARKS

1. Climb Speed 120 Knots CAS.
2. OPERATIVE ENGINE: Cowl and Oil Cooler Flaps Open.
3. INOPERATIVE ENGINE: Propeller Feathered, Cowl and Oil Cooler Flaps Closed.
4. Emergency Electrical Draw, 17 BHP(4 psi TP).

B-SAD1-352

Figure 11-38

part 7

SPECIFIC RANGE

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SPECIFIC RANGE

SPECIFIC RANGE CURVES

Specific Range Curves are presented for configurations A, B, C, and D in figures 11-39, 11-48, 11-61 and 11-62 respectively. The Curves bracket all possible aircraft weights and allow for easy interpolation. Specific Range is plotted against calibrated airspeed using a sub-scale of true airspeed. Superimposed on these curves are lines of constant power, maximum endurance CAS and long range CAS. Maximum endurance CAS is the airspeed corresponding to minimum fuel flow for a particular weight and long range CAS is the highest airspeed at which 99 per cent of the maximum specific range may be obtained. The long range CAS (0.99 of maximum specific range) is established rather than to allow for slight variations in airspeed and still achieving range quoted in manual.

When flying in a wind, the long range true airspeed should be adjusted by adding one quarter of the headwind to the no wind true airspeed or subtracting one quarter of the tail wind from the no wind true airspeed.

The effect of wind on ground speed and nautical miles per pound may be determined directly by the use of the nautical miles per pound curves in the following manner: Add the tail wind, or subtract the head wind, from the no wind true airspeed, along the power setting line, and read the ground speed and ground (or corrected for wind) miles per pound directly from the abscissa and ordinate, respectively. The minimum recommended RPM for cruise is 1450 RPM. Use of these curves are illustrated in Sample Problem No. 1.

Cruise Performance At Non-Standard Temperatures

The cruise performance for non-standard temperatures may be obtained by either of two methods. Using

the first method, the density altitude is found from the Density Altitude Curve (figure 11-6) at known values of pressure altitude (altimeter reading) and outside air temperature. The Specific Range Curves may then be read directly at this value of density altitude. The cruise performance, including specific range, fuel flow, TAS, and engine power settings, is independent of temperature at a given density altitude. For the second method, the Specific Range Curves are read at the flight pressure altitude and cruise speed (CAS). The specific range obtained from the chart is correct for all temperatures. However, the true airspeed, fuel flow, and engine power setting will vary with temperature. The true airspeed is obtained by the method outlined in Part 3, this section. Fuel flow is obtained by dividing the true airspeed by the specific range. Power settings must be adjusted in flight to maintain the cruise speed and pressure altitude.

LONG RANGE SUMMARY

Operating conditions for Long Range on a standard day and zero wind, are presented for configurations A, B, C and D in figures 11-45, 11-52, 11-59 and 11-66. The foregoing curves were developed by cross plotting performance and engine data, presented on the Specific Range curves. All presented information is based on a standard day with zero wind and clearly indicates the effect of altitude and weight on Specific Range. Use of these curves are illustrated in Sample Problem No. 2.

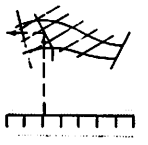
Long Range Prediction — Distance

Long Range Prediction-Distance for configurations A, B, C and D are presented in figures 11-46, 11-53, 11-60 and 11-67. The subject curves were developed using the Specific Range information of figures 11-39, 11-48, 11-55 and 11-62 at Long Range CAS. It should be noted that curves presented in figures 11-45, 11-52, 11-59 and 11-66 are to be used on an incremental basis determining distance by subtracting the value corresponding to the initial cruise weight from that at the final cruise weight. These curves cannot be read directly. The use of these figures is illustrated in Sample Problem No. 2.

Long Range Prediction — Time

Long Range Prediction-Time for configurations A, B, C and D are presented in figures 11-47, 11-54, 11-62 and 11-68. They present curves for predicting time when flying at recommended cruise airspeed. This curve is to be used on an incremental basis and cannot be read directly. The use of the foregoing curve is demonstrated in Sample Problem No. 1.

GUIDE



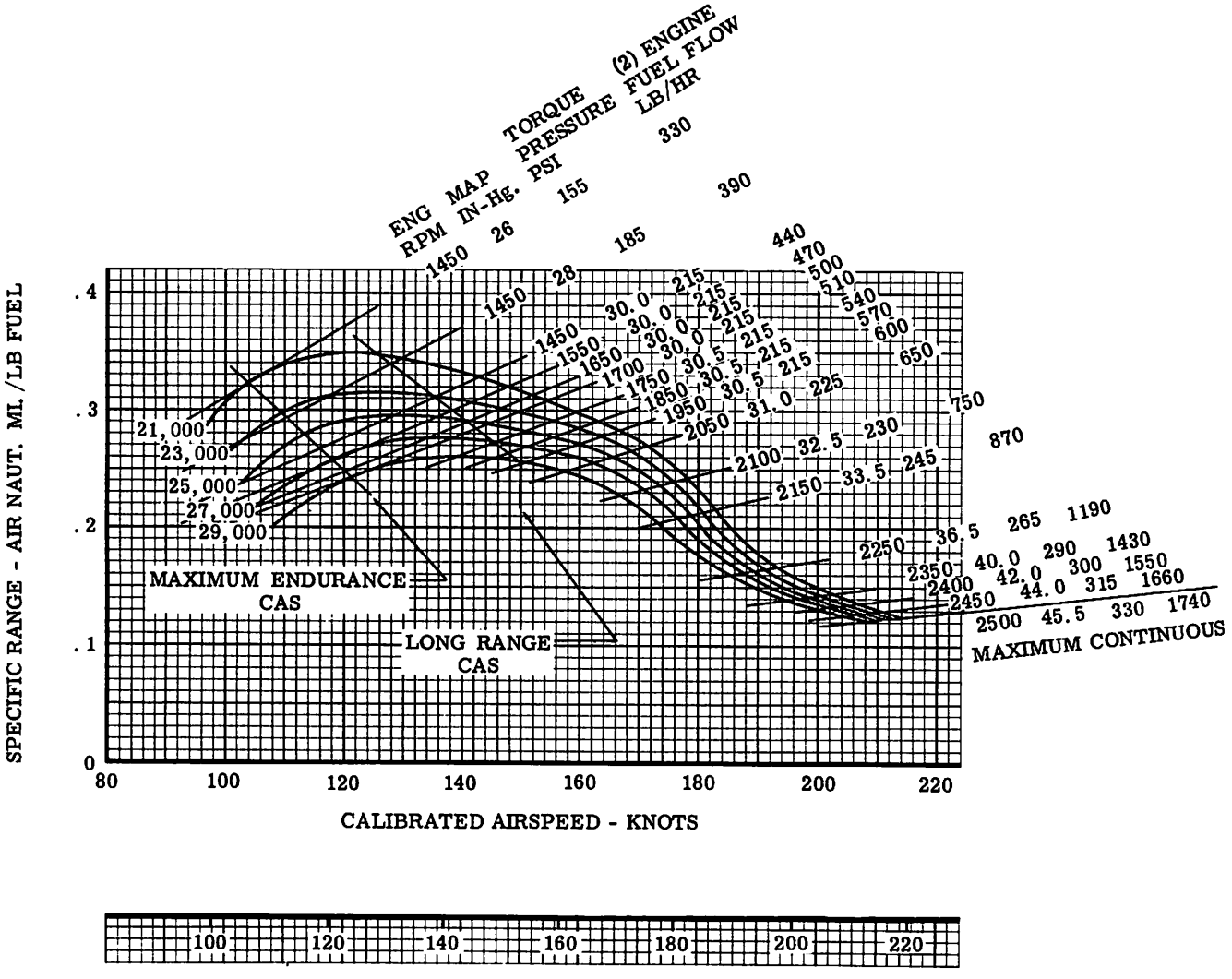
SPECIFIC RANGE—1500 FEET

CONFIGURATION A
CLEAN

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

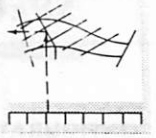
1. 1450 RPM is Minimum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG)
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-Operational Below a True Airspeed of 100 Knots.

A-SAD1-321

Figure 11-39

SPECIFIC RANGE—5000 FEET

GUIDE

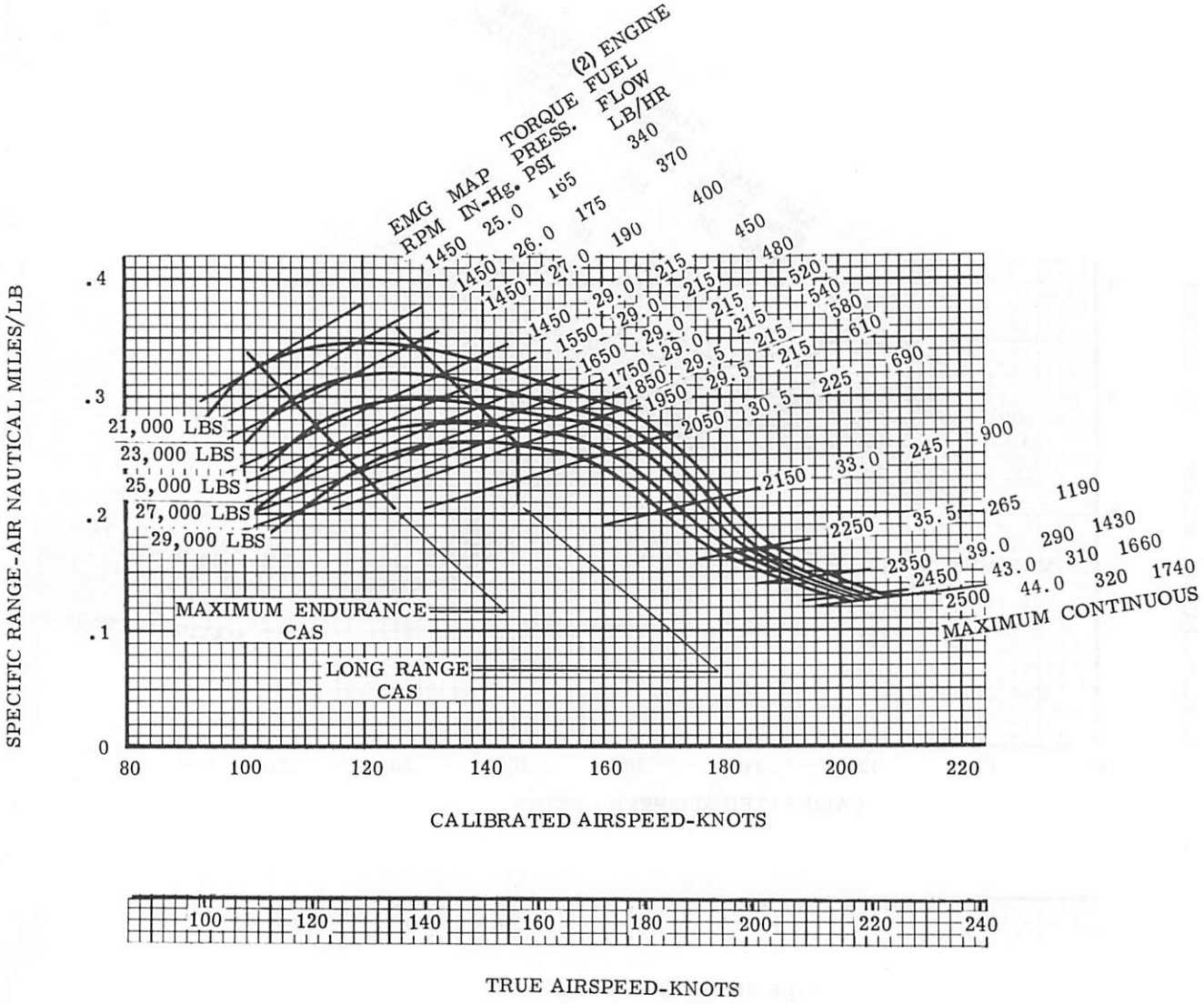


CONFIGURATION A
CLEAN

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



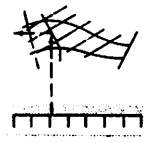
REMARKS

1. 1450 RPM is Minimum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included (20BHP/ENG).
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-Operational Below A True Airspeed of 100 Knots.

A-SAD1-322

Figure 11-40

GUIDE



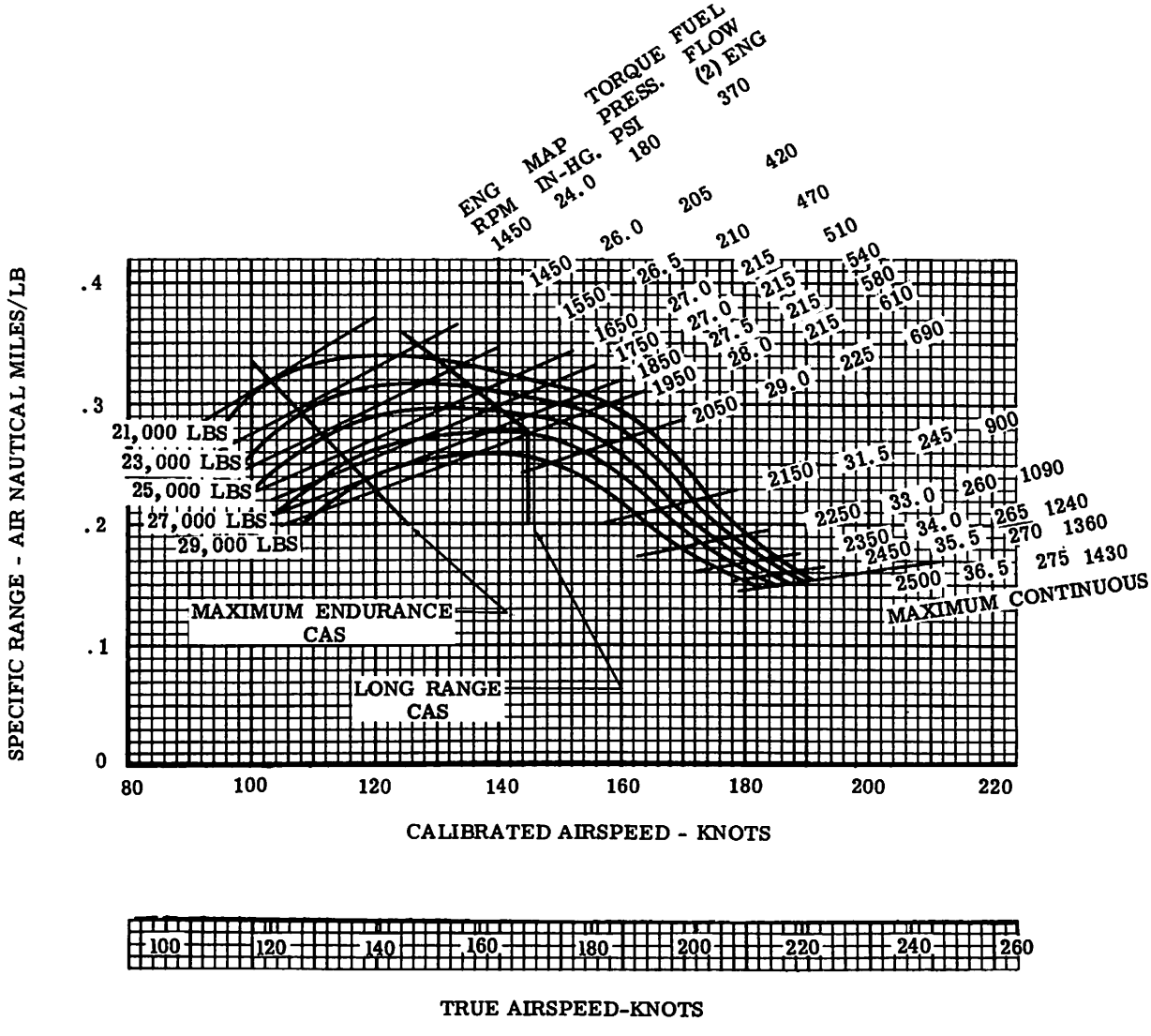
SPECIFIC RANGE — 10,000 FEET

CONFIGURATION A
CLEAN

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

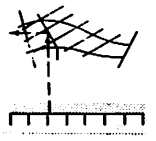
1. 1450 RPM is Minimum Recommended
2. Normal Mixture
3. Cowl Flaps Closed
4. Oil Cooler Flaps Closed
5. Flap Setting 0 Degrees
6. Accessory Draw Included (20 BHP/ENG)
7. Mild Engine Vibration May be Encountered Below 1650 RPM
8. ASA-13A Non Operational Below a True Airspeed of 100 Knots

A-SAD1-323

Figure 11-41

SPECIFIC RANGE—15,000 FEET

GUIDE

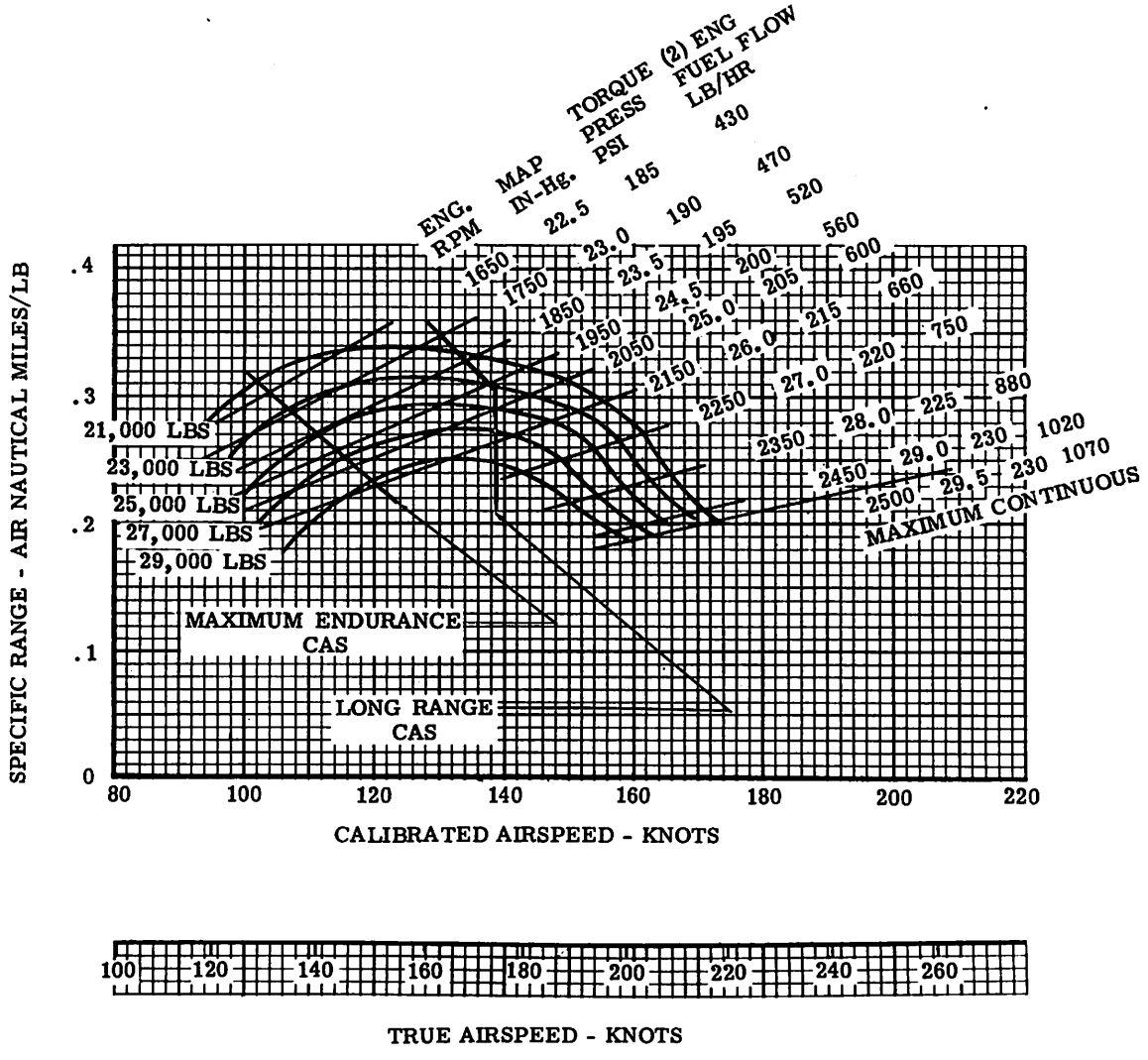


CONFIGURATION A
CLEAN

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



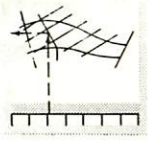
REMARKS

1. 1450 RPM is Minimum Recommended
2. Normal Mixture
3. Cowl Flaps Closed
4. Oil Cooler Flaps Closed
5. Flap Setting 0 Degrees
6. Accessory Draw Included (20 BHP/ENG)
7. Mild Engine Vibration May be Encountered Below 1650 RPM
8. ASA-13A Non Operational Below a True Airspeed of 100 Knots

A-SAD1-324

Figure 11-42

GUIDE



SPECIFIC RANGE — SEA LEVEL

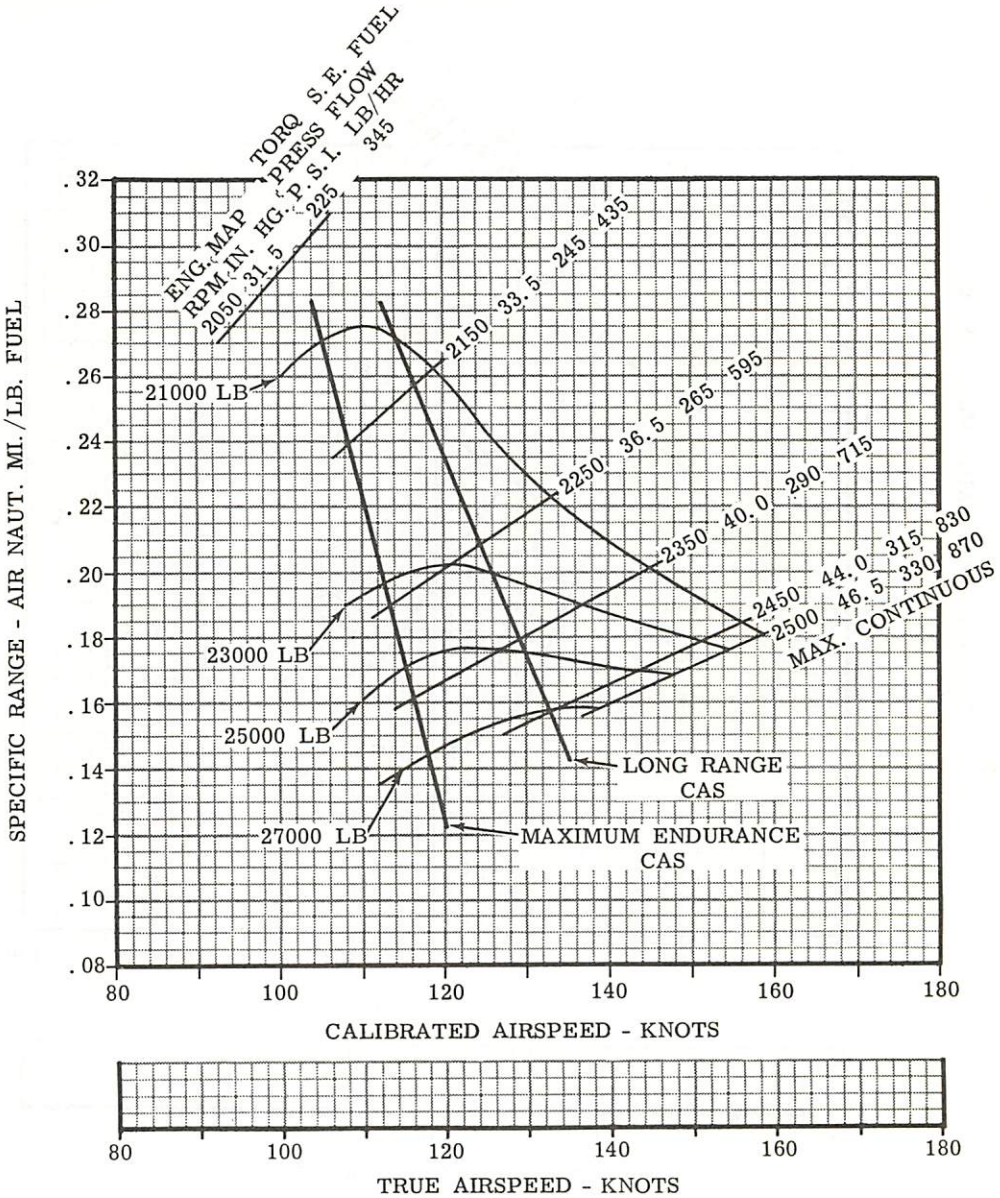
SINGLE ENGINE

CONFIGURATION A
CLEAN

MODEL(S): S-2D/E
DATA AS OF: JUNE 1962
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Operating Engine Cowl and Oil Cooler Flaps Full Open.
2. Inoperative Engine: Prop Feathered, Cowl and Oil Cooler Flaps Closed.
3. Normal Mixture.
4. Landing Gear Retracted.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG.)

A-SAD1-363

Figure 11-43

SPECIFIC RANGE — 5000 FEET

GUIDE



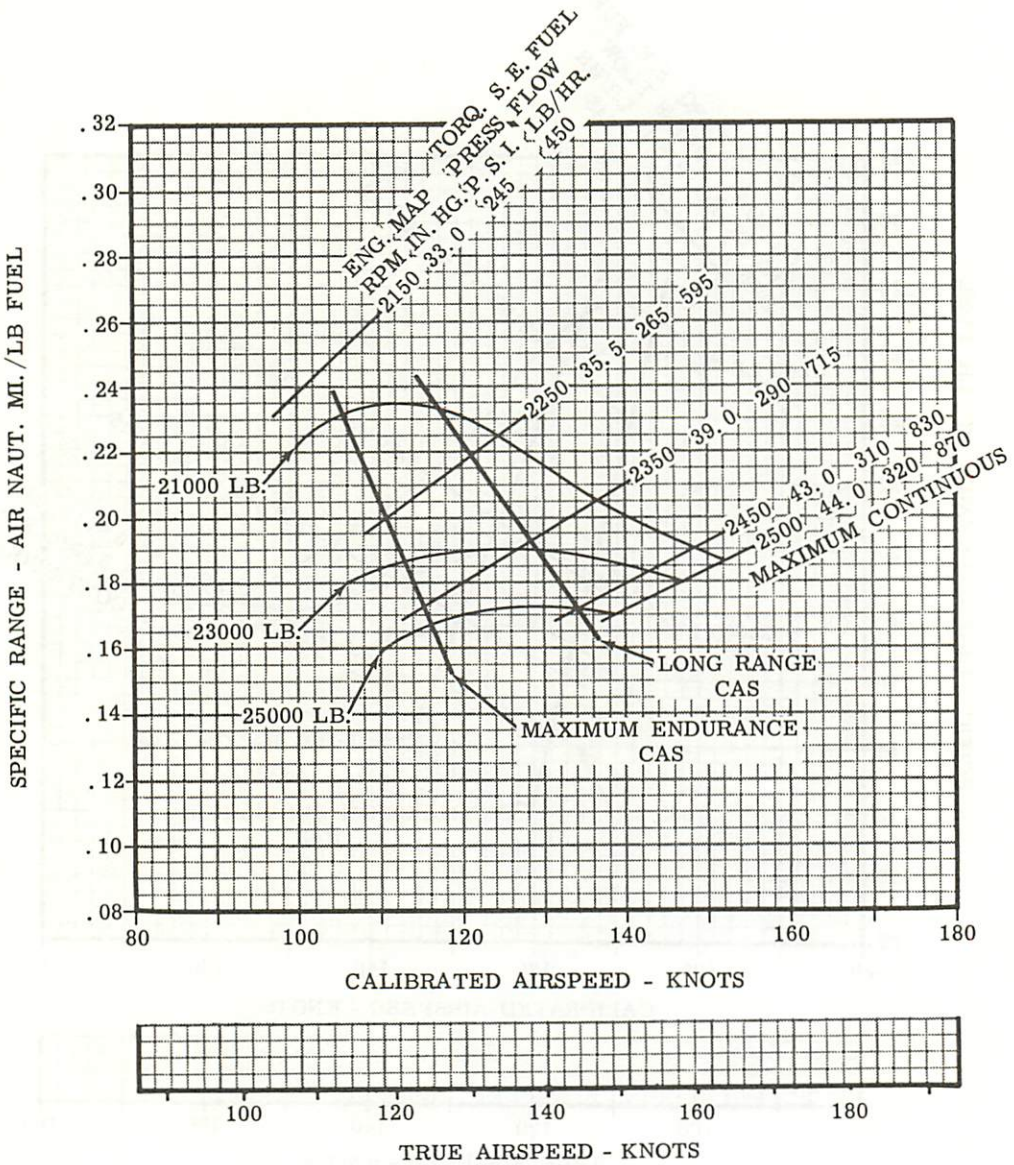
SINGLE ENGINE

CONFIGURATION A
CLEAN

MODEL(S): S-2D/E
DATA AS OF: JUNE 1962
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

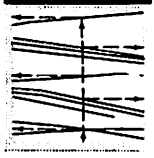
1. Operating Engine Cowl and Oil Cooler Flaps Full Open.
2. Inoperative Engine: Prop Feathered, Cowl and Oil Cooler Flaps Closed.
3. Normal Mixture.
4. Landing Gear Retracted.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG.)

A-SAD1-362

Figure 11-44

LONG RANGE SUMMARY

GUIDE

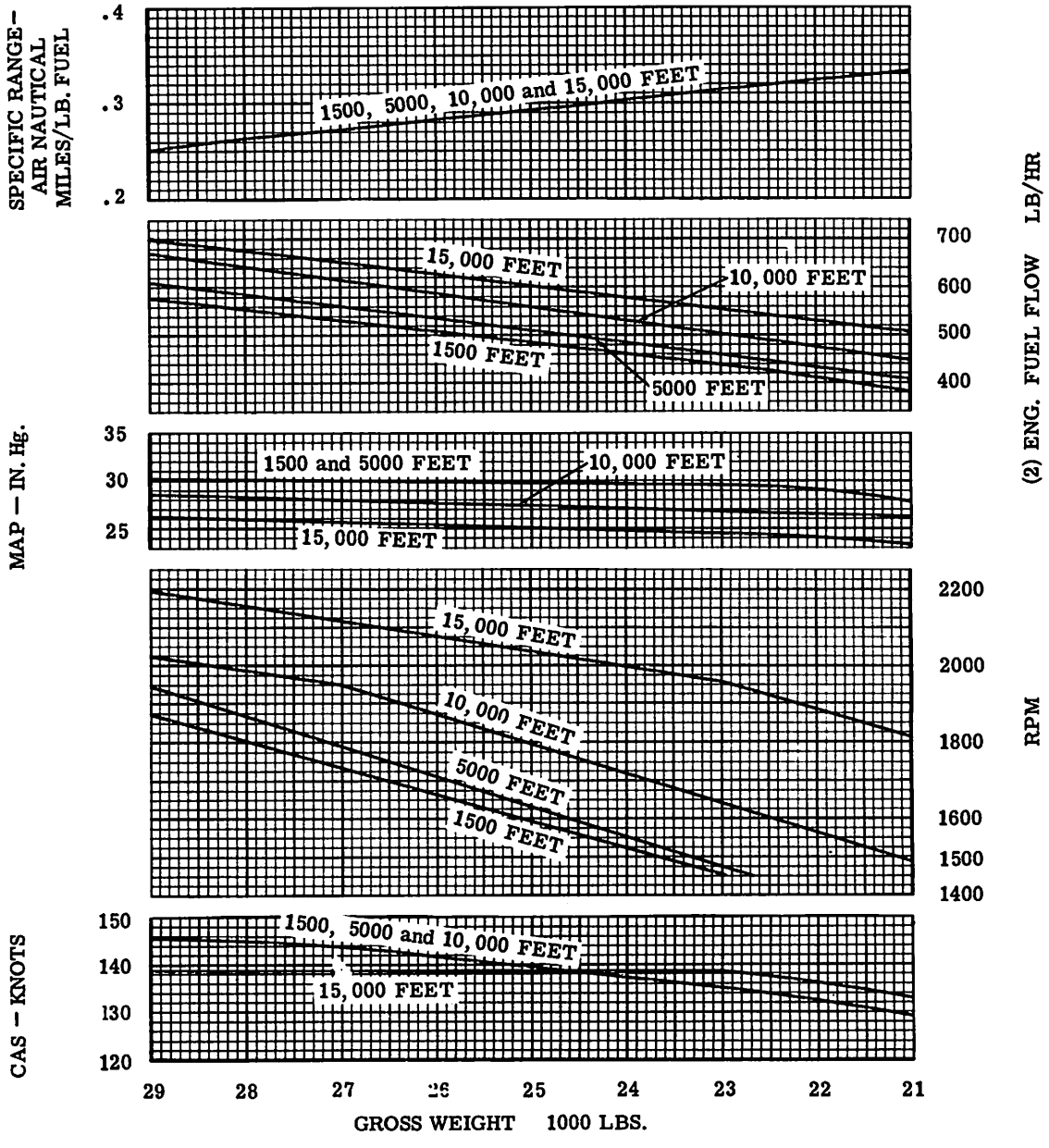


CONFIGURATION A
CLEAN

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

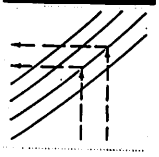
1. Based on Long Range CAS.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG).
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-325

Figure 11-45

LONG RANGE PREDICTION—DISTANCE

GUIDE

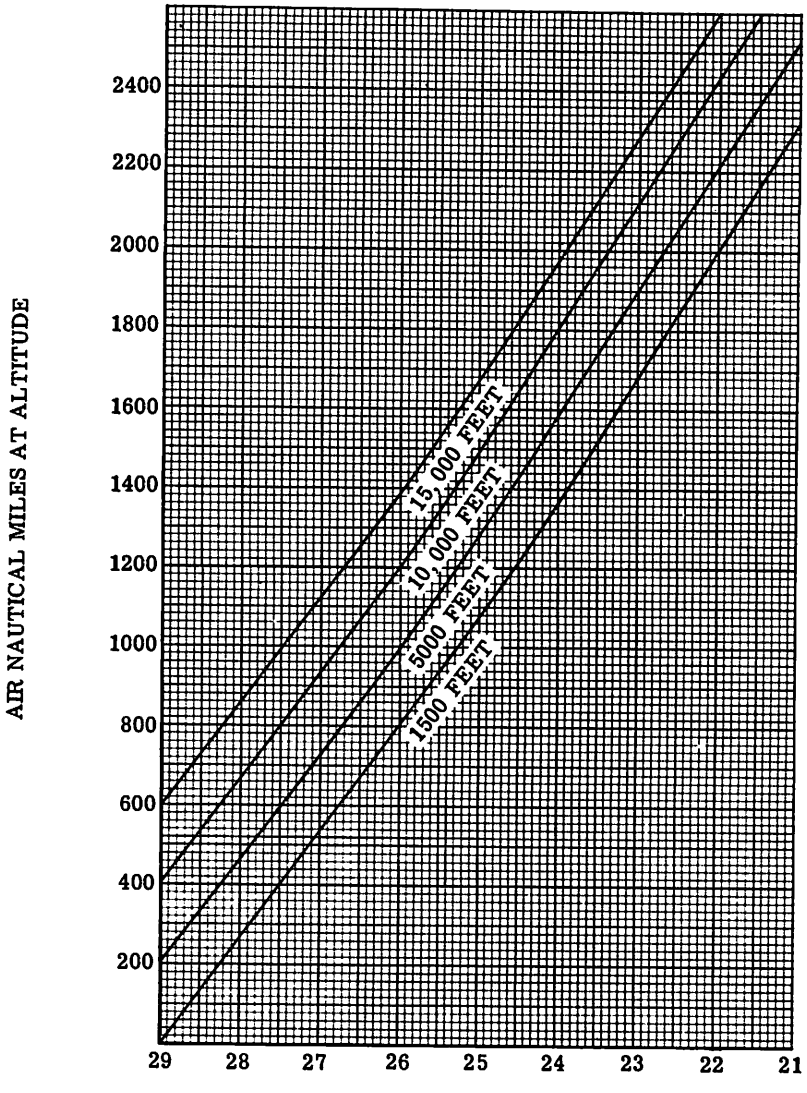


CONFIGURATION A
CLEAN

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

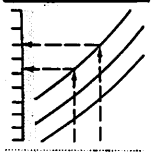
1. Based on Long Range CAS.
2. Use on Incremental Basis.
3. Normal Mixture.
4. Cowl Flaps Closed.
5. Oil Cooler Flaps Closed.
6. Flap Setting 0 Degrees.
7. Accessory Draw Included. (20 BHP/ENG).

A-SAD1-327

Figure 11-46

LONG RANGE PREDICTION—TIME

GUIDE

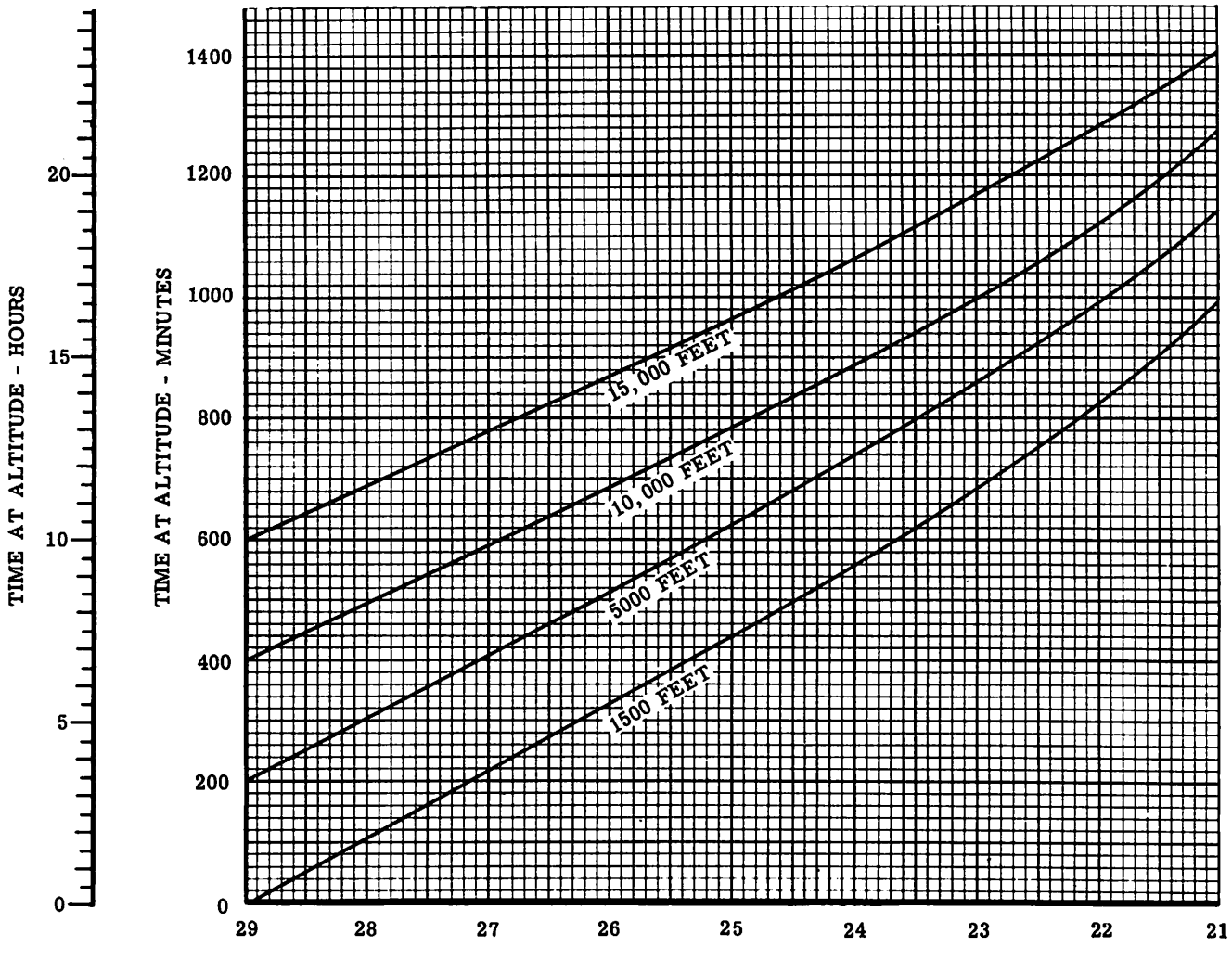


CONFIGURATION A
CLEAN

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

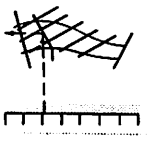
1. Based on Long Range CAS.
2. Use on Incremental Basis.
3. Normal Mixture.
4. Cowl Flaps Closed.
5. Oil Cooler Flaps Closed.
6. Flap Setting 0 Degrees.
7. Accessory Draw Included. (20 BHP/ENG).

A-SAD1-326

Figure 11-47

SPECIFIC RANGE—1500 FEET

GUIDE

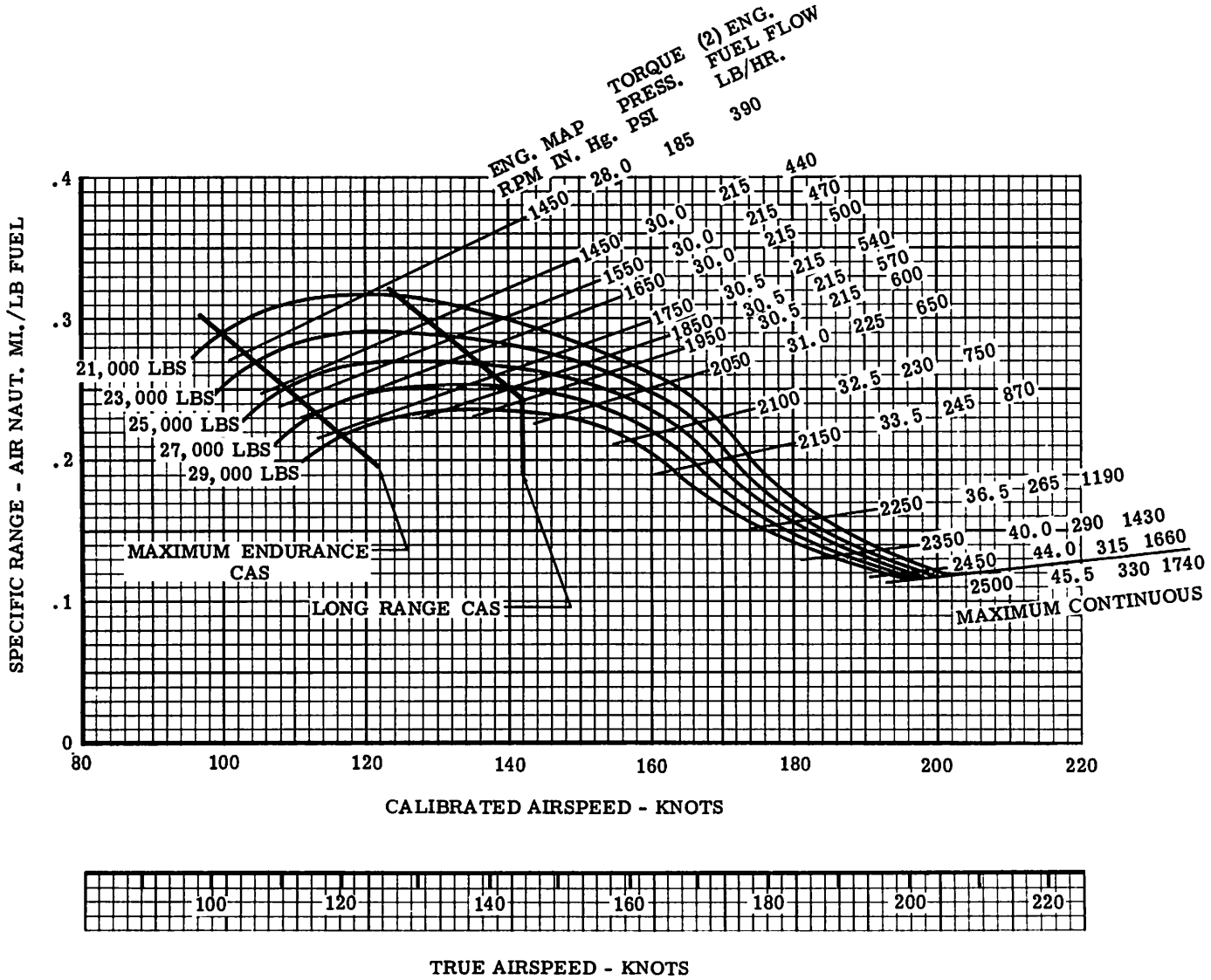


CONFIGURATION B
RADOME AND MAD
BOOM EXTENDED

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

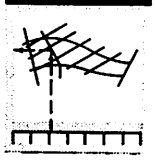
1. 1450 RPM is Minimum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG)
7. Mild Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-333

Figure 11-48

SPECIFIC RANGE — 5000 FEET

GUIDE

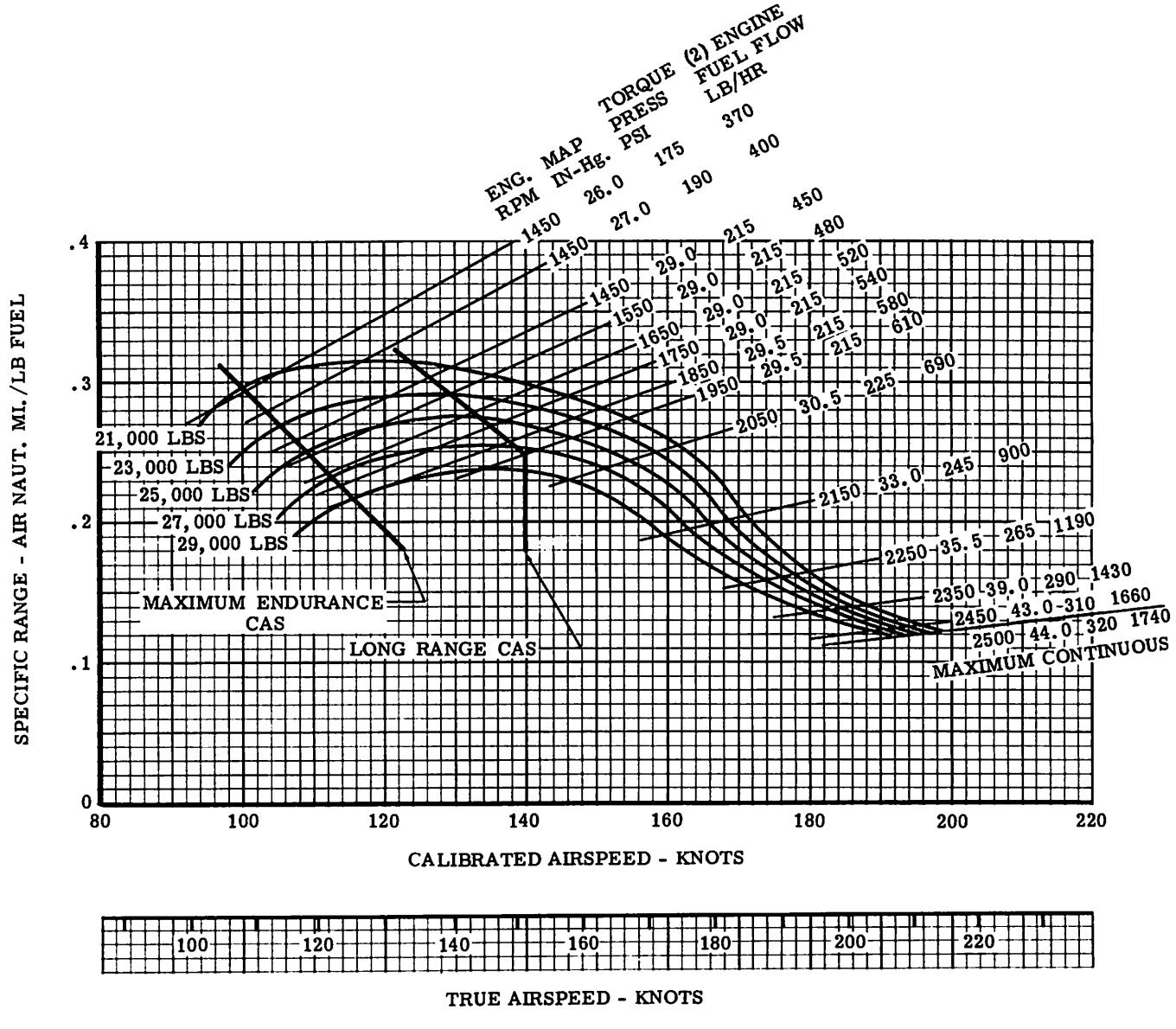


CONFIGURATION B
RADOME AND
MAD BOOM
EXTENDED

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

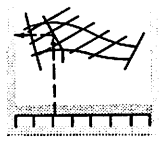
1. 1450 RPM is Mininum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG)
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-334

Figure 11-49

SPECIFIC RANGE — 10,000 FEET

GUIDE

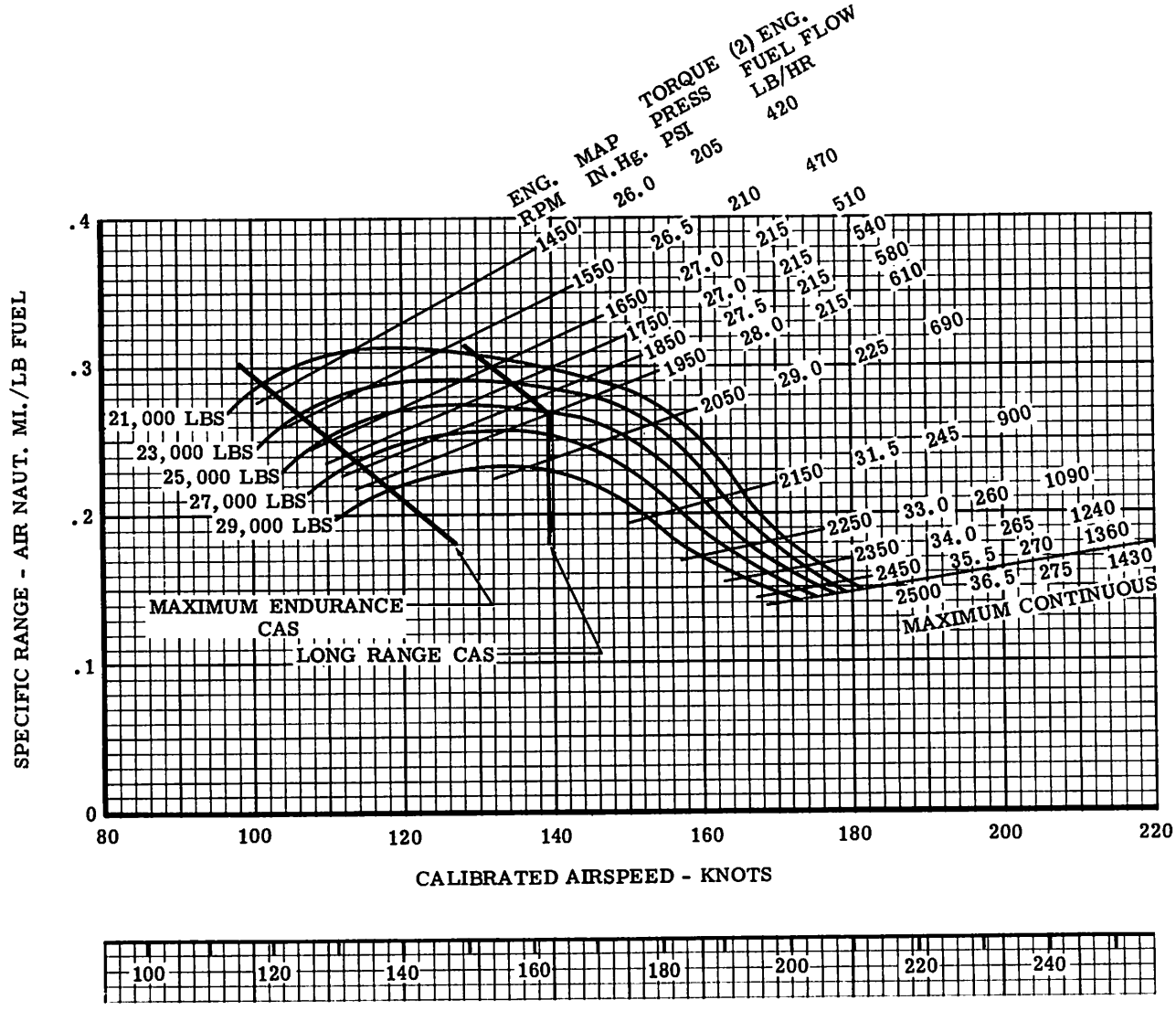


CONFIGURATION B
RADOME AND
MAD BOOM
EXTENDED

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



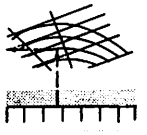
REMARKS

1. 1450 RPM is Minumum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG)
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-335

Figure 11-50

GUIDE

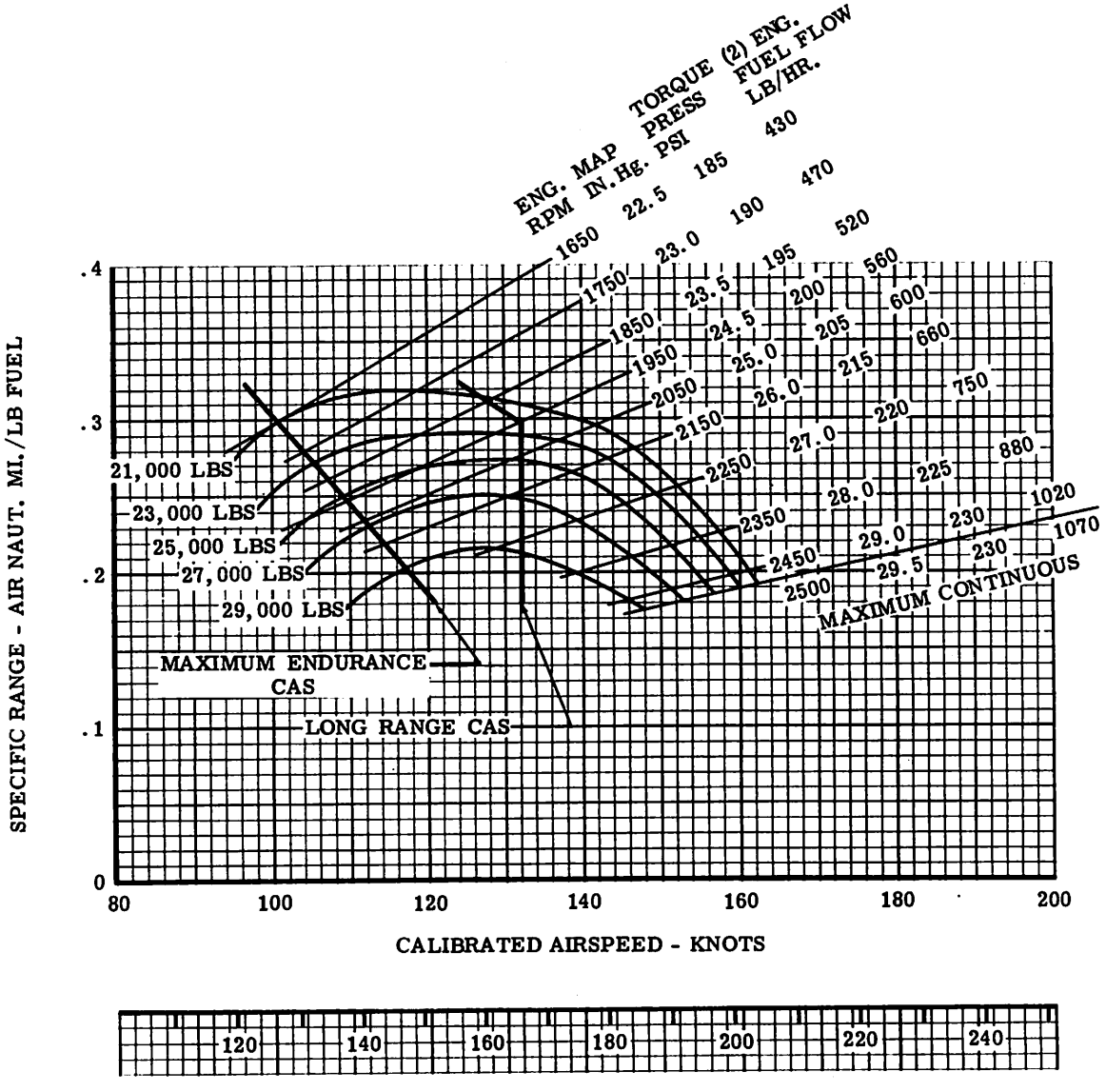


SPECIFIC RANGE—15,000 FEET

CONFIGURATION B
RADOME AND MAD BOOM EXTENDED
MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

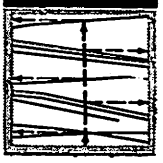
1. 1450 RPM is Minimum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG)
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-336

Figure 11-51

LONG RANGE SUMMARY

GUIDE

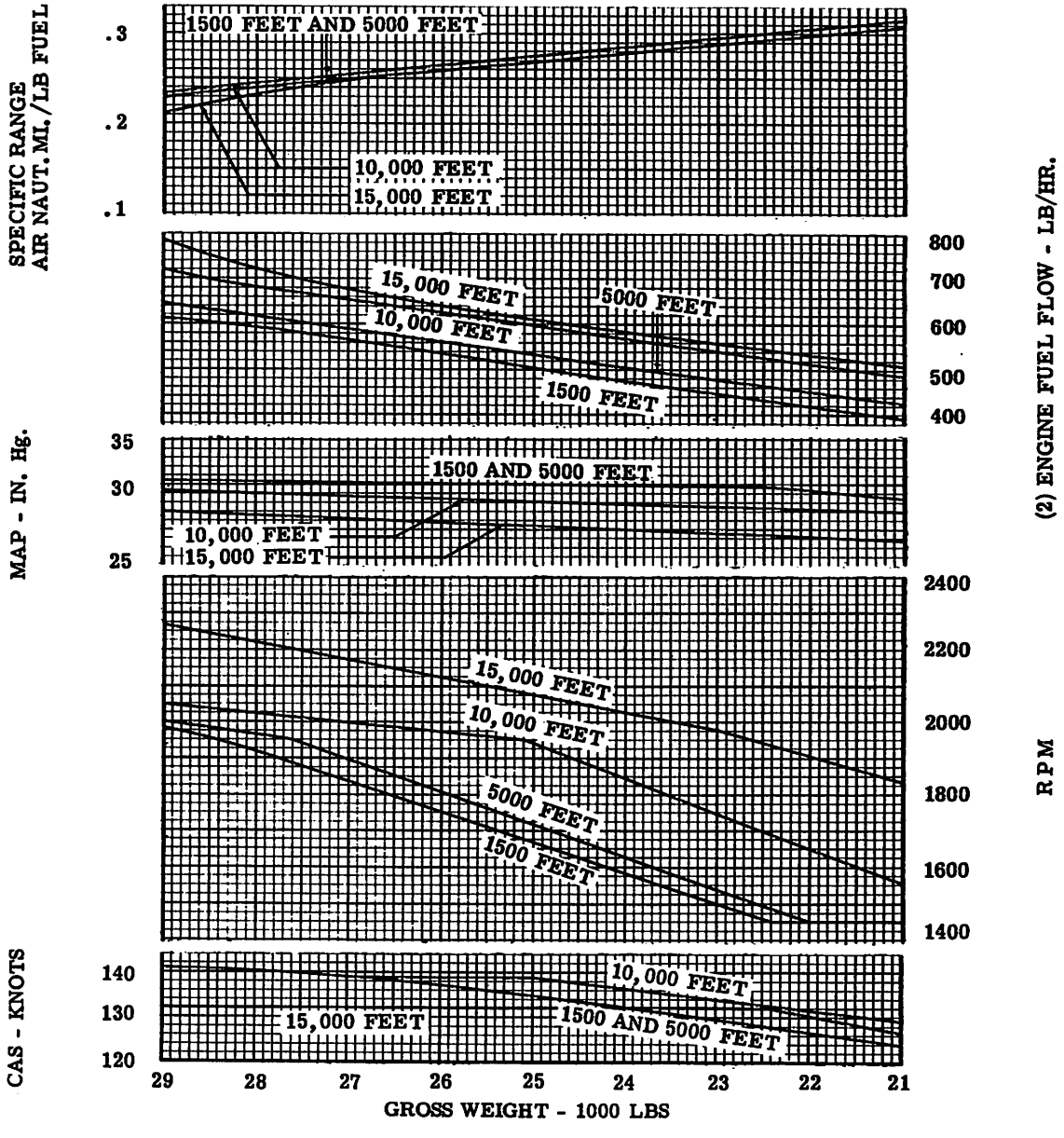


CONFIGURATION B
RADOME AND MAD BOOM EXTENDED

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Based on Long Range CAS.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG)
7. Mild Engine Vibration may be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-337

Figure 11-52

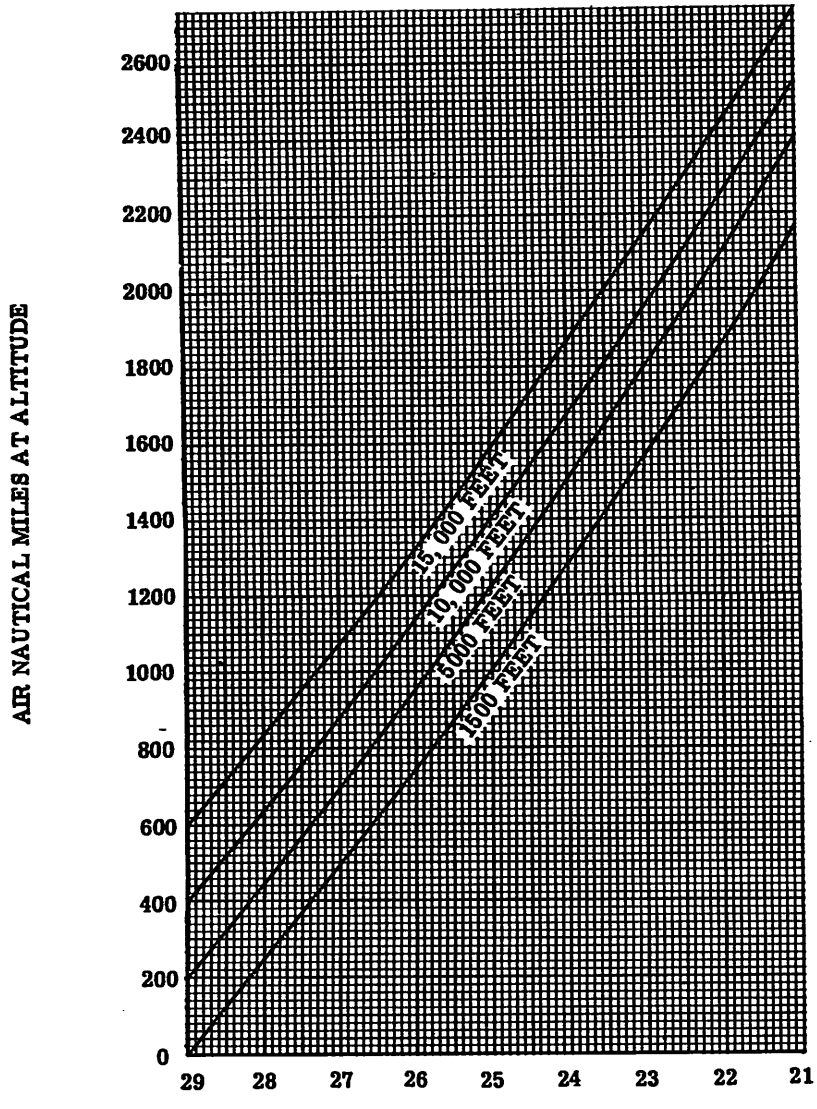
GUIDE

LONG RANGE PREDICTION—DISTANCE

CONFIGURATION B
RADOME AND
MAD BOOM
EXTENDED
MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

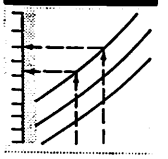
1. Based on Long Range CAS.
2. Use on Incremental Basis.
3. Normal Mixture.
4. Cowl Flaps Closed.
5. Oil Cooler Flaps Closed.
6. Flap Setting 0 Degrees.
7. Accessory Draw Included. (20 BHP/ENG)

A-SAD1-339

Figure 11-53

LONG RANGE PREDICTION—TIME

GUIDE

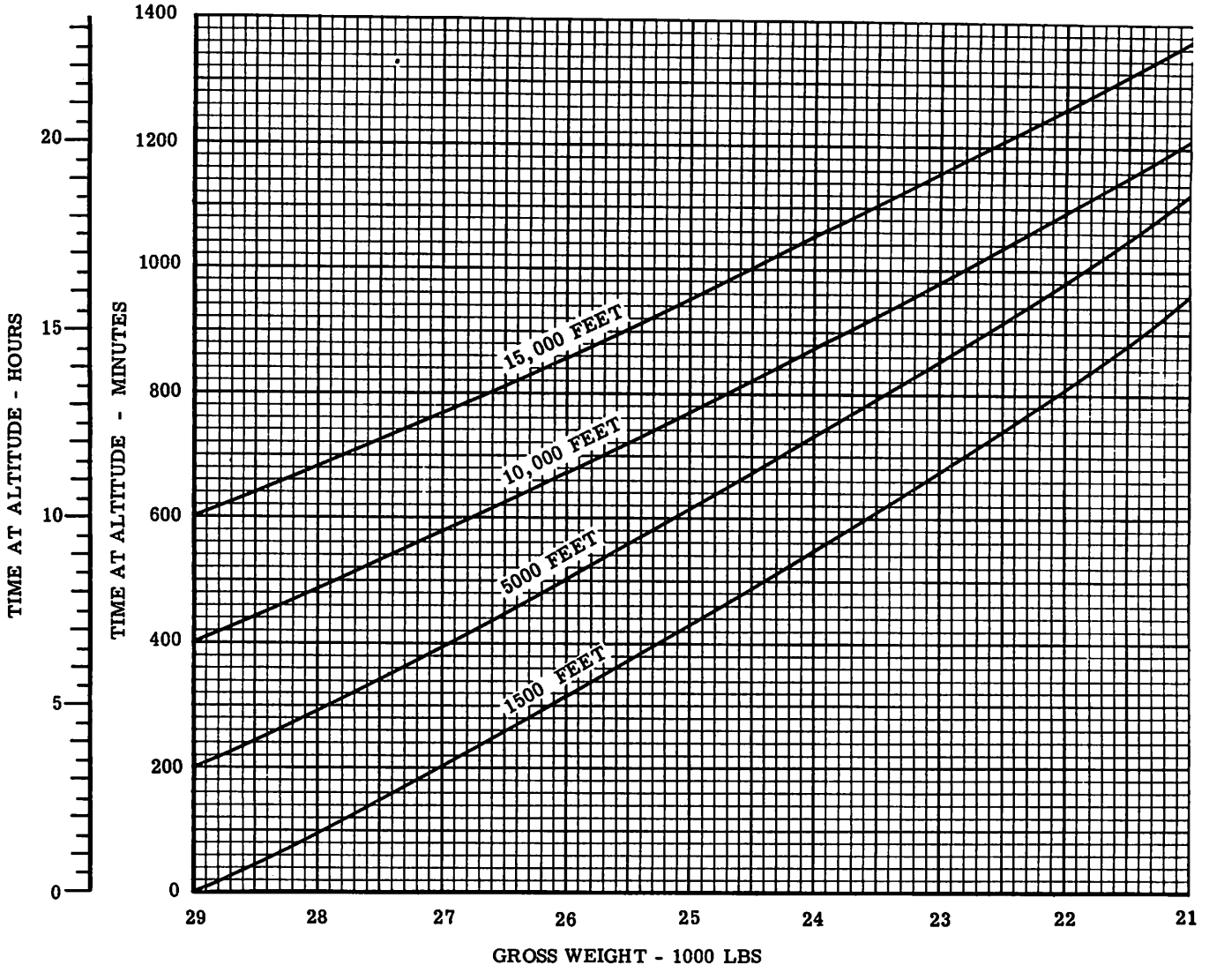


CONFIGURATION B
RADOME AND
MAD BOOM
EXTENDED

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Based on Long Range CAS.
2. Use on Incremental Basis.
3. Normal Mixture.
4. Cowl Flaps Closed.
5. Oil Cooler Flaps Closed.
6. Flap Setting 0 Degrees.
7. Accessory Draw Included. (20 BHP/ENG)

A-SAD1-338

Figure 11-54

GUIDE

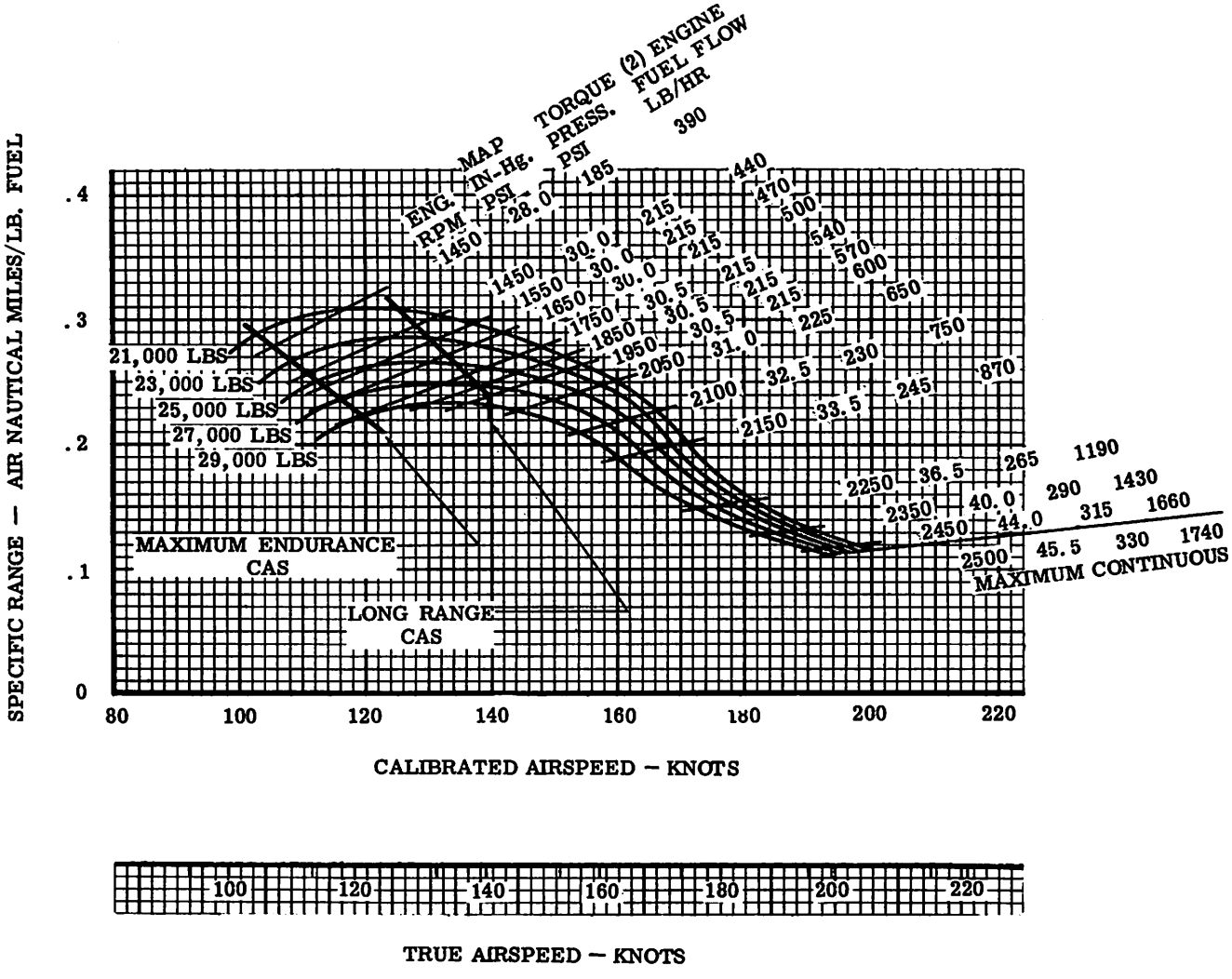
SPECIFIC RANGE—1500 FEET

CONFIGURATION C
(4) MK 43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

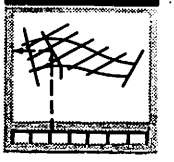
1. 1450 RPM is Minimum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG.)
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-342

Figure 11-55

SPECIFIC RANGE — 5000 FEET

GUIDE

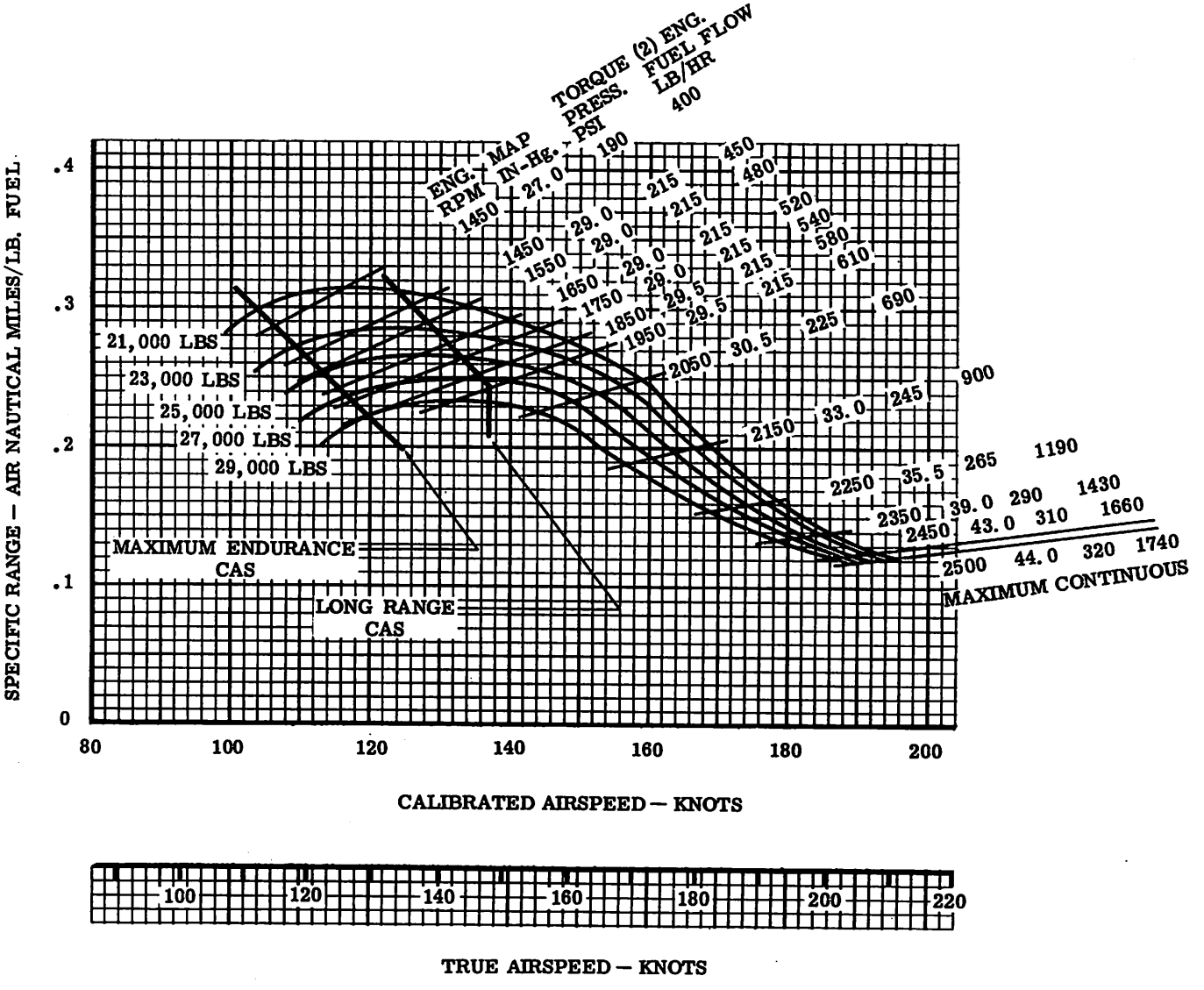


CONFIGURATION C
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. 1450 RPM is Minimum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees
6. Accessory Draw Included. (20 BHP/ENG)
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-Operational Below a True Airspeed of 100 Knots.

A-SAD1-343

Figure 11-56

GUIDE



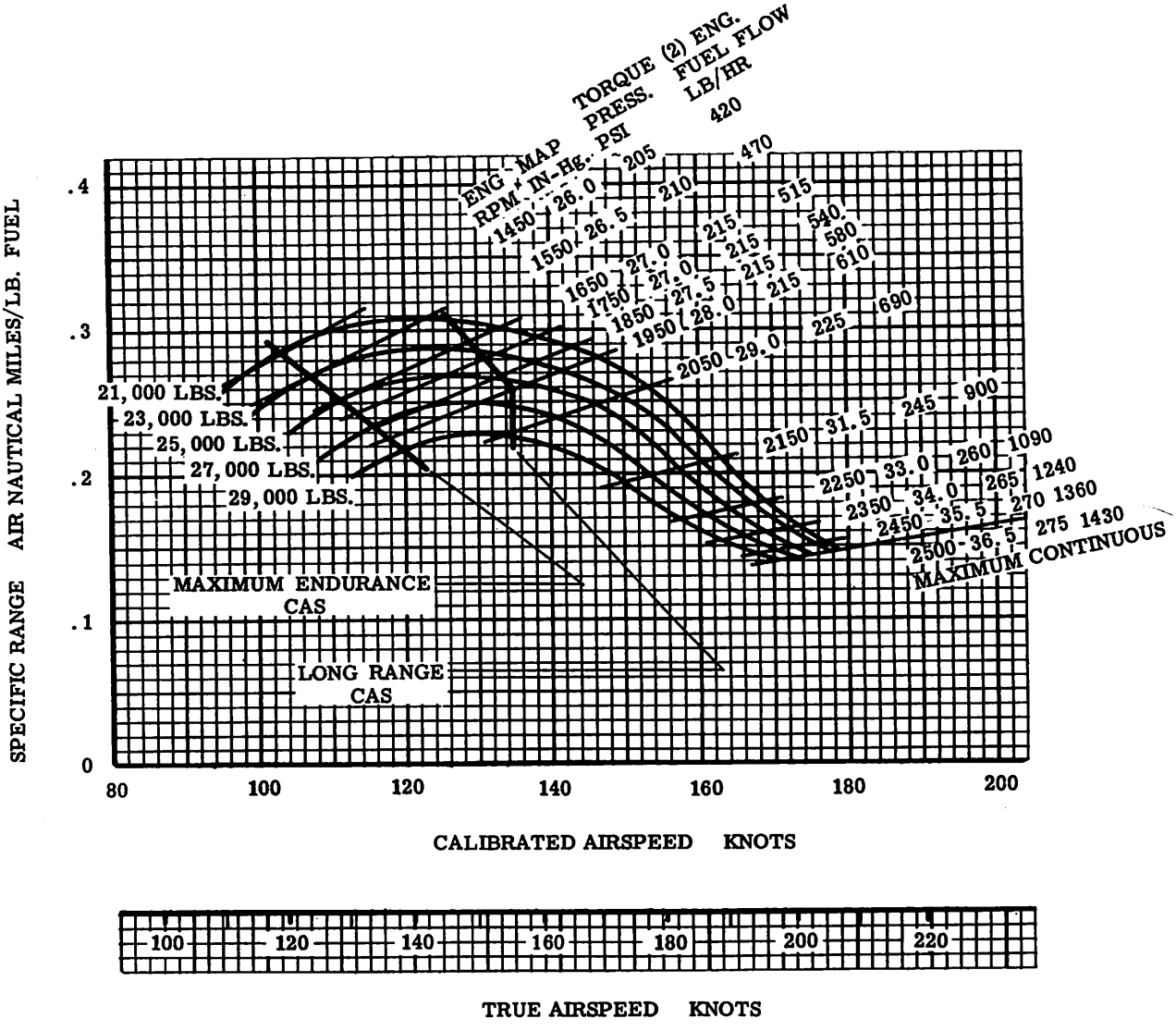
SPECIFIC RANGE — 10,000 FEET

CONFIGURATION C
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. 1450 RPM is Minimum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG).
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-344

Figure 11-57

SPECIFIC RANGE — 15,000 FEET

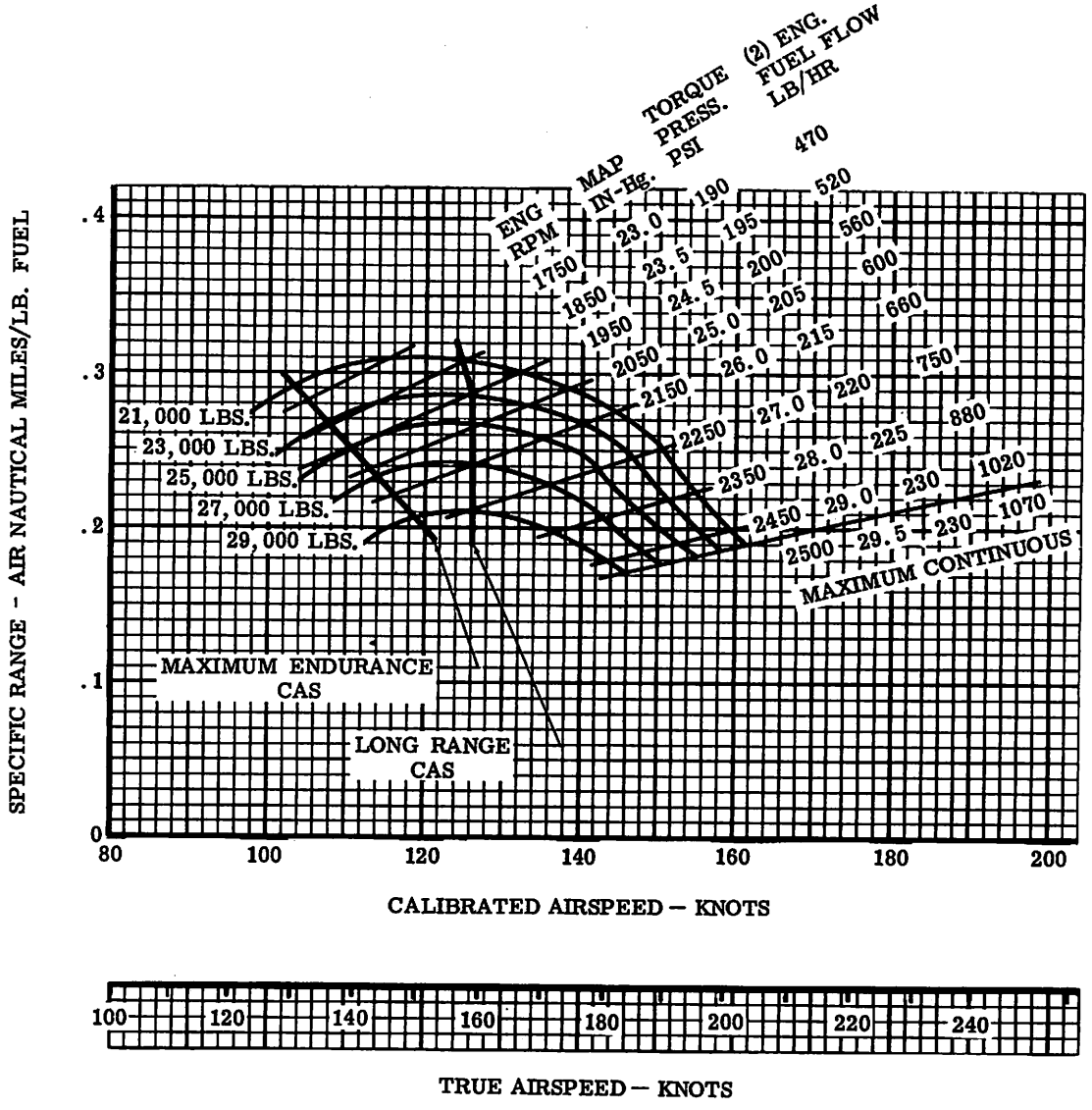
GUIDE

CONFIGURATION C
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



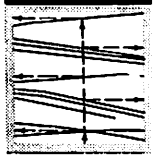
REMARKS

1. 1450 RPM is Minimum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG).
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-345

Figure 11-58

GUIDE



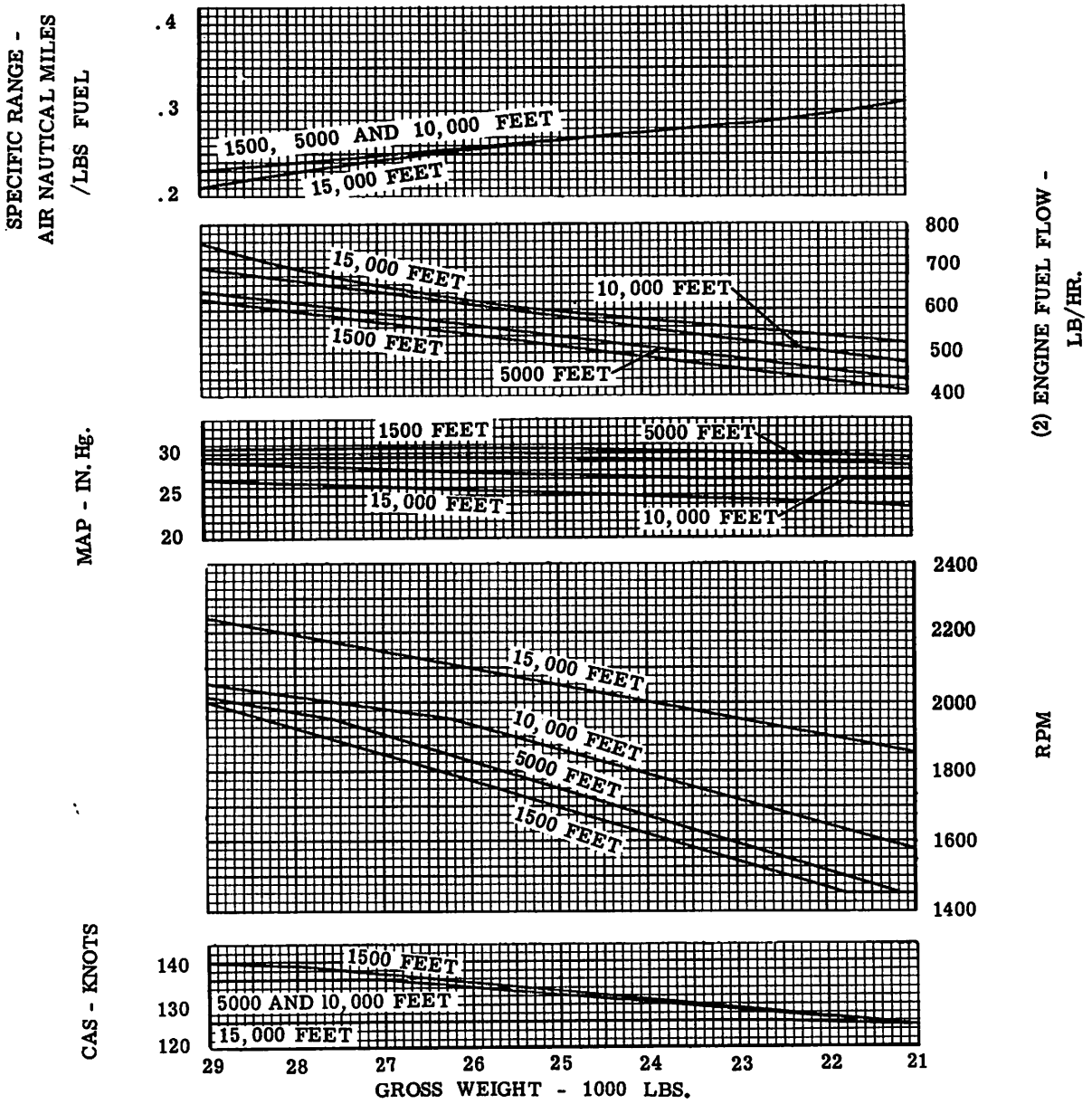
LONG RANGE SUMMARY

CONFIGURATION C
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Based on Long Range CAS.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG).
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-346

Figure 11-59

LONG RANGE PREDICTION — DISTANCE

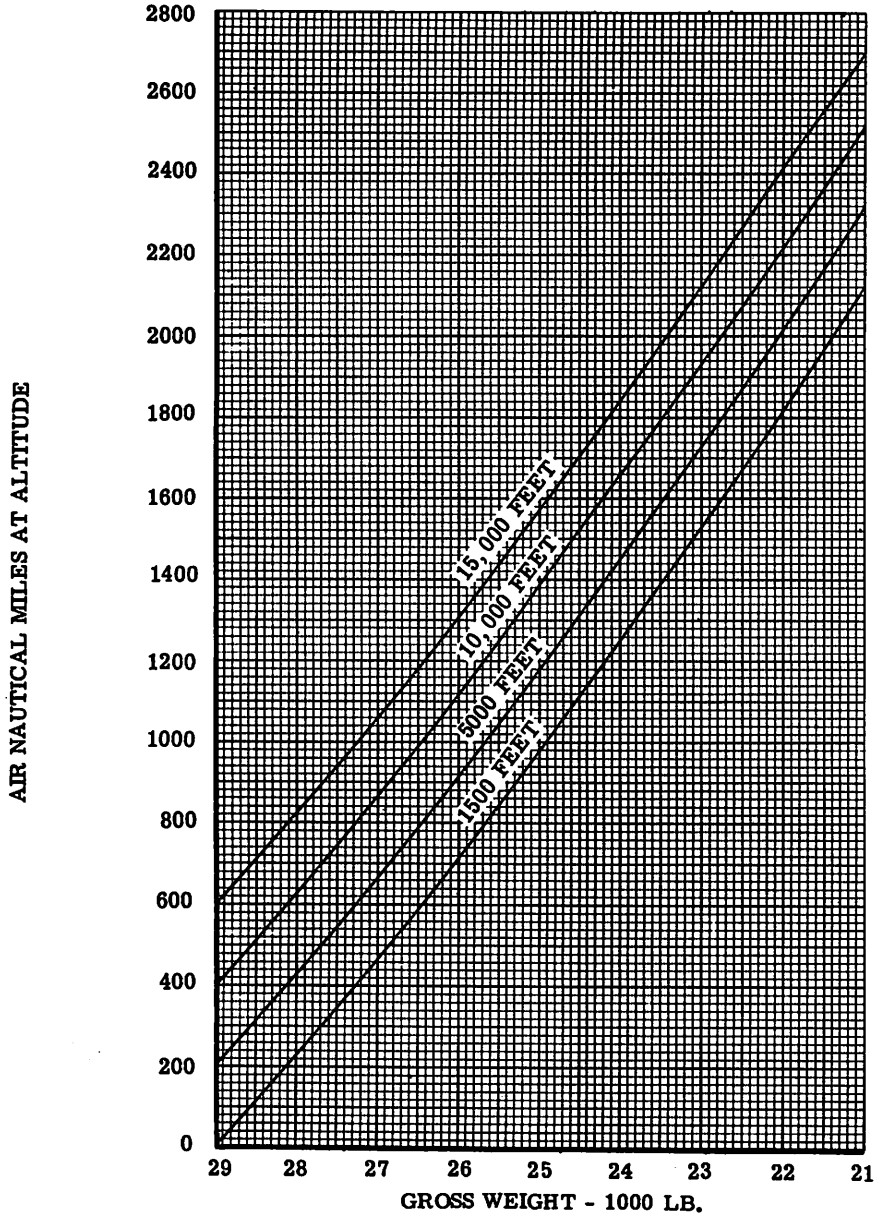


CONFIGURATION C
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

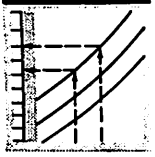
1. Based on Long Range CAS.
2. Use on Incremental Basis.
3. Normal Mixture.
4. Cowl Flaps Closed.
5. Oil Cooler Flaps Closed.
6. Flap Setting 0 Degrees.
7. Accessory Draw Included. (20 BHP/ENG).

A-SAD1-348

Figure 11-60

LONG RANGE PREDICTION—TIME

GUIDE

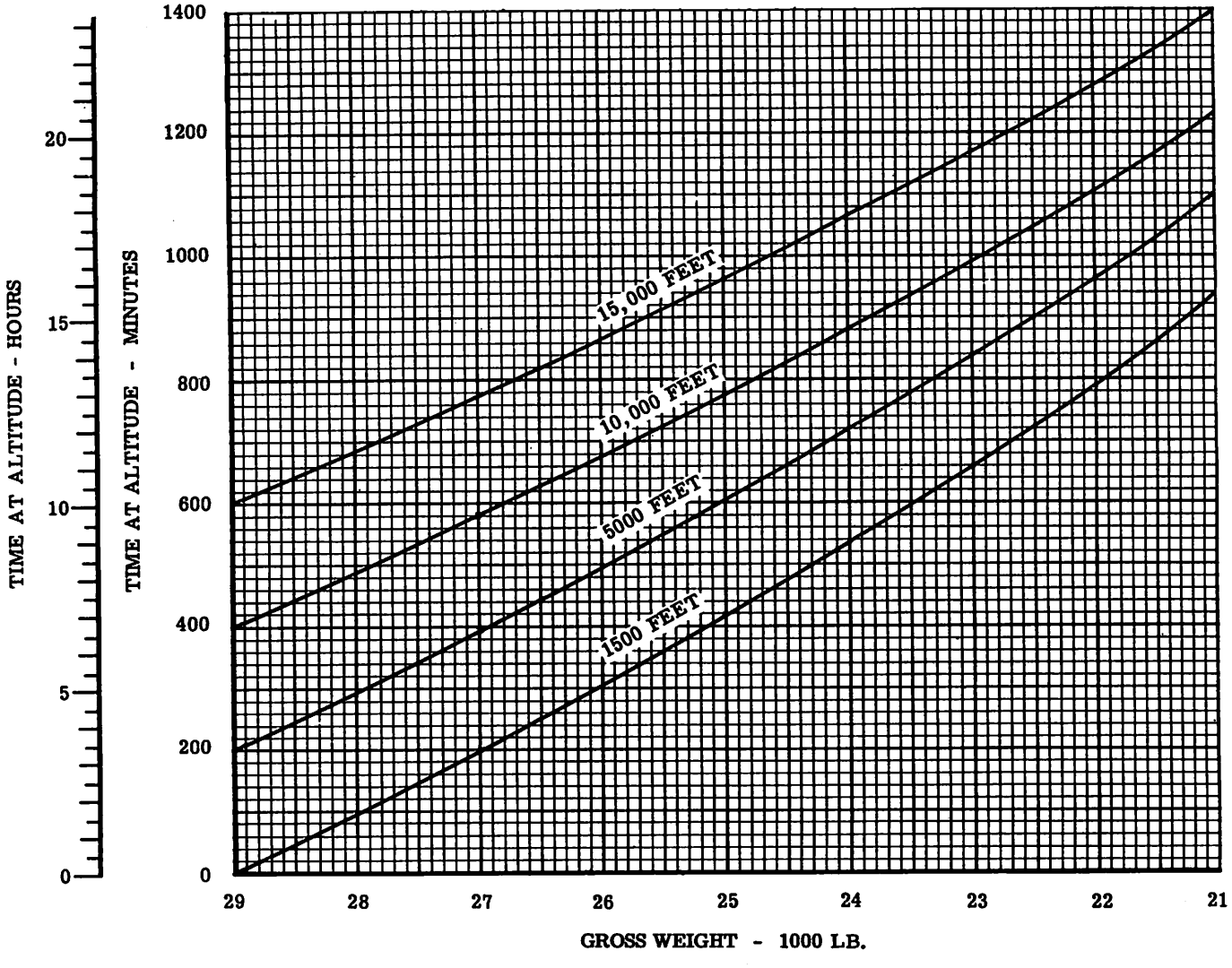


CONFIGURATION C
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

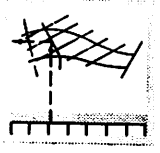
1. Based on Long Range CAS.
2. Use on Incremental Basis.
3. Normal Mixture.
4. Cowl Flaps Closed.
5. Oil Cooler Flaps Closed.
6. Flap Setting 0 Degrees.
7. Accessory Draw Included. (20 BHP/ENG).

A-SAD1-347

Figure 11-61

SPECIFIC RANGE—1500 FEET

GUIDE

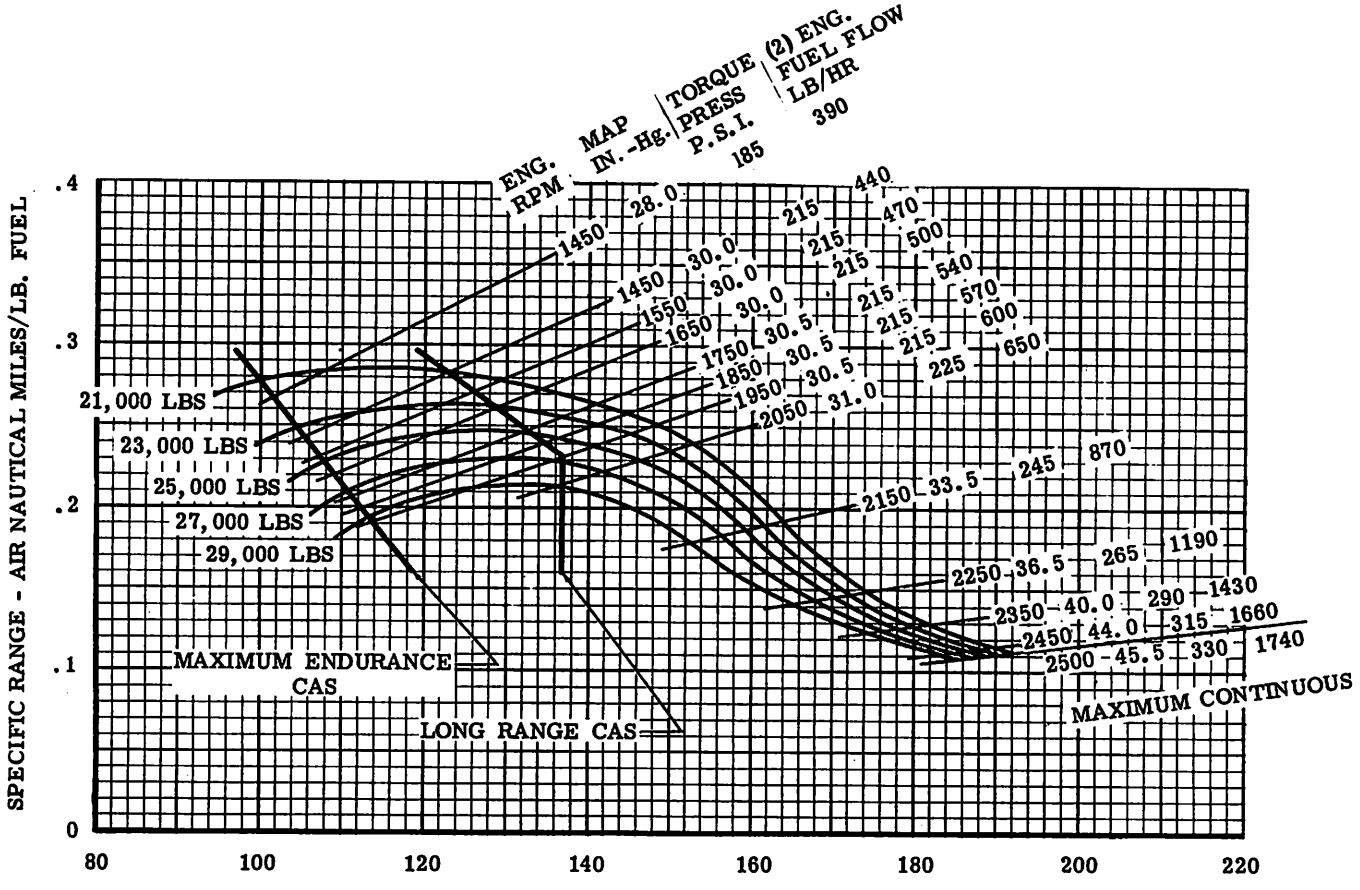


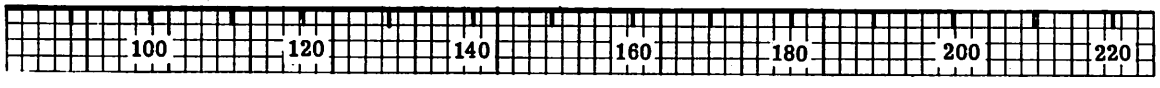
CONFIGURATION D
RADOME AND MAD BOOM EXTENDED
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL





TRUE AIRSPEED - KNOTS

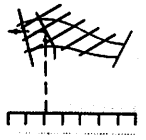
REMARKS

1. 1450 RPM Is Minimum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included (20 BHP/ENG).
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-353

Figure 11-62

GUIDE



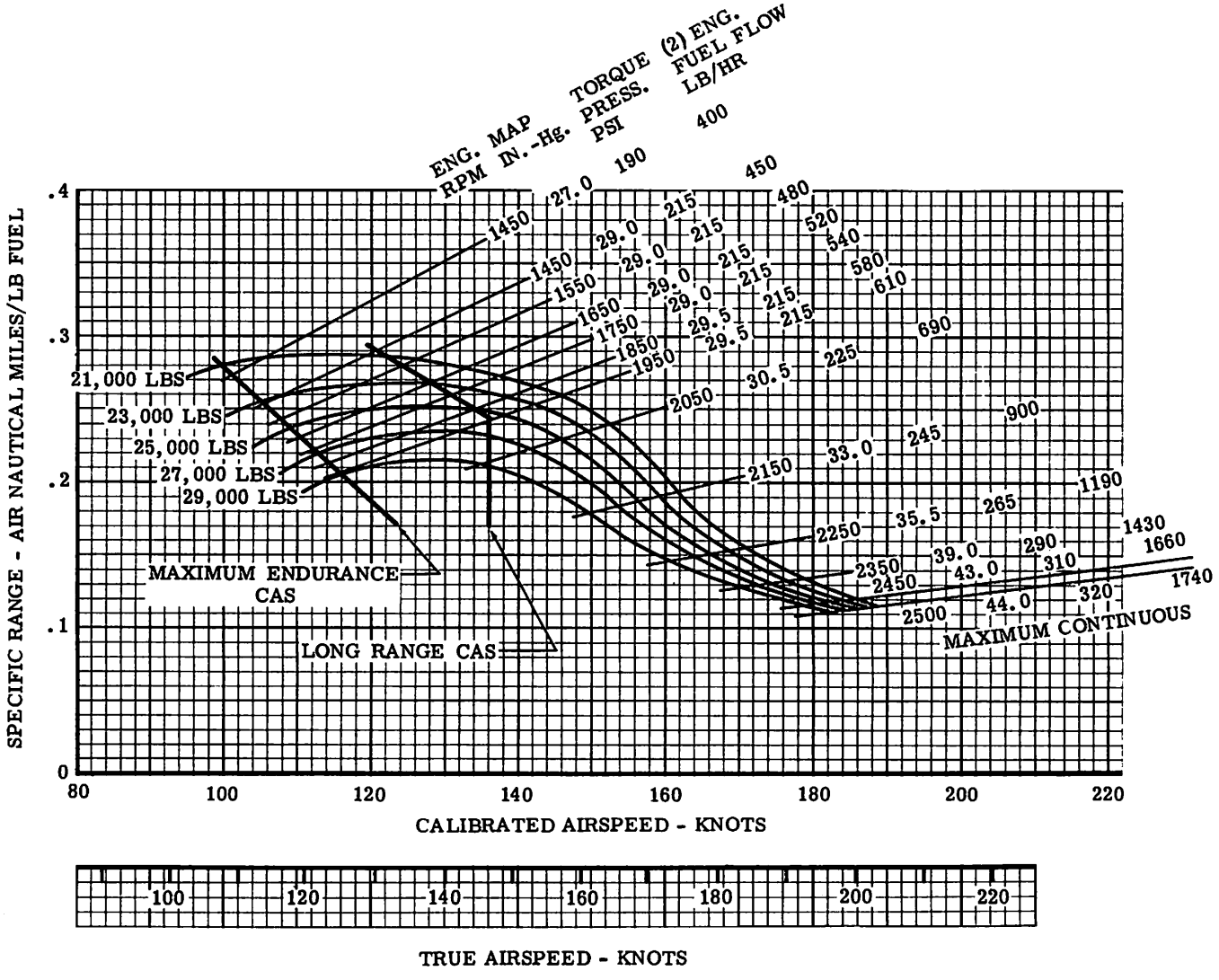
SPECIFIC RANGE — 5000 FEET

CONFIGURATION D
RADOME AND MAD
BOOM EXTENDED
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. 1450 RPM Is Minimum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included (20 BHP/ENG).
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-354

Figure 11-63

SPECIFIC RANGE—10,000 FEET

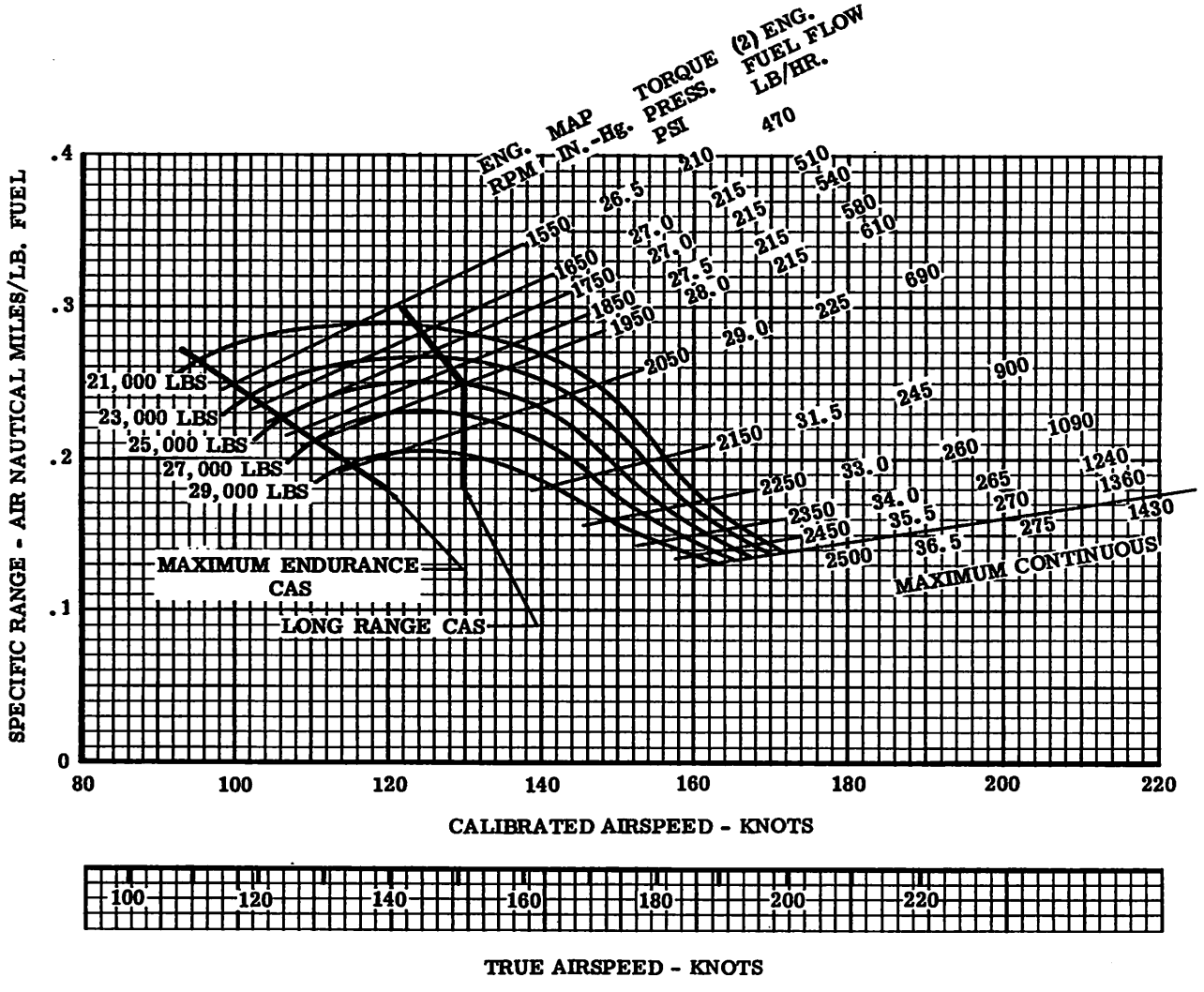
GUIDE

CONFIGURATION D
RADOME AND MAD BOOM EXTENDED
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. 1450 RPM Is Minimum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included (20 BHP/ENG).
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA- 13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-355

Figure 11-64

GUIDE

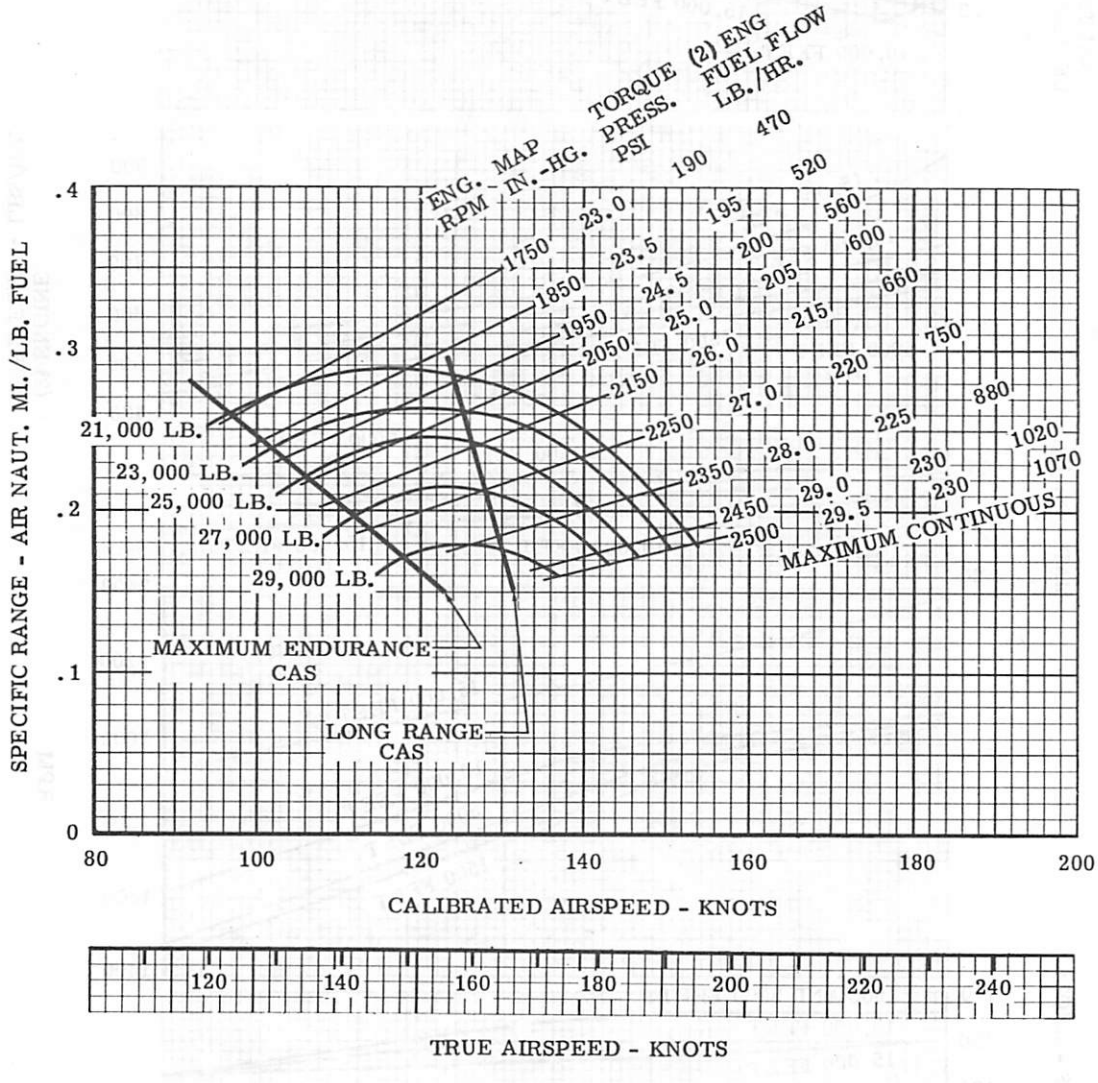
SPECIFIC RANGE—15,000 FEET

CONFIGURATION D
RADOME AND MAD
BOOM EXTENDED
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

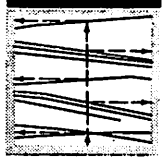
1. 1450 RPM Is Minimum Recommended.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included (20 BHP/ENG).
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-356

Figure 11-65

LONG RANGE SUMMARY

GUIDE

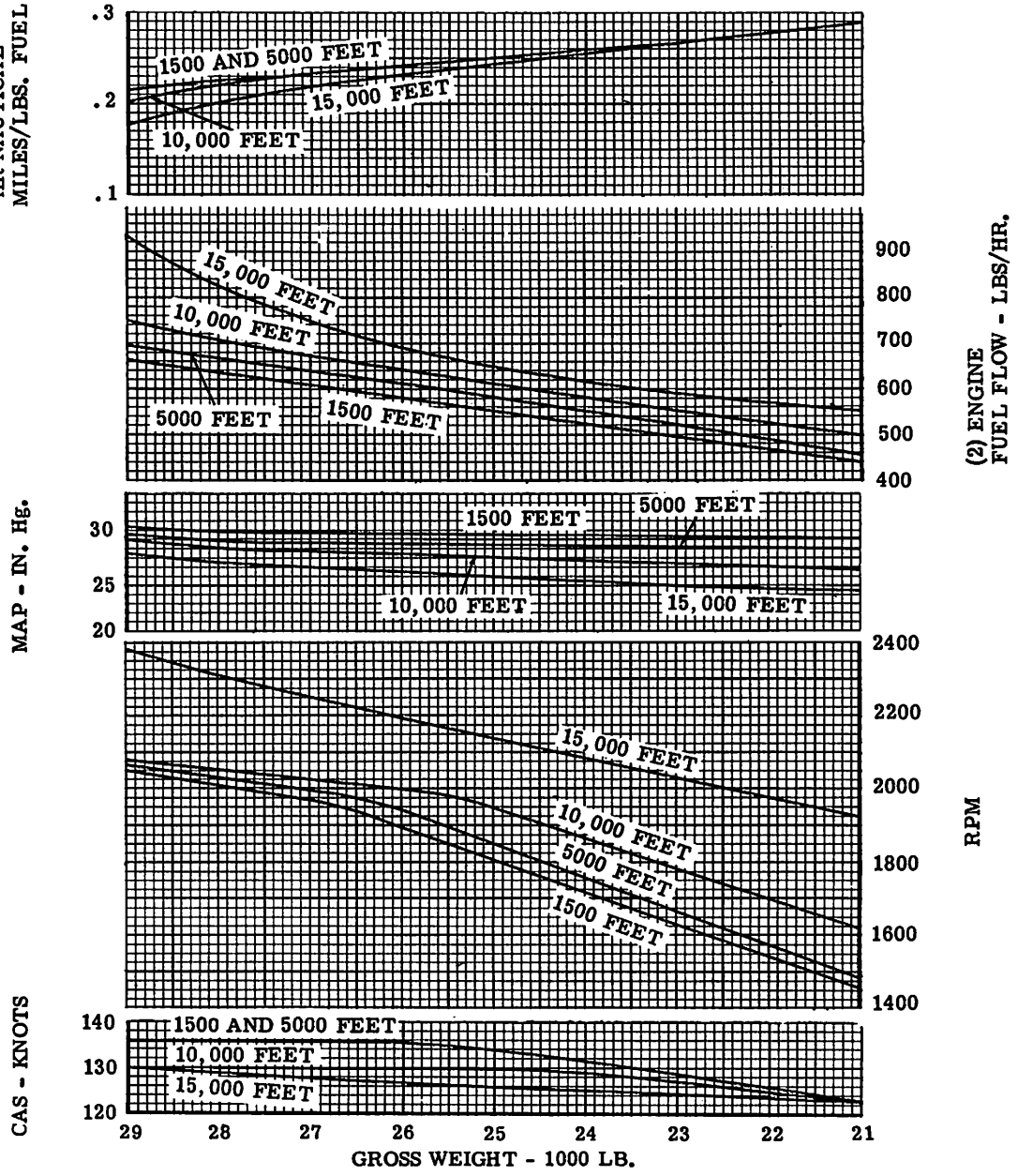


CONFIGURATION D
RADOME AND MAD BOOM
EXTENDED (4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



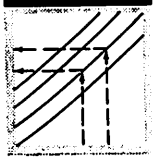
REMARKS

1. Based on Long Range CAS.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included (20 BHP/ENG).
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-357

Figure 11-66

GUIDE



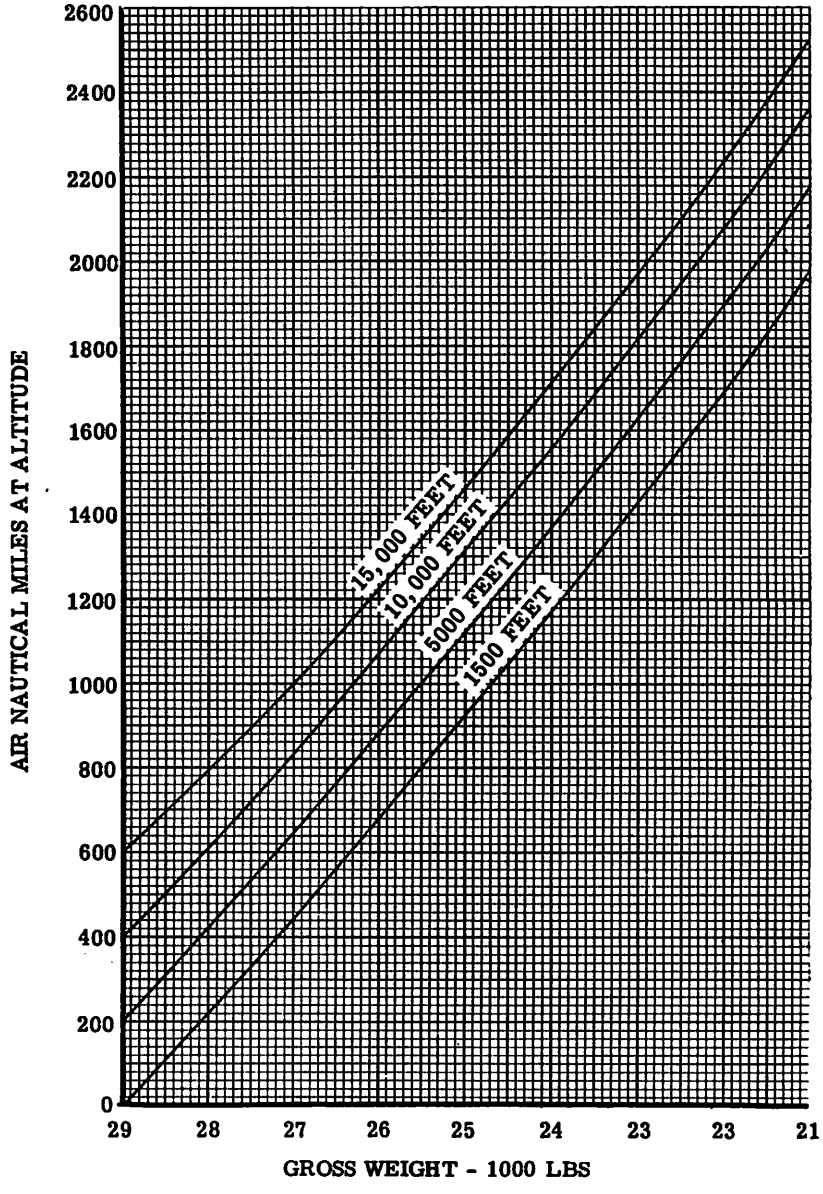
LONG RANGE PREDICTION—DISTANCE

CONFIGURATION D
RADOME AND MAD
BOOM EXTENDED
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



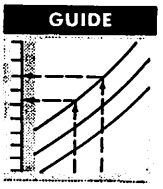
REMARKS

1. Based on Long Range CAS.
2. Use on Incremental Basis.
3. Normal Mixture.
4. Cowl Flaps Closed.
5. Oil Cooler Flaps Closed
6. Flap Setting 0 Degrees.
7. Accessory Draw Included (20 BHP/ENG).

A-SAD1-359

Figure 11-67

LONG RANGE PREDICTION — TIME

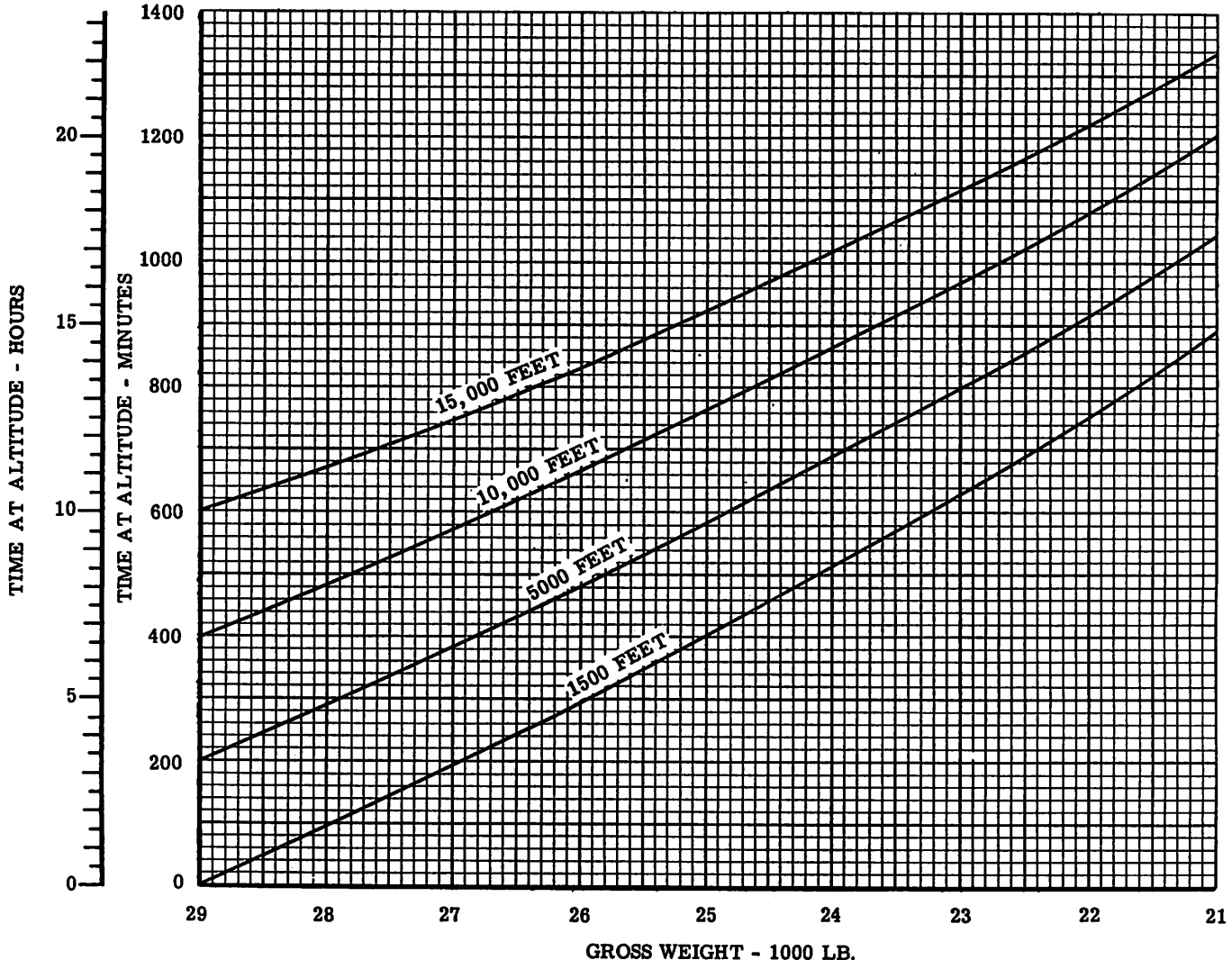


CONFIGURATION D
RADOME AND MAD
BOOM EXTENDED
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Based on Long Range CAS.
2. Use on Incremental Basis.
3. Normal Mixture.
4. Cowl Flaps Closed.
5. Oil Cooler Flaps Closed.
6. Flap Setting 0 Degrees.
7. Accessory Draw Included (20 BHP/ENG).

A-SAD1-358

Figure 11-68

part 8

MAXIMUM ENDURANCE

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Configuration D

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Maximum Endurance Prediction - Time.... 11-109

MAXIMUM ENDURANCE SUMMARY

Maximum Endurance Summary Curves are presented for configurations A, B, C and D in figures 11-69, 11-71, 11-73, and 11-75 respectively. The curves present engine data as a function of gross weight for flight at maximum endurance airspeeds. All data has been extracted from the Specific Range Curves.

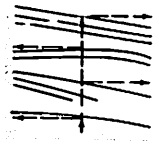
MAXIMUM ENDURANCE PREDICTION-TIME

Maximum Endurance Prediction-Time curves are presented for configurations A, B, C and D in figures 11-70, 11-72, 11-74, and 11-76 respectively. The curves were developed from fuel flow data obtained from the Specific Range Curves for flight at maximum endurance airspeeds.

These curves are to be used by taking the value in time, corresponding to the higher gross weight, and subtracting it from the value in time read at the lower gross weight. This increment in time is the maximum time available at altitude when flying at maximum endurance airspeeds.

MAXIMUM ENDURANCE SUMMARY

GUIDE

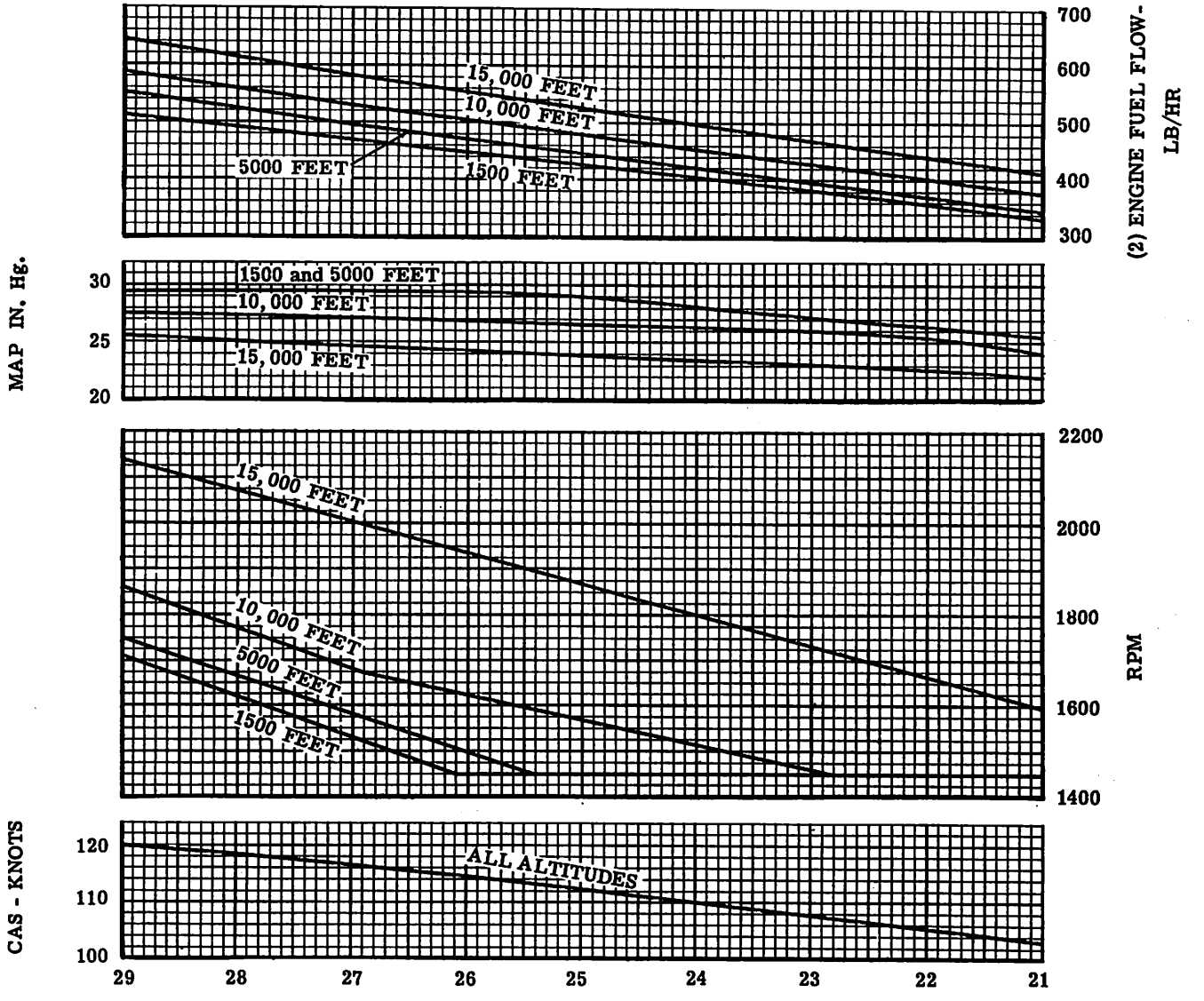


CONFIGURATION A
CLEAN

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



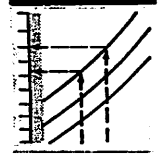
REMARKS

1. Based on Maximum Endurance CAS.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG)
7. Mild Engine Vibration May be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-328

Figure 11-69

GUIDE



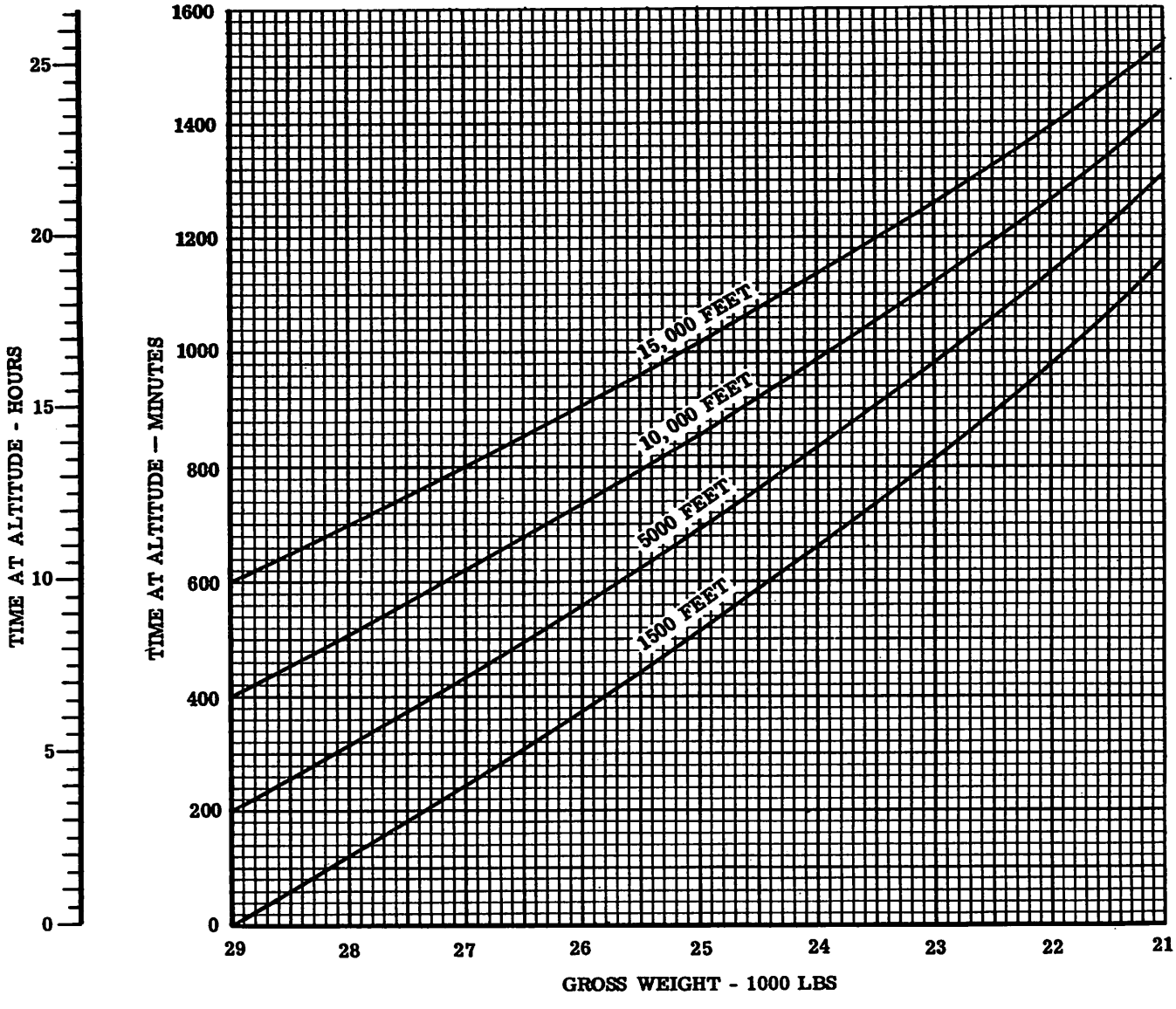
MAXIMUM ENDURANCE PREDICTION—TIME

CONFIGURATION A
CLEAN

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

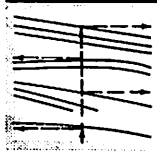
1. Based on Maximum Endurance CAS.
2. Use on Incremental Basis.
3. Normal Mixture.
4. Cowl Flaps Closed.
5. Oil Cooler Flaps Closed.
6. Flap Setting 0 Degrees.
7. Accessory Draw Included. (20 BHP/ENG).

A-SAD1-329

Figure 11-70

MAXIMUM ENDURANCE SUMMARY

GUIDE

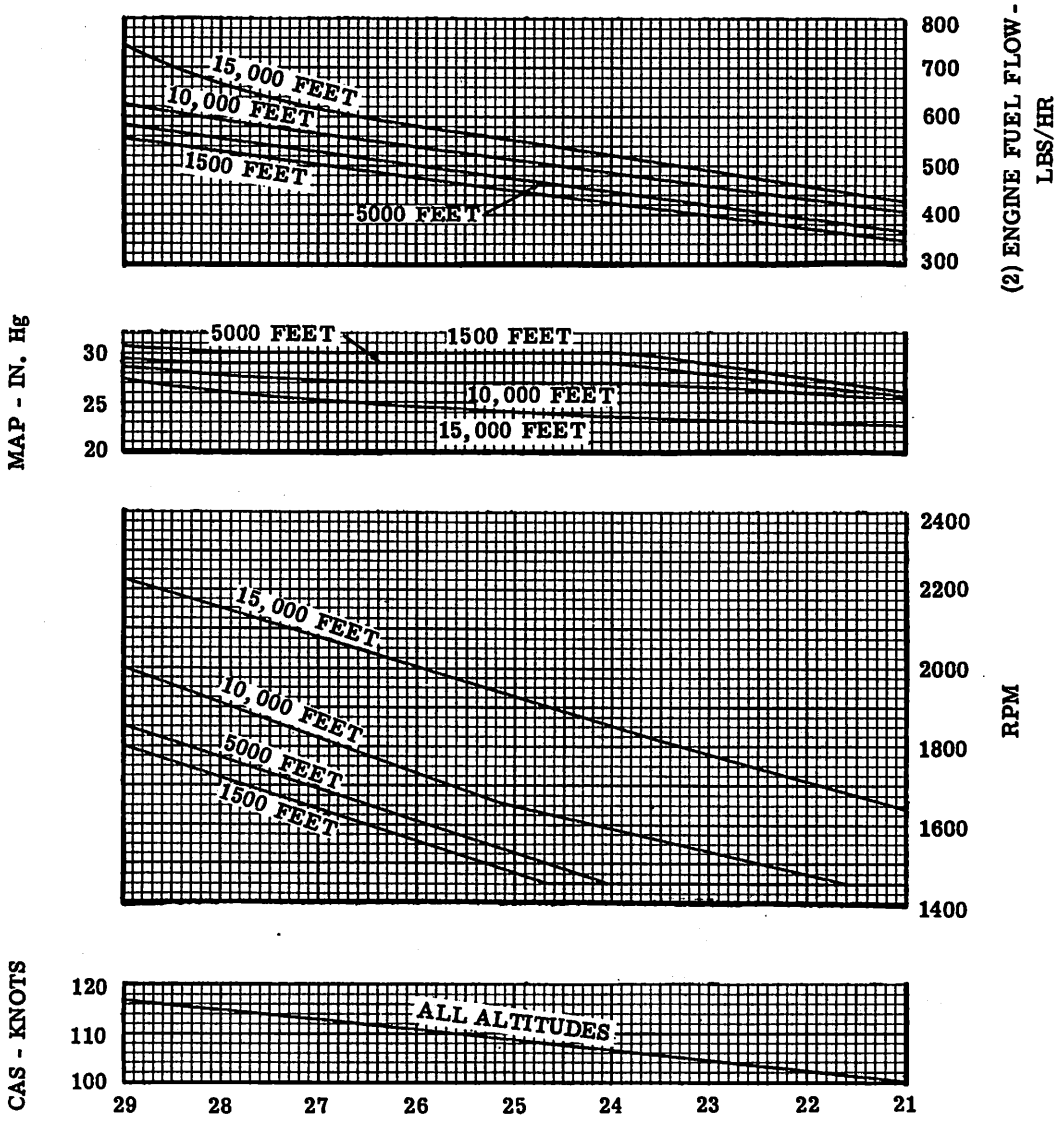


CONFIGURATION B
CLEAN
RADOME AND MAD
BOOM EXTENDED

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 · 115/145
FUEL DENSITY: 6.0 LB/GAL



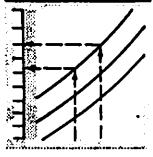
REMARKS

1. Based on Maximum Endurance CAS.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG)
7. Mild Engine Vibration May be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-340

Figure 11-71

GUIDE



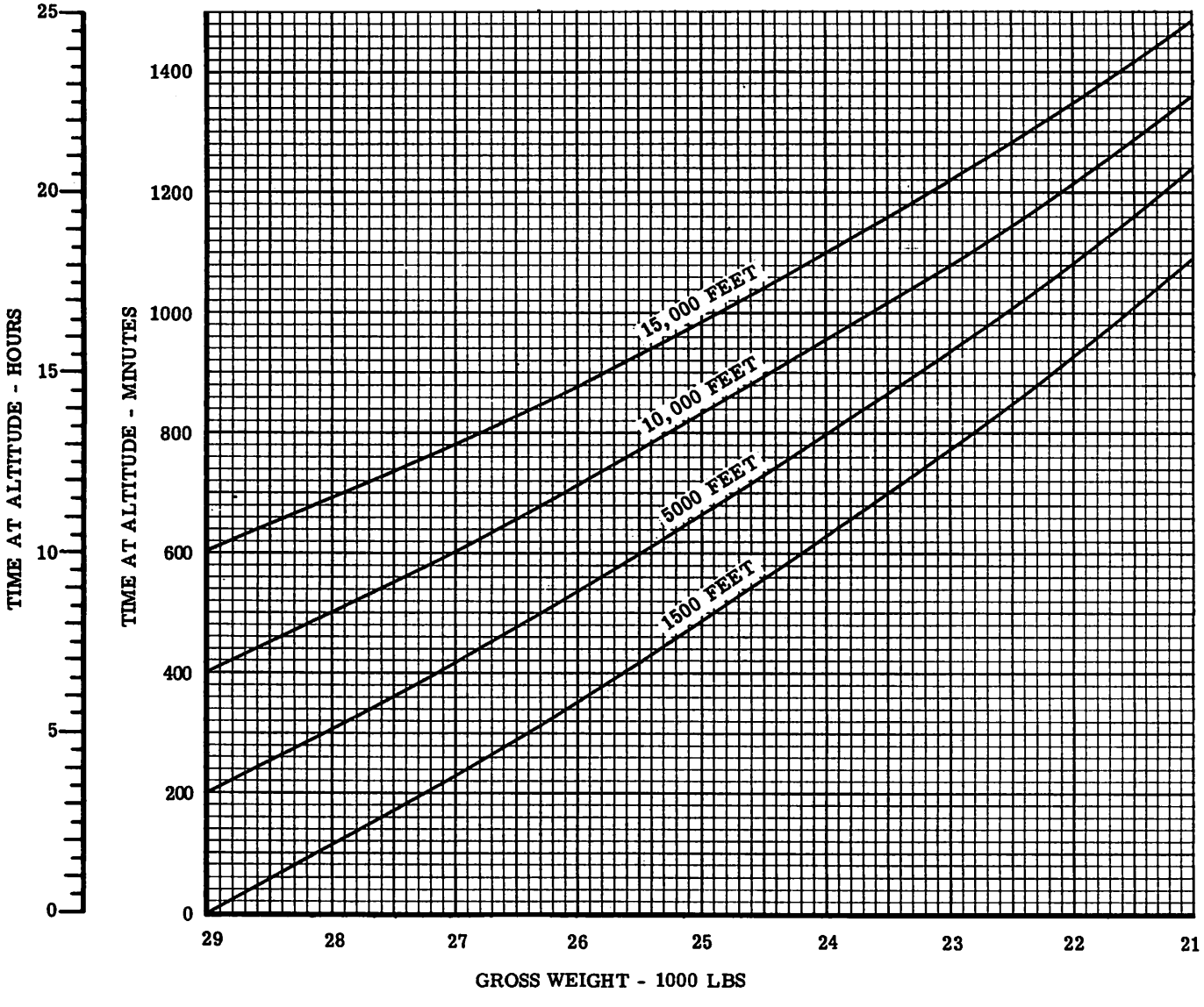
MAXIMUM ENDURANCE PREDICTION—TIME

CONFIGURATION B
RADOME AND MAD BOOM EXTENDED

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

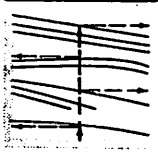
1. Based on Maximum Endurance CAS.
2. Use on Incremental Basis.
3. Normal Mixture.
4. Cowl Flaps Closed.
5. Oil Cooler Flaps Closed.
6. Flap Setting 0 Degrees.
7. Accessory Draw Included. (20 BHP/ENG)

A-SAD1-341

Figure 11-72

MAXIMUM ENDURANCE SUMMARY

GUIDE



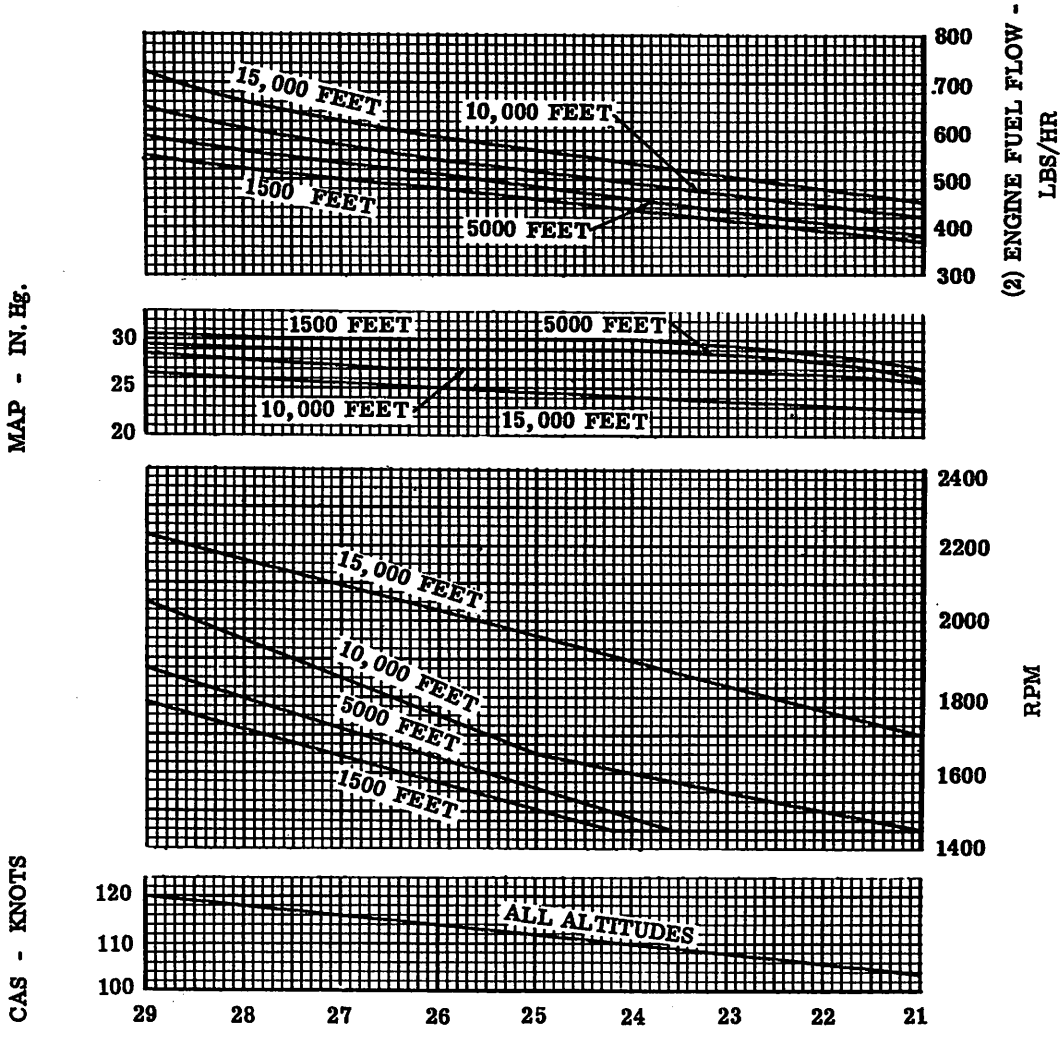
CONFIGURATION C

(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Based on Maximum Endurance CAS.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included. (20 BHP/ENG).
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-349

Figure 11-73

MAXIMUM ENDURANCE PREDICTION—TIME

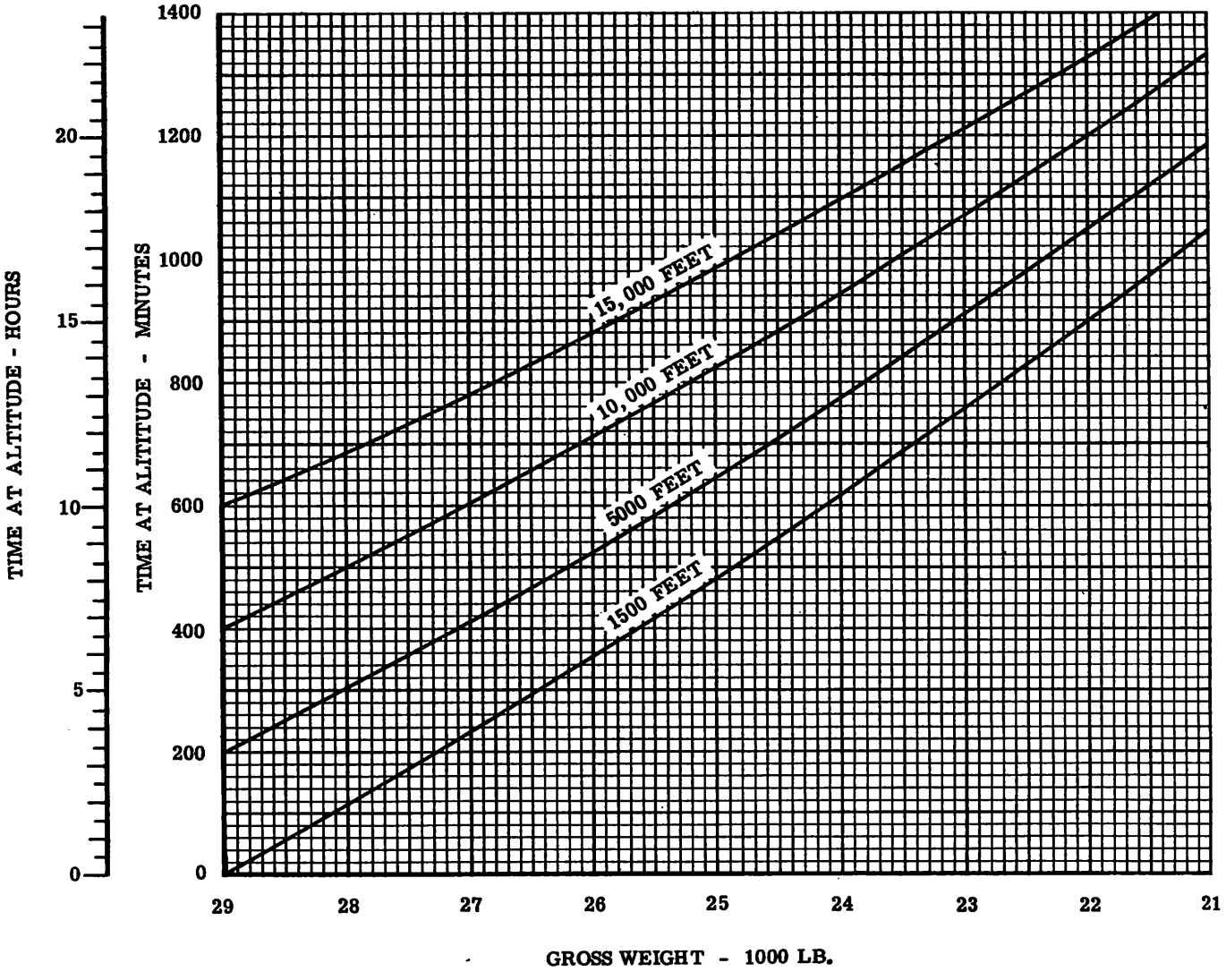
GUIDE

CONFIGURATION C
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



1. Based on Maximum Endurance CAS.
2. Use on Incremental Basis.
3. Normal Mixture.
4. Cowl Flaps Closed.
5. Oil Cooler Flaps Closed.
6. Flap Setting 0 Degrees.
7. Accessory Draw Included (20 BHP/ENG).

A-SAD1-350

Figure 11-74

MAXIMUM ENDURANCE SUMMARY

GUIDE

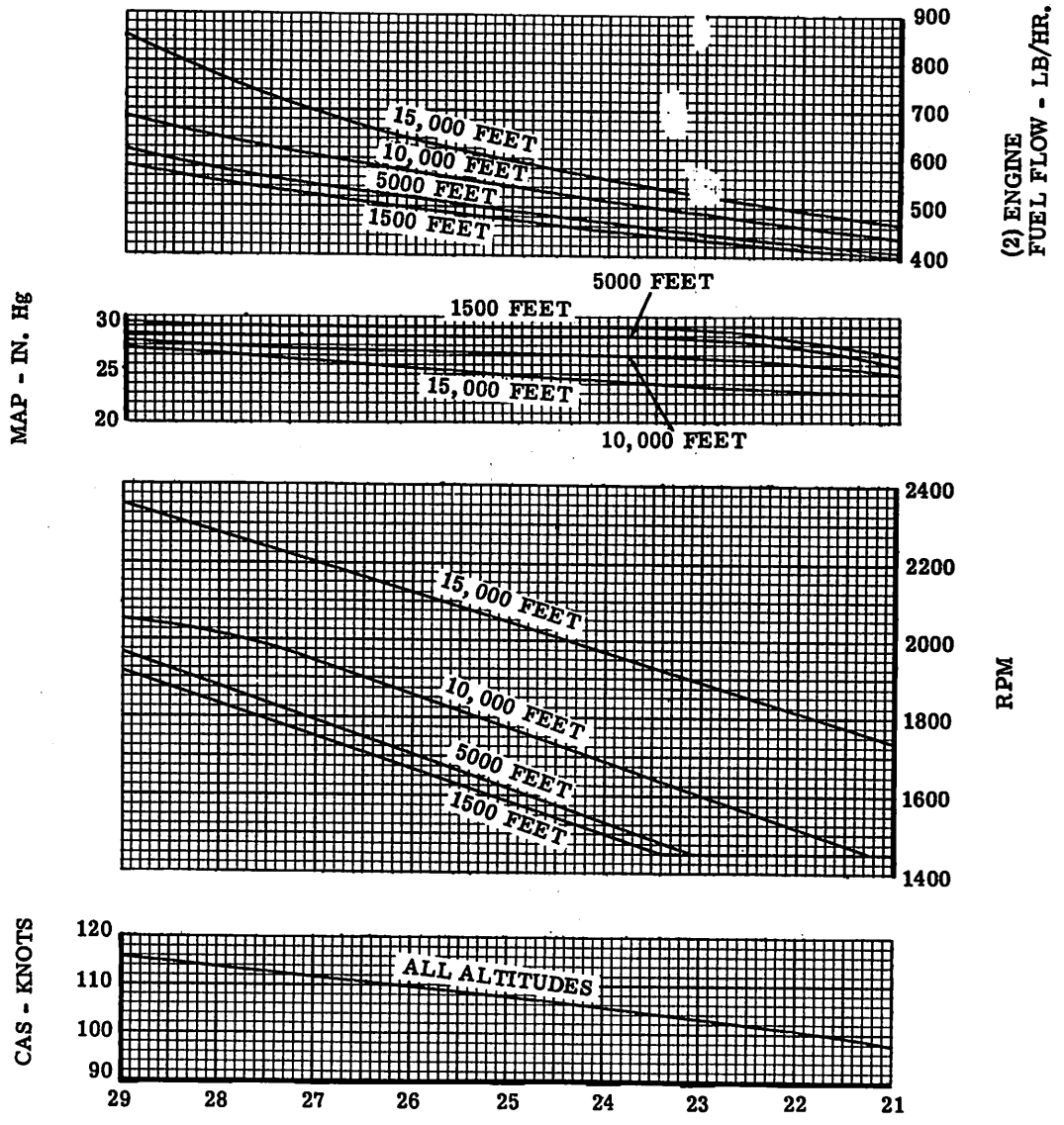


CONFIGURATION D
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



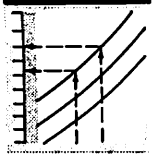
REMARKS

1. Based on Maximum Endurance CAS.
2. Normal Mixture.
3. Cowl Flaps Closed.
4. Oil Cooler Flaps Closed.
5. Flap Setting 0 Degrees.
6. Accessory Draw Included (20 BHP/ENG).
7. Mild Engine Vibration May Be Encountered Below 1650 RPM.
8. ASA-13A Non-operational Below a True Airspeed of 100 Knots.

A-SAD1-360

Figure 11-75

GUIDE



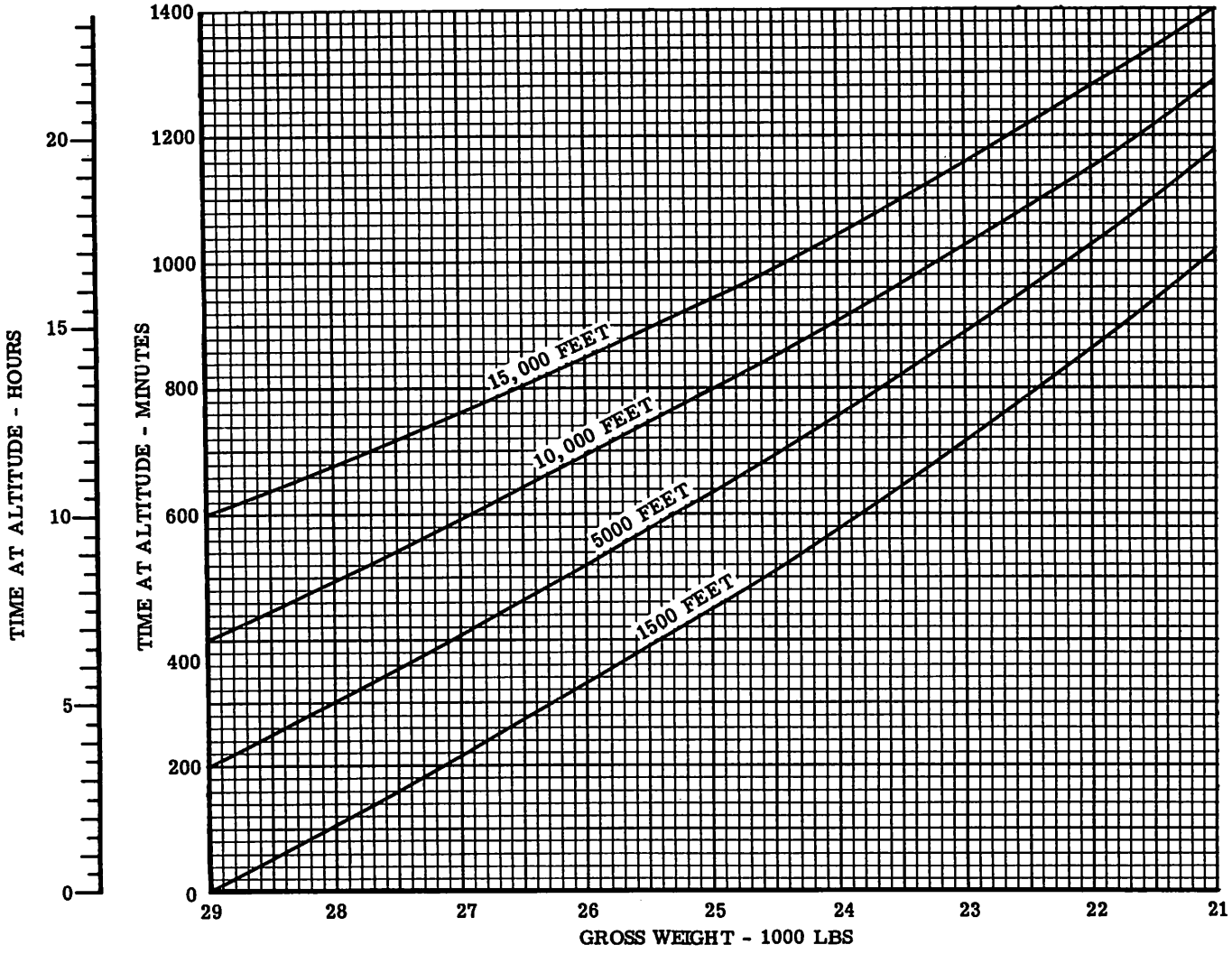
MAXIMUM ENDURANCE PREDICTION—TIME

CONFIGURATION D
RADOME AND MAD BOOM EXTENDED
(4) MK43 TORPEDOES

MODEL(S): S-2D/E
DATA AS OF: SEPTEMBER 1959
DATA BASIS: NATC & GAEC FLIGHT TESTS

ENGINE(S): R1820-82A(2)
PROPELLER(S): HAM. STD. 6985-7(2)
ICAO STANDARD DAY

FUEL GRADE: MIL-G-5572 115/145
FUEL DENSITY: 6.0 LB/GAL



REMARKS

1. Based on Maximum Endurance CAS.
2. Use on Incremental Basis.
3. Normal Mixture.
4. Cowl Flaps Closed.
5. Oil Cooler Flaps Closed.
6. Flap Setting 0 Degrees.
7. Accessory Draw Included (20 BHP/ENG).

A-SAD1-361

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