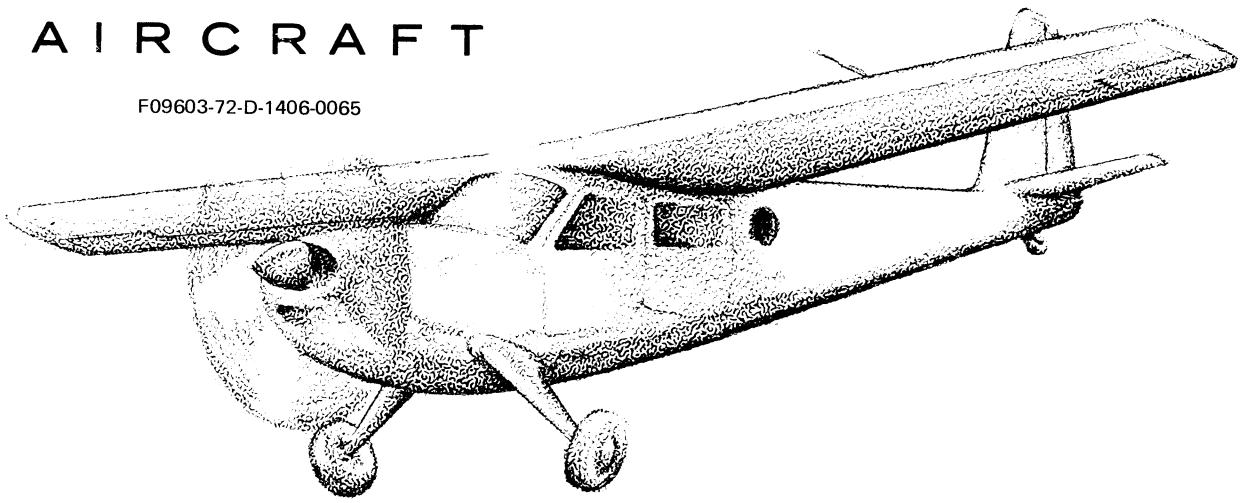
FLIGHT MANUAL

USAF & ARMY SERIES

U-10A
U-10B
U-10D

AIRCRAFT

F09603-72-D-1406-0065



Commanders are responsible for bringing this publication to the attention of all personnel cleared for operation of affected aircraft.

SEE T.O. 0-1-1-5 for current status of Flight Manuals, Safety Supplements, Operational Supplements, and Flight Crew Checklists.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE.

AFLC RAFB, GA

15 JANUARY 1967

CHANGE 18 – 6 JUNE 1974

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Insert latest changed pages; dispose of superseded pages in accordance with applicable regulations.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

Original	0	15 Jan 67
Change	1	20 Jul 67
Change	2	30 Oct 67
Change	3	23 Nov 67
Change	4	13 Jun 68
Change	5	24 Sep 68
Change	6	15 Feb 69
Change	7	23 May 69
Change	8	15 Oct 69
Change	9	2 Mar 70
Change	10	7 May 70
Change	11	15 Jan 71
Change	12	1 Apr 71
Change	13	15 Jun 71
Change	14	10 Apr 72
Change	15	18 Sep 72
Change	16	29 Jan 73
Change	17	10 Apr 74
Change	18	6 Jun 74

Total number of pages in this manual is 210 consisting of the following:

Page No.	# Change No.
Title	18
A	18
B	16
C Blank	16
i	0
ii	8
iii	12
iv	0
1-1 — 1-2	13
1-3	9
1-4 — 1-5	5
1-6	12
1-7	2
1-8	1
1-9	0
1-10 — 1-10A	13
1-10B Blank	13
1-11	13
1-12 — 1-13	0
1-14	10
1-15 — 1-16	13
1-17	9
1-18	12
1-19	2
1-20 — 1-21	13
1-22	18
1-23	14
1-24	13
1-24A	11
1-24B Blank	11
2-1	12
2-2	13
2-2A	12
2-2B Blank	12
2-3	12
2-4	7
2-4A	13
2-4B Blank	13
2-5 — 2-7	0
2-8	13
2-9	7
2-10	15
2-10A	9
2-10B	9
2-11	0
2-12 — 2-12A	13
2-12B Blank	13
2-13	15
2-14	13
2-15	14
2-16	15
2-17	12
2-18 Blank	12
3-1 — 3-4	14
3-5	9
3-6 — 3-6A	16
3-6B Blank	16
3-7 — 3-8	14
4-1	0
4-2	2
4-3	3
4-4 — 4-6	0
4-7	2
4-8	1
4-9	0
4-10	2
4-11 — 4-12	0
4-13	2
4-14 — 4-15	0
4-16	2
4-16A	2
4-16B Blank	2
4-17	0
4-18	17
4-19 - 4-23	0
4-24 — 4-26	3
4-27 — 4-29	0
4-30	3
4-31 — 4-34	0
4-34A	3
4-34B Blank	3
4-35	3
4-36	13
4-37	0
4-38	2
4-38A	3
4-38B — 4-38C	2
4-38D Blank	2
4-39	0
4-40	3
4-41	2
4-42	1
4-42A	13
4-42B	1
4-42C	13
4-42D	3
4-43 — 4-44	0
4-45	3
4-46	12
4-47	12
4-48 Blank	12
5-1 — 5-2	0
5-3 — 5-4	13
5-5 — 5-11	0
5-12	14
5-13	0
5-14 Blank	0
6-1	0
6-2	13
7-1	9
7-2 Blank	9
8-1	0
8-2 Blank	0
9-1 — 9-2	13
9-3	16
9-4	0
1A1-1	0
1A1-2 Blank	0

Zero in this column indicates an original page.

TABLE OF CONTENTS

READ this first...

SCOPE

This manual contains the necessary information for safe and efficient operation of the U-10A, U-10B, and U-10D aircraft. These instructions provide you with a general knowledge of the aircraft, its characteristics, and specific normal and emergency operating procedures. Your flying experience is recognized, and therefore, basic flight principles are avoided.

SOUND JUDGEMENT

Instructions in this manual are for a crew inexperienced in the operation of this aircraft. This manual provides the best possible operating instructions under most circumstances, but it is a poor substitute for sound judgement. Multiple emergencies, adverse weather, terrain, etc. may require modification of the procedures.

PERMISSIBLE OPERATIONS

The Flight Manual takes a "positive approach" and normally states only what you can do. Unusual operation or configurations (such as asymmetrical loading) are prohibited unless specifically covered herein. Clearance must be obtained from Hq. WRAMA, Attn: WRNEA, Robins AFB, Georgia before any questionable operation which is not specifically permitted in this manual is attempted.

STANDARDIZATION AND ARRANGEMENT

Standardization assures that the scope and arrangement of all Flight Manuals are identical. The manual is divided into 10 independent sections to simplify reading it straight through or using it as a reference manual.

SAFETY AND OPERATIONAL SUPPLEMENTS

Information involving safety will be promptly forwarded to you by Safety Supplements. TWX-type Safety Supplements covering loss of life (called Interim Safety Supplements), will get to you in 48 hours; those concerning serious damage to equipment within 10 days by mail (in a formal printed form). Operational information not involving safety but of an urgent nature will be forwarded to you by Operational Supplements. These will be forwarded by TWX (interim) or by mail (formal), depending on the urgency of the information. Interim supplements are normally replaced by formal printed supplements at an early date. Formal printed Supplements are identified by red letters "SS" for Safety Supplements and black letters "OS" for Operational Supplements printed around the borders of the pages. The currency of Safety Supplements and Operational Supplements affecting your aircraft and Flight Manual can be determined by referring to T.O. 0-1-1-5). The title block of each supplement and the title page or this manual should also be checked to determine the effect they may have on existing supplements. You must remain constantly aware of the status of all supplements - current supplements must be complied with, but there is no point in restricting your operation by complying with a replaced or rescinded supplement. As a further aid, supplement summaries for both Safety Supplements and Operational Supplements are included in this manual following the A page; however, these records can only be as current as this manual.

CHECKLISTS

The Flight Manual contains only amplified checklists. Abbreviated checklists have been issued as a separate technical order - see the back of the title page for the T.O. number of your latest checklist. Line items in the Flight Manual and checklists are identical with respect to arrangement and item number. Whenever a Safety Supplement affects the abbreviated checklist, write in the applicable change on the affected checklist page. As soon as possible, a new checklist page, incorporating the supplement, will be issued. This will keep handwritten entries of Safety Supplement information in your checklist to a minimum.

HOW TO GET PERSONAL COPIES

Each flight-crew member is entitled to a personal copy of the Flight Manual, Safety Supplements and Checklists. The required quantities should be ordered before you need them to assure their prompt receipt. Check with your supply personnel - it is their job to fulfill your Technical Order requests. You must order the required quantities in the Publication Requirement Table (T.O. 0-3-1). Technical Orders 00-5-1 and 00-5-2 give detailed information for properly ordering these publications. Make sure a system is established at your base to deliver these publications to the flight crews immediately upon receipt.

FLIGHT MANUAL AND CHECKLIST BINDERS

Loose leaf binders and sectionalized tabs are available for use with your manual. These are obtained through local purchase procedures and are listed in the Federal Supply Schedule (FSC Group 75, Office Supplies, Part 1). Binders are also available for carrying your abbreviated checklist. These binders contain plastic envelopes into which individual checklist pages are inserted. They are available in three capacities and are obtained through normal Air Force supply under the following stock list numbers: 7510-766-4268, -4269, and -4270 for 15, 25, and 40 envelope binders respectively. Check with your supply personnel for assistance in securing these items.

WARNINGS, CAUTIONS, AND NOTES

The following definitions apply to "Warnings" "Cautions", and "Notes" found through the manual.

WARNING Operating procedures, techniques, etc., which will result in personal injury or loss of life if not carefully followed.

CAUTION Operating procedures, techniques, etc., which will result in damage to equipment if not carefully followed.

NOTE An operating procedure, technique, etc., which is considered essential to emphasize.

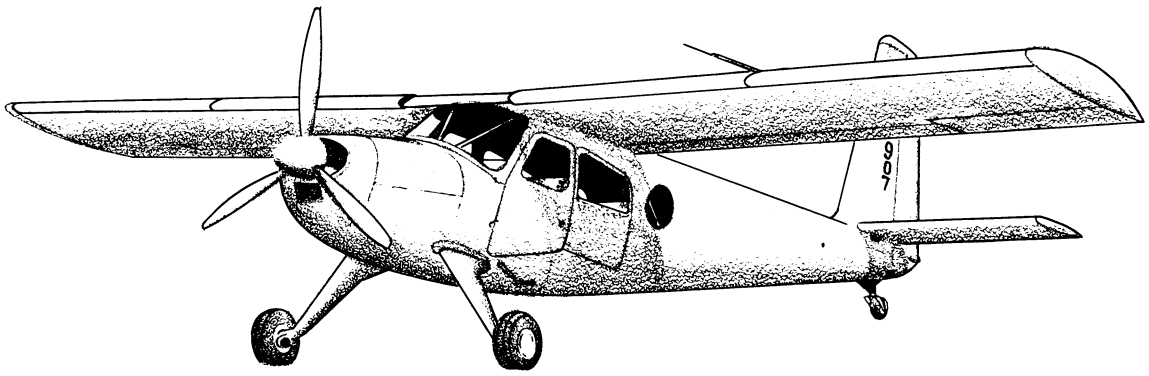
YOUR RESPONSIBILITY - LET US KNOW

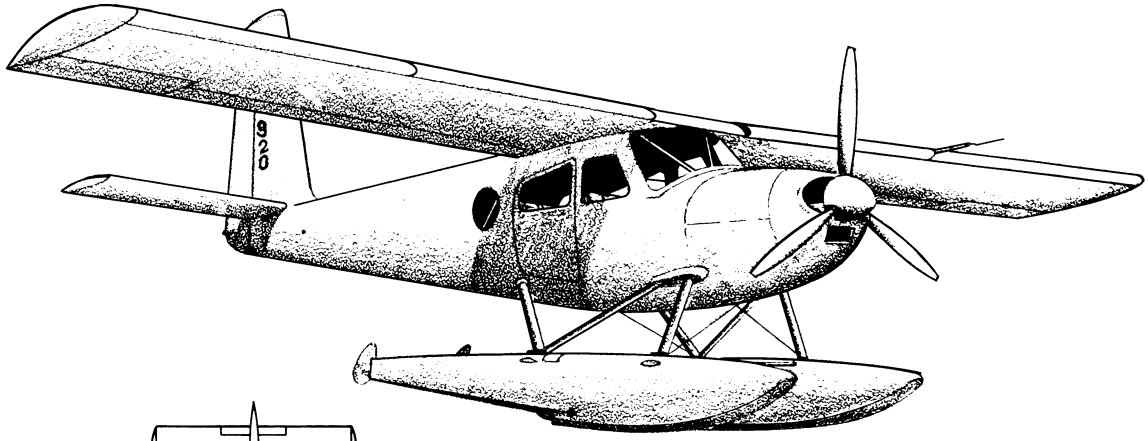
Every effort is made to keep the Flight Manual current. Review conferences with operating personnel, and a constant review of accident and flight test reports assure inclusion of the latest data in the manual. However, we cannot correct an error unless we know of its existence. In this regard, it is essential that you do your part. Comments, corrections, and questions regarding this manual or any phase of the Flight Manual program are welcomed. These should be forwarded through your Command Headquarters to WRAMA, Attn: WRNEA, Robins AFB, Georgia.

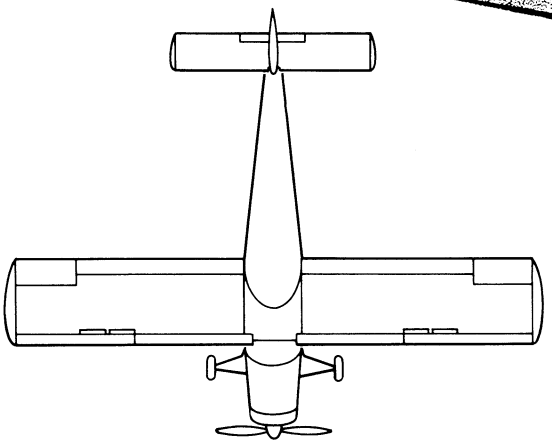
GROUP CODING

The information contained in this manual is applicable to both the U-10A, U-10B and U-10D aircraft. The following code symbols will be used throughout the manual to distinguish information which is applicable to only one group of aircraft from which is applicable to other groups. When a code symbol appears preceding a paragraph or in a sentence, then the information following will apply only to the group of aircraft represented by that symbol. When code symbols are not used, the information is applicable to all aircraft.

CODE SYMBOL	USAF SERIAL NO.	AIRCRAFT
A	62-3603 thru 62-3608	U-10A
A_1	63-13166 thru 63-13185	U-10A
B	62-5907 thru 63-8110	U-10B
B_1	62-5907 thru 62-5920	U-10B
B_2	63-8091 thru 63-8098	U-10B
B_3	63-13090 thru 63-13113	U-10B
B_4	63-13090 thru 63-13112	U-10B
B_5	62-5907, 62-5912, 62-5915, 62-5917	
B_6	63-8093	
B_8	62-5912, 62-5917 63-8093, 63-13097 thru 63-13099, 63-13103, 63-13105, 63-13108 63-13111, 63-13112	U-10B
D	66-14332 thru 66-14375	U-10D
D_1	66-14332 thru 66-14345	U-10D
D_2	66-14346 thru 66-14369	U-10D
D_3	66-14370 thru 66-14375	U-10D

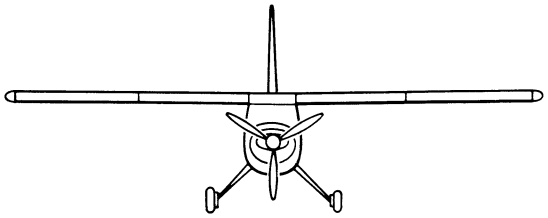


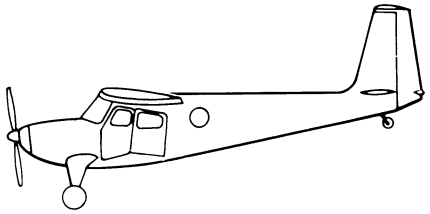




USAF & ARMY SERIES

U-10A
U-10B
&
U-10D
AIRCRAFT





LIST OF EFFECTIVE PAGES (CONTINUED)

Page No.	# Change No.	Page No.	# Change No.	Page No.	# Change No.
1A1-3 — 1A1-7	0				
1A1-8 Blank	0				
1A2-1	14				
1A2-2	0				
1A2-3	14				
1A2-4 Blank	14				
1A3-1	7				
1A3-2	15				
1A3-3 — 1A3-4	0				
1A3-5	8				
1A3-6 Blank	8				
1A4-1 — 1A4-3	0				
1A4-4 Blank	0				
1A5-1 — 1A5-3	0				
1A5-4 Blank	0				
1A6-1 — 1A6-4	0				
2A1-1	0				
2A1-2 Blank	0				
2A1-3 — 2A1-4	0				
2A3-1	7				
2A3-2 — 2A3-4	0				
2A3-5	7				
2A3-6 Blank	7				
2A4-1 — 2A4-3	0				
2A4-4 Blank	0				
2A5-1 — 2A5-2	0				
2A6-1 — 2A6-2	0				
Index I	12				
Index II	1				
Index III	16				
Index IV	16				
Index V	0				
Index VI Blank	0				

Section I DESCRIPTION

TABLE OF CONTENTS

THE AIRCRAFT

The aircraft is a single engine, high wing, five place monoplane, except aircraft coded D which is six place, manufactured by Helio Aircraft Corporation of Bedford, Mass. This all-metal (except for fabric covered ailerons) aircraft is designed as a liaison and light cargo aircraft to be operated from moderately rough, unprepared fields requiring short field takeoff and landing capabilities. The aircraft is characterized by a large, full cantilever wing and a forward mounted fixed landing gear. The fixed gear may be replaced by a twin float. Power is provided by a Lycoming six-cylinder, normally-aspirated engine driving a three-bladed Hartzell propeller. Dual flight controls are provided. Dual brakes are provided on aircraft coded A1, D. Aircraft without dual brakes shall only be taken off or landed from the copilot position when an instructor pilot occupies the pilot position.

OVERALL DIMENSIONS

The overall dimensions of the aircraft are:

Wing Span	39.0'
Length, Overall	30.7'
Height, Overall (tail wheel on ground)	8.8'

Refer to Section II (Figure 2-2) for turning radius and ground clearance.

GROSS WEIGHT

The design gross weight is 3000 pounds for A and B model aircraft and 3400 for D model aircraft. For gross weight limitations refer to Section V.

ENGINE

The aircraft is powered by a Lycoming GO-480-G1D6 engine with a takeoff rating at sea level of 295 horsepower. The six-cylinder, wet-sump normally-aspirated engine drives a three-blade Hartzell HG-93Z20-181-10151C-5, constant-speed propeller. Manually operated cowl flaps are installed to aid in controlling engine temperature.

CARBURETOR

Carburetion is furnished by a pressure type carburetor utilizing an automatic mixture control unit which operates up to an altitude of 30,000 feet. A manually operated primer is installed on the instrument panel to aid in engine starting.

MIXTURE CONTROL KNOB. The mixture control knob (Figures 1-5 and 1-6) is mechanically linked to the carburetor to provide fuel-air mixture control. The aircraft shall be operated at all times with the mixture control knob full forward (FULL RICH) to utilize the automatic mixture control which automatically compensates the fuel mixture at all flight altitudes. The engine is stopped when the mixture control knob is pulled aft to the IDLE CUTOFF position.

CARBURETOR AIR KNOB. The carburetor air knob (Figures 1-5 and 1-6) is linked to the carburetor air-induction box. When the knob is full forward, in the cold position, the engine is supplied with filtered air at ambient temperature. Pulling the knob aft allows warm air to mix with ambient air before entering the carburetor. When the knob is in the full out position, only warm air is supplied to the carburetor. An indication of carburetor heat on aircraft coded A1 is provided by the carburetor air temperature gage. On all other aircraft an indication of heat is obtained by observing a drop in manifold pressure and engine rpm after applying carburetor heat.

THROTTLE. Engine power is controlled by the throttle control knob (Figures 1-5 and 1-6), located in the center of the instrument panel, within easy reach of both the pilot and copilot. The throttle is attached to a flexible cable control, which is routed through the firewall and connected to the carburetor throttle control arm. Pulling the throttle aft to the closed position idles the engine. Pushing the throttle forward increases engine speed. The throttle has a built-in friction lock which retains the throttle in any selected position and prevents engine speed changes in flight.

ENGINE COOLING

Engine cooling is controlled by cowl flaps, located on the lower cowling immediately forward of the

MAIN DIFFERENCES TABLE

ITEM	GROUP CODING
60 GALS. FUEL CAPACITY	A1
120 GALS. FUEL CAPACITY	A B B3 D
PARA-DROP DOOR	A1 B B3 D
SEATING CAPACITY 2 SEATS	B4 B5 B6
SEATING CAPACITY 4 SEATS	A1 B
SEATING CAPACITY 5 SEATS	A B3
SEATING CAPACITY 6 SEATS	D
LITTER DOOR	A
TAIL WHEEL LOCK	A1 B D
AIRBORNE LOUDSPEAKER SYSTEM	B4 B5 B6

ITEM	GROUP CODING
ARMAMENT SYSTEM	B8
EXTERNAL POWER RECEPTACLE	A A1 B3 D
RELIEF TUBE	A1 B B3 D
UHF EQUIPMENT NOT INSTALLED	B2 B3
FAC CONFIGURATION	B1
100 AMP GENERATOR	A1 B1 D
FUSELAGE AUX. FUEL TANK (25 GAL.)	B3
DUAL BRAKE SYSTEM	A1 D
TACAN EQUIPMENT	D3

A U-10A A/C S.N. 62-3603▶62-3608

A1 U-10A A/C S.N. 63-13166▶63-13185 (ARMY)

B U-10B A/C S.N. 62-5907▶63-8110

B1 U-10B A/C S.N. 62-5907▶62-5920

B2 U-10B A/C S.N. 63-8091▶63-8098

B3 U-10B A/C S.N. 63-13090▶63-13113 (ANG)

B4 U-10B A/C S.N. 63-13090▶63-13112

B5 U-10B A/C S.N. 62-5907, 62-5912, 62-5915, 62-5917

B6 U-10B A/C SN. 63-8093

D1 U-10D A/C S.N. 66-14332▶14345

D2 U-10D A/C S.N. 66-14346▶66-14369

D3 U-10D A/C S.N. 66-14370▶66-14375

B8 Aircraft Modified by T.O. 1U-10B-510

Figure 1-1.

firewall. A push-pull cowl flap handle (Figures 1-5 and 1-6) is mechanically linked through a flexible cable control to the cowl flap. The cowl flap handle is actuated by depressing a knob located in the center of the handle and moving the handle either forward or aft. Moving the handle forward closes the cowl flap, thus reducing air flow through the engine cowling to a minimum and increasing the engine cylinder head temperature. Pulling the handle aft toward the OPEN position progressively opens the cowl flap to allow an increase in air flow through the engine cowling, thus lowering engine cylinder head temperature. The handle is locked in any selected position when the knob in the center of the handle is released.

IGNITION SYSTEM

The engine utilizes a dual ignition system which operates independently from the aircraft's electrical system. Two magnetos are installed on the engine and are controlled individually by a single magneto switch located in the cockpit. Two spark plugs are provided for each cylinder. Each magneto supplies high-voltage current to one spark plug in each cylinder. The left magneto incorporates an impulse controling that is used when starting the engine.

On A and B model aircraft a key-locked ignition switch (41, Figure 1-5) marked OFF, R, L and BOTH, is located on the instrument panel. With the switch in the OFF position, both magnetos are grounded and the engine will not fire. When the switch is rotated to the R (right) position, the right magneto supplies high-voltage current to one set of spark plugs. When the switch is rotated to the L (left) position of starting, the left magneto, containing an impulse coupling, supplies high-voltage current to the other set of spark plugs. Placing the switch in the BOTH position supplies high-voltage current to both sets of spark plugs. The switch is placed in the BOTH position for normal operation. On aircraft coded D, a key-locked ignition switch (43, Figure 1-6) marked OFF, R, L, BOTH and START PUSH is located on the instrument panel. The electrical functions of the switch, with the exception of START PUSH, are the same as other coded aircraft.

ENGINE PRIMER

Engine priming is accomplished by actuating the engine primer (Figures 1-5 and 1-6), located on the instrument panel. The positive-action primer is hand actuated and delivers a steady, even flow of fuel to the engine primer harness with each stroke of the primer. Fuel is injected into each of the four aft cylinders only. The front two cylinders are not primed.

GENERAL ARRANGEMENT AND SERVICING DIAGRAM

SPECIFICATIONS

ENGINE OIL SPECIFICATION MIL-L-22851	NATO SYMBOL
Below 40 (degree) F Type III (Grade 1065)	O-123
Above 40 (degree) F Type II (Grade 1100)	O-128

NOTE

Fill engine to "FULL" mark on OIL DIPSTICK.

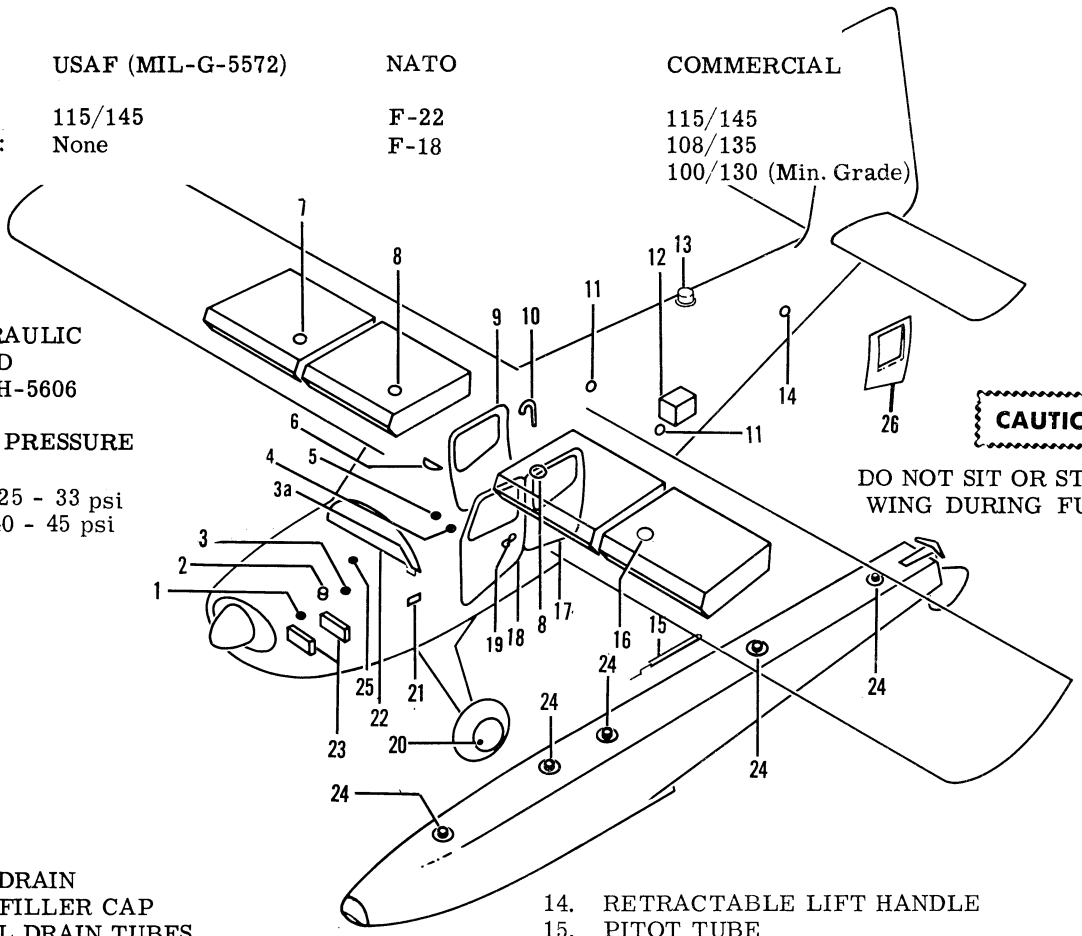
FUEL

	USAF (MIL-G-5572)	NATO	COMMERCIAL
	115/145	F-22	115/145
Alternate:	None	F-18	108/135
			100/130 (Min. Grade)

HYDRAULIC FLUID MIL-H-5606

TIRE PRESSURE

Main 25 - 33 psi
Tail 40 - 45 psi



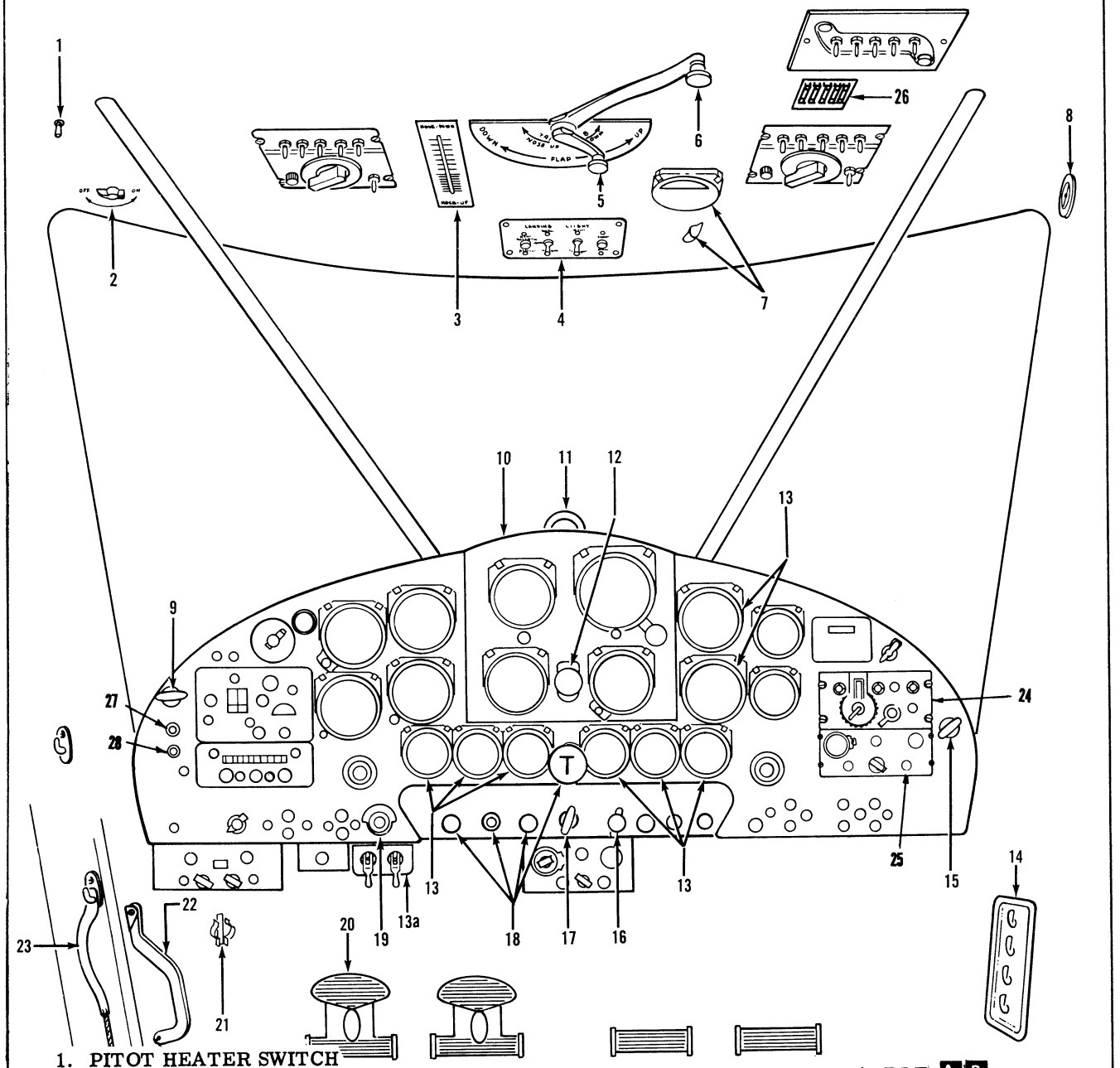
CAUTION

DO NOT SIT OR STAND ON WING DURING FUELING

1. OIL DRAIN
2. OIL FILLER CAP
3. FUEL DRAIN TUBES
3A. PITOT/STATIC DRAIN PANEL A B1 B2 B3 D
4. STRAINER DRAIN (AUX TANKS) A B B3 D
5. STRAINER DRAIN (MAIN TANKS)
6. TRIM TAB AND FLAP CONTROL PANEL
7. RIGHT AUXILIARY FUEL FILLER CAP A B B3
8. MAIN TANK FUEL FILLER CAPS
9. PASSENGER COMPARTMENT DOOR
10. FUEL VENT
11. STATIC PORTS
12. BATTERY
13. ANTI-COLLISION LIGHT
14. RETRACTABLE LIFT HANDLE
15. PITOT TUBE
16. LEFT AUXILIARY FUEL FILLER CAP A B B3 D
17. LITTER DOOR A PARA-DROP DOOR A1 B B3 D
18. PILOT COMPARTMENT DOOR
19. RELIEF TUBE DRAIN A1 B B3 D
20. TIRE FILLER VALVE
21. EXTERNAL POWER RECEPTACLE A A1 B3 D
22. INSTRUMENT PANEL
23. INDUCTION AIR FILTERS
24. FLOAT INSPECTION COVERS
25. STRAINER DRAIN D
26. AIRBORNE LOUDSPEAKER DOOR B4 B5 less B6

Figure 1-2.

TYPICAL FLIGHT COMPARTMENT U-10A AND U-10B



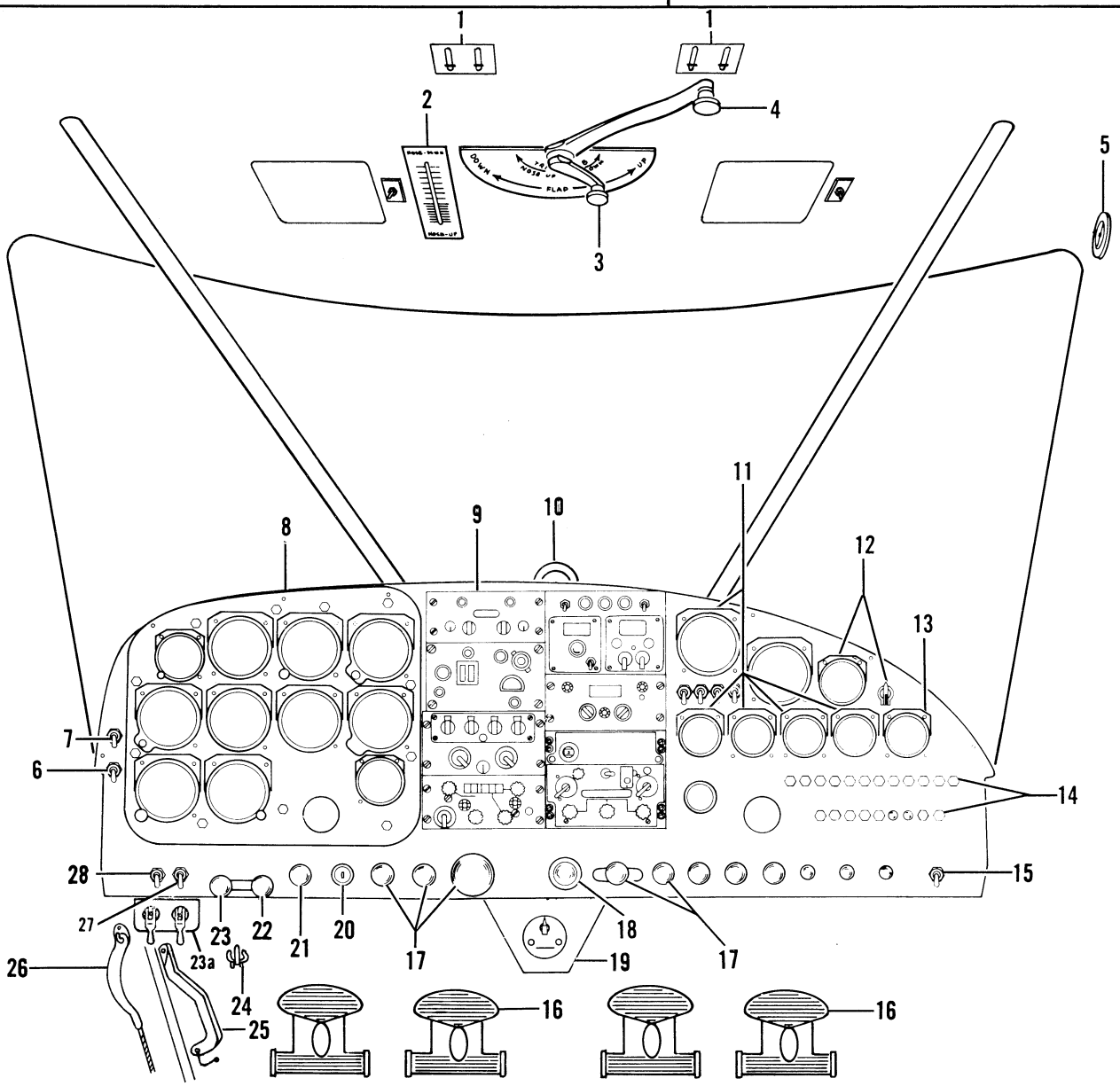
1. PITOT HEATER SWITCH
2. INTERCONNECTING FUEL LINE VALVE SWITCH
3. TRIM TAB POSITION INDICATOR
4. LANDING LIGHT CONTROL PANEL
5. TRIM TAB CRANK
6. WING FLAP CRANK
7. DC VOLTMETER AND SELECTOR SWITCH B1
8. AMBIENT AIR TEMPERATURE GAUGE
9. CROSS-WIND LANDING GEAR LOCK HANDLE
10. BASIC FLIGHT INSTRUMENTS
11. STANDBY COMPASS
12. PROPELLER CONTROL KNOB
13. ENGINE INSTRUMENTS

■ 13A. PITOT/STATIC DRAIN PANEL A B1 B2 B3

14. FUEL SELECTOR PANEL B B3 A
15. TAIL WHEEL LOCK HANDLE A1 B
16. COWL FLAP HANDLE
17. PARKING BRAKE HANDLE
18. ENGINE CONTROLS
19. IGNITION SWITCH
20. RUDDER - BRAKE PEDAL
21. MICROPHONE CLIP
22. JETTISONABLE DOOR HANDLE
23. WATER RUDDER RETRACT HANDLE
24. AN/ARC-44 CONTROL UNIT — B4
25. AN/ARC-27 CONTROL UNIT — B4
26. SPARE FUSE PANEL — B4
27. ARC-44 10 AMP FUSE — B4
28. ARC-27 25 AMP FUSE — B4

Figure 1-3.

TYPICAL FLIGHT COMPARTMENT U-10D



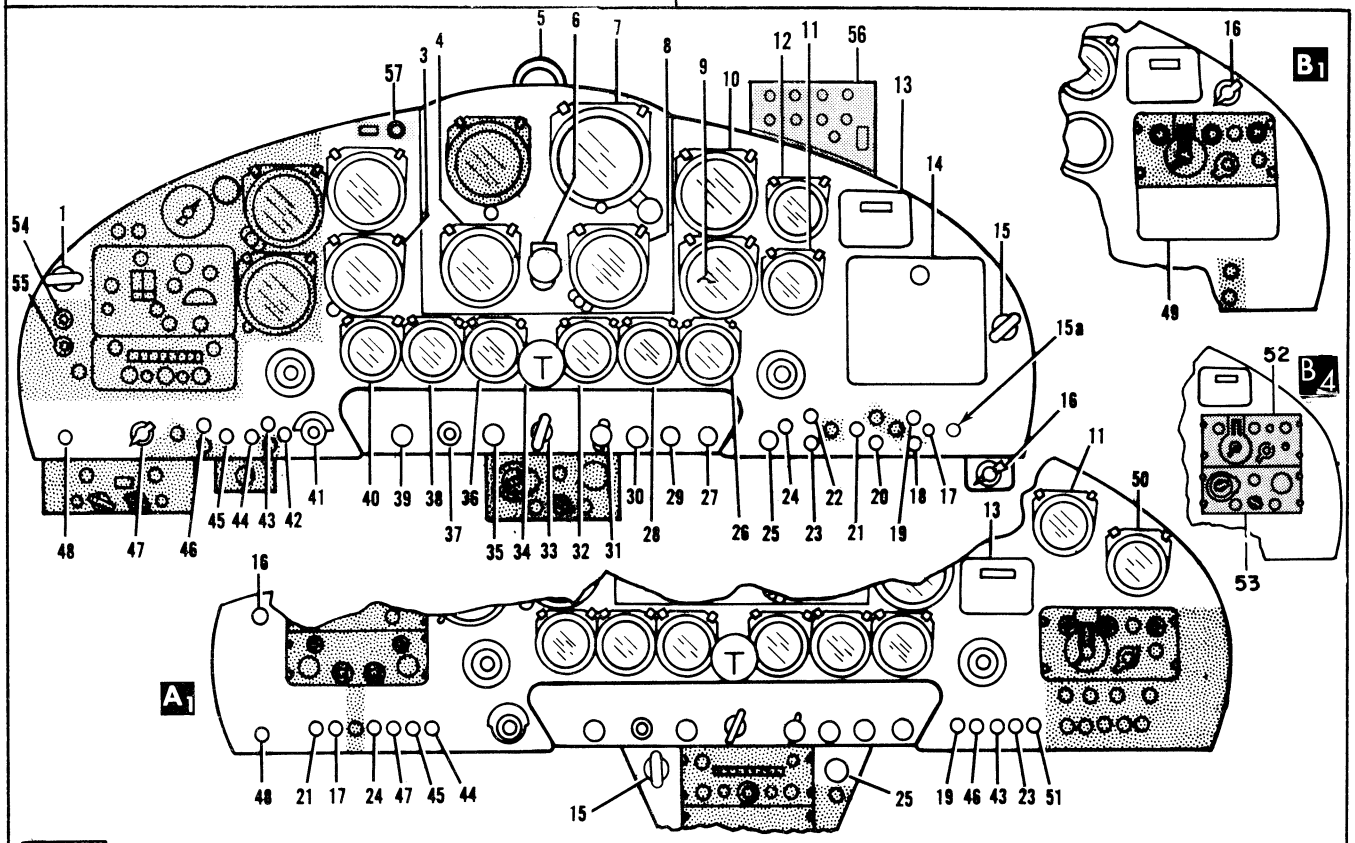
1. FUEL SELECTOR
2. TRIM TAB POSITION INDICATOR
3. TRIM TAB CRANK
4. WING FLAP CRANK
5. AMBIENT AIR TEMPERATURE GAGE
6. LANDING LIGHT SWITCH
7. TAXI LIGHT SWITCH
8. BASIC FLIGHT INSTRUMENTS
9. COMMUNICATION AND NAVIGATION EQUIPMENT
10. STANDBY COMPASS
11. ENGINE INSTRUMENTS
12. FUEL QUANTITY GAGE AND SELECTOR SWITCH
13. AMMETER
14. CIRCUIT BREAKERS
15. AIRBORNE SPEAKER SWITCH
16. RUDDER-BRAKE PEDAL
17. ENGINE CONTROLS
18. PROPELLER CONTROL KNOB
19. AUTO-PILOT
20. IGNITION SWITCH
21. PARKING BRAKE HANDLE
22. TAIL WHEEL LOCK HANDLE
23. CROSS-WIND LANDING GEAR LOCK HANDLE

■ 23A. PITOT/STATIC DRAIN PANEL

24. MICROPHONE CLIP
25. JETTISONABLE DOOR HANDLE
26. WATER RUDDER RETRACT HANDLE
27. GENERATOR SWITCH
28. MASTER SWITCH

Figure 1-4.

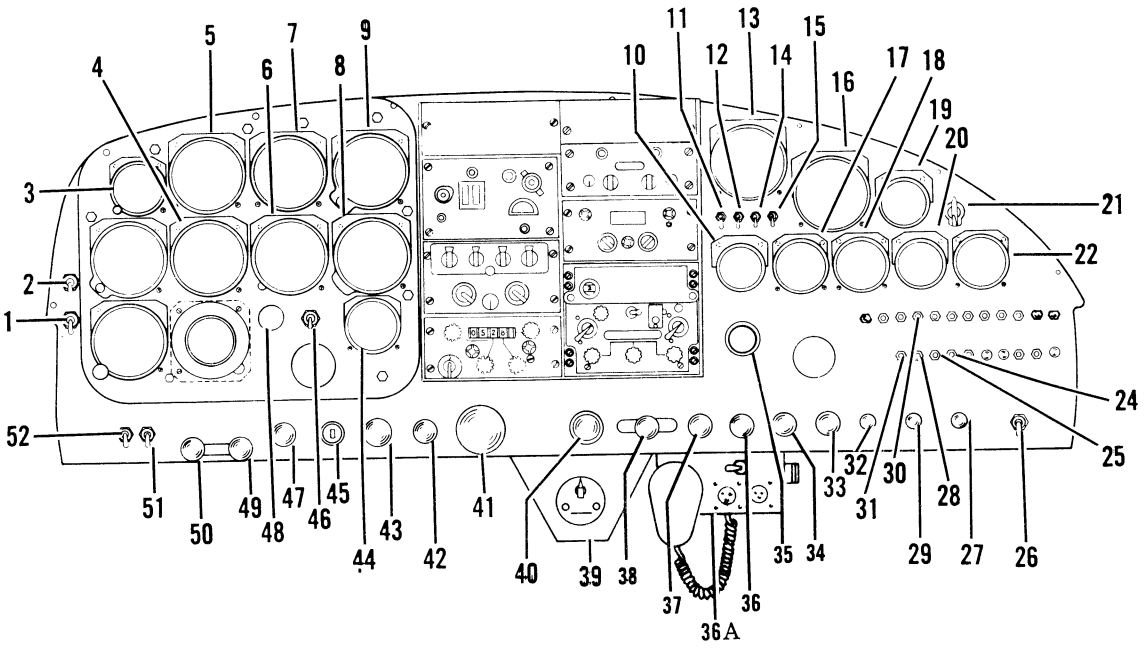
INSTRUMENT PANEL A B B4 B8



1. CROSSWIND LANDING GEAR LOCK HANDLE
2. AIRSPEED INDICATOR
3. ALTIMETER
4. TURN-AND-SLIP INDICATOR
5. STANDBY COMPASS
6. PROPELLER CONTROL KNOB
7. ATTITUDE INDICATOR
8. VERTICAL VELOCITY INDICATOR
9. MANIFOLD PRESSURE GAGE
10. TACHOMETER
11. SUCTION GAGE
12. CLOCK
13. ASH TRAY
14. GLOVE COMPARTMENT
15. TAIL WHEEL LOCK HANDLE A1 B
15a. ANTI-COLLISION LIGHT FUSE. ALL LESS A1
16. RIM LIGHTS CONTROL KNOB
17. ANTI-COLLISION LIGHT SWITCH
    ANTI-COLLISION CKT BKR SWITCH A1
18. PITOT HEATER FUSE (10 AMP) CKT BKR A1
19. RIM LIGHTS FUSE (5 AMP) CKT BKR A1
20. NAVIGATION LIGHTS FUSE (5 AMP) CKT BKR A1
21. NAVIGATION LIGHTS SWITCH
    NAVIGATION LIGHTS CKT BKR SWITCH A1
22. FUEL PUMP FUSE (10 AMP) CKT BKR A1
23. FUEL QUANTITY FUSE (10 AMP) CKT BKR A1
24. ELECTRIC FUEL PUMP SWITCH
    (FUEL PUMP CKT BKR SWITCH A1)
25. DEFROSTER CONTROL KNOB
26. FUEL QUANTITY INDICATOR
27. CABIN HEAT CONTROL KNOB
28. FUEL PRESSURE GAGE
29. CABIN AIR CONTROL KNOB
30. CARBURETOR AIR CONTROL KNOB
31. COWL FLAP HANDLE
32. CYLINDER HEAD TEMP. GAGE
33. PARKING BRAKE HANDLE
34. THROTTLE CONTROL KNOB
35. MIXTURE CONTROL KNOB
36. AMMETER
37. STARTER SWITCH
38. OIL TEMP. GAGE
39. ENGINE PRIMER
40. OIL PRESSURE GAGE
41. IGNITION SWITCH
42. TURN-AND-SLIP PRIMARY POWER SWITCH
43. TURN-AND-SLIP FUSE (5 AMP) CKT BKR A1
44. GENERATOR SWITCH
45. MASTER SWITCH
46. PANEL LIGHTS FUSE CKT BKR A1
47. FUEL QUANTITY MONITOR SWITCH
48. PANEL LIGHTS RHEOSTAT
49. SPARE FUSE PANEL B1
50. CARBURETOR AIR TEMP. GAGE A1
51. CARBURETOR AIR CKT BKR A1
52. AN/ARC-44 CONTROL UNIT- B4
53. AN/ARC-27 CONTROL UNIT- B4
54. ARC-44 10 AMP FUSE- B4
55. ARC-27 25 AMP FUSE- B4
56. Armament Control Panel - B8
57. Emergency Salvo Button - B8

Figure 1-5.

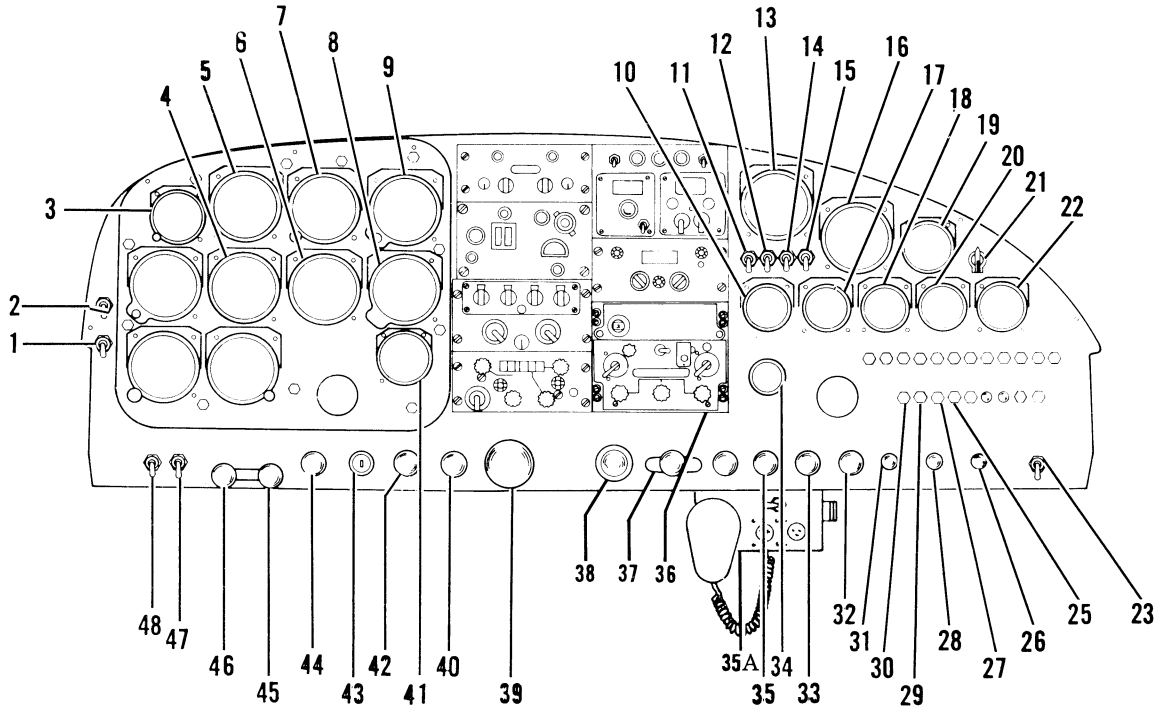
INSTRUMENT PANEL P1 P3



1. LANDING LIGHT SWITCH
2. TAXI LIGHT SWITCH
3. CLOCK
4. RATE OF CLIMB INDICATOR
5. AIRSPEED INDICATOR
6. SLAVED GYRO
7. GYRO HORIZON
8. TURN & BANK INDICATOR
9. ALTIMETER
10. OIL PRESSURE GAGE
11. ELECTRIC FUEL PUMP SWITCH
12. NAVIGATION LIGHTS SWITCH
13. MANIFOLD PRESSURE GAGE
14. ANTI COLLISION LIGHTS SWITCH
15. PITOT HEAT SWITCH
16. TACHOMETER
17. OIL TEMP. GAGE
18. CYLINDER HEAD TEMP. GAGE
19. FUEL QUANTITY GAGE
20. FUEL PRESSURE GAGE
21. FUEL QUANTITY SELECTOR SWITCH
22. AMMETER
23. DELETED
24. FUEL QUANTITY CKT BKR
25. PANEL LIGHTS CKT BKR
26. AIRBORNE SPEAKER SWITCH
27. RADIO LIGHTS RHEOSTAT
28. INSTRUMENT LIGHTS CKT BKR
29. PANEL LIGHTS RHEOSTAT
30. INSTRUMENT RELAY CKT BKR
31. TURN & SLIP CKT BKR
32. INSTRUMENT LIGHTS RHEOSTAT
33. DEFROSTER CONTROL KNOB
34. CABIN HEAT CONTROL KNOB
35. GYRO FILTER
36. COLD AIR CONTROL KNOB
36A. MICROPHONE & RECORDER SELECTOR PNL
37. CARBURETOR HEAT CONTROL KNOB
38. COWL FLAP CONTROL KNOB
39. AUTOPILOT
40. PROPELLER CONTROL KNOB
41. THROTTLE CONTROL KNOB
42. MIXTURE CONTROL KNOB
43. ENGINE PRIMER
44. VACUUM GAGE
45. IGNITION-START SWITCH
46. CD-4 CKT BKR SWITCH
47. PARKING BRAKE KNOB
48. SLAVING INDICATOR
49. TAIL WHEEL LOCK CONTROL
50. CROSS WIND LANDING GEAR LOCK CONTROL
51. GENERATOR SWITCH
52. MASTER SWITCH

Figure 1-6. (Sheet 1 of 2)

INSTRUMENT PANEL D2



1. LANDING LIGHT SWITCH
2. TAXI LIGHT SWITCH
3. CLOCK
4. RATE OF CLIMB INDICATOR
5. AIRSPEED INDICATOR
6. DIRECTIONAL GYRO
7. GYRO HORIZON
8. TURN & BANK INDICATOR
9. ALTIMETER
10. OIL PRESSURE GAGE
11. ELECTRIC FUEL PUMP SWITCH
12. NAVIGATION LIGHT SWITCH
13. MANIFOLD PRESSURE GAGE
14. ANTI-COLLISION LIGHT SWITCH
15. PITOT HEAT SWITCH
16. TACHOMETER
17. OIL TEMP. GAGE
18. CYLINDER HEAD TEMP. GAGE
19. FUEL QUANTITY GAGE
20. FUEL PRESSURE GAGE
21. FUEL QUANTITY SELECTOR SWITCH
22. AMMETER
23. AIRBORNE SPEAKER SWITCH
24. DELETED
25. FUEL QUANTITY CKT BKR
26. RADIO LIGHTS RHEOSTAT
27. PANEL LIGHTS CKT BKR
28. PANEL LIGHTS RHEOSTAT
29. INSTRUMENT LIGHTS CKT BKR
30. TURN AND SLIP CKT BKR
31. INSTRUMENT LIGHTS RHEOSTAT
32. DEFROST CONTROL KNOB
33. CABIN HEAT CONTROL KNOB
34. GYRO FILTER
35. COLD AIR CONTROL KNOB
35A. MICROPHONE & RECORDER SELECTOR PNL
36. CARBURETOR HEAT CONTROL KNOB
37. COWL FLAP CONTROL KNOB
38. PROPELLER CONTROL KNOB
39. THROTTLE CONTROL KNOB
40. MIXTURE CONTROL KNOB
41. VACUUM GAGE
42. ENGINE PRIMER
43. IGNITION-START SWITCH
44. PARKING BRAKE KNOB
45. TAIL WHEEL LOCK CONTROL
46. CROSSWIND LANDING GEAR LOCK CONTROL
47. GENERATOR SWITCH
48. MASTER SWITCH

Figure 1-6. (Sheet 2 of 2)

STARTER SWITCH

A starter switch button (37, Figure 1-5) is located on the instrument panel for all aircraft except code D. Depressing the starter switch button energizes the direct-drive starting motor. Releasing the starter switch button breaks the circuit, and the starting motor is de-energized. No external power receptacle is provided on aircraft coded B, therefore, battery power must be conserved during cold weather starting. On aircraft coded D the starter switch is on the ignition switch. By turning to START and PUSHING the key, the ignition switch energizes the direct-drive starting motor. When the key is released, the circuit is opened and the ignition switch returns to BOTH.

ENGINE INSTRUMENTS

TACHOMETER. The tachometer (Figures 1-5 and 1-6), incorporating an engine hour-meter, is installed on the instrument panel to indicate engine speed and engine time. The tachometer is calibrated in revolutions-per-minute. Each increment on the instrument face is equal to 100 rpm. The tachometer is mechanically driven by a flexible tachometer shaft connected to the engine gear case.

MANIFOLD PRESSURE GAGE. The manifold pressure gage (Figures 1-5 and 1-6) is located on the co-pilot's side of the instrument panel. The instrument is calibrated from 10 to 50 inches Hg and indicates the pressure of the fuel-air mixture entering the engine cylinders.

OIL PRESSURE GAGE. The oil pressure gage (Figures 1-5 and 1-6) is located on the instrument panel. The instrument is calibrated from 0 - 100 psi and indicates engine oil pressure. Oil pressure is transmitted through a direct pressure line from the oil pump, located on the left side of the engine, to the indicator.

OIL TEMPERATURE GAGE. The oil temperature gage (Figures 1-5 and 1-6) is located on the instrument panel. The instrument is calibrated from 60° to 260° Fahrenheit and indicates engine oil temperature. Oil temperature is sensed by a stem-sensitive resistance bulb, located in the oil pump on the left side of the engine.

FUEL PRESSURE GAGE. The fuel pressure gage (Figures 1-5 and 1-6) is located on the instrument panel. The instrument is calibrated from 0 to 15 psi and indicates fuel pressure delivered to the carburetor. Pressure is transmitted from the carburetor through a direct hose to the instrument.

CYLINDER HEAD TEMPERATURE GAGE. The cylinder head temperature gage (Figures 1-5 and 1-6), located on the instrument panel, indicates the operating temperature of cylinder number 5. A thermocouple transmits the heat indication to the temperature gage which is calibrated from 0° to 600° Fahrenheit.

CARBURETOR AIR TEMPERATURE GAGE. A The carburetor air temperature gage (Figures 1-5 and 1-6), indicates the temperature of ambient air entering the carburetor. A stem-sensitive resistance bulb located in the forward carburetor air induction box, transmits temperature readings to the gage located on the instrument panel. The gage is marked with a yellow arc from 55°C to 74°C. A red line at 74°C indicates the maximum allowable operating temperature.

PROPELLER

The aircraft is equipped with a Hartzell three-blade, constant-speed, all-metal propeller. Constant speed control of the propeller is maintained by a governor, installed on the nose case of the engine and actuated by a push-pull control rod. A setting, introduced into the governor by the pilot, establishes the engine speed to be maintained, and the governor then controls the flow of engine oil, boosted to high pressure by the governing pump, to or from the piston in the propeller hub. Oil pressure, directed against the piston in the propeller hub, moves the piston forward, and a pitch-change linkage, connected between the piston and blades, turns the blades toward low pitch (high rpm). When oil pressure from the governor to the propeller piston is relieved, centrifugal force, acting on the propeller counter-weights, turns the blades toward high pitch (low rpm).

PROPELLER CONTROL KNOB

The propeller control knob (Figures 1-5 and 1-6) is located in the center of the instrument panel. The knob is attached to a flexible shaft which controls the governor. When the knob is pushed full forward, the propeller blade angle is decreased and high rpm is obtained. The knob must be in the INCREASE RPM (full forward) position during takeoff. Use vernier control at all speeds above 2200 rpm. Pulling the knob aft progressively provides increased pitch and decreased rpm. THE PROPELLER CANNOT BE FEATHERED. In the full DECREASE RPM position (knob full aft), propeller drag is at a minimum.

OIL SUPPLY SYSTEM

Ten quarts of engine lubricating oil is carried in the engine oil sump. Oil is drawn into the gear-type oil pump and passed through the suction and oil pressure screens to the oil cooler inlet. The oil cooler is equipped with a thermostat control valve which controls oil temperature. Oil from the oil cooler is then forced through the engine for lubricating purposes and is returned to the engine oil sump. A combination oil filler cap and dipstick is located on top of the engine and is reached through an access door on top of the engine cowl. The oil is drained from the engine by reaching through an access door on the lower cowl and actuating a drain valve located on the lower aft side of the engine sump. See Figure 1-2 for oil grade and specifications

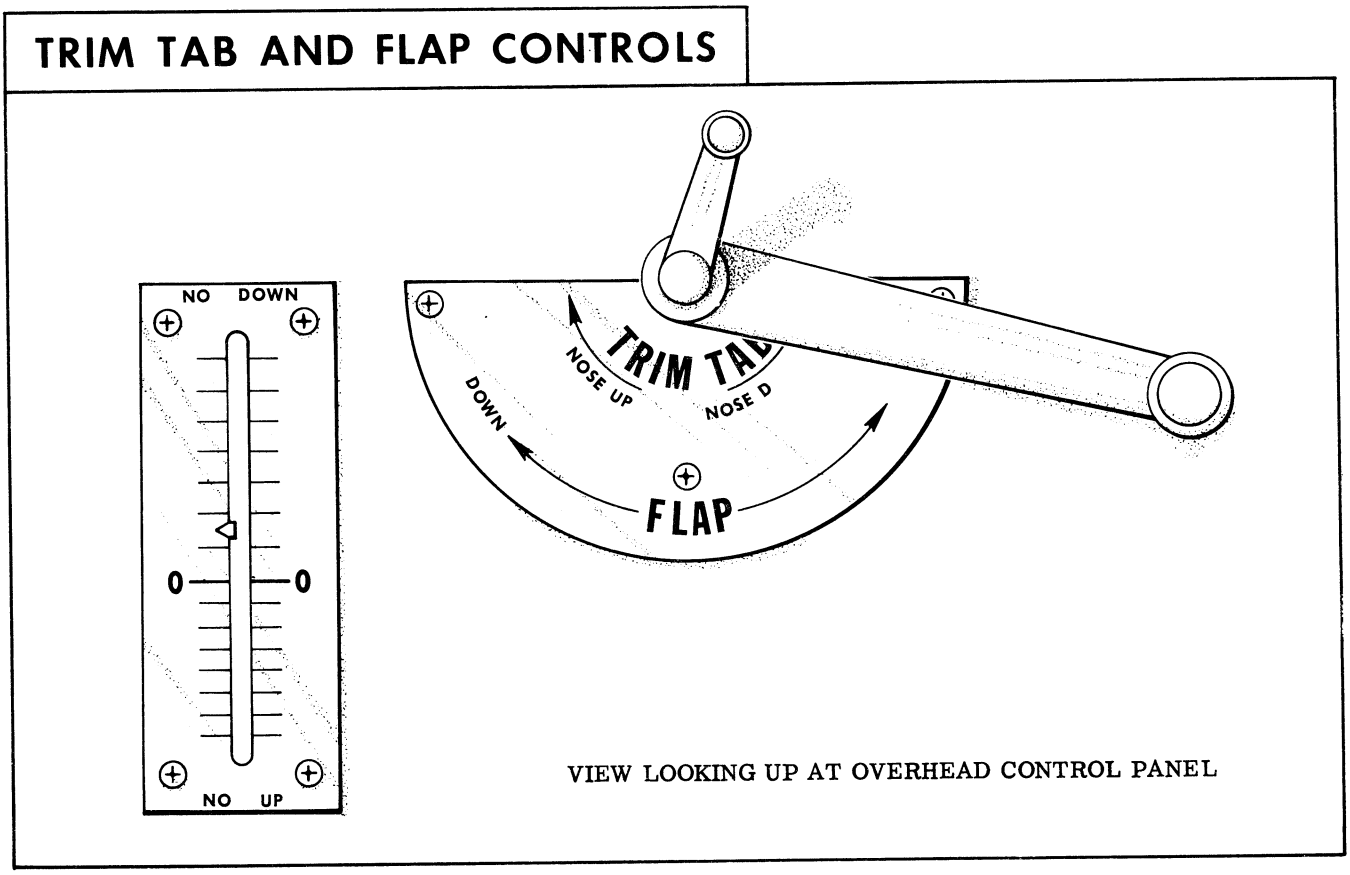


Figure 1-7.

FUEL SUPPLY SYSTEM

Fuel is contained in the main tank and two auxiliary tanks located in the wing, see Figures 1-8, 1-9 and 1-10. A fuselage auxiliary fuel tank holding 25.0 gallons of usable fuel may be installed in the passenger compartment area on aircraft coded B3 .

NOTE

The installation of the 25.0 gallon fuselage auxiliary fuel tank is not approved from an engineering standpoint, and should be used only for ferrying. With this tank installed the aircraft is restricted to normal flight maneuvers with no smoking and flight crew restricted to essential personnel.

A shutoff valve labeled AUX. FUSE is located on the fuel selector panel (14, Figure 1-3). The tanks are not interconnected but supply fuel to the engine as selected on the fuel selector panel. On A and B model aircraft ashutoff valve, labeled INTERCONNECTING FUEL LINE VALVE is located on the pilot's overhead control apnel. Should one of the two cells comprising the main tank be damaged and a leak occur, the shutoff valve shall be placed in the OFF position. This prevents interflow from the undamaged cell to the damaged cell. The interconnecting fuel line valve switch is normally left in the ON position. The main tank is comprised of two fuel cells, each holding 29. 10 gallons of fuel to make a total of 58. 2 gallons of usable fuel. Each main tank fuel cell is filled through its respective filler cap, located in the upper wing surface, and vented through a tube extending above the upper fuselage skin. On D aircraft, the main and auxiliary fuel tanks are vented thru two overboard vents, located on the upper wing surface, extending thru the wing root gap cover. See figure 1-10 On aircraft A B B3 D the left auxiliary (L. H. AUX) and right auxiliary (R.H.AUX.) fuel tanks each hold 29.10 gallons of usable fuel. The auxiliary tanks are not interconnected but are controlled by their respective fuel shutoff valves, located on the fuel selector panel. Each auxiliary tank is filled through its respective filler cap, located on the upper wing surface. On aircraft A B B3, auxiliary tanks are vented through a tube extending outboard and thru the aft lower wing surface. On all aircraft, a return line returns fuel vapor and unused fuel from the carburetor to the right main fuel cell of the main fuel tank. Fuel level unbalance can be expected, however engine will receive fuel under all conditions. The fuselage auxiliary fuel tank is filled through a filler cap lo-

cated on the tank. On aircraft coded **D** the main and auxiliary fuel system (Figure 1-10) consists of four bladder type wing cells (two in each wing). Capacity of each fuel cell is 30.35 U.S. gallons. The fuel cells are not interconnected, however, manually operated valves accessible to the pilot and copilot will allow

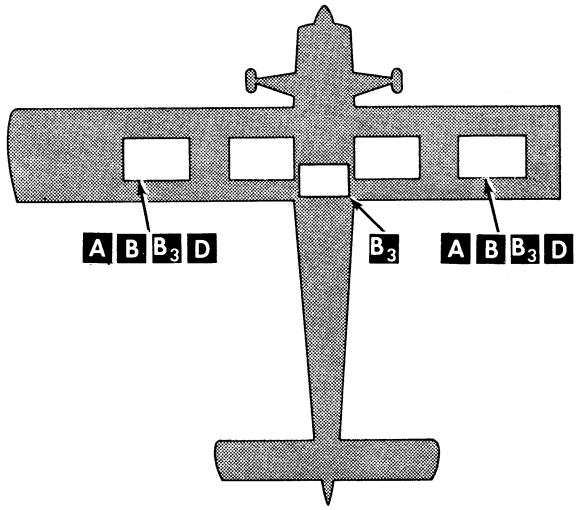
FUEL QUANTITY DATA TABLE

U. S. GALLONS AND POUNDS

NOTE

Multiply U. S. Gallons by 6.0 to Obtain Pounds. (Standard Day)

* If aircraft is equipped with Polyurethane Foam Baffles in fuel cells, the usable fuel is reduced by approximately 5%.



CODE	TANK	USEABLE FUEL IN MANEUVERING FLIGHT		USEABLE FUEL IN LEVEL FLIGHT		FULLY SERVICED	
		GALLONS	POUNDS	GALLONS	POUNDS	GALLONS	POUNDS
	MAIN	58.2	349.2	60.7	364.2	60.7	364.2
A B B3 D	L.H. AUX	29.1	174.6	30.4	182.4	30.4	182.4
A B B3 D	R.H. AUX	29.1	174.6	30.4	182.4	30.4	182.4
B3	AUX. FUSELAGE	25.0	150.0	25.0	150.0	25.0	150.0
B3	TOTAL ALL TANKS	* 141.4	* 848.4	* 146.5	* 879.0	* 146.5	879.0
A B D	TOTAL ALL TANKS	* 116.4	* 698.4	* 121.5	* 729.0	121.5	729.0

Figure 1-8.

fuel to be used from any combination of cells. In the event of damage to any cell, that cell may be isolated from the system. Some aircraft have Polyurethane Foam Baffles installed in both the main and auxiliary fuel tanks. In the event of damage such as that caused by gunfire, the foam acts as an explosion suppressant. Fuel quantity in each tank may be monitored by means of a selector switch.

WARNING

On aircraft coded D it is possible for fuel to transfer through open fuel selector valves. When parking an aircraft, ensure that all fuel selector valves are closed.

FUEL SELECTOR PANEL

On all aircraft, except D, the fuel selector panel (Figures 1-11 and 1-12) is located on the right side of the cabin next to the copilot's seat. The panel contains four shutoff valves which are used to control and manage the flow of fuel to the engine. The valve labeled MAIN 58.2 GAL. USABLE controls the flow of fuel from the main fuel tank. The two valves labeled L.H. AUX. and R.H. AUX. control the flow of fuel from the left auxiliary and right auxiliary tanks, respectively. The valve labeled AUX. FUSE. controls the flow of fuel from the fuselage auxiliary fuel tank when installed. On aircraft coded D, four manually operated levers located on the overhead control panel operate the fuel shutoff valve for each cell.

FUEL SYSTEM SCHEMATIC

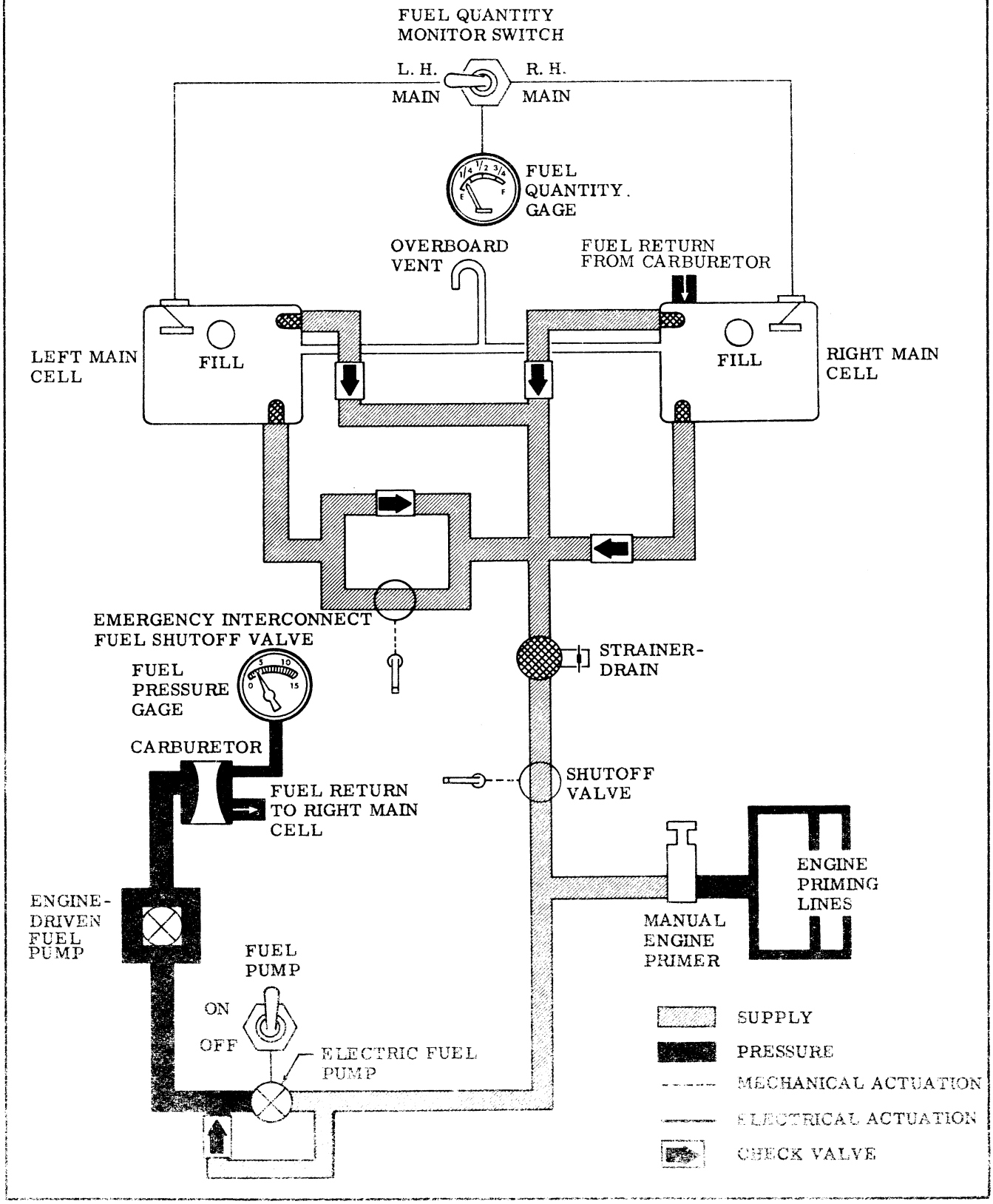


Figure 1-9. (Sheet 1 of 2)

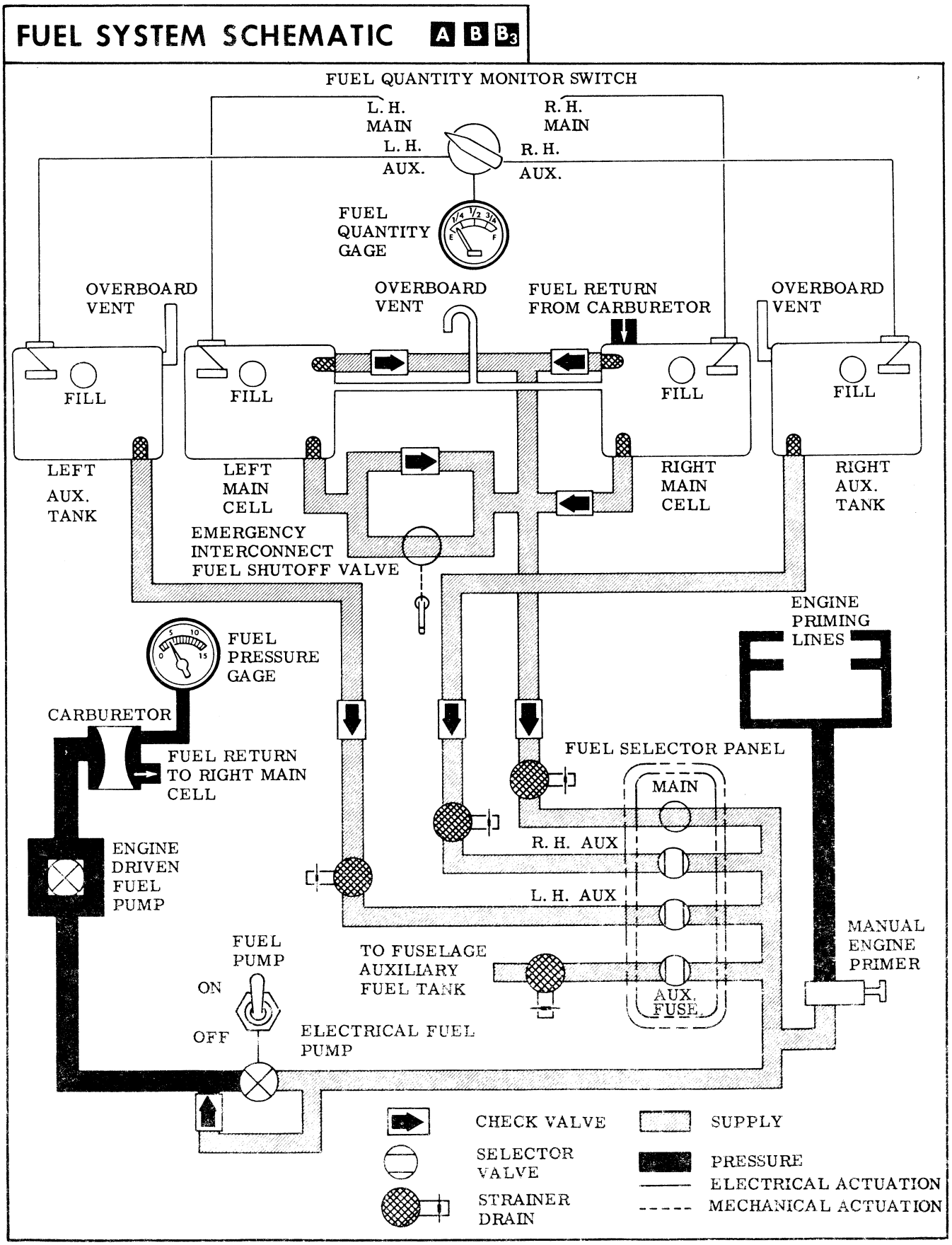


Figure 1-9. (Sheet 2 of 2)

FUEL SYSTEM SCHEMATIC D

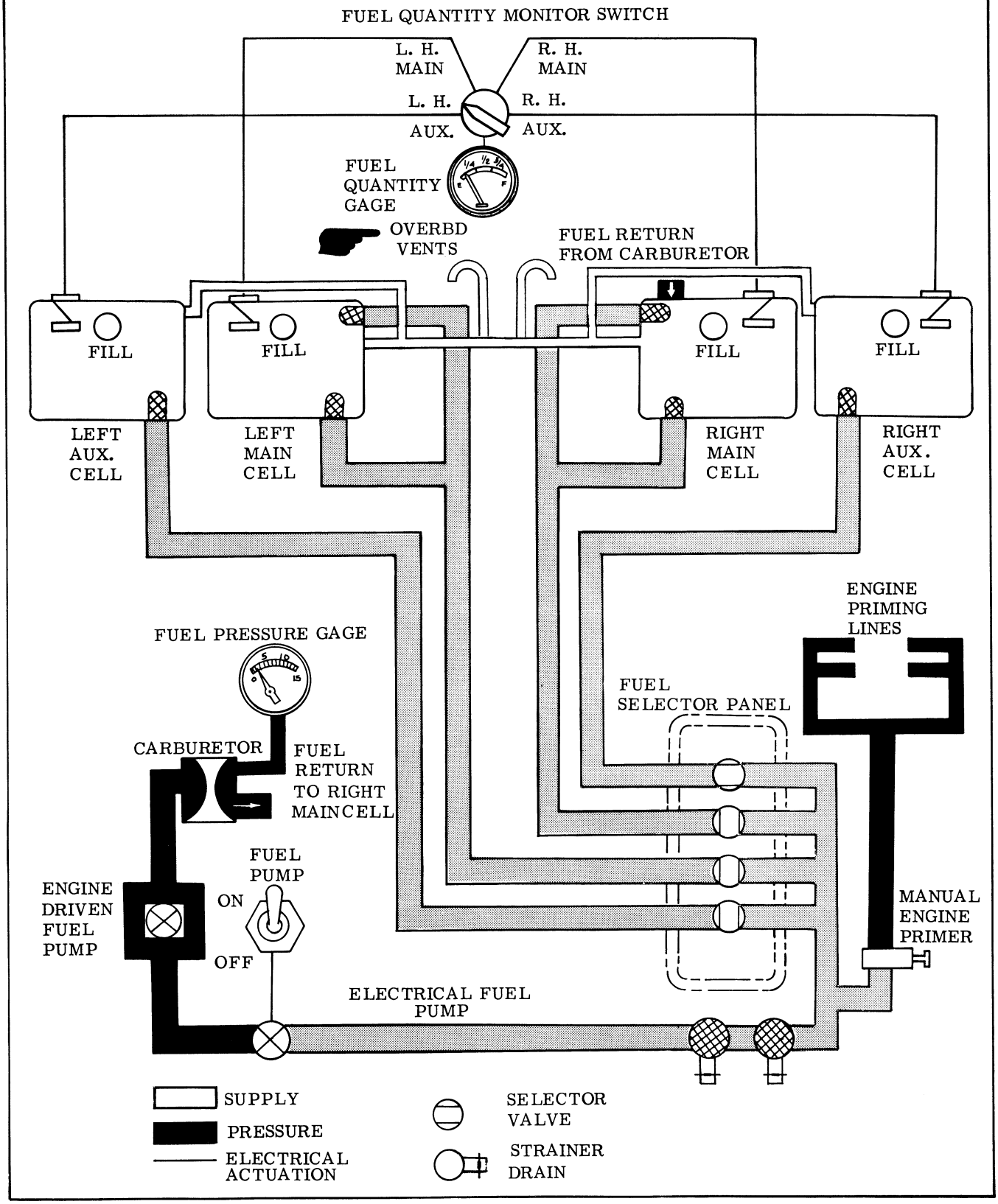


Figure 1-10.

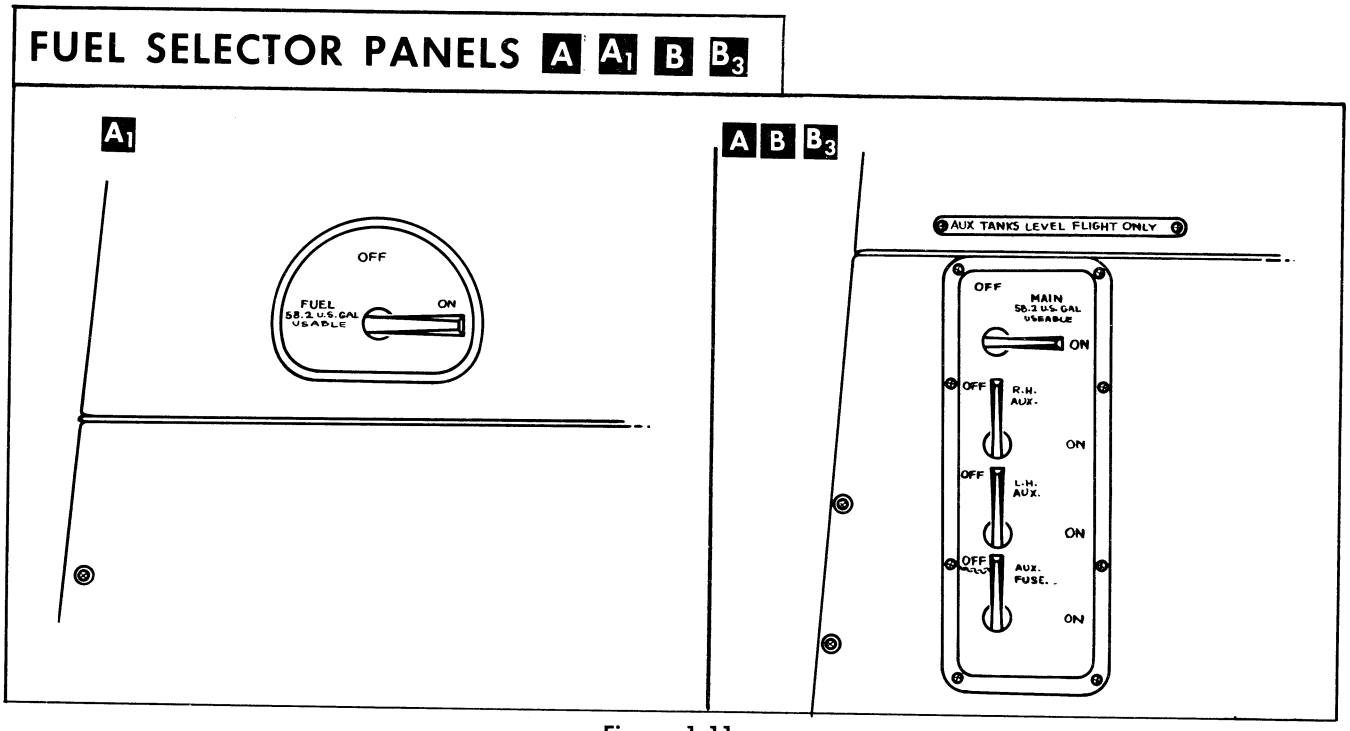


Figure 1-11.

ELECTRIC FUEL PUMP SWITCH

A fuel pump is installed on the engine firewall in the main fuel line to the carburetor and is electrically controlled by the fuel pump switch (Figures 1-5 and 1-6), located on the lower right side of the pilot's instrument panel. With the switch in the ON position, the pump is energized. Placing the switch in the OFF position breaks the circuit, deenergizing the pump. The pump is used during takeoff and landing procedures and while switching fuel tanks. The system is protected by the 10-ampere fuel pump fuse, located immediately to the right of the switch, except on aircraft coded D which are protected with a 5-ampere circuit breaker switch.

FUEL QUANTITY INDICATOR

A single fuel quantity indicator (Figures 1-5 and 1-6) is located on the instrument panel. The indicator face is calibrated from E (empty) to F (full) with intermediate increment markings of 1/4, 1/2, and 3/4. On aircraft coded A B B3 a rotary fuel quantity monitor switch (47, Figure 1-5) is installed on the instrument panel immediately in front of the pilot, and on aircraft coded D it is located in front of the copilot (19, Figure 1-6). This switch has four positions: L.H. AUX., L. H. MAIN, R.H. MAIN, AND R.H. AUX. When the switch is placed in any one of the four positions, the fuel quantity transmitter in the applicable fuel cell is electrically connected to the fuel indicator. On aircraft coded A1, the fuel quantity monitor switch is a two-position toggle switch which selects either the left or right fuel cell in the main fuel tank. On aircraft coded A B B3, the fuel quantity indicating system is protected by a 10-ampere fuel quantity fuse (23, Figure 1-5); on aircraft coded A, by a 10-ampere circuit breaker (20, Figure 1-5); and on aircraft coded D, by a 5-ampere circuit breaker (24, Figure 1-6) located on the instrument panel below the copilot's control wheel.

ELECTRICAL POWER SYSTEM

Electrical power is supplied by a 24 volt battery and a 100 ampere engine driven generator, with exception of some B aircraft which have a 24 volt battery with a 50 ampere engine driven generator. Aircraft coded B1 have two 12 volt batteries connected in series and a 100 ampere engine driven generator. The battery, which is accessible through a door in the fuselage skin, is located on the left of the aft fuselage. On aircraft coded B1 an additional battery access door is provided on the right side of fuselage. The battery serves as a stand-by power source and supplies current to the electrical system when the generator is inoperative, or when generator voltage is insufficient to close the reverse-current relay. The generator supplies current to the aircraft electrical system when the engine is turning approximately 1500 RPM or above. An external power receptacle is provided on aircraft coded A A1 B3 D and some aircraft coded B

NOTE

On aircraft modified by T. O. 1U-10D-506 a generator failure warning light is installed. The warning light should illuminate anytime the generator is not powering the DC bus.

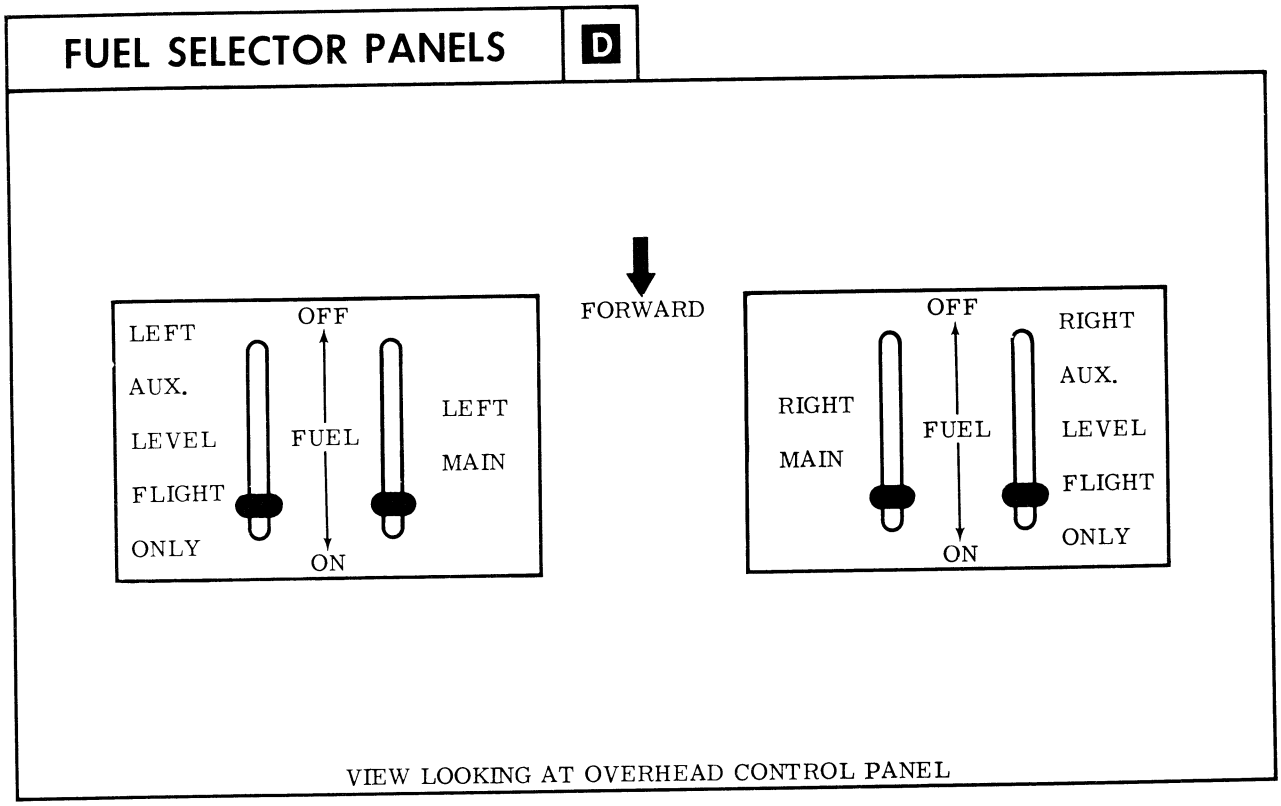


Figure 1-12.

EXTERNAL POWER RECEPTACLE A A1 B3 D

An external power receptacle (21, Figure 1-2) is located on the left side of the engine nacelle. External power should be used when available, to prevent needless drain on the battery.

NOTE

Some B aircraft also have an external power receptacle.

FUSES AND CIRCUIT BREAKERS

The complete electrical system and all its components except the starter and generator are protected by fuses on aircraft coded A B B3 and by circuit breakers on aircraft coded A1 D. The landing light is protected by circuit breakers installed adjacent to the switches on the landing light control panel (34, Figure 1-3) on all aircraft, except D, which has a circuit breaker switch (1, Figure 1-6). In addition to the circuit breakers for the radio equipment, the following fuses, or circuit breakers, are provided: panel lights, turn and bank, fuel pump, fuel quantity, rim lights, and pitot heat. On aircraft equipped with fuses there is no visible indication that a fuse has blown until the cap is removed to expose the fuse. Spare fuses are located on copilot's instrument panel or overhead panel.

REVERSE CURRENT RELAY A1 B B3 D

A reverse current relay, installed on the firewall, automatically connects the generator to the aircraft's electrical system when the generator voltage exceeds battery voltage. The generator is normally connected to the aircraft's system at approximately 1500 engine rpm or above. The reverse-current relay also disconnects the generator when battery voltage exceeds generator voltage. This prevents the possibility of a current flow from the battery motorizing the generator.

VOLTAGE REGULATOR A1 B B3 D

Generator voltage is controlled by a carbon pile voltage regulator, located forward of the instrument panel on the aft side of the firewall. The voltage regulator maintains and stabilizes the voltage output of the generator at 28.0 (±0.5) volts.

REGULATOR ASSEMBLY A

An automotive type regulator is installed on the engine firewall. The regulator contains three units as follows:

1. A cutout which operates as a reverse-current relay and connects the generator to the aircraft system between 12.7 and 12.9 volts.

ELECTRICAL SCHEMATIC DIAGRAM A

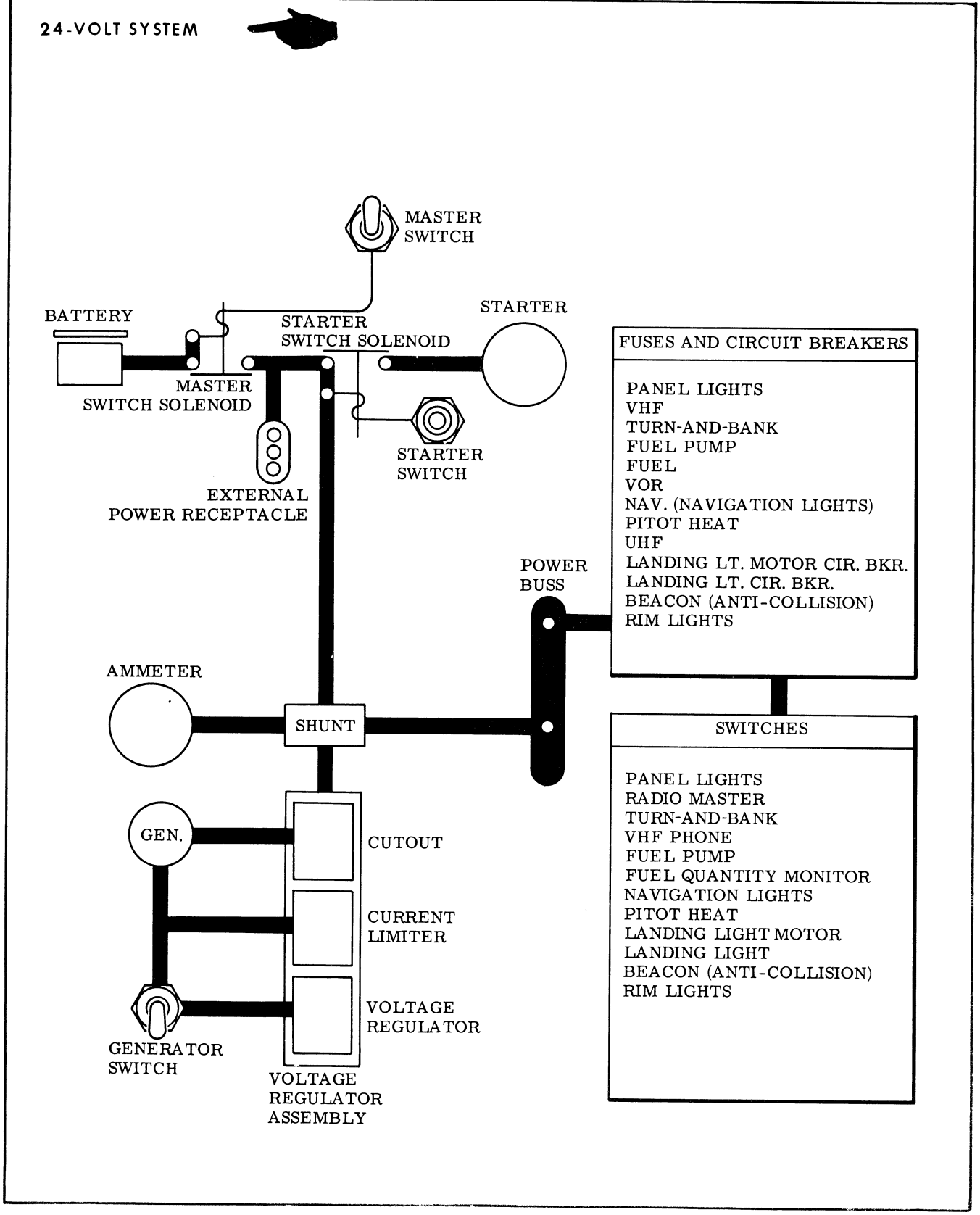


Figure 1-13. (Sheet 1 of 2)

ELECTRICAL SCHEMATIC DIAGRAM A1 B B3 B8

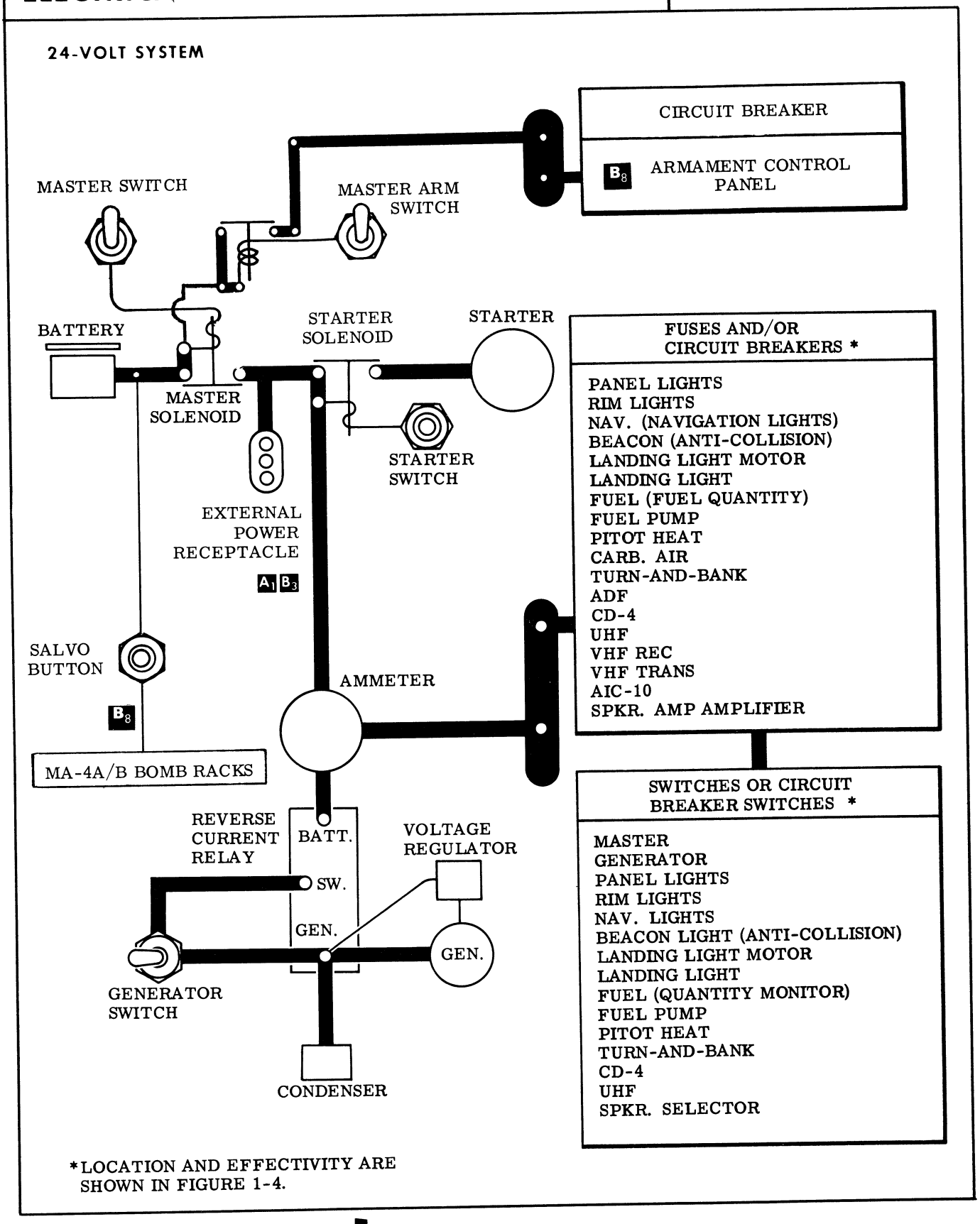


Figure 1-13. (Sheet 2 of 2)

ELECTRICAL SCHEMATIC DIAGRAM D

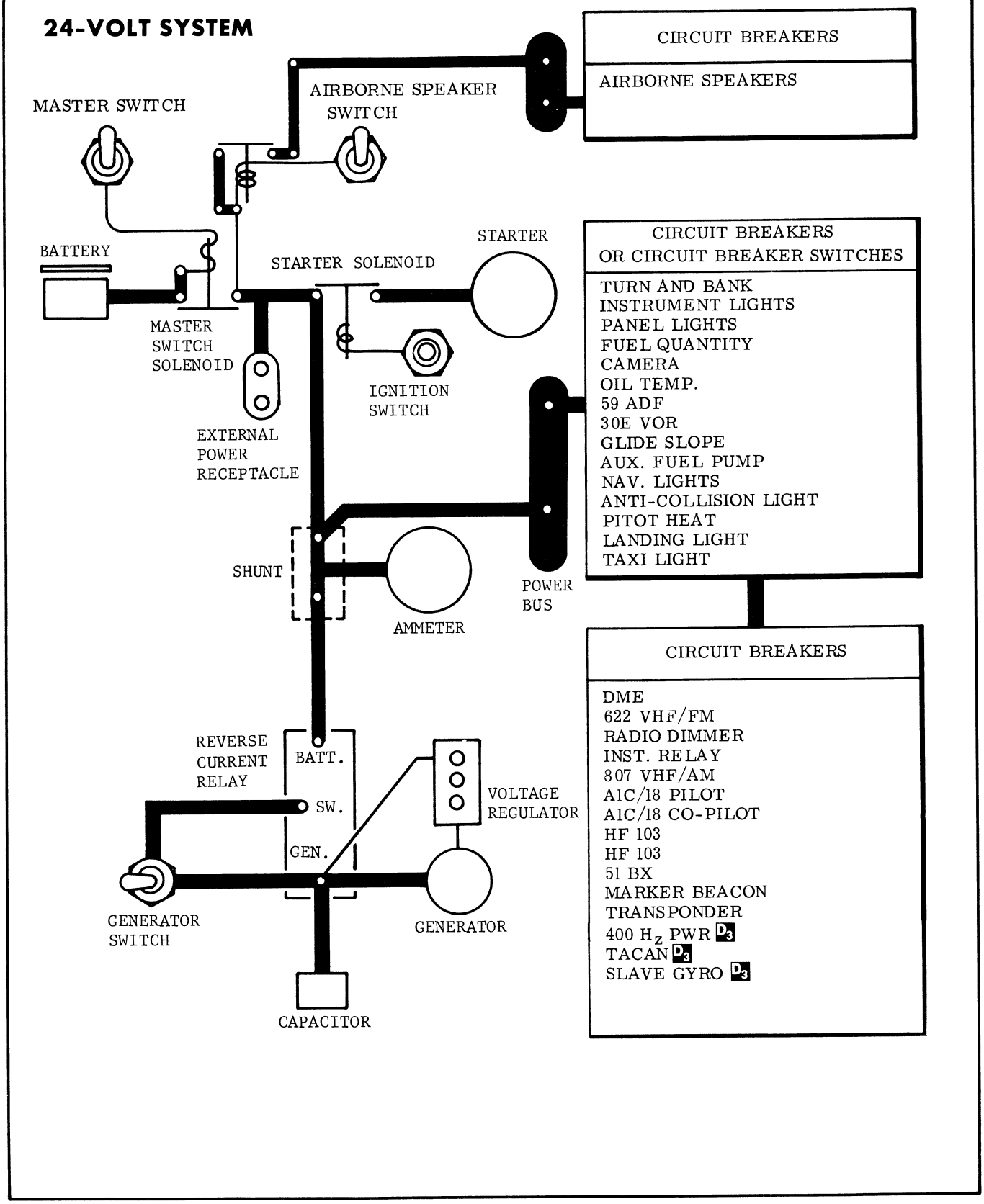


Figure 1-14

TYPICAL BATTERY INSTALLATION

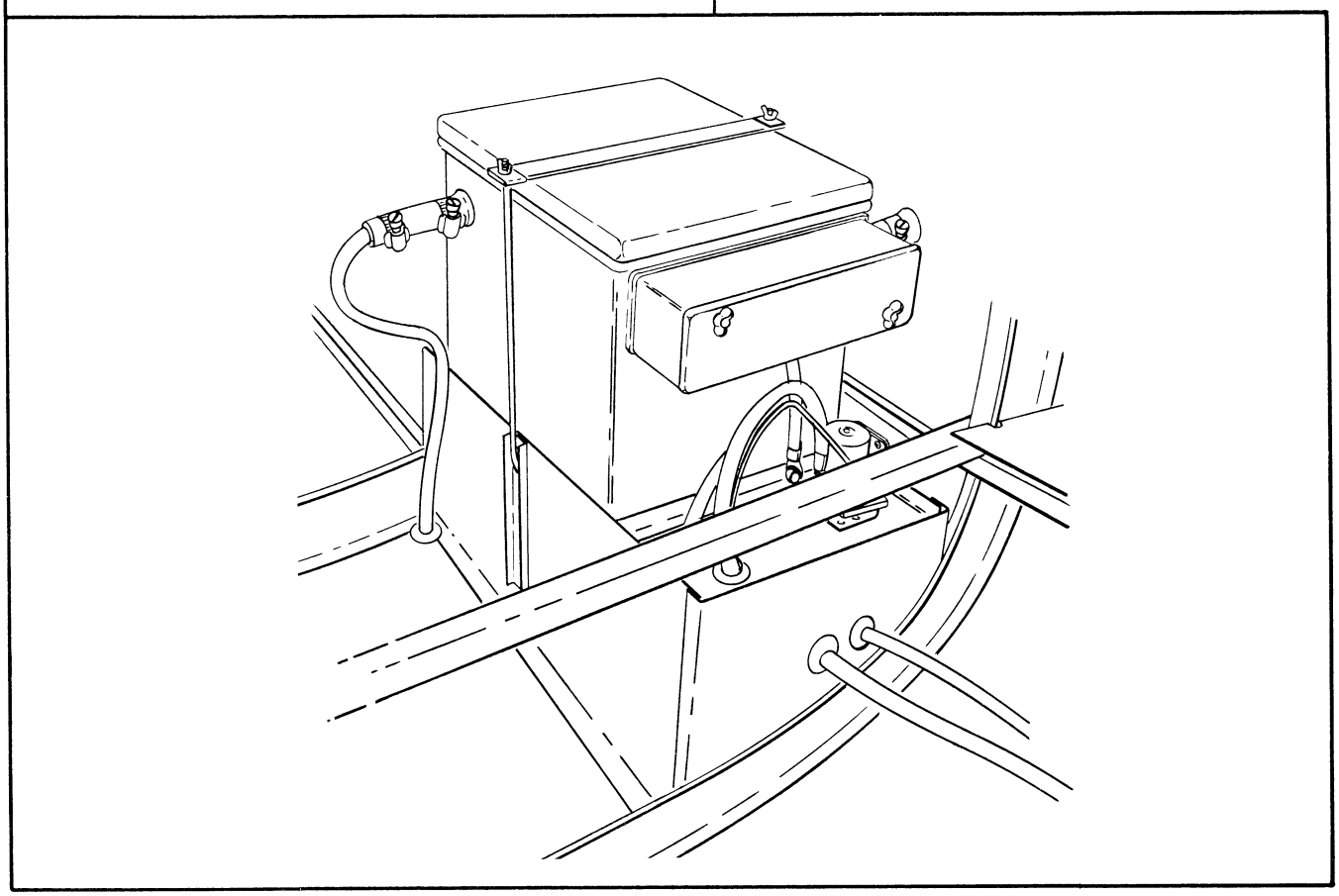


Figure 1-15.

2. A voltage regulator which maintains and stabilizes the voltage output of the generator at 14.2 to 14.4 volts at an engine rpm of 2600.
3. A current limiter which acts as a safety for the voltage regulator. The current limiter prevents the generator from exceeding its rated output of 50 amps in the event the voltage regulator should fail.

MASTER SWITCH

The master switch (Figures 1-5 and 1-6), installed on the instrument panel, is a two-position, ON-OFF toggle switch. Placing the switch in the ON position closes the master switch solenoid to supply battery voltage to the main power bus. The master switch is maintained in the ON position throughout all phases of operation. Thus the aircraft's electrical system will be energized in the event the generator is disconnected from the system. Placing the master switch in the OFF position opens the circuit and disconnects the battery from the main power bus. The master switch is left in the OFF position while the external power receptacle on aircraft coded A A_1 B_3 D is being utilized to prevent the possibility of current feeding back to the battery.

GENERATOR SWITCH

The generator switch (Figures 1-5 and 1-6) installed on the instrument panel is a two-position, ON-OFF toggle switch. Placing the switch in the ON position closes the circuit between the generator and the aircraft electrical system. The switch is maintained in the ON position so that the generators will be connected to the electrical system when engine rpm exceeds approximately 1500. Placing the switch in the OFF position disconnects the generator from the aircraft electrical system.

AMMETER

An ammeter (Figures 1-5 and 1-6) is installed in the instrument panel. The ammeter indicates the rate of battery charge and discharge in amperes, except on aircraft coded A_1 B_1 D and some A and B_3 aircraft, which only indicates a charge. Some aircraft are equipped with a voltmeter (7, Figure 1-3) and a voltmeter selector switch (7, Figure 1-3) both being located on the overhead control panel. The voltmeter selector switch selects the desired voltage (generator or main dc bus) to be indicated by the voltmeter.

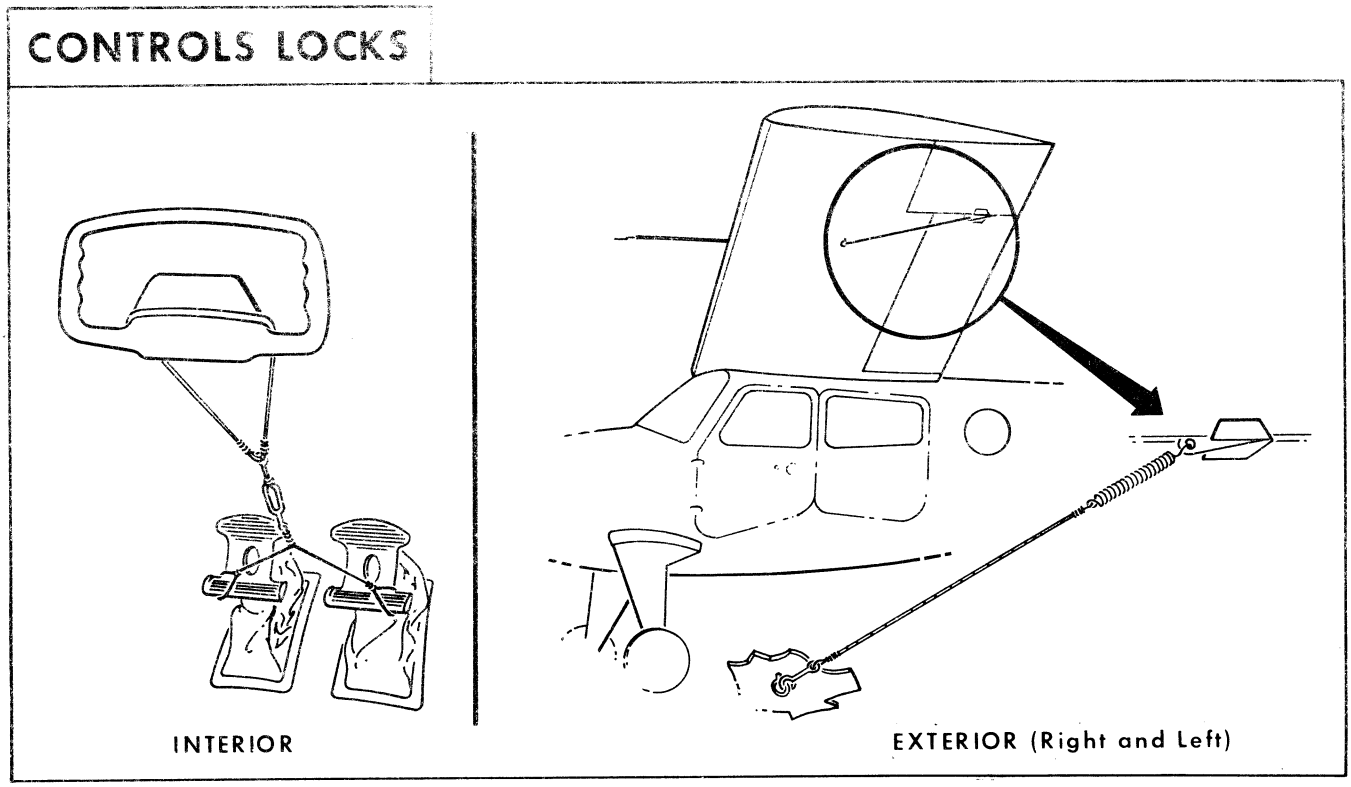


Figure 1-16.

FLIGHT CONTROL SYSTEM

The primary flight control surfaces consist of a conventional rudder, a single movable horizontal tail surface (or stabilator) and spoilers (or interceptors)which are slaved to conventional ailerons. Conventional operation of dual control wheels and rudder pedals controls the aircraft. The stabilator trim tab crank mechanically actuates the flight adjustable trim tab on the left surface of the stabilator. The rudder and right aileron have ground-adjustable metal trim tabs to aid in trimming out undesired rudder and aileron forces reported by the pilot after flight. The right surface of the stabilator has an anti-balance tab installed. This tab moves automatically with the stabilator to provide a force which tends to restore the stabilator to the trimmed position. Retracting slats are incorporated into the leading edge of the wing. The slats open and close automatically in response to the airloads upon them. They allow the wing to operate without stalling over a much wider than normal angle of attack range.

CONTROL WHEELS

The pitch (stabilator) and roll (ailerons and interceptors) control surfaces are operated in a conventional manner with the dual control wheels. The control wheels are installed, one on each side of the instrument panel, to provide control from the pilot or copilot seats.

RUDDER PEDALS

Dual rudder pedals are provided for conventional mechanical operation of the rudder. The pilot's rudder pedals incorporate toe brakes for operation of the wheel brakes. Copilot toe brakes are provided on aircraft with dual brakes. Both sets of rudder pedals are adjustable (only on the ground) for comfortable leg reach. Adjust rudder pedals by unsnapping rudder pedal boots, adjusting pedals to desired position with the adjusting bolts, and replacing boots.

STABILATOR TRIM TAB

The stabilator trim tab crank, located on the overhead control panel (Figure 1-7) in the cockpit, extends through the center of the wing flap crank. The tab is located on the left side of the stabilator and is actuated by a system of cables, pulleys, and a flexible push-pull control. Rotating the crank clockwise produces a nose up attitude while a counterclockwise rotation produces a nose down attitude. Trim tab position, as related to trim tab movement, is shown on the indicator located immediately to the left of the crank.

CONTROLS LOCKS

Removable external and internal controls locks are attached, as shown in Figure 1-16, to prevent damage to control surfaces due to wind buffeting. With external control locks installed, care must be exercised

not to move the control wheels or the control surfaces may be damaged.

WING FLAP SYSTEM

The slotted wing flaps are operated by a wing flap crank (Figure 1-7) through a series of gears, screws, push rods, and bellcranks. The flaps may be set in any position from full up (0°) to full down (40°). Extension and retraction time is dependent upon the speed with which the crank is rotated by the pilot.

WING FLAP CRANK

The wing flap crank is located on the overhead control panel (Figure 1-7). Approximately eighteen turns of the crank lowers the flaps to the full down (approximately 40°) position; fifteen turns lowers the flaps to approximately 30°; and eleven turns lowers the flaps to approximately 20°. Approximately six to seven turns are required to raise the flaps from full down (40°) to ½ (20°) flaps. In-flight airloads on the flaps reduce the flap settings approximately 2°. The flap settings can be checked by observing the flap position marks on the second flap rail on the left wing. The marks indicate 10°, 20°, and 30° of flap travel toward the full down (40°) position.

WARNING

Counting flap crank turns to position the flaps is an approximation and may vary between aircraft. When using this method it is incumbent on the pilot to check flap settings by reference to the position marks on the left flap rail.

LANDING GEAR SYSTEM

The non-retractable, conventional-type landing gear consists of two main gears equipped with automatic cross-wind landing wheels, and a steerable tail gear. On aircraft coded A1 B D a lock is provided to lock the tail wheel. All aircraft are equipped with a cross-wind landing gear lock to prevent castoring of the wheels. All aircraft are equipped with provisions for the installation of removable, all-metal floats for aquatic maneuvering.

CROSS-WIND LANDING GEAR LOCK HANDLE

A cross-wind landing gear lock handle (Figures 1-5 and 1-6) is located on the extreme left side of the instrument panel. Pulling the handle aft disengages a lock-pin from the cross-wind wheel assemblies which unlocks the wheels and allows them to castor. Pushing the handle full forward engages the lock-pin in the cross-wind wheel assembly, and locks the wheels in the streamline position. On aircraft coded D the cross-wind landing gear lock handle (44, Figure 1-6) is located adjacent to the tail wheel lock handle. A bar attached to the cross-wind gear lock, and through which the tail wheel lock control passes, restricts the use of the cross-wind mode unless the tail wheel is unlocked. This eliminates the possibility of landing or taking off with the cross-wind gear unlocked and the tail wheel locked.

Aircraft modified by T.O. 1U-10-522 have a new design cross-wind lock, utilizing a spring-loaded pin encased in a sliding housing. The pin and housing are lever actuated by positive linkage. When the control is in the unlocked position, both the pin and housing are moved clear of the wheel. As there is no spring force acting to return the pin to the locked position, a different "feel" will be noticed when the lock handle is actuated. Pilot operation of the lock control is unchanged by this modification.

TAIL WHEEL LOCK HANDLE A1 B D

A tail wheel lock handle (Figures 1-5 and 1-6) is provided to engage and disengage the steerable tail wheel. Pulling the handle aft disengages a lock-pin from the tail wheel assembly, allowing it to castor in conjunction with rudder movement. Pushing the handle full forward engages the lock-pin and locks the tail wheel.

STEERING SYSTEM

Steering of the landplane is achieved through individually actuated wheel brakes and a steerable tail wheel mechanism. Water rudders are installed on the floatplane to provide steering while taxiing on the water.

TAIL WHEEL STEERING

The steerable tail wheel is designed to operate in conjunction with the rudder throughout the range of rudder travel (approximately 30° either side of the aircraft centerline). Beyond this steering range, the tail wheel automatically disengages from the rudder pedals and becomes fully castoring. Re-engagement of the tail wheel steering mechanism is achieved automatically by taxiing forward after sharp turns, and actuating the rudder pedals to align the steering mechanism for re-engagement. When the steering mechanism is engaged, a resistance will be felt when the rudder pedals are actuated.

TAIL WHEEL ANTI-SHIMMY

The tail wheel anti-shimmy device relieves shock loads on the tail cone from excessive shimmy action from the tail wheel. This shock load is absorbed by a shock strut mounted on the tail wheel "A" frame assembly and connected to a link assembly mounted on the tail wheel swivel.

WATER RUDDERS

Retractable water rudders are mounted at the aft end of each float to provide steering for water operations. The water rudders are connected by a system of cables to the aircraft rudder, thus, normal operation of the rudder pedals operates the water rudders. A spring is incorporated into the system to permit aircraft rudder operation in the event the water rudders become inoperative due to icing.

WATER RUDDER RETRACT HANDLE

A water rudder retract handle (Figures 1-3 and 1-4) is located on the forward jamb of the pilot's compartment entrance door below the instrument panel when the floats are installed. Flexible steel cables connect the water rudders to the water rudder retract handle. Pulling the handle up to the upper latched position

retracts the water rudders for step runs, all takeoff flight operations, and for beaching operations. Lowering the handle lowers the water rudders for aircraft taxi operations in the water.

BRAKE SYSTEM

Hydraulic brakes on the main wheels are conventionally operated by applying tow pressure to the brake pedals. A parking brake is incorporated in the brake system to hold the brake units in the ON position after the brakes have been applied by toe pressure. The floatplane does not have a braking system, and a minimum forward motion of 3 knots results any time the engine is running.

PARKING BRAKE HANDLE

A parking brake handle (Figures 1-5 and 1-6) is located on the instrument panel just below the throttle control knob. Applying toe pressure to the brake pedals then lightly pulling the handle aft locks the wheel brakes. To release the parking brakes, the handle is pushed forward and toe pressure applied to the wheel brakes.

NOTE

The parking brake handle actuates a check valve which traps the pressure, applied by the toe brakes, between the check valve and the wheel brakes. Brake pressure is dependent on toe pressure only and not on the force applied to the parking brake handle.

When pulling the parking brake handle, the check valve is moved against pressure applied by the brake pedals. Apply gentle pressure to the brake pedals until parking brake handle is set, then apply more pressure to brake pedals to assure locking of the wheels.

INSTRUMENTS

The instruments covered herein are only those instruments which are not considered to be part of the complete system such as the fuel system, engine, etc. All instruments have been located for maximum comfort and convenience to both the pilot and copilot. Each instrument dial is clearly visible and is illuminated by an individual rim light, augmented by red overhead cabin lights.

PITOT-STATIC SYSTEM

The altimeter, vertical velocity indicator, and airspeed indicator (Figures 1-5 and 1-6) are operated by the pitot-static system. Static ports on either side of the aft fuselage, and an electrically heated pitot tube located on the left wing, provide the air source for the operation of this system. The operating ranges of the aircraft are marked on the airspeed indicator. (See Figure 5-1.)

A pitot/static system drain valve panel located below the instrument panel, provides a means for draining accumulated moisture from the pitot or static systems. When the respective valve lever is lifted, accumulated moisture drains downward from a tee fitting directly forward of the panel.

CAUTION

Do not open drain valve in flight except in case of emergency. Refer to Section IX.

AMBIENT AIR TEMPERATURE GAGE

An ambient air temperature gage is installed through the fuselage skin at the upper right corner of the windshield. The gage measures the free air temperature in degrees Centigrade and Fahrenheit from -50°C (-60°F) to 60°C (140°F).

GYRO INSTRUMENTS

The turn-and-slip indicator (Figures 1-5 and 1-6) is electrically operated. The attitude indicator, and on some aircraft, the heading indicator. (Figures 1-5 and 1-6) are vacuum-driven instruments. Some aircraft are equipped with a heading indicator which is electrically-driven.

CABIN DOORS

Entrance to the pilot-copilot compartment is gained through a large door (18, Figure 1-2) on the left side of the aircraft. Entrance to the rear compartment seats is gained through a large door (9, Figure 1-2) on the right side of the aircraft. Both the jettisonable pilot and passenger entrance doors (Figure 1-17) utilize a rotary door latch installed on the interior and exterior surfaces of the doors. A key type lock is provided to lock the pilots' door. The pilot compartment door window may be opened at any airspeed below 70 knots IAS by pressing the unlock push-button, raising the arm rest to unlock the window, and swinging the window outward approximately six inches. The window is closed by pulling the arm rest inward and downward to the latched position.

PITOT/STATIC DRAIN PANEL (Aircraft Modified by T.O. 1U-10-519).

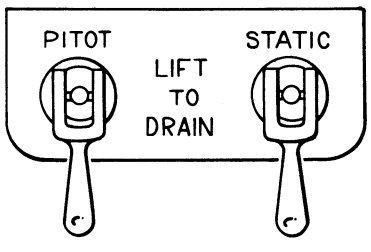


Figure 1-16A.

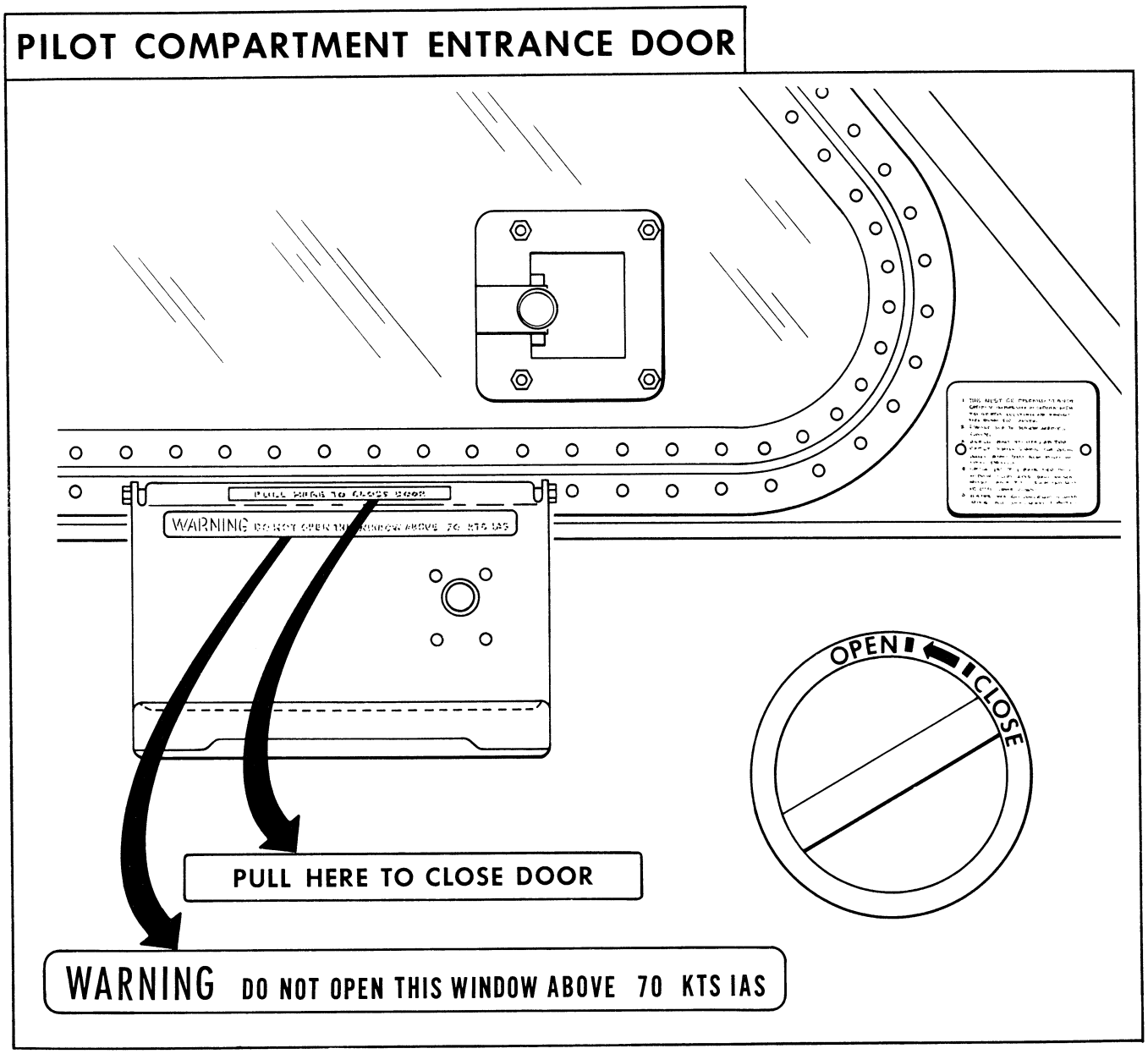


Figure 1-17.

LITTER DOOR **A**

The litter door (17, Figure 1-2) is hinged at the top to swing outward and latch to the lower wing skin. There is no center post between the pilot compartment door and the litter door. With both pilot and litter compartment doors open, a large area is available for loading and unloading the stokes litter.

PARA-DROP DOOR **A_1 B B_3 D**

A para-drop door (17, Figure 1-2) is installed to provide an in-flight exit, or a cargo-loading opening while the aircraft is on the ground. The door is constructed of two removable sections which when removed are stored inside the aircraft. The door is removed by pulling the release handles on the upper section towards each other and lifting the upper half inward. The lower section is removed in the same manner.

AIRBORNE LOUDSPEAKER DOOR

On aircraft with an airborne loudspeaker system, a loudspeaker door replaces the existing para-drop door. It is installed to provide a means of attaching the loudspeaker horn.

SEATS

The individual, non-adjustable seats are equipped with safety belts and diagonal, single-strap shoulder harnesses. Side-by-side seating is provided for the pilot and copilot in two individual front seats, and two passengers in the passenger seat. On aircraft coded **A B_3**, one additional single seat for a third passenger

is installed behind the passenger seat, and the back of each passenger seat hinges forward to allow access to the rear cabin area. On aircraft coded A1 B B3 D back of each front seat may be removed by pulling the quick-release pins located on the outside of each seat back. The passenger seat may be removed to gain the necessary space for the cargo and litter configuration. On aircraft coded D , the rear seat is a sling type arrangement providing for seating of two persons. Entrance is provided by unlatching and folding the back of middle seat to forward position. The seat consists of a forward support tube across the center of the compartment and an aft support tube across the aft end of the cabin; the two being connected by a padded canvas sling. The forward support tube may be removed from its support and moved aft and out of the way to provide for storage room. The safety harness is a lap and shoulder combination. The lap portion attaches to the fuselage tubular structure and the shoulder portion to fittings in the tailcone.

AUXILIARY EQUIPMENT

Refer to Section IV for description and operating instructions for the following auxiliary equipment: cabin heating and ventilating system, communication and associated electronic equipment, lighting equipment, litter and cargo arrangement, and miscellaneous equipment.

EMERGENCY EQUIPMENT

A-20 BROMOCHLOROMETHANE FIRE EXTINGUISHER

An A-20 CB fire extinguisher bottle is located under the co-pilot's seat.

CAUTION

Bromochloromethane is an anesthetic agent of moderate intensity, prolonged exposure to its fumes or decomposition products should be avoided.

FIRST AID KIT

A First Aid Kit is located in the aft cabin (cargo) compartment.

Section II
NORMAL PROCEDURES

TABLE OF CONTENTS

PREPARATION FOR FLIGHT

FLIGHT RESTRICTIONS

Refer to Section V for detailed aircraft and engine limitations.

FLIGHT PLANNING

The performance data in the Appendix Section is provided to determine fuel consumption, correct airspeed, power settings, and altitudes for intended flight missions. Takeoff and landing runway distance requirements are included. Refer To Figure 1-2 for fuel grade limits.

CAUTION

During long missions, of long duration, the possibility exists that the engine will use enough oil to drop the oil level below safe limits. In planning flights of long duration the actual oil consumption rate of the airplane to be flown must be used to calculate estimated oil consumption. Total consumption for the flight must not exceed seven quarts. (Sump filled to 10 quarts prior to engine start.)

TAKEOFF AND LANDING DATA CARD

A Takeoff and Landing Data Card will be found in the Pilots Abbreviated Flight Crew Checklist, T.O. 1U-10A-1CL-1, and shall be completed prior to each flight as locally directed. Refer to Appendix I for an example and explanation of how this card shall be completed.

WEIGHT AND BALANCE

Refer to Section V for weight and balance limitations. Check the aircraft's weight and balance when applying other than standard fuel and passenger loads. For detailed information refer to Manual of Weight and Balance Data, T.O. 1-1B-40, and to the load information applicable to this aircraft as required. Check the takeoff and anticipated landing gross weights.

CHECKLIST

The amplified checklist in this section provides a chronological listing of the steps of procedure used throughout the normal operation of the aircraft. The abbreviated checklist, T.O. 1U-10A-1CL-1 is designed to be inserted into plastic holders. Insofar as possible, each phase of action described in the checklist shall be performed in conjunction with direct reference to the checklist. The checklist will be used in accordance with AFR 60-9.

NOTE

The term 'climatic' is used in the checklists indicates equipment operation or settings which may be necessary depending on the prevailing conditions. In practice, the response to climatic items will be the required switch or control position.

ENTRANCE

NOTE

Check to see that chocks and static ground wires are in place.

Entrance to the pilot's compartment is attained through the door (18, Figure 1-2) on the left side of the aircraft. A step is provided to assist the pilots during entry. The door is latched when fully closed. Passengers enter the aircraft through the passenger compartment door (9, Figure 1-2) on the right side of the aircraft. The door is closed and latched by pulling inward in the normal manner.

PREFLIGHT CHECK

It shall be the responsibility of the pilot to ensure that an interior and exterior visual inspection is completed as outlined.

BEFORE EXTERIOR INSPECTION

1. Chocks - IN PLACE.
2. Exterior control locks - Removed.
3. Form 781 (DA Form 2408-13) - CHECK.

Check Form 781 (DA Form 2408-12) for status of aircraft and maintenance inspections completed.

4. Publications - CHECK.

Check that all required publications are aboard.

5. Ignition Switch - OFF.
6. Radio Switches - OFF.
7. All remaining switches - OFF.
8. Fuel selectors - ON.

Place all fuel tank selectors in the ON position for fuel tanks containing fuel.

NOTE D

If the fuel selector valve control handle comes in contact with the end of slot it indicates the control needs adjustment.

9. Fuel quantity - CHECK.

Turn master switch ON, perform fuel quantity check, turn master switch OFF.

10. Interior control lock - As required.

CAUTION

If high winds are prevalent, do not remove control locks until after the interior inspection is completed.

11. Master switch - OFF.
12. Tail wheel - UNLOCKED (if applicable)
13. Cross-wind landing gear - UNLOCKED.

It may be necessary to shake tires to eliminate binding of locking pins before handle can be pulled.

14. Trim tab - NEUTRAL.
15. CB fire extinguisher - CHECKED.

Check for proper installation, evidence of leaks and proper pressure.

CAUTION

Bromochloromethane is an anesthetic agent of moderate intensity, prolonged exposure to its fumes should be avoided.

16. Parking brake - SET.
17. Armament system CHECK.

Check in accordance with Armament Procedures - Before Exterior Check.

EXTERIOR INSPECTION

1. Left landing gear - CHECK.
   a. Tire for condition and slippage.
   b. Cross-wind landing gear lock pin pulled flush with housing.
   c. Brake puck housing to brake disc clearance no more than 5/16 inch.
   d. Hydraulic lines and bleeder plug for looseness and leaks.
   e. Strut fairing for loose screws.
2. Nose Section - CHECK.
   a. Engine cowl secure and free of cracks.
   b. Oil quantity 10 quarts, filler cap secure.
   c. Propeller for general condition, nicks, cracks, and oil leaks.
   d. Check that three fuel overflow tubes are extended thru cowling, except D which has two.
   e. Check landing lights for security and cleanliness D.
3. Right landing gear - CHECK.
   a. Tire for condition and slippage.
   b. Cross-wind landing gear lock pin pulled flush with housing.
   c. Brake puck housing to brake disc clearance no more than 5/16 inch.
   d. Hydraulic lines and bleeder plug for looseness and leaks.
   e. Strut fairing for loose screws.
4. Fuel strainer drain assembly DRAIN.

On aircraft equipped with auxiliary fuel tanks, drain auxiliary strainer drains located on underside of fuselage. Check fuel for presence of water and contamination.

5. Right Wing - CHECK.
   a. Wing slats for freedom of movement, dents, and general condition.
   b. Wing tip for general condition, and navigation light for condition and security of mounting.
   c. Aileron and interceptors for general condition.
   d. Interceptor movement in relation to aileron movement. (Right interceptors should be extended when right aileron is up.)
   e. Top of wing for condition. Fuel tank filler caps for security.
   f. Main fuel tank vent free of obstruction and aligned fore and aft. D
   g. Wind flaps for looseness; hinges and actuator for condition. Auxiliary fuel tank vent free from obstruction.
   h. Lower wing skin and inspection plates free from cracks or dents.
   i. External stores - CHECK.

   Check external stores in accordance with Armament Procedures - Exterior Check.
6. Rear Seat and Cargo Area -CHECK.
   a. Check for loose equipment or cargo, and for condition of general area. Check survival equipment.
   b. Make certain seat back locking pins are properly engaged on both sides of seat back.

7. Right fuselage - CHECK.
   a. General condition, and static ports free from obstruction.
   b. Battery compartment door for security B_1 .
   c. Battery vent and drain free from obstructions B_1 .
8. Empennage - CHECK.
   a. Vertical and horizontal surfaces for condition, freedom from cracks and dents.
   b. Stabilator for excessive bearing play or binding.
   c. Anti-balance, trim tabs, and control cables for condition. Anti-balance tab must not be damaged in any respect.
   d. Navigation light for condition and security of mounting.
   e. Tail wheel tire for condition and slippage.
   f. Strut for condition and properly inflated.
   g. Check for presence of cotter pin in bolt holding anti-balance actuating arm to tailcone.

EXTERIOR INSPECTION

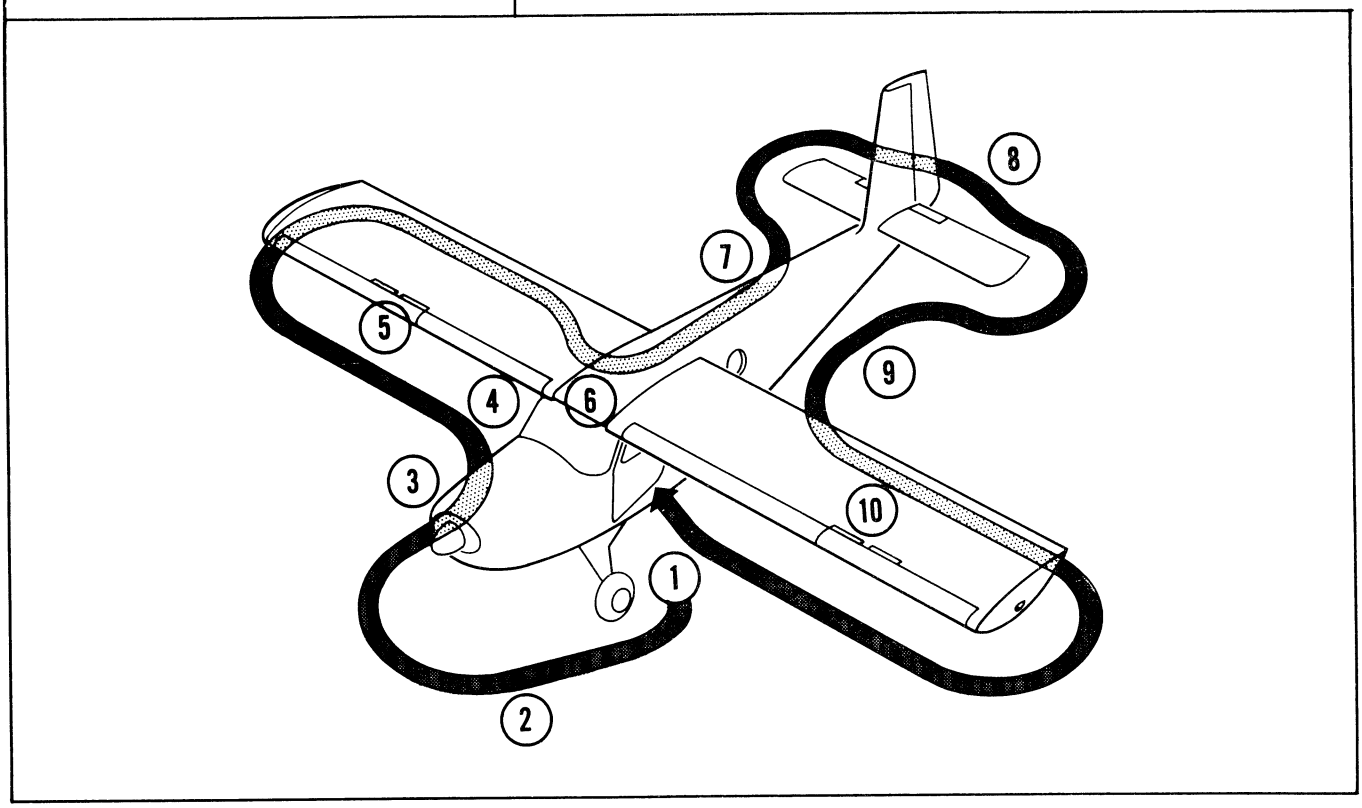


Figure 2-1.

9. Left fuselage - CHECK.
   a. General condition and static ports free from contamination.
   b. Battery compartment door for security.
   c. Battery vent and drain free from obstruction.
   d. DELETED
10. Left wing - CHECK.
   a. Lower wing skin and inspection plates free from cracks or dents.
   b. Landing light (except for aircraft coded D) for general condition and security of mounting. Light should be flush with housing.
   c. Wing flaps for looseness; hinges and actuator for condition. Auxiliary fuel tank vent free from obstruction.
   d. Top of wing for condition. Fuel tank filler caps for security.
   e. Main fuel tank vent free of obstruction and aligned fore-and-aft
   f. Interceptor movement in relation to aileron movement. (Left interceptors should be extended when left aileron is up.)
   g. Aileron and interceptors for general condition.
   h. Wing tip for general condition, and navigation light for condition and security of mounting.
   i. Remove pitot tube cover and check tube for obstructions. Use caution to avoid bending tube.
   j. Wing slats for freedom of movement, dents, and general condition.
   k. External stores - CHECK.
   Check external stores in accordance with Armament Proceedures - Exterior Check.

EXTERIOR INSPECTION (Floatplane)

The walk-around exterior inspection of the aircraft is shown in Figure 2-1. Additional checks for the floatplane are made at locations 1 (left landing gear) and 3 (right landing gear), as outlined below:

a. Water rudders for full travel and free of debris.
b. Rudder cables and pulleys for condition.
c. Floats for general condition.
d. Float struts and stringers for general condition.
e. Remove float inspection covers and check for water seepage. Secure covers with vent hole facing aft.

CAUTION

Each float compartment should be as dry as possible. Water in float compartments will increase aircraft weight.

f. Water rudder operation. Check that both rudders retract simultaneously.

CAMERA PREFLIGHT INSPECTION D

1. Power-off inspection - PERFORM.
   a. Camera system installation - GENERAL CONDITION AND SECURITY.
   b. Electrical cables - PROPERLY CONNECTED AND SECURE.
   c. Loaded camera magazines - INSTALLED.
   d. Shutter speeds and f stops - SET AS REQUIRED.
   e. Lens covers - REMOVE (check lens for cleanliness).
   f. All switches and intervalometer controls - OFF.
   g. Oblique camera position - SET TO DESIRED ANGLE.
   h. Oblique camera sight position - SET TO PROPER ANGLE.
   Set oblique camera sight to correspond to angle of oblique camera.
2. Power-on inspection - PERFORM.
   a. Master switch - ON.
   b. Cam pwr switch - ON.
   Place camera power switch, located on camera control box, in the ON position.
   c. Power lamp - ILLUMINATED.
   d. Diaphragm control switch - PLACE TO B, H, D, AND OBSERVE CAMERA DIAPHRAGM FOR PROPER OPERATION.
   Camera diaphragm must open as diaphragm control switch is moved from B, H, then to D.
   e. Vertical and oblique camera selection switches - STEADY.
   f. Extra picture switch - DEPRESS AND RELEASE.
   Camera must expose once each time switch is pressed and released. Pulse lamp must illuminate during each exposure.
   g. Intervalometer - SET (1 second).
   h. Vertical then oblique pulse switches - PULSE.
   Cameras will expose at 1 second intervals. Pulse lamp will illuminate during each exposure.
   i. Camera pulse switches - OFF.
   j. Cam pwr switch - OFF.
   k. Master switch - OFF.

SPEAKER PREFLIGHT INSPECTION D

1. Power-off inspection - PERFORM.
   a. Speaker system installation - GENERAL CONDITION AND SECURITY.
   Check complete system for general condition and security of mounting.
   b. Electrical cables - PROPERLY CONNECTED AND SECURE.
   c. Speaker amplifiers power switches - OFF.
   d. Tape recorder - SECURITY AND TAPE INSTALLED.
2. Power-on inspection - PERFORM.
   a. Master switch - ON.
   b. Airborne speaker switch - ON.
   c. Amplifiers and tape recorder volume level - SET TO MID RANGE
   d. Mic/recorder selector switch - MIC.
   Place mic/recorder selector switch located on microphone and recorder selector panel in appropriate position.
   e. Oral speaker test - PERFORM.
   Speak directly into micorphone to test oral output of loudspeaker. With one amplifier power switch on, conduct oral speaker test, adjusting speaker amplifier volume control for proper operation. Turn amplifier power switch off. Continue same test with remaining amplifiers.
   f. Mic/recorder selector switch - RECORDER.
   g. Tape recorder - OPERATE.
   Operate tape recorder to test speaker output, then rewind recorder.
   h. Airborne speaker switch - OFF.
   i. Master switch - OFF.

INTERIOR INSPECTION

After completing the Exterior Inspection and entering the aircraft, perform the following checks:

1. All control locks and pitot cover - CHECK REMOVED AND STOWED.
2. Passengers - BRIEFED AND SECURED.
Passengers briefed on mission, noise of automatic slat operation. Passenger seat belts and shoulder harnesses adjusted and secure.
3. Seat harness - SECURED.
Adjust and fasten seat belt and shoulder strap.
4. Controls - CHECK
Check all flight controls for free and correct movement
5. Pitot/static drain valve - OPEN, then CLOSE

WARNING

To assure closing of valves, position the valve lever with concave (or cut out) in lever facing toward drain valve.

BEFORE STARTING ENGINE

1. Fire guard - POSTED.
2. Wheel chocks - IN PLACE.
3. Parking brake handle - SET.
4. Main fuel tank selector handle - MAIN, ON.
On aircraft coded A B B_3 D , place the fuel selector handles for auxiliary tanks in the OFF position.
5. Interconnecting fuel line valve switch - ON. A A_1 B B_3
6. Electric fuel pump switch - ON.
7. Navigation lights - ON.
8. Cowl flap handle - OPEN.
9. Propeller control knob - INCREASE RPM.
10. Throttle control knob - OPEN 1/8.
11. Mixture control knob - IDLE CUTOFF.
12. Engine primer - CLIMATIC.
Three full primes for cold engine. Check locked after use.

13. Ignition switch - L (left). A A1 B B3
14. Master and generator switches - ON.

STARTING ENGINE

1. Engine - START.
   a. Starter button - DEPRESSED.
   On aircraft coded D turn key to START and push key until engine starts, then release.

CAUTION

If propeller fails to turn when starter button or key is depressed, release immediately as starter circuit is not protected by an overload protection device.

   b. Mixture control knob - FULL RICH.
   When engine starts, push mixture control knob full forward to the FULL RICH position.

2. Ignition switch - BOTH.
   a. Oil pressure - CHECK.

CAUTION

Within 30 seconds after engine start check for rise in oil pressure above minimum limits.

   b. Engine - Operate engine at 1000 to 1100 rpm during initial warmup until oil pressure drops below 85 psi, then do not exceed 85 psi oil pressure or 2200 rpm until oil temperature is at least 100° F.

NOTE

Engine start procedures are the same for the floatplane. If possible warm up engine while beached to reduce spray damage to propeller.

3. Electric fuel pump switch - OFF.

Place electric fuel pump switch in the OFF position and check fuel pressure.

4. Turn and Slip Switch - ON.
5. Radio Master Switch - ON (if installed).
6. Communication Radios - As required.
7. CD-4 Switch - ON (if installed).

BEFORE TAXIING

1. Radio call - AS REQUIRED.

Call the tower for altimeter setting and time check. Taxi instructions may be obtained at this time.

2. Flight instruments - CHECKED and SET.
   a. Altimeter - Set to current altimeter setting and tap altimeter gently. Check altimeter at a known elevation and note error in feet. If error exceeds 75 feet, do not use altimeter for IFR flight.
   b. Attitude indicator - adjust miniature aircraft level with the 90-degree bank indices.
   c. Airspeed indicator - check for zero reading.
   d. Vertical velocity - check for zero reading, readjust if necessary.
   e. Heading indicator - set to, or check for, proper magnetic heading.
3. Ignition grounding - CHECK

Perform at idle RPM. Place ignition switch momentarily in L (left), R (right), and OFF, then back to BOTH; check that engine is firing on L and R and that engine quits firing in OFF.

4. Chocks - REMOVED.
5. Parking brake - RELEASED.

CAUTION

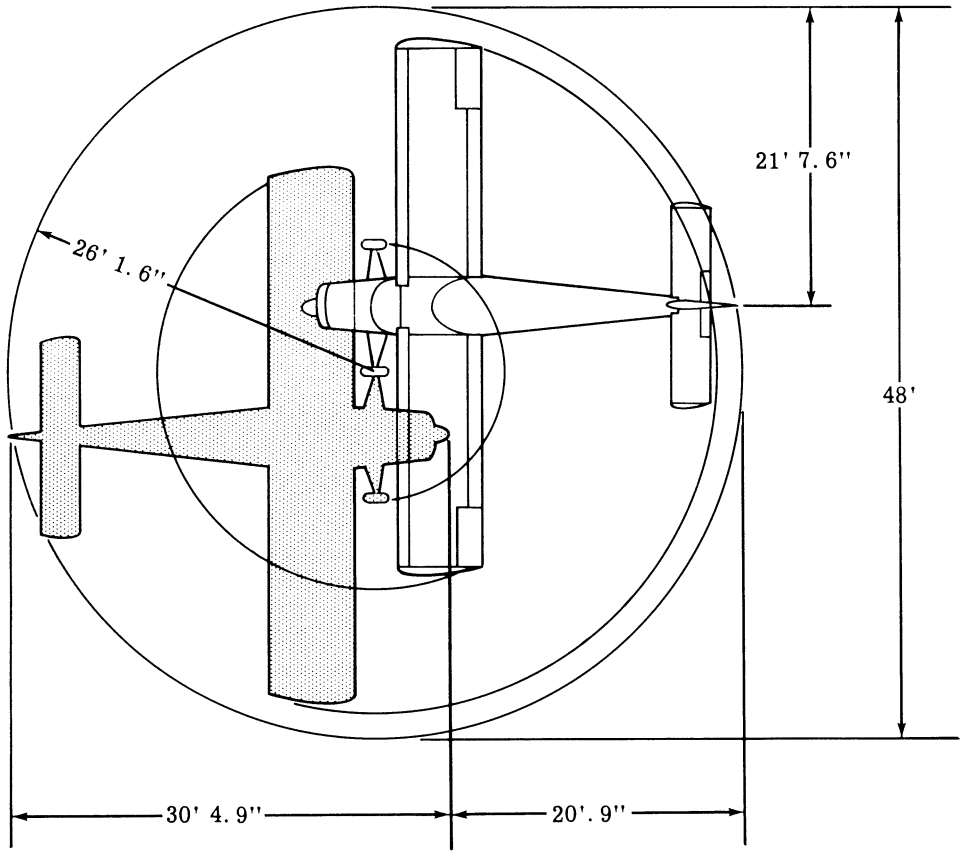
Do not exceed 2200 rpm or 85 psi oil pressure to taxi aircraft if oil temperature is not within minimum limits. Damage to the engine may result.

CASTING OFF (Floatplane)

Starting of the engine prior to casting off is dependent upon direction and velocity of the wind and general weather conditions, and when the aircraft is moored to an off-shore buoy, upon the proximity of the shore. If the engine is started before cast-off from a buoy, proceed as follows:

MINIMUM TURNING RADII AND GROUND CLEARANCE

LANDPLANE



NOTE:

TAIL CLEARANCE WITH TAIL WHEEL ON GROUND 8' 10"

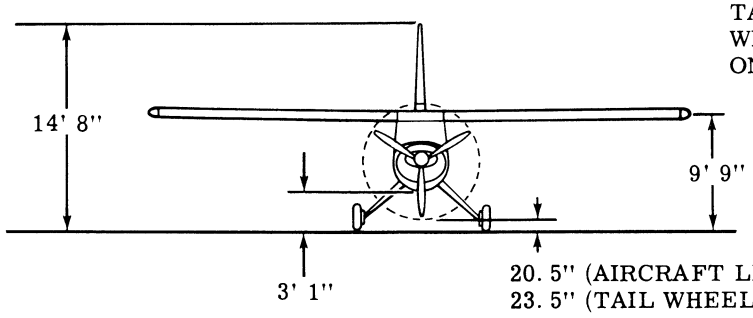


Figure 2-2. (Sheet 1 of 2)

MINIMUM TURNING RADII AND GROUND CLEARANCE

FLOATPLANE

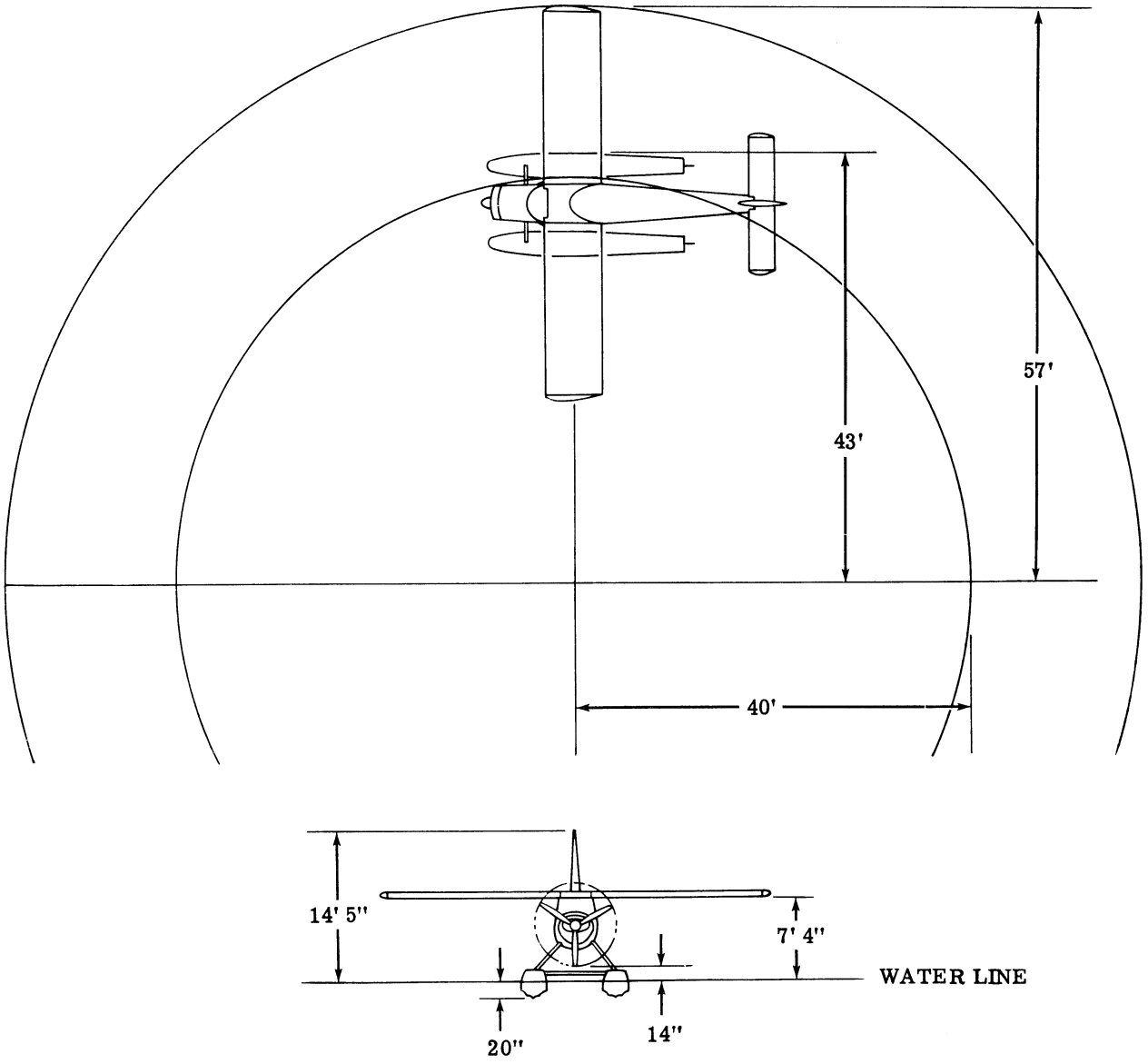


Figure 2-2. (Sheet 2 of 2)

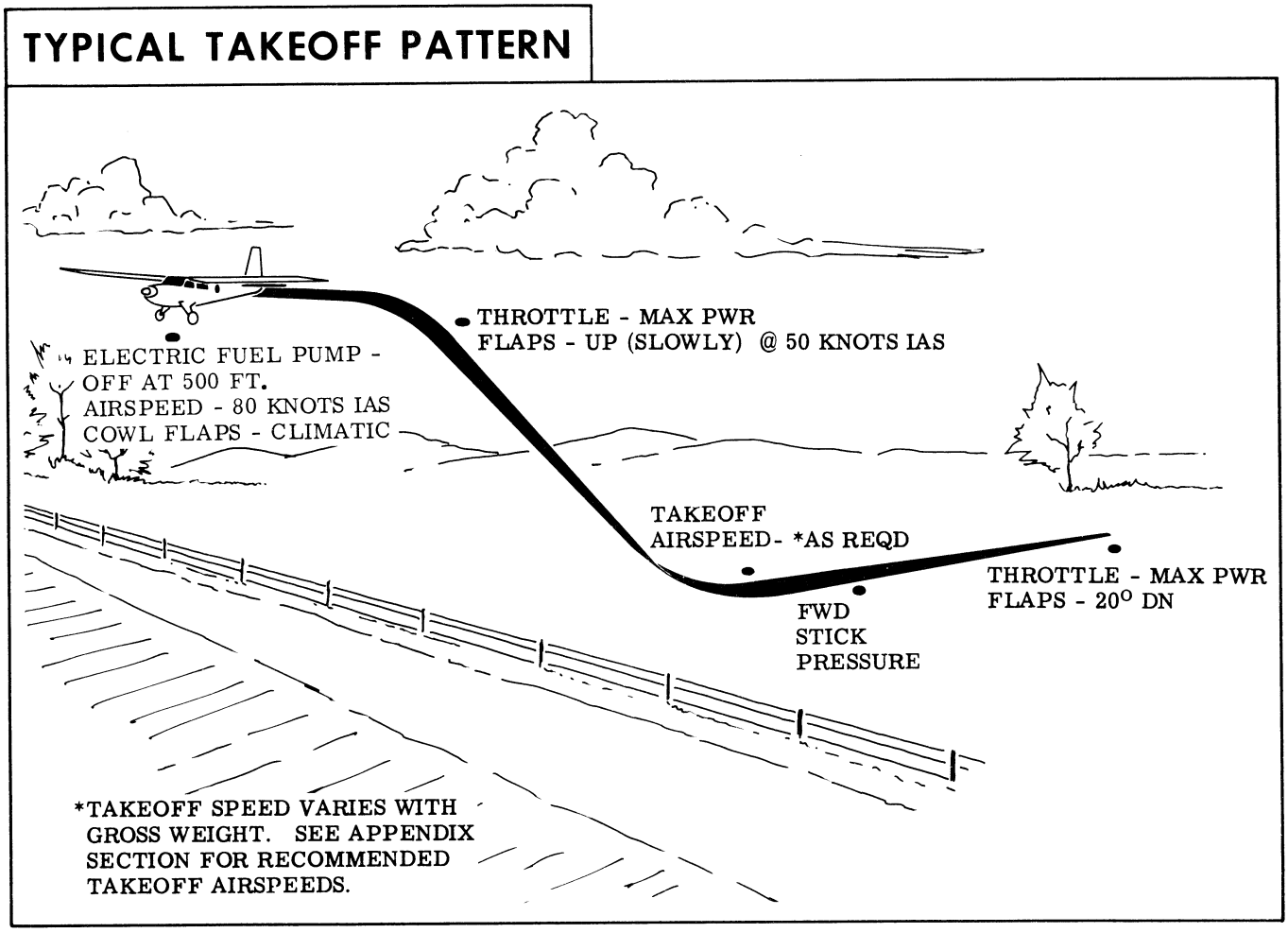


Figure 2-3.

a. Untie the mooring rope.
b. Move aircraft forward, by pulling on the rope until the buoy is behind the propeller.
c. Start engine and slip rope when engine picks up smoothly.

TAXIING (LANDPLANE)

After receiving a signal from the ground crewman indicating that the propeller blast area is clear, apply power to start taxi roll and perform the following checks:

NOTE

Make "S" turns as necessary while taxiing to provide adequate forward vision.

1. Wheel brakes - CHECKED.
2. Flight instruments - CHECKED.

Check turn-and-slip and heading indicators for proper turn indications when executing turns while taxiing.

3. Cross-wind landing gear operation - CHECKED.

With practice, cross-wind landing gear operation may be checked at low taxi speeds and moderate power. While taxiing slowly, apply brake until rotation of wheel being checked is almost stopped. At the same time apply power, causing the aircraft to continue to turn. After castor of gear, straighten the wheel and repeat operation for the opposite gear. Taxiing with cross-wind landing gear lock handle unlocked, but with gear centered may be accomplished in normal conditions after development of smooth taxiing technique.

NOTE

Except for familarization, extended taxiing with gear out of center should be avoided to prevent excessive wear on tires.

4. Tail wheel lock operation - CHECKED (if applicable).

CAUTION

Do not lock tail wheel when main wheels are unlocked as structural damage to the aircraft will result.

TAXIING (FLOATPLANE)

1. Water rudder retract handle - EXTEND.
Check freedom of movement. Release the mooring rope and ensure that it does not foul the floats.

CAUTION

If aircraft is held by ground crew, do not signal for RELEASE until engine is running smoothly with ignition switch on BOTH.

2. Wing flap crank - UP.
Taxi clear of all mooring buoys and obstructions, steering by use of the water rudders.

NOTE

Whereas the landplane remains in a fixed position with the engine idling, the floatplane, under identical conditions, moves along a path which is determined by the position of the aircraft controls, the propeller thrust, the wind, and the water current. In calm winds, the floatplane moves through the water at a speed of approximately 3 knots with the engine idling, and a direct headwind of 15 knots is required to hold the aircraft motionless with respect to the water. At higher than 1100 rpm, the propeller contacts considerable water spray in calm conditions. This maximum spray-free rpm can be increased slightly with a headwind and decreased slightly with a tailwind (minimum 800 rpm). The propeller operates relatively free of water spray when taxiing on the step; thus, the floatplane should be taxied very slowly or on the step. A step run should be made when a long distance must be covered on the water. Flaps should be UP when step turns are made.

WARNING

Step turns shall not be made from a downwind heading to an upwind heading as wind and centrifugal force, in combination, may be strong enough to capsize the aircraft. To make a turn into the wind, cut power and allow aircraft to settle into water and weathercock to upwind heading.

3. Flight instruments - CHECK.
Check turn-and-slip and heading indicators for proper turn indications when executing turns while taxiing.

ENGINE RUNUP (LANDPLANE)

1. Wheel brakes - HOLD.
Parking brakes may be set, but may not hold at high power settings.

2. Engine instruments - CHECK.
Check for temperature and oil pressure within limits prior to engine runup.

3. Propeller control knob - INCREASE RPM.
4. Mixture control knob - FULL RICH.
5. Control wheel - FULL AFT.
6. Carburetor heat - CHECK AT 1500 RPM.
Momentarily pull carburetor air knob to HOT position and note decrease in engine rpm, note increase in engine rpm when knob is returned to NORMAL position. Observe carburetor air temperature gage on aircraft coded A.

7. Generator - CHECK.
At approximately 1500 RPM check ammeter for excessive load. Check voltage 28V ± 0.5V (if applicable).

NOTE

On aircraft modified by T.O. 1U-10D-506, the generator failure warning light should illuminate anytime the generator is not powering the DC bus.

8. Propeller operation - CHECK.
   a. Throttle control knob - 2200 RPM.
   b. Propeller control knob - DECREASE RPM.
   Engine rpm should decrease to 1275 (± 75) RPM.

CAUTION

Use push-pull method of control knob operation only on the ground. Normal in-flight rpm changes shall be made by rotating the control knob to prevent rapid engine surge and resulting reduction gear or crankshaft damage.

9. Ignition system - CHECK.
   a. Throttle control knob -2600 RPM
   b. Ignition switch - CHECK.
   Rotate ignition switch from BOTH to L (left), note rpm drop, return to BOTH. Rotate switch from BOTH to R (right), note rpm drop and return to BOTH. Maximum permissible drop off is 125 RPM and should be within 50 RPM of each other.

10. Navigation radios - CHECK AS REQUIRED.
   a. VOR - station tuned and identified if available. Center CDI and check for approximate station bearing and TO-FROM indicator for proper indication.
   b. Localizer - if field has operational ILS, tune frequency and check for proper CDI displacement.
   c. Radio compass - station tuned and identified if available. Check set in ANT, COMP, and LOOP positions. Check for approximate station bearing on the radio compass indicator.

NOTE

While performing this check engine rpm should be adjusted to assure generator operation to preclude unnecessary drain on the battery.

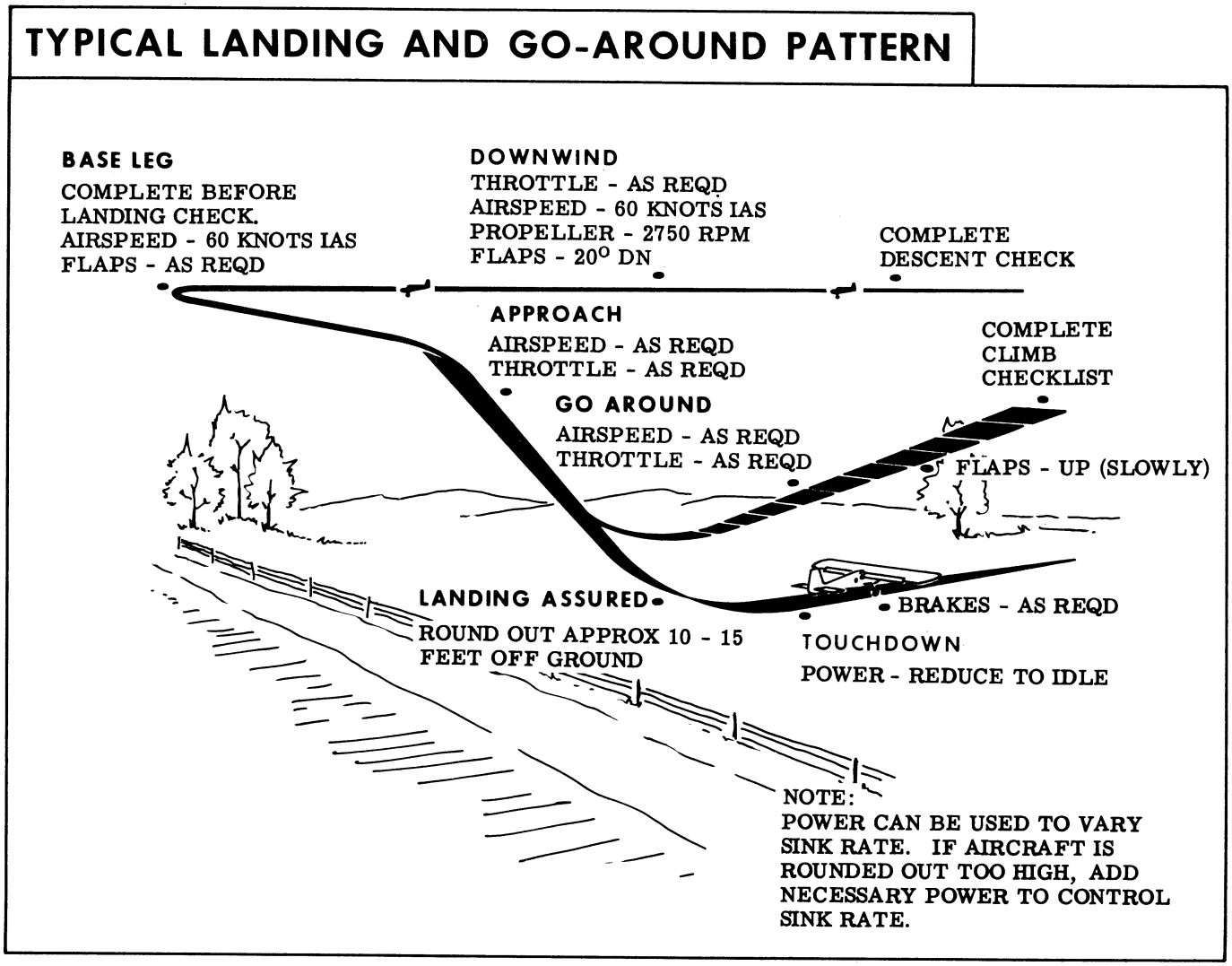


Figure 2-4.

ENGINE RUNUP (FLOATPLANE)

Use engine runup procedure as for landplane. Power checks may be performed with the aircraft moored or after taxiing away from the moorings. With the control wheel in the full aft position, the checks must be performed as quickly as possible to prevent excess water spraying onto the propeller and to prevent engine overheating. This may be done on the takeoff run provided all before takeoff checks have been completed and there is sufficient takeoff distance. In calm wind and sea conditions, it is possible to perform a full engine check by securing a rope to the rear support struts of the floats and connecting the bridle by a strong rope to a substantial fixture on the shore.

CAUTION

Excessive water spray will erode the propeller when the aircraft is held stationary and the engine is run at full power.

BEFORE TAKEOFF

1. Cargo and passengers - CHECK.

Check for security of passengers and cargo, and that passengers are prepared for takeoff.

2. Fuel selector handle - MAIN, ON.
3. Navigation and anti-collision lights - AS REQUIRED.
4. Electric fuel pump switch - ON.
5. Carburetor air knob - COLD.

Place carburetor air knob in the COLD position (full forward).

6. Cowl flaps handle - OPEN.
7. Tail wheel lock handle - UNLOCKED (if applicable).

Check tail wheel lock handle in the UNLOCKED position.

8. Mixture control knob - FULL RICH.
9. Propeller control knob - INCREASE RPM.
10. Flight instruments - CHECKED.
    a. Attitude indicator - recheck miniature aircraft adjusted level with 90-degree bank indices.
    b. Heading indicator - CHECK HEADING.
11. Wing flap crank - AS REQUIRED.

CAUTION

Place wing flap crank in forward position to reduce likelihood of head hitting crank in event of turbulence or sudden stop.

12. Trim tab crank - AS REQUIRED.
13. Pitot heater switch - CLIMATIC.

CAUTION

Pitot heat should not be used for a prolonged period on the ground as it will overheat and damage the heating element.

14. Cross-wind landing gear lock handle - AS REQUIRED.
15. Water rudder retract handle - RETRACT (if applicable).

Lift water rudder retract handle fully up, then latch.

16. Armament Checklist - COMPLETED.

STOP-AND-GO TAKEOFF

Items 4. through 14. of the Before Takeoff Check will be accomplished prior to takeoff on Stop-and-Go operation. Set cowl flaps as desired.

TAKEOFF (LANDPLANE)

CAUTION

To avoid wake turbulance allow a minimum of two minutes before takeoff or landing behind a heavy aircraft. This will permit the lateral displacement of the phenomenon of wing tip vortices. This phenomenon is the result of a lifting wing shedding a continuous sheet of vortices or eddies along its trailing edges. The vortices, being unstable, roll up quickly into a pair of vortex cores, behind each wing near the tip. The vortices of a heavy transport descend directly down toward the runway, and near the ground moves laterally. The rate of descent and lateral movement is approximately 300 to 350 feet per minute. A lighter aircraft penetrating the center of a vortex core would be subjected to a vertical airflow having a downward direction on one wing and an upward direction on the other. A light plane will roll very rapidly, the roll being much more than the available control could produce and therefore more than it could counteract.

CAUTION

Due to ground-loop tendency, positive directional control must be maintained throughout takeoff roll. Main landing gear struts are not stressed to withstand side loading incidental to most ground loops. Outside strut will usually fail, thereby allowing the wing tip to contact ground. If ground loop is not corrected in incipient stage through use of rudder and brakes, all control pressures except aileron should be released inasmuch as braking at this point increases side loading on gear struts. Aileron pressure should be applied in the direction of the turn. This procedure may reduce chances of equipment damage and personal injury.

The following procedures will produce the takeoff performance shown in Appendix I:

Align the aircraft for takeoff with the landing wheels centered.

1. Wing flap crank - DOWN (20^{o}).
2. Trim tab crank - NEUTRAL (0^{o}).

Rotate trim tab crank to position stabilator trim tab at neutral setting.

3. Wheel brakes - RELEASE.

NOTE

Takeoff ground roll will not be decreased (or increased) by holding brakes while applying takeoff power, then releasing brakes.

4. Throttle control knob - MAX. POWER.

Advance throttle control knob smoothly to full open position. Approximately 3 seconds is required to accelerate the engine smoothly from idle to maximum power.

CAUTION

Do not operate engine at maximum power over loose dirt and stones with brakes set, as damage to propeller blades will result.

5. Control wheel - PRESSURE AS REQUIRED.

NOTE

At light weights (2800 to 3000 lbs) raise the tail wheel only a few inches off the ground. As the takeoff weight increases, the tail must be raised higher. When compared to conventional light planes the takeoff attitude of the tail is relatively low.

6. Takeoff airspeed - ATTAIN BEST AIRSPEED.

The takeoff airspeed varies with gross weight and altitude. Refer to Appendix I for proper airspeeds.

7. Climb-out - ACCOMPLISH.

Normal technique - accelerate to attain a minimum increase of 15 knots above takeoff airspeed at 50 foot altitude.

Obstacle clearance technique - Refer to Appendix I for recommended airspeed to clear 50 foot obstacle. Accelerate to higher airspeed for sustained climb to clear high obstacles. See Appendix I for recommended climb speed.

CAUTION

Because of the relatively slow takeoff and climb out airspeeds possible with this aircraft, the airspeed should be increased as necessary to allow for wind shear and/or turbulent conditions.

8. Propeller control knob - 3000 RPM.

NOTE

It is recommended that 3400 rpm be held no more than 1 minute after starting the takeoff roll.

HIGH ALTITUDE TAKE-OFF (LANDPLANE)

During high altitude takeoff the control wheel should be held aft to keep the tail wheel on the ground up to approximately 15 KIAS to maintain directional control.

CAUTION

The aircraft nose restricts forward visibility during this time and difficulty is encountered in determining that the takeoff path is clear.

Do not attempt to rotate before the recommended takeoff speed. Takeoff speeds below those presented in Appendix I will result in longer ground distances; the aircraft will become airborne a few inches and then fall back to the ground. Landing gear vibrations will occur as the aircraft again becomes airborne.

Directional control is very sensitive during a high speed ground run. Overcontrolling of the rudder can cause the aircraft to swerve.

NOTE

Landing gear chatter is encountered before and after lift-off from a high speed ground run. The vibration can be stopped by applying wheel brakes after lift-off.

Flap retraction should not be initiated before 65 KIAS and a safe attitude is attained.

CAUTION

Premature flap retraction can cause the aircraft to descend.

Pushover to accelerate to best climb speed should be accomplished slowly after clearing an obstacle from a high altitude takeoff.

CAUTION

A rapid pushover can cause the aircraft to descend.

TAKEOFF (FLOATPLANE)

NOTE

Because of maneuvering restrictions floatplane operation on the water is not recommended when wind speeds exceed 25 knots or when a 15 knot crosswind component will exist on takeoff. Takeoff can be made in direct headwinds up to 35 knots if water maneuvering is not required. Sea conditions may preclude flight at lower wind speeds since sea conditions do not vary directly with the existing wind.

Visually check for air and surface craft in the vicinity and ensure that there are no obstructions in the water in the takeoff path. Taxi into takeoff position:

1. Engine runup - COMPLETE.
2. Wing flap crank - AS REQUIRED.

Rotate wing flap crank to attain desired flap setting.

3. Trim tab crank - NOSE UP (1^{O}).
4. Water rudder retract handle - RETRACT.

Lift water rudder retract handle fully up, then latch.

NOTE

When operating from a large body of water, retract the water rudders and wait for the aircraft to "weathercock" into the wind to determine takeoff heading. When operating from narrow lakes or rivers under crosswind conditions it is advisable to keep the water rudders extended during takeoff. Retract the water rudders when on the step or after becoming airborne. Make takeoffs down stream and directly into wind, when possible.

5. Control wheel - HOLD FULL AFT.

Hold control wheel full back to lift nose and reduce spray on the propeller.

6. Throttle control knob - MAX. POWER.

CAUTION

Directional control may not be adequate with a strong left crosswind due to "weathercocking" and engine torque effect. Leave water rudders extended for additional control until pushed over onto step, or after becoming airborne. Refer to Figure F2A3-1 in Appendix 2 for recommended maximum crosswind conditions.

7. Pushover - ACCOMPLISH.

Apply forward pressure on control wheel. Push forward on control wheel when aircraft nose is at highest point.

CAUTION

The aircraft may porpoise if pushover onto the step is made too abruptly or prematurely in certain sea conditions. Hold control wheel slightly aft of neutral to damp out oscillations. If the oscillations persist, abort takeoff by cutting power and pulling the control wheel all the way back. This will dampen the oscillations by forcing the tail of the floats into the water.

8. Step run - ACCOMPLISH.

Maintain most efficient planing position. Slight back pressure on the control wheel may be required to hold the floats at the most efficient planing angle, which is

approximately the same attitude as when the aircraft is at rest in the water.

9. Rotation - ACCOMPLISH.

After reaching takeoff speed (see Appendix) apply slight back pressure on control wheel. A smooth lift off will occur with no abrupt acceleration as the aircraft leaves the water.

CAUTION

The rotation speed is very critical. Attempts to rotate below the proper airspeed will increase the water run significantly.

NOTE

Under glassy water conditions, a slight but quick movement on the controls may be necessary to break the floats free of the water during rotation.

10. Climb out - ACCOMPLISH.

Normal technique - accelerate to attain a minimum increase of 15 knots above takeoff airspeed at 50 foot altitude.

Obstacle clearance technique - Maintain takeoff airspeed to clear 50-foot obstacle. Accelerate to higher airspeed for sustained climb to clear higher obstacles. See Appendix 2 for recommended climb speed.

11. Propeller control knob - 3000 RPM.

CLIMB

To obtain climb performance shown in Appendix proceed as follows:

1. Wing flap crank - UP.
2. Propeller control knob - 2750 RPM.

For maximum rate of climb leave rpm at 3000. Refer to Figures F1A4-2 and F2A4-2 in Appendix Section.

3. Electric fuel pump switch - OFF.
4. Fuel pressure - CHECK.

While turning boost pump switch off, check fuel boost pressure.

5. Throttle control knob - MAX. POWER.

NOTE

Full throttle is recommended for climb-out to ensure adequate cooling due to the enriching feature of the automatic mixture control.

6. Airspeed - BEST CLIMB AIRSPEED.

Refer to Appendix for recommended climb airspeeds.

7. Cowl flap handle - AS REQUIRED.

CRUISE

Refer to Appendix Section for power settings.

1. Throttle control knob - SET.
2. Propeller control knob - SET.

Set propeller control to attain desired engine rpm.

3. Cowl flap handle - CLIMATIC.
4. Carburetor air knob - CLIMATIC.

NOTE

The carburetor air knob should be in the cold position during normal flight on aircraft not equipped with a carburetor air temperature gage. If carburetor icing occurs (indicated by an unaccountable loss of power), apply full carburetor heat until icing conditions are no longer present, then return to the cold position. Partial heat should not be used on aircraft not equipped with a carburetor air temperature gage. If a carburetor heat gage is installed, use partial heat to maintain 15°C.

FUEL MANAGEMENT

A B B_3 D

WARNING

Monitor fuel quantity closely when operating on auxiliary tanks. As one tank approaches empty, the corresponding fuel selector will be placed in the off position. This will prevent engine malfunction due to air entering the system and will allow the remaining fuel to be used from the other auxiliary tank.

All aircraft incorporate a fuel return system which returns fuel vapor and unused fuel from the carburetor to the right cell of the main fuel tank at approximately 3 gallons per hour. For this reason on aircraft equipped with the 120-gallon fuel system it becomes necessary to properly manage the fuel system to allow sufficient space in the fuel cell for fuel return from the carburetor. On long missions it is necessary to use approximately 25 percent of the fuel out of the main fuel tank before switching to the auxiliary tanks. If mission flying time is sufficiently long, monitor the fuel quantity in the right fuel cell of the main fuel tank at frequent intervals to prevent it from overflowing from carburetor return fuel.

SWITCHING FUEL TANKS

When it becomes necessary to switch from one fuel tank to another, proceed as follows:

1. Electric fuel pump switch - ON.
2. Fuel selector handle - ON as desired.
3. Fuel selector handle - OFF (depleted tank).

Place tank fuel selector handle (for tank being switched from) in the OFF position.

4. Electric fuel pump switch - OFF.

Place electric fuel pump switch in the OFF position after fuel pressure stabilizes (approximately 10-15 seconds).

FLIGHT CHARACTERISTICS

Refer to Section VI for detailed information regarding flight characteristics.

DESCENT

Prior to descent, complete the following:

1. Throttle control knob - AS REQUIRED.
For extended descents at low power, use 2200-2500 rpm.

2. Cowl flap handle - AS REQUIRED.
Set cowl flap handle to attain desired cylinder head temperatures.

3. Carburetor air knob - CLIMATIC.

NOTE

When carburetor icing conditions are present, carburetor heat should be used during long descents at low power settings. The throttle should be partially opened at intervals to clear the engine.

BEFORE LANDING

Prior to entering final approach, complete the following:

1. Fuel selector handle - MAIN, ON.
2. Electric fuel pump switch - ON.
3. Tail wheel lock handle - AS REQUIRED (if applicable).
4. Carburetor air knob - AS REQUIRED.

5. Cowl flap handle - AS REQUIRED.
6. Propeller control knob - 2750 RPM.
7. Water rudder retract handle - RETRACT (if applicable).
8. Cross wind landing gear lock handle - AS REQUIRED.

Check cross-wind landing gear lock handle. If handle has vibrated forward, land wing-low to correct for drift, as there is no positive check in the air to assure that the wheels are unlocked. On D aircraft the cross-wind lock handle has a thumb pressure button which is pressed to release the knob.

9. Wing flap crank - AS REQUIRED. Rotate wing flap crank to desired flap setting.
10. Armament Checklist - COMPLETED.

LANDING

CAUTION

- To avoid wake turbulance allow a minimum of two minutes before takeoff or landing behind a heavy aircraft. This will permit the lateral displacement of the phenomenon of wing tip vortices. This phenomenon is the result of a lifting wing shedding a continuous sheet of vortices or eddies along its trailing edges. The vortices, being unstable, roll up quickly into a pair of vortex cores, behind each wing near the tip. The vortices of a heavy transport descend directly down toward the runway, and near the ground moves laterally. The rate of descent and lateral movement is approximately 300 to 350 feet per minute. A lighter aircraft penetrating the center of a vortex core would be subjected to a vertical airflow having a downward direction on one wing and an upward direction on the other. A light plane will roll very rapidly, the roll being much more than the available control could produce and therefore more than it could counteract.

- Due to ground-loop tendency, positive directional control must be maintained throughout landing ground roll and including taxi.

See Figure 2-4 for complete landing procedures.

CAUTION

Fast taxiing or maximum performance landings (tail first or three point) on semi-prepared or rougher fields at gross weights above 3100 pounds may overstress the tail gear or tail cone and result in structural failure.

NORMAL APPROACH

1. Wing flap crank - 1/2 (20°) to FULL DOWN. Rotate wing flap crank to desired flap setting.
2. Airspeed - 50 to 60 KTS IAS.
3. Throttle control knob - AS REQUIRED.

NOTE

Increase airspeed as required to allow for turbulance and possible wind shear. Do not exceed flap limit speed.

OBSTACLE CLEARANCE APPROACH

The following conditions will result in a steady rate of descent of approximately 500-700 fpm. Ensure that landing area is clear.

1. Wing flap crank - FULL DOWN.
2. Airspeed - AS REQUIRED.

Refer to Appendix Section for proper airspeeds.

3. Throttle control knob - AS REQUIRED.

Vary power, as necessary, to maintain desired sink rate in turbulent air.

NOTE

Appendix data is based on 10 inch Hg manifold pressure.

CAUTION

Stabilator control effectiveness is marginal below 45 knots IAS with less than 10 inches of manifold pressure.

RESTRICTED AREA APPROACH

When landing must be made in a restricted area with the approach bounded by high obstacles, actual practice indicates that it is advantageous to approach the obstacle with flaps full down in a slight descent at no less than 45 knots IAS, reduce power when definitely clear of the obstacle, and dive the aircraft to pickup an airspeed of at least 50 knots IAS. The aircraft descends rapidly, so the flare must be executed high enough to break the sink rate; also, the aircraft has little "float" in the flare, so the flare must not be made too high or a high sink rate will again develop, resulting in a hard landing. Add power in the flare, as necessary, to cushion the landing.

WARNING

This type of approach should be attempted only when familiar with the aircraft and after it has been practiced several times at a safe altitude. If the airspeed is too low at the bottom of the approach, pitch control may not be adequate to flare the aircraft which will cause the aircraft to hit hard on the main gear and bounce back into the air in a very nose high attitude.

TOUCHDOWN

LANDPLANE. As the threshold of the landing is reached, start round-out approximately 10-15 feet above the ground and establish a "3-point" attitude for touchdown. (The aircraft must be slightly more nose high than when sitting on the ground, as the main landing gear hangs lower in flight). The landing flare should be adequate to break the sink rate and produce a smooth landing, if power is not reduced until touchdown. Add power if necessary, to control the sink rate after flaring. Plan touchdown to require minimum braking prior to turning or stopping. If necessary, after touchdown on a smooth surface, brakes may be applied hard while the control wheel is held full back. Maximum braking may cause excessive fore and aft movement of the main landing gear. In this case, less braking should be used, and allowance should be made for additional ground run.

FLOATPLANE. The landing procedures for the floatplane are similar to those for the landplane. Certain additional considerations, however, must be taken into account. Before attempting a floatplane landing, the landing area must be checked from the air to assure that there are no floating or partly submerged objects in the landing path. Ascertain direction of wind by noting drift while flying crosswind, the direction seagulls are facing or lifting off from water (quite consistently up-wind), or the heading of boats at anchor unless currents and tides are likely to swing them the other way. Landing approaches in the floatplane are similar to those in the landplane. Touchdown should be made from a slightly tail low attitude. Power should be chopped upon contact with the water, to obtain the landing performance shown in Figure F2A6-1, Appendix 2. Do not attempt to land on rough water if it can be avoided, but preferably select a cove in the lee of a point, or an area in the lee of a dock or large vessel, having a smooth surface. This will prevent heavy impact loads on the floats. If possible, land on other than a glassy water surface. Because of the extreme difficulty in judging altitude when landing on a glassy water surface, or when executing a night landing, do not make a landing flare prior to contact.

WARNING

If it is necessary to land on glassy water surfaces, or make a night landing on the water, use the normal approach technique described for the landplane and maintain power for a rate of descent of approximately 200 feet per minute until contact with the water is made. No visual reference should be made to the water except to assure that no obstructions are in the landing path. Only shoreline, docks, etc., should be used as points of reference from which the landing procedure can be commenced. It is obvious that this type of landing requires appreciably more space than for a landing under normal conditions.

CAUTION

To prevent damage to the water rudders, do not lower them until the floatplane has stopped planing.

CROSS-WIND LANDING

CAUTION

When using the cross-wind landing gear, ensure that the cross-wind landing gear lock handle is locked in the aft position. It is possible for an unlocked handle to vibrate forward and partially engage the lock pin in the cross-wind wheel assembly preventing castoring in a cross-wind landing situation.

With functional cross-wind landing gear, drift control is effected through final approach and landing by crabbing into the wind to maintain the desired track. Particular care should be exercised not to permit the aircraft to be drifting right or left of the intended landing track on final or on touchdown. Limit the amount of crab to 15^{o} and at no time exceed the castor limit of the cross-wind landing gear as this may cause a ground loop. Don't expect the cross-wind landing gear to compensate for all cross-wind conditions. Normal use of rudder and brakes after touchdown must be used. With cross-wind landing gear locked, normal approach and touchdown is accomplished with the up-wind wing lowered as necessary to control drift, and the rudder used to maintain the aircraft straight with the desired heading. This method may also be used with the cross-wind landing gear unlocked.

MINIMUM RUN LANDINC

To perform a minimum run landing, follow the procedures shown in Figure 2-4 and observe the following:

Power may be reduced just prior to touchdown.

CAUTION

When using power-on approach technique with flaps down, do not reduce power until instant of touchdown. This will help prevent hard landings.

Reduce power to idle immediately upon touchdown and apply maximum braking necessary for the existing field surface conditions.

AFTER LANDING

1. Water rudder retract handle - EXTEND (if applicable).
2. Wing flap crank - UP.

3. Pitot heat - OFF.

CAUTION

Pitot heat should not be used for a prolonged period on the ground as it will overheat and damage the heating element.

4. Cross-wind landing gear lock handle - AS REQUIRED.

After final landing, turn handle 1/4 turn to the left and push full forward (in) to engage the lock-pin in the cross-wind wheel assembly to lock the wheels in the streamline position.

5. Tail wheel lock handle - AS REQUIRED (if applicable).
6. Electric fuel pump switch - OFF.
7. Propeller control knob - INCREASE RPM.
8. Cowl flap handle - OPEN.
9. Stabilator trim tab - NEUTRAL.
10. Navigation radios - OFF.

This will help prevent unnecessary battery drain.

11. Anti-collision light - OFF.
12. Armament Checklist - COMPLETED

GO AROUND

Upon decision to go around; increase power to full throttle. Rotate propeller control knob to 3000 rpm or 3400 rpm as required. Check area clear and continue as in normal takeoff.

NOTE

On the floatplane the decision must be made to preclude contact with water, since water drag will increase the distance required for go-around.

POST FLIGHT

LANDPLANE

1. Control wheel - FULL AFT.
2. Wheel brakes - HOLD.
3. Ignition grounding - CHECK.

At idle rpm place ignition switch momentarily in OFF position and check that engine quits firing.

4. Propeller operation - CHECK.

At an engine speed of 2200 rpm, exercise the propeller throughout its operating range.

5. Ignition system - CHECK.
   a. Throttle control knob - 2600 RPM.
   b. Ignition system - CHECK.

   Rotate ignition switch from BOTH to L (left) note rpm drop, return to BOTH. BOTH to R (right), note rpm drop, return to BOTH. Maximum permissible drop off is 125 RPM and should be within 50 RPM of each other.

6. Idle speed and idle mixture - CHECK.

Close throttle control knob and check for an idle speed of 700-800 rpm. With engine rpm at idle, and cylinder head temperature normal, slowly move mixture control knob aft toward the IDLE CUTOFF position. This slow movement of the knob is necessary for the engine to respond to the change in fuel-air mixture, so that an accurate reading can be obtained. As soon as a decrease in rpm is noted, return the mixture control knob to the FULL RICH position. A rise of not more than 75 rpm is permitted. An immediate decrease in rpm indicates the idle mixture is too lean.

7. Pitot/Static drain valve - OPEN then CLOSE.

FLOATPLANE

With control wheel full aft perform postflight checks while taxiing to mooring site or after aircraft has been secured. Use same procedure as listed for the landplane except for idle speed and idle mixture check, which should be accomplished when shutting engine down to end flight.

CAMERA POSTFLIGHT INSPECTION **D**

1. Camera film magazines - REMOVE.
2. Camera lens covers - INSTALL.
3. Camera panels - CLOSED AND LOCKED.

SPEAKER POSTFLIGHT INSPECTION **D**

1. Tape recorder - TAPE REMOVED.

Remove and stow tape.

2. Speaker system installation - GENERAL CONDITION AND SECURITY.

ENGINE SHUTDOWN

1. Throttle control knob - IDLE.
2. Unnecessary electrical equipment - OFF.
3. Cylinder head temperature - CHECK.

Do not shut down engine until cylinder head temperature is below 350°F or until stabilized.

4. Mixture control knob - IDLE CUTOFF.
5. Ignition switch and all other switches - OFF.
6. All fuel selector handles - OFF.
7. Mixture control knob - 1/3 to 1/2 FORWARD.

CAUTION

With the mixture control lever in the 1/3 to 1/2 forward position after engine shutdown, pressure on the idle cutoff diaphragm is relieved. This procedure will facilitate engine starting, provide smoother engine operation during warmup, and eliminate the need for constant engine priming during warmup period.

BEFORE LEAVING AIRCRAFT (LANDPLANE)

1. Wheel brakes - RELEASED.

Release after chocks are in place.

2. Forms - COMPLETED.

Fill out and sign off all applicable forms.

3. Aircraft - SECURED.

CAUTION

In addition to established requirements for reporting any system defects or unusual and excessive operations, the flight crew will also make entries in Form 781 to indicate when any limits in the flight manual have been exceeded.

BEFORE LEAVING AIRCRAFT (FLOATPLANE)

Mooring - Secure as follows:

a. When mooring against a jetty, the floatplane should be secured with ropes tied to the base of the float struts on the float adjacent to the jetty. The opposite ends of the ropes should be securely attached to support posts, or other securing points on the jetty. Suitably padded fenders must be placed between the float and the jetty, and attached securely to the jetty. Sufficient slack must be allowed to the mooring ropes to allow for shrinkage and changes in water level.

b. The floatplane may be moored to an off-shore buoy by ropes tied around the bases of the forward attachment struts on the floats.

CAUTION

Tie the mooring ropes around both struts; never to the spreader bar between the floats.

Beaching - Proceed as follows:

CAUTION

When using power-on approaches for beaching do not engage the beach or shore line at higher than idle taxi speeds (Approximately 3 knots). If speed is excessive, damage to the front of the floats may occur or the floats may dig in possibly causing the aircraft to nose over.

When the aircraft is to be beached, maintain rpm necessary to provide directional control until floats strike ground. A side-to-side rudder movement while approaching the beach will indicate that the aircraft will respond if it becomes necessary to abort the approach. If a ground crew is available to meet the aircraft in the water, to place dolly under aircraft for towing onto shore, cut engine and coast to shore to prevent propeller causing injury to personnel. Use rope to secure aircraft. Tie one end of rope to wing tie-down ring, and other end of rope to stake or other secure object. Secure tail in like manner, if possible.

1. Forms - COMPLETED.

Fill out and sign off all applicable forms.

2. Flight controls - LOCKED.
3. Aircraft - SECURED.
4. Lighting regulations - CHECK.

Ensure lighting regulations are complied with, if the floatplane is to remain moored to an off-shore buoy overnight.

5. Water rudder retract handle - RETRACT.

CAUTION

In addition to established requirements for reporting any system defects, unusual and excessive operations, the flight crew will also make entries in Form 781 to indicate when any limits in the flight manual have been exceeded.

PILOT'S FLIGHT CREW CHECKLIST

Your checklist is contained in T.O. 1U-10A-1CL-1.

ARMAMENT PROCEEDURES

This section contains the amplified proceedures for the delivery of 2.75 in. target marking rockets for the performance of combat or training missions; proceedures for weapon preflite, firing, before landing, and after landing inspections.

BEFORE EXTERIOR INSPECTION

1. Control panel circuit breaker - OUT.
2. Master arm switch - OFF.
3. Drop switches - OFF.
4. Fire Select switches - OFF.

EXTERIOR INSPECTION

1. Launcher Safety Pins - INSTALLED.
2. Sway braces - TIGHT.
3. Adapter cable - SECURED.
4. MA-4A/B lock indicator - LOCKED POSITION.
5. Rockets - LOCKED IN DETENTS.

BEFORE TAKEOFF

1. Launcher safety pins - REMOVED.

CAUTION

Aircract with up-loaded rockets will not be taxied toward or thru congested or populated areas with launcher safety pins removed. Pilot will have launcher safety pins removed as the last step before takeoff; he will place his hands where the armament personnel removing the safety pins can see them and be assured the ordnance delivery button cannot be inadvertently actuated during removal of safety pins.

BEFORE FIRING

1. Selected Fire Select switch - ON.

   Limit of one rocket per wing per firing.

2. Circuit breaker - IN.
3. Master arm switch - ON.

FIRING PROCEEDURES

1. Dive angle - AS REQUIRED.
2. Air speed - AS REQUIRED.
3. Target - TRACK.
4. Ordnance delivery button - PRESS.

BEFORE LANDING

1. Master arm switch - OFF.
2. Fire Select switches - OFF.
3. Circuit breaker - OUT.

AFTER LANDING (UNFIRED ROCKETS)

1. Launcher safety pins - INSTALLED.

EMERGENCY RELEASE PROCEEDURES

EMERGENCY JETTISON. To jettison all pylon launchers with or without rockets.

1. Salvo button - PRESS.

SELECTIVE JETTISON

1. Selected drop switch(s) - ON.
2. Circuit breaker - IN.
3. Master arm switch - ON.
4. Ordnance delivery button - PRESS.

Section III
EMERGENCY PROCEDURES

TABLE OF CONTENTS

INTRODUCTION

This section contains what are considered the best procedures for coping with various emergencies that may be encountered during takeoff, flight, and landing. Every emergency presents a different problem; therefore, a thorough knowledge of the basic procedures outlined in this section will enable you to cope with the emergencies you may encounter. It is essential that the pilot carefully analyze the difficulty prior to taking corrective action.

NOTE

The urgency of certain emergencies requires immediate action by the air crew member. These checklist items are in bold print and will be memorized by the crew member. Following completion of the bold print items, the remaining portion of the checklist will be completed in its entirety, time permitting.

ENGINE FAILURE

ABORT

If engine failure occurs during take-off run, proceed as follows:

1. Throttle - CLOSED.
2. Control Wheel - AS REQUIRED.
3. Wheel brakes - AS REQUIRED.

Apply sufficient braking action to stop aircraft safely.

4. Water rudders - EXTEND (If applicable).
5. Mixture - IDLE CUTOFF
6. All switches - OFF

ENGINE FAILURE DURING TAKEOFF (Before Becoming Airborne)

USE ABORT PROCEDURES.

ENGINE FAILURE DURING TAKEOFF (After Becoming Airborne)

1. AIRSPEED AND/OR ATTITUDE - ATTITUDE IF ALTITUDE DOES NOT PERMIT MINIMUM FLARE AIRSPEED.

Assume best aircraft attitude (three point) if altitude is not sufficient to obtain minimum flare airspeed.

2. Directional control - AS REQUIRED TO AVOID OBSTACLES.

Assume a straight ahead glide path, turning only when necessary to avoid obstacles.

3. Wing flap crank - AS REQUIRED (IF ALTITUDE PERMITS).

WARNING

Steep climb-outs during obstacle clearance takeoffs may result in low airspeed/altitude combinations from which the aircraft cannot be safely landed following sudden and complete engine failure. Land with wings level and attempt three point landing attitude to minimize injury to crew and passengers.

ENGINE FAILURE DURING FLIGHT.

The great majority of engine failures are gradual and warning of impending failure is provided. Some of the indications that failure is imminent are: A rough running engine, loss of oil pressure, excessive oil temperature, and fluctuating RPM. If engine failure appears imminent, select and arrive at the nearest landing area as expeditiously as possible. In this precautionary situation, use of the forced landing pattern is recommended; however, entry into the pattern should be at the point which allows the aircraft to be landed as quickly and safely as possible, with minimum maneuvering. If engine failure occurs, proceed as follows:

1. THROTTLE - RETARD.
2. PROPELLER - FULL DECREASE.
3. MAXIMUM GLIDE AIRSPEED - ATTAIN.

Attain glide airspeed as shown in Figure 3-1.

If altitude and conditions permit a restart, refer to Engine Restart In Flight.

ENGINE RESTART IN FLIGHT

1. Throttle - SET AT 1/8 OPEN.
2. Ignition - BOTH.
3. Fuel Selector - ON.

If fuel contamination is suspected, switch fuel tanks.

4. Electric Fuel Pump - ON.
5. Carburetor Air - AS REQUIRED.
6. Cowl Flaps - CLOSED.
7. Mixture - FULL RICH.
8. Primer - CHECK IN AND LOCKED.
9. Master and generator switches - ON.
10. All unnecessary electrical equipment - OFF.
11. Starter - DEPRESS/TURN KEY TO START AND PUSH (if propeller is not windmilling).

CAUTION

Do not operate the starter switch with propeller windmilling as severe damage to the starter and internal engine drive gears will result.

When engine starts, insure that engine oil pressure, temperature and fuel pressure are within limits before applying more power.

If Engine Fails to Start, or altitude or other emergency conditions do not permit a restart, attempt to intercept the forced landing pattern at high key, low key, base leg or final approach as altitude and circumstances dictate and proceed with Landing With Engine Inoperative procedures.

FUEL PRESSURE DROP - ENGINE OPERATING NORMALLY

If the fuel pressure drops below the operating limits during flight, but the engine continues to operate normally, the cause may be one or more of the following: primer leakage; engine-driven fuel pump bypass valve leakage; clogged pressure line; instrument failure; or line leakage. Whenever fuel pressure drops and the engine continues to operate normally, the first concern of the pilot must be to guard against the outbreak of an engine fire. The greatest danger lies in the fact that the pilot develops a false sense of security because no fire exists at the time that the fuel pressure drop is noticed, nor after a prolonged period of flight. However, when the throttle is retarded (as in preparation for a landing), an engine fire develops and the results are usually disastrous. What has happened is that a fuel leak existed, but the cooling and dispersing effect of the airflow through the engine cowling at cruising speed has prevented the start of a fire. When the throttle was retarded, the airspeed dropped and the airflow was reduced sufficiently to permit ignition of the leaking fuel. Any change in the airflow pattern, such as reducing rpm and entering a climb, can start a fire if a fuel leak exists. Increasing the power is less likely to start a fire since airspeed will be increased, but even here there is a possibility of fire since the exhaust heat and flame pattern may change sufficiently to outweight the increase in cooling airflow. Accordingly, it must be the objective of the pilot to prevent fuel flow to the fire before any change is made to the airflow or exhaust pattern. The most effective means of accomplishing this is by moving the mixture control knob to the IDLE CUTOFF position before any throttle reduction, or any other engine shutdown procedure is initiated. An additional advantage of moving the mixture control knob to the IDLE CUTOFF position is that it provides the most rapid means of eliminating exhaust stack flames and reducing exhaust heat.

ENGINE SHUTDOWN PROCEDURE

When engine shutdown becomes necessary proceed as follows:

WARNING

When fuel pressure drops and engine continues to operate normally, mixture control knob must be moved to the IDLE CUTOFF position before airspeed is reduced, or before any engine shutdown procedure is initiated such as retarding the throttle.

1. MIXTURE CONTROL KNOB - IDLE CUTOFF
2. FUEL SELECTOR HANDLES - ALL OFF.
3. Electric fuel pump switch - OFF.
4. Ignition switch - OFF.
5. Master and generator switches - OFF.
6. Propeller control knob - DECREASE RPM.

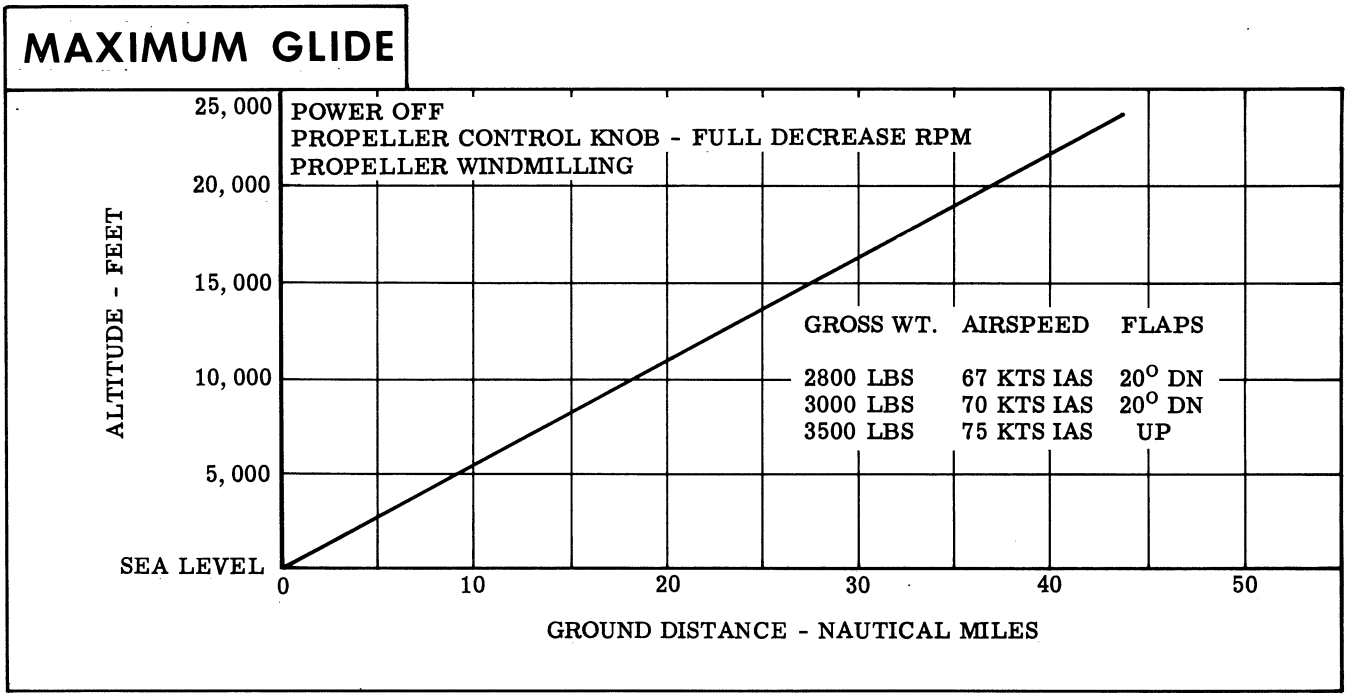


Figure 3-1.

COURSE OF ACTION DURING GROUND OPERATION. If the fuel pressure drops below the operating limits, but the engine continues to operate normally, stop the aircraft and perform the engine shutdown procedure.

WARNING

DO NOT TAKE OFF. Investigate the cause of the malfunction and perform the necessary corrective action.

COURSES OF ACTION DURING FLIGHT. The proper course of action during flight is as follows:

a. Keep the engine in operation until a suitable power-off landing area is reached. The aircraft should be maneuvered to a position from which a safe power-off landing can be accomplished prior to any throttle manipulation, then perform the engine shutdown procedure and make a power-off landing.

b. Keep the engine in operation at or above cruising speed while maintaining watch for fire. This can be done if it cannot be determined whether or not an actual fuel leak exists. The aircraft should be maneuvered to a position from which a safe power-off landing can be accomplished prior to any throttle manipulation. Upon retarding the throttle, a close watch should be maintained for fire. If a fire should occur proceed as outlined in Engine Fire During Flight paragraph in this section.

c. Continue operating the engine normally. This may be done if it can be reasonably ascertained that the indicated fuel pressure drop has not resulted from a fuel leak.

NOTE

Course (a.) is generally the safest, because of the ease with which power-off landings can be accomplished with this aircraft. The size and condition of the landing site, weather conditions, pilot's proficiency, and known condition of the aircraft are also factors to be considered.

MAXIMUM GLIDE

In the event of engine failure, a maximum gliding distance may be obtained with the propeller in FULL DECREASE RPM. Obtain glide speed and flap setting as shown in Figure 3-1.

NOTE

Pulling the propeller control knob back to FULL DECREASE RPM increases gliding distance significantly.

LANDING WITH ENGINE INOPERATIVE

1. Throttle - CLOSED.
2. Propeller - FULL DECREASE.

NOTE

The propeller control may be used as a method of extending and shortening glide in order to touchdown in the desired landing area.

3. Fuel Selector - OFF.
4. Electric Fuel Pump - OFF.
5. Mixture - IDLE CUT-OFF.
6. Ignition - OFF.
7. Radio Call - ACCOMPLISH.
8. Master and Generator Switches - OFF.
9. Safety Belts and Shoulder Harness - SECURE.
10. Wing Flap - AS REQUIRED.
11. Airspeed - 55 KTS MINIMUM.

CAUTION

Once flaps are lowered to a setting they should not be retracted to a lesser setting. Landing with flaps more than one-half down results in rapid deceleration in the flare; thus a flare must be made close to the ground and touchdown must occur immediately thereafter. Landing with flaps up results in a relatively high speed touchdown.

NOTE

If a suitable landing area is not available following engine failure in the floatplane, select a clear field or other smooth landing surface and touchdown smoothly on the float step.

PROPELLER FAILURE

PROPELLER BLADE FAILURE DURING TAKEOFF (Before Leaving Ground)

USE ABORT PROCEDURES.

PROPELLER OVERSPEEDING

An overspeeding propeller is one which has exceeded 3400 rpm but which is controllable by the propeller control knob. See Section V for engine limitations.

PROPELLER FAILURE IN FLIGHT - RUNAWAY

If an uncontrollable high rpm occurs during flight, proceed as follows:

1. THROTTLE CONTROL KNOB - RETARD.
2. AIRSPEED - REDUCE AS REQUIRED.
3. Propeller control knob - ATTEMPT TO DECREASE RPM.

NOTE

If propeller governor regains control maintain 60 knots IAS and land at the nearest suitable landing area. If propeller governor does not regain control, use an attitude, airspeed, and power combination to attempt to keep the rpm below 3400. Land at nearest suitable landing area.

PROPELLER UNDERSPEEDING (During Takeoff)

USE ABORT PROCEDURES.

PROPELLER UNDERSPEEDING (During Flight)

If propeller underspeeds (during flight) an immediate decrease of rpm will be noted. If this happens, proceed as follows:

1. Throttle control knob - INCREASE POWER AS REQUIRED.

Increase power as required to maintain altitude and speed above 52 knots IAS. During a climbout, reduce attitude as much as possible. If speed is very low it may be necessary to dive the aircraft, use full throttle or both to increase airspeed above 52 knots IAS. In an extreme case it may be necessary to crash in a three-point attitude.

CAUTION

If possible maintain manifold pressure within limits.

2. Landing - ACCOMPLISH.

Land as soon as possible.

FIRE

ENGINE FIRE ON THE GROUND

If an engine fire occurs on the ground and is known to be in the induction system keep the engine running as the fire may be sucked through the engine and extinguished. If the source of the fire is not definitely known, perform the Engine Shutdown Procedure as outlined in this section.

ENGINE FIRE (During Flight)

In the event of an engine fire during flight, perform the Engine Shutdown procedure as outlined in this section.

FUSELAGE FIRE (During Flight)

Turn master switch OFF. If fire goes out, refer to Electrical Fire (During Flight). If fire does not go out, bail out (if applicable) or accomplish emergency descent and land as soon as possible. Abandon aircraft.

WING FIRE

If a fire occurs in a wing, switch off the navigation lights, landing light, and if the fire is in the left wing, switch off the pitot heat. Attempt to extinguish the fire by sideslipping the aircraft away from the flames. If the fire cannot be extinguished bail out (if applicable) or land as quickly as possible, and abandon aircraft.

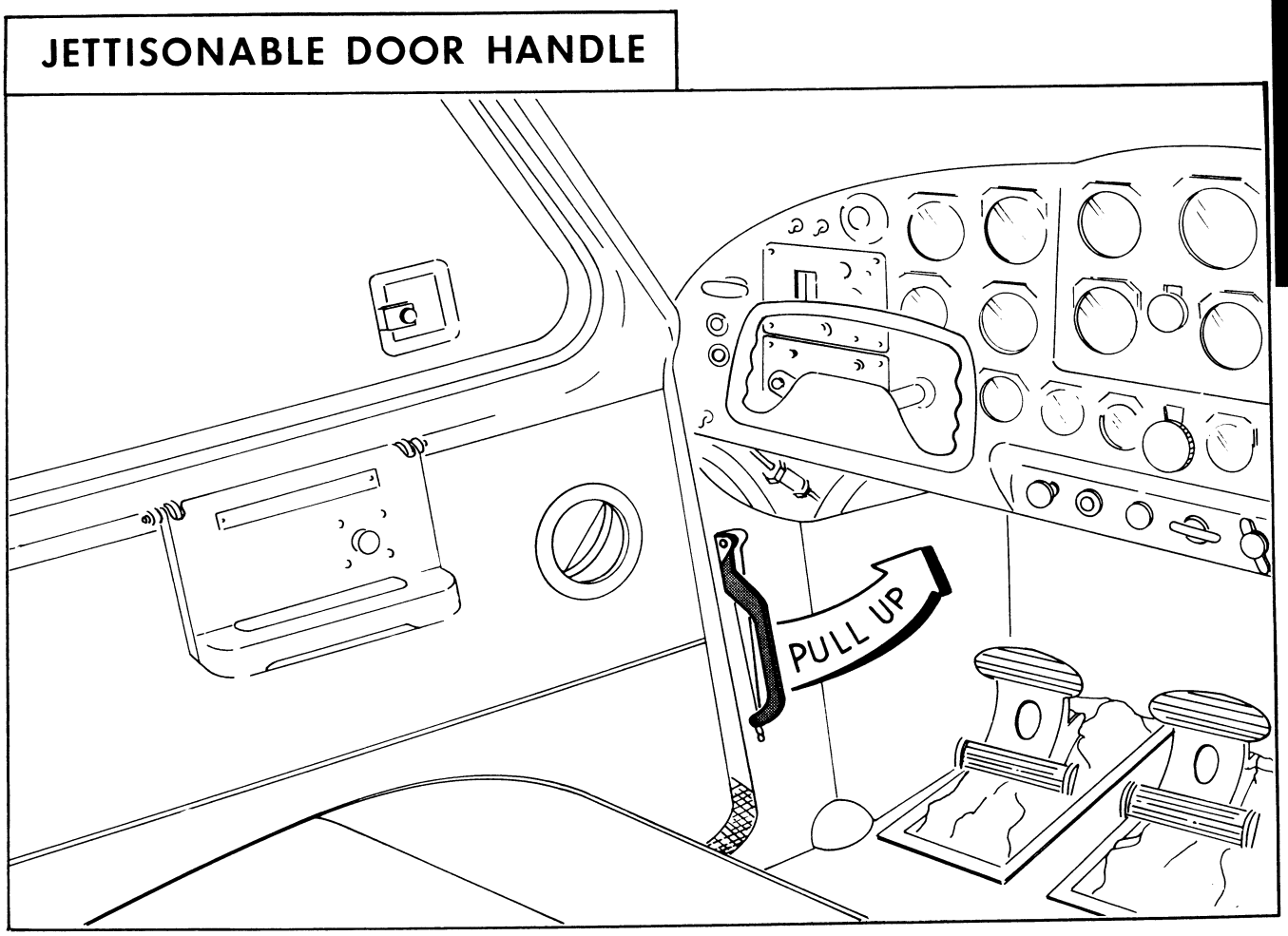


Figure 3-2.

ELECTRICAL FIRE (During Flight)

1. MASTER AND GENERATOR SWITCHES - OFF.
2. All electrical switches - OFF.

After fire is out:

3. Master and generator switches - ON.
4. Electrical switches - ON individually.

Turn each electrical switch ON individually to determine source of trouble. Place switch for the defective circuit OFF.

ELECTRICAL FIRE (On the Ground)

If the system which caused the trouble can be determined, isolate the circuit by placing the applicable switch in the OFF position. If source of fire cannot be determined, proceed as follows:

1. Master and generator switches - OFF.
2. Mixture control knob - IDLE CUTOFF.
3. Fuel tank selector handles - ALL OFF.
4. Abandon aircraft - ACCOMPLISH.

An A-20 Bromochloromethane fire extinguisher located under the co-pilot's seat is available for fire fighting but should be used only on the ground or when there is no danger of the pilot being exposed to the fumes.

CAUTION

Bromochloromethane is an anesthetic agent of moderate intensity, prolonged exposure to its fumes should be avoided.

SMOKE AND FUMES ELIMINATION

To remove smoke or fumes from the cabin, proceed as follows:

1. Source of smoke or fumes - ELIMINATE. Make sure source (fire) of smoke or fumes is eliminated, or will not be aggravated by draft.
2. Cabin heat control knob - OFF.
3. Cold air control knob - OPEN.
4. Cabin ventilators - ALL OPEN.
5. Pilot compartment access window (if smoke still persists) - OPEN.

DITCHING

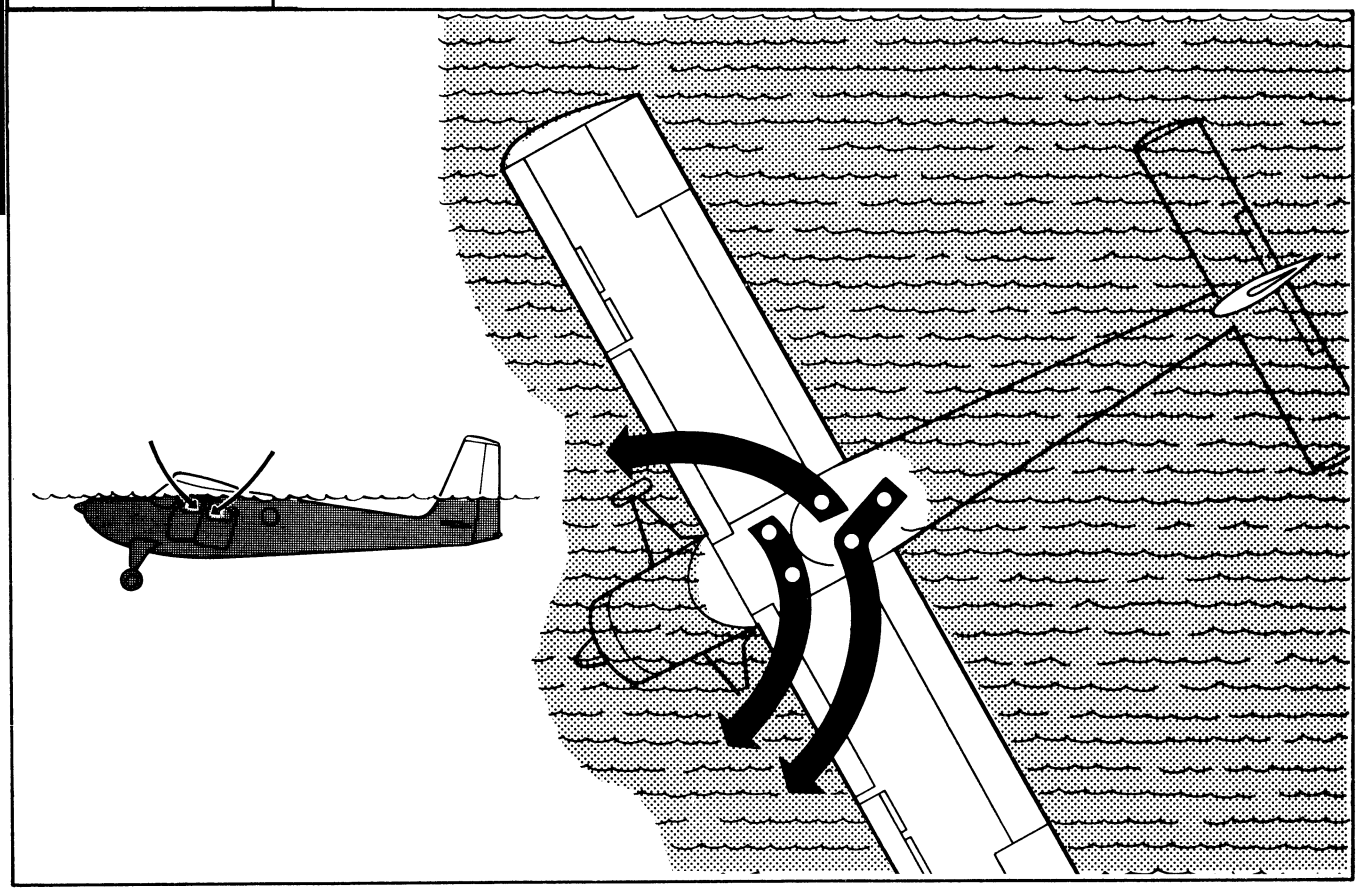


Figure 3-3.

In most cases, the preceding steps should provide enough airflow to eliminate all smoke and fumes. However, if smoke still persists, the pilot compartment access door may be unlatched and held open two or three inches.

BAIL OUT

This airplane was not designed for flight operation by personnel wearing parachutes. The fuselage truss, the personnel restraint system, and the relatively low forward and sink speeds possible at impact, minimize the chance of injury to the occupants. If the airplane can be controlled, crash landing is preferable to bail-out. If the airplane cannot be brought to the ground under control, and the occupants are wearing parachutes, the following procedure should be used for bail out.

1. Airspeed - REDUCE.

Reduce to lowest practical airspeed (approximately 60 knots IAS).

2. Wing flap crank - 20° DOWN (maximum).
3. Seat belts and shoulder harness - RELEASE.
4. Pilot compartment access door - JETTISON.
5. Passenger compartment doors - JETTISON.
6. Bail out - ACCOMPLISH.

All personnel bail out through nearest exit.

EMERGENCY DESCENT

The maximum safe rate of descent that should be attained is approximately 3000 FPM in the clean configuration at the maximum airspeed with the throttle closed and the propeller in FULL INCREASE rpm.

LANDING EMERGENCIES

FORCED LANDING PATTERN.

The forced landing pattern is designed to provide a procedure for safely landing an aircraft with total or partial engine failure. Ideally a high key entry should be made. However, at the altitudes at which this aircraft flys, high key entry is not always possible over a suitable landing area. In this case the pattern should be entered at the most immediately attainable point. Refer to Figure 3-4.

SIMULATED FORCED LANDING

1. Throttle - CLOSED
2. Propeller - FULL INCREASE
   Place prop in full increase to assure rapid engine response if a go-around is required.

NOTE

During an actual forced landing the prop will be set at full decrease for maximum glide and may be manipulated as necessary to increase or decrease drag.

3. Glide Speed - ATTAIN (See Figure 3-1)
4. Mixture - RICH
5. Fuel Selector - ON
6. Fuel Boost Pump - ON
7. Cowl Flaps - CLOSED
8. Flaps - As Desired

CAUTION

Once flaps are lowered to a setting, they should not be retracted to a lesser setting. Landing with more than one-half flaps results in rapid deceleration in the flare; thus a flare must be made close to the ground with touchdown occuring immediately thereafter.

NOTE

To prevent spark plug fouling, the engine should be cleared every 30 seconds by advancing throttle three-fourths open and back to idle.

If actual forced landing is required, refer to Landing with Engine Inoperative.

LANDING WITH FLAT TIRE

When landing is made with a flat tire on one main gear, the aircraft will turn in the direction of the flat tire. Maintain directional control with the brakes. Land to the edge of the runway opposite the flat tire. Make normal landing utilizing as much flap as possible under prevailing conditions.

LANDING ON UNPREPARED RUNWAY

Landing procedure for unprepared runways is similar to MINIMUM RUN LANDINGS (see Section II). On soft or rough ground use caution in applying brakes to prevent undue strain on the landing gear. Raise the wing flaps as soon as possible to prevent damage from propeller blown debris. Avoid coming to a stop in loose sand or dirt.

LANDING IN TREES OR EXTREMELY ROUGH TERRAIN

Make a normal approach. Flare so as to minimize forward speed at impact. At night set flaps and trim for minimum forward airspeed without pitching oscillation. Jettison all unnecessary loose equipment. Secure all other gear to minimize the chances of injury at impact from flying miscellanea. Do not jettison the doors until after the airplane stops. The door will help prevent branches and debris from coming into the cockpit and cabin. All personnel except the pilot (who must fly the airplane as long as possible) should shield their heads and faces during the crash. Turn all switches and fuel selector valves off just prior to impact or as soon as possible thereafter. Jettison the doors and evacuate the aircraft as soon as it stops completely. If the crash was in a dense forest, the airplane may not penetrate to the forest floor so be careful while leaving the airplane.

EMERGENCY ENTRANCE

The windshield or windows may be broken if entrance to the cabin cannot be gained through any of the access doors.

DITCHING (LANDPLANE)

Experience gained with other types of aircraft indicates that best results are obtained by the use of power in the selection of the best spot for sea conditions; for controlling the rate of descent, to minimize the hazard of lack of depth perception overwater; and the establishment of the most favorable landing position and attitude. Should it become necessary to ditch the aircraft, follow radio distress procedures. Personnel shall remove all unnecessary personal gear such as parachutes, headsets, etc., and jettison all unsecured equipment. Check that all seat belts are tight and fastened. The pilot shall lower the wing flaps to the full DOWN position, and assume a three-point attitude with minimum rate of descent. Prior to touchdown jettison pilot and passenger compartment doors. If time permits, remove para-drop door on aircraft coded A1 B B3 D . Just after touchdown abandon aircraft. Do not inflate underarm life preserver until clear of aircraft.

NOTE

Unless wind is high or sea is rough, plan approach landing parallel to any uniform swell pattern and try to touchdown along wave crest or just after crest passes. If wind is as high as 25 knots or surface is irregular, the best procedure is to approach into the wind and touchdown on the falling side of a wave. Make normal approach and flare-out in a nose-high landing attitude. When aircraft stops, exit as shown in Figure 3-3.

AIRCRAFT SYSTEMS (EMERGENCY OPERATION)

FLIGHT CONTROL SYSTEM

The rudder can be used to execute wide radius turns if the aileron control fails, and the ailerons can be used to maintain directional control if the rudder fails. In either case, execute maneuvers carefully.

If the stabilator control fails, the airplane can be landed safely by using stabilator trim and/or power to control the airplane in pitch.

WARNING

In the event of failure or damage to the flight control system, thoroughly determine the controllability of the airplane before attempting to land.

FUEL SUPPLY SYSTEM

In the event of fuel shortage at the carburetor, as indicated by the fuel pressure gage and/or abnormal engine operation, assure that the selected tank contains fuel. After an adequate fuel supply has been established by the fuel quantity indicator, turn the electric fuel pump on. The electric fuel pump should be turned off after the engine-driven fuel pump has established a normal fuel pressure. If the engine-driven pump does not function properly, the electric fuel pump can be used to maintain normal fuel pressure. A shutoff valve labeled INTERCONNECTING FUEL LINE VALVE on aircraft coded A A1 B B3 , is located on the pilot's overhead control panel. Should one of the two cells comprising the main tank be damaged and a leak occur, the shutoff valve shall be placed in the OFF position. This prevents interflow from the undamaged tank to the damaged tank. The interconnecting fuel line valve switch is normally left in the ON position. On aircraft coded D , fuel tanks are controlled individually; a damaged tank can be isolated from the system by the fuel control valve.

ELECTRICAL SYSTEM

In the event the ammeter indicates that the generator is not operating (a negative reading of the ammeter), all nonessential electrical equipment should be turned off at once, and the operation of the radio equipment should be restricted in order to conserve the battery for occasions when their use is imperative to the safety of the aircraft. A landing should be made as soon as practicable.

HYDRAULIC SYSTEM

If hydraulic lines are ruptured, braking action will not be available.

PILOT'S FLIGHT CREW CHECKLIST

The pilot's emergency checklist is contained in T. O. 1U-10A-1CL-1.

U-10 FORCED LANDING PATTERN

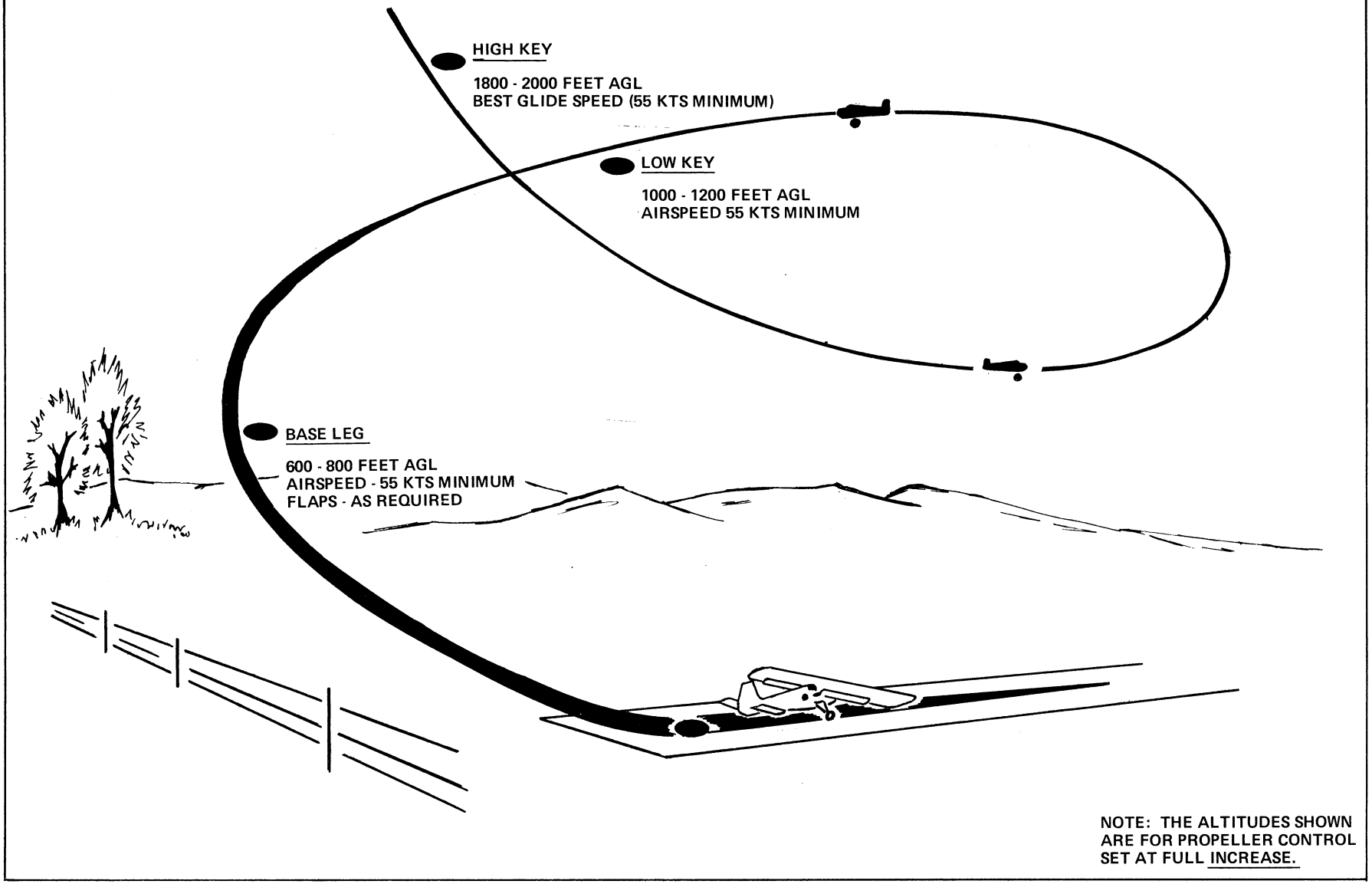


Figure 3-4.

Section IV

AUXILIARY EQUIPMENT

TABLE OF CONTENTS

HEATING, VENTILATING, AND DEFROSTING SYSTEM

The heating, ventilating, and defrosting system (Figure 4-1) provides fresh heating or ventilating air to the cabin area. The system consists of two ram air inlets in the nose of the aircraft, a heating muff, and an air mixer box. Air entering the ram air inlet on the left forward side of the engine lower cowl is ducted directly to the air mixing box. The temperature and flow of air entering the cabin is regulated in the air mixing box, and vented into the cabin through the cabin heater and defroster outlets.

CABIN AIR TEMPERATURE CONTROL KNOBS

Cabin air temperature is regulated by two push-pull knobs (27, 29, Figure 1-4) labeled COLD AIR and CABIN HEAT. When either the cold air or cabin heat control knob is pulled out, the selected air flows into the cabin area from the heater outlet. When both control knobs are pulled out at the same time the hot air from the cabin heat muff and cold air from the left ram air inlet enters the air mixing box, mixes, and flows into the cabin area. When both control knobs are pushed all the way in, the air flow is shut off completely. Air flow and temperature may be regulated by placing the control knobs in the desired intermediate position.

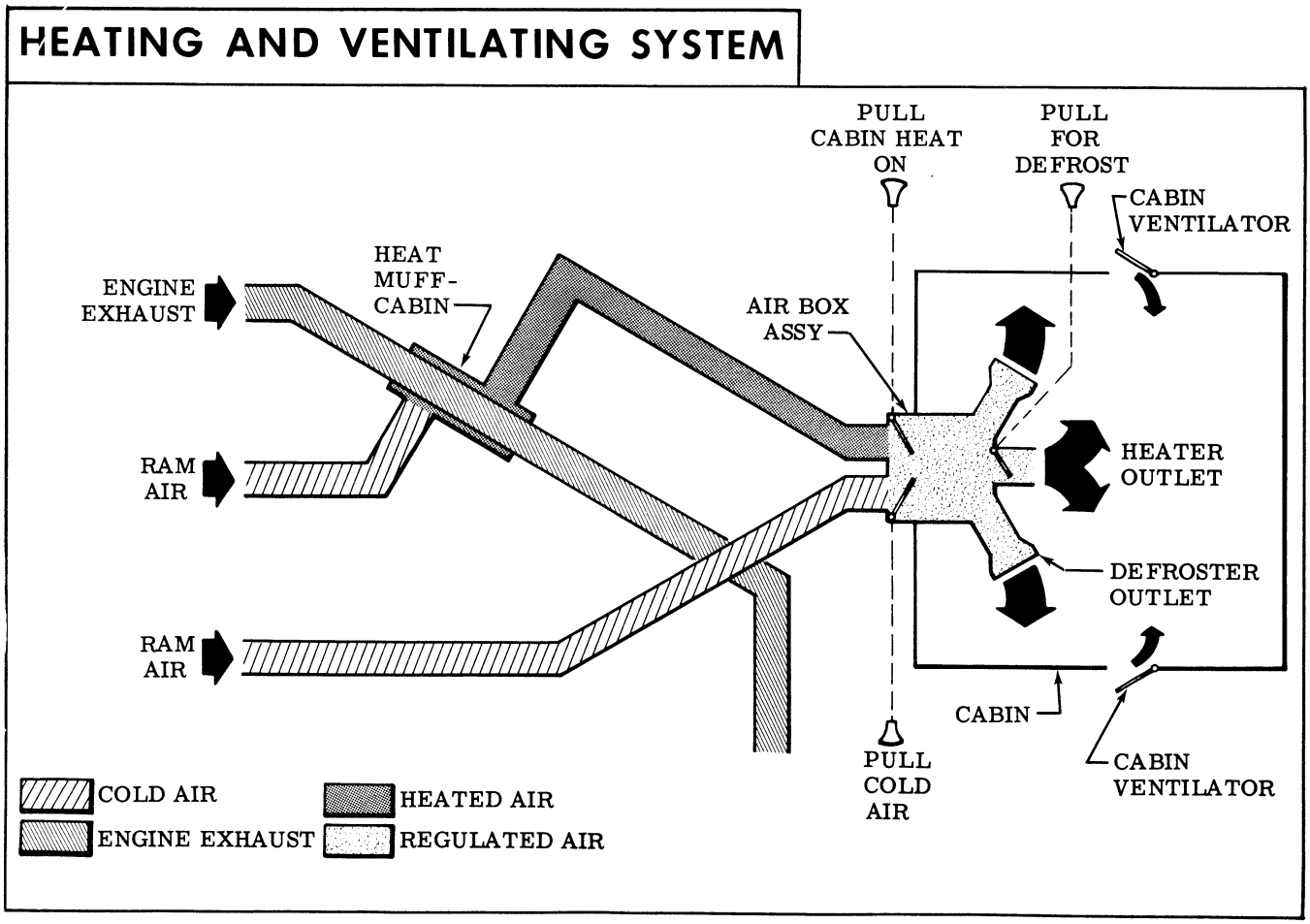


Figure 4-1.

DEFROST CONTROL KNOB

Air for windshield defrosting and defogging is controlled by a push-pull control knob (61, Figure 1-4) labeled DEFROST. When the control knob is pulled out, air is deflected from the heater outlet to the defroster outlets. The defroster air flow and temperature is regulated by placing the cold air and cabin heat control knobs in their desired intermediate position. When the defrost control knob is pushed all the way in, air flow is directed to the heater outlet.

CABIN VENTILATORS

Ventilators (Figure 1-17) are installed in the side windows. Rotating the ventilator knob clockwise will open the ventilator into the aircraft's slipstream and direct ambient air into the cabin area. Rotating the knob counterclockwise will close the ventilator.

COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT

The effectivity, type, and function of the communications and radio navigation equipment are given in Figure 4-2. The radio master switch (28, Figure 4-3) (on aircraft coded A B) must be turned on before the above equipment can be operated. Each piece of equipment is protected by its own fuse. Spare fuses are located inside the glove compartment box or behind the spare fuse panel on aircraft coded B_1.

MICROPHONE A B less B_1

A microphone is installed with a supporting bracket on the pilot's scuff panel. The microphone jack is located on the left side of the pilot's instrument panel.

HEADPHONES

Two sets of headphones are provided with the aircraft. The headphone jacks are located in each outboard side of the instrument panel.

MICROPHONE HEADSETS D

Two microphone headsets provided with the aircraft are terminated under each outboard side of the instrument panel and electrically connected to the AN/AIC-18 control unit.

AUDIO SELECTOR PANEL B less B_1 B_2 D

On some aircraft an audio selector panel (28, Figure 4-3) is installed on the lower left portion of the instrument panel to provide audio and transmission selection of the radio equipment. The audio selector panel (Figure 4-8) for aircraft coded D is installed to the right of the intercommunication control panel. The switch labeled (ADF-VOR D_1) (ADF-TACAN or VOR D_3) is provided to monitor the ADF or VOR or TACAN through the mixer switch on the interphone control panel.

AN/AIC-10A INTERCOMMUNICATION EQUIPMENT B_1 B_3

The AN/AIC-10A system provides intercommunication between the pilot and copilot whenever the master switch is in the ON position. Two control panels, pilot's and copilot's, are installed in the overhead control panel with the necessary switches to operate the equipment either as an interphone or an integrated radio communication system.

COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT

DESIGNATION	TYPE	FUNCTION	OPERATOR	RANGE	LOCATION
AN/AIC-10A B_1 B_3 C1611/AIC A_1 AN/AIC-18 D	VOICE COMMUNICATION	CREW COMMUNICATION CONTROL OR RADIO TRANSMISSION AND RECEPTION	PILOT COPILOT PASSENGER A_1		OVERHEAD CONTROL PANEL
AN/ARN-59 A_1 B B_3 D	LF NAVIGATION (ADF RADIO COMPASS)	AUTOMATIC DIRECTION FINDER AND LF RECEIVER	PILOT	UP TO 200 MILES	INSTRUMENT PANEL
AN/ARN-30D AN/ARN-30E D	VHF NAVIGATION OMNI SYSTEM	RECEPTION OF VOR AND VOICE	PILOT	LINE OF SIGHT	INSTRUMENT PANEL
ARC TYPE CD-4 A_1 B B_3 D_1	COURSE DIRECTOR	STEERING COMPUTER	PILOT		INSTRUMENT PANEL

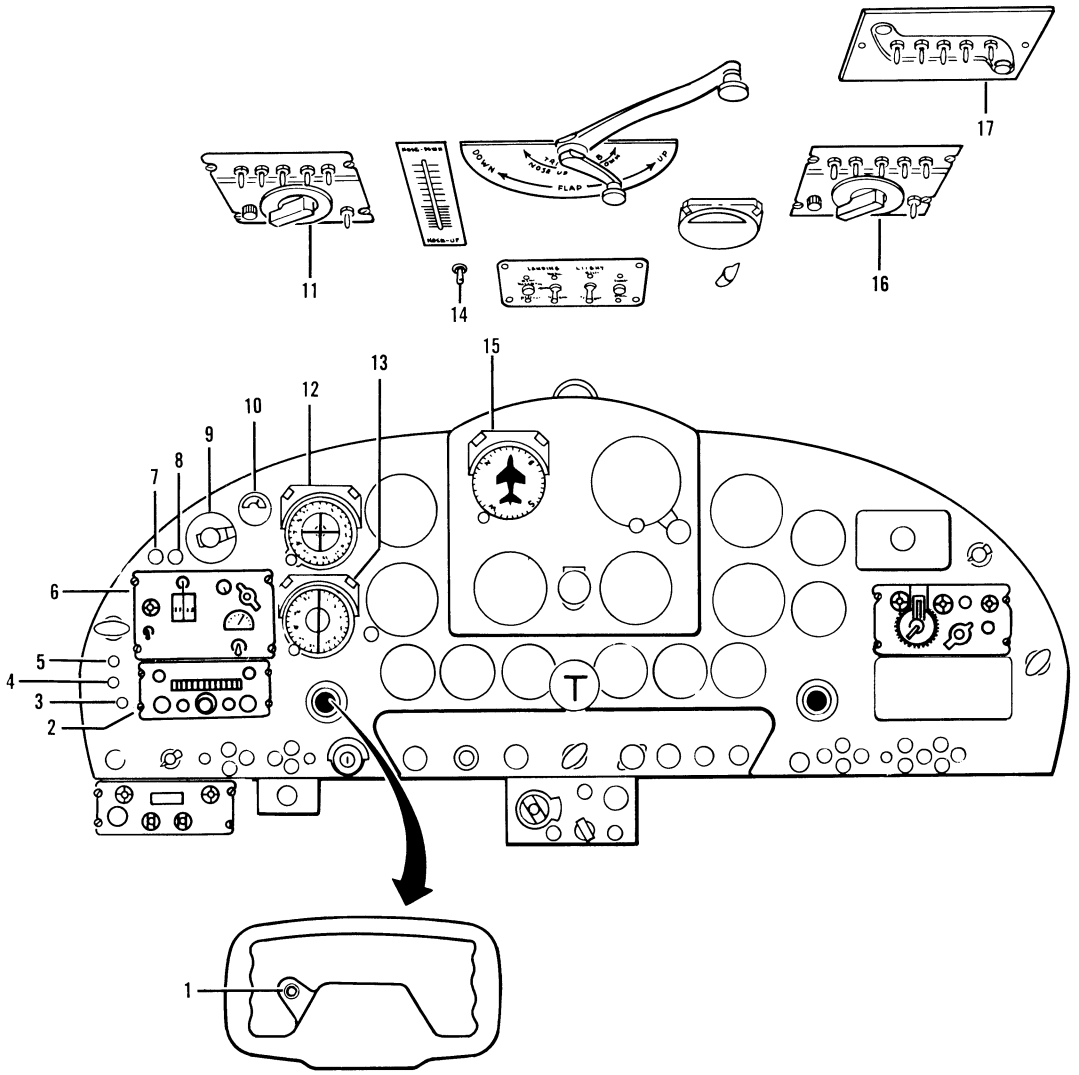
Figure 4-2. (Sheet 1 of 2)

COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT

DESIGNATION	TYPE	FUNCTION	OPERATOR	RANGE	LOCATION
ARC TYPE T-25C B less B_1	VHF TRANSMITTER	VHF VOICE TRANSMISSION	PILOT	LINE OF SIGHT	INSTRUMENT PANEL
VHF-101 A_1 B_1 B_3	VHF COMMUNICATION SYSTEM	VHF VOICE COMMUNICATION	PILOT	LINE OF SIGHT	INSTRUMENT PANEL
AN/ARC-44 A_1 B_1 B_4	FM RADIO	VOICE COMMUNICATION	COPILOT	LINE OF SIGHT	INSTRUMENT PANEL
AN/ARA-31 A_1 B_1	ANTENNA GROUP	HOMING (FM)	PILOT COPILOT	LINE OF SIGHT	INSTRUMENT PANEL (THROUGH FM RADIO)
AN/ARA-56 D					
AN/ARN-32 A_1	MARKER BEACON	RECEIVES LOCATION MARKER SIGNAL ON NAVIGATIONAL BEAM	PILOT COPILOT	OVER STATION	INSTRUMENT PANEL
AN/ARC-60 A	UHF-VHF COMMUNICATION	VOICE COMMUNICATION	PILOT	LINE OF SIGHT	INSTRUMENT PANEL
AN/ARC-27 B B_4 less B_2 B_6	UHF COMMUNICATION	UHF COMMUNICATION	PILOT	LINE OF SIGHT	INSTRUMENT PANEL
AN/ARC-51X A_1	UHF COMMUNICATION	UHF COMMUNICATION	PILOT	LINE OF SIGHT	INSTRUMENT PANEL
AN/ARC-51BX D					
WILCOX 807 D	VHF (AM) COMMUNICATION	VHF COMMUNICATION	PILOT COPILOT	LINE OF SIGHT	INSTRUMENT PANEL
HF-103 SSB (COLLINS) D	HF/SSB COMMUNICATION TRANSCEIVER	VOICE AND CW COMMUNICATION	PILOT COPILOT	LONG RANGE	INSTRUMENT PANEL
FM-622A D	VHF/FM RADIO TRANSMITTER-RECEIVER	VOICE COMMUNICATION	PILOT COPILOT	LINE OF SIGHT	INSTRUMENT PANEL
AVQ-75 D_2	DME SYSTEM INTERROGATOR	MEASURE DISTANCE AND GROUND SPEED	PILOT COPILOT	LINE OF SIGHT	INSTRUMENT PANEL
TPR-600 D_2	ATC TRANSPONDER SYSTEM	AIRCRAFT IDENTIFICATION	PILOT COPILOT	WITHIN CONTROL AREA	INSTRUMENT PANEL
R-33A D_2	MARKER BEACON RECEIVER	RECEIVE LOCATION MARKER SIGNAL ON NAVIGATIONAL BEAM	PILOT COPILOT	OVER STATION	INSTRUMENT PANEL
R-31A D_2	GLIDESLOPE RECEIVER	RECEIVE ILS, GLIDESLOPE SIGNALS	PILOT COPILOT	WITHIN CONTROL AREA	INSTRUMENT PANEL
B-2D D_1 D_3	TWO AXIS AUTOPILOT	FLIGHT STABILIZATION SYSTEM	PILOT		INSTRUMENT PANEL
AN/ARN-65 D_3	NAVIGATION	AIRBORNE NAV.	PILOT	UP TO 200 MILES	INSTRUMENT PANEL
AN/ARC-95	VHF/AM VOICE COMMUNICATION	VOICE COMMUNICATION	PILOT COPILOT	LINE OF SIGHT	INSTRUMENT PANEL

Figure 4-2. (Sheet 2 of 2)

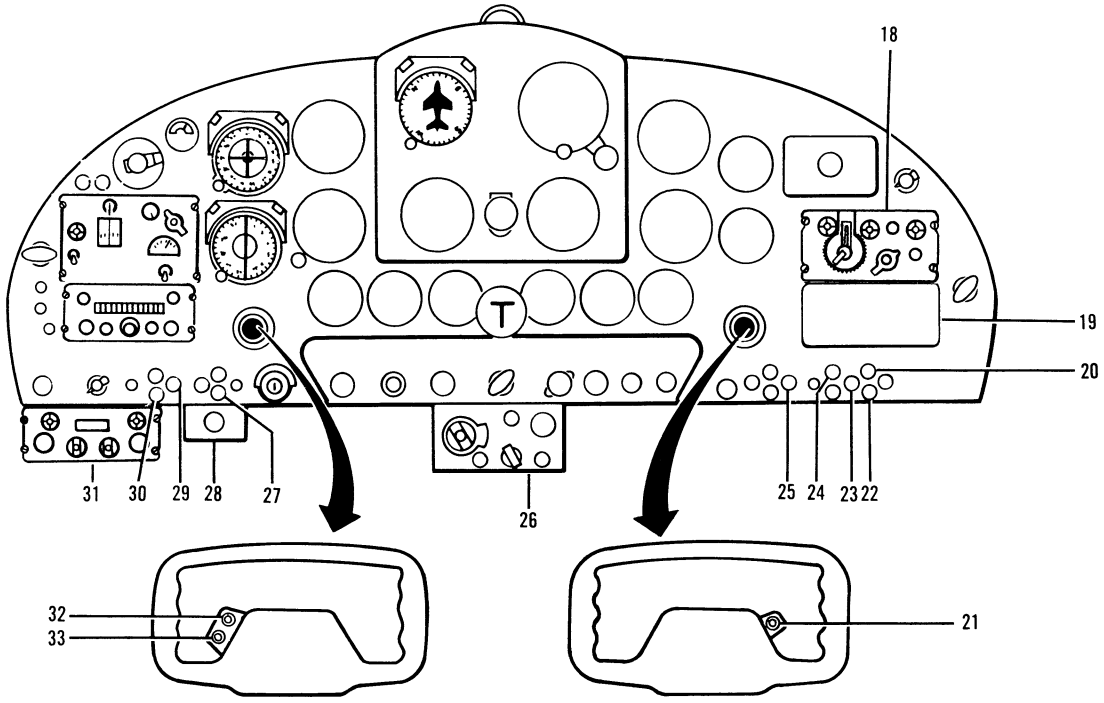
NAVIGATION EQUIPMENT CONTROLS A B B_3



1. MONITOR SWITCH (CD-4) B
2. VHF NAVIGATION CONTROL UNIT A B less B_1
   VHF COMMUNICATION CONTROL UNIT B_1
3. CD-4 PRIMARY POWER SWITCH B_1
4. UHF FUSE B_1
   HEADSET JACK A B less B_1
5. VHF RECEIVER FUSE B_1
   MICROPHONE JACK A B less B_1
6. LF NAVIGATION CONTROL UNIT B B_3
   UHF CONTROL UNIT A
7. A1C-10 FUSE B_1
   CD-4 PRIMARY SWITCH B B_3
8. VHF TRANSMITTER FUSE B_1
   UHF PRIMARY SWITCH B less B_1 B_2
9. CD-4 CONTROL UNIT B B_3
10. SLAVING INDICATOR B B_3
11. PILOT'S A1C-10A CONTROL UNIT B_1 B_3
12. COURSE INDICATOR
13. RADIO COMPASS INDICATOR B B_3
14. SPEAKER SELECTOR SWITCH B_3
15. HEADING INDICATOR
16. COPILOT'S A1C-10A CONTROL UNIT B_1 B_3
17. FM SWITCH SELECTOR PANEL. B_1

Figure 4-3. (Sheet 1 of 2)

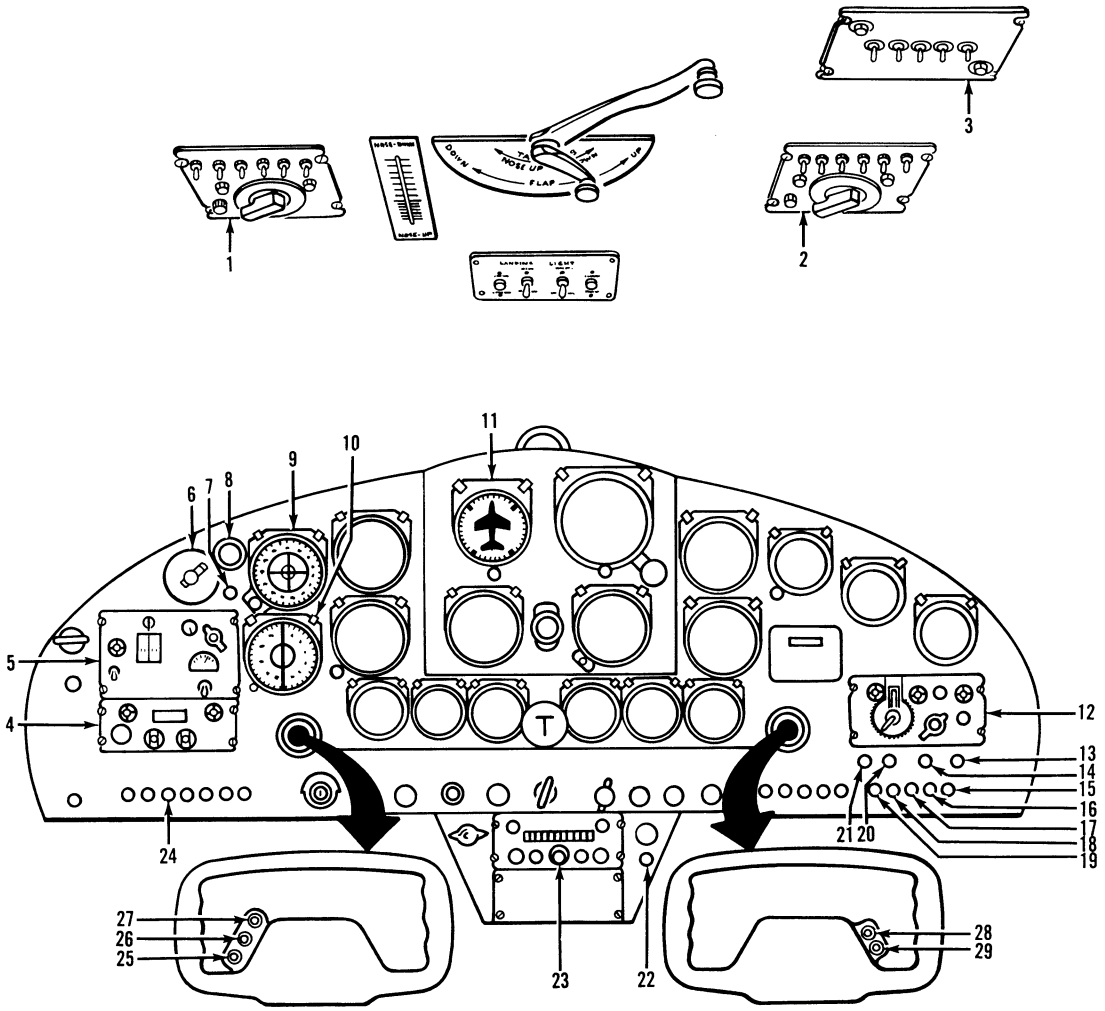
NAVIGATION EQUIPMENT CONTROLS A B B3



18. FM CONTROL UNIT B1
19. SPARE FUSE PANEL B1
20. A1C-10 FUSE B3
21. COPILOT'S TALK SWITCH B3
22. SPEAKER AMPLIFIER FUSE B3
23. UHF FUSE B1
    VHF RECEIVER FUSE B3
24. CD-4 FUSE B B3
25. VOR FUSE
26. UHF CONTROL UNIT B less B2
    VHF COMMUNICATION CONTROL UNIT B3
27. ADF FUSE B B3
28. RADIO MASTER SWITCH B1
    AUDIO SELECTOR PANEL B less B1 B2
29. FM CIRCUIT BREAKER B1
30. VHF TRANSMITTER FUSE B B3
31. VHF NAVIGATION CONTROL UNIT B1
    VHF TRANSMITTER CONTROL UNIT B less B1
32. MONITOR SWITCH (CD-4) B3
33. PILOT'S TALK SWITCH B3

Figure 4-3. (Sheet 2 of 2)

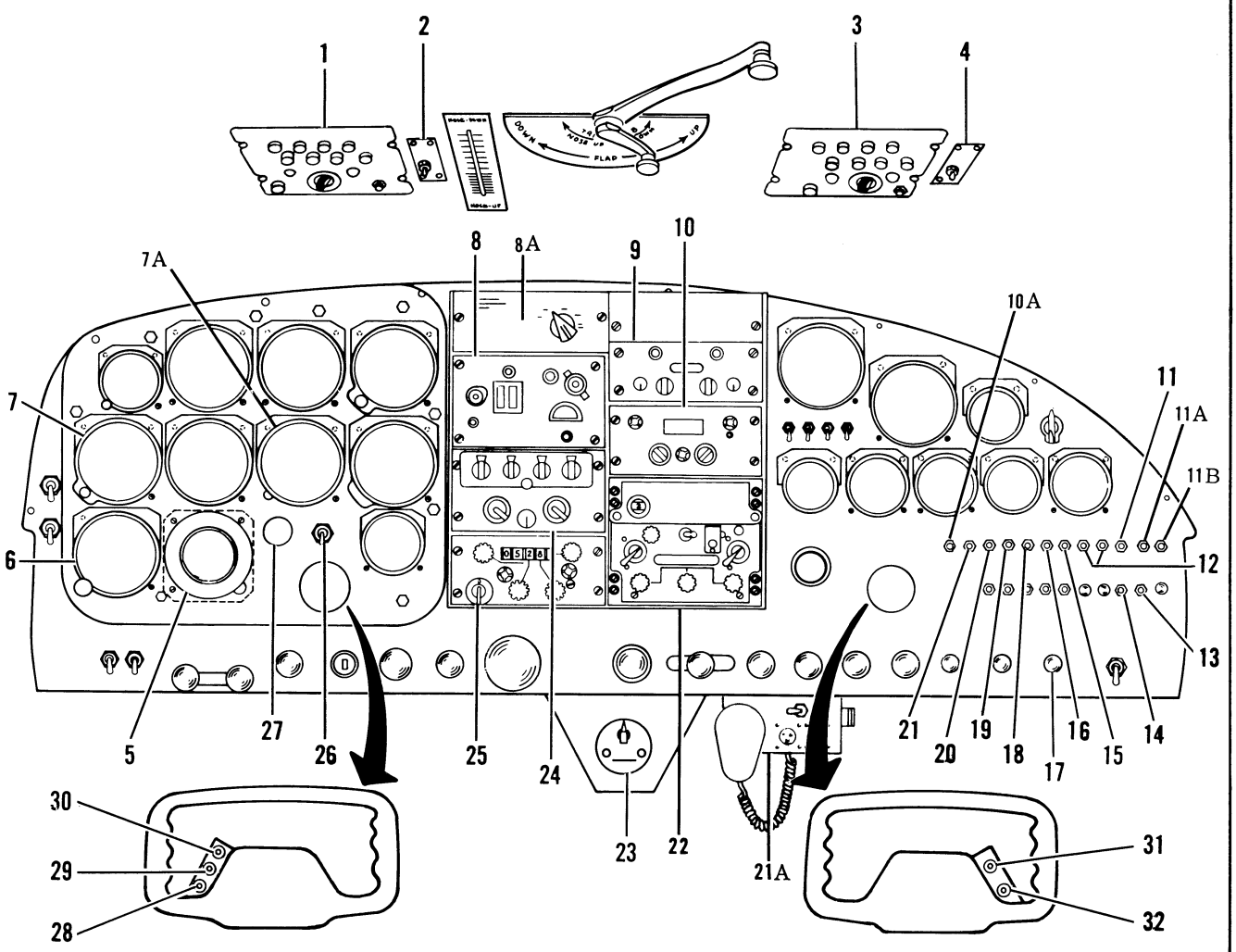
NAVIGATION EQUIPMENT CONTROLS A1



1. PILOT'S C-1611/AIC CONTROL UNIT
2. COPILOT'S C-1611/AIC CONTROL UNIT
3. FM SWITCH SELECTOR PANEL
4. VHF NAVIGATION CONTROL UNIT
5. LF NAVIGATION CONTROL UNIT
6. CD-4 CONTROL UNIT
7. MARKER BEACON INDICATOR LIGHT
8. SLAVING INDICATOR
9. COURSE INDICATOR
10. RADIO COMPASS INDICATOR
11. HEADING INDICATOR
12. FM CONTROL UNIT
13. ADF CIRCUIT BREAKER
14. VOR CIRCUIT BREAKER
15. C-1611/AIC CIRCUIT BREAKER
16. VHF TRANSMITTER CIRCUIT BREAKER
17. VHF RECEIVER CIRCUIT BREAKER
18. FM COMMUNICATION CIRCUIT BREAKER
19. UHF CIRCUIT BREAKER
20. MB CIRCUIT BREAKER
21. FM HOMING CIRCUIT BREAKER
22. MB ON-OFF VOLUME CONTROL
23. VHF COMMUNICATION CONTROL UNIT or UHF COMMUNICATION CONTROL UNIT
24. CD-4 CIRCUIT BREAKER SWITCH
25. CD-4 MONITOR SWITCH
26. PILOT'S INTERPHONE TALK SWITCH
27. PILOT'S TRANSMISSION TALK SWITCH
28. COPILOT'S TRANSMISSION TALK SWITCH
29. COPILOT'S INTERPHONE TALK SWITCH

Figure 4-4.

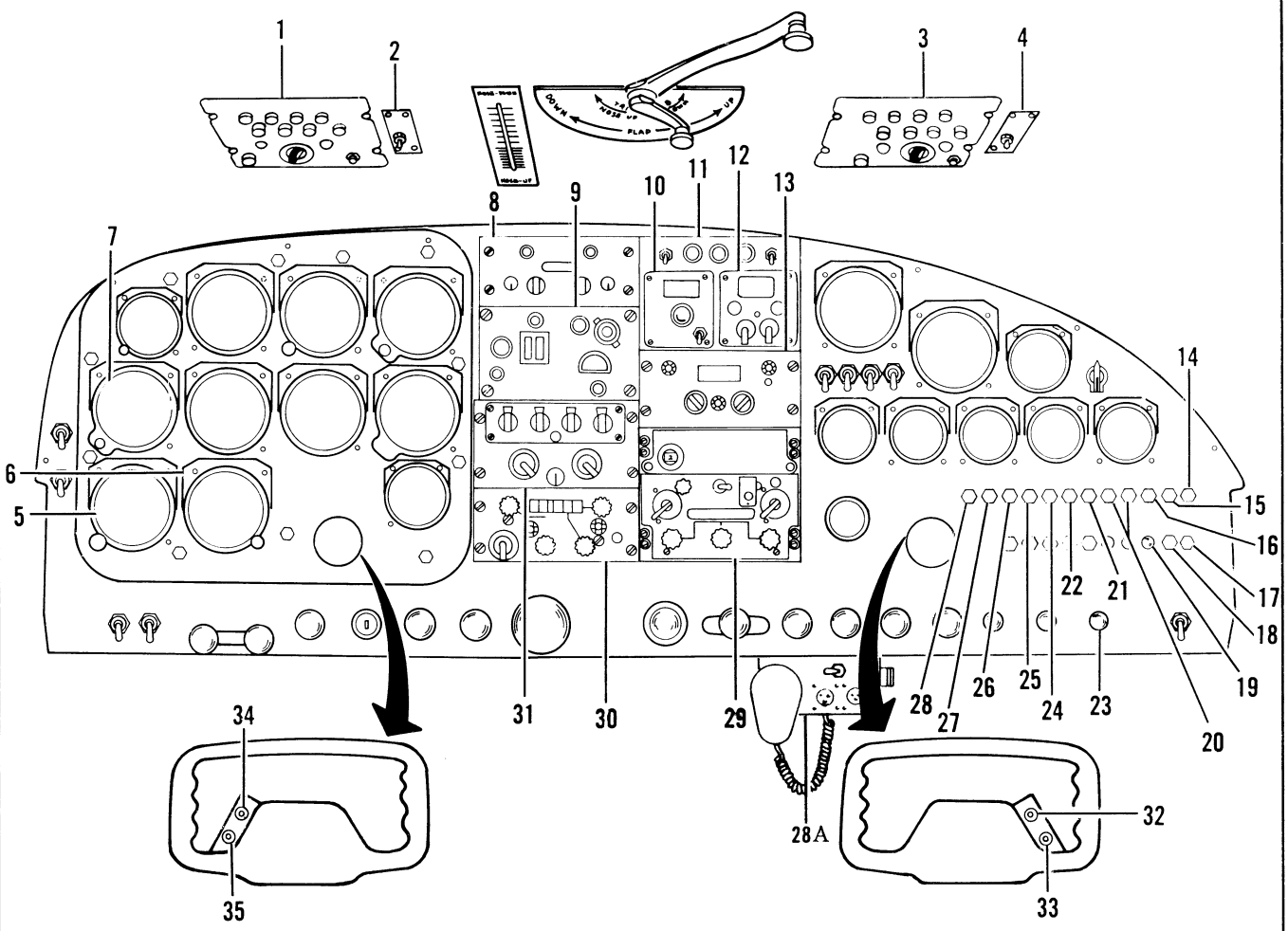
NAVIGATION EQUIPMENT CONTROLS D1 D3



1. PILOT'S C-2106/AIC-18 CONTROL UNIT
2. PILOT'S AUDIO SELECTOR PANEL
3. COPILOT'S C-2106/AIC-18 CONTROL UNIT
4. COPILOT'S AUDIO SELECTOR PANEL
5. CD-4 CONTROL UNIT D1
   BEARING DISTANCE-HEADING IND. D3
6. RADIO COMPASS INDICATOR
7. COURSE INDICATOR
7A. HEADING INDICATOR D3
8. LF NAVIGATION CONTROL UNIT
8A. POWER MANAGEMENT PNL D3
9. VHF NAVIGATION CONTROL UNIT D1
   C1763/ARN-21A CONTROL UNIT D3
10. VHF/AM CONTROL UNIT
10A. 400H_Z PWR CIRCUIT BRK D3
11. UHF CIRCUIT BREAKER
11A. SLV GYRO (Heading Ind) CIR BRK D3
11B. TACAN CIR BRK D3
12. SSB CIRCUIT BREAKER
13. VHF NAVIGATION RECEIVER CIRCUIT BREAKER
14. ADF CIRCUIT BREAKER
15. PILOT'S C-2106/AIC-18 CIRCUIT BREAKER
16. COPILOT'S C-2106/AIC-18 CIRCUIT BREAKER
17. RADIO LIGHTS DIMMER CONTROL
18. VHF/AM CIRCUIT BREAKER
19. INSTRUMENT RELAY CIRCUIT BREAKER
20. RADIO LIGHTS CIRCUIT BREAKER
21. VHF/FM CIRCUIT BREAKER
21A. MICROPHONE & RECORDER SELECTOR PNL
22. UHF COMMUNICATION CONTROL UNIT
23. B-2D AUTOPILOT
24. VHF/FM CONTROL UNIT
25. SSB CONTROL UNIT
26. CD-4 ON-OFF SWITCH
27. SLAVING INDICATOR
28. CD-4 MONITOR SWITCH
29. PILOT'S INTERPHONE TALK SWITCH
30. PILOT'S TRANSMISSION TALK SWITCH
31. COPILOT'S TRANSMISSION TALK SWITCH
32. COPILOT'S INTERPHONE TALK SWITCH

Figure 4-5.

NAVIGATION EQUIPMENT CONTROLS D2



1. PILOT'S C-2106/AIC-18 CONTROL UNIT
2. PILOT'S AUDIO SELECTOR PANEL
3. COPILOT'S C-2106/AIC-18 CONTROL UNIT
4. COPILOT'S AUDIO SELECTOR PANEL
5. RADIO COMPASS INDICATOR
6. DME INDICATOR
7. COURSE INDICATOR
8. VHF NAVIGATION CONTROL UNIT (VOR-OMNI - GLIDESLOPE)
9. LF NAVIGATION CONTROL UNIT
10. DME CONTROL UNIT
11. MARKER BEACON CONTROL PANEL
12. ATC TRANSPONDER CONTROL UNIT
13. VHF/AM CONTROL UNIT
14. ATC TRANSPONDER CIRCUIT BREAKER
15. MARKER BEACON CIRCUIT BREAKER
16. UHF COMMUNICATION CIRCUIT BREAKER
17. GLIDE SLOPE CIRCUIT BREAKER
18. VOR CIRCUIT BREAKER
19. ADF CIRCUIT BREAKER
20. SSB CIRCUIT BREAKERS
21. PILOT'S C-2106/AIC-18 CIRCUIT BREAKER
22. COPILOT'S C-2106/AIC-18 CIRCUIT BREAKER
23. RADIO LIGHTS CONTROL
24. VHF/AM CIRCUIT BREAKER
25. INSTRUMENT RELAY CIRCUIT BREAKER
26. RADIO LIGHTS CIRCUIT BREAKER
27. VHF/FM CIRCUIT BREAKER
28. DME CIRCUIT BREAKER
28A. MICROPHONE & RECORDER SEL PNL
29. UHF COMMUNICATION CONTROL UNIT
30. SSB CONTROL UNIT
31. VHF/FM CONTROL UNIT
32. COPILOT'S TRANSMISSION TALK SWITCH
33. COPILOT'S INTERPHONE SWITCH
34. PILOT'S TRANSMISSION TALK SWITCH
35. PILOT'S INTERPHONE SWITCH

Figure 4-6.

CONTROL UNIT. Each control unit (11, 16, Figure 4-3) for the AN/AIC-10A, located in the overhead control panel, includes five mixer switches, a normal-auxiliary listen switch, a function selector switch, and a volume control knob.

Mixer Switches

The five mixer switches (1, 2, 3, 4, and 5, Figure 4-9) labeled UHF, VHF, FM, ADF, and OMNI control the mixed-signal facility of the intercommunication set. A mixer switch is on when placed in the aft position. When any switch or combination of switches is placed in the aft (ON) position, and the function selector switch is turned to interphone (INTER) the selected signals of that station can be monitored. When a mixer switch is placed in the forward (OFF) position, the corresponding signal is cut out. Exceptions to this are when the function selector switch is in a position other than interphone. The radio signals of the selected position as indicated by the function selector switch will then be received regardless of the positions of the mixer switches.

Function Selector Switch

The function selector switch (8, Figure 4-9) has five positions labeled CALL, INTER, LINE, FM, and VHF. The spring-loaded CALL position is used to call other stations regardless of the switch positions of their control panels. At the CALL position, the volume control is ineffective, and it is not necessary to press the talk button at the originating station. With the function selector switch in INTER (interphone) position, another station may be called only if that station's function selector switch is in INTER (interphone) position. With the function selector switch set to either LINE (UHF), FM or VHF, the selected signals will be monitored regardless of the positions of the mixer switches, and transmission can be accomplished on the selected signal by depressing the talk button.

Volume Control Knob

Turning the volume control knob counterclockwise reduces the volume of the selected incoming radio signal. Turning the knob clockwise increases the volume of that signal. The volume control knob should be set to a position to give the desired interphone communication volume before adjusting the volume of all receivers.

NOTE

The CALL function overrides any setting of the volume control knob. Thus, CALL signals will always be heard in the headsets.

OPERATION OF AN/AIC-10A INTERCOMMUNICATION SET. For selective interphone operation only:

1. Function selector switch - INTER.
2. All mixer switches - OFF.

NOTE

The talk button must be released to allow the called station to reply.

For interphone call operation:

1. Function selector switch - hold in CALL position and talk.

NOTE

All other stations will receive the message regardless of the position of their function selector or mixer switches. No Signal mixing is possible during call.

To monitor other radio signals:

1. Function selector switch - INTER.
2. Desired mixer switches - ON.

NOTE

This permits monitoring several different signals simultaneously.

3. Volume control knob - as desired.

For radio transmission (pilot's or copilot's station):

1. Function selector switch - selected radio operation.
2. Depress talk button and talk.
3. Release talk button when transmission is completed to permit receiving reply.

LS-184/AIC-10 LOUDSPEAKER B_3

These aircraft utilize a loudspeaker in conjunction with AN/AIC-10A intercommunication system. The LS-184/AIC-10 loudspeaker contains an amplifier to provide aural amplification of the aircraft's radio receiving equipment selected by the pilot or copilot.

OPERATION OF LS-184/AIC-10 LOUDSPEAKER.

To operate the loudspeaker, proceed as follows:

1. Desired radio receiving equipment - Operating.
2. Speaker selector switch (14, Figure 4-3) - Desired operator (pilot or copilot).
3. Interphone receiver switches - ON (for desired aural reception).
4. Adjust volume with operator's interphone volume control knob.

C-1611/AIC INTERCOMMUNICATION SYSTEM A_1

The C-1611/AIC intercommunication system provides communication between the pilot, copilot, and a third crew member whenever the master switch is in the ON position. The intercommunication system consists of three C-1611/AIC control sets installed above the

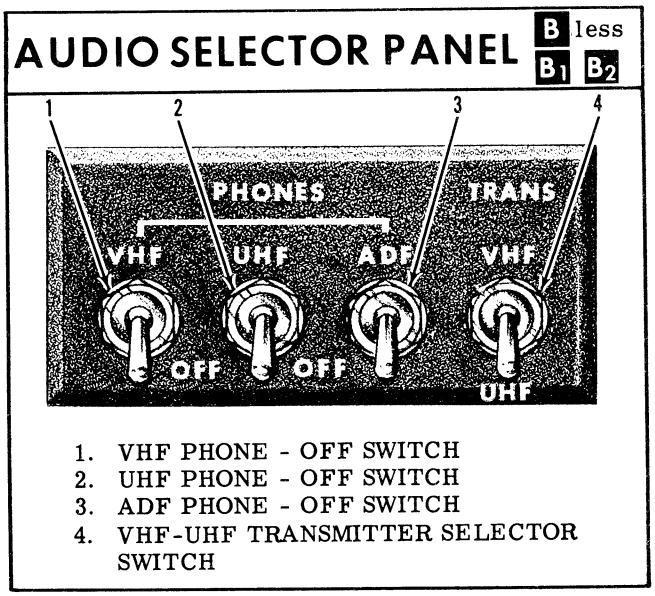


Figure 4-7.

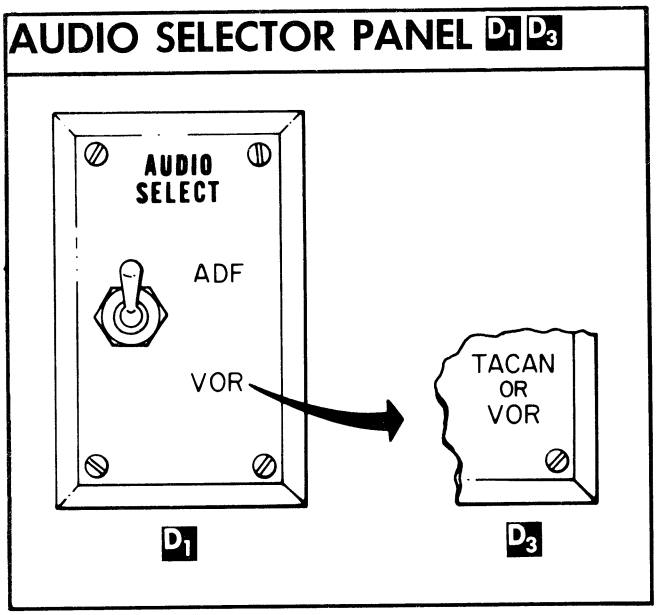


Figure 4-8.

respective operator with the necessary switches to operate the equipment, either as an interphone or an integrated radio communication system.

CONTROL UNIT. Each control unit (1, 2, Figure 4-4) for the C-1611/AIC, located above the respective operator, includes 6 receiver switches, a function selector switch, and a volume control knob.

Receiver Switches

The communication receiver switches 1 (FM), 2 (UHF), 3 (VHF), 4 (not used) and the navigation receiver switch (6, Figure 4-10) connect or disconnect the audio circuit of the receiver to or from earphones of headset-microphone. The RECEIVERS INT switch (5, Figure 4-7) connects or disconnects the earphones from the interphone system. When any switch or combination of switches is placed in the ON position, the selected signals can be monitored. When the switch is placed in the OFF position, the corresponding signal is cut out. Exceptions to this are when the function selector switch is in a position other than interphone. The mode of operation selected 1, 2, 3, indicated by the function selector switch will then be received regardless of the position of the receiver switches.

Function Selector Switch

The function selector switch (8, Figure 4-10) has six positions labeled PVT, INT, 1 (FM), 2 (UHF), 3 (VHF), and 4 (not used). The PVT interphone position provides hot mike operation. With the function selector in the INT (interphone) position another station may be called, only if the talk switch is depressed. With the function selector switch set to one of the numbered positions, the signal represented by the number will be monitored regardless of the position of the receiver switches, and transmission can be accomplished on a selected signal by depressing the transmit talk switch and speaking into the microphone.

Volume Control Knob

Turning the volume control knob counterclockwise reduces the volume of the selected incoming radio signal. Turning the knob clockwise increases the volume of the signal. The volume control knob should be set to a position to give the desired interphone communication volume before adjusting the volume of the receivers.

Talk Switches

Transmission talk switches (27, 28, Figure 4-4) and interphone talk switches (26, 29, Figure 4-4 are provided for the pilot and copilot. A crew station talk switch is installed in the headset-microphone cord extending from the crew station intercommunication control panel located above the passenger seat, for crew interphone and radio transmission operation.

OPERATION OF C-1611/AIC INTERCOMMUNICATION SET

PILOT AND COPILOT INTERPHONE OPERATION.

To operate the pilot and copilot interphone system, proceed as follows:

1. Receivers interphone switch - ON.
2. All other receiver switches - OFF.
3. Interphone talk switch - Push to talk.

CREW INTERPHONE OPERATION. To operate the crew interphone system, proceed as follows:

1. Transmit interphone selector switch - INT.
2. Receivers interphone switch - ON.

3. All other receiver switches - OFF.
4. Talk switch - Push to talk.

All crew stations of the C-1611/AIC have hot-mike operating facilities when the transmit-interphone selector switch is placed in the PVT position.

TO MONITOR OTHER RADIO SIGNALS. To monitor radio signals, operate the C-1611/AIC control as follows:

1. Receivers interphone switch - ON.
2. Desired receiver switches - ON.
   1-AN/ARC-44 (FM), and FM Homing.
   2-AN/ARC-51X (UHF).
   3-AN/ARC-73 (VHF)
   4-(not used)
   NAV - VOR, ADF, and MB receivers.

NOTE

Communication radio receivers 1, 2, or 3, can be monitored individually or simultaneously; however, the navigation receivers cannot be monitored separately through the C-1611/AIC control unit.

3. Volume control knob as desired.

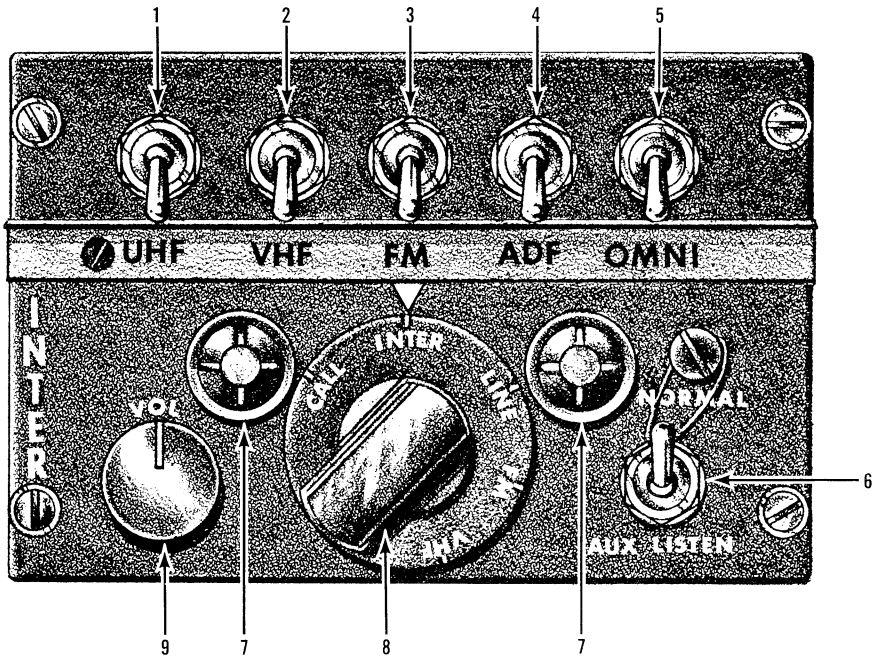
FOR RADIO TRANSMISSION. To transmit through the C-1611/AIC intercommunication system, proceed as follows:

1. Transmit interphone selector switch - selected radio for transmission.
2. Transmit talk switch - Push to transmit.
3. Release talk switch when transmission is completed to permit receiving reply.

AN/AIC-18 INTERCOMMUNICATION EQUIPMENT D

The AN/AIC-18 system provides intercommunication between the pilot and copilot. Two control panels, pilot's and copilot's, are installed in the overhead control panel with the necessary switches to operate the system either as an interphone or as an integrated radio communication system. The AN/AIC-18 receives power and is protected by a circuit breaker (15, 16, Figure 4-5) (21, 22, Figure 4-6).

AIC-10 CONTROL UNIT B1 B3



1. UHF MIXER SWITCH
2. VHF MIXER SWITCH
3. FM MIXER SWITCH
4. ADF MIXER SWITCH
5. OMNI MIXER SWITCH
6. NORMAL-AUXILIARY LISTEN SWITCH
7. CONTROL PANEL LIGHTS
8. FUNCTION SELECTOR SWITCH
9. VOLUME CONTROL KNOB

Figure 4-9.

CONTROL UNIT. Each control unit (1, 3, Figure 4-5) (1, 3, Figure 4-6) for the AN/AIC-18, includes seven mixer control knobs, a volume control knob, a call switch, a hot microphone knob, and a function selector knob.

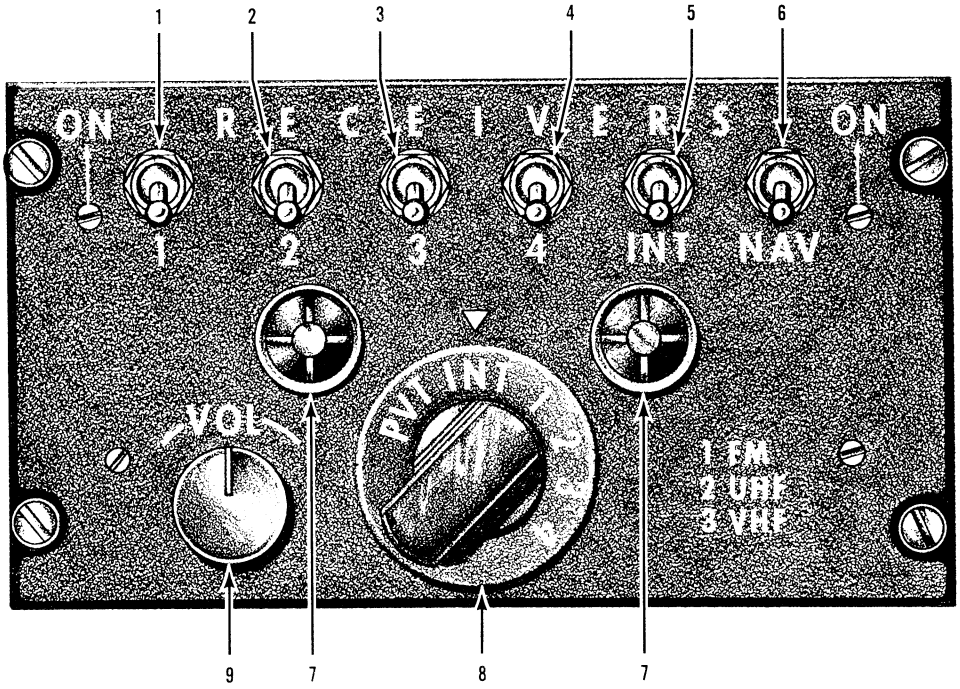
Mixer Control Knobs

The mixer control knobs (1, 2, 3, 4, 6, 7, 12, Figure 4-11) are combination ON-OFF and volume controls (push for OFF-pull for ON and clockwise rotation for increased volume). They are labeled INT, HF, UHF, VHF-FM, HOT MIC, VHF-AM, ADF VOR and control the selection of the desired receiver signals to be monitored through the intercommunication equipment.

NOTE

After selecting ADF-VOR mixer switch, the choice of audio from ADF or VOR is selected through the toggle switch on the audio-selector panel (Figure 4-8). The same or opposite selection can be made by the pilot or copilot. When any switch or combination of switches is pulled to the ON position, the selected signals can be monitored when the function selector knob (10, Figure 4-11) is on the INT position. When the function selector knob is in a position other than interphone (INT), the mode of operation selected will be indicated by the function selector knob regardless of the position of the mixer knobs.

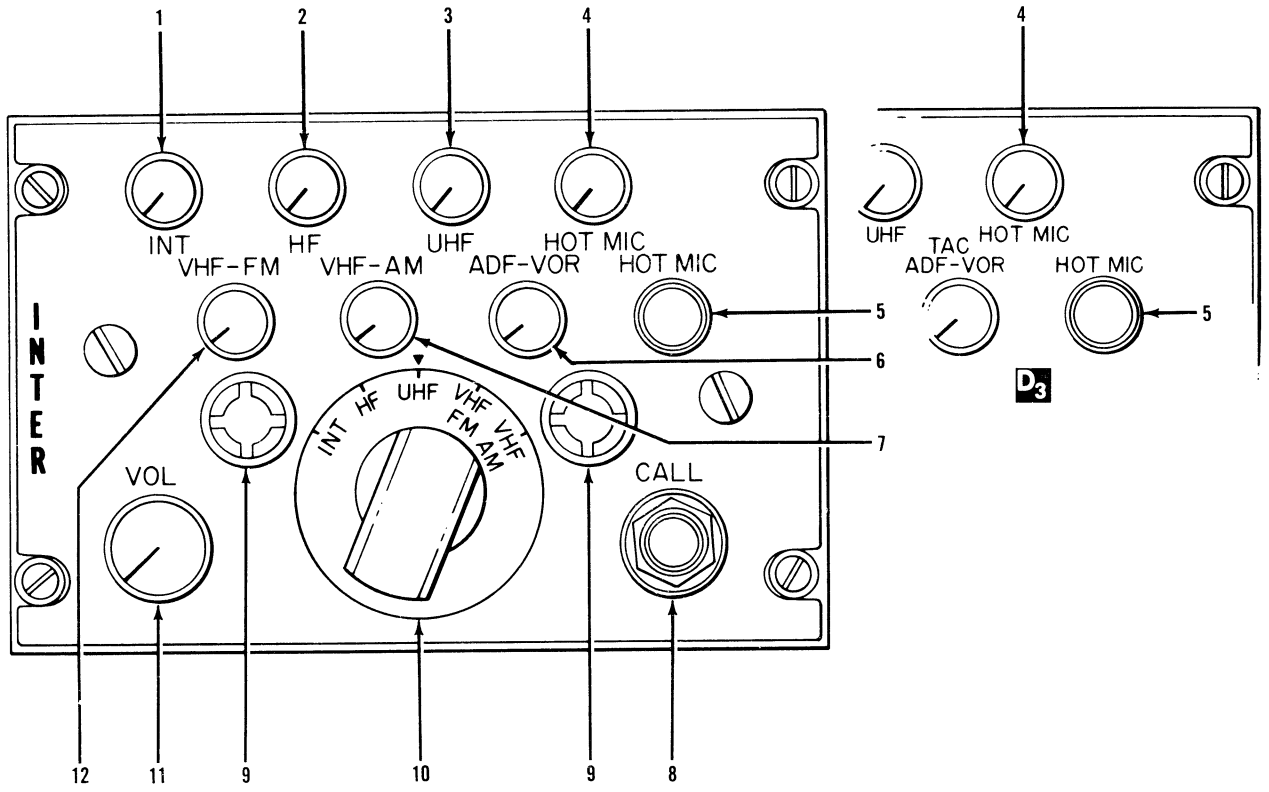
C-1611 CONTROL UNIT A1



1. FM RECEIVER SWITCH
2. UHF RECEIVER SWITCH
3. VHF RECEIVER SWITCH
4. NOT USED
5. INTERPHONE MONITOR SWITCH
6. VOR, ADF, AND MB RECEIVER SWITCH
7. CONTROL PANEL LIGHT
8. TRANSMIT-INTERPHONE SELECTOR SWITCH
9. VOLUME CONTROL

Figure 4-10.

AIC-18 CONTROL PANEL D



1. INTERPHONE MIXER CONTROL KNOB
2. HF MIXER CONTROL KNOB
3. UHF MIXER CONTROL KNOB
4. NOT USED
5. HOT MIC MIXER CONTROL KNOB
6. ADF-VOR MIXER CONTROL KNOB D1 D2
   ADF-VOR-TAC MIXER CONTROL KNOB D3
7. VHF-AM MIXER CONTROL
8. CALL PUSH BUTTON
9. CONTROL PANEL LIGHTS
10. FUNCTION SELECTOR KNOB
11. VOLUME CONTROL KNOB
12. VHF-FM MIXER CONTROL KNOB

Figure 4-11.

Hot Microphone Knob

The hot microphone knob (HOT MIC) (5, Figure 4-11) and the mixer control knob (HOT MIC) (4, Figure 4-11) are pulled to ON to provide an open microphone for transmission and reception without operating the talk switch. This feature is available on HF, UHF or VHF-AM of the function selector knob.

Call Push Button

The CALL push button (8, Figure 4-11) is used to override the opposite intercommunication station regardless of the switch positions of the control panels. Depressing the CALL button provides immediate break-in to the opposite station without the use of the interphone knob at the originating station.

Volume Control Knob

Rotate the volume control knob (11, Figure 4-11) to the desired audio level while on interphone (INT) position before adjusting the volume of all receivers.

Function Selector Knob

The five-position function selector knob (10, Figure 4-11) labeled INT, HF, UHF, VHF-FM, and VHF-AM, selects the mode of communication transmissions through the AN/AIC-18 intercommunication system. With the function selector knob in INT position, the other interphone station may be called only if that station's function selector knob is in INT position. With function selector knob set to HF, UHF, VHF-FM, or VHF-AM the selected signals will be

monitored regardless of the positions of the mixer switches, and transmissions can be accomplished on the selected signal by depressing the transmission switch.

OPERATION OF AN/AIC-18 INTERCOMMUNICATION SET.

PILOT AND COPILOT INTERPHONE OPERATION. To operate the interphone system between pilot and copilot, proceed as follows:

1. Place function selector knob to INT.
2. Pull interphone mixer control knob (INT) to ON position.
3. Rotate mixer control knob (INT) full clockwise.
4. Push all other mixer control knobs to OFF.
5. Push interphone switch (29, 32, Figure 4-5) (33, 35, Figure 4-6) to talk.
6. Release interphone switch to receive reply.
7. Adjust volume control knob (VOL) to desired audio level.

PILOT AND COPILOT CALL OPERATION. For interphone call operation, proceed as follows:

1. Place function selector knob to INT.
2. Depress and hold CALL button to talk.
3. Release CALL button to receive station reply.

TO MONITOR RADIO RECEIVER SIGNALS. To monitor the radio receiver signals, operate the AN/AIC-18 control unit as follows:

1. Place function selector knob to INT.
2. Pull one or more of the desired mixer knobs to ON.

NOTE

This permits simultaneous monitoring of several different receivers.

3. Rotate mixer control knobs to desired level.

FOR RADIO TRANSMISSION. To transmit through the AN/AIC-18 intercommunication system, proceed as follows:

1. Place function selector knob to the desired radio position for operation.
2. Depress transmit switch (30, 31, Figure 4-5) (32, 34, Figure 4-6) to talk.
3. Release transmit switch to receive and monitor reply.

LOW FREQUENCY (LF) NAVIGATION A_1 B B_3 D

The AN/ARN-59 automatic direction finder (ADF) provides low frequency (LF) navigation within the frequency range of 190 to 1750 kc and is covered in three separate bands which are selected on the ADF receiver control panel. The AN/ARN-59 is a radio compass set which automatically provides a visual bearing indication of the direction from which an rf signal is being received. It can be used for position plotting, homing, aural reception of amplitude-modulated signals, and aural identification of keyed CW stations. The AN/ARN-59 receives power from the main dc bus, and is protected either by a fuse (27, Figure 4-3) or a circuit breaker (13, Figure 4-4) (14, Figure 4-5) (19, Figure 4-6).

NOTE

Homing on a selected magnetic course may be accomplished by operating the AN/ARN-59 in conjunction with the CD-4 course director (see CD-4 Course Director).

CONTROL UNIT. The control unit (6, Figure 4-3) (5, Figure 4-4) (8, Figure 4-5) (9, Figure 4-6) for the AN/ARN-59 is located on the instrument panel and is labeled ADF REC. The control unit includes a primary power switch (ON-OFF) and volume control knob (VOL), a band selector switch (MC BAND), a tuning crank, a tuning meter, a function selector switch (COMP-ANT-LOOP), a switch for controlling loop rotation (LOOP), and a beat frequency oscillation (BFO) switch.

Volume Control

The volume control (4, Figure 4-12) is labeled VOL-OFF. Turning the volume control clockwise will turn the receiver on and increase the volume. The receiver is turned off by turning the volume control knob counterclockwise to the OFF position.

Band Selector Switch

The band selector switch, labeled MC BAND (3, Figure 4-12), actuates a masking drum which surrounds the frequency dial drum and allows only the selected band to be visible on the frequency dial (2, Figure 4-8).

Tuning Crank

The tuning crank (8, Figure 4-12) is used to select a particular frequency on any of the three bands.

Tuning Meter

The tuning meter (6, Figure 4-12) provides a visual indication of the accuracy of the tuning when the function switch is in the COMP position. Maximum deflection of the pointer to the right indicates the selected station is tuned to the maximum signal strength.

Function Selector Switch

The function selector switch, labeled COMP-ANT-LOOP (5, Figure 4-12) issued to select the operation desired for the AN/ARN-59. When the compass (COMP) position is selected, both the loop and sense antennas are used and the AN/ARN-59 functions as

an automatic direction finder. In the antenna (ANT) position, only the sense antenna is used and systems function as a low-frequency receiver. The LOOP position utilizes only the loop antenna and permits the AN/ARN-59 to be used as a manual directional finder, or for radio range reception during heavy static conditions.

Loop Switch

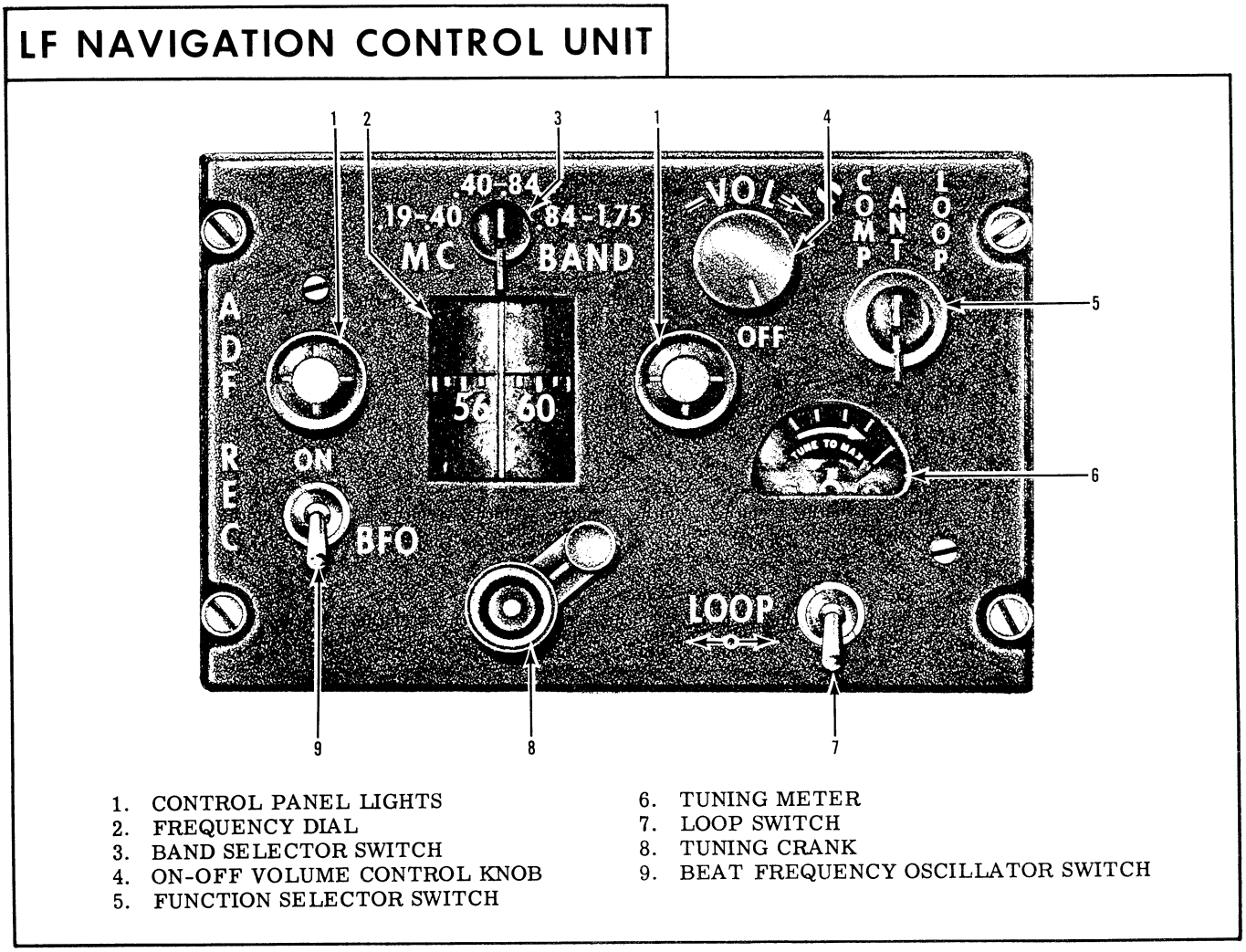
The loop switch (7, Figure 4-12) is a spring loaded double-throw, center off toggle switch. The loop switch is used to electrically position the loop antenna to a desired azimuth when the function selector switch (5, Figure 4-12) is in the LOOP position. When operating in the COMP position, the loop switch can be used to check the reliability of the bearing pointer reading by holding it in either position to rotate the loop antenna away from its original bearing. When the loop switch is released, the bearing pointer will return to its original position if the signal received is adequate.

Beat Frequency Oscillator Switch (BFO)

The beat frequency oscillator switch, labeled BFO (9, Figure 4-12) when placed in the ON position, energizes an oscillator that produces a modulated tone. This tone can be regulated with the tuning crank and is used in the ANT position to permit identification of keyed CW stations or in the LOOP position to facilitate aural null navigation.

ADF PHONE SWITCH. On some aircraft, the phone switch, labeled ADF (3, Figure 4-7), is located on the audio selector panel and selects the desired audio circuit. On aircraft coded D1, the audio selector panel (Figure 4-8) ADF position selects ADF audio.

RADIO COMPASS INDICATOR. The radio compass indicator (Figure 4-13) is synchro-driven by the transmitter in the loop antenna and with zero on the compass card aligned with the top index, the bearing pointer will indicate relative bearing and points to the station received. The indicator is equipped with a



1. CONTROL PANEL LIGHTS
2. FREQUENCY DIAL
3. BAND SELECTOR SWITCH
4. ON-OFF VOLUME CONTROL KNOB
5. FUNCTION SELECTOR SWITCH
6. TUNING METER
7. LOOP SWITCH
8. TUNING CRANK
9. BEAT FREQUENCY OSCILLATOR SWITCH

Figure 4-12.

variation set knob marked VAR to facilitate magnetic corrections when obtaining true bearings for plotting purposes, or the magnetic heading of the aircraft can be set under the top index and magnetic bearing to the station can be read directly under the head of the bearing pointer.

OPERATION OF LF NAVIGATION SYSTEM (ADF)

1. D3 Turn 400 Hz power selector knob to ADF position. ADF information will be displayed on the single-bar needle of the bearing-distance-heading indicator.

NOTE

In case of 400 Hz power loss, turn power selector knob on power management panel to ADF AUX PWR position.

2. D3 The audio select switch (Figure 4-8) and AIC-18 mixer control knob (6, Figure 4-11) must be in proper positions.
3. D3 If ADF is to be used in conjunction with TACAN, turn 400 Hz power selector knob to BOTH position.

NOTE

When operating 622A VHF/FM unit simultaneously with TACAN, the 622A will take command of course indicator when placed in HOME position. No marker beacon or glide slope information is available on the course indicator.

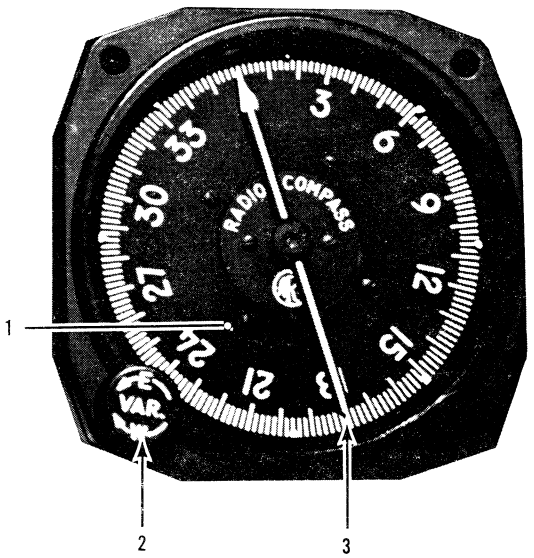
4. Place ADF phone switch to PHONE position and all other phone switches to OFF position. (On aircraft coded A1 B1 B3 D , the intercommunication system will be utilized.)
5. Rotate volume control knob clockwise. (Allow approximately 30 seconds for equipment to warm up)
6. Turn function selector switch to ANT.
7. Select desired frequency band and tune to the station frequency for best audible signal and identify.
8. Adjust volume control knob to desired audio level.

NOTE

If volume is advanced too far, the course may appear broad and the accuracy will be affected.

9. Turn function selector switch to position for desired function.
   a. To use AN/ARN-59 as a low-frequency radio range receiver, switch will remain at ANT.
   b. To use AN/ARN-59 as an automatic direction finder, set switch to COMP position and tune for maximum tuning meter deflection by slowly rotating tuning crank in vicinity of desired frequency. Operation of ADF is checked by momentarily operating loop switch either to left or right. If bearing pointer of the radio compass indicator does not return to same bearing, the signal should not be used for ADF navigation.
   c. To use AN/ARN-59 for a manual direction finder utilizing aural null procedures, or during conditions of poor reception, set the switch to LOOP position.

RADIO COMPASS INDICATOR



1. COMPASS CARD (ROTATABLE)
2. VARIATION SET KNOB
3. BEARING POINTER

Figure 4-13.

AN/ARN-30 VHF NAVIGATION SYSTEM

There are two models of the AN/ARN-30 VHF navigation system. The AN/ARN-30D is used on aircraft coded A and B. The AN/ARN-30E is used on aircraft coded D1 and D2. Both models of the AN/ARN-30 utilize a 190 channel navigation-communication radio receiving set, with a frequency range of 108.00 through 126.90 megacycles. The principal function of the AN/ARN-30 navigation system is to receive and interpret VHF omnidirectional range and localizer signals. On aircraft coded A and A1, the AN/ARN-30D is used for navigation only. On aircraft coded B , less B1 B2 , the AN/ARN-30D is used as the receiver section with the ARC TYPE T-25 transmitter to provide a VHF communication system. For aircraft equipped with a glide slope receiver, the AN/ARN-30E control unit has an added feature of automatically tuning the glide slope frequency when the localizer frequency is selected. Both models of the AN/ARN-30 receive power from the main dc bus. The AN/ARN-30D is protected either by a fuse (25, Figure 4-3) or a circuit breaker (14, Figure 4-4).

The AN/ARN-30E is protected by a circuit breaker (13, Figure 4-5) (18, Figure 4-6).

CONTROL UNIT. The control unit for the AN/ARN-30D labeled VHF NAV is located on the left side of the pilot's instrument panel for aircraft coded A B. The control unit for AN/ARN-30E labeled VHF ILS, used on aircraft coded D, is located on the center of the instrument panel. On the aircraft coded D_2, the AN/ARN-30E control unit simultaneously changes the frequencies of the VHF navigation system and the glide slope receiver. This control unit automatically tunes both receivers to the associated glide slope and localizer frequencies. Both control units (Figure 4-14) include a primary power switch and volume control, two frequency selector knobs, a frequency indicator window, and a squelch control knob.

Volume Control Knob.

The volume control knob (1, Figure 4-14) is labeled VOL-OFF. Rotating the volume control knob clockwise will turn on the receiver and increase the volume. The receiver is turned off by rotating the volume control knob counterclockwise to the OFF position.

Frequency Selector Knobs

Two frequency selector knobs (3, 5, Figure 4-14) provide a manual means of tuning the omni-range equipment to the desired operating frequency, as shown in the frequency indicator window (4, Figure 4-14). The left knob selects the whole megacycles of the desired frequency and the right knob selects the tenth of a megacycle.

Squelch Control Knob

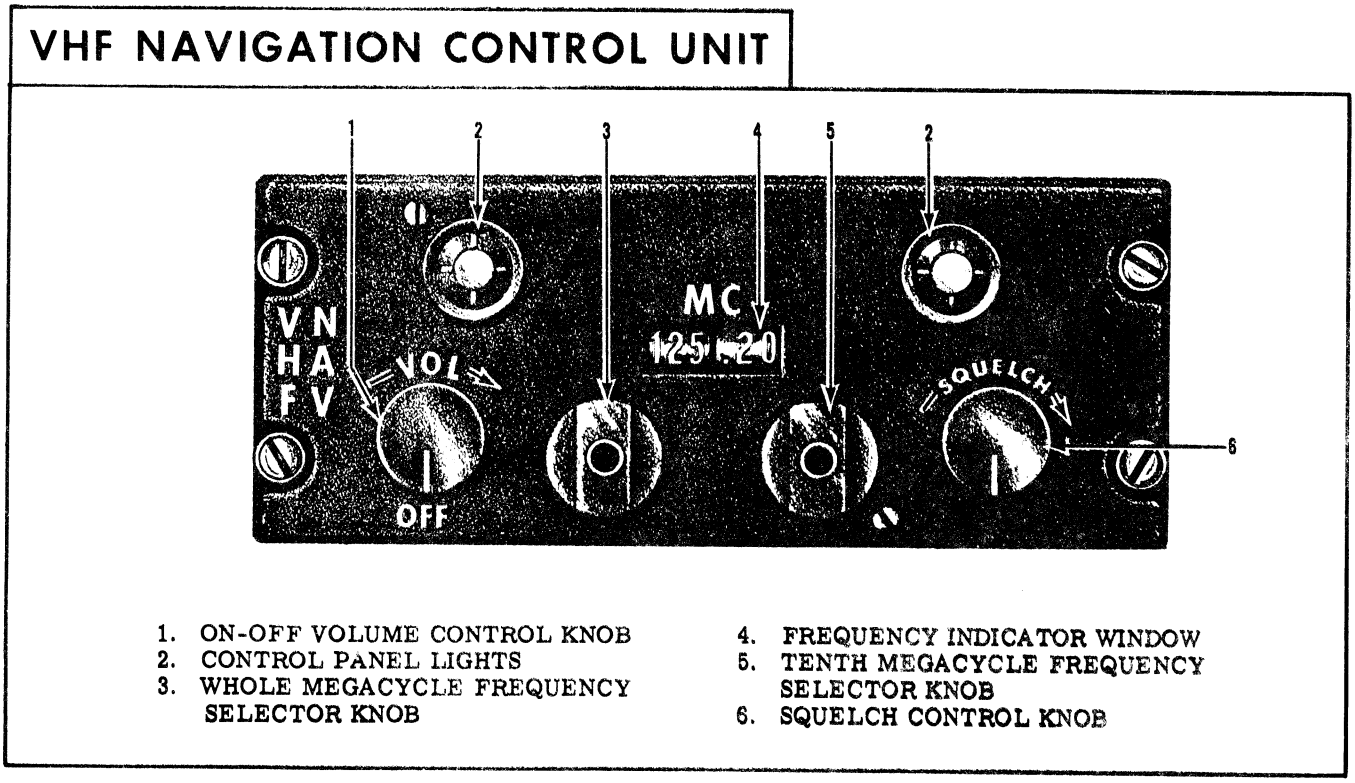
When the squelch control knob (6, Figure 4-14) is placed in the OFF position (maximum counterclockwise rotation), the receiver squelch circuit is disabled. The degree of clockwise rotation determines the receiver squelch threshold level.

COURSE INDICATOR. The IN-14-1 course indicator on aircraft coded A B D_1, or the IN-10 on aircraft coded D_2 (Figure 4-15), is located on the left side of the instrument panel. The course indicator contains a course deviation indicator (CDI), a glide slope indicator (GSI), inoperative on aircraft coded A B D_1 which have no glide slope receiver, a course set knob, a course arrow which depicts the course selected and the reciprocal thereof, a TO-FROM indicator, a course warning flag for the CDI, and a glide slope warning flag for the GSI. The warning flags indicate the operation or non-operating condition of the CDI and GSI and with the equipment on will indicate whether the signal received is of sufficient strength to be used for navigation. On aircraft coded D, the course indicator is also used for visual presentation of the homing signal. Placing the homing equipment in operation automatically removes the GSI and CDI information used for VHF navigation in order to display the homing signal on the course indicator.

ARC TYPE R-31A GLIDE SLOPE RECEIVER D_2

The ARC Type R-31A glide slope receiver is a 20 channel navigational aid receiver with a frequency range of 329.3 through 335.0 megacycles. The principal function of the R-31A is to receive and interpret ILS glide slope signals for visual presentation on a deviation indicator. This receiver is used with the AN/ARN-30E VHF navigation system. The associated glide slope frequency is automatically selected and tuned to the localizer frequency by the control unit of the AN/ARN-30E omni-receiver.

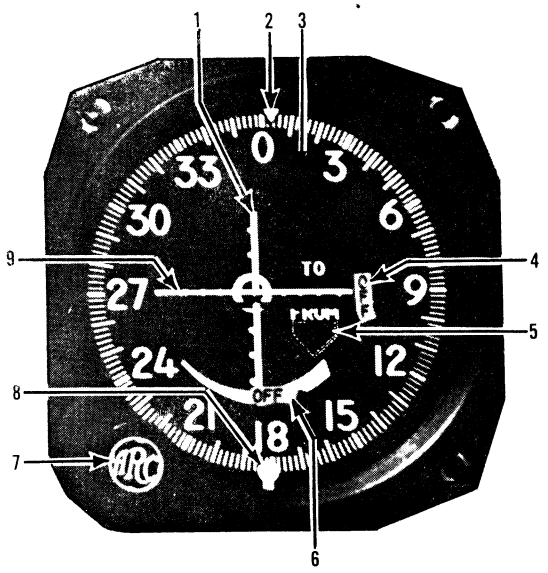
VHF PHONE SWITCH. The phone switch labeled VHF (1, Figure 4-7) located on the audio selector



1. ON-OFF VOLUME CONTROL KNOB
2. CONTROL PANEL LIGHTS
3. WHOLE MEGACYCLE FREQUENCY SELECTOR KNOB
4. FREQUENCY INDICATOR WINDOW
5. TENTH MEGACYCLE FREQUENCY SELECTOR KNOB
6. SQUELCH CONTROL KNOB

Figure 4-14.

COURSE INDICATOR



1. COURSE DEVIATION INDICATOR (CDI)
2. COURSE ARROW (HEAD)
3. COURSE SELECTOR DIAL
4. GLIDE SLOPE WARNING FLAG
5. TO-FROM INDICATOR
6. COURSE WARNING FLAG
7. COURSE SET KNOB
8. COURSE ARROW (TAIL)
9. GLIDE SLOPE INDICATOR (GSI)

Figure 4-15.

panel, selects the desired audio circuit. (On aircraft coded A_1 B_1 B_3 D, the intercommunication system will be utilized.)

WARNING

On aircraft coded D_1, the power source is disconnected from the CD-4 system when the mode switch on the VHF/FM is in the HOME position; on aircraft coded D_2, the power source to the glide slope receiver and AN/ARN-30E is disconnected when the mode switch on the VHF/FM is in HOME position. Ensure that the VHF/FM mode switch is positioned to RETRAN, T/R, or OFF when operating the VHF navigation system.

OPERATION OF VHF NAVIGATION SYSTEM

1. Place VHF phone switch to PHONE position and all other phone switches to the OFF position.

2. Rotate the volume control knob clockwise. Allow equipment to warm up.

NOTE

On aircraft coded D_2, selection of desired frequency automatically tunes both receivers to the associated glide slope and localizer frequency.

3. Select desired frequency.
4. Adjust volume control knob to comfortable listening level.

NOTE

Visual indications are independent of audio circuits and are not affected by the volume level.

5. Set CD-4 function selector switch (not used on aircraft coded D_2) to VOR/LOC or CD VOR as desired.
6. Set CD-4 normal-reverse switch as desired.

NOTE

GSI will be displayed on aircraft coded D_2 only.

7. IN-14-1 or IN-10 course indicator - select desired course to or from the station.
8. On aircraft coded D_1, observe the deflection of the CDI to intercept and maintain the selected course. On aircraft coded D_2, observe the deflection of the CDI and GSI to intercept and maintain the selected course and glidepaths.

CD-4 COURSE DIRECTOR

WARNING

On aircraft coded D_1, the CD-4 system power source is disconnected, except for ADF, when the mode switch on the VHF/FM is in the HOME position.

The CD-4 course director is used with the AN/ARN-30 VHF navigation-communication radio receiver and the AN/ARN-59 automatic direction finder. The components of the CD-4 compass system provide precise stabilized magnetic heading information. The CD-4 computer combines this heading information with bearing data supplied by either VOR, LOCALIZER, or LF ground facilities. By manipulation of the CD-4 controls, heading, course, or computed steering information is displayed through the IN-14-1 course indicator.

CONTROL UNIT. The control unit (9, Figure 4-3) (6, Figure 4-4) (5, Figure 4-5) for the CD-4 course director is located on the left side of the pilot's instrument panel. The control unit includes a polarity (NORM-REV) switch (1, Figure 4-16) which is used to reverse the polarity of the CDI circuit to permit flying toward the CDI at all times. The polarity switch is placed in the REV position any time the aircraft reverses direction and the pilot does not wish to reset the course selector on the IN-14 indicator.

NOTE

The Normal-Reverse switch must be in either of its detent positions for proper course director operation.

A six position rotary selector switch (2, Figure 4-16) selects the function to be displayed on the IN-14-1 course indicator. The six switch positions and their functions are as follows:

VOR/LOC Only: VOR or localizer course is presented in the IN-14-1 course indicator. Course director computed steering data omitted.

CD VOR: Computed steering data presented on the IN-14-1 indicator. For all enroute or approach navigation operation using VOR.

NOTE

The CD-4 course director will resolve any intercept problem provided the aircraft is in an area of approximately ±45° to the desired course.

ADF Only: Displacement from selected ADF course shown by position of IN-14-1 CDI. Course director computed steering data omitted.

MAG HDG: Heading indication only is presented on the IN-14-1 indicator. Radio navigational signal omitted.

CD LOC: Computed steering presented on the IN-14-1 indicator. For performing precise localizer appraches.

IN-14-1 COURSE INDICATOR. For description of the IN-14-1 indicator see related paragraph under VHF navigational system.

HEADING INDICATOR. The heading indicator (15, Figure 4-3) (11, Figure 4-4) provides continuous and precise magnetic heading information.

IN-11 SLAVING METER. The IN-11 slaving meter (10, Figure 4-3) (8, Figure 4-4) (27, Figure 4-5) is used to monitor the gyro slaving current.

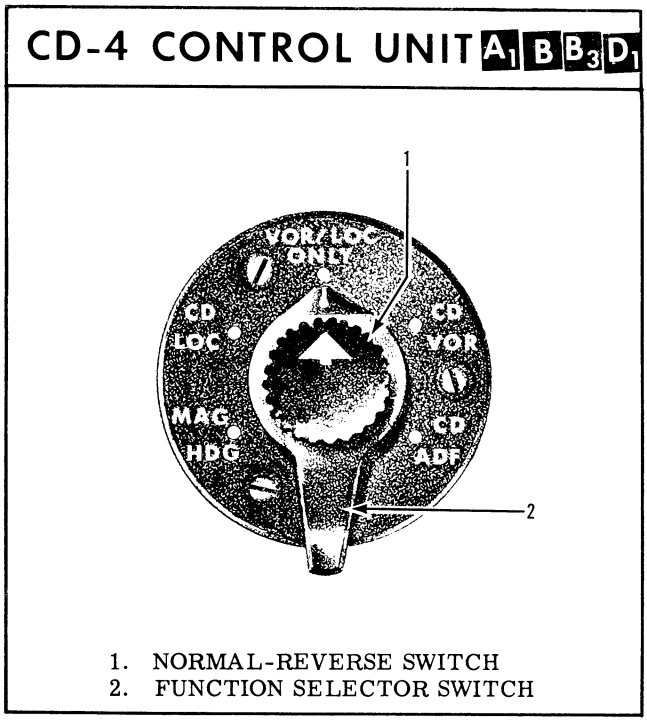


Figure 4-16.

NOTE

An inoperative slaving system is indicated when the IN-11 needle either remains centered or continuously deflects to one side.

MONITOR SWITCH. The monitor switch (32, Figure 4-3) (25, Figure 4-4) (28, Figure 4-5) is located on the pilot's control wheel. When the monitor switch is depressed, all heading information is removed from the IN-14-1 course indicator. The approximate displacement of the aircraft from the desired course is then indicated by the position of the IN-14-1 CDI.

OPERATION OF CD-4 SYSTEM

1. With the engine operating, apply primary power to CD-4 course director. Turn on AN/ARN-30 VHF navigation equipment and AN/ARN-59 automatic direction finder as desired.
2. Note the direction of IN-11 slaving meter deflection. Cage the heading indicator (Figure 4-17) and turn the caging knob in the direction indicated by the needle until the needle centers.
3. Uncage the heading indicator. Set the function selector switch (CD-4 control) to MAG HDG and the NORM-REV switch to NORM. Rotate the course set knob of the IN-14-1 course indicator until the IN-14-1 course arrow agrees with the heading indicator. The CDI should center. This function may be used for precise heading control on takeoff and DR navigation.

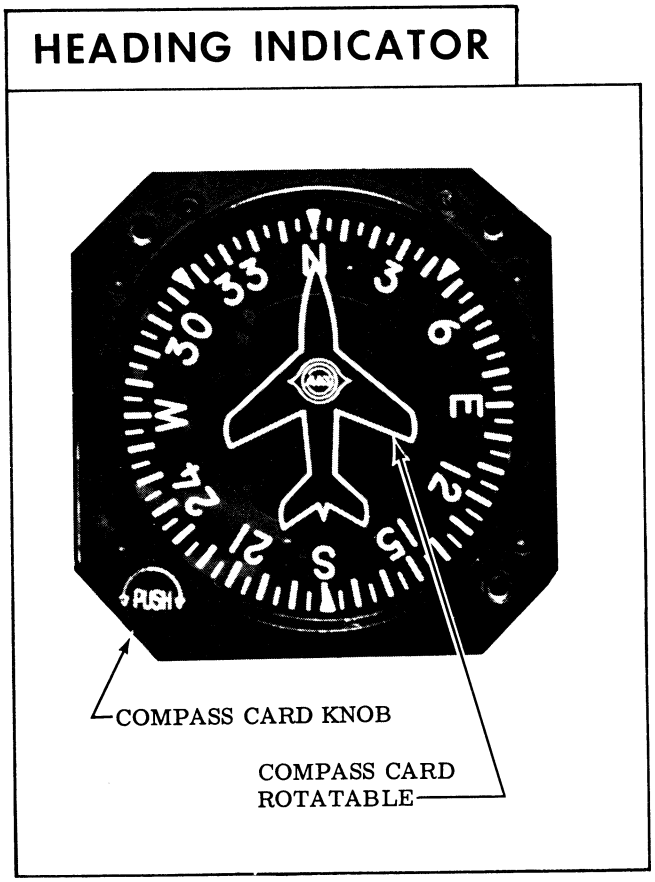


Figure 4-17.

NOTE

In case of slaving system failure, flight may be continued by using the heading indicator as a free directional gyro after the CD-4 has been turned off. It will be necessary to reset the heading indicator from time to time.

POSSIBLE OPERATIONAL PROCEDURES USING CD-4 COURSE DIRECTOR WITH VHF OR LF NAVIGATION EQUIPMENT

CD-4 CONTROL

FUNCTION SWITCH	NORM-REV SWITCH
CD LOC	NORM

Procedure: Front course ILS apprach optimum steering onto localizer beam. Precludes overrunning of localizer beam.

CD LOC	REV

Procedure: Allows normal CDI presentation on back course ILS approach. Optimum steering onto localizer beam. Precludes overrunning localizer beam.

VOR LOC ONLY	NORM

Procedure: Conventional VOR, ILS localizer operation.

VOR LOC ONLY	REV

Procedure: Gives normal CDI presentation when flying back course ILS approach or on reciprocal of set VOR course.

CD VOR	NORM

Procedure: VOR navigation, letdown. Provides optimum steering onto selected VOR radial.

CD VOR	REV

Procedure: Not normally used.

ADF ONLY	NORM

Procedure: Navigation on selected magnetic course to (and/or from) the low frequency facility.

ADF ONLY	REV

Procedure: Flying reciprocal of selected magnetic course to (and/or from) low frequency facility.

CD ADF	NORM

Procedure: ADF navigation, letdown. Provides optimum steering and tracking of selected magnetic course to (and/or from) the low frequency facility.

CD ADF	REV

Procedure: Not normally used.

NOTE

TO-FROM flag on IN-14 indicator operates only when VOR information is selected with the CD-4 control unit selector switch.

MAG	NORM

Procedure: Provides precise magnetic heading information (CDI is more sensitive than heading indicator. Full CDI deflection is ±15° off selected heading) and may be used for instrument takeoff. All radio information is removed from the course indicator.

MAG HDG	REV

Procedure: Not normally used.

NOTE

When changing CD-4 function make sure NORM-REV switch does not move.

AN/ARN-32 MARKER BEACON A1

The AN/ARN-32 marker beacon is a navigational and landing aid, giving the pilot aural and visual reception of 75-mc marker beacon signals. The AN/ARN-32 receiver is tuned to a fixed frequency of 75 megacycles and is controlled by the marker beacon ON-OFF volume control switch (22, Figure 4-4). A press-to-test indicator light (7, Figure 4-4) located on the instrument panel, will illuminate to indicate the presence of a marker beacon signal.

OPERATION OF AN/ARN-32 MARKER BEACON

1. Turn marker beacon ON-OFF volume control switch clockwise.
2. Place the interphone (INT) and navigation (NAV) receiver switches to the ON position.

NOTE

The position of the interphone and navigation reciever switches will not affect operation of the marker beacon indicator light.

TYPE R-33A MARKER BEACON D2

The marker beacon provides visual reception of 75-mc marker beacon signals, amplitude-modulated with 400, 1300, or 3000 cps tones. A control unit installed on the instrument panel provides the necessary operating control and three lights to distinguish each of three marker beacon modulating frequencies. The R-33A Marker Beacon Receiver receives power from the main dc bus and is protected by a circuit breaker (15, Figure 4-6).

CONTROL UNIT. The control panel for the marker beacon receiver is located on the upper center of the instrument panel between the pilot and copilot (Figure 4-18). The control unit includes a primary power switch (ON-OFF), a white lamp (AIRWAYS), a blue lamp (OUTER), an amber lamp (MIDDLE), and a sensitivity switch (HI-LO).

Power On-Off Switch

The two-position power switch (1, Figure 4-18) labeled ON-OFF controls power to the marker beacon receiver. Place the switch to ON to apply power and to OFF to remove power from the receiver.

VISUAL INDICATIONS

Separate visual indications for identification of three modulating marker beacon frequencies are provided by three lamps. A white lamp (2, Figure 4-18) labeled AIRWAYS is energized when receiving 3000 cps from Z markers and fan markers. A blue lamp (3, Figure 4-18) labeled OUTER is energized when receiving 400 cps from ILS outer markers. An amber lamp (4, Figure 4-18) labeled MIDDLE is energized when receiving 1300 cps from ILS middle markers.

Sensitivity Switch

A sensitivity switch (5, Figure 4-18) labeled HI-LO selects the proper sensitivity to receive marker beacon signals. Set the switch to HI position for high-altitude airway flying of fan and Z markers. Set the switch to LO position for ILS approaches.

OPERATION OF R-33A MARKER BEACON

1. Set the power switch to ON.

NOTE

One or more of the indicating lights may light momentarily.

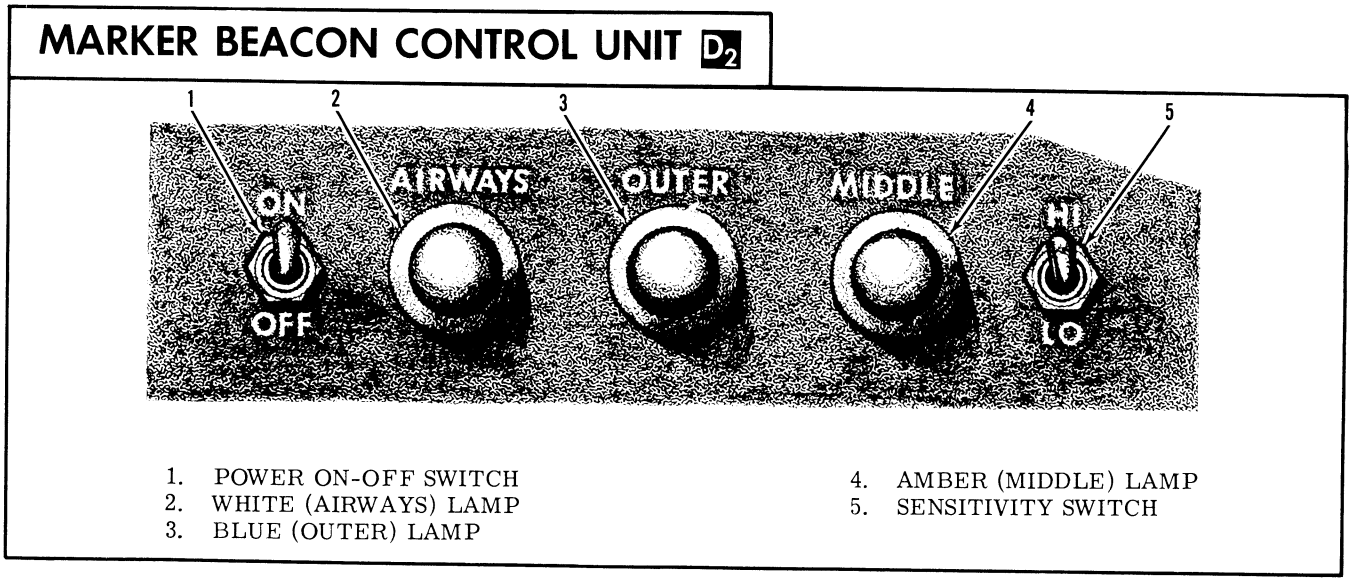


Figure 4-18.

2. Press each lamp cap to test operation of lights.
3. Place the sensitivity switch in the HI position for high-altitude airway flying or in the LO position for ILS approaches.

NOTE

The position of the interphone and navigation receive switches will not affect operation of the marker beacon indicator lamps.

4. To remove power from the equipment, set the power switch (1, Figure 4-18) to OFF.

VHF COMMUNICATION SYSTEM

Some aircraft are equipped with a T-25C transmitter which is used with the AN/ARN-30D receiver to make a complete two-way VHF communication system. The T-25C transmitter operates over a frequency range of 118.00 - 135.95 mc in 50-kc steps, providing a total of 360 channels.

CONTROL UNIT. The control panel for the T-25C transmitter, located on the lower left corner of the pilot's instrument panel, is labeled VHF COMM TRANS. The control unit includes a primary power switch (ON-OFF), two frequency selector knobs, and a frequency indicator window. The T-25C receives power from the main dc bus, and is protected by a fuse.

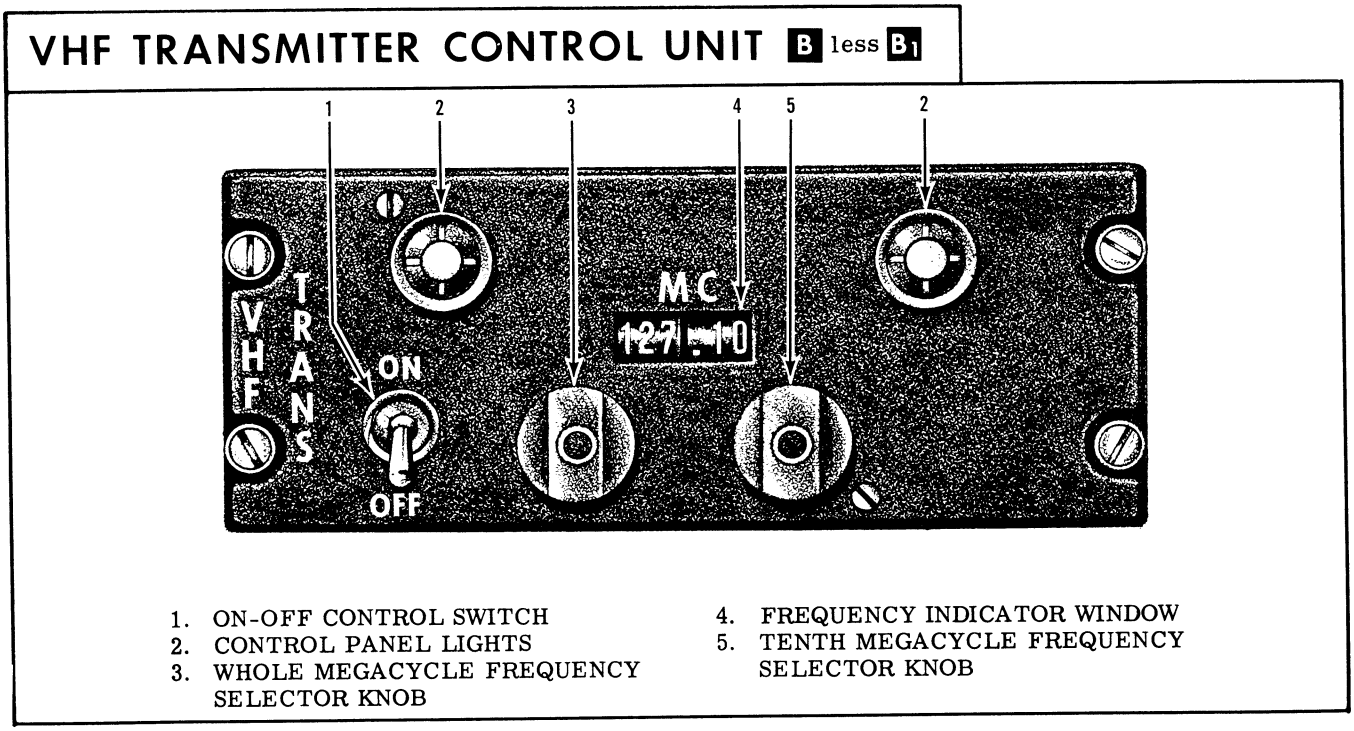
Frequency Selector Knobs

Two frequency knobs (3, 5, Figure 4-19) provide a manual means for tuning the VHF transmitter to the desired operating frequency, as shown in the frequency indicator window (4, Figure 4-19). The left knob sets up the whole megacycles of the desired frequency and the right knob selects the tenth of a megacycle.

TRANSMITTER SELECTOR SWITCH. On aircraft coded B less B_1 B_2, the transmitter selector switch (4, Figure 4-7) labeled VHF-UHF is located on the audio selector panel. A transmitter selector switch is not installed on other U-10A and U-10B aircraft. The transmitter selector switch selects the desired transmitting circuit.

OPERATION OF VHF COMMUNICATION SYSTEM

1. Place radio master switch to the ON position.
2. VHF communication control unit - turn the volume control knob to ON. (Allow approximately 30 seconds for equipment to warm up.)
3. Place VHF phone switch to VHF position and all other phone switches to OFF position.
4. Select desired receiving frequency between 118 - 126.90 mc.
5. VHF communication transmitter control panel-place primary power switch to the ON position.
6. Set the transmitting frequency to agree with receiving frequency.



1. ON-OFF CONTROL SWITCH
2. CONTROL PANEL LIGHTS
3. WHOLE MEGACYCLE FREQUENCY SELECTOR KNOB
4. FREQUENCY INDICATOR WINDOW
5. TENTH MEGACYCLE FREQUENCY SELECTOR KNOB

Figure 4-19.

7. Press the microphone switch and speak directly into the microphone to transmit. The transmission will be monitored in the sidetone circuit.
8. Release the microphone switch to receive.
9. Adjust volume control knob on VHF communication control panel to comfortable listening level.
10. Place primary power switch of VHF communication transmitter control panel to OFF position.
11. Rotate volume control knob counterclockwise to OFF position.

VHF-101 COMMUNICATION SYSTEM A1 B1 B3

The VHF communication and radio provides 680 channels within the frequency range of 116.00 through 149.95 mc. The principal function of the VHF-101 is to provide voice communication between aircraft, and between aircraft and ground. The VHF-101 receives power from the main dc bus. The receiver is protected either by a 5-amp fuse (23, Figure 4-3), or circuit breaker (17, Figure 4-4) and the transmitter is protected either by a 10-amp fuse (30, Figure 4-3) or circuit breaker (16, Figure 4-4).

CONTROL UNIT. The control unit (2, 26, Figure 4-3) (23, Figure 4-4) for the VHF-101 includes a primary power switch, a mode switch, two frequency selector knobs, a frequency indicator, and a dual control knob for squelch and volume control.

Mode Switch

The mode switch, labeled SCS-DCS/DCD (3, Figure 4-20), selects three different modes of operation which are described as follows:

a. SINGLE-CHANNEL-SIMPLEX (SCS)
The receiver and transmitter are tuned to the same frequency. The receiver is disabled during operation of the transmitter. Operation is thereby restricted to either transmission or reception on the assigned channel.

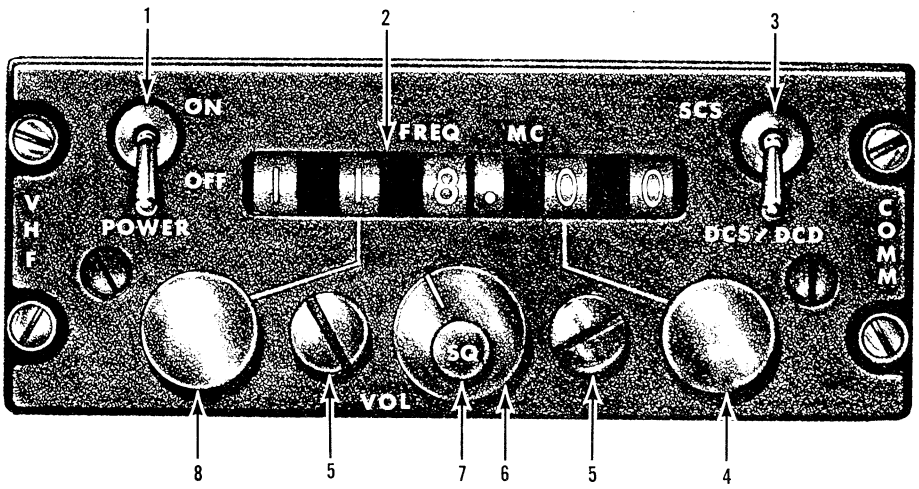
b. DOUBLE-CHANNEL-SIMPLEX (DCS)
This type of operation is the same as SCS, except that the transmitter is tuned to a frequency that is six megacycles above that of the receiver.

c. DOUBLE-CHANNEL-DUPLEX (DCD)
DCD operation is the same as DCS except that the receiver is not disabled during transmission, permitting simultaneous transmission and reception.

Frequency Selector Knobs

Two frequency selector knobs (4, 8, Figure 4-20) provide a manual means of tuning the VHF equipment to the desired operating frequency as shown in the frequency indicator window (2, Figure 4-20). The left frequency selector knob sets up the megacycles of the desired frequency and the right frequency selector knob selects the hundredths of a megacycle or 50 kc.

VHF COMMUNICATION UNIT A1 B1 B3



1. PRIMARY ON-OFF SWITCH
2. FREQUENCY INDICATOR WINDOW
3. MODE SWITCH
4. 50 KC FREQUENCY SELECTOR KNOB
5. CONTROL PANEL LIGHTS
6. VOLUME CONTROL KNOB
7. SQUELCH CONTROL KNOB
8. MC FREQUENCY SELECTOR KNOB

Figure 4-20.

Squelch - Volume Control Knobs

A dual control is provided for the squelch and volume control. The squelch control knob (SQ) (7, Figure 4-20) is located in the center of the volume control and adjusts the squelch threshold on the receiver output. The volume control knob (VOL) (6, Figure 4-20) adjusts the receiver volume level in the interphone system.

OPERATION OF VHF-101 COMMUNICATION SYSTEM

1. Place primary power switch in the ON position.
2. Select the desired mode of operation SCS, DCS DCD.
3. Select desired frequency.
4. Press the microphone switch to transmit, and speak directly into the microphone. The transmission will be monitored in the sidetone circuit.
5. Release the microphone switch to receive except when the mode switch is placed in the DCD position.
6. Adjust volume control knob to a comfortable listening level.

WILCOX 807 VHF/AM COMMUNICATIONS SYSTEM D

The Wilcox 807 VHF/AM is a very high frequency transceiver which operates on 1360 transmitting and receiving channels spaced at 25 kc, from 116.00 to 149.975 megacycles. The principal function of the Wilcox 807 is to provide amplitude modulated voice signals for air-to-air and air-to-surface communications. The equipment receives power from the main dc bus and is protected by a circuit breaker (18, Figure 4-5) (24, Figure 4-6).

CONTROL UNIT. The control unit (Figure 4-22) for the Wilcox 807 VHF/AM is located on the instrument panel between the pilot and copilot. The control unit includes a power knob (OFF-PWR), a volume control knob (VOL), a frequency indicator window, two frequency selector knobs, and a squelch disable button (COMM TEST).

Power Knob

The power knob (OFF-PWR) (7, Figure 4-22) controls the power to the Wilcox VHF/AM transceiver. A clockwise rotation to the PWR position turns the equipment on. The equipment is turned off by rotating the control counterclockwise to OFF.

Volume Control Knob

The volume control knob (4, Figure 4-22) is labeled VOL. The receiver audio level is controlled by rotating the volume control knob clockwise to increase the level and counterclockwise to decrease the level.

Frequency Selector Knobs

The megacycle frequency selector knob (6, Figure 4-22) selects the first three digits of the desired frequency. The kilocycle frequency selector knob (5, Figure 4-22) selects the last three digits (thousandths) of the desired frequency. The frequency selected will be displayed in the frequency indicator window (2, Figure 4-22).

SQUELCH DISABLE BUTTON

The squelch disable is a push button (3, Figure 4-22) labeled COMM TEST. The button is used to temporarily disable the Wilcox 807 VHF/AM receiver squelch.

OPERATION OF WILCOX VHF/AM COMMUNICATION TRANSCEIVER

1. Rotate power knob clockwise to PWR.

NOTE

Intercommunication control unit must be set as described in the related paragraph for AN/AIC-18.

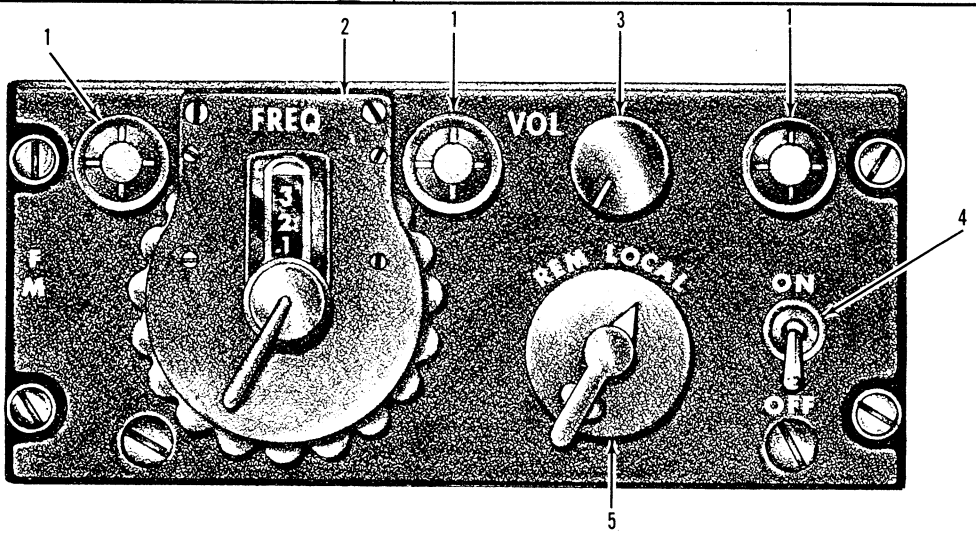
2. Rotate frequency selector knobs to desired frequency for display in the frequency indicator window.
3. Press transmission switch and speak into microphone.
4. Release transmission switch to receive.
5. Adjust volume control knob to the desired audio level.
6. Rotate power knob counterclockwise to OFF to remove power from the equipment.

AN/ARC-44 LIAISON RADIO SET A1 B1 B4

The AN/ARC-44 liaision radio set is an airborne frequency modulated radio receiver-transmitter system, covering a frequency range of 24.0 to 51.9 megacycles. Its primary function is to provide two-way communication between aircraft and between aircraft and ground stations, or between the aircraft and vessels. An auxiliary function enables the operator to use the equipment to home on any signal within its frequency range. This set includes the following operating components; a radio receiver-transmitter, a dynamotor for high-voltage power supply, an FM control unit, a switch panel assembly, and two separate antenna systems (communications and homing). Electrical power to operate the equipment is supplied from the 28 volt dc bus. Circuit protection is provided by a circuit breaker on aircraft coded A1, B1 (18, Figure 4-4) and by fuse on those aircraft coded B4.

FM CONTROL UNIT. The control panel (18, Figure 4-3) (12, Figure 4-4) for the AN/ARC-44, located on the left side of the copilot's instrument panel, is labeled FM. The control unit includes a primary ON-OFF switch, volume (VOL) control, frequency selector switch, and a remote-local selector switch.

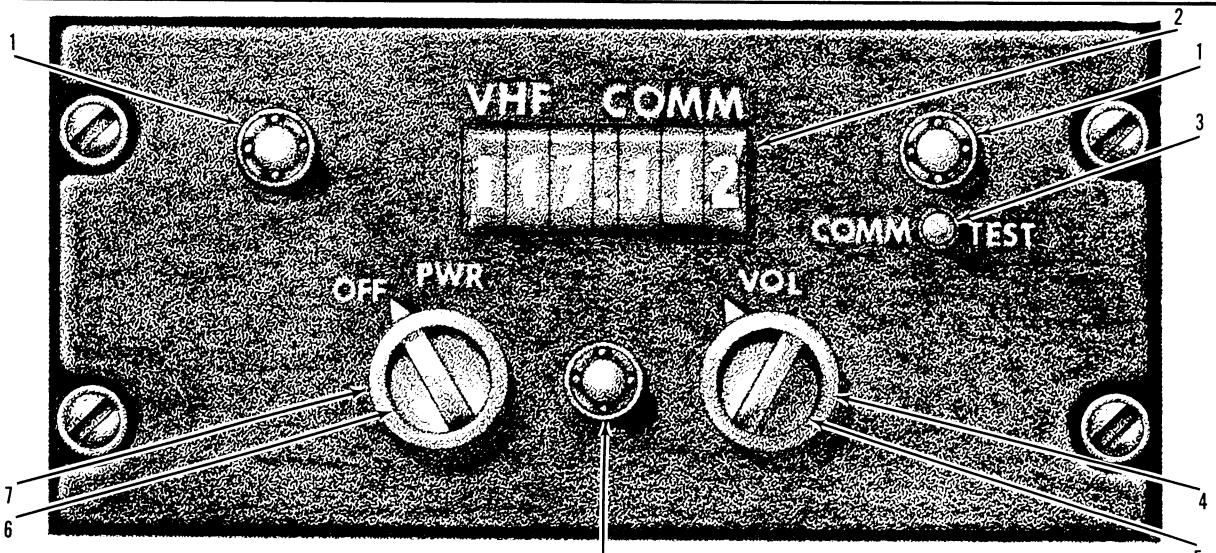
FM CONTROL UNIT A1 B1 B4



1. CONTROL PANEL LIGHTS
2. FREQUENCY SELECTOR SWITCH
3. VOLUME CONTROL KNOB
4. PRIMARY ON-OFF SWITCH
5. REMOTE-LOCAL SELECTOR SWITCH

Figure 4-21.

VHF/AM CONTROL UNIT D



1. CONTROL PANEL LIGHTS
2. FREQUENCY INDICATOR WINDOW
3. SQUELCH DISABLE BUTTON
4. VOLUME CONTROL KNOB
5. KILOCYCLE FREQUENCY SELECTOR KNOB
6. MEGACYCLE FREQUENCY SELECTOR KNOB
7. POWER KNOB

Figure 4-22.

Volume Control Knob

The volume control knob (3, Figure 4-21), provides volume control for the receiver audio circuit in the receiver-transmitter unit. Turning the volume control knob clockwise increases the audio output level.

Frequency Selector Switch

The frequency selector switch (2, Figure 21) provides manual frequency selection for the AN/ARC-44 receiver-transmitter. The whole megacycle selector provides both receiver and transmitter circuit operating frequency tuning in 28 steps, spaced at one-megacycle intervals, in the frequency range between 24.0 and 51.9 megacycles. Rotation of the knurled knob selects the upper two digits of the three-digit operating frequency shown in the frequency window. The two digits selected thus represent the whole megacycle portion of the three-digit operating frequency. The 1/10-megacycle selector changes the frequency of each of the whole megacycle settings in ten steps spaced at 1/10-megacycle intervals.

Remote - Local Selector Switch

The remote-local selector switch (5, Figure 4-21) provides remote-local frequency control and receiver audio volume control of the receiver-transmitter unit.

AN/ARC-44 SWITCH PANEL ASSEMBLY. The switch panel assembly (17, Figure 4-3), (3, Figure 4-4), located in the overhead control panel, contains five front panel toggle switches. These switches are numbered 1, 2, 3, 4, and 5, and their functions are as follows: No. 1 toggle switch is marked HOME (2, Figure 4-23). When this switch is placed in the up position it energizes homing circuits, disconnects the communication antenna, connects the homing antenna through a keyer to the receiver-transmitter unit receiver input, and disables the FM transmitter. When the switch is placed in the down position, the homing operation becomes disabled, allowing the radio set to return to normal operation. No. 2 toggle switch is marked SQUEL (3, Figure 4-23). In the up position, this switch squelches the receiver output. In the down position, the receiver is not squelched, allowing background noise to be heard. Toggle switches 3, 4, and 5 are not wired into the system and do not apply to this installation.

OPERATION OF AN/ARC-44 RADIO EQUIPMENT

FM Reception - AN/ARC-44

1. Master switch - ON.
2. Homing switch on radio switch panel - down to OFF.
3. SQUEL switch on radio switch panel - down to OFF.
4. Power switch on FM control panel - ON.
5. Whole 1/10 megacycle selectors on FM control panel - set to desired frequency.
6. REM-LOCAL selector on FM control panel - LOCAL.
7. VOL control - one-half turn clockwise.
8. AN/AIC-10 function switch - FM position A1 B1 B4
   C1611/AIC No. 1 receiver switch - ON.

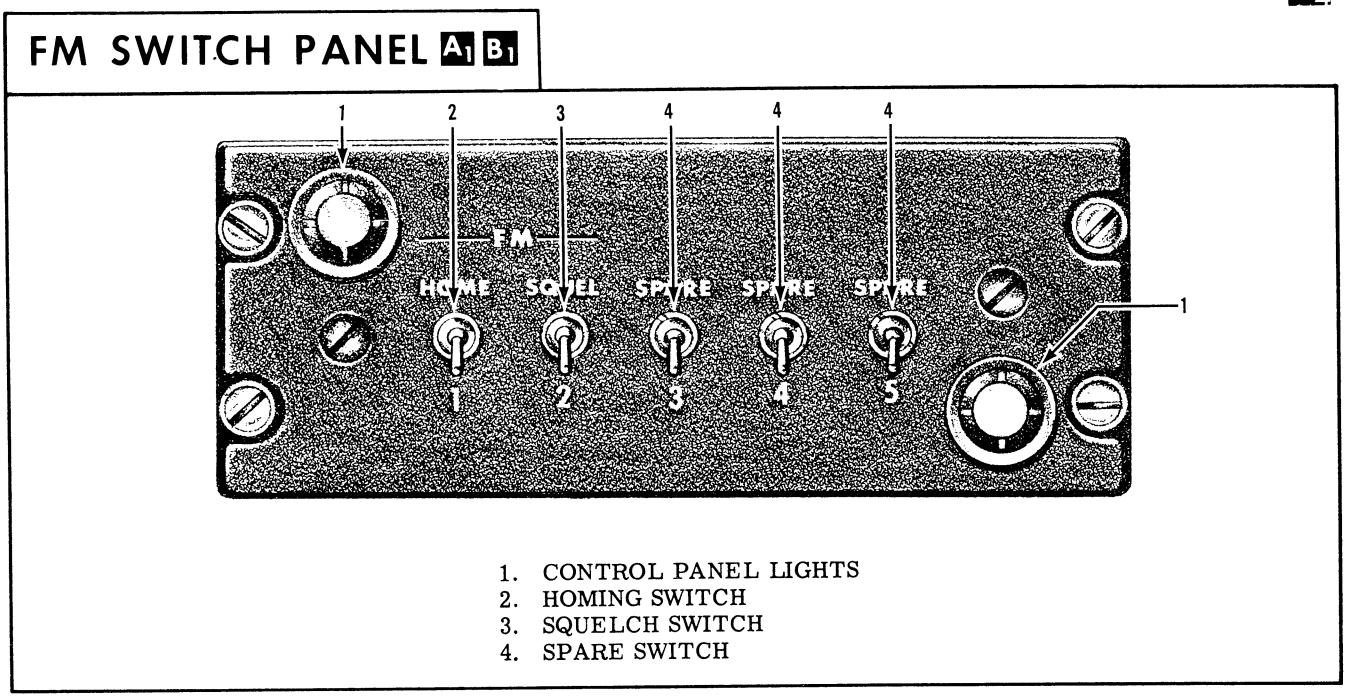


Figure 4-23.

9. AN/AIC-10 mixer switches - may be set as required to monitor other receivers.
10. VOL control on intercommunication control panel - adjust for desired headset volume.

NOTE

The operator should position the squelch switch to the up (ON) position for normal operation following a momentary check in down position to ascertain that the FM receiver is operating. Neglecting to do this may result in background noise becoming highly objectionable; however, distant and/or weak communications may be read by placing the squelch switch to the down (OFF) position.

FM Transmission - AN/ARC-44

1. Set the AN/ARC-44 radio equipment panels for FM reception.
2. Press the talk button and talk into microphone. Observe normal traffic precautions to avoid breaking in on a transmission reception.

Homing Operation - AN/ARC-44

1. Set the AN/ARC-44 radio equipment panels for FM reception.
2. Homing switch on radio switch panel (2, Figure 4-23) up to HOME position and tune to desired frequency. The code D and U signal or steady 400 cps on course tone should be heard in the headset. When the code D is heard in the headset, the pilot turns left to head toward the station. When the code U is heard, the pilot turns right to head toward the station.

FM-622A VHF/FM **D**

The FM-622A VHF/FM is a frequency modulated transceiver providing 920 channels over a frequency range of 30 to 76 megacycles. The FM-622A has dual functions of providing two-way voice communication or homing capability between aircraft, and between aircraft and ground stations. When the equipment is used for homing, a visual display of the homing signal is presented on the course indicator (Figure 4-15). The equipment includes a control unit to provide selection of frequency and mode of operation. The equipment receives power from the main dc bus and is protected by a circuit breaker (21, Figure 4-5) (27, Figure 4-6).

CONTROL UNIT. The control unit (24, Figure 4-5) (31, Figure 4-6) for the FM-622A VHF/FM includes a volume control knob, a squelch control knob, four frequency selector knobs, four frequency indicators, and a mode control knob.

Mode Control Knob

The mode control knob labeled OFF-T/R-RETRAN-HOME (5, Figure 4-24) applies power to the FM-622A VHF/FM equipment and selects three modes of operation. In the transmit-receive (T/R) position, the transceiver will provide for voice communication on any preselected frequency. In the retransmission (RETRAN) position, the equipment is used as a relay station. The switch in the HOME position provides the use of the equipment to home on any signal within its frequency range.

Volume Control Knob

The volume control knob (VOL) (6, Figure 4-24) provides volume control of the receiver audio circuit in the receiver-transmitter unit.

Frequency Selector Knobs

The four frequency selector knobs (1, 2, 3, 4, Figure 4-24) provide selection of any one of 920 channels in the 30 to 76 megacycles range and display the frequency on the indicators above each selector knob.

Squelch Control Knob

The squelch control knob labeled DIS-CARR-TONE (7, Figure 4-24) provides control of the squelch threshold. In the DIS position the squelch is disabled. The TONE position is used if the homing station is transmitting a 150 cps tone modulated signal.

OPERATION OF 622A VHF/FM TRANSCEIVER

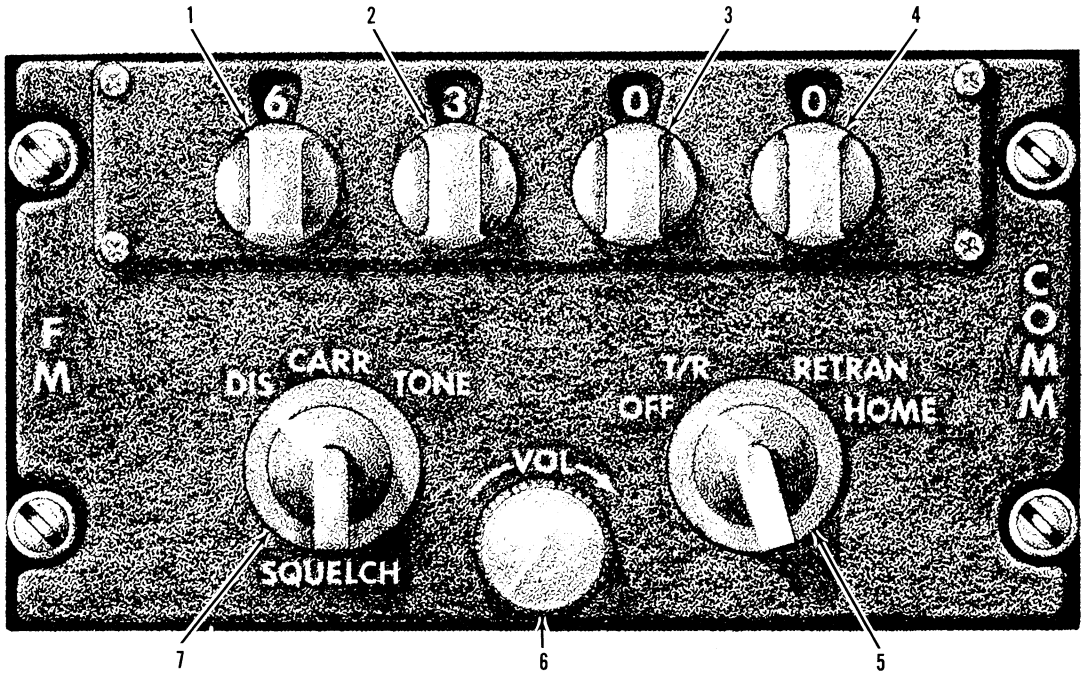
1. Set mode control knob to T/R.

NOTE

Intercommunication control unit must be set as described in related paragraph for AN/AIC-18.

2. Rotate frequency selector knobs to display the desired frequency on frequency indicators.
3. Set squelch control knob to CARR. For reception of weak signals, set the squelch control knob to DIS.
4. PRESS transmitter talk switch and speak into microphone.
5. Release transmitter talk switch to receive.
6. Adjust volume control knob to the desired audio level.
7. Turn off the equipment by rotating the mode control knob counterclockwise to OFF.

VHF/FM CONTROL UNIT D



1. TENS MEGACYCLE FREQUENCY SELECTOR KNOB
2. UNITS MEGACYCLE FREQUENCY SELECTOR KNOB
3. TENTHS MEGACYCLE FREQUENCY SELECTOR KNOB
4. HUNDREDTHS MEGACYCLE FREQUENCY SELECTOR KNOB
5. MODE CONTROL KNOB
6. VOLUME CONTROL KNOB
7. SQUELCH CONTROL KNOB

Figure 4-24.

Homing Operation - 622A VHF/FM

1. Set the mode control knob to HOME.

WARNING

In the selection of HOME position on aircraft coded D_1, the CD-4 information is automatically removed from the course indicator and power is simultaneously removed from the CD-4 system and the AN/ARN-30E, allowing homing information to be displayed on the course indicator. On aircraft coded D_2, the selection of HOME position simultaneously disconnects the power from the AN/ARN-30E and the glideslope receivers to allow homing information to be displayed on the course indicator.

2. Display the desired frequency of the homing station on the frequency indicator by rotating the four frequency selector knobs.
3. Set the squelch control knob to CARR. (TONE position may be used if the homing station is transmitting a 150 cps tone modulated signal.)
4. Observe the vertical pointer of the course indicator. Sufficient signal strength is indicated by flags out of sight.

WARNING

If the flags do not disappear, or if they fluctuate, under no circumstances should the homing procedure be continued. Either the signal received is not of sufficient strength to be reliable, or the associated FM radio set is not functioning properly.

5. Note that the vertical pointer is centered in the indicator when aircraft is headed directly toward the homing station.

NOTE

Confirm that the aircraft is heading toward the station by performing a 180° ambiguity check.

6. Over-the-station position is indicated by the horizontal pointer of the course indicator.

WARNING

When homing is not required, return the mode control switch to T/R, RETRAN, or OFF position to restore power to the CD-4 and the AN/ARN-30E on aircraft coded D1, and to restore power to the AN/ARN-30E and glideslope receiver on aircraft coded D2.

7. The equipment is turned off by rotating the mode control switch counterclockwise to OFF.

AN/ARC-60 UHF COMMUNICATION EQUIPMENT A

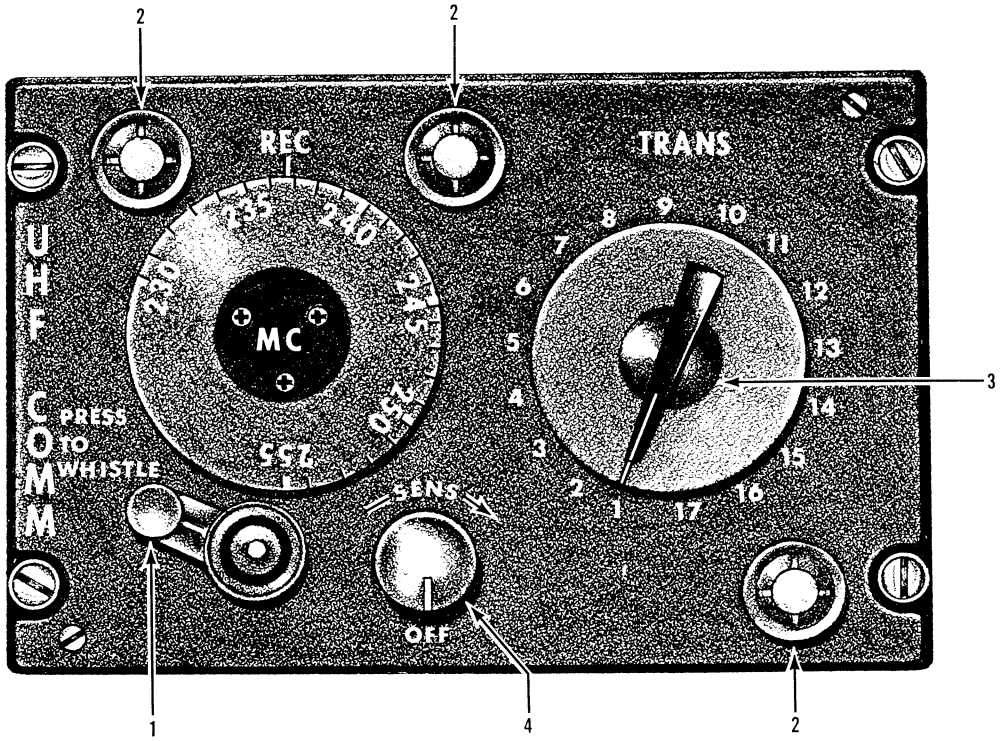
The AN/ARC-60 UHF communication equipment provides voice transmission in the UHF band of 228 to 258 mc.

CONTROL UNIT. The control unit for the AN/ARC-60 is located on the left side of the pilot's instrument panel and is labeled UHF COMM. The control unit includes a combination power switch and volume control (SENS-OFF), combination receiver tuning whistle-through control, and a transmitter channel-selector switch (TRANS) that provides selection of up to 16 UHF channels.

Volume Control

The combination power switch and volume control (4, Figure 4-25) is labeled SENS-OFF. Rotating the volume control clockwise will turn the equipment on

UHF COMMUNICATION CONTROL UNIT A



1. TUNING CONTROL
2. CONTROL PANEL LIGHTS
3. CHANNEL SELECTOR
4. VOLUME CONTROL

Figure 4-25.

and increase the volume. The equipment is turned off by rotating the volume control counterclockwise to the OFF position.

Tuning Control

The tuning control (1, Figure 4-25) provides manual tuning of the AN/ARC-60 communications equipment to the desired receiving frequency as shown on the indicator dial. Pressing the tuning control in while tuning utilizes a whistle-through circuit.

Transmitter Channel Selector

The transmitter channel selector switch (TRANS) (3, Figure 4-25) selects up to 16 UHF channels.

UHF PHONE SWITCH. The phone switch labeled UHF, located on the instrument panel, selects the desired audio circuit.

OPERATION OF AN/ARC-60 COMMUNICATION EQUIPMENT

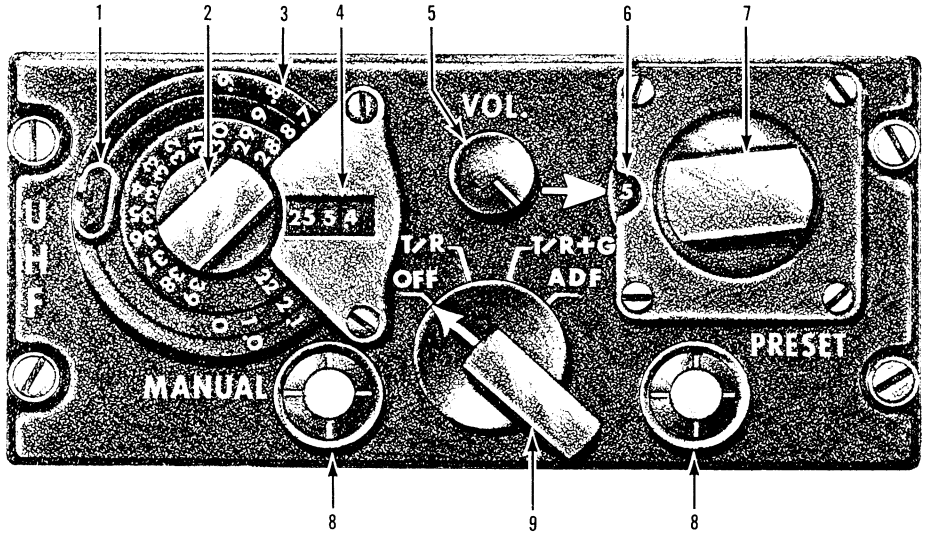
1. Place radio master switch in the ON position.
2. Rotate primary power switch and volume control full clockwise and allow equipment to warm up for two or three minutes.
3. Set transmitter channel selector switch to desired transmitting channel.
4. Tune receiver to desired receiving frequency (use whistle-through facility for precise tuning if reception is desired on the same frequency as the transmitting channel).
5. Press the microphone switch and speak directly into the microphone. The transmission will be monitored in the sidetone circuit.
6. Release the microphone switch to receive.
7. Adjust volume to a comfortable listening level.

AN/ARC-27 UHF COMMUNICATION EQUIPMENT **B** **B4** less **B2**

The AN/ARC-27 provides voice communication within the frequency range of 225.0 to 399.9 megacycles. The principal function of the AN/ARC-27 is to provide communication between aircraft and ship, aircraft and ground, or between aircraft. The AN/ARC-27 receives power from the main dc bus, and is protected by a fuse.

CONTROL UNIT. The control unit (26, Figure 4-3) for the AN/ARC-27 is located below the instrument panel between the pilot and copilot. The control unit includes a function selector switch (OFF-T/R - T/R+G - ADF), a volume control knob (VOL), a channel selector switch (PRESET), and a frequency selector switch (MANUAL).

UHF COMMUNICATIONS CONTROL UNIT **B** less **B2**



1. THIRD DIGIT FREQUENCY SELECTOR CONTROL
2. FIRST TWO DIGIT FREQUENCY SELECTOR CONTROL
3. TENTH MEGACYCLE FREQUENCY SELECTOR CONTROL
4. FREQUENCY INDICATOR WINDOW
5. VOLUME CONTROL KNOB
6. PRESET INDICATOR WINDOW
7. PRESET CHANNEL SELECTOR
8. CONTROL PANEL LIGHTS
9. FUNCTION SELECTOR SWITCH

Figure 4-26.

Function Selector Switch

The purpose of the function selector switch (9, Figure 4-26) is to turn the equipment on and to select the operation desired for the AN/ARC-27. When the transmit and receive (T/R) position is selected, the AN/ARC-27 functions only as a UHF transceiver. In the T/R+G (guard) position, the UHF operates on any preselected channel in addition to monitoring the G (guard) channel. In the ADF position the receiver functions as an automatic direction finder, while the transmitter and guard receiver are placed in standby. The OFF position turns the UHF transceiver off.

Volume Control

The volume control (5, Figure 4-26) is labeled VOL. Rotating the volume control knob clockwise will increase the volume. The receivers volume is decreased by rotating the volume control knob counterclockwise.

Preset Channel Selector

The channel selector (PRESET) switch (7, Figure 4-26) selects any of the twenty preset channels, G (guard channel), or M (manual) operation. The position selected will appear in the window of the preset indicator.

Frequency Selector

The frequency selector (MANUAL) switch (1, 2, 3, 4, Figure 4-26) permits the manual selection of any of the 1750 available frequencies:

1. Selects the first two digits.
2. Selects the third digit.
3. Selects the tenth of mc.
4. Indicates the frequency selected.

UHF PHONE SWITCH. The UHF phone switch (2, Figure 4-7) selects the desired audio circuit. (On aircraft coded **B1** the AIC-10A will be utilized.)

VHF-UHF TRANS SWITCH. The VHF-UHF TRANS switch (4, Figure 4-7) selects the desired transmitter for transmitting. (On aircraft coded **B1** the AIC-10A will be utilized.)

OPERATION OF UHF TRANSCEIVER

1. Place UHF master switch to ON position.
2. Place UHF phone switch to PHONE position and all other phone switches to OFF position.
3. Place VHF-UHF transmitter switch to UHF.
4. Turn function selector switch to T/R. (Allow approximately 30 seconds for equipment to warm up.)
5. Select desired channel or frequency. If manual frequency selection is desired the channel selector (PRESET) switch must be turned to the M position.
6. Release the microphone switch to receive.
7. Press the microphone switch to transmit and speak directly into the microphone. The transmission will be monitored in the sidetone circuit.
8. Adjust volume control on UHF control panel to comfortable listening level.
9. Place function selector switch to desired operating function.
10. Place function selector switch to OFF position.

AN/ARC-51X UHF COMMAND RADIO **A1**

The AN/ARC-51X UHF command radio interchanges with the AN/ARC-73 (VHF-101) command radio to provide air-to-air and air-to-surface communication, with 1750 crystal-controlled frequency channels spaced 100 kc apart, in the 225.00 to 399.9 mc range. The AN/ARC-51X receives power from the main dc bus and is protected by a circuit breaker (19, Figure 4-4). The AN/ARC-51X utilizes either a control unit (Figure 4-27) with preset channel and manual frequency selection capabilities, or a control unit (Figure 4-28) that provides manual frequency selection only. The AN/ARC-51X control unit (23, Figure 4-4) is located below the instrument panel between the pilot and copilot.

CONTROL UNIT (Preset Channel Selection). The control unit (Figure 4-27) includes a function selector switch (OFF-T/R - T/R+G - ADF), preset channel selector switch (CHAN), frequency selector switches (MANUAL), and a dual control knob for volume and sensitivity control.

Function Selector Switch

The purpose of the function selector switch (6, Figure 4-27) is to turn the equipment on and to select the desired operation for the AN/ARC-51X. When the transmit and receive (T/R) position is selected, the AN/ARC-51X functions only as a UHF transceiver. In the T/R+G (guard) position, the AN/ARC-51X operates on any preselected channel or frequency in addition to monitoring the G (guard) channel. ADF position (not used). The OFF position turns the AN/ARC-51X off.

Preset Channel Selector

The channel selector (CHAN) switch (9, Figure 4-27) selects any of the nineteen preset channels, G (Guard channel), or M (Manual) operation.

Frequency Selector

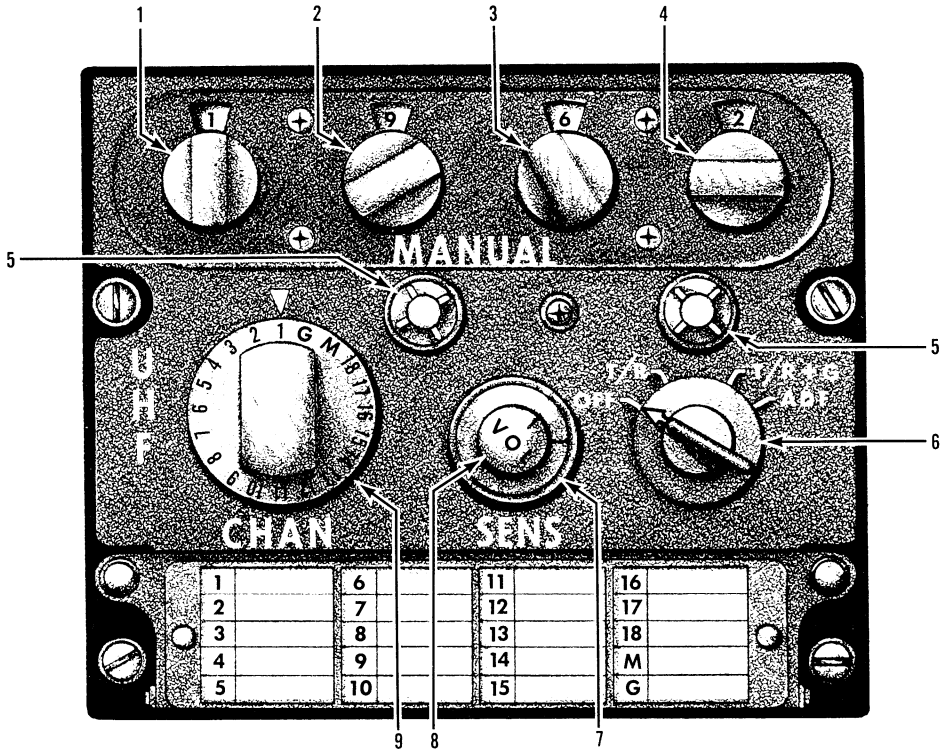
The frequency selector (MANUAL) switches (1, 2, 3, and 4, Figure 4-27) permit manual selection of any of the 1750 available frequencies. The frequency selected will appear above the respective manual selector switch.

Volume - Sensitivity Control Knobs

A dual control is provided for the volume and sensitivity control. The volume control (VOL) knob (8, Figure 4-27) is located in the center of the sensitivity control and adjusts the receiver volume level in the

UHF COMMUNICATION CONTROL UNIT A1

AUTOMATIC



1. FIRST DIGIT FREQUENCY SELECTOR CONTROL
2. SECOND DIGIT FREQUENCY SELECTOR CONTROL
3. THIRD DIGIT FREQUENCY SELECTOR CONTROL
4. TENTH MEGACYCLE FREQUENCY SELECTOR CONTROL
5. CONTROL PANEL LIGHTS
6. FUNCTION SELECTOR SWITCH
7. SENSITIVITY CONTROL KNOB
8. VOLUME CONTROL KNOB
9. CHANNEL SELECTOR SWITCH

Figure 4-27.

interphone system. The sensitivity control (SENS) knob (7, Figure 4-27) adjusts the squelch threshold on the receiver output.

Control Unit (Manual).

The control unit (Figure 4-28) includes a function selector switch (OFF-T/R - T/R+G - ADF), frequency selector switches, and a dual control knob for volume and sensitivity control.

Function Selector Switch

The purpose of the function selector switch (5, Figure 4-28) is to turn the equipment on and to select the operation desired for the AN/ARC-51X. When the transmit and receive (T/R) position is selected, the AN/ARC-51X functions only as a UHF transceiver. In the T/R+G (GUARD) position, the AN/ARC-51X operates on any selected frequency in addition to monitoring the G (GUARD) channel. ADF position (not used). The OFF position turns the AN/ARC-51X off.

Frequency Selector

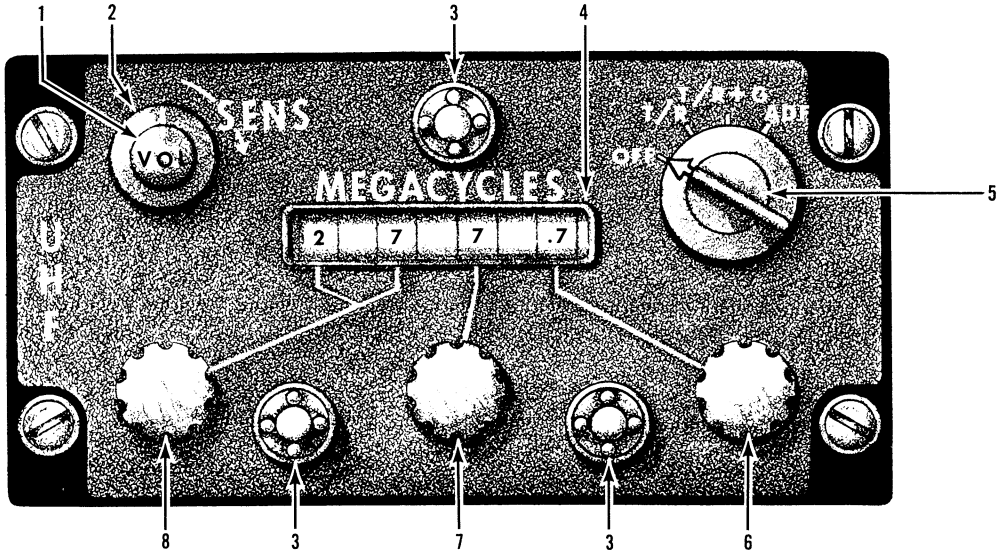
The frequency selector switches (6, 7, and 8, Figure 4-28) permit manual selection of any of the 1750 available frequencies. The frequency selected will appear in the frequency indicator window above the respective manual selector switch.

Volume - Sensitivity Control Knobs

A dual control is provided for the volume and sensitivity control. The volume control (VOL) knob (1, Figure 4-28) is located in the center of the sensitivity control and adjusts the receiver volume level in the

UHF COMMUNICATION CONTROL UNIT A1

MANUAL



1. VOLUME CONTROL KNOB
2. SENSITIVITY CONTROL KNOB
3. CONTROL PANEL LIGHTS
4. FREQUENCY INDICATOR WINDOW
5. FUNCTION SELECTOR SWITCH
6. FIRST TWO DIGIT FREQUENCY SELECTOR CONTROL
7. THIRD DIGIT FREQUENCY SELECTOR CONTROL
8. TENTH MEGACYCLE FREQUENCY SELECTOR CONTROL

Figure 4-28.

interphone system. The sensitivity control (SENS) knob (2, Figure 4-28) adjusts the squelch threshold on the receiver output.

OPERATION OF AN/ARC-51X UHF COMMAND RADIO

1. Place aircraft master switch in the ON position.
2. Place (C-1611) UHF receiver switch (No. 2) and the interphone switch in the ON position, and all other receiver switches to the OFF position.
3. Turn function selector switch to T/R (allow approximately 30 seconds for equipment to warm up).
4. Select desired frequency or channel (control unit with channel facilities).
5. Press transmitter talk button and speak directly into microphone.
6. Release the transmitter talk button to receive.
7. Adjust the volume control to a comfortable listening level.

AN/ARC-51BX UHF COMMAND RADIO D

The AN/ARC-51BX UHF command radio provides air-to-air and air-to-surface communication with 3500 crystal-controlled frequency channels in the 225.00 to 399.95 megacycles range. The AN/ARC-51BX utilizes a control unit (Figure 4-29) with preset channel and manual frequency selection capabilities. The control unit also provides monitoring of the emergency channel frequency of 243.00 megacycles simultaneously with the selected operating frequency. The control unit (22, Figure 4-5) (29, Figure 4-6) is located on the instrument panel between the pilot and copilot. The AN/ARC-51BX receives power from the main dc bus and is protected by a circuit breaker (11, Figure 4-5) (16, Figure 4-6) on the preselected frequency, in addition to monitoring the guard (G) channel of 243.00 megacycles. The ADF position is not used. The OFF position turns the AN/ARC-51BX off.

Operation Mode Selector Knob

The operation mode selector knob (10, Figure 4-29) is a three-position control. In the extreme counterclockwise position, the equipment is prepared to operate on any one of the 20 preset channels. In the center position (MAN), the equipment is prepared for manual selection of any one of 3500 available frequencies without disrupting the 20 preset channels. In the GD-XMIT position, the equipment automatically selects the guard frequency of 243.00 megacycles for transmission.

Channel Selector Knob

The channel selector knob (PRESET CHAN) (2, Figure 4-29) selects any one of twenty preset channels. The channel selected is displayed in the channel indicator window (1, Figure 4-29) and the frequency is displayed in the frequency indicator window (3, Figure 4-29).

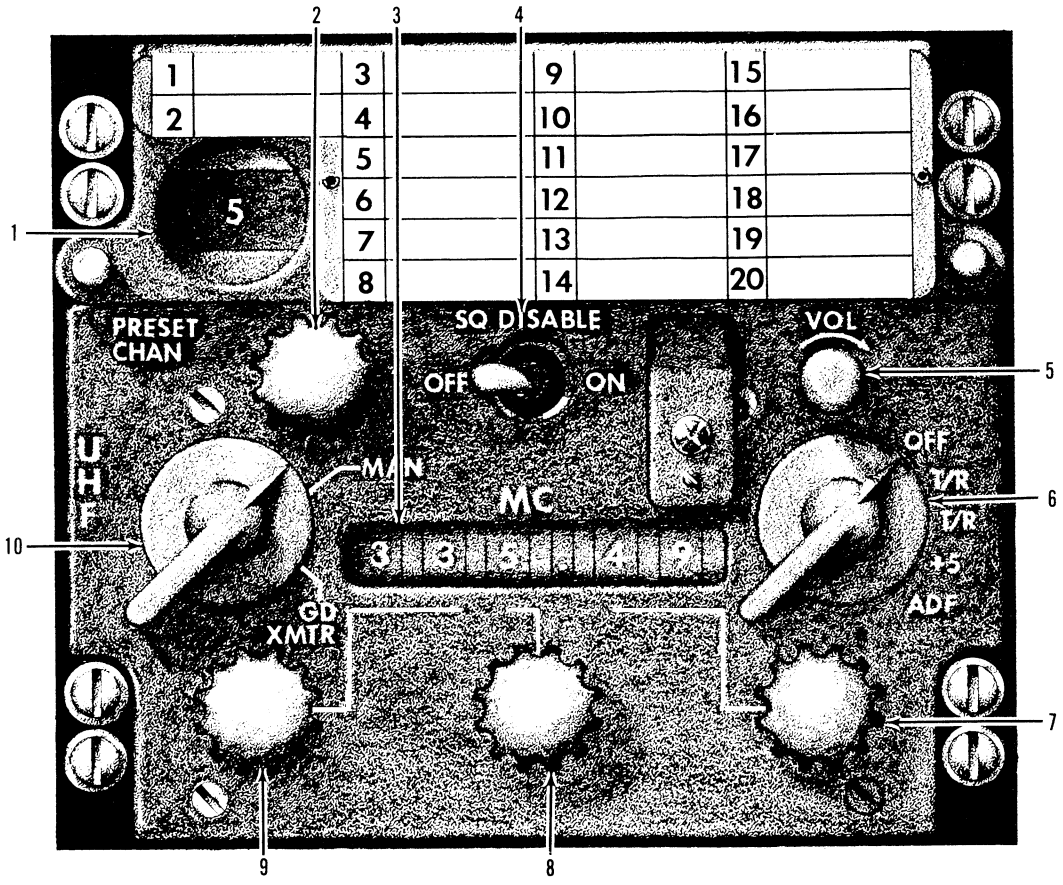
Frequency Selector Knobs

The three frequency selector knobs (7, 8, 9, Figure 4-29) at the bottom of the control unit manually select and display the desired operating frequency in the frequency indicator window. The left knob selects the first two digits of the frequency. The center knob selects the third digit of the frequency. The right knob selects the hundredths of megacycle of the frequency.

Volume Control Knob

The volume control knob (VOL), (5, Figure 4-29) adjusts the audio of the AN/ARC-51BX receiver to the desired level.

51BX UHF CONTROL UNIT D



1. CHANNEL INDICATOR WINDOW
2. CHANNEL SELECTION KNOB
3. FREQUENCY INDICATOR WINDOW
4. SQUELCH SWITCH
5. VOLUME CONTROL KNOB
6. FUNCTION SELECTOR KNOB
7. HUNDREDTHS MEGACYCLE FREQUENCY SELECTOR KNOB
8. THIRD DIGIT FREQUENCY SELECTOR KNOB
9. FIRST TWO DIGIT FREQUENCY SELECTOR KNOB
10. OPERATION MODE SELECTOR KNOB

Figure 4-29.

Squelch Switch

The squelch switch (4, Figure 4-29) is labeled SQ DISABLE-ON-OFF. It is a two-position switch which enables the operator to disable the squelch when receiving weak signals.

OPERATION OF AN/ARC-51BX COMMAND RADIO

Preset Channel Selection

1. Rotate the function selector knob to T/R or to T/R+G when monitoring of emergency frequency is desired.
2. Set the intercommunication control unit as described in related paragraph for AN/AIC-18.
3. Rotate the operation mode selector knob to extreme counterclockwise position.
4. Rotate the channel selector knob to display desired channel in channel indicator window.
5. Set squelch switch to ON.
6. Press the transmission talk switch and speak into microphone.
7. Release the talk switch to receive.
8. Adjust the volume control knob to desired audio level.
9. Rotate the function selector knob counterclockwise to OFF to remove power from the AN/ARC-51BX.

Manual Frequency Selection

1. Rotate the function selector knob to T/R or to T/R+G when monitoring of emergency frequency is desired.
2. Set the intercommunication control unit as described in related paragraph.
3. Rotate the operation mode selector knob to manual position (MAN).
4. Rotate the frequency selector knobs for the display of the desired frequency in the frequency indicator window.
5. Set the squelch switch to ON.
6. Press the transmission talk switch and speak into the microphone.
7. Release the talk switch to receive.
8. Adjust volume control knob to the desired audio level.
9. Rotate the function selector knob to OFF to remove power from the AN/ARC-51BX.

AN/ARC-95 UHF COMMAND RADIO (Installed on Aircraft Showing Compliance with T.O. 1U-10-513).

AN/ARC-95 is an amplitude modulated communication radio for use by the pilot and copilot. It provides voice communication between aircraft to aircraft or aircraft to ground stations over a frequency range of 2.0 to 18.0 megacycles. The AN/ARC-95 receives power from the aircraft's dc power supply and is protected by a 10 AMP circuit breaker located on the left side of the instrument panel control unit.

The control unit located below the instrument panel contains the VOL-OFF power switch which is a combination volume control and on-off switch. A channel selector control which permits selection of any desired channel 1 through 22, RF gain control which controls receiver sensitivity and an RF indicator which measures the transmitter output. The indicator will read between 1/4 and 1/2 scale when the transmitter is operating properly.

Operation of AN/ARC-95

1. Place the aircraft master power switch and equipment circuit breaker on.
2. Rotate the VOL-OFF control fully clockwise and then counterclockwise until receiver noise is down to a comfortable level.
3. Adjust the RF GAIN control to mid position.
4. Establish two way communication with the local control tower.
5. Adjust RF GAIN control for adequate reception.
6. To turn equipment off rotate the VOL-OFF switch counterclockwise to the off position and place circuit breaker in the off position.

AVQ-75 DME SYSTEM D2

The AVQ-75 DME is a navigational aid that interrogates the DME portion of the common civil-military VORTAC system of air navigation. The principal function of the AVQ-75 DME is to provide the pilot with continuous measurement of the line-of sight distance between the in-flight aircraft and a selected VORTAC station within range. The distance is digitally displayed in nautical miles on an indicator which also displays ground speed in knots. Audio identification of the VORTAC station is also available. The DME system has a memory circuit incorporated that continues to indicate the last distance derived in the event the signal is lost for 10 seconds. If the signal is regained during the memory period, the distance indication is automatically adjusted and tracking resumes. If it is not regained in 10 seconds, the AVQ-75 will automatically go to standby, a feature which prevents searching needlessly when the aircraft is out of range of the ground station. This feature also enables the pilot to turn to DME ahead of time to an enroute ground station. When the aircraft comes within range of the ground station, the DME automatically searches out and locks on the station. The AVQ-75 DME system receives power from the main dc bus and is protected by a circuit breaker (28, Figure 4-6).

CONTROL UNIT. The control unit (10, Figure 4-6) for the AVQ-75 DME system is located on the upper center area of the instrument panel between the pilot and copilot. The control unit includes a stacked primary power and volume control knob (VOL-OFF) with two rotating frequency selector knobs, a frequency indicator window, and a mode control switch (STBY-DME).

Power and Volume Control Knob

The power and volume control knob labeled (VOL-OFF) (3, Figure 4-30) applies power to the AVQ-75 DME system with continuous rotation to adjust the audio to the desired level.

Frequency Selector Knobs

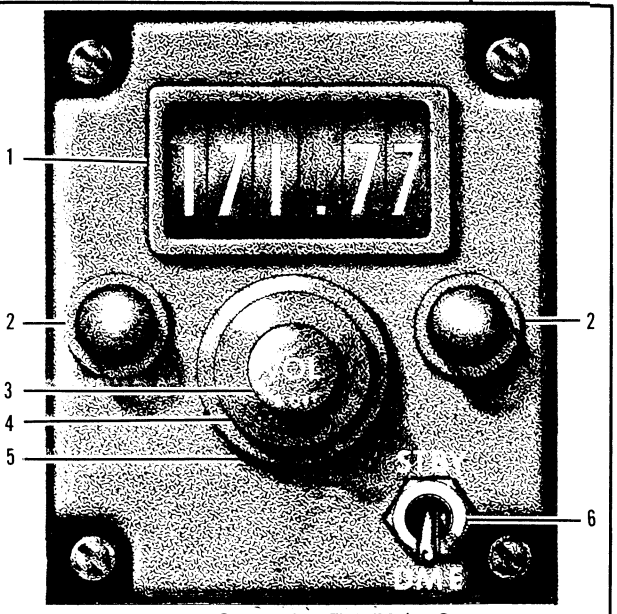
The frequency selector knobs provide selection of frequency of the desired VORTAC station with a display on the frequency indicator window (1, Figure 4-30). Rotation of the whole megacycle frequency selector knob (4, Figure 4-30) selects the whole megacycle of the desired frequency while rotation of tenths frequency selector knob (5, Figure 4-30) selects the fraction megacycle of the frequency. Clockwise rotation increases the frequency reading.

Mode Control Switch

The mode control switch, labeled (STBY-DME) (6, Figure 4-30) is a two-position toggle switch. With the switch in DME position, the equipment is fully operative. With the switch in STBY position, the DME remains warm and ready to operate.

INDICATOR. The DME Distance/Ground Speed Indicator, MI-59085-3 provides distance by digital readout and displays ground speed on the indicator dial (2, Figure 4-31). The ground speed covers an 80 to 600 knot range of speed. Also included on the indicator is the minutes to station dial. When the knob in the lower right hand corner (3, Figure 4-31) of the indicator is rotated so that the indicated DME reading is duplicated in the window (4, Figure 4-31) at the bottom of the indicator, the ground speed needle points to MINUTES TO STATION, in addition to ground speed in knots. The indicator has a red flag which drops into position across the numerals

DME CONTROL UNIT D2



1. FREQUENCY INDICATOR WINDOW
2. CONTROL PANEL LIGHTS
3. POWER AND VOLUME CONTROL KNOB
4. WHOLE MEGACYCLE FREQUENCY SELECTOR KNOB
5. TENTHS MEGACYCLE FREQUENCY SELECTOR KNOB
6. MODE CONTROL SWITCH

Figure 4-30.

whenever the distance displayed is not to be considered valid. It comes into view when the DME is in steady, search, or off.

OPERATION OF AVQ-75 DME SYSTEM

1. Rotate the frequency selector knobs of the control unit to the frequency of the desired VORTAC channel. The indicator dials will quickly rotate to proper position to display the nautical milage reading computed by the DME. During this period (search) the flag alarm drops into view across the numerals.
2. View the DME indicator window for lock on (ends the search) when the flag alarm vanishes from sight, displaying the distance reading. The numerals will rotate slowly, indicating that the aircraft is in the track mode.

NOTE

When the DME is turned to a new station, the distance displayed on the indicator automatically becomes invalid. The flag alarm drops into view across the numerals. This flag will vanish when the DME is in the track mode of the new station.

3. Rotate the knob in the lower right-hand corner of the DME indicator to duplicate the indicated DME reading in the DME duplication window at the bottom of the indicator. The ground speed needle simultaneously points to MINUTES TO STATION and to ground speed in knots.

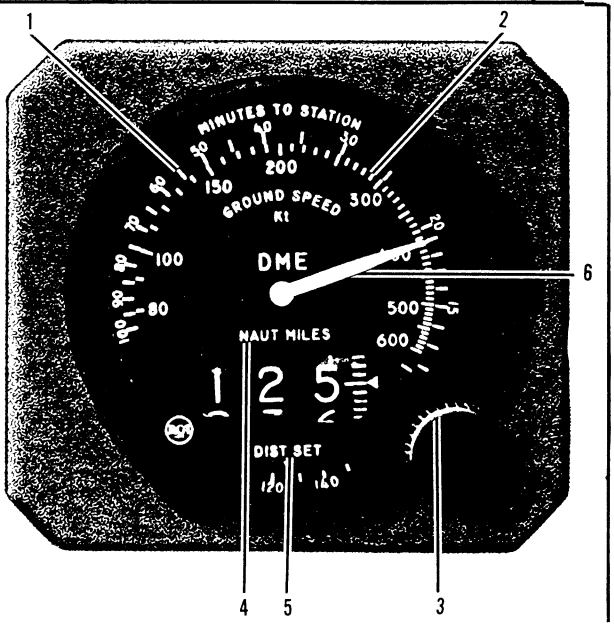
NOTE

The ground speed pointer will give an erroneous indication if the aircraft is not tracking directly toward or away from the station.

TPR-600 ATC TRANSPONDER SYSTEM D2

The TPR-600 ATC Transponder System is basically a transceiver that receives an interrogation signal from a ground air traffic control station (ATC), interprets the interrogation, and responds by transmitting one of 4096 reply codes to provide ATC with aircraft identification (mode A) and automatic reporting of aircraft altitude information (mode C).

DISTANCE/GROUND SPEED INDICATOR D2



1. MINUTES TO STATION DIAL
2. GROUND SPEED DIAL
3. DME SET KNOB
4. DME DUPLICATING WINDOW
5. GROUND SPEED POINTER
6. DISTANCE DIGIT DIAL

Figure 4-31.

NOTE

Civil mode A interrogations are identical to military IFF mode 3 and are often referred to as the common ATC mode 3/A.

The reply codes of the interpreted interrogation modes are determined by the ground station operator and selected by the pilot on a control unit. The TPR-600 receives power from the main dc bus and is protected by a circuit breaker (14, Figure 4-6).

CONTROL UNIT CN-602B. The control unit (10, Figure 4-6) is located in the upper right center of the instrument panel between the pilot and copilot. The control unit includes a primary power and function selector switch labeled OFF-SBY-ON-LO, four code selector knobs, identification switch (IDENT), a digital dial as a code indicator, a reply indicator (REPLY), a reply indicator intensity control (DIM), and a mode control knob (A-AC).

Function Selector Knob

The function selector knob labeled OFF-SBY-ON-LO (8, Figure 4-32) is used to select the desired function of the TPR-600 ATC Transponder System. Turning the control clockwise to ON applies power to the transponder. In the SBY (standby position) no replies are generated in response to interrogation signals. In the LOW position, the transponder sensitivity is reduced.

Code Selector Knobs

The code selector knobs (5, 6, 9, 10, Figure 4-32) are used to select one of 4096 different reply codes from 0000 to 7777, which can be assigned by the ground ATC to the aircraft. The code is read left to right on the digital indicator (2, Figure 4-32). Since present ground equipment is capable of interrogating on 64 codes only, the knobs controlling the two numbers on the right are locked, thereby limiting the transponder to reply to only 64 different codes. Presently, two codes have been set aside to announce difficulties. Code 77 is reserved to announce an emergency; code 76 to announce a failure in the communication equipment.

Identification Switch

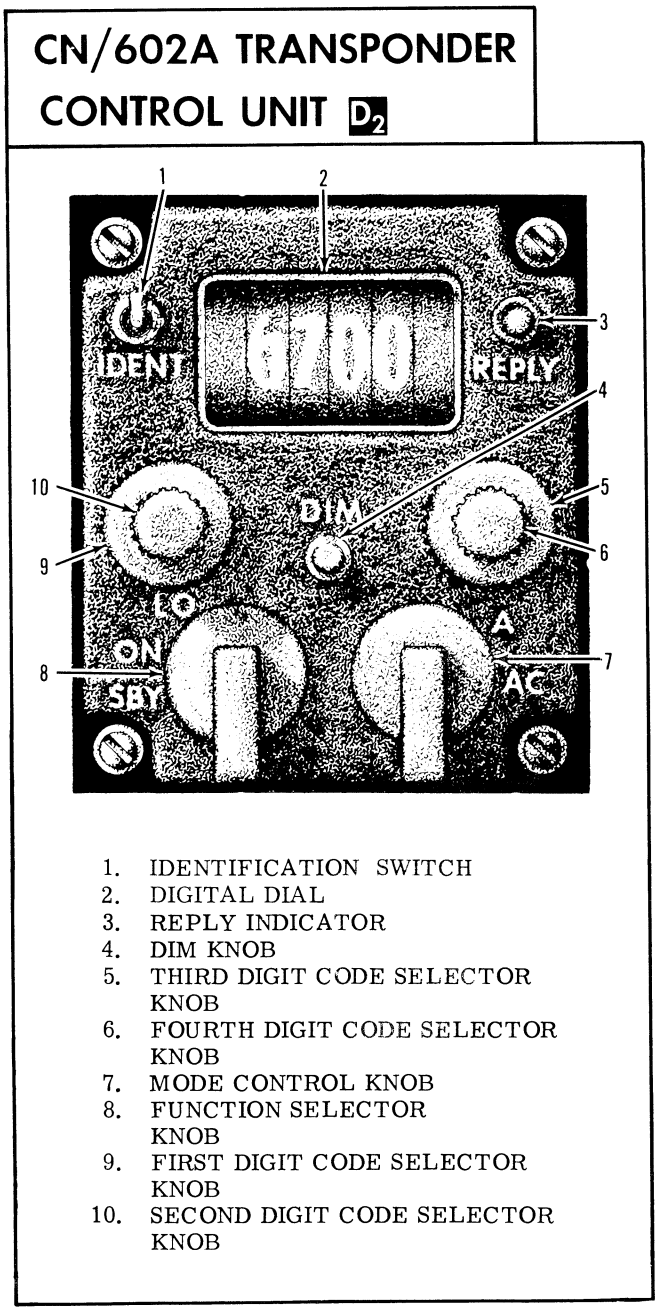
The identification switch labeled IDENT (1, Figure 4-32) is depressed to generate a special 15 to 30 second identification signal in the reply code, providing the ground station with a unique display for the particular aircraft.

REPLY INDICATOR

The reply indicator labeled REPLY (3, Figure 4-32) flashes to indicate that the ATC transponder is replying to interrogations. The DIM knob (4, Figure 4-32) varies the intensity of the flashing light.

Mode Control Knob

The mode control knob is labeled A-AC (7, Figure 4-32) for mode selection. Placing the knob to A after the proper code is assigned by ATC, the transponder will return identity information to the ground controller. The AC position is used by aircraft equipped with an altitude digitizer (not used on U-10 aircraft) which will automatically return aircraft altitude information when it receives mode C interrogation signals.



1. IDENTIFICATION SWITCH
2. DIGITAL DIAL
3. REPLY INDICATOR
4. DIM KNOB
5. THIRD DIGIT CODE SELECTOR KNOB
6. FOURTH DIGIT CODE SELECTOR KNOB
7. MODE CONTROL KNOB
8. FUNCTION SELECTOR KNOB
9. FIRST DIGIT CODE SELECTOR KNOB
10. SECOND DIGIT CODE SELECTOR KNOB

Figure 4-32.

OPERATION OF TPR-600 ATC TRANSPONDER SYSTEM

1. Set function selector knob to SBY (standby) on the CN-602A control unit.
2. Rotate code selector knob to set digital dial to code assigned by ATC.
3. Set mode control knob to A.
4. Rotate function knob to ON.
5. Observe REPLY indicator. Flashing light indicates that the transponder is replying to interrogations.
6. Press IDENT switch for special identification of aircraft as requested by ATC.
7. Rotate the function selector knob to OFF to remove power from the transponder.

HF-103 SSB COMMUNICATION EQUIPMENT D

The HF-103 is a single sideband transceiver which operates on the high frequency band from 2 to 29.999 megacycles. It provides the aircraft with long range communication on voice, CW or data communications. The primary operation mode of the HF-103 is SSB. The equipment can also operate on a compatible amplitude-modulated (AM) signal to provide communication with stations having only AM capability. The HF-103 receives power from the main dc bus. Circuit protection is provided by circuit breakers (12, Figure 4-5) (20, Figure 4-6).

CONTROL UNIT. The control unit (25, Figure 4-5) (30, Figure 4-6) for the HF-103 includes a mode control knob with an off position, four frequency control knobs, a frequency indicating window, and an rf gain control knob.

Mode Control Knob

The mode control knob (1, Figure 4-33) is a rotary type control which is used to apply power to the equipment and to select one of five modes of operation. It is labeled power off (OFF), upper sideband (USB), lower sideband (LSB), amplitude modulation (AM), (DATA), and (CW).

NOTE

DATA and CW modes are not used.

Frequency Selector Knobs

Any one of 28,000 channels, spaced one kilocycle apart in the 2 to 29.999 megacycle range can be directly selected by rotating the four frequency control knobs (2, 4, 6, 7, Figure 4-33) until the desired operating frequency is displayed in the frequency window (3, Figure 4-33).

RF Gain Control Knob

The RF gain control knob is labeled RF SENS (5, Figure 4-33). Rotating the control clockwise will increase the audio level of the receiver section of the transceiver.

OPERATION OF HF-103 SSB TRANSCEIVER

1. Rotate the function selector knob clockwise to apply power and select the desired mode of operation to either SSB, USB, or AM.
2. Rotate the frequency selector knobs to display the desired frequency on the frequency indicator window.
3. Set the intercommunication control unit, AN/AIC-18, as described in related paragraph.
4. Depress the transmission switch and speak into the microphone.
5. Release the transmission switch to receive.
6. Adjust the volume control to desired audio level.
7. Rotate the mode control knob counterclockwise to OFF to remove power from the equipment.

AN/ARN-65 AIRBORNE NAVIGATION SYSTEM D3

The AN/ARN-65 is an airborne navigation interrogator-receiver which operates in conjunction with a surface beacon transponder. These two equipments comprise a radio navigation system of the polar coordinate type. A ground bearing facility provides the aircraft with a visual display to indicate its direction in degrees of bearing in relation to the ground bearing facility selected by the pilot. A ground distance facility provides the aircraft with a digital display indicating the aircraft slant range distance in nautical miles from the ground facility.

CONTROL UNIT. The control unit (Figure 4-32A) for the AN/ARN-65 is labeled TACAN, and is located on the upper center section of the instrument panel. The control unit permits selection of the operating channel, selection of the operating mode, and control of volume of the identity tone. The channel selector consists of two concentric knobs. Adjusting either or both knobs energizes a servo system which tunes the receiver to the desired channel and sets the channel indicator to that channel. The identification tone volume control is an audio attenuator which controls the intensity of the audio tone to the pilots headset. The mode of operation is controlled by a multi-position switch which provides three alternate positions.

Operation Mode Knob

The operation mode knob (1, Figure 4-32A) allows the operator to select the TACAN mode of operation. The T/R position provides for both transmitting and receiving. Course, bearing, heading, and distance information are displayed on the Bearing-Distance-Heading indicator (5, Figure 4-5) and Course indicator (7, Figure 4-5). The REC position provides for receiving only, and course, bearing, and heading information is available. The unit is turned off by rotating the knob to the OFF position.

Channel Selector Knob

The channel selector knob (2, Figure 4-32A) provides a manual means of tuning the receiver to the desired channel. The selected channel is indicated in the

vertical window provided directly above the selector knob.

Volume Knob

The volume knob (3, Figure 4-32A) is labeled VOL, and is used to regulate the audio level of the signal. Rotating the knob clockwise will increase the volume.

POWER MANAGEMENT PANEL. The power management panel (Figure 4-32B) labeled 400 Hz PWR, is located directly to the left of the control unit on the instrument panel. This panel contains a rotary selector switch containing five positions to provide a power selection for both the ADF and TACAN systems.

Power Selector Knob

The power selector knob (1, Figure 4-32B) contains five positions; The TAC (TACAN) position provides power to the TACAN system. The ADF position provides power to the ADF system. The BOTH position provides power for both the TACAN and ADF systems. Should the 400 Hz power fail, placing the knob in the ADF AUX PWR position will provide auxiliary power only to the ADF system. Placing the knob in OFF shuts off power to either the ADF or TACAN systems. The knob must be left in OFF except when operating ADF or TACAN.

AUDIO SELECTOR PANEL. On aircraft coded D3 the audio selector panel (Figure 4-8), has two positions; ADF and TACAN or VOR to provide selection of desired audio circuit.

BEARING-DISTANCE-HEADING INDICATOR. The bearing-distance-heading indicator (Figure 4-32C) installed in the instrument panel displays range and bearing information. The double bar needle provides the aircraft bearing information from the AN/ARN-65 system. A distance readout is also supplied, giving distances from 0 to 200 miles. The single needle pointer provides heading information as determined by the AN/ARN-65 bearing information and the magnetic compass output (ADF).

OPERATION OF AN/ARN-65 TACAN SYSTEM

1. Turn 400 Hz power switch to TAC position.
2. Place control unit operation mode knob to REC or T/R position. Allow five minutes for warm-up.
3. Place control unit channel selector to desired channel.
4. Turn volume control clockwise for station identification.
5. Place audio selector switch in TACAN or VOR position.
6. Pull AIC-18 TAC/VOR/ADF mixer control switch out, rotate clockwise to receive audio station identification.
7. The following will be displayed on the course indicator:
   a. Course deviation.
   b. To-from indication.
   c. Course warning flag.
   d. Right-left wind correction angle.
   e. Course selection dial.
8. The following will be displayed on the bearing-distance-heading indicator:
   a. Magnetic heading (top arrow and rotating card).
   b. TACAN bearing (double-bar needle).
   c. Distance to TACAN beacon (digital readout).
   d. ADF bearing (single-bar needle).

ANTENNAS

VHF OMNI-RANGE ANTENNA A1 B B3 D

The VHF omni-range antenna is a rams-horn type installed on the top of the cabin. On aircraft coded D2, the glideslope receiver uses part of the rams-horn antenna.

ADF LOOP ANTENNA A1 B B3 D

The ADF loop antenna is housed in a small protruding blister on the top of the tail cone.

ADF SENSE ANTENNA A1 B B3 D

A wire type sense antenna is installed between the vertical fin and the VHF omni-range antenna. This antenna is used for ADF sense and LF reception.

VHF TRANSMITTER ANTENNA B

The VHF transmitter antenna is a quarter wave, base-fed inverted L-type antenna. The antenna is installed on the bottom of the cabin and is used for VHF transmissions only.

VHF COMMUNICATIONS ANTENNA B1 B3 D

A quarter wave, base-bed inverted L-type antenna, designed to operate in the VHF band, is installed on the bottom of the cabin and is used for VHF communications only.

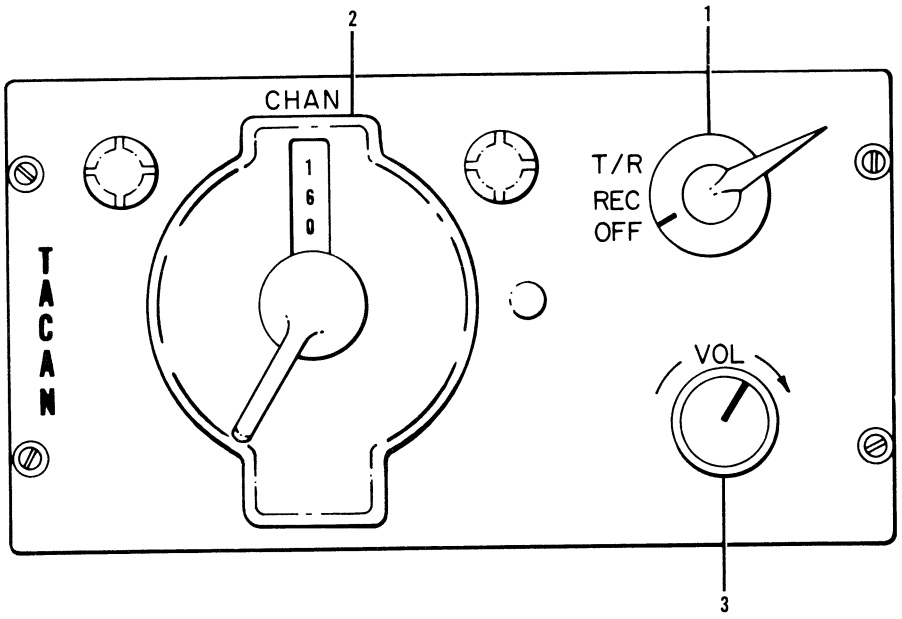
FM COMMUNICATION ANTENNA A1 B1 B4 D

The FM communication antenna is mounted on the top of the cabin area and is provided for the FM communication system.

FM HOMING ANTENNAS A1 B1 B4 D

The FM homing antennas consist of two impedance matching networks installed on the forward fuselage (one on each side) at station 12.00.

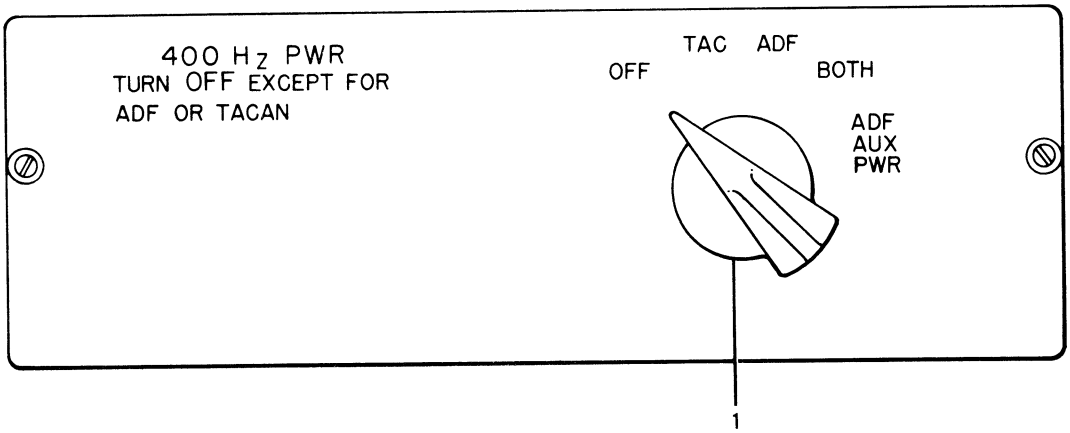
AN/ARN-65 CONTROL UNIT



1. OPERATION MODE KNOB
2. CHANNEL SELECTOR KNOB
3. VOLUME KNOB

Figure 4-32A.

POWER MANAGEMENT PANEL



1. POWER SELECTOR KNOB

Figure 4-32B.

BEARING - DISTANCE - HEADING INDICATOR

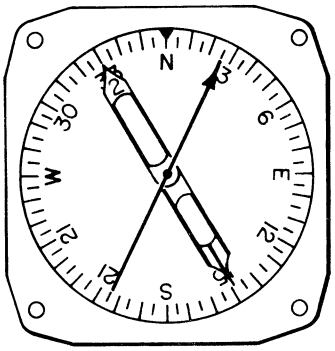
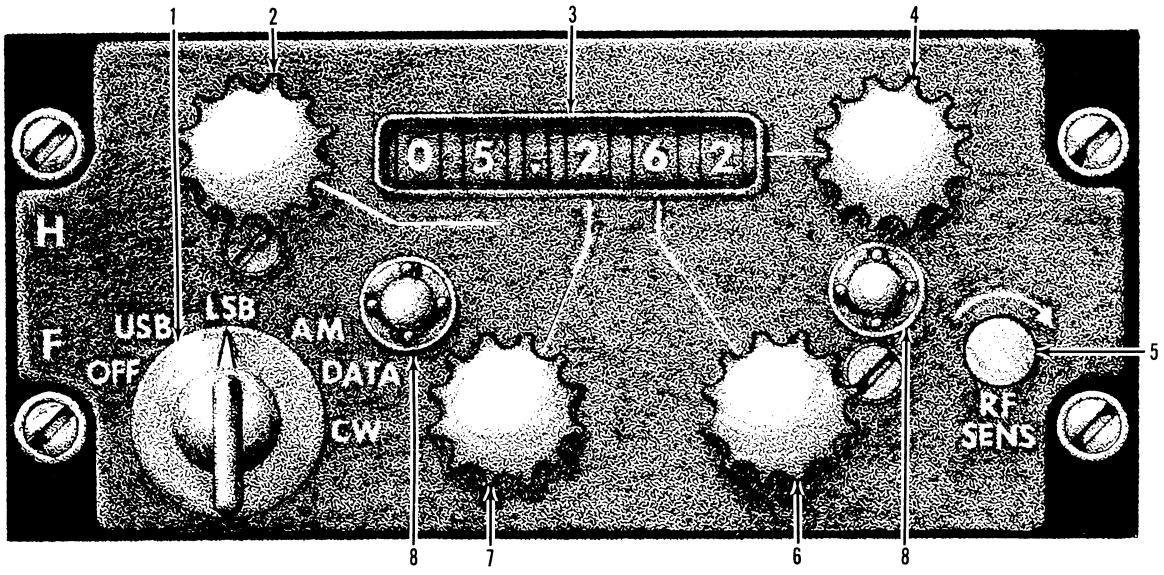


Figure 4-32C.

HF SSB CONTROL UNIT D



1. MODE CONTROL KNOB
2. MC FREQUENCY SELECTOR KNOB
3. FREQUENCY INDICATOR WINDOW
4. THOUSANDTHS MEGACYCLE SELECTOR KNOB
5. RF GAIN CONTROL
6. HUNDREDTHS MC SELECTOR KNOB
7. TENTHS MC SELECTOR KNOB
8. CONTROL PANEL LIGHTS

Figure 4-33.

UHF COMMUNICATIONS ANTENNAS

On aircraft coded A , quarter wave, base fed inverted L-type antennas, designed to operate in the UHF band, are installed on the top of the cabin and are used for UHF communications. On aircraft coded B , less B_2, a UHF knife blade antenna is installed on the bottom of the cabin and is used for UHF communications. On aircraft coded D , a quarter wave antenna is installed on the bottom of the cabin.

UHF/VHF ANTENNA A_1

The UHF and VHF communication antenna elements are contained within a single fiber glass housing which is installed on top of the tail cone section of the aircraft.

MARKER BEACON ANTENNA D_2

The marker beacon antenna is an end loaded rod element enclosed in a fiberglass housing. This antenna is used for reception of 75 megacycle signals from ILS, Z and fan markers. It is installed on the bottom of the fuselage.

ATC TRANSPONDER ANTENNA D_2

The ATC Transponder antenna is a vertically polarized L-band stub antenna located on the bottom of the cabin.

HF SSB ANTENNA D

The HF single side band antenna is long wire antenna used on high frequency band. It is installed above the center line of the fuselage between cabin, vertical stabilizer, and wing tip.

DME ANTENNA D_2

The antenna for the distance measuring equipment is omnidirectional with vertical polarization. It is mounted on the bottom of the cabin and to the rear of the UHF antenna.

LIGHTING EQUIPMENT

NAVIGATION LIGHTS

The navigation lights (1, 9, 12, Figure 4-34) (1, 8, 12, Figure 4-35) are provided as a means of indication to other aircraft, the aircraft's position and

heading under low visibility conditions such as night, weather, haze, etc. Wing tip lights are located on the outboard edge of the wing tips; red on the left tip, and green on the right tip. A clean light is installed on the lower portion of the trailing edge of the rudder.

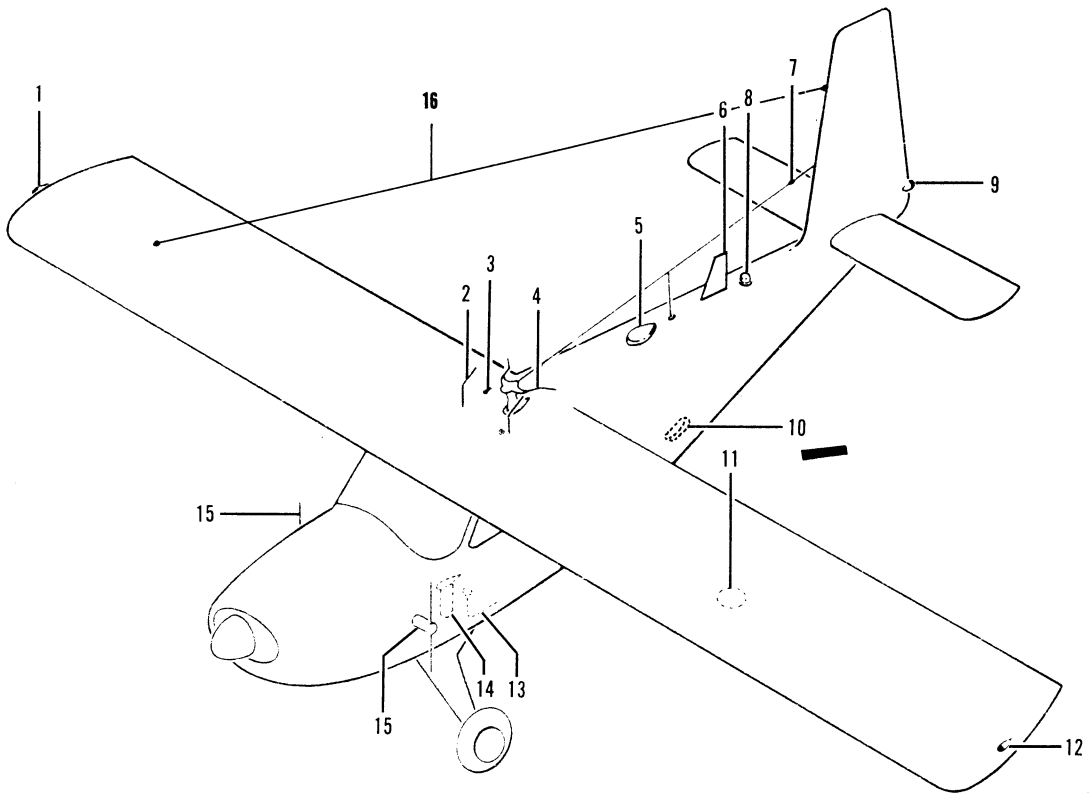
NAVIGATION LIGHTS SWITCH. The navigation lights switch (21, Figure 1-4) is located on the lower right portion of the copilot's instrument panel. The switch is labeled NAVIGATION LIGHTS with ON-OFF positions, and controls the navigation lights.

LANDING LIGHT

A landing light (11, Figure 4-34) installed on the bottom of the left wing, provides illumination forward and downward during night takeoff and landing. The landing light is controlled by two switches. The landing light is retractable to reduce drag. On aircraft coded D, dual landing lights are located in the lower nose bowl and are permanently focused. The left light (16, Figure 4-35) is focused for taxi and ground operation. The right (17, Figure 4-35) is focused for landing approach. Each light is controlled by a circuit breaker type switch.

LANDING LIGHT SWITCHES. The landing light switches (4, Figure 1-3) are installed on the pilot's overhead control panel. The landing light position switch, labeled RETRACT-OFF-DOWN controls the desired position of the landing light. (The landing light will automatically stop in either the RETRACT or DOWN position.) The light is turned on with the

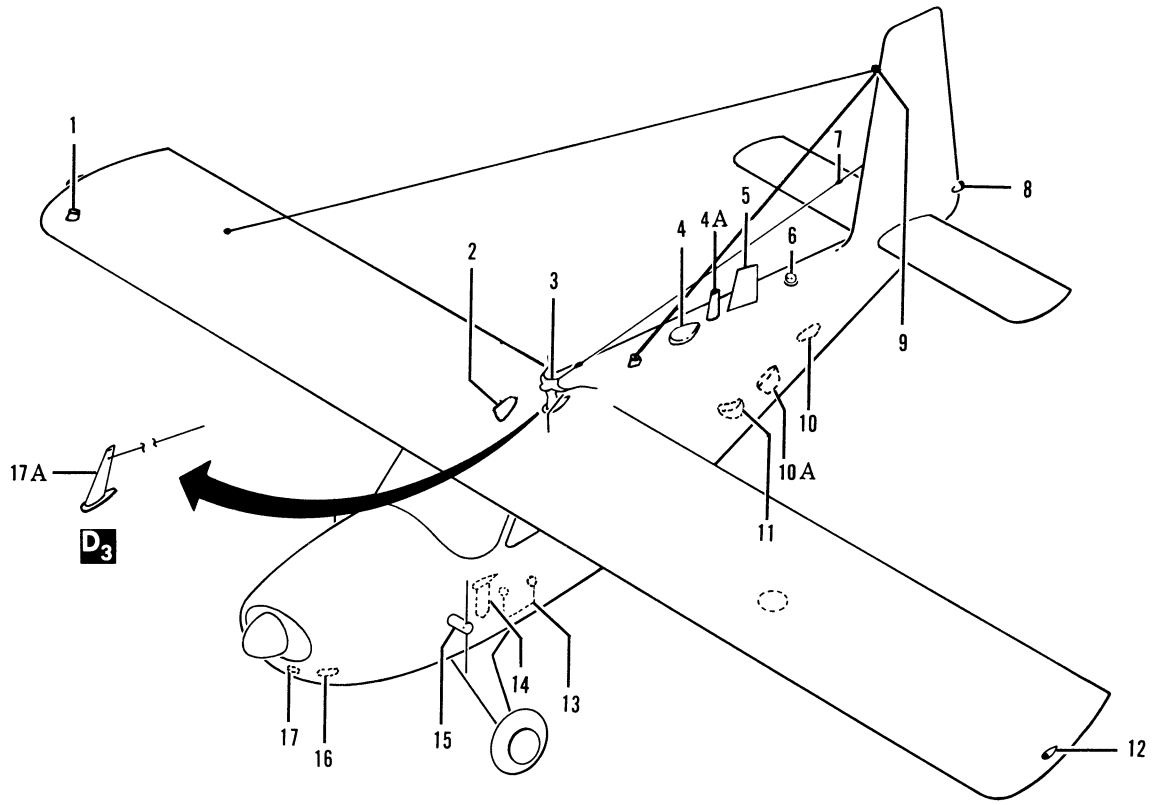
ANTENNAS AND EXTERIOR LIGHTS A B



1. RIGHT WING TIP NAVIGATION LIGHT
2. UHF COMMUNICATION ANTENNA A
3. FM COMMUNICATION ANTENNA A B_1 B_4
4. VHF OMNI ANTENNA
5. ADF LOOP ANTENNA A_1 B B_3
6. UHF/VHF COMMUNICATION ANTENNA A_1
7. ADF SENSE ANTENNA A_1 B B_3
8. ANTI-COLLISION LIGHT
9. TAIL NAVIGATION LIGHT
10. MARKER BEACON ANTENNA A_1
11. LANDING LIGHT
12. LEFT WING TIP NAVIGATION LIGHT
13. VHF COMMUNICATION ANTENNA B B_3
14. UHF COMMUNICATION ANTENNA B B_4 less B_2
15. FM HOMING ANTENNA A_1 B_1 B_4
16. AN/ARC 95 ANTENNA

Figure 4-34.

ANTENNAS AND EXTERIOR LIGHTS D



1. RIGHT WING TIP LIGHT
2. FM COMMUNICATION ANTENNA
3. VHF OMNI AND GLIDE SLOPE
4. ADF LOOP ANTENNA
4A. AN/ARN-65 ANTENNA D3
5. VHF COMMUNICATIONS ANTENNA
6. ANTI-COLLISION LIGHT
7. ADF SENSE ANTENNA
8. TAIL NAVIGATION LIGHT
9. HF SSB COMMUNICATION ANTENNA
10. ATC TRANSPONDER ANTENNA D2
10A. AN/ARN-65 ANTENNA D3
11. MARKER BEACON ANTENNA D2
12. LEFT WING TIP LIGHT
13. DME ANTENNA D2
14. VHF COMMUNICATION ANTENNA
15. FM HOMING ANTENNA
16. TAXI LIGHT
17. LANDING LIGHT
17A. ADF ANTENNA D3

Figure 4-35.

landing light OFF-ON switch. On aircraft coded D, two switches for the landing lights are located on the instrument panel. The ON-OFF switch (2, Figure 1-6) controls power to the landing light. The ON-OFF switch (2, Figure 1-6) controls power to the taxi light.

CAUTION

On aircraft coded A B, the landing light should be turned OFF prior to retraction.

ANTI-COLLISION (BEACON) LIGHT

An anti-collison light (8, Figure 4-34) (6, Figure 4-35) is installed on top of the fuselage just forward of the vertical stabilizer. The light is red and rotates 360° when the anti-collision light switch is in the ON position.

ANTI-COLLISION (BEACON) LIGHT SWITCH

The anti-collision light switch (17, Figure 1-4) (14, Figure 1-6) is located on the instrument panel. For aircraft coded A B, the switch is labeled BEACON light. For aircraft coded D, the switch is labeled

ANTI-COL LIGHT. It is ON in the up position and OFF in the down position.

NOTE

The anti-collison light should be turned off during flight through conditions of reduced visibility where the pilot could experience spatial disorientation as a result of the rotating reflections of the light against the clouds. (Light would also be ineffective as an anti-collision light during these conditions.)

INSTRUMENT AND RADIO CONTROL PANEL LIGHTS

On aircraft coded A B , all instruments installed on the instrument panel are illuminated by rim-type lights. The LF navigation control panel and all radio control panels are illuminated by edge-mounted lights. Lighting for all instruments installed on the instrument panel and the radio control panels is controlled by one rheostat. Additional instrument panel lighting and overhead control panel lighting is provided by two red overhead panel lights installed at the upper corner of the windshield post. The two red overhead panel lights are controlled by one rheostat. On aircraft coded D , the lighting of the instrument panel, overhead panel, and radio control panel are controlled by separate rheostats.

INSTRUMENT AND RADIO CONTROL PANEL LIGHTS RHEOSTAT. On aircraft coded A B , the instrument and radio control panel lights are controlled by a rheostat (16, Figure 1-4) located on the lower right portion of the copilot's instrument panel. The rheostat is labeled RIM LIGHTS, and is off in the extreme counterclockwise position. As the rheostat is rotated clockwise to the DIM position the lights are on, and they will reach their maximum intensity at the BRIGHT position. On aircraft coded D , the rheostat (29, Figure 1-6) labeled INST LIGHTS controls the instrument panel lights. The rheostat (17, Figure 4-5) (23, Figure 4-6) labeled RADIO LIGHTS controls the radio panel lights. The panel lights are OFF when the rheostats are in the extreme counterclockwise position. As the rheostats are rotated clockwise, the intensity of the lights is increased.

OVERHEAD PANEL LIGHTS RHEOSTAT. The overhead panel lights are controlled by a rheostat (48, Figure 1-4) (26, 27, Figure 1-6) located on the instrument panel. The rheostat is labeled PANEL LIGHTS, and is off in the extreme counterclockwise position. As the rheostat is rotated clockwise the intensity of the lights is increased.

MISCELLANEOUS EQUIPMENT

CAMERA SYSTEM D

The vertical and oblique cameras are mounted in a modified left paradrop door panel, and controlled by the camera control box (Figure 4-35A). The cameras provide vertical and oblique coverage and the oblique camera may be adjusted over a range of 60^{0} to provide the desired coverage. An oblique sight mounted on the pilots side window may be adjusted to the same angle as the oblique camera and is used to increase the accuracy of high oblique photography at distant targets. The camera control box provides full control over both camera diaphragms and exposure rate. The camera control box cable permits unit to be operated by either a camera operator or the aircraft pilot. A separate extra picture switch permits remote operation of the cameras as selected on the camera control box. A junction box attached to the vertical truss tube of the sling seat provides a circuit breaker and power connection for installation of the camera system.

Intervalometer

The intervalometer control (1, Figure 4-35A) provides pulse duration control from 0.2 to 6 seconds. An OFF position is also included.

Power Lamp

The red power lamp (2, Figure 4-35A) indicates when the power switch is ON and 28V DC is available to the system.

Pulse Lamp

The pulse lamp (3, Figure 4-35A) indicates the intervalometer has operated the camera shutter and exposed on frame of film.

Power Diaphragm Control Switch

This rotary control switch (4, Figure 4-35A) supplies power to the cameras to change the diaphragm setting for B (bright) H (hazy) and D (dull).

Camera Selection Switches

These three-position switches (5, Figure 4-35A) provide control for the camera to be operated. Each camera may be operated in either the STEADY or PULSE mode. The center position is OFF. The spare switch is not used in this installation.

Extra Picture Switch

This switch (6, Figure 4-35A) operates the selected camera when pressed momentarily, or continuously until released. The camera will pulse as dictated by the setting of the intervalometer control knob. A remote extra picture switch may also be connected to the camera control box which operates in the same manner.

Camera Power Switch

This switch (7, Figure 4-35A) is an ON, OFF switch which supplies 28V DC power to the camera control box.

OPERATION OF CAMERA SYSTEM

1. Approaching Target:
   a. Set desired camera exposure interval on intervalometer.

b. Set camera selection switches for cameras to be used.

2. Target Area. When entering the target area, perform the following:

a. Place switch in the ON position.
b. Item stations should begin operation. Check item operation.
c. Pulse lamp will flash at interval rate selected on the intervalometer.
d. If desired, use extra picture switch to obtain extra exposures in addition to those initiated by the intervalometer.
e. Use oblique sight to align the aircraft for pin point photo's with oblique camera. The extra picture switch is used by the pilot to operate the camera.
f. The pilot must hold his left eye 4 or 5 inches away from the sight. The target must be in the center Newton Ring.

NOTE

When changing magazines inflight, return camera panels to the closed position.

3. When photo run is completed:

a. Place power switch in OFF position.
b. Place intervalometer control in OFF position.
c. Place camera selection switches in OFF position.
d. Camera panels to the close position, and locked. (If no operator is aboard the aircraft, camera panels will remain extended.)

4. Postflight procedures:

a. Remove the film magazines.
b. Install camera body covers.
c. Install lens covers.
d. Camera panels to the close position, and locked.

AIRBORNE SPEAKER SYSTEM (Aircraft modified in accordance with T.O. 1U-10B-503).

The Airborne Speaker System (See figure 4-35C) provides recorder playback and personal microphone audio broadcast modes of transmitting aural information to local inhabitants over a wide area. This equipment consists of a transistorized portable tape recorder, loudspeaker, four audio amplifiers and a microphone. The tape recorder provides recording and playback speeds of 1-7/8 and 3-3/4 inches per second. The loudspeaker system is mounted in the modified left paradrop door. Power for operation of the audio amplifiers is supplied from the 28 volt dc primary bus through four 15-amp circuit breakers located on the aft circuit breaker panel. Power for operation of the tape recorder is supplied by eight self contained 1.5 volt dc flashlight batteries. The maximum loudspeaker power output is approximately 1000 watts.

Mike/Recorder Switch

This switch (4, Figure 4-35B) is utilized to select the desired method of speaker transmission. When placed in the MIKE position the voice transmission may be used. When placed in the RECORDER position, a prerecorded tape may be transmitted through the speaker.

NOTE

If operation of tape recorder or loudspeaker system is adversly affected by the operation of radio transmitters, turn systems off during periods of necessary transmission.

OPERATION OF AIRBORNE SPEAKER SYSTEM

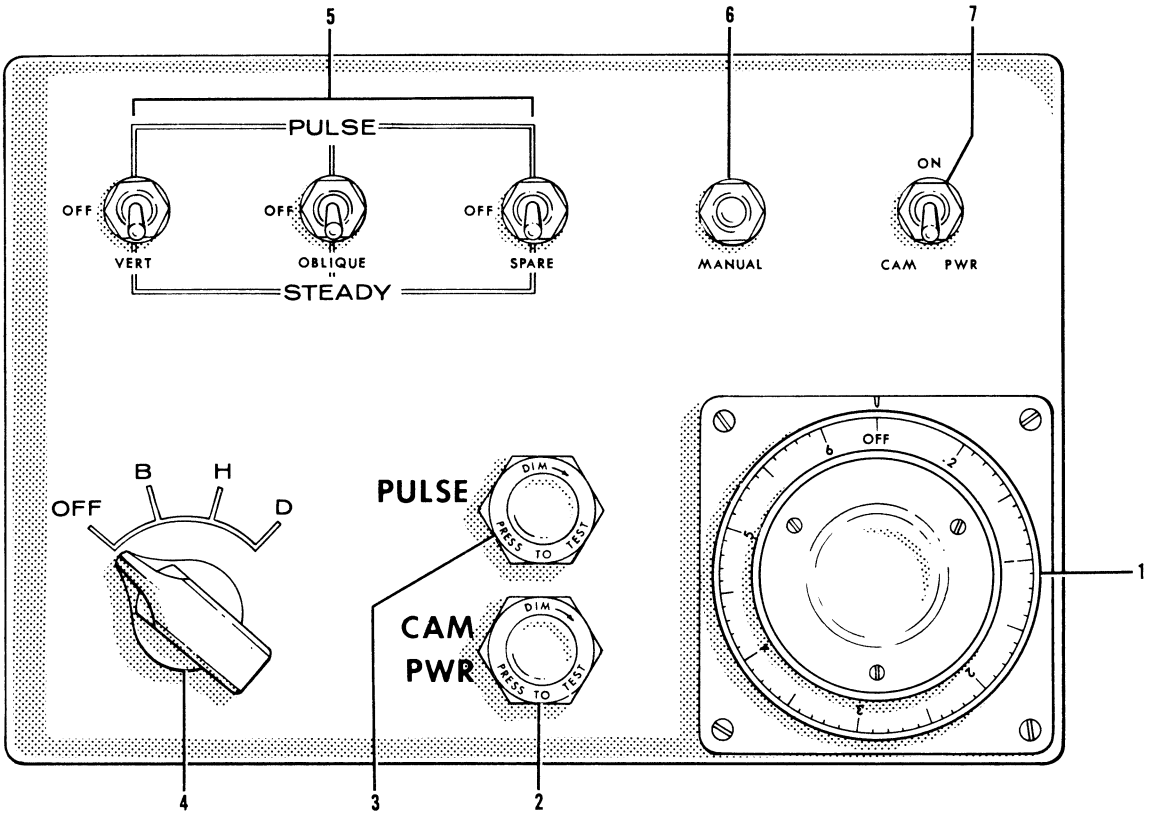
1. Loudspeaker must be steadily directed on target at all times by proper aircraft banking. This is necessary since the loudspeaker has highly directional characteristics.

2. The slant range of the loudspeaker must not be exceeded. The pilot can ensure that this criteria is met by flying 3/4 mile radius turns at all altitudes from 3000 to 5000 feet. Turns must be uncoordinated in order to properly aim the loudspeaker.

3. The narrator must speak directly into the grille with lips from 1/4 to 1/2 inch away. Speak in a distinct tone at a level of intensity slightly above that used in normal room conversation. Any tape recordings used must have been previously recorded below the saturation level of the recorder. The volume level of both the amplifiers and the recorder should be set to maximum.

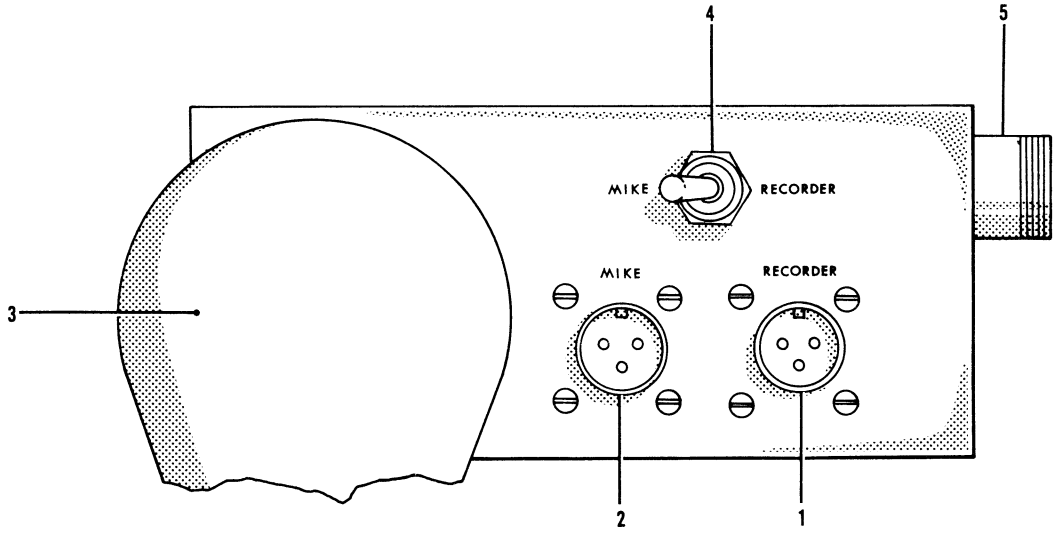
A. Audio Amplifier Activiation.

1. Place Master Battery switch to ON position.



1. INTERVALOMETER
2. POWER LAMP
3. PULSE LAMP
4. POWER DIAPHRAGM CONTROL SWITCH
5. CAMERA SELECTION SWITCHES
6. EXTRA PICTURE SWITCH
7. CAMERA POWER SWITCH

Figure 4-35A. Camera Control Box



1. TAPE RECORDER ELECTRICAL PLUG
2. MICROPHONE ELECTRICAL PLUG
3. MICROPHONE
4. MICROPHONE & RECORDER SELECTOR SW
5. ELECTRICAL CONNECTOR FOR 295-075-920-2 CABLE ASSY

Figure 4-35B. Microphone and Recorder Selector Panel

2. Position VOLUME controls, located on each side of the four amplifiers, fully counterclockwise to zero.

3. Place the power ON-OFF switch, located on each of the four amplifiers to on position.

NOTE

An automatic protective circuit is incorporated in each audio amplifier to prevent damage from overload. If the protective circuit trips, power cannot be applied again until the volume control has been turned fully counterclockwise and the audio amplifier power switch is first positioned OFF then to ON position.

B. Tape Recorder Mode.

1. Place the Audio Selector switch to Recorder position.

NOTE

Tape recorder should be preloaded with a prerecorded tape spool.

2. Adjust TAPE SPEED selector to match speed of the recorded tape.

3. Adjust PLAYBACK VOLUME and PLAYBACK TONE controls approximately half way of full travel.

4. Depress tape recorder FORWARD push button to apply power and start tape.

5. Ajust each of the four audio amplifier VOLUME controls clockwise until the respective audio power meter indicates proper operating level.

6. Depress tape recorder STOP push button to turn power OFF and stop the tape.

C. Microphone Mode.

1. Place the AUDIO SELECTOR switch to MICROPHONE position.

2. Depress the MICROPHONE switch and commence speaking. Adjust each of the four audio amplifier controls clockwise until the respective audio power meter indicates proper operating level.

D. Turn-Off Procedure.

1. Place the power ON-OFF switches, located on each of the four amplifiers to OFF position.

2. Place MASTER BATTERY switch to OFF position.

CARGO LOADING EQUIPMENT A B_3

Heavy and bulky cargo may be carried in the cabin when the passenger seats are removed. See Figure 4-36. Refer to Section V for cargo-loading limitations. The "D" rings in which the passenger seat belts are secured will serve as the tiedown points for cargo. See T.O. 1U-10A-5 for cargo tiedown data and procedures.

PARACHUTE ANCHOR POINTS (Static Lines)

The "D" rings utilized for cargo tiedown, and the pilot's and copilot's shoulder harnesses also serve as attachment points for parachute static lines.

CASUALTY CARRYING EQUIPMENT A

A stoke-type litter can be installed in the passenger area of the cabin (Figure 4-38). To allow the litter to be installed the back of the two-passenger seat and the fifth seat must be removed.

NOTE

The back of two-passenger seat and the fifth seat are secured in their respective positions with Faspins.

The litter is loaded and unloaded from the left side of the aircraft by opening the forward door to its full 90° position, and unlatching the litter door (which is hinged at the top of the door). The litter door is opened outward and secured with a hook provided on the lower surface of the wing. The five straps provided for securing the litter are identified by their bright red color and should be placed in their respective positions (Figure 4-38) before the litter is loaded. To facilitate loading and unloading the pilot's and copilot's seat backs are folded forward. See T.O. 1U-10A-5 for cargo tiedown data and procedures.

PASSENGER SEATS

Access to the passenger seat (Figure 4-36) behind the pilot and copilot seats, is accomplished through the door on the right side of the aircraft. The seat is designed to accommodate two passengers. The seat back is hinged at the two lower attachment points. By turning the seat-back locking handle to the unlock position, the seat back can be folded forward to permit access to the baggage compartment or to the fifth seat A B_3 , or the sling seat D (Figure 4-37).

AIRBORNE LOUDSPEAKER SYSTEM B1 B5 B6

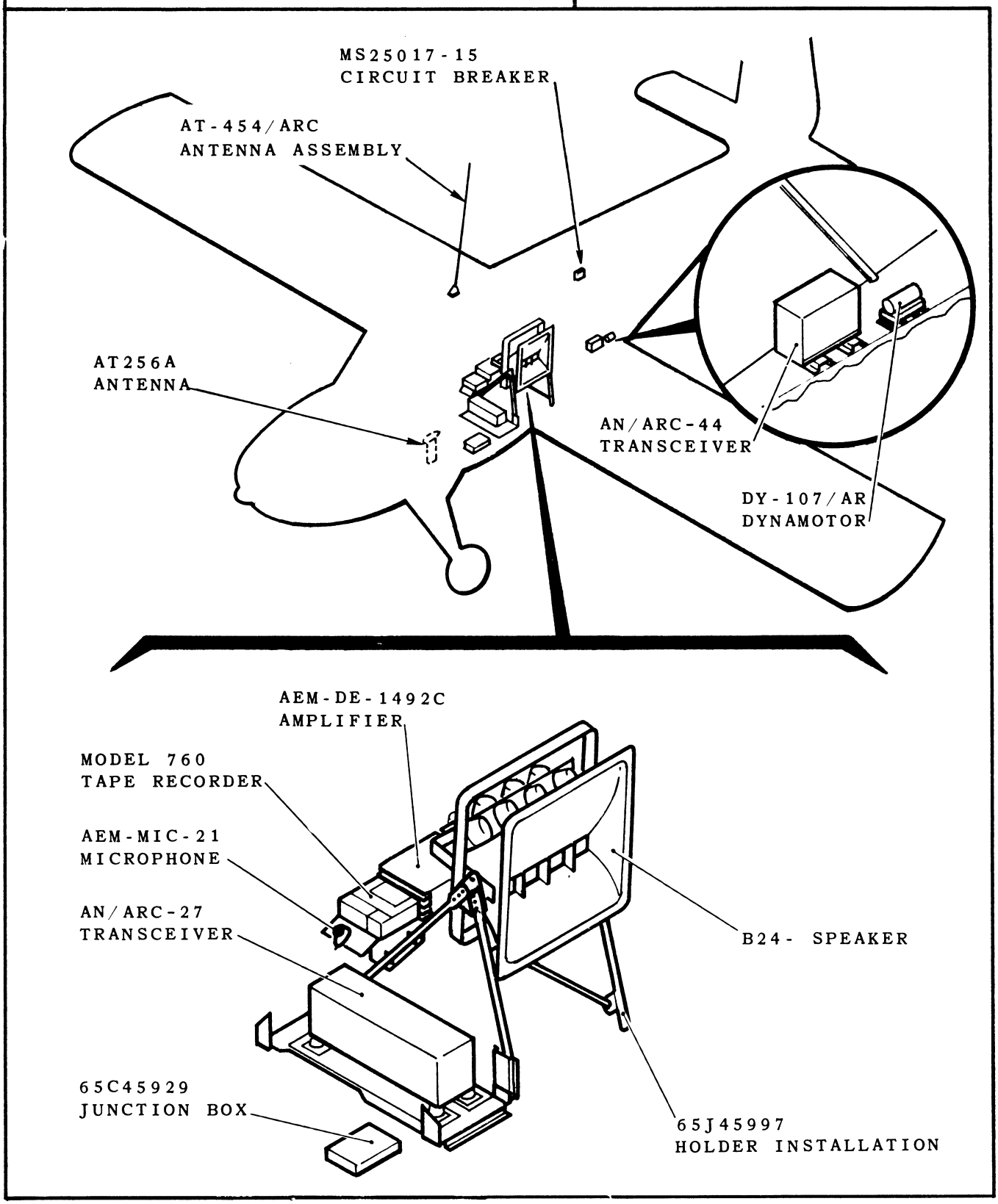
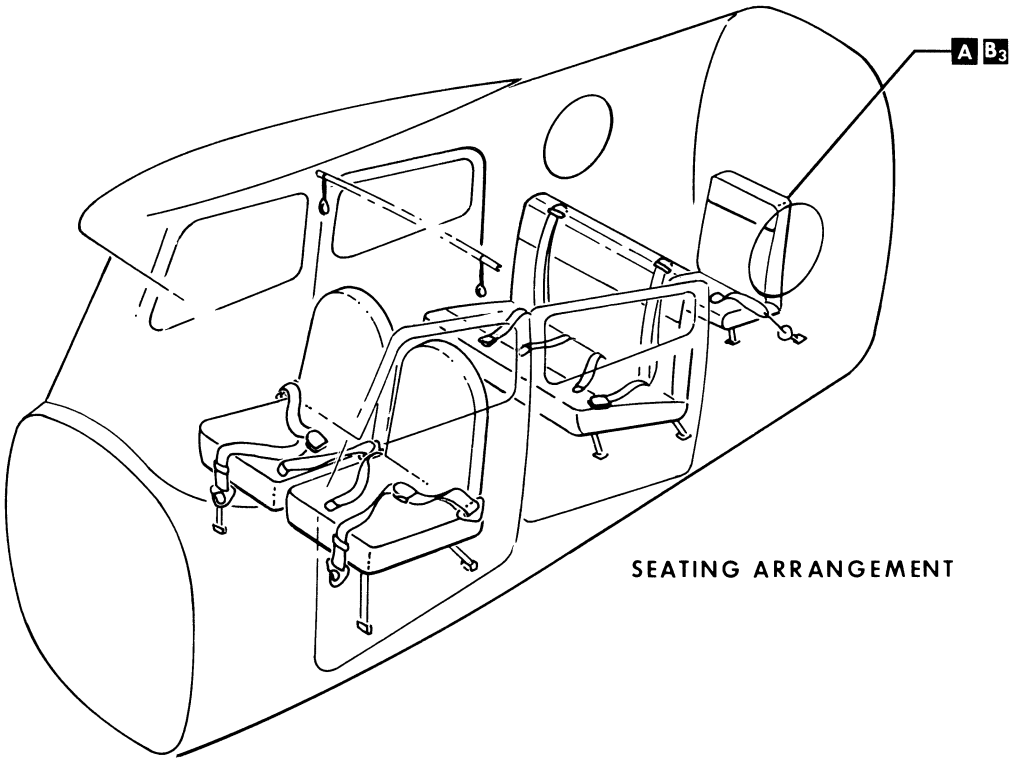
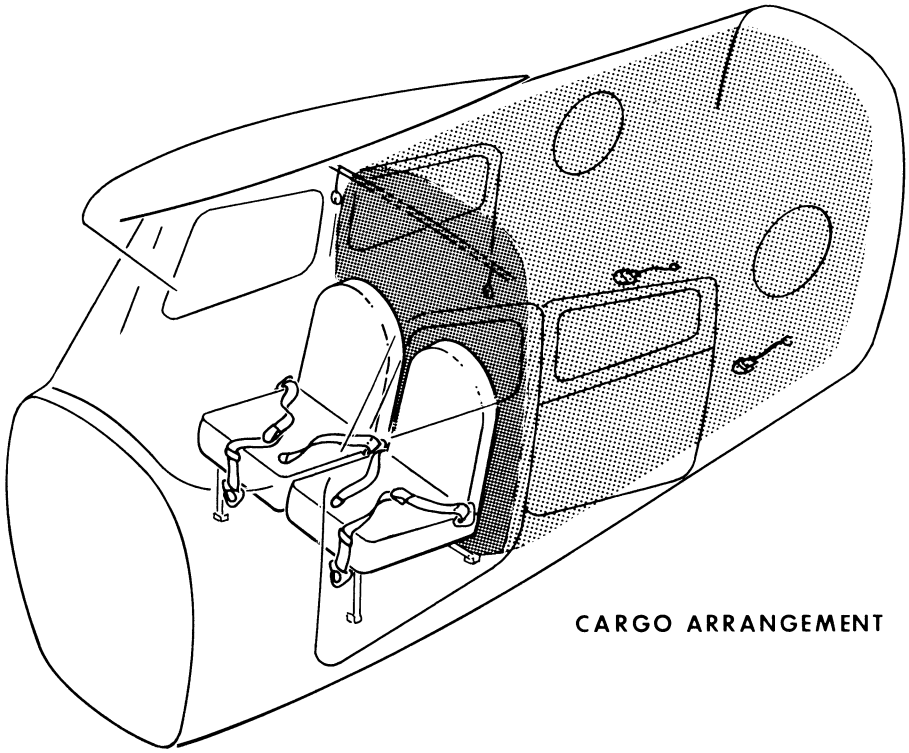


Figure 4-35C.

SEATING AND CARGO ARRANGEMENTS A B



SEATING ARRANGEMENT



CARGO ARRANGEMENT

Figure 4-36.

SEATING ARRANGEMENT D

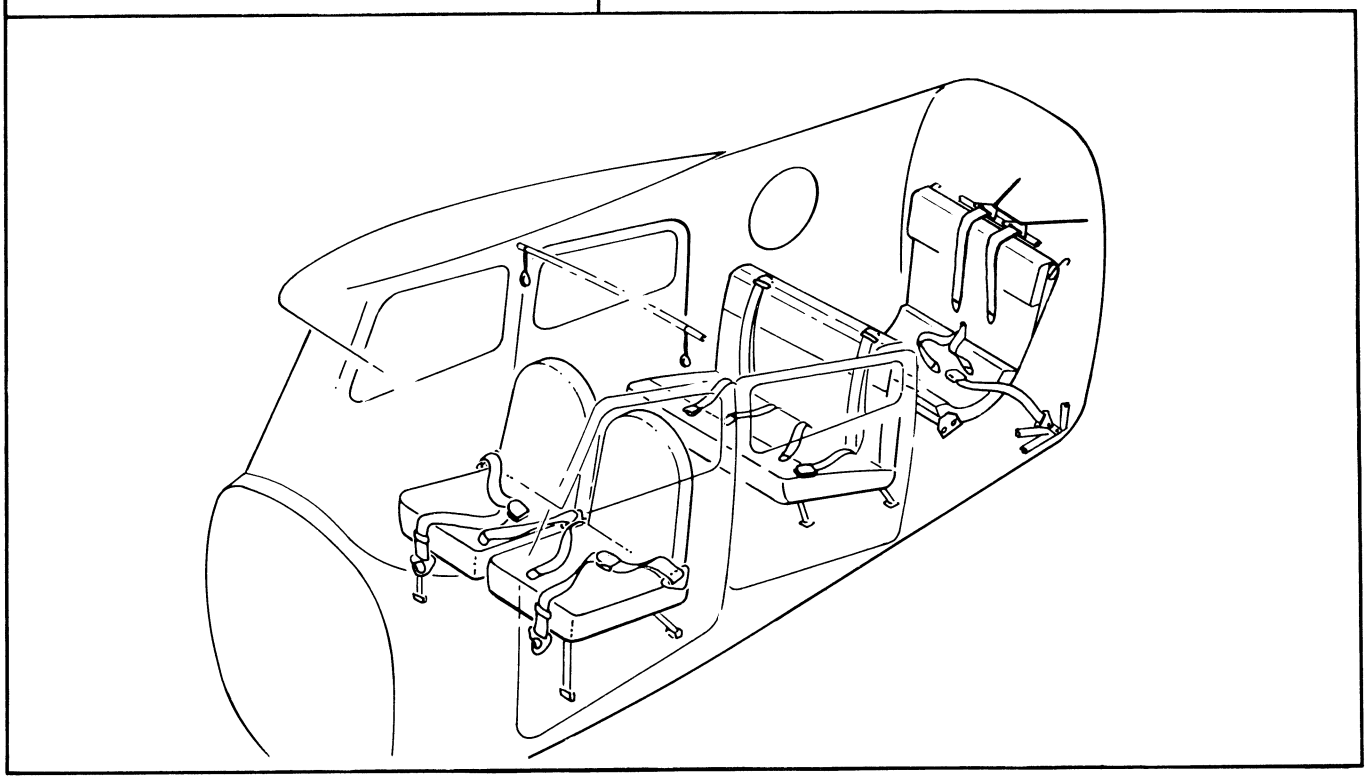


Figure 4-37.

LITTER ARRANGEMENT A

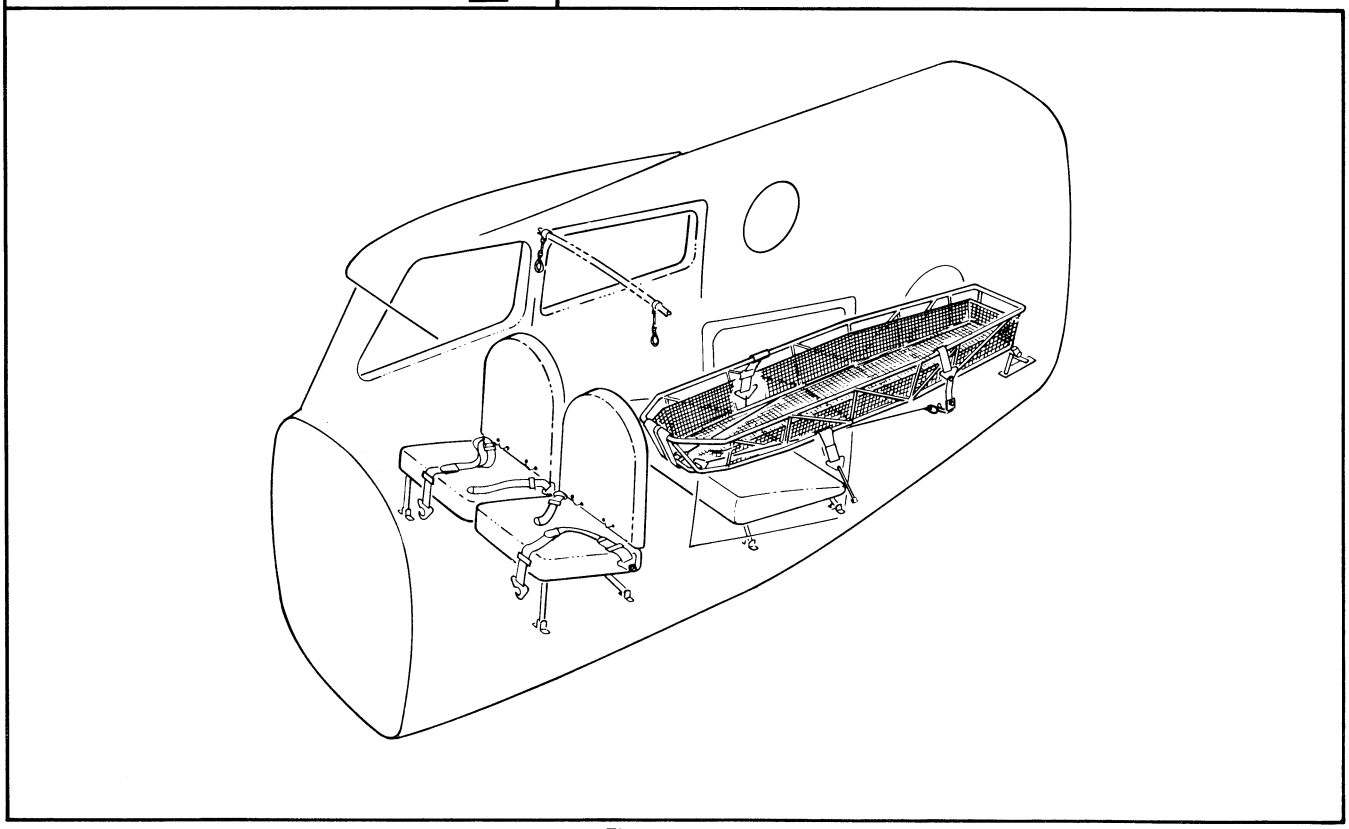


Figure 4-38.

WARNING

Make certain seat back locking pins are properly engaged on both sides of seat back.

The fifth seat is secured with Faspins and can be quickly removed from aircraft coded A B3 . On aircraft coded D1, the sling seat is bolted to the cabin.

CABIN WINDOWS

All of the cabin side windows with the exception of the pilot's window (Figure 1-17) are of the fixed type. The pilot's window is hinged at the top and can be opened outward approximately six inches.

CAUTION

Do not open the pilot's window at speeds in excess of 70 knots IAS.

The pilot's window is opened by pressing the unlock push-button (Figure 1-17) located on the arm rest support bracket, and raising the arm rest and pressing the window outward to its full limit of travel. The window is closed by pulling the arm rest inward and downward to the latched position.

PARA-DROP DOOR A1 B B3 D

A para-drop door is provided to aid in the loading or unloading of cargo either in the air or on the ground. The door is constructed of two removable sections that are removed and kept inside the aircraft. The door is designed so that the top section must be removed before the lower section can be removed. The installation of the door will be the reverse of the removal.

NOTE

The para-drop door can be opened at airspeeds up to 140 knots IAS.

ASH RECEIVER AND GLOVE COMPARTMENT A B

An ash receiver and a glove compartment are provided on some aircraft on the right side of the instrument panel.

RELIEF TUBES A1 B B3 D

Two relief tubes are installed in the aircraft. One is installed on the floor between the pilot and copilot while the other is installed just aft of the right passenger door and approximately three inches above the floor.

MAP POCKET

A map pocket is installed in the paneling at the right of the copilot.

B-2D AUTOPILOT. D1 and those aircraft modified in accordance with T.O. 1U-10B-505

The autopilot is a pneumatically powered automatic control device providing in-flight lateral stability and, by use of the associated control unit (19, Figure 1-4) mounted on the instrument lower panel, regulated right and left timed turns. The unit is identified as a two-axis automatic control, however, the installation in aircraft coded D1 provides for controlled in-flight stability about the longitudinal (roll) axis only. Power for operation of the panel mounted sense gyro and the aileron control servos is derived from the engine-driven vacuum pump. The power requirement of 8 inches Hg ± 0.5 inch is regulated by the suction relief valve. A secondary control, identified as a vacuum adapter, incorporated in the vacuum system and installed adjacent to the relief valve, is used to regulate suction in a range of 3.75 to 4.25 inches Hg for operation of the gyroscopic flight instruments. Suction to the instruments is indicated on the vacuum gage mounted in the instrument panel (44, Figure 1-6).

CONTROL UNIT. The control unit (23, Figure 4-5) located on the instrument panel includes the command knob, trim control knob, pull on master knob, and sensitivity control knob.

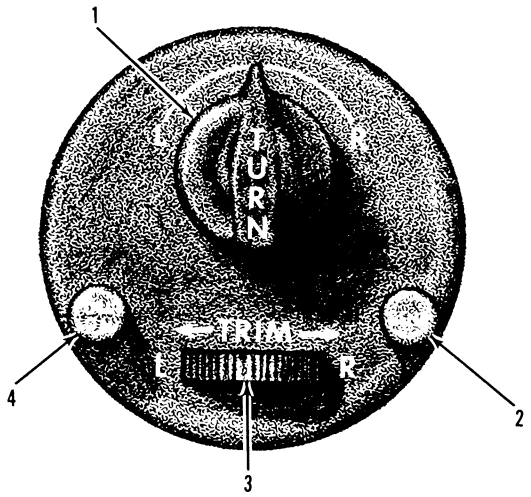
Pull On Master Knob

The pull on master knob (4, Figure 4-39) engages or disengages the autopilot instantaneously.

Command Knob

The command knob (1, Figure 4-39) provides for proportionate turning of the aircraft by rotating the

B-2D AUTO-PILOT D1 D3



1. COMMAND KNOB
2. SENSITIVITY CONTROL KNOB
3. TRIM CONTROL KNOB
4. PULL ON MASTER KNOB

Figure 4-39.

knob to the right or left. Full rotation of the knob provides for a maximum turn of three degrees per second (standard rate turn). Maneuvering of the aircraft by use of the command knob may be accomplished by rotating the knob right or left. Varying degrees of rotation will produce varying degrees of bank, up to a maximum bank angle of approximately 20 degrees. When recovering from a maximum bank angle, the command knob should be either:

1. Rotated to center detent position and level flight will be resumed gradually.
2. Rotated to the stop in the opposite direction until the aircraft assumes a level attitude at which time the command knob should be placed in center detent.

WARNING

Prior to engaging the flight control system, ensure that the command knob is in the center detent position.

Trim Control Knob

The trim control knob (3, Figure 4-39) is adjusted to compensate for any tendency of the aircraft to turn as a result of out of trim or uneven fuel loading.

NOTE

When adjusting the trim control knob to hold a constant heading or to maintain wings level flight, corrections should be made slowly to allow the autopilot sufficient time to react and stabilize at the new position.

Sensitivity Control Knob

The sensitivity control knob (2, Figure 4-39) varies the rate of response of the pneumatic servos for optimum control in both smooth and turbulent air.

ARMAMENT SYSTEM (Aircraft modified by T.O. 1U-10B-505)

The U-10 armament system is capable of delivering target marking rockets. Four MA-4A/B bomb racks are mounted on pylons (two per wing) to carry MA-2A/A, two-tube launchers for loading with 2.75 inch Folding Fin Aircraft Rockets (FFAR). The drag increase caused by this installation decreases the cruise performance by approximately 10 knots.

Armament Control Panel

The armament control panel (Figure 4-40) located on top of the instrument panel, contains the master arm switch, circuit breaker, drop and fire select switches.

Master Arm Switch

The red-guarded master arm switch (1, Figure 4-40) controls power to the ordnance delivery system. Unless this switch is ON, no armament circuits can be energized, except the emergency salvo circuit.

Circuit Breaker

A twenty-five ampere circuit breaker (2, Figure 4-40) protects the armament system from electrical overload. The position of this circuit breaker does not affect the operation of the emergency salvo circuit.

Drop Switches

Four drop switches (3, Figure 4-40) control releases from the MA-4A/B bomb shackles.

Fire Select Switches

Four fire select switches having two positions each (4, Figure 4-40), control left and right tube selection of MA-2A/A launchers.

Ordnance Delivery Button

The ordnance delivery button (Figure 4-41) is located on the pilot's control wheel, and is actuated by pressing with the left forefinger. A cup-guard encloses the button to prevent inadvertant operation. Ordnance fired is determined by the position of the fire select switches. Use of this button in conjunction with drop switches enables selective launcher jettison.

Emergency Salvo Button

The emergency salvo button (Figure 4-42) is located on the instrument panel and is housed in a recessed mounting (cup-guard) to prevent accidental release of rocket launchers. Pressing this button causes all drop-load shackles of the MA-4A/B racks to open simultaneously. The salvo circuit is wired directly to the battery, and will operate independently of all other circuits.

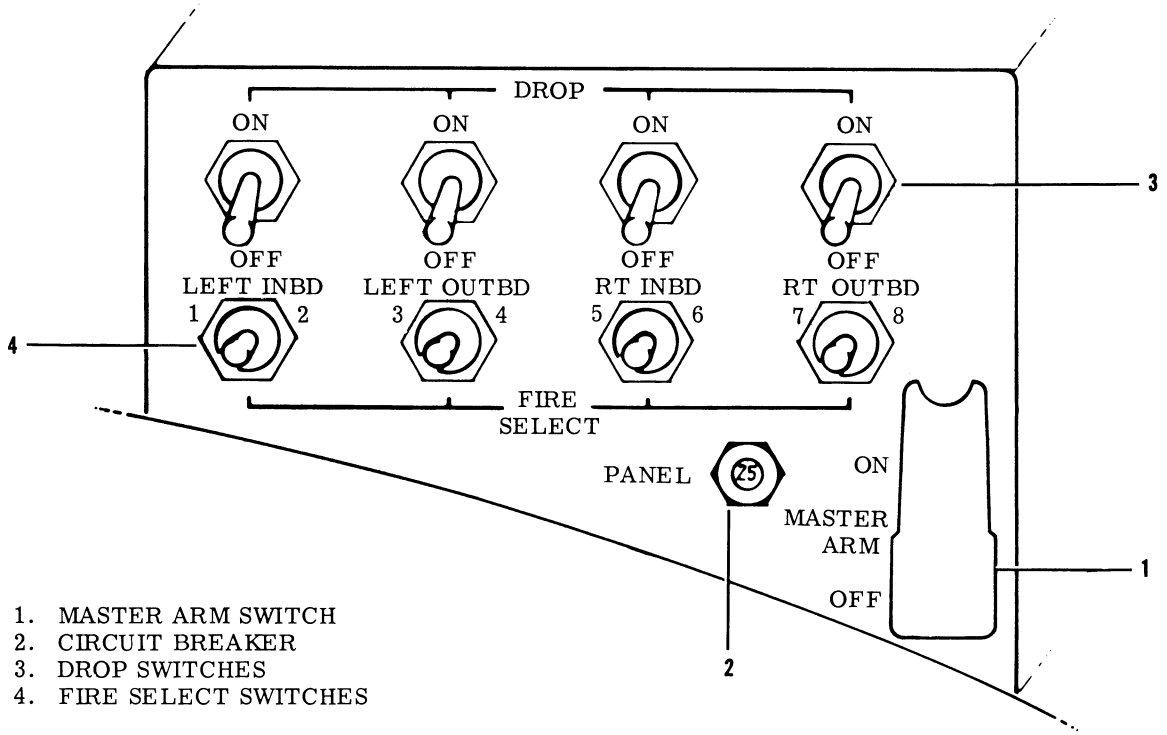
Operation of Armament System (Target Marking)

1. Rocket fire select switch placed in ON position for desired rocket.
2. Circuit breaker IN.
3. Master arm switch ON.
4. Set up dive angle and airspeed as required.
5. Track on target, and when ready to fire, press ordnance delivery button to ignite rocket.

CAUTION

Do not fire more than one rocket from the same wing simultaneously. Failure of the rocket motor folding fin assembly could cause rockets to collide in dangerous proximity to the aircraft.

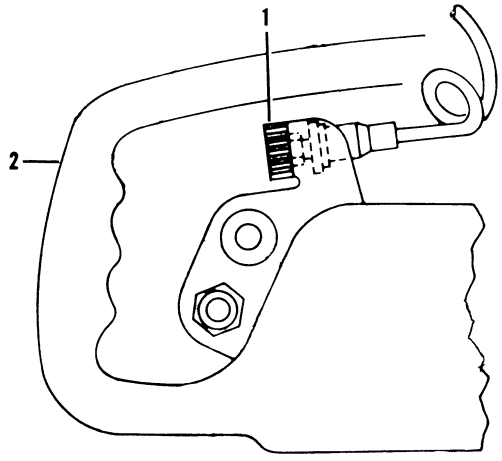
ARMAMENT CONTROL PANEL B8



1. MASTER ARM SWITCH
2. CIRCUIT BREAKER
3. DROP SWITCHES
4. FIRE SELECT SWITCHES

Figure 4-40

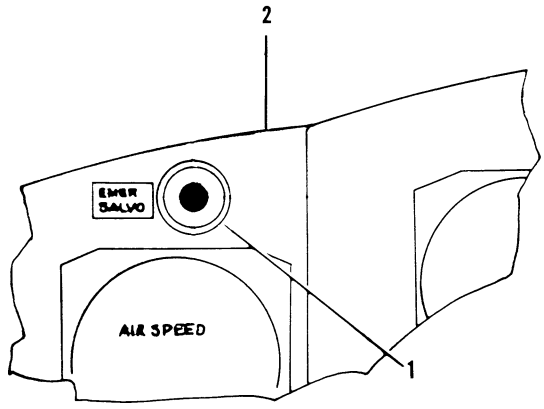
ORDNANCE DELIVERY BUTTON B8



1. ORDNANCE DELIVERY BUTTON
2. PILOT'S CONTROL WHEEL

Figure 4-41

EMERGENCY SALVO BUTTON B8



1. SALVO BUTTON
2. INSTRUMENT PANEL

Figure 4-42

Section V
OPERATING LIMITATIONS

TABLE OF CONTENTS

GENERAL LIMITATIONS

This section includes the aircraft and engine limitations that must be observed during normal operation. Instrument markings giving various operation limitations are shown in Figure 5-1. Instrument markings that are not discussed in the text are self explanatory.

MINIMUM CREW

There are provisions for both a pilot and copilot; however, the aircraft can be flown easily and safely by one pilot under any condition. Therefore, the minimum crew will be a pilot in the left seat. Additional crew members as required, will be added at the direction of the Commander.

INSTRUMENT MARKINGS

See Figure 5-1.

ENGINE LIMITATIONS

Overspeed limitations are as follows:

a. Maximum overspeed without inspection or teardown is 3520 rpm.
b. Overspeed from 3520 rpm to 3600 rpm requires inspection.
c. Overspeed above 3600 rpm requires engine to be removed for overhaul.
d. With manifold pressure at 15 inch Hg. or lower, an engine speed of 3000 rpm shall not be exceeded.

The engine operating time limitations are as follows:

a. Maximum power - 3400 RPM for 5 minutes.
b. METO power - 3000 RPM, continuous.

See Figure 5-1 for additional engine limitations.

AIRSPEED LIMITATIONS

MAXIMUM ALLOWABLE AIRSPEED

See Figure 5-2.

MAXIMUM MANEUVERING SPEED

See Figure 5-2 for maximum speed limits. These curves give the corresponding maximum speed for a given gross weight at which maneuvers requiring abrupt control stick movement (or full control deflection) may be performed without exceeding the corresponding "g" limit of that gross weight. The maximum maneuver speed curve also must be observed if highly turbulent air is encountered. By flying at speeds below the maximum maneuver airspeed it will be impossible to impose "g" loading in excess of the corresponding limit load factor.

MAXIMUM AIRSPEED FOR WING FLAP EXTENDED

The maximum allowable airspeed for wing flap lowering operations is 70 knots IAS.

MANEUVERS

The maximum maneuvering airspeed shall vary with gross weight as shown on the gross weight versus speed limitation curve shown on Figure 5-2. At these speeds abrupt or full control deflections may be used. Maneuvers that may be performed, however, are limited, that is, acrobatics, spins or hammer type stalls are not permitted. Maneuvers with flaps extended should never be abrupt; only gentle maneuvers should be made since the chances of exceeding the maneuver limit load factor corresponding to the airplanes gross weight are greatly increased.

CENTER OF GRAVITY LIMITATIONS

See Figure 5-3, this section, and Chart E in T.O. 1U-10A-5.

WEIGHT LIMITATIONS

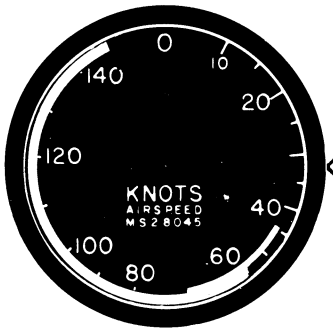
Landplane: Takeoff and flight - maximum gross weight is 3600 pounds. Landing - maximum gross weight is 3450 pounds except aircraft coded D which is 3600 pounds.

Floatplane: Takeoff and flight - maximum gross weight is 3300 pounds except aircraft coded D which is 3600 pounds. Landing - maximum gross weight is 3300 pounds except aircraft coded D which is 3600 pounds.

See figure 5-2 for additional information.

INSTRUMENT MARKINGS

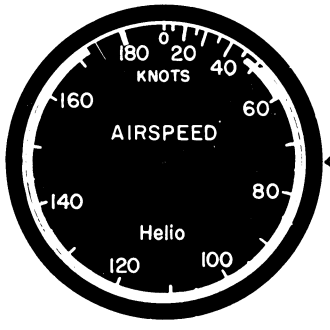
AIRSPEED LIMITATIONS ARE BASED ON DESIGN GROSS WEIGHT. REFER TO THE APPLICABLE WEIGHT LIMITATION CHART.



AIRSPEED

44-70 KTS (IAS)	☐	FULL FLAP OPERATING RANGE
55-130 KTS (IAS)		NORMAL
130-150 KTS (IAS)		CAUTION RANGE
150 KTS (IAS)	■	MAXIMUM

NOTE:
INDICATORS INSTALLED IN AIRCRAFT CODED [A] [B1] [B2] ARE MARKED WITH A YELLOW ARC 150-154 KTS (IAS) RED LINE 164 KTS (IAS)



AIRSPEED

46-60 KTS (IAS)	☐	FULL FLAP OPERATING RANGE
52-139 KTS (IAS)		NORMAL
139-174 KTS (IAS)		CAUTION RANGE
174 KTS (IAS)	■	MAXIMUM

NOTE:
[D] ONLY

Figure 5-1. (Sheet 1 of 3)

INSTRUMENT MARKINGS

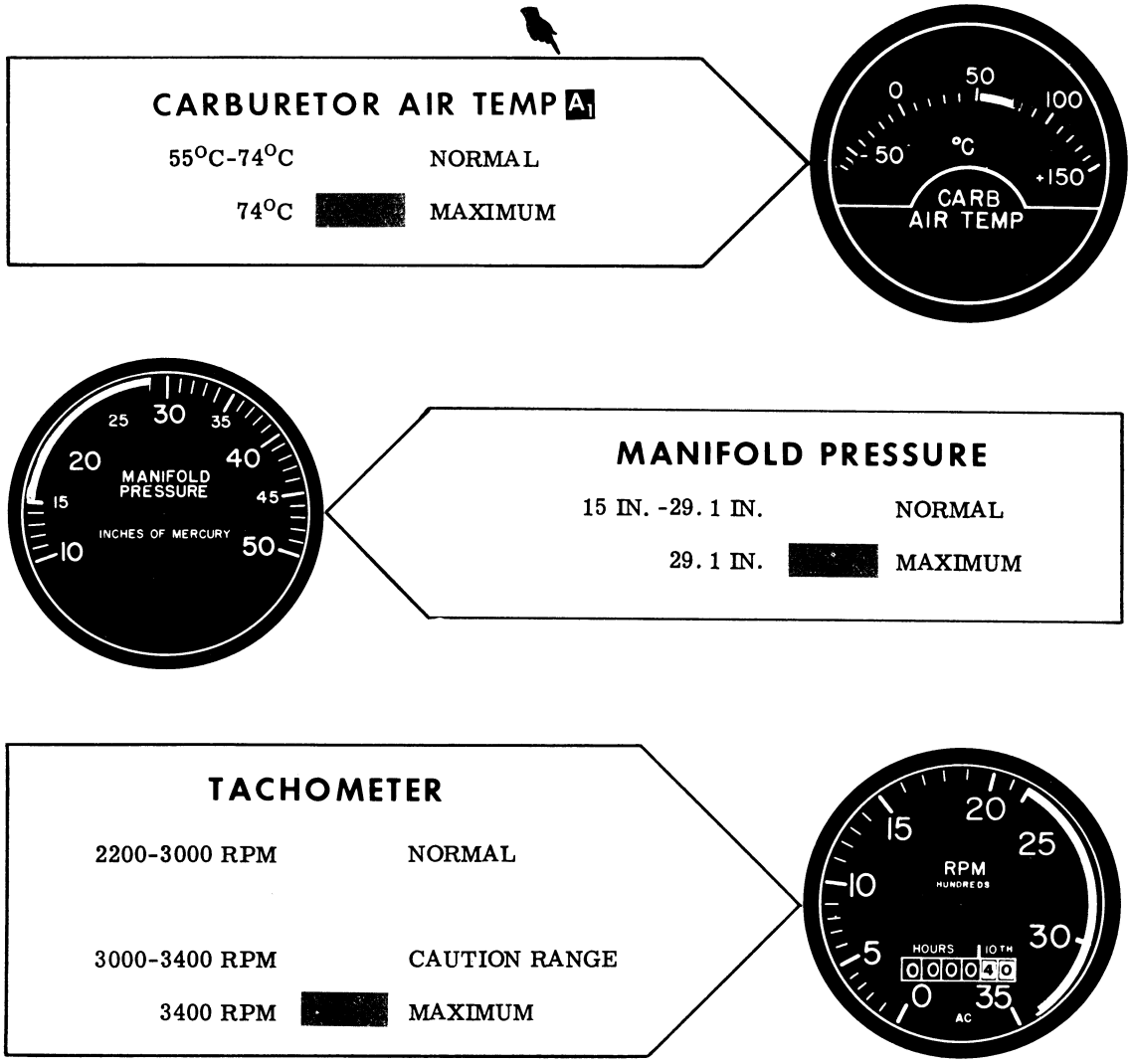
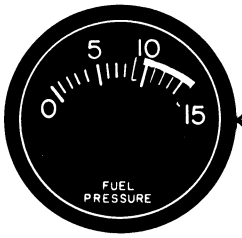


Figure 5-1. (Sheet 2 of 3)

INSTRUMENT MARKINGS

Markings based on use of 115/145 grade fuel.

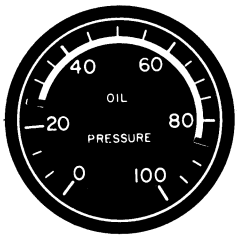


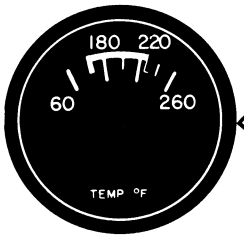
FUEL PRESSURE

9 PSI	■	MINIMUM
9 PSI-15 PSI		NORMAL
15 PSI	■	MAXIMUM

OIL PRESSURE

25 PSI	■	MINIMUM
25-65 PSI		CAUTION RANGE
65-85 PSI		NORMAL
85 PSI	■	MAXIMUM



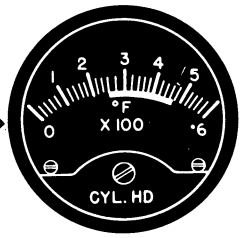


OIL TEMPERATURE

BELOW 100° F		CAUTION RANGE
100° F-225° F		NORMAL
225° F	■	MAXIMUM

CYLINDER HEAD TEMPERATURE

250° F-475°F		NORMAL
475°F	■	MAXIMUM



VACUUM (WITH G-14A INDICATOR)

3.75 IN. Hg	■	MINIMUM
3.75 IN. Hq-4.25 IN. Hg		NORMAL
4.60 IN. Hg	■	MAXIMUM

VACUUM (WITH G-20 INDICATOR)

4.50 IN. Hg	■	MINIMUM
4.50 IN. Hg - 5.20 IN. Hg.		NORMAL
5.60 IN. Hg.	■	MAXIMUM

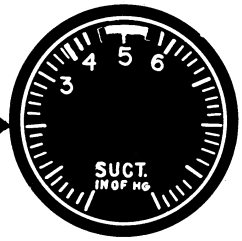


Figure 5-1. (Sheet 3 of 3)

WEIGHT LIMITATIONS CHART (LAND PLANE) A A_1 B B_3

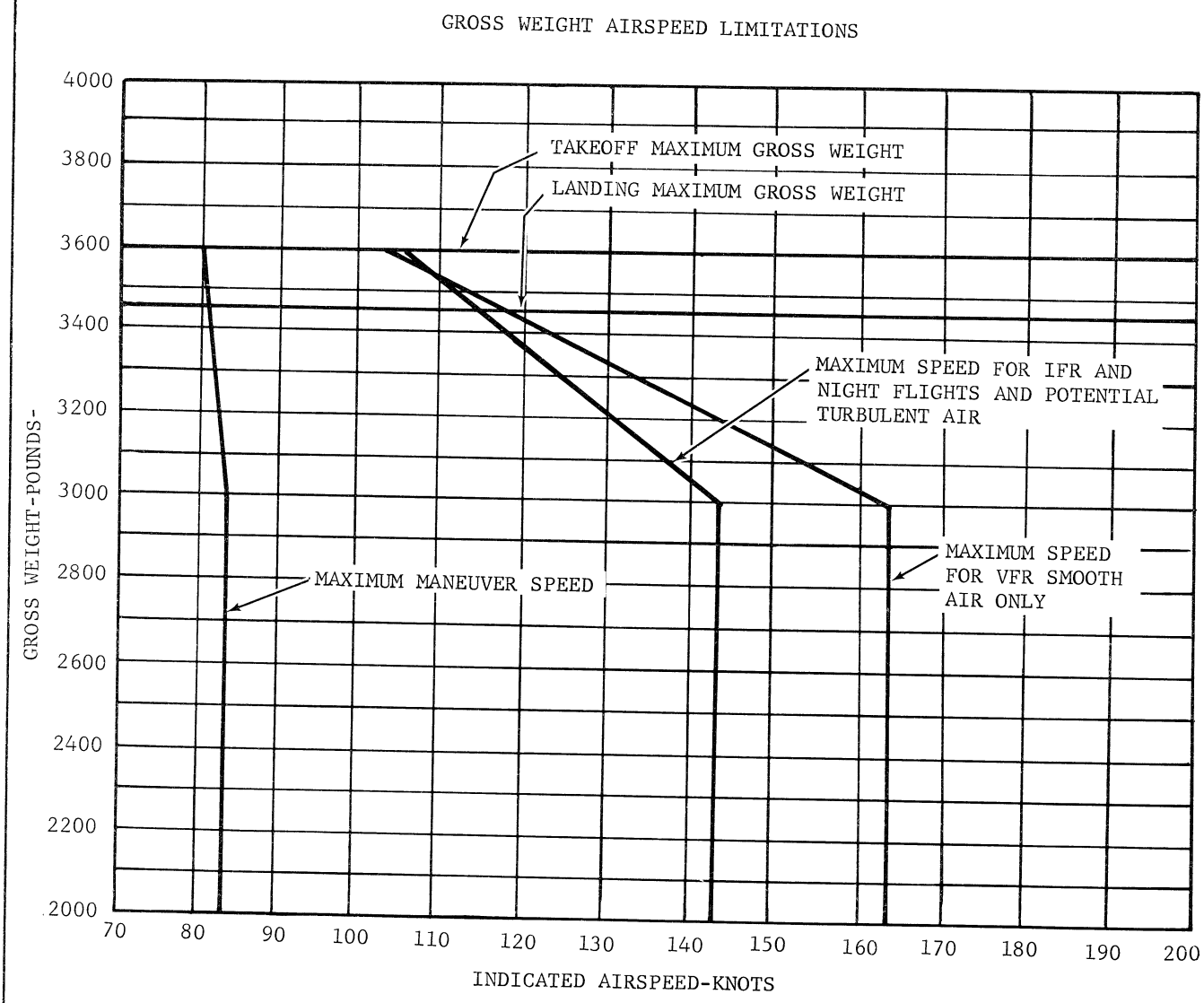
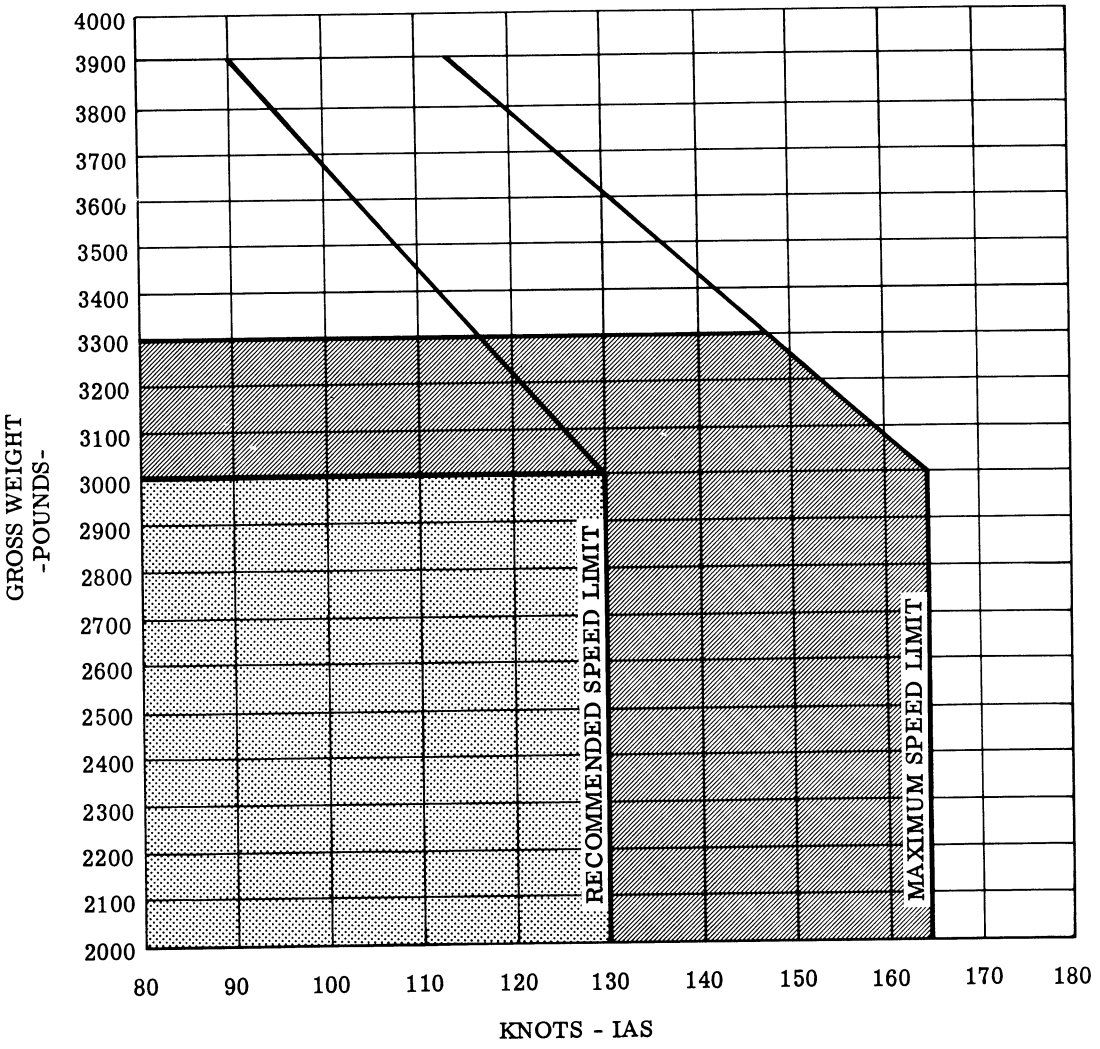


Figure 5-2. (Sheet 1 of 3)

WEIGHT LIMITATIONS CHART (Float Plane) A A_1 B B_3



NORMAL OPERATING RANGE

OPERATE WITH CAUTION

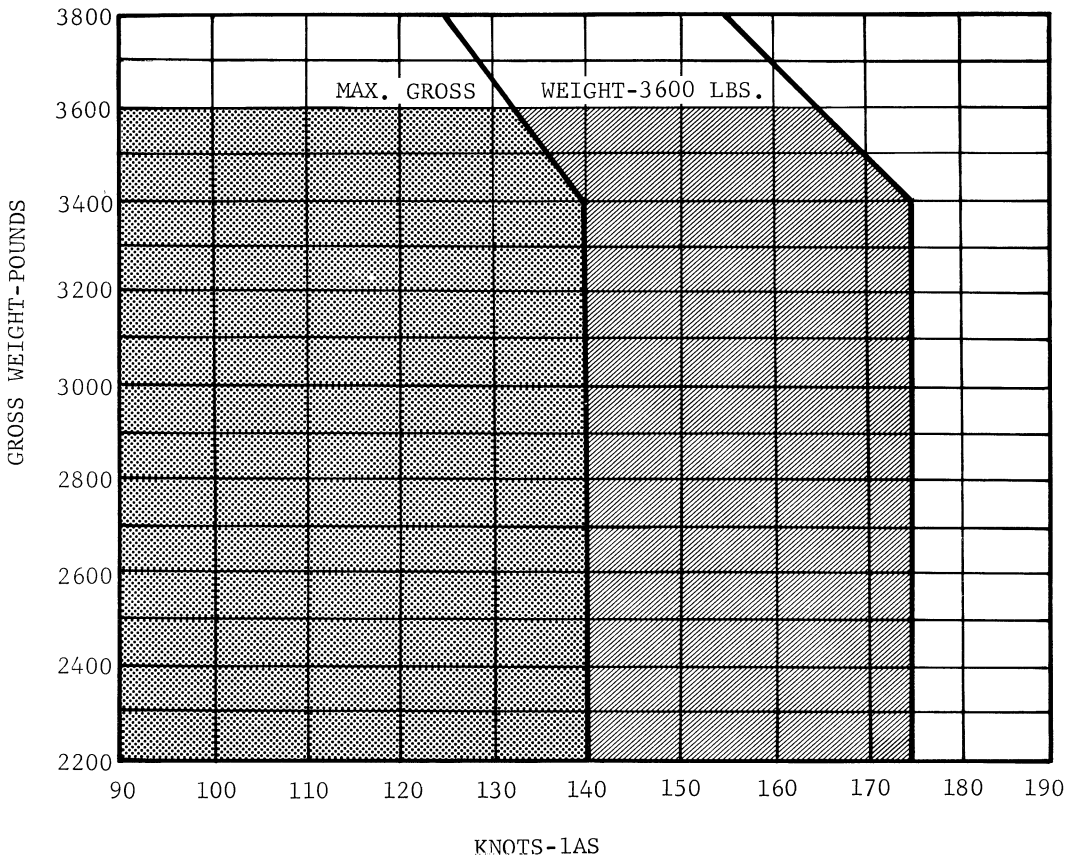
OPERATION NOT PERMITTED

NOTE:
CALCULATED USING EDO 582-3430 FLOATS

MAXIMUM GROSS WEIGHT - 3300 LBS
(BASED ON STRUCTURAL LIMIT)
DESIGN GROSS WEIGHT - 3000 LBS

Figure 5-2. (Sheet 2 of 3)

WEIGHT LIMITATIONS CHART (LAND PLANE & FLOAT PLANE) D



NORMAL OPERATING RANGE

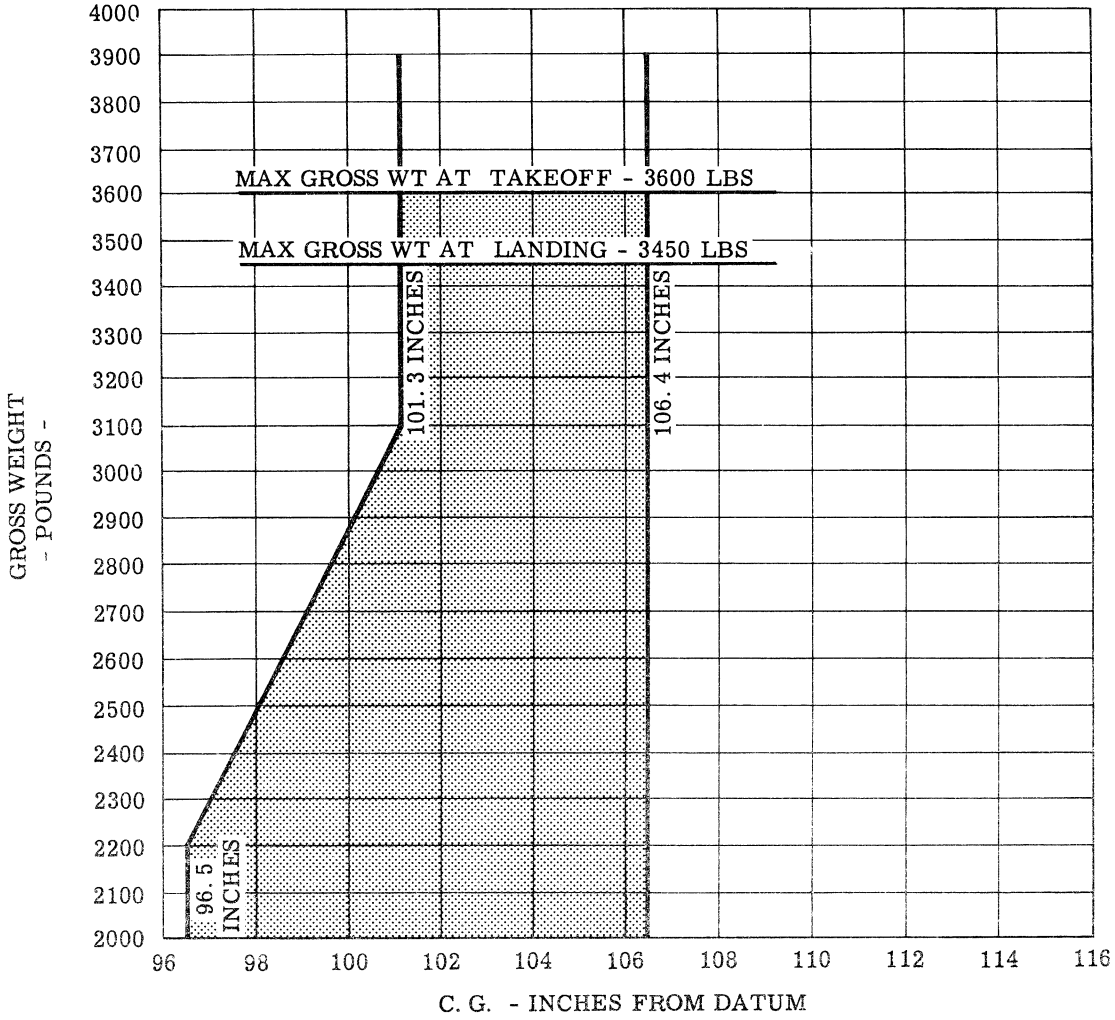
OPERATE WITH CAUTION

OPERATION NOT PERMITTED

1. USE CONTROLS WITH CAUTION ABOVE 110 KNOTS
2. IN GUSTY AIR, IT IS ADVISABLE TO REDUCE CRUISING SPEED BELOW NORMAL, AND IN SEVERE TURBULENCE REDUCE SPEED BELOW 85 KNOTS (FLAPS UP) AND BELOW 60 KNOTS (FLAPS DOWN)

Figure 5-2. (Sheet 3 of 3)

C. G. ENVELOPE (LAND PLANE) A A1 B B3



OPERATE WITHIN THIS ENVELOPE

CAUTION

OBSERVE LANDING
GROSS WEIGHT LIMITS

Figure 5-3. (Sheet 1 of 4)

C. G. ENVELOPE (Float Plane) A A_1 B B_3

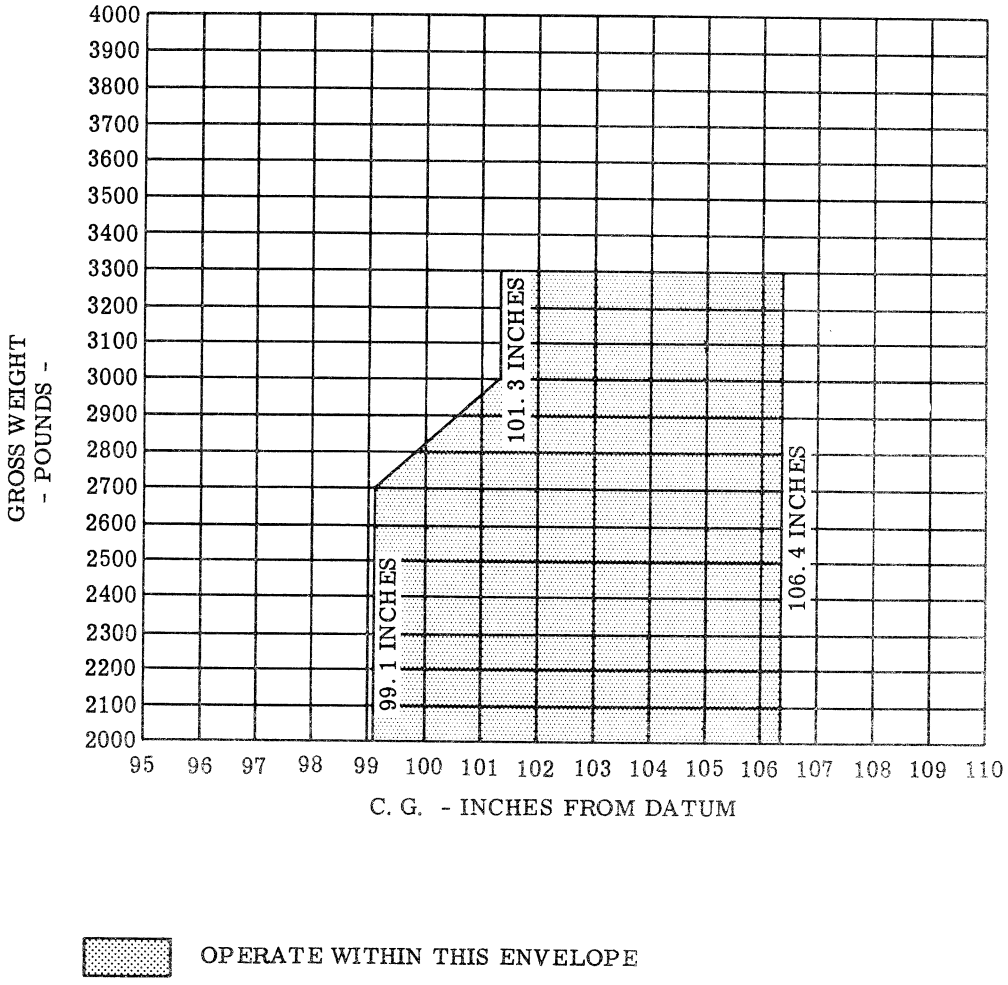


Figure 5-3. (Sheet 2 of 4)

C. G. ENVELOPE (LAND PLANE) D

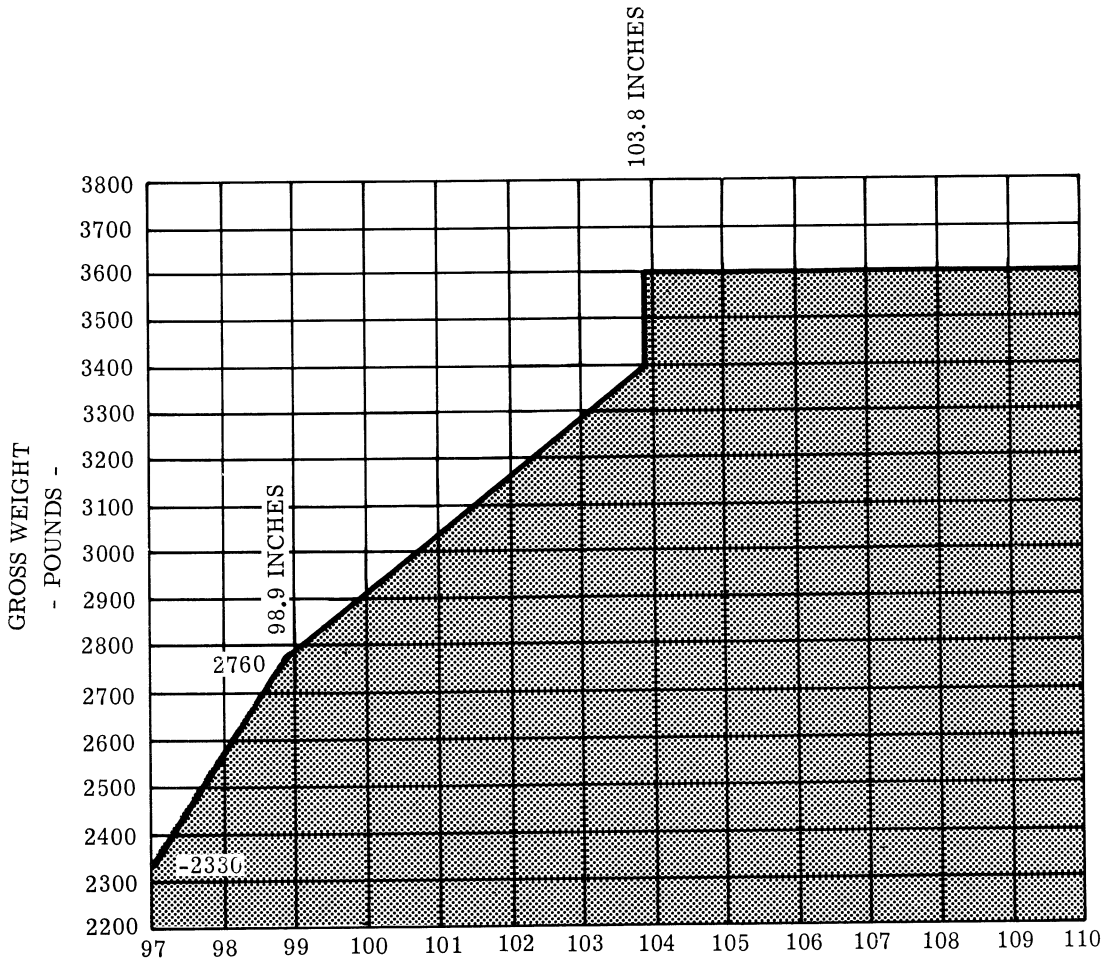


Figure 5-3. (Sheet 3 of 4)

C. G. ENVELOPE (FLOAT PLANE) D

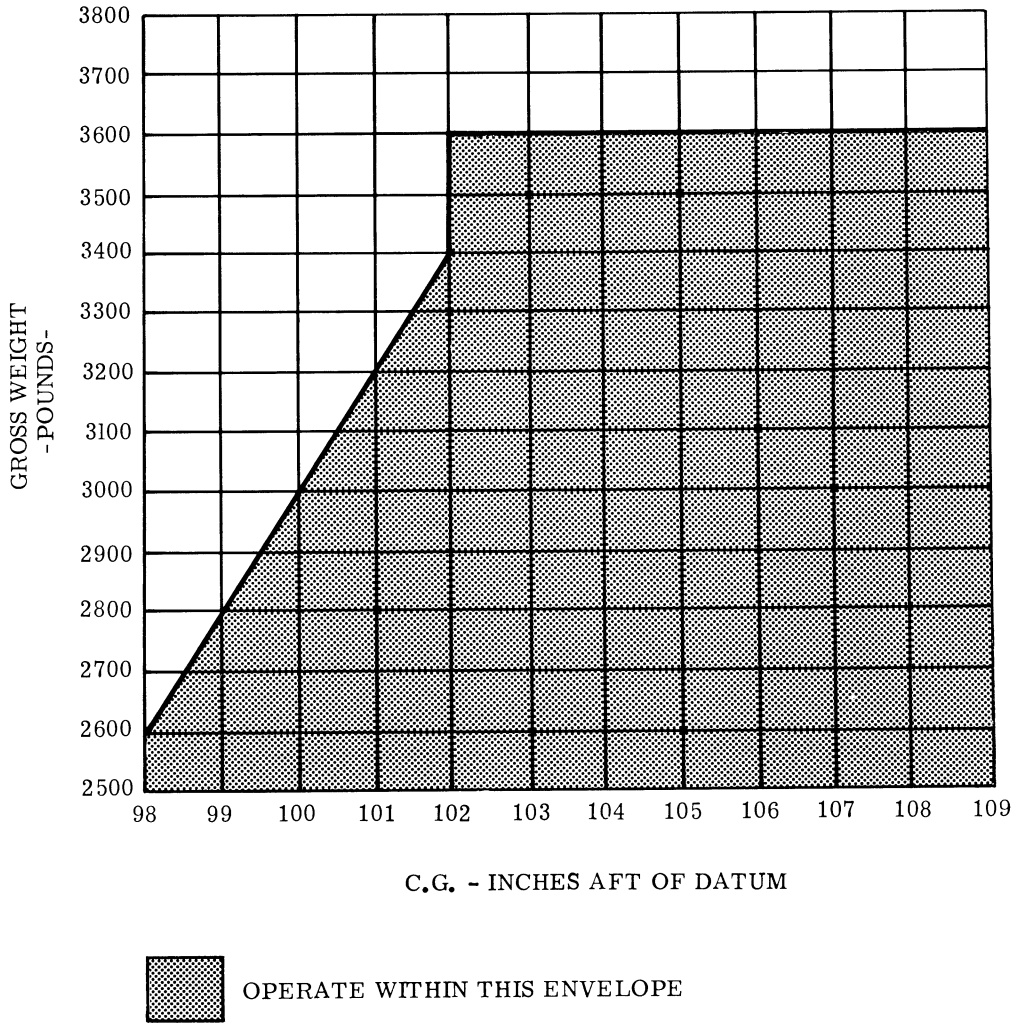


Figure 5-3. (Sheet 4 of 4)

LIMIT FLIGHT LOAD FACTORS

A A1 B B3

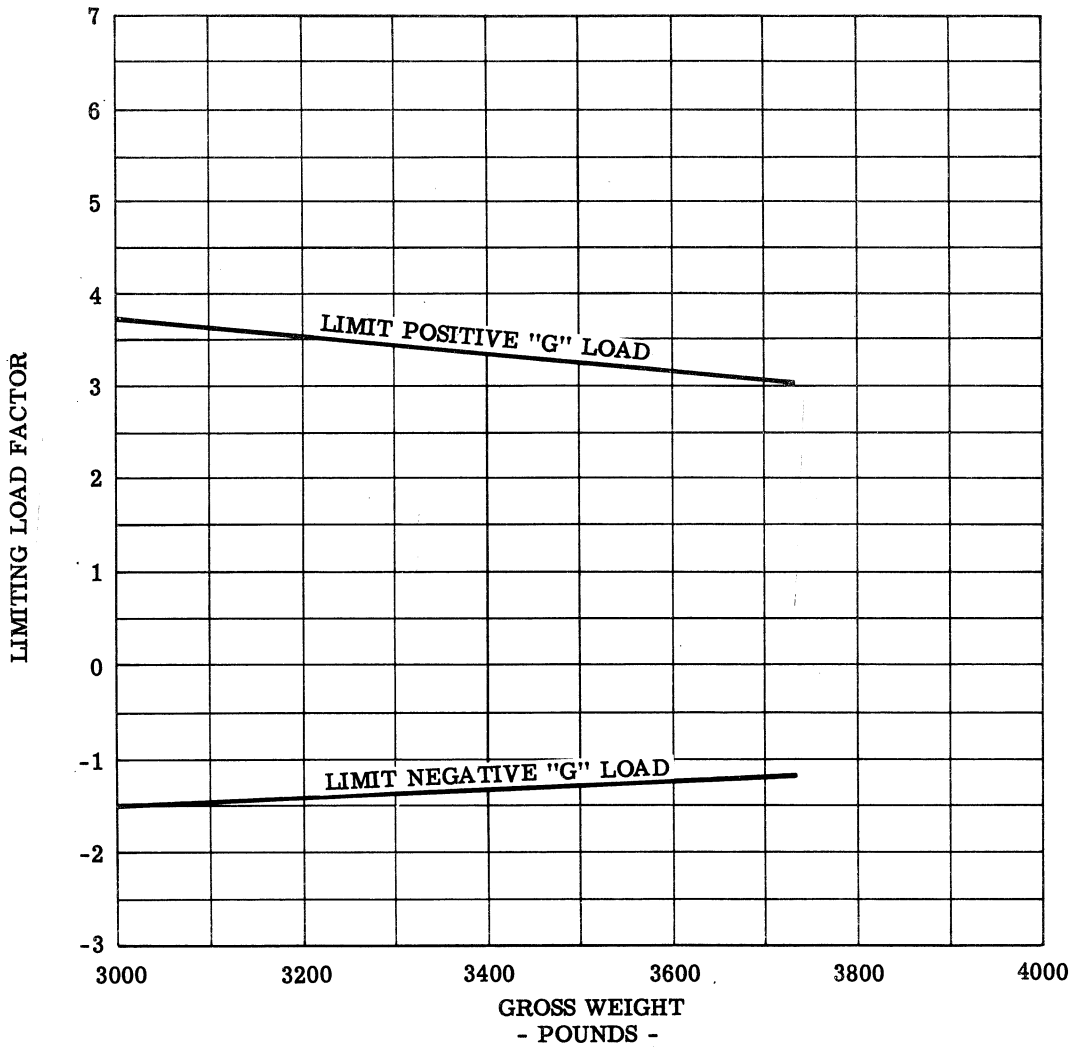


Figure 5-4. (Sheet 1 of 2)

LIMIT FLIGHT LOAD FACTORS D

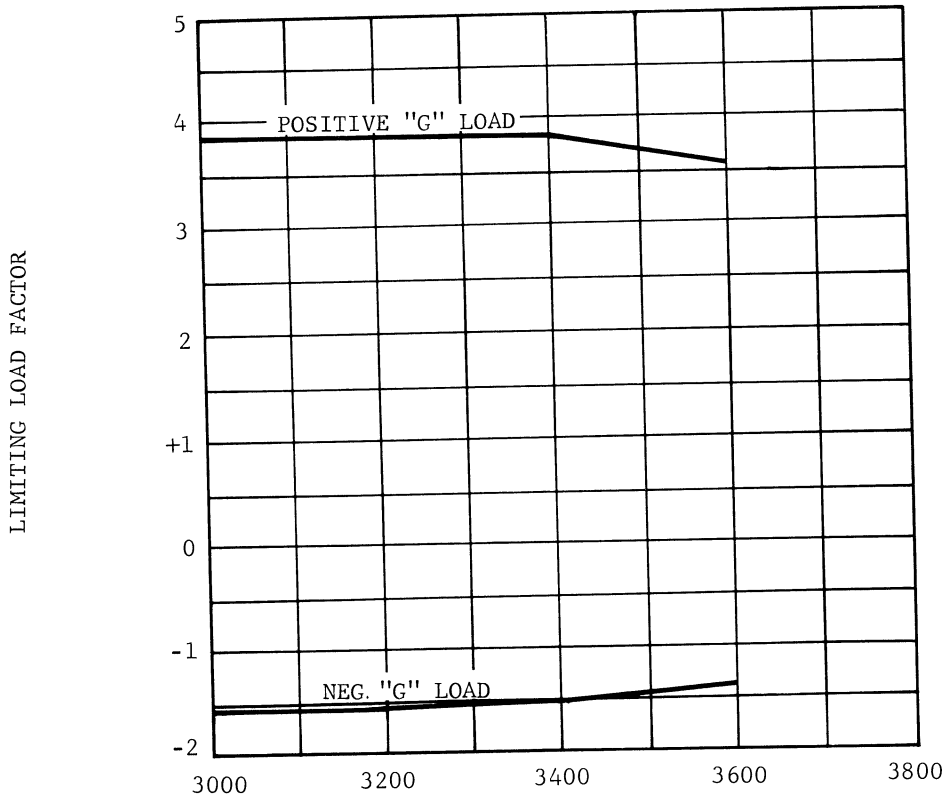


Figure 5-4. (Sheet 2 of 2)

Section VI
FLIGHT CHARACTERISTICS

TABLE OF CONTENTS

INTRODUCTION

Handling and stability characteristics of the aircraft are good throughout the speed range of the aircraft. Good control during very slow flight is obtained through the use of leading edge slats, large trailing edge flaps, interceptors, and a fully movable horizontal tail operating in the propeller slipstream. The flight characteristics with floats are similar to those of the landplane. Differences in procedure during takeoff and landing are covered in Section II, Normal Procedures, and Section IX, All Weather Operation.

MINIMUM STEADY FLIGHT SPEEDS

Minimum steady flight speed is determined by thrust-drag equilibrium - not by stall or loss of control. With METO power, the control wheel is held slightly aft of the neutral position to maintain level flight. With power off, the control wheel is held almost full aft to permit the aircraft to descend steadily. The power-on minimum steady flight speed can be decreased slightly by the application of more power (beyond METO) and increasing the pitch attitude of the aircraft. The additional power offsets the increase in drag, thereby maintaining the thrust-drag equilibrium. If pitch attitude is increased further, no loss of control or wing stall will occur. The aircraft will merely lose altitude due to drag exceeding propeller thrust.

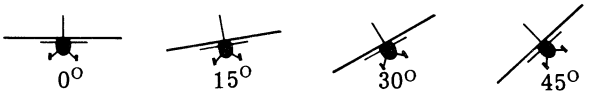
NOTE

The high angle of attack assumed during power-on flight at minimum speeds introduces large position errors in the airspeed system. For instance, with meto power and 20° of flaps, the position error correction can be as much as +15 knots.

MINIMUM STEADY FLIGHT CHART

STEADY FLIGHT AT 3000 LBS GROSS WEIGHT
SEA LEVEL, STANDARD DAY CONDITIONS

ANGLES OF BANK



	FLAP SETTING	MINIMUM STEADY FLIGHT SPEED KNOTS, IAS			
Power On (METO)	0°	22	23	24	28
	20°	20	21	22	26
	40°	23	24	25	29
Power Off	0°	52	53	56	62
	40°	46	47	49	54

Figure 6-1.

STALLS

The leading edge slats and restricted travel of the stabilator make it impossible to hold the wing in a fully stalled condition. As airspeed is reduced below minimum steady flight speed, an aileron nibble and tail buffet becomes noticeable. When the control wheel is held full aft, the nose of the aircraft oscillates up and down causing the airspeed to fluctuate about the minimum steady flight speed. There is no stall or loss of control such as is normally associated with an aircraft in a stalled condition. Power off, the aircraft descends in an approximately level attitude at 1000 - 1500 feet per minute. Power on, the aircraft descends in a very nose high attitude at a slightly slower sink rate. Pitching and tail buffeting is more noticeable with power on than power off.

WARNING

With slats inoperative, the aircraft may stall abruptly followed by a strong nose down pitching moment.

SPINS

The aircraft can be forced into autorotation, which is technically a spin. A spin cannot occur accidentally and contrary to the pilot's movement of the controls. No forward movement of the control wheel or dive is required for recovery. Recovery is effected by normal use of either the aileron or rudder control.

SLOW FLIGHT CHARACTERISTICS

At slow flight speeds with high power settings, the aircraft flies in a very nose high attitude. The propeller thrust provides a significant vertical lift component, and the propeller slipstream provides an increase in stabilator effectiveness. Thus, the minimum flight speed is considerably lower with power on than with power off. Sudden power loss reduces total lift and stabilator effectiveness. The nose of the aircraft drops automatically and the aircraft begins to descend. As much as 200 feet of altitude may be lost before obtaining minimum power off speed and sufficient stabilator effectiveness to rotate the aircraft to a landing attitude. Refer to Engine Failure During Takeoff, Section III, Emergency Procedures.

FLIGHT CONTROLS

The flight controls are effective throughout the speed range of the aircraft except for the condition described under Slow Flight Characteristics. Control harmony is good in cruise flight. When flying at slow airspeeds with the slats extended, aileron control forces are noticeably higher than stabilator control forces.

RUDDER

Directional stability and control is good throughout the speed range of the aircraft. Turns are easy to make with rudders alone, and a low wing can be raised by applying opposite rudder, even at very low airspeeds.

STABILATOR

Longitudinal stability is positive throughout the speed range of the aircraft in all configurations. When climbing in turbulent air, the control wheel pulses occasionally because the stabilator is slightly gust sensitive. At very low airspeeds, particularly with the flaps extended, elevator control forces are light and elevator control response low, compared to the other controls.

STABILATOR TRIM TAB

The stabilator trim tab is effective in trimming off stabilator control forces, except at very slow approach speeds. However, the aircraft is easy to control, and only light forces are required to hold the control wheel at any aft position.

AILERON

The ailerons are effective throughout the speed range of the aircraft. At approach speeds in turbulent air, effort must be exerted to keep the wings level due to the high sensitivity of the wings to vertical asymmetric gusts. If the slats on one side extend before the other side, the aircraft will start to roll away from the wing with the slats extended. The wings can be held level with aileron control, and the opposite slats can be extended by applying rudder to bring the aircraft back to coordinated flight. Turns are easy to make with the ailerons alone, the rudder pedals being held fixed.

MANEUVERING FLIGHT

Acrobatics, including spins, are prohibited. Normal maneuvers may be accomplished with little pilot effort. Sideslips are permissible, though unnecessary, after the pilot has become familiar with the flight characteristics of the aircraft. There are no conditions of normal maneuvering flight which produce a reversal of control pressure. In heavy turbulence the speed of the aircraft should be reduced to the specified maximum maneuvering speed corresponding to the gross weight of the aircraft as shown in Figure 5-2.

DIVING

There are no adverse characteristics when diving this aircraft. For recovery use a gentle aft movement of the control wheel.

AFT CENTER OF GRAVITY

Care must be taken not to exceed the allowable aft center of gravity limit of the aircraft. If the aft c. g. limit is exceeded, the control wheel must be pushed unusually far forward with heavy force to raise the tail during the takeoff roll. Takeoff should be aborted if this condition is encountered. If it is not possible to abort the takeoff, use forward stabilator control to hold the aircraft on the ground until 50 knots IAS is obtained. Utilize no more than 20° flaps for takeoff. Do not let airspeed drop below 50 knots IAS during takeoff or at any other time during flight. Never extend flaps more than 20° since increasing the flap setting decreases the aircraft's stability and controllability. Land with no more than 20° flaps and maintain at least 50 knots IAS during the approach. Increase airspeed when landing in turbulent air.

Section VII
SYSTEMS OPERATION

TABLE OF CONTENTS

INTRODUCTION

This section presents additional material on the operation of various aircraft systems to supplement or amplify information given in Section II.

SPARK PLUG FOULING.

Spark plug fouling is a principal cause of ignition trouble. Fouling might be defined as an accumulation of deposits which cause misfiring or not firing across the spark plug electrodes. The most common types of fouling are lead fouling and carbon fouling, with lead fouling the main trouble-maker. Prevention is the most profitable line of attack on the problem.

GROUND RUNNING.

Type and Cause.

Either lead or carbon fouling. Lead foulding may be residual from a previous flight. Carbon foulding is usually due to prolonged ground running at idle, particularly when the idle mixture is richer than best power; excess carbon from the rich mixture plus engine oil during combustion tend to build up as fouling deposits. The symptoms of such fouling usually include excessive mag drop during ignition check.

Prevention.

Wherever possible avoid prolonged, or unnecessary ground running. The idle mixture should be adjusted to best power mixture at the idle speed commonly used for ground running, rather than at the minimum idle speed, since there is a tendency for the mixture to enrich with any increase in rpm. Excessively rich idling mixtures are the most common causes of carbon fouling.

NOTE

After each 10 minutes of ground running, the engine should be run up to 3000 RPM for one minute.

IN FLIGHT.

Type and Cause.

Cruise conditions usually generate lead fouling rather than carbon fouling. Conditions favorable to lead fouling include long continued application of a given set of engine conditions typical of cruise flight, particularly those involving very lean mixtures, at or leaner than best economy. Associated contributing factors include abnormally cool CHT and low BMEP. Common symptoms include backfiring or afterfiring.

Prevention.

During power off descents where the engine is subjected to closed throttle operation and low temperatures, sparkplug fouling and induction system fuel loading are possible. To clear the engine, momentarily advance the throttle to approximately 3/4 open position every 30 seconds. Adjust descent as required to preclude exceeding any operational limitations.

NOTE

During descent, if the carburetor heat control is used on aircraft without air temperature gage, use either full hot or full cold position only.

Section VIII CREW DUTIES

SECTION VIII IS NOT APPLICABLE TO THIS AIRCRAFT

Section IX
ALL WEATHER OPERATION

TABLE OF CONTENTS

INTRODUCTION

This section discusses special all-weather procedures and techniques which either emphasize or add to procedures and techniques presented in Sections II and III. Flying the aircraft in all weather conditions requires normal instrument flight proficiency on the part of the pilot as well as the usual conscientious preflight planning.

INSTRUMENT FLIGHT PROCEDURES

The following instructions for ALL WEATHER OPERATION supplement the NORMAL PROCEDURES; therefore, this section does not include procedures which duplicate those given in Section II, except where necessary for emphasis of continuity.

PREFLIGHT

Complete all normal day and night checks as outlined in Section II, paying particular attention to the operation of flight instruments and radio equipment. Be sure to check operation of equipment during the engine run-up check. The anti-collision (beacon) light should be turned off during flight through conditions of reduced visibility. The pilot could experience spatial disorientation as a result of the rotating reflection of the light against the clouds. In addition, the light would be ineffective as an anti-collision light during these conditions since it could not be observed by pilots of other aircraft.

INSTRUMENT TAKEOFF

Procedures for instrument takeoff are essentially the same as for a normal visual takeoff. Recheck all instruments and set directional indicator to runway heading. The initial climb of the aircraft can be established by placing the aircraft in a climb that places the miniature aircraft of the attitude indicator approximately one bar-width above the horizon bar. When the vertical velocity indicator shows a definite climb, reduce engine rpm to 3000.

INSTRUMENT CLIMB

When the airspeed reaches a minimum of 50 knots IAS, slowly raise the flaps and increase airspeed to 80 knots IAS at 3000 engine rpm. After wing flaps have retracted, reduce engine rpm to 2750. Trim the aircraft for "hands-off" flight and use carburetor heat if desired. Satisfactory turns of 45° angle of bank can be made; however, a maximum of 30° angle of bank is recommended for ease handling and passenger comfort.

INSTRUMENT CRUISE

The aircraft has satisfactory handling characteristics in smooth air, using the cruise schedule shown in the Appendix Section.

DESCENT

Normal descent or radar controlled descent to traffic altitude can be made with cruising configuration and at cruising speed. Reduce manifold pressure slightly more than one inch for each 100 fpm rate of descent desired. In addition, reduce manifold pressure approximately one inch with each 1000-feet loss of altitude to maintain the same rate of descent.

NOTE

Prior to letting down through an overcast, full carburetor heat should be used on aircraft not equipped with a carburetor air temperature gage. Heat should be adjusted to maintain a minimum of 15°C on aircraft equipped with a carburetor air temperature gage.

HOLDING

Holding in this aircraft presents no particular problem at 85 knots IAS (low cruise).

INSTRUMENT APPROACHES

NOTE

Pilots will have to compute time to fly from low station to landing facility, as most approach plates do not give airspeeds utilized by this aircraft.

VOR, ADF, RANGE, LOCALIZER AND RADAR APPROACHES.

Refer to Figures 9-1 and 9-2 for typical approach pattern.

TYPICAL RADIO RANGE, ADF, VOR AND LOCALIZER APPROACH

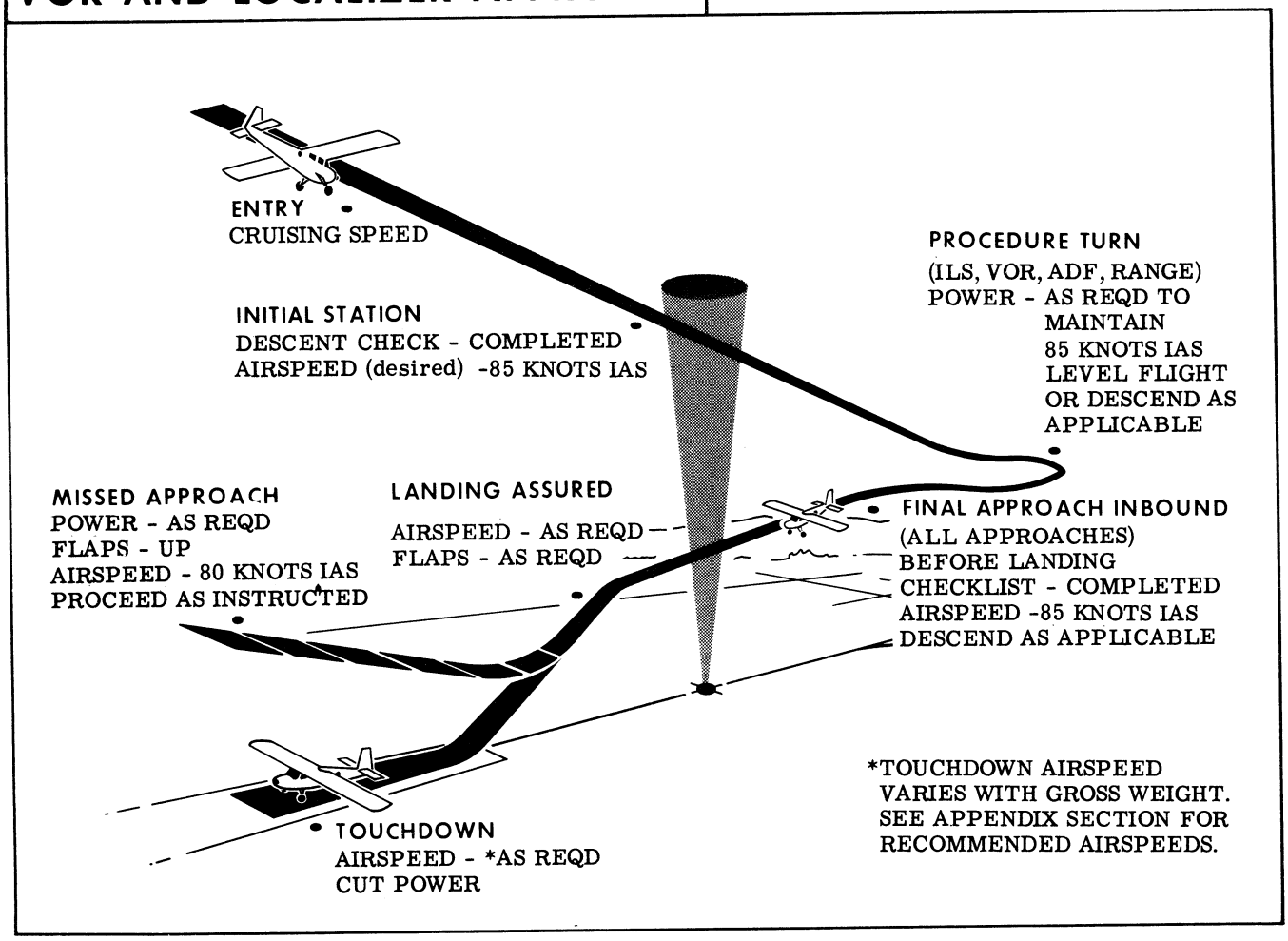


Figure 9-1.

ICE AND RAIN

WARNING

Do not fly the aircraft into known or forecast icing conditions.

A takeoff should not be attempted if the aircraft is covered with frost or snow. Ice will normally adhere to the empennage, antennas, and windshield. If icing conditions cannot be avoided, the following procedures are recommended.

WARNING

With slats inoperative, the aircraft may stall abruptly followed by a strong nose down pitching moment.

1. Cabin heat and defrost knob - FULL ON.
2. Pitot heat switch - ON.
3. Carburetor air knob - HOT.

NOTE

Change altitude if possible.

If a landing is to be made with ice on the aircraft, make a power-on approach at a slightly higher than normal airspeed. (Do not rely on proper wing slat operation.)

In the event of erratic airspeed, altimeter, or vertical velocity indicator readings, and icing of static source or a clogged static line is suspected, the static drain valve may be opened to provide an alternate static source. Instrument readings may not be reliable when drain valve is used as an alternate static source.

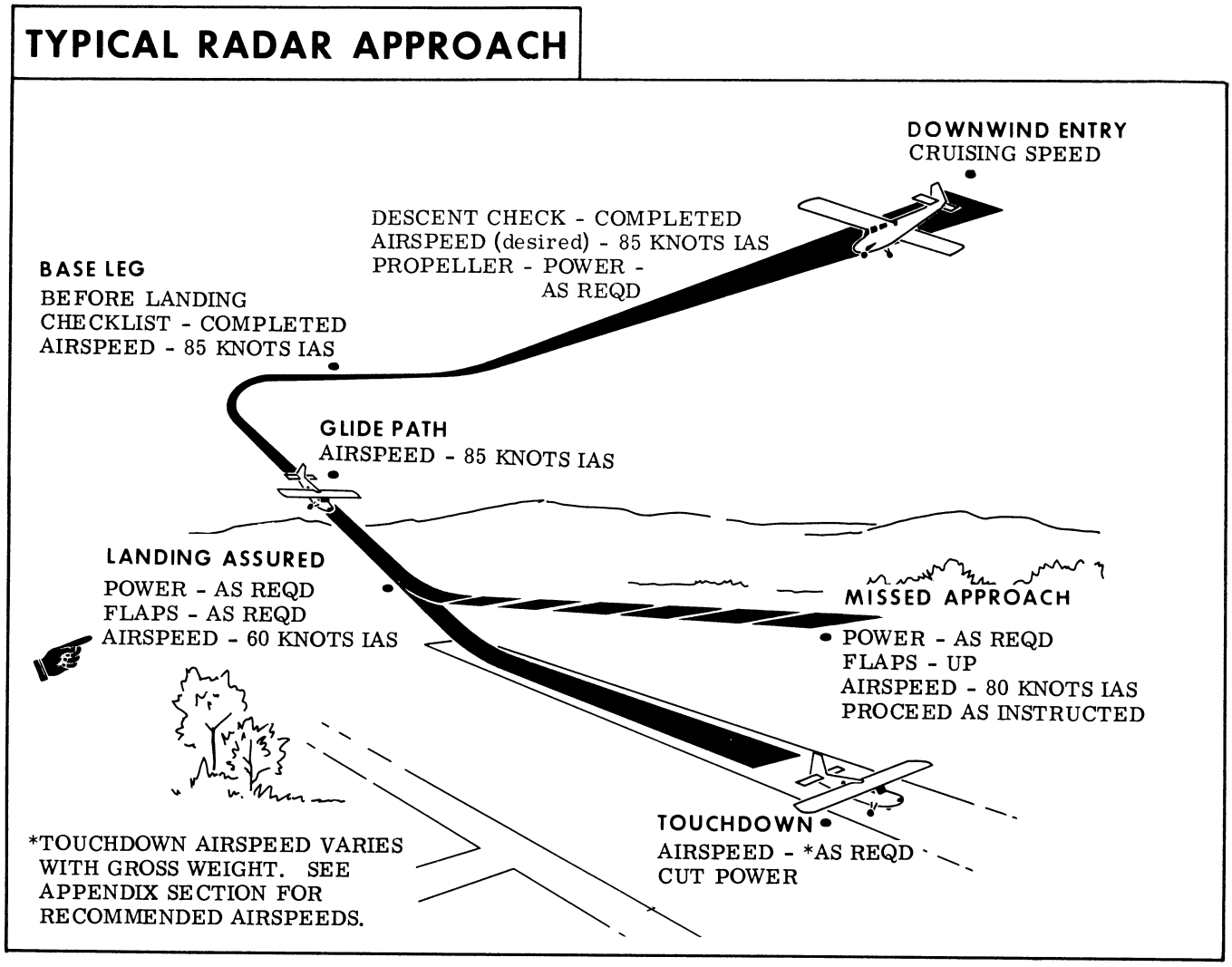


Figure 9-2.

TURBULENCE AND THUNDERSTORMS

Flight in turbulence of moderate to severe intensity is not recommended because of the difficulty in controlling the aircraft and possibility of exceeding its structural limitations. If these conditions are inadvertently encountered, the aircraft speed should be reduced to the specified maximum maneuvering speed limitations corresponding to the gross weight of the aircraft as shown in Figure 5-2. Known areas of thunderstorms and turbulence should be avoided if at all possible. Plan your flight requiring the least possible exposure to these conditions. Some tactical missions may make the penetration of these areas necessary. In this case prepare the aircraft before entering these areas as follows:

1. Pitot heat switch - ON.
2. Carburetor air knob - HOT.
3. Power - As required.

Set power to maintain desired penetration speed. Maintain 2750 rpm.

4. Instruments - Check for proper operation.
5. Safety belts fastened securely. All loose equipment secure.
6. Cockpit lights - Full intensity at night to minimize blinding effects of lightning.
7. Turn off radio equipment rendered useless by static.

In the storm maintain power setting and pitch presentation on the attitude indicator established prior to entry. Use as little stabilator control as possible to minimize stresses on the aircraft. Disregard the pitot static instrument readings as differential pressures within the storm and partial blocking of the pitot head by heavy precipitation will cause erratic fluctuations. Devote your full attention to flying the aircraft.

NOTE

Normally, the least turbulent areas in a thunderstorm will be in the vicinity of 6,000 feet above the terrain. The freezing level or altitudes between 10,000 and 20,000 feet will produce the most severe conditions.

NIGHT FLYING PROCEDURES

Instrument flight and night flight are closely related in many points of technique. Takeoff, climb, and landing will require instrument reference whenever visual orientation becomes uncertain. Individual lighting for each instrument is provided in the instrument panel. Lighting by the overhead panel light is also provided. Before each night flight, check the following items:

1. Landing light - CHECK OPERATION.

NOTE

There is no speed limit on operation of the light.

2. Navigation lights - CHECK OPERATION.
3. Instrument lighting - CHECK OPERATION.
4. Overhead panel lights - CHECK OPERATION.
5. Flashlight - CHECK OPERATION.

COLD WEATHER PROCEDURES

The engine is sometimes difficult to start during the cold weather season. On aircraft coded A A_1 B_3 D the external power source should be used for each start. There is no oil dilution system provided. If temperature is below 0°F, arrangements should be made when possible to get the aircraft indoors at least two hours before starting. This will allow ample time for the aircraft to warm. If this is not possible, the oil should be drained and the battery stored in a warm area, or prior to start, use ground heaters two (2) hours.

BEFORE ENTERING THE AIRCRAFT

1. Wing and tail surfaces - CHECK ICE, SNOW, AND FROST REMOVED.
2. Control surfaces - CHECK OPENINGS AND MOUNTS FREE OF ICE.
3. Fuel sump - DRAIN TO REMOVE MOISTURE.
4. Landing gear struts - CHECK FREE OF ICE.
5. Engine preheating - AS NECESSARY.
6. Tires - CHECK NOT FROZEN TO GROUND OR CHOCKS.
7. Check that parking brakes were not left on, pucks and discs free of ice.

BEFORE STARTING ENGINE

If may be necessary to prime the engine approximately 5 strokes by using the primer. Better results have been noted with the carburetor heat ON after starting and during ground warm-up in extreme cold weather. Leave primer out and loaded as it may be required to keep engine running until warm.

HOT WEATHER PROCEDURES

No particular problem in aircraft operation is presented by hot weather. Care must be taken not to overprime during hot weather starting. It may be necessary for the fuel boost pump to be on for ground operation to preclude a vapor lock in the fuel system in hot weather. Normal starting procedures are recommended for hot weather operation. Ground testing should be complete, but accomplished as quickly as possible to prevent engine overheating.

Appendix 1

LANDPLANE PERFORMANCE DATA

Table Of Contents

PART 1 - INTRODUCTION

TABLE OF CONTENTS

DISCUSSION OF CHARTS

DENSITY ALTITUDE CHART

The Density Altitude Chart, Figure F1A1-1, is provided to obtain density altitude from temperature and pressure altitude. Pressure altitude is the altimeter reading with the altimeter set at 29.92 inches Hg.

EXAMPLE: (see Figure F1A1-1)

Known: Ambient temperature- -15°C
Pressure altitude - 6000 feet
Find: Density altitude and $\frac{1}{\sqrt{\sigma}}$

Solution: Proceed along -15°C line to 6000 foot pressure altitude line. Density altitude is 4000 feet, $\frac{1}{\sqrt{\sigma}}$ is 1.06.

TEMPERATURE CONVERSION CHART

The Temperature Conversion Chart, Figure F1A1-2, is included to provide a ready method of converting from one temperature scale to the other.

EXAMPLE: (see Figure F1A1-2)

Known: OAT - +10°C
Find: Degrees Fahrenheit
Solution: Proceed up 10°C line to temperature conversion line. Read 50°F on Fahrenheit scale.

AIRSPEED POSITION CORRECTION CHART

The Airspeed Position Correction Chart, Figure F1A1-3, is used to convert indicated airspeed (IAS) to calibrated airspeed (CAS) by adding or subtracting the proper correction factor. Two separate charts are included; one chart reflects the forward air controller (FAC) configuration, the other chart reflects the aircraft not so equipped. Both charts contain curves for gross weights of 3000, 3500, and 4000 pounds.

EXAMPLE: (see Figure F1A1-3)

Known: FAC Configuration
Indicated airspeed - 50 knots
Gross Weight - 3000 pounds
Find: Calibrated airspeed - 50.5 knots
Add correction factor of 0.5 knots to 50 knots IAS.

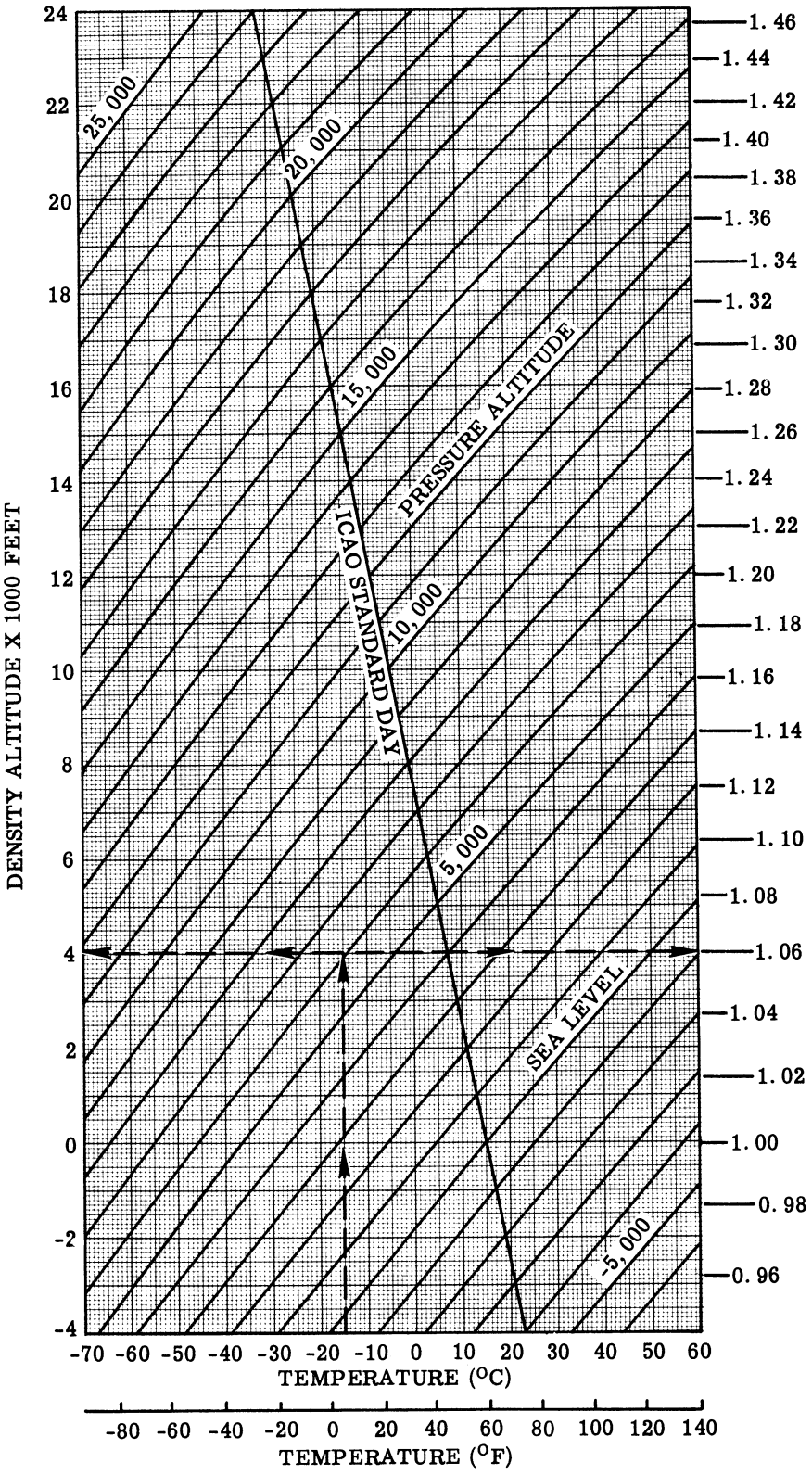
AIRSPEED CONVERSION CHART

The Airspeed Conversion Chart, Figure F1A1-4, is used to convert miles per hour to knots, or from knots to miles per hour.

EXAMPLE: (see Figure F1A1-4)

Known: Airspeed - 115 mph
Find: Airspeed, knots
Solution: Proceed along 115 mph line to airspeed conversion line. Read 100 knots airspeed, on knots column.

DENSITY ALTITUDE CHART



$\frac{1}{\sqrt{\sigma}}$

Figure F1A1-1.

TEMPERATURE CONVERSION CHART

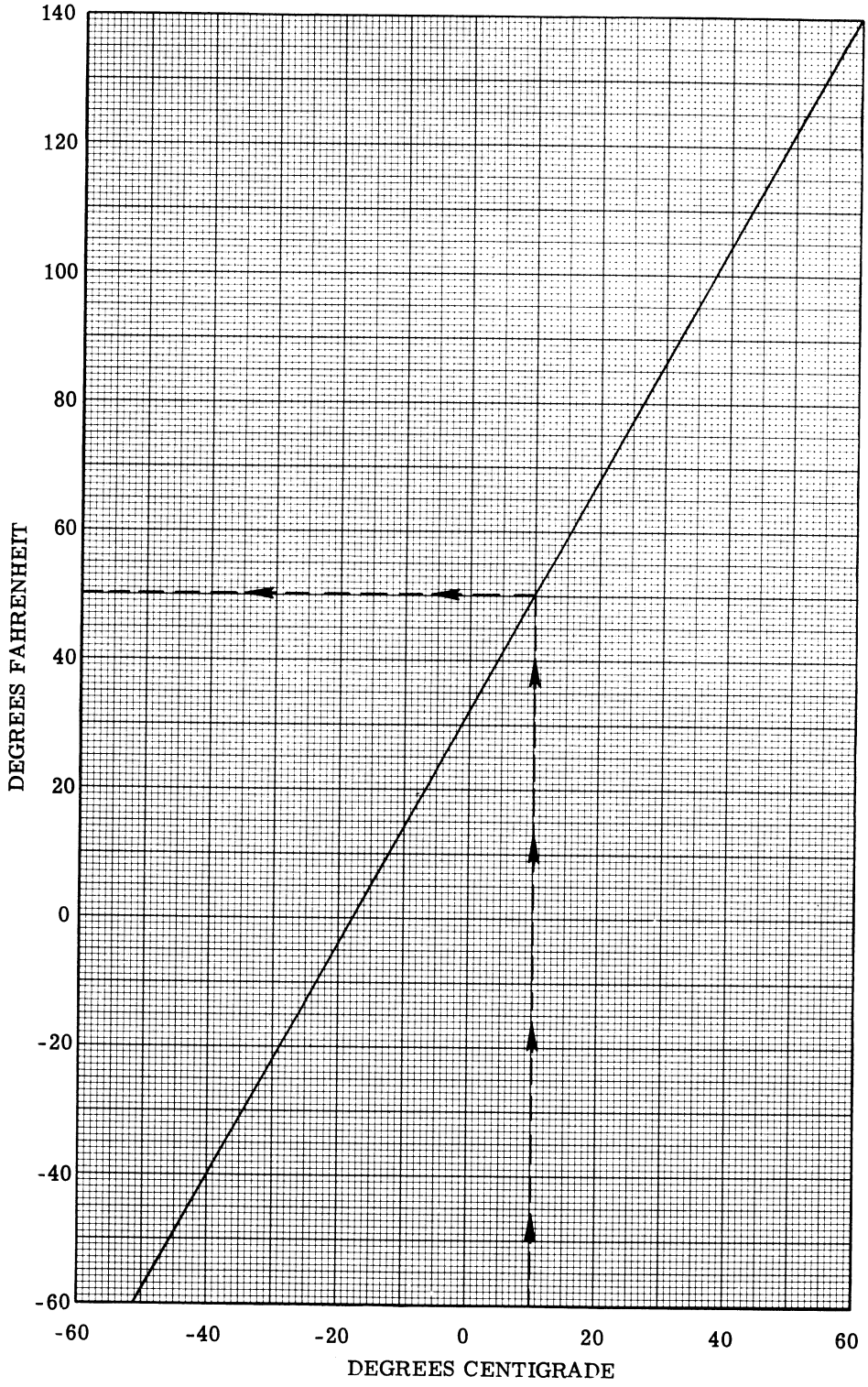


Figure F1A1-2.

AIRSPEED POSITION CORRECTION CHART

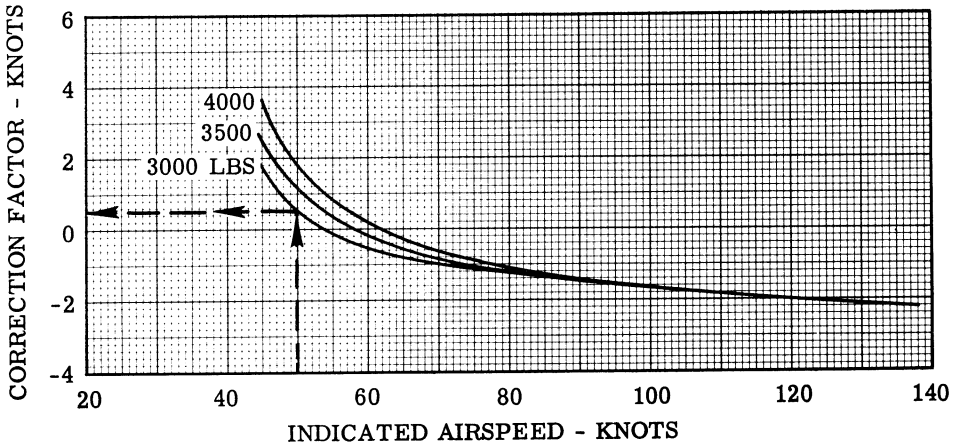
(LANDPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: SEPTEMBER 1963
DATA BASIS: FLIGHT TEST

ENGINE: GO-480-G1D6
FUEL DENSITY: 6. 0 LBS/GAL.
FUEL GRADE: 115/145

CONDITIONS:

1. OUT OF GROUND EFFECT
2. FAC CONFIGURATION
3. FLAPS - UP



CONDITIONS:

1. OUT OF GROUND EFFECT
2. FLAPS - UP

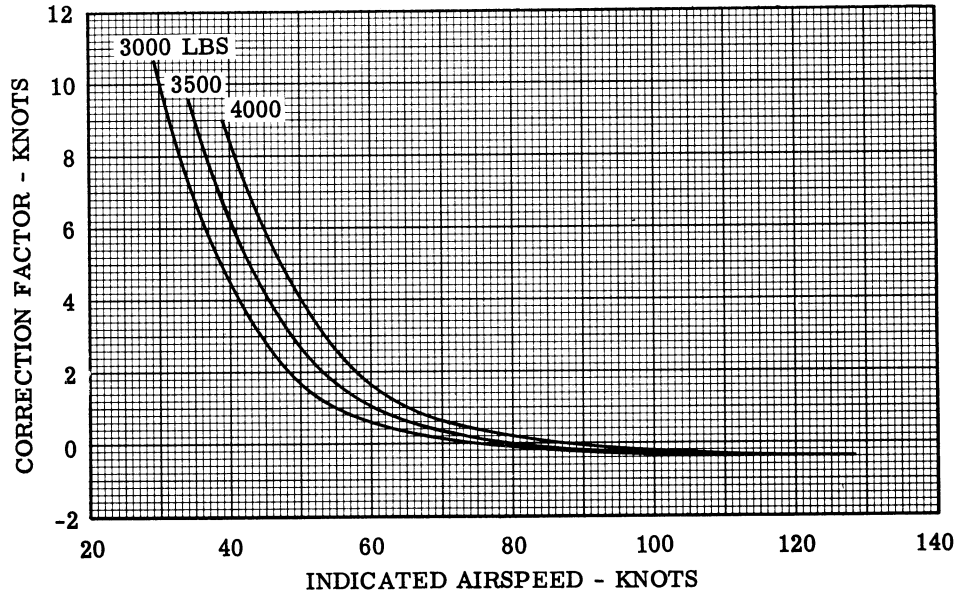


Figure F1A1-3.

AIRSPEED CONVERSION CHART

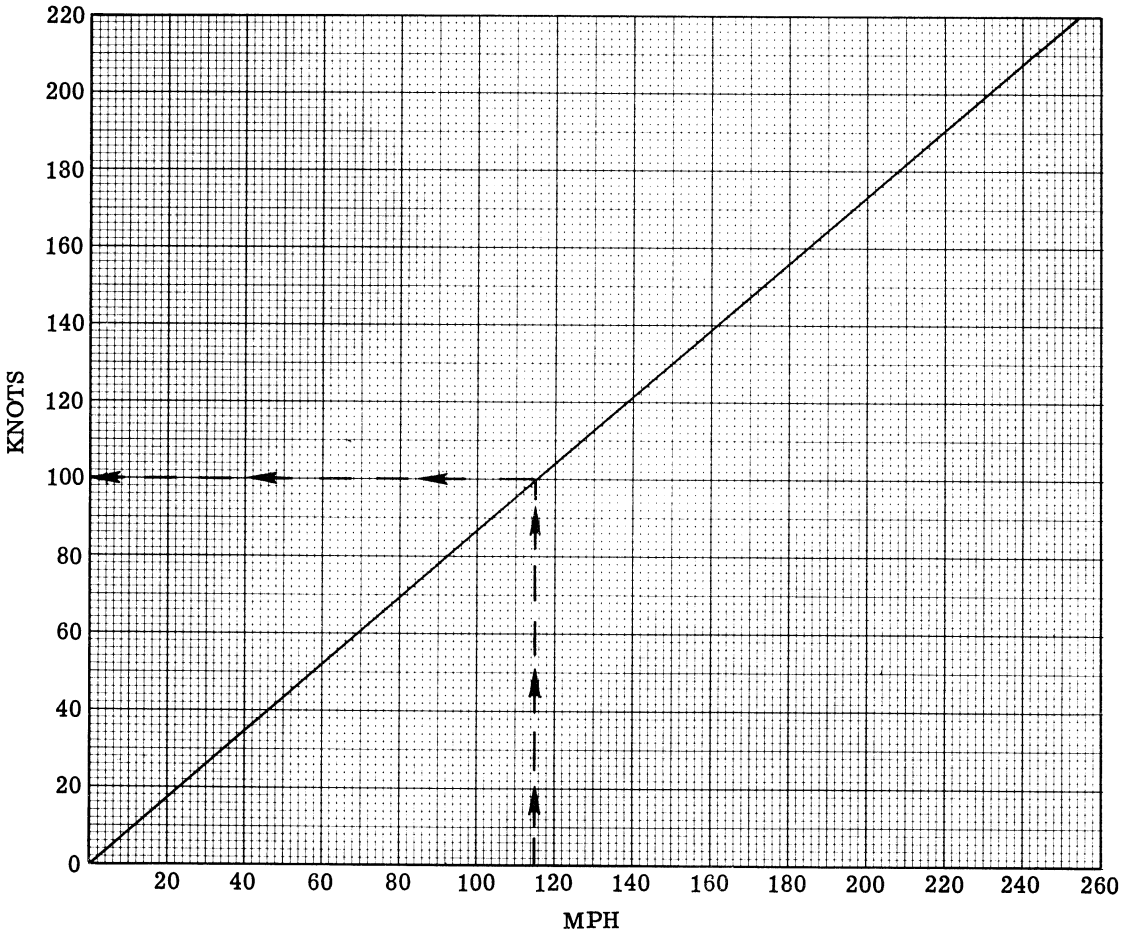


Figure F1A1-4.

PART 2 - ENGINE DATA

TABLE OF CONTENTS

DISCUSSION OF CHARTS

ENGINE OPERATING LIMITS CHART

The Engine Operating Limits Chart, Figure F1A2-1, is used to find engine power settings at any operational altitude.

EXAMPLE: (see Figure F1A2-1)

Known: RPM - 2600
Manifold Pressure - 21 in Hg.
Pressure Altitude - 7500 ft.
OAT (Standard Day) - 0°C

Find: BHP

Solution: Enter Sea Level Chart at 21 in. Hg. manifold pressure (point A), read up to 2600 RPM (point B), across to altitude chart (point C). On the altitude chart, locate the intersection of the 21 in. Hg. manifold pressure line with the 2600 RPM line (point D). Connect points C and D with a straight line. Locate the intersection of the line CD with the given altitude (7500 ft.) line. Project this intersection (point E) horizontally to the BHP axis, and locate point F. The required BHP (178) will be found at point F.

NOTE

Chart data is for standard day.
Correct chart BHP for non-standard day as follows:
For each 5°C hotter than standard, reduce BHP by 1%.
For each 5°C colder than standard, increase BHP by 1%.

ENGINE POWER SCHEDULE

The Engine Power Schedule, Figure F1A2-2, provides a ready reference to data for operation of the engine. The schedule is a tabular compliation of limiting power at various altitudes and outside air temperatures. Figure F1A2-2 shows power settings at 210 BHP (75% of METO), 180 BHP (65% of METO), and 155 BHP (55% of METO).

EXAMPLE: (See Figure F1A2-2)

Known: BHP - 210
Pressure Altitude - 5000 ft.
OAT - + 20°C

Find: Fuel Flow
Manifold Pressure
RPM

Solution: Enter Figure F1A2-2 at 210 BHP and locate 5000 ft. in the pressure altitude column. Read fuel flow, manifold pressure, and RPM directly opposite altitude.
Fuel Flow - 19.0 gal/hr.
Manifold Pressure - 23.6 in. Hg.
RPM - 2750

ENGINE OPERATING LIMITS CHART

MODEL: U-10A, U-10B, & U-10D
DATE: 7 February 1972
DATA BASIS: ENGINE MANUFACTURER'S DATA
CARBURETOR - 391717-2 (Bendix PS-5BD)

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/CAL.
FUEL GRADE: 115/145

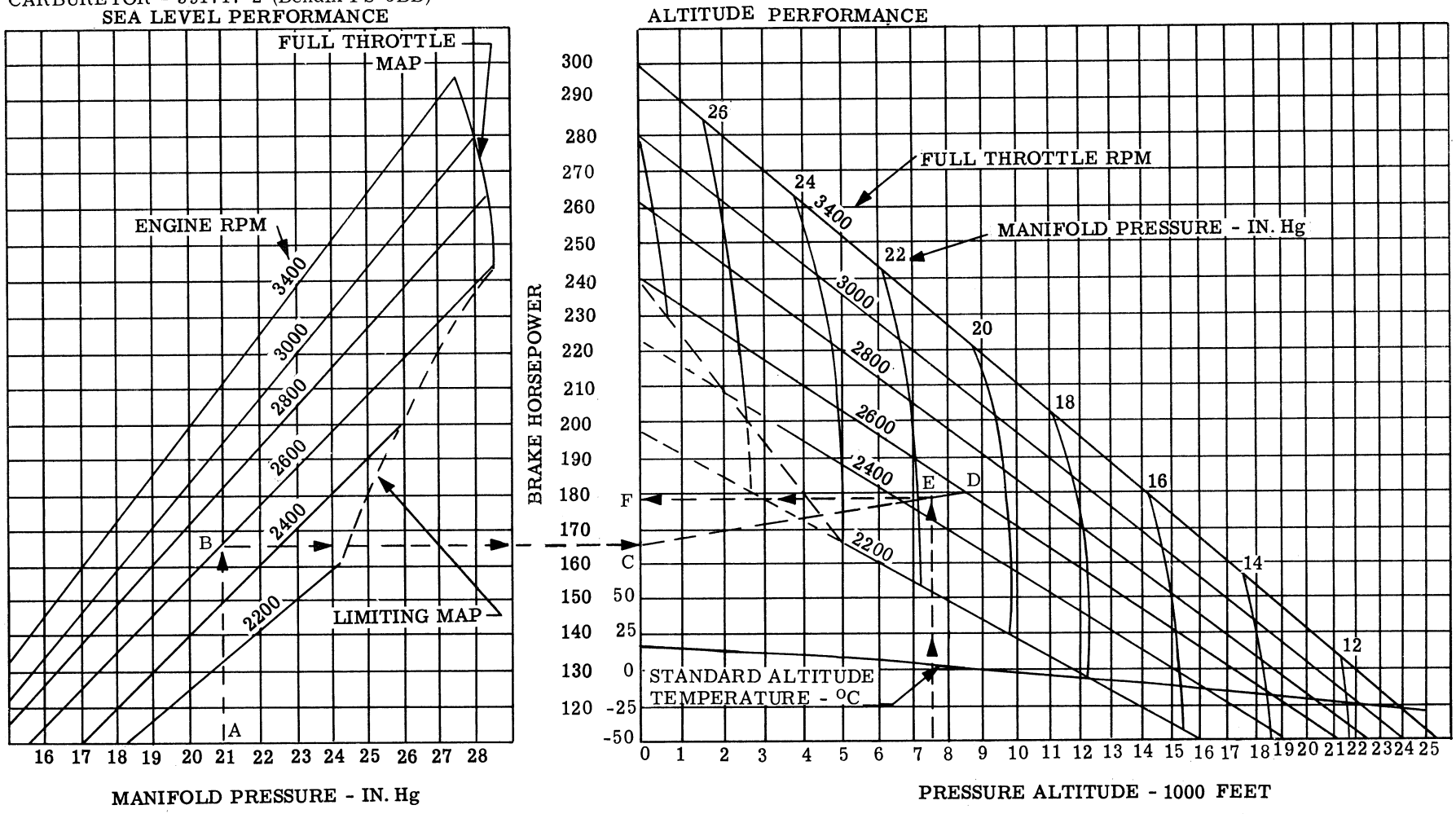


Figure F1A2-1.

ENGINE POWER SCHEDULE

210, 180, AND 155 BHP

MODEL: U-10A, U-10B, & U-10D
DATE: 2 FEBRUARY 1972
DATA BASIS: ENGINE MANUFACTURER'S DATA

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145

BHP	PRESS ALT. (FEET)	FUEL FLOW (Gal/Hr)	MANIFOLD PRESSURE (In. Hg) Outside Air Temperature (Degrees C) -40	-20	0	20	40	RPM
210 BHP	0	19.0	21.5	22.4	23.3	24.2	25.0	2750
	1000	19.0	21.4	22.3	23.2	24.1	24.9	2750
	2000	19.0	21.3	22.2	23.1	24.0	24.7	2750
75% Meto Power	3000	19.0	21.2	22.1	23.0	23.8	24.6	2750
	4000	19.0	21.1	22.0	22.8	23.7	24.5	2750
	5000	19.0	21.0	21.9	22.7	23.6	24.4	2750
	6000	19.0	20.9	21.8	22.6	23.5	24.3	2750
180 BHP	0	14.8	20.1	21.0	21.8	22.5	23.4	2600
	1000	14.8	20.0	20.9	21.6	22.4	23.2	2600
65% Meto Power	2000	14.8	19.9	20.7	21.5	22.3	23.1	2600
	3000	14.8	19.8	20.5	21.4	22.1	23.0	2600
	4000	14.8	19.7	20.4	21.2	22.0	22.8	2600
	5000	14.8	19.6	20.3	21.1	21.9	22.7	2600
	6000	14.8	19.5	20.2	21.0	21.8	22.6	2600
	7000	14.8	19.4	20.1	20.9	21.6	22.5	2600
	8000	14.8	19.2	20.0	20.7	21.5	22.3	2600
	9000	14.8	19.1	19.9	20.6	21.4	22.2	2600
155 BHP	0	11.5	18.9	19.8	20.5	21.1	22.0	2450
	1000	11.5	18.8	19.7	20.4	21.0	21.8	2450
55% Meto Power	2000	11.5	18.7	29.6	20.3	20.9	21.7	2450
	3000	11.5	18.5	19.4	20.2	20.8	21.6	2450
	4000	11.5	18.4	19.3	20.0	20.7	21.5	2450
	5000	11.5	18.3	19.1	19.9	20.6	21.3	2450
	6000	11.5	18.2	19.0	19.8	20.5	21.2	2450
	7000	11.5	18.1	18.8	19.7	20.4	21.1	2450
	8000	11.5	18.0	18.7	19.5	20.2	21.0	2450
	9000	11.5	17.9	18.6	19.4	20.1	20.8	2450
	10000	11.5	17.8	18.5	19.2	19.9	20.6	2450

REMARKS:

(1) Maximum recommended power setting for performance cruise (75% Power) is 2750 RPM at full throttle.
(2) Maximum recommended power setting for economy cruise (65% Power) is 2600 RPM at full throttle.

PROCEDURE:

Read fuel flow and manifold pressure directly opposite altitude.

Figure F1A2-2.

PART 3 - TAKEOFF DATA

TABLE OF CONTENTS

DISCUSSION OF CHARTS

TAKEOFF AND LANDING CROSS-WIND CHART

The Takeoff and Landing Cross-wind Chart, Figure F1A3-1, is used to determine both the headwind and cross-wind component, and whether a safe take-off or landing can be accomplished. For this purpose, the chart is divided into two areas; recommended and not recommended, and for two configurations; cross-wind landing gear locked and unlocked.

EXAMPLE: (see Figure F1A3-1)

Known: Takeoff runway - 30°
Wind - 80° at 25 knots
Cross-wind landing gear - unlocked
Find: Is takeoff recommended.
Solution: Runway wind angle - 50° (80° -30°)
Proceed along 50° wind angle line to 25 knot wind velocity line.
Takeoff or landing is recommended for aircraft with cross-wind landing gear unlocked, and NOT recommended with cross-wind landing gear locked.

TAKEOFF GROUND RUN

The takeoff Ground Run Chart, Figure F1A3-2, is used to determine total ground run to takeoff and takeoff speed. The chart shows a takeoff gross weight limit based on 200 feet per minute rate of climb, which is depicted by a dashed line. A table presents correction factors for wet grass or soft turf. The value from the chart is multiplied by the correction factor to obtain the distance on wet grass or soft turf.

EXAMPLE: (See Figure F1A3-2)

Known: Density altitude - 4000 feet
Gross weight - 3500 pounds
Headwind - 10 knots
Find: Ground Run - 650 feet
Takeoff speed - 41 knots IAS

TAKEOFF DISTANCE TO CLEAR 50 FOOT OBSTACLE

The takeoff Distance to Clear 50 Ft. Obstacle Chart, Figure F1A3-3, is used to determine the total distance to clear a 50 ft. obstacle during takeoff and the airspeed at the 50 ft. obstacle. This chart, like the Takeoff Ground Run Chart, also shows a gross weight limit based on 200 feet per minute rate of climb.

EXAMPLE: (See Figure F1A3-3)

Known: Density pressure - 4000 feet
Gross Weight - 3500 pounds
Headwind - 10 knots
Find: Takeoff distance over 50 ft. obstacle 1000 feet 50 ft. obstacle airspeed - 42 knots IAS

REFUSAL SPEED AND DISTANCE

The refusal speed and distance chart, figure F1A3-4, is used to determine if the takeoff should be aborted due to malfunction of the aircraft. The takeoff should be aborted if a malfunction occurs before the refusal speed or refusal distance is attained by the aircraft. The takeoff run, obtained from figure F1A3-2, and gross weight determine the refusal speed and distance.

Example: (See Figure F1A3-4)

Known: Headwind - 10 knots
Takeoff run - 2000 feet
Gross Weight - 3200 pounds

Find: Refusal Speed - 41. 8 knots
Refusal Distance - 425 feet

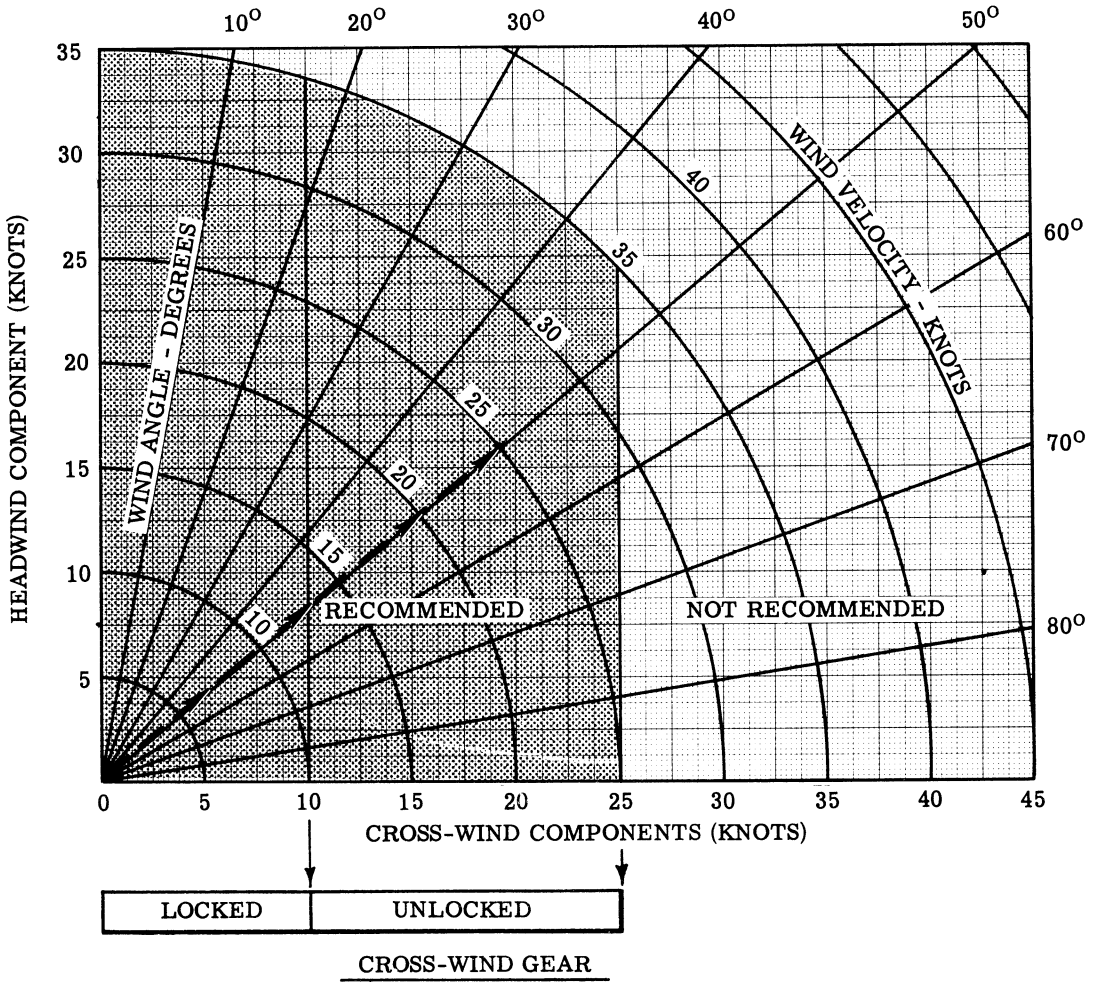
TAKEOFF AND LANDING CROSS-WIND CHART

STANDARD DAY
(LANDPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: JANUARY 1960
DATA BASIS: CALCULATED

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145

NOTE: Use maximum gust velocity for determining cross-wind component and steady wind velocity for determining headwind component.



NOTE: Maximum cross-wind component for takeoff and landing on narrow runways (less than 100 feet wide) and/or sloping terrain is 10 knots.

Figure F1A3-1.

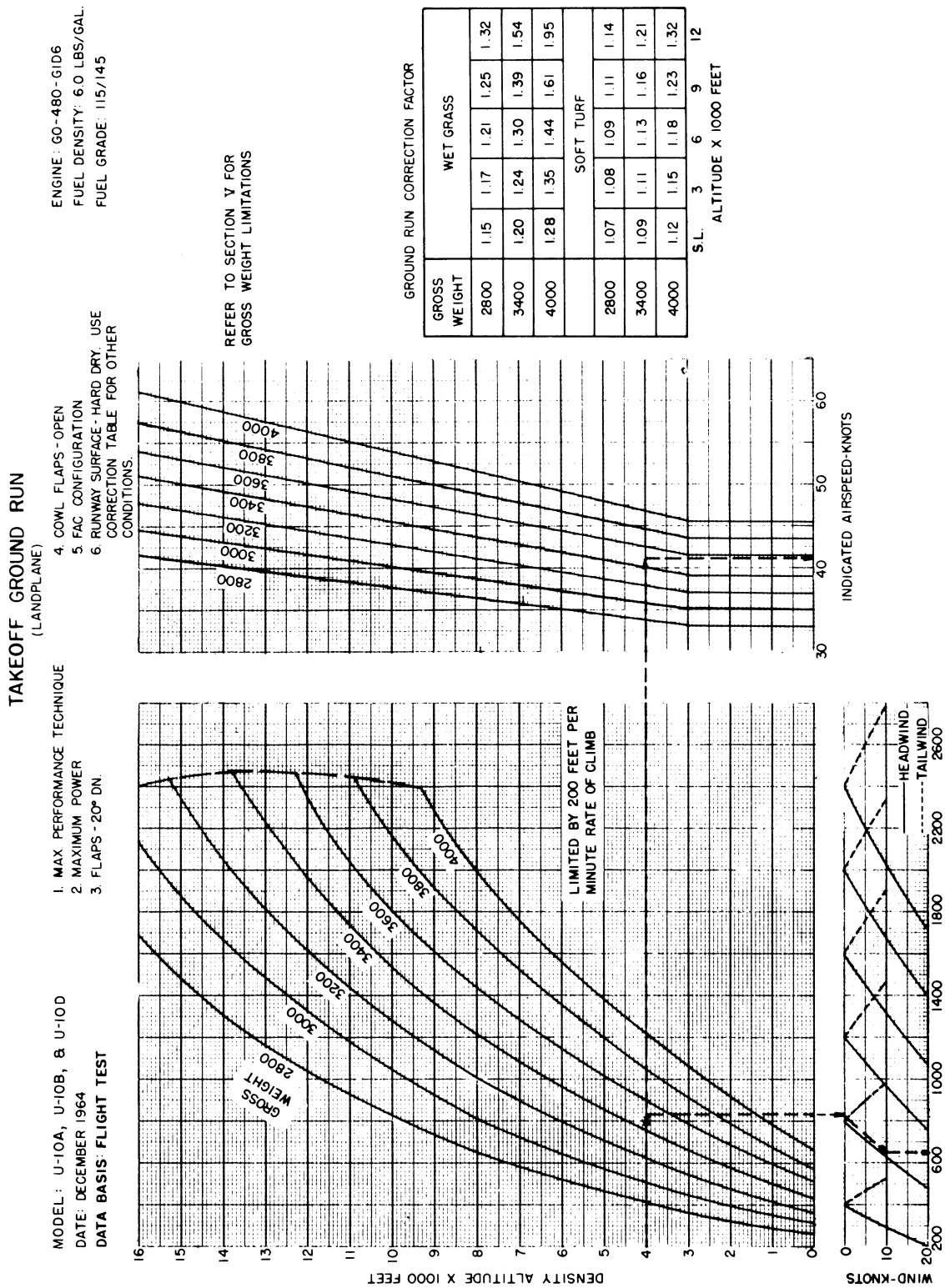


Figure F1A3-2.

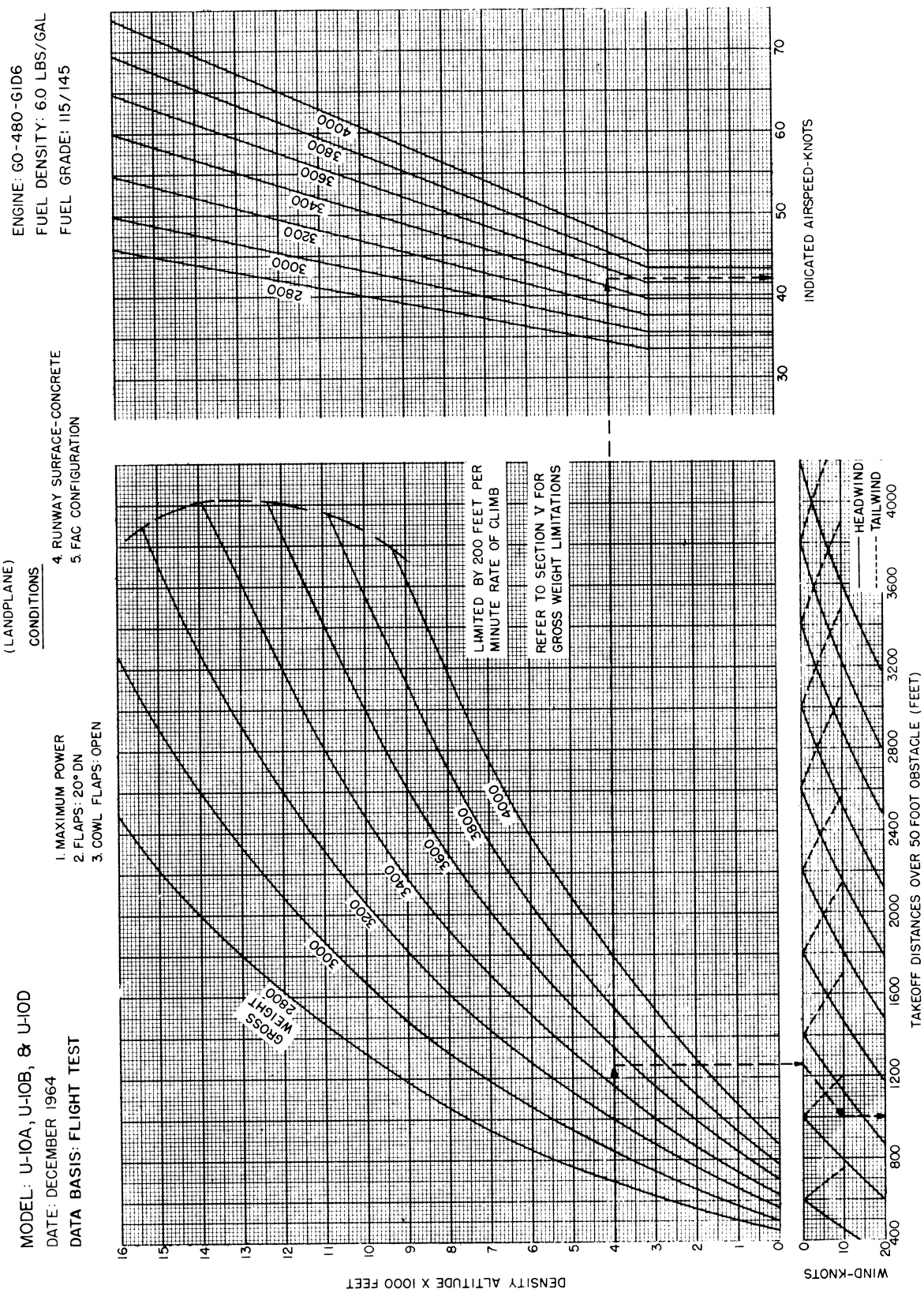


Figure F1A3-3

REFUSAL SPEED AND DISTANCE
(LANDPLANE)

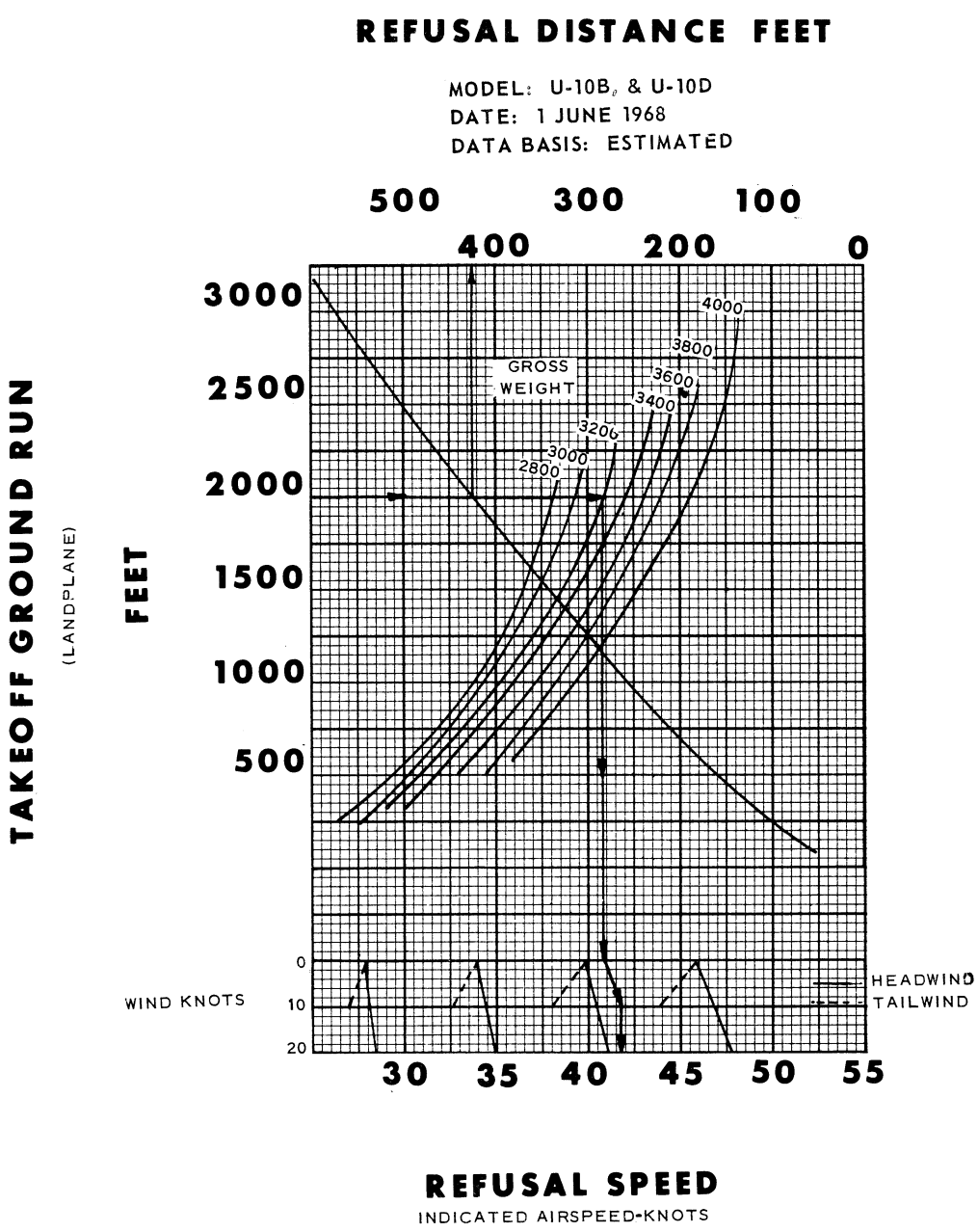


Figure F1A3-4

PART 4 - CLIMB DATA

TABLE OF CONTENTS

DISCUSSION OF CHARTS

CLIMB PERFORMANCE

The Climb Performance Chart, Figure F1A4-1, shows time to climb, nautical air miles traveled, and fuel used for various gross weights.

EXAMPLE: (see Figure F1A4-1)

Known: Density altitude - 9000 feet
Gross Weight - 3600 pounds

Find: Nautical Air Miles traveled - 20 miles
Time to Climb - 15 minutes
Fuel Used - 4.5 gallons (add 2.2 gallons for taxi and takeoff)

RATE OF CLIMB

The Rate of Climb Chart, Figure F1A4-2, shows rate of climb versus density altitude at various gross weights using METO power and a climb speed of 78 knots CAS.

EXAMPLE: (see Figure F1A4-2)

Known: Density altitude - 5000 feet
Gross weight - 3200 pounds

Find: Rate of climb - 830 fpm

CLIMB PERFORMANCE

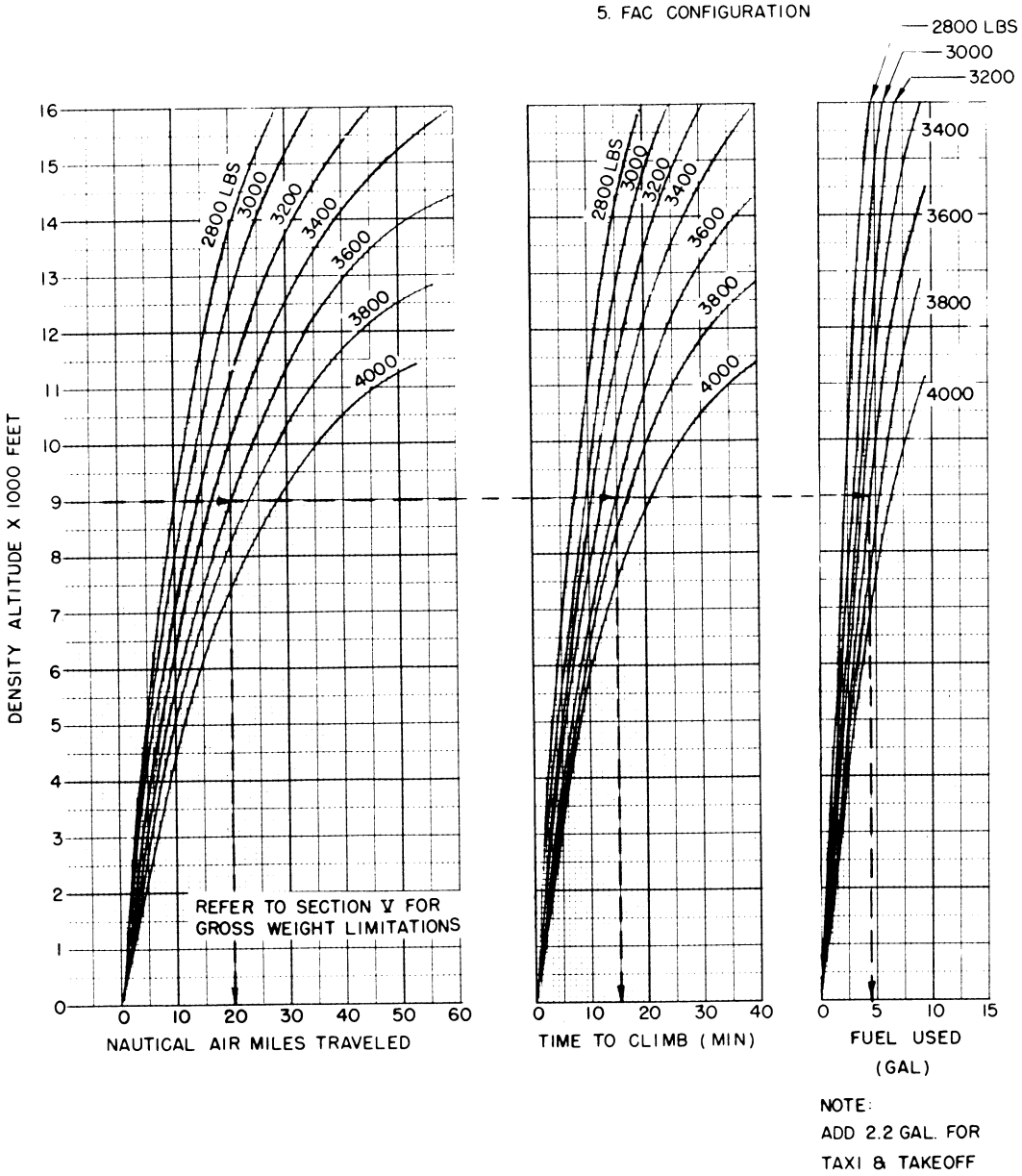
(LANDPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: DECEMBER 1964
DATA BASIS: FLIGHT TEST

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL
FUEL GRADE: 115/145

CONDITIONS

1. METO POWER
2. MIXTURE-FULL RICH
3. COWL FLAPS-OPEN
4. AIRSPEED-75KTS CAS
5. FAC CONFIGURATION



NOTE:
ADD 2.2 GAL. FOR TAXI & TAKEOFF

Figure F1A4-1.

RATE OF CLIMB

(LANDPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: DECEMBER 1964
DATA BASIS: FLIGHT TEST

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL
FUEL GRADE: 115/145

CONDITIONS:

1. METO POWER
2. COWL FLAPS-OPEN
3. MIXTURE: FULL RICH
4. FAC CONFIGURATION

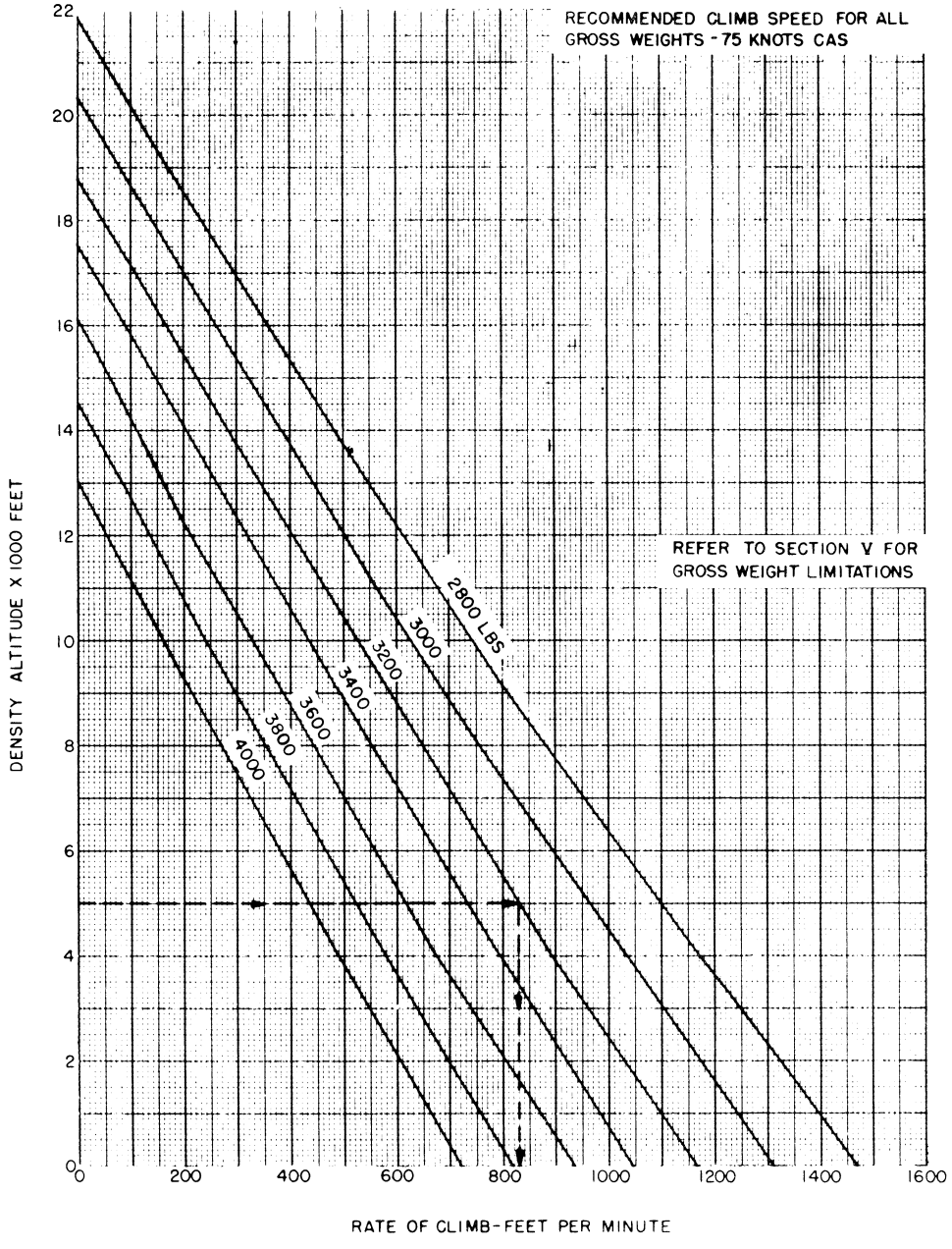


Figure F1A4-2.

PART 5 - CRUISE DATA

TABLE OF CONTENTS

DISCUSSION OF CHARTS

LEVEL FLIGHT PERFORMANCE

The Level Flight Performance Chart, Figure F1A5-1, is used to determine the brake horsepower required to cruise at a given speed and density altitude. Both calibrated and true airspeeds are included and are expressed in knots.

EXAMPLE: (see Figure F1A5-1)

Known: Density altitude - 10,000 feet
True airspeed - 100 knots
Gross weight - 3400 pounds
Find: BHP required - 110
CAS - 85 knots

CRUISE FUEL CONSUMPTION

The Cruise Fuel Consumption Chart, Figure F1A5-2, shows fuel flow in gallons per hour versus brake horsepower at altitudes from 5000 feet to 15,000 feet.

EXAMPLE: (see Figure F1A5-2)

Known: BHP - 195
Altitude - 5,000 feet
Find: Fuel flow - 17.6 gph

LEVEL FLIGHT PERFORMANCE

STANDARD DAY

(LANDPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: SEPTEMBER 1963
DATA BASIS: FLIGHT TEST

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145

CONDITIONS:

1. FAC CONFIGURATION

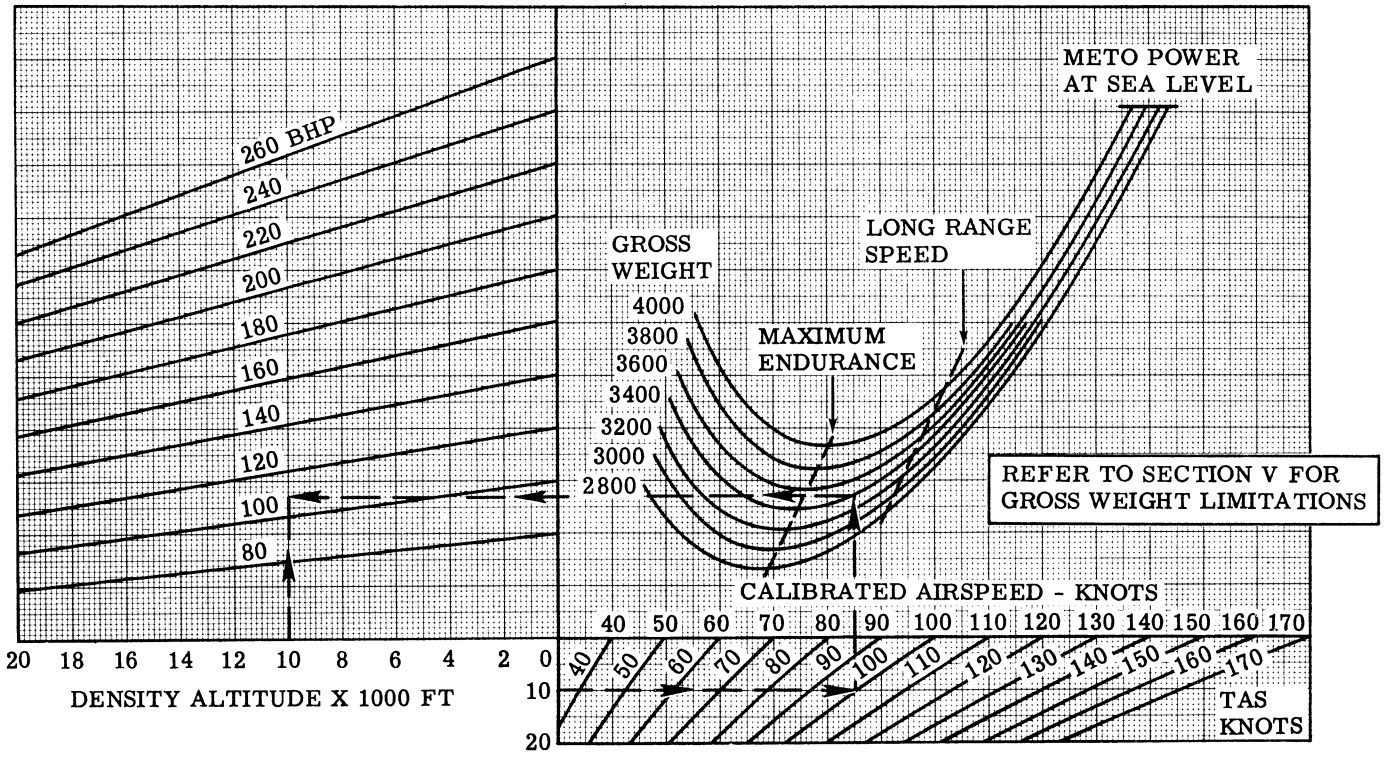


Figure F1A5-1.

CRUISE FUEL CONSUMPTION

STANDARD DAY

(LANDPLANE AND FLOATPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: SEPTEMBER 1963
DATA BASIS: FLIGHT TEST

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145

CONDITIONS:

1. FAC CONFIGURATION

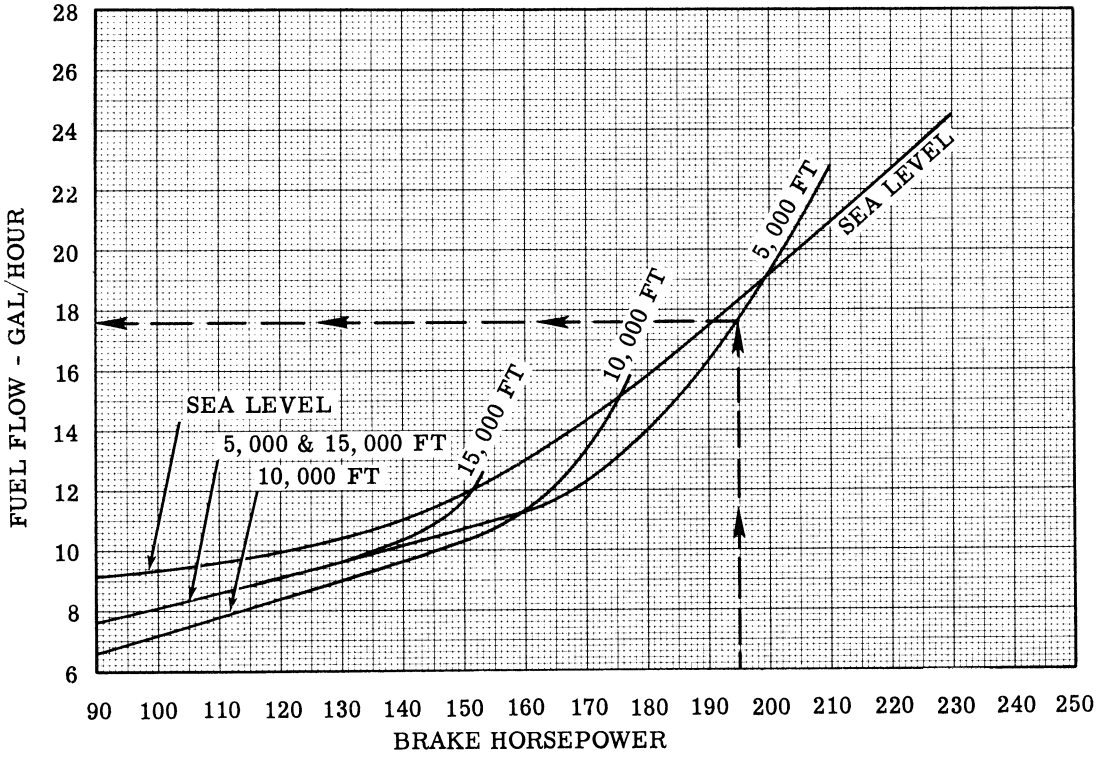


Figure F1A5-2.

PART 6 - LANDING DATA

TABLE OF CONTENTS

DISCUSSION OF CHARTS

LANDING GROUND ROLL

The Landing Ground Roll Chart, Figure F1A6-1, shows the total ground roll distance to stop after touchdown. The airspeed-gross weight configuration is shown on the landing airspeed table.

EXAMPLE: (see Figure F1A6-1)

Known: OAT - +20°F
Pressure altitude - 6000 feet
Gross weight - 3600 pounds
Headwind - 10 knots

Find: Landing ground run - 370 feet

EFFECT OF RUNWAY CONDITIONS.

Since the Landing Ground Roll chart is based on the use of a dry hard surface runway, the ground run portion of the landing distance may be expected to increase considerably when a slippery runway is encountered, due to less effective braking action. The EFFECT OF RUNWAY CONDITIONS chart provides a means of correcting the landing ground run to the existing runway surface conditions. Runway Condition Readings (RCR), as obtained from the weather forecast, may be applied directly to this chart.

NOTE

If no RCR is available, use 23 for dry runway, 15 for dry turf, 12 for wet runway, 08 for wet grass, wet sod or snow, and 05 for icy runway. For ICAO report of GOOD, use 23, for MEDIUM, use 12 and for POOR, use 05.

EXAMPLE:

Given: Landing ground roll of 600 feet

Find: Landing ground roll distance for RCR of 14

Solution:

1. Enter chart with ground roll (hard, dry surface) at 600 feet.
2. Move vertically upward to RCR of 14
3. From this point move horizontally left to landing ground roll (slippery runway) scale and read 890 feet.

TAKEOFF AND LANDING DATA CARD

A Takeoff and Landing Data Card is published as part of the Pilot's Abbreviated Checklist, T.O. 1U-10A-1CL-1. See Figure F1A6-2 for an example of this card. When the detailed analysis of the flight has been completed, the factors related to takeoff and landing performance shall be entered on the card for ready reference. This information may then be reviewed by the pilot as a checklist item prior to takeoff and landing.

CONDITIONS

GROSS WEIGHT - Gross weight of aircraft at takeoff.
RUNWAY LENGTH - Obtained from Base Operations or Air Force Pilot's Handbook.
OAT - Obtained from Base Operations or tower.
WIND - Obtained from Base Operations or tower.
PRESSURE ALTITUDE - Obtained from Base Operations or tower.

TAKEOFF

TAKEOFF DISTANCE - See Appendix Section, Part 3 for distance required for takeoff.
TAKEOFF SPEED - See Appendix Section, Part 3 for required takeoff airspeed.
CLIMB SPEED - See Appendix Section, Part 4 for required climb speed.

LANDING IMMEDIATELY AFTER TAKEOFF

APPROACH SPEED - See Appendix Section, Part 6, for required approach speed.
LANDING GROUND ROLL - Distance required to bring aircraft to a complete stop after touchdown. See Appendix Section, Part 6.

LANDING

FIELD ELEVATION - Obtained from Base Operations or tower.
LANDING GROSS WEIGHT - Takeoff gross weight minus weight of fuel required to complete the mission.
APPROACH SPEED - Best airspeed for approach. See Appendix Section, Part 6 for required approach speed.
LANDING GROUND ROLL - Distance required to bring aircraft to a complete stop after touchdown. See Appendix Section, Part 6.

LANDING GROUND ROLL

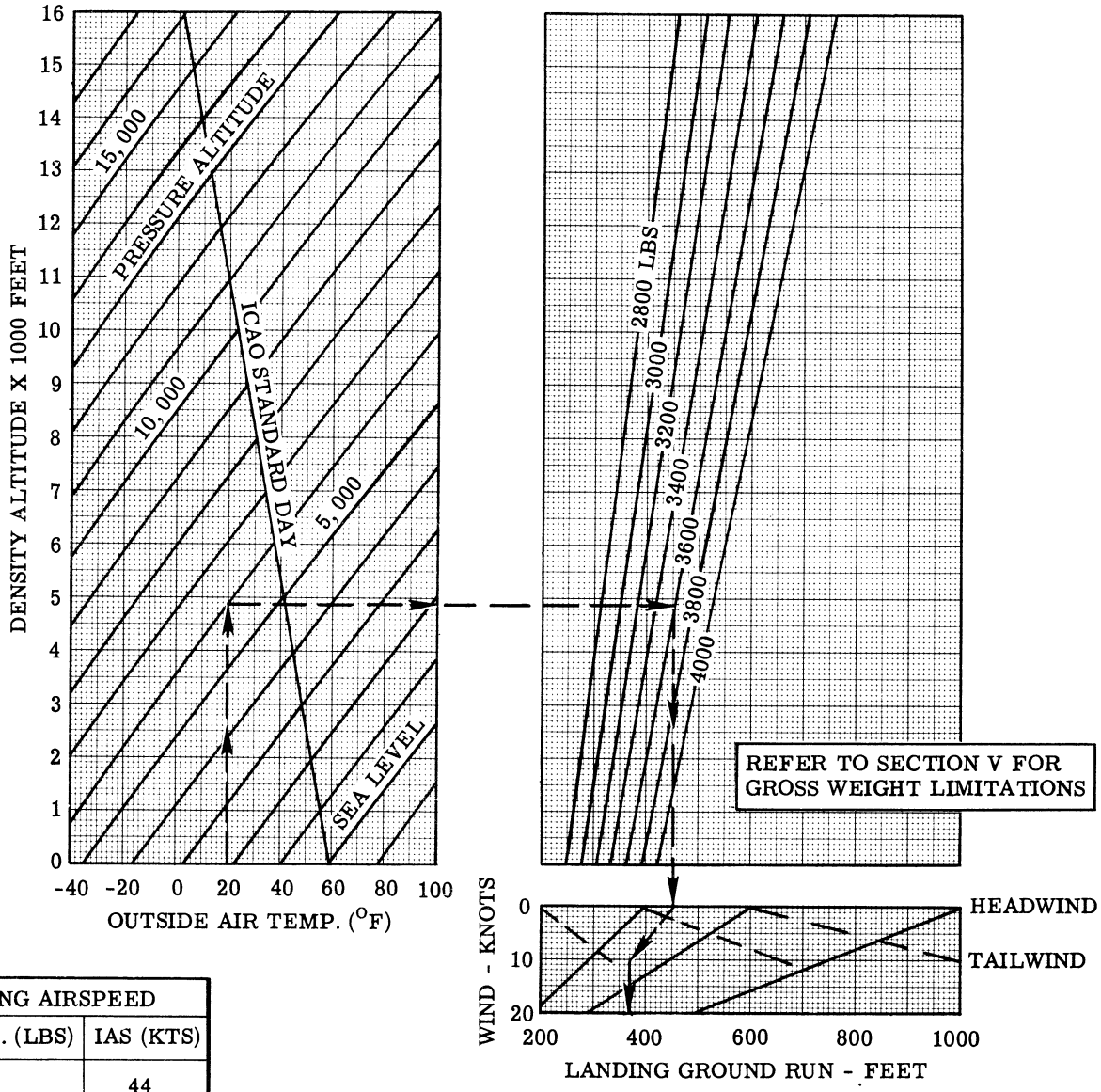
(LANDPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: SEPTEMBER 1963
DATA BASIS: FLIGHT TEST

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145

CONDITIONS:

1. MAX PERFORMANCE TECHNIQUE
2. FLAPS - 40° DN
3. DRY HARD RUNWAY SURFACE
4. FAC CONFIGURATION
5. LANDING AIRSPEED AT 50 FT. OBSTACLE - SEE TABLE



LANDING AIRSPEED	
GROSS WT. (LBS)	IAS (KTS)
2800	44
3000	45
3200	46
3400	47
3600	48
3800	50
4000	51

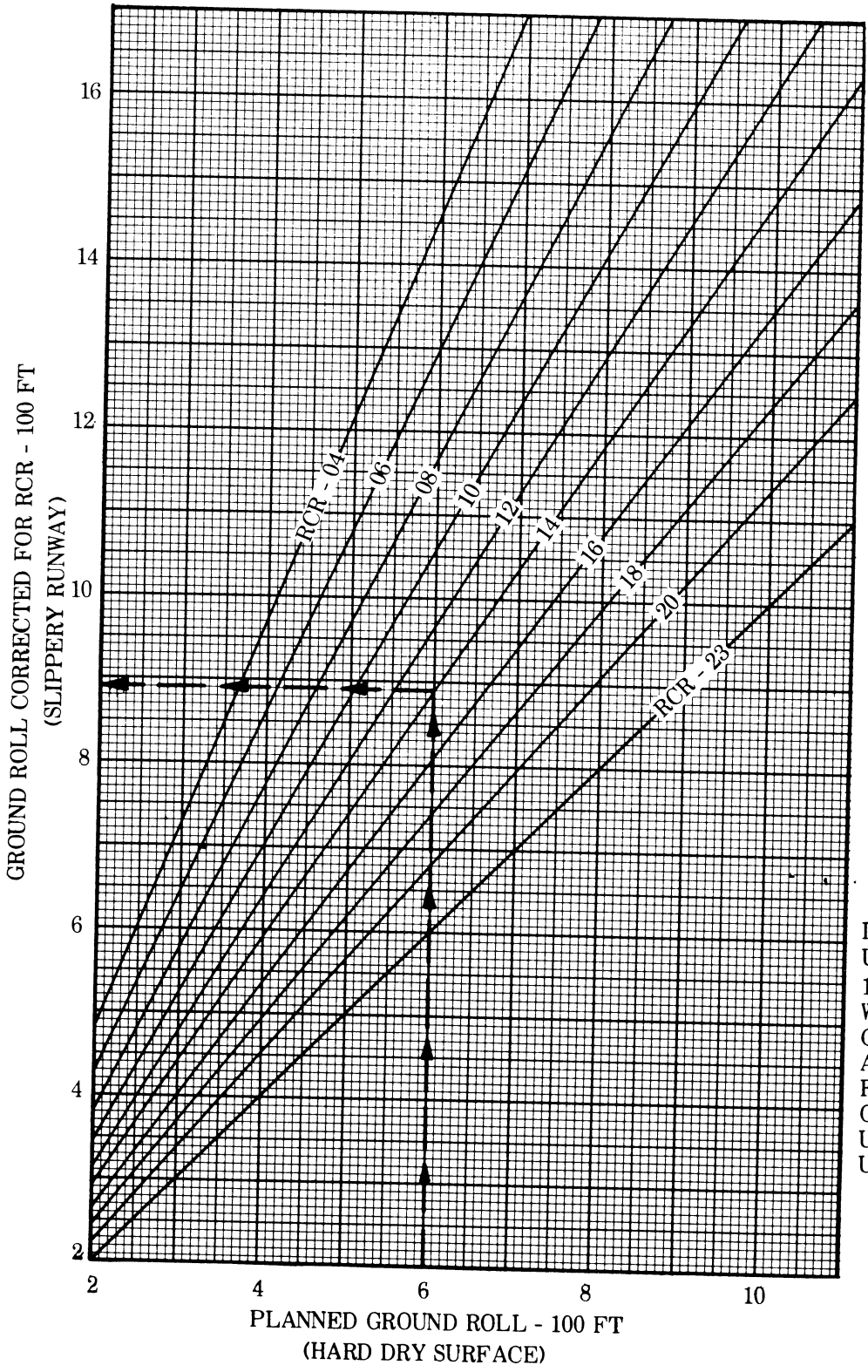
NOTE:
1. DISTANCE FROM 50-FT OBSTACLE TO TOUCHDOWN IS 490 FEET.

Figure F1A6-1.

EFFECT OF RUNWAY CONDITIONS

MODEL: U-10A & U-10B
DATE: SEPTEMBER 1963
DATA BASIS: ESTIMATED

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145



NOTE

IF NO RCR IS AVAILABLE, USE 23 FOR DRY RUNWAY, 15 FOR DRY TURF, 12 FOR WET RUNWAY, 08 FOR WET GRASS, WET SOD OR SNOW AND 05 FOR ICY RUNWAY. FOR ICAO REPORT OF GOOD, USE 23, MEDIUM, USE 12 AND FOR POOR, USE 05.

Figure F1A6-1A.

T.O. 1U-10A-1CL-1

TAKEOFF AND LANDING DATA CARD

CONDITIONS

GROSS WEIGHT _____

RUNWAY LENGTH _____

OAT _____

WIND _____

PRESSURE ALTITUDE _____

TAKEOFF

TAKEOFF DISTANCE _____

TAKEOFF SPEED _____

CLIMB SPEED _____

N-13

T.O. 1U-10A-1CL-1

TAKEOFF AND LANDING DATA CARD (CONTD)

LANDING IMMEDIATELY AFTER TAKEOFF

APPROACH SPEED _____

LANDING GROUND ROLL _____

LANDING

FIELD ELEVATION _____

LANDING GROSS WEIGHT _____

APPROACH SPEED _____

LANDING GROUND ROLL _____

N-14

Figure F1A6-2.

Appendix 2

FLOATPLANE PERFORMANCE DATA

Table Of Contents

PART 1 - INTRODUCTION

TABLE OF CONTENTS

DISCUSSION OF CHARTS

AIRSPEED POSITION CORRECTION CHART

The Airspeed Position Correction Chart, Figure F2A1-1, is used to convert indicated airspeed (IAS), by adding or subtracting the proper correction factor. Three curves for gross weights of 3000, 3500, and 4000 pounds are provided.

EXAMPLE: (see Figure F2A1-1)

Known: Indicated airspeed - 51 knots
Gross weight - 3000 pounds
Find: Calibrated airspeed - 53 knots
Add correction factor of 2 knots to 51 knots IAS

AIRSPEED POSITION CORRECTION CHART

(FLOATPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: SEPTEMBER 1963
DATA BASIS: FLIGHT TEST

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145

CONDITIONS:

1. OUT OF GROUND EFFECT
2. FAC CONFIGURATION
3. FLAPS - UP

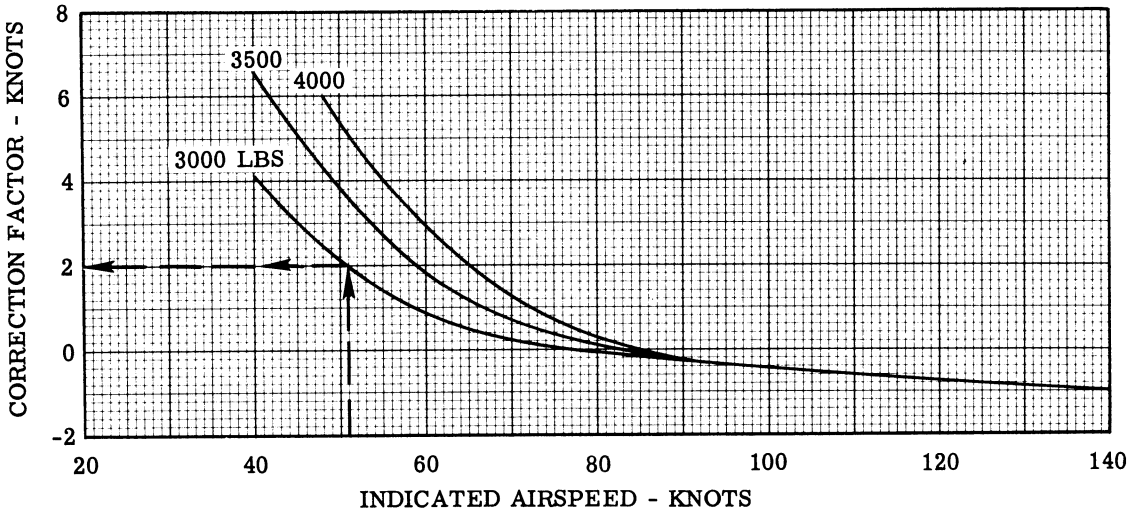


Figure F2A1-1.

PART 3 - TAKEOFF DATA

TABLE OF CONTENTS

DISCUSSION OF CHARTS

TAKEOFF AND LANDING CROSS-WIND CHART

The Takeoff and Landing Cross-Wind Chart, Figure F2A3-1, is used to determine headwind and cross-wind components, and whether a safe takeoff or landing can be accomplished. For this purpose the chart is divided into two areas; recommended and not recommended.

EXAMPLE: (see Figure F2A3-1)

Known: Wind angle (to takeoff path) - 60°
Wind velocity - 20 knots
Find: Is takeoff recommended
Solution: Proceed along 60° wind angle line to 20 knots wind velocity line. Takeoff or landing is not recommended.

TAKEOFF WATER RUN

The Takeoff Water Run Chart, Figure F2A3-2, is used to determine total water run to takeoff using an airspeed-gross weight configuration as shown on takeoff airspeed table.

EXAMPLE: (see Figure F2A3-2)

Known: OAT - +60°F
Pressure altitude - 4000 feet
Gross weight - 3600 pounds
Headwind - 10 knots
Find: Water Run - 1340 feet

TAKEOFF DISTANCE TO CLEAR 50 FT. OBSTACLE

The Takeoff Distance to Clear 50-Ft. Obstacle Chart, Figure F2A3-3, is used to determine the total distance to clear a 50 ft. obstacle during takeoff. The effects of altitude and gross weight on takeoff airspeed at the 50 ft. obstacle are noted on the chart.

EXAMPLE: (see Figure F2A3-3)

Known: OAT - +40°F
Pressure altitude - 4000 feet
(At this altitude, airspeed at 50 ft. obstacle = takeoff airspeed)
Gross weight - 3400 pounds
Headwind - 10 knots
Find: Takeoff distance over 50 ft. obstacle - 1200 feet

REFUSAL SPEED AND DISTANCE

The refusal speed and distance chart, figure F2A3-4, is used to determine if the takeoff should be aborted due to malfunction of the aircraft. The takeoff should be aborted if a malfunction occurs before the refusal speed or refusal distance is attained by the aircraft. The takeoff run, obtained from Figure F2A3-2, and gross weight determine the refusal speed and distance.

Example: (See Figure F2A3-4)

Known: Takeoff run - 2000 feet
Gross Weight - 3200 pounds

Find: Refusal Speed - 34.1 knots
Refusal Distance - 345 feet

TAKEOFF AND LANDING CROSS-WIND CHART

STANDARD DAY

(FLOATPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: MAY 1964
DATA BASIS: CALCULATED

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145

NOTE: Use maximum gust velocity for determining cross-wind component and steady wind velocity for determining headwind component.

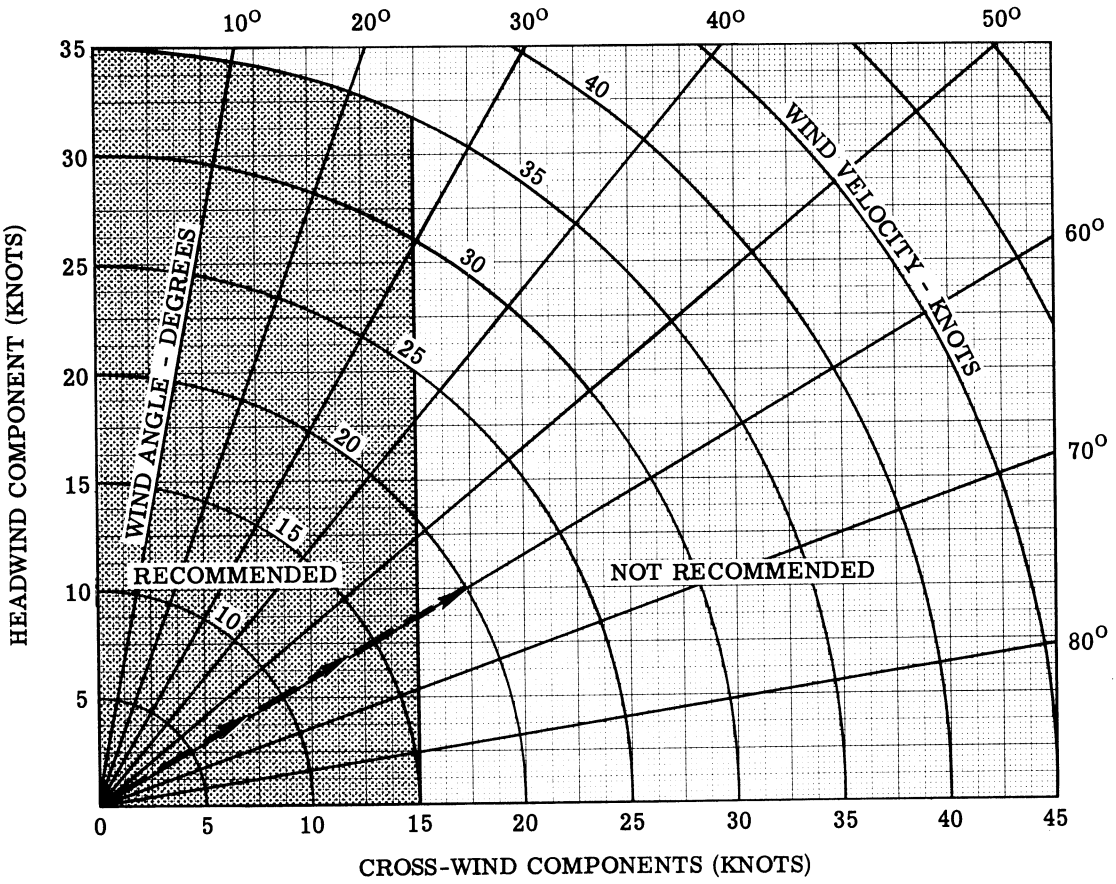


Figure F2A3-1.

TAKEOFF WATER RUN

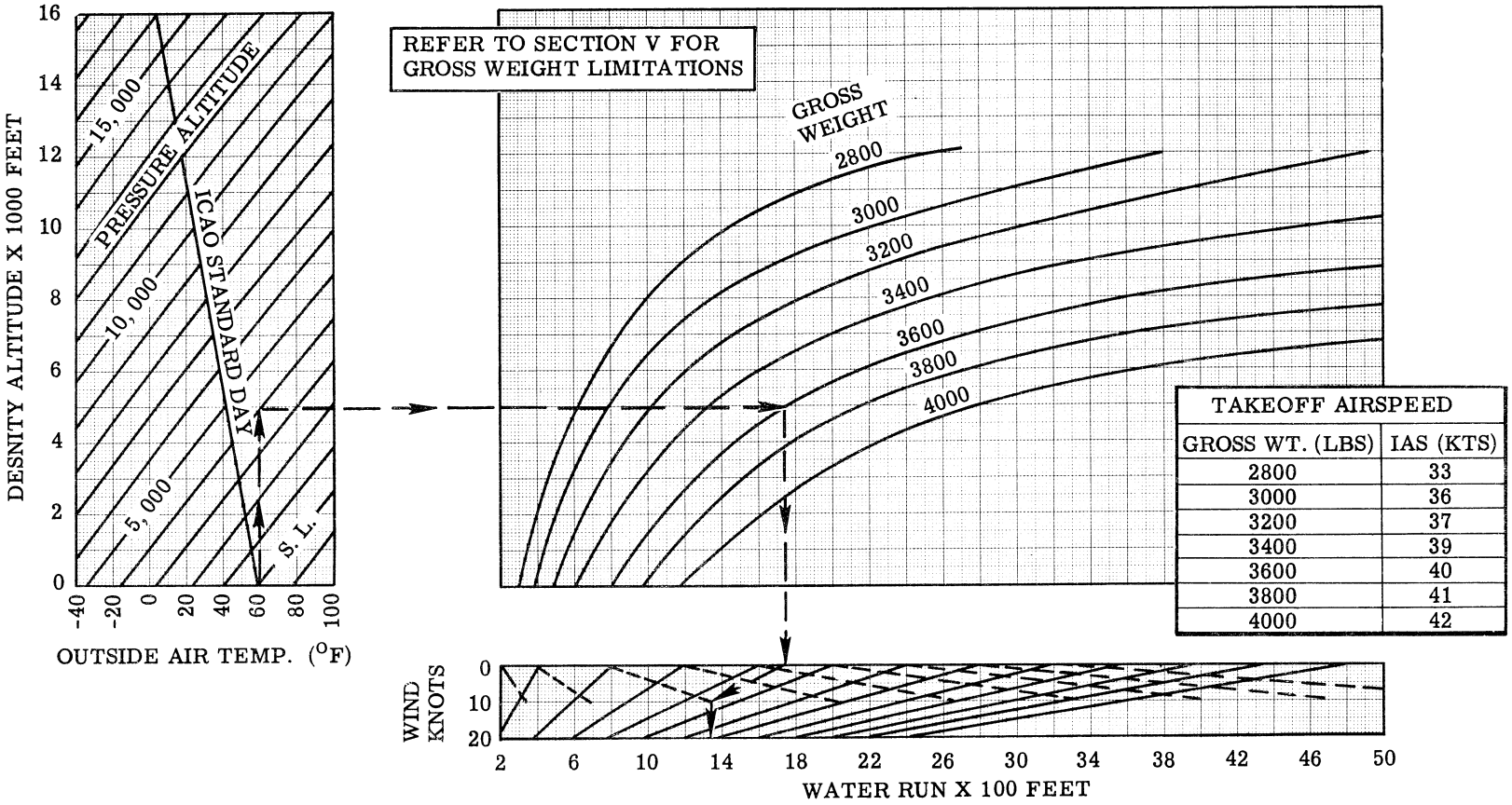
(FLOATPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: SEPTEMBER 1963
DATA BASIS: FLIGHT TEST

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145

CONDITIONS:

1. FAC CONFIGURATION
2. MAXIMUM POWER
3. FLAPS - 20° DN
4. COWL FLAPS - OPEN
5. TAKEOFF AIRSPEED - SEE TABLE



TAKEOFF AIRSPEED	
GROSS WT. (LBS)	IAS (KTS)
2800	33
3000	36
3200	37
3400	39
3600	40
3800	41
4000	42

Figure F2A3-2.

TAKEOFF DISTANCE TO CLEAR 50-FT. OBSTACLE

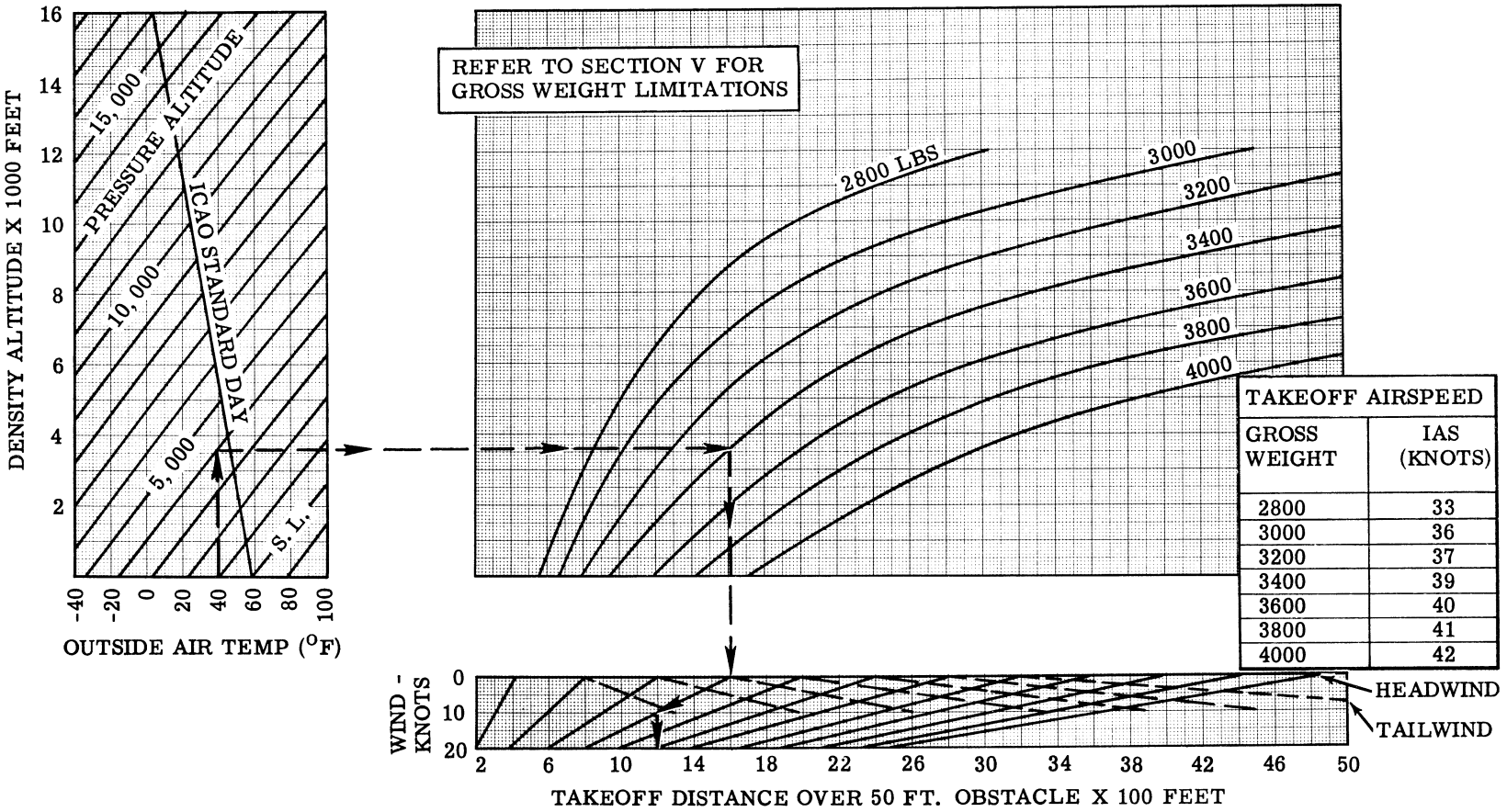
(FLOATPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: SEPTEMBER 1963
DATA BASIS: FLIGHT TEST

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145

CONDITIONS:

1. MAXIMUM PERFORMANCE TECHNIQUE
2. MAXIMUM POWER
3. FLAPS - 20° DOWN
4. COWL FLAPS - OPEN
5. FAC CONFIGURATION
6. SEA LEVEL - AIRSPEED AT 50 FT OBSTACLE = TAKEOFF AIRSPEED (IAS)
7. 6000 FT. ALTITUDE AND ABOVE - AIRSPEED AT 50 FT. OBSTACLE = TAKEOFF AIRSPEED +3 KTS (IAS)



TAKEOFF AIRSPEED	
GROSS WEIGHT	IAS (KNOTS)
2800	33
3000	36
3200	37
3400	39
3600	40
3800	41
4000	42

Figure F2A3-3.

REFUSAL SPEED AND DISTANCE

(FLOATPLANE)

NOTE: U-10A, U-10B, & U-10D
DATE: JUNE 1968
DATA BASIS: ESTIMATED

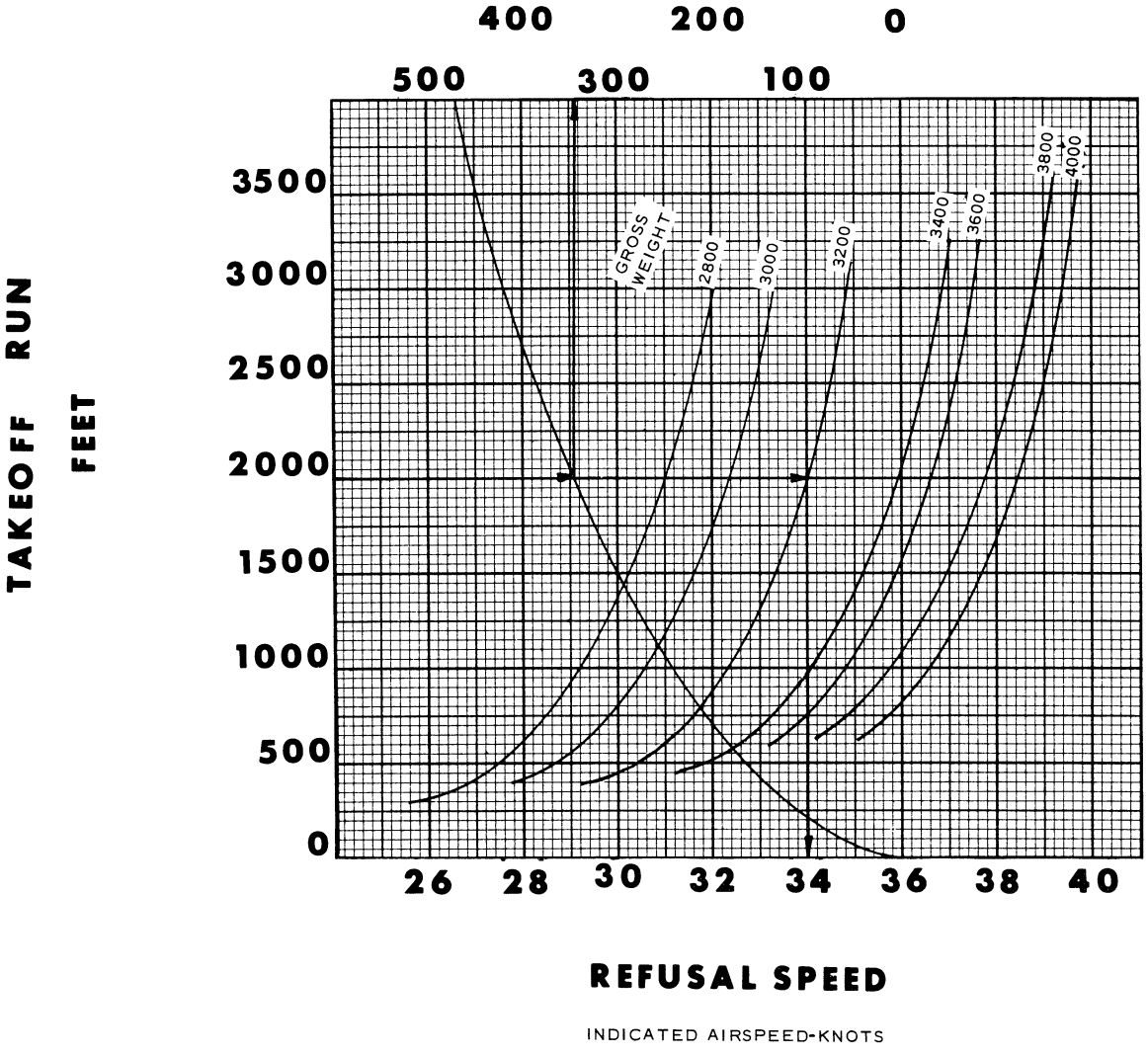


Figure F2A3-4

PART 4 - CLIMB DATA

TABLE OF CONTENTS

DISCUSSION OF CHARTS

CLIMB PERFORMANCE

The Climb Performance Chart, Figure F2A4-1, shows time to climb, nautical air miles traveled, and fuel used for various gross weights

EXAMPLE: (see Figure F2A4-1)

Known: OAT - +50°F
Pressure altitude - 8000 feet
Gross weight - 3600 pounds

Find: Time to climb - 18 minutes
Nautical air miles traveled - 26 miles
Fuel used - 7 gallons (Add 2. 2 gallons for taxi and takeoff)

RATE OF CLIMB

The Rate of Climb Chart, Figure F2A4-2, shows rate of climb versus density altitude at various gross weights using METO power and a recommended climb speed of 79 knots CAS.

EXAMPLE: (see Figure F2A4-2)

Known: Density altitude - 5000 feet
Gross weight - 3200 pounds

Find: Rate of climb - 700 fpm

CLIMB PERFORMANCE

(FLOATPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: SEPTEMBER 1963
DATA BASIS: FLIGHT TEST

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145

CONDITIONS:

1. METO POWER
2. MIXTURE - FULL RICH
3. COWL FLAPS - CLOSED
4. AIRSPEED - 79 KTS CAS
5. FAC CONFIGURATION

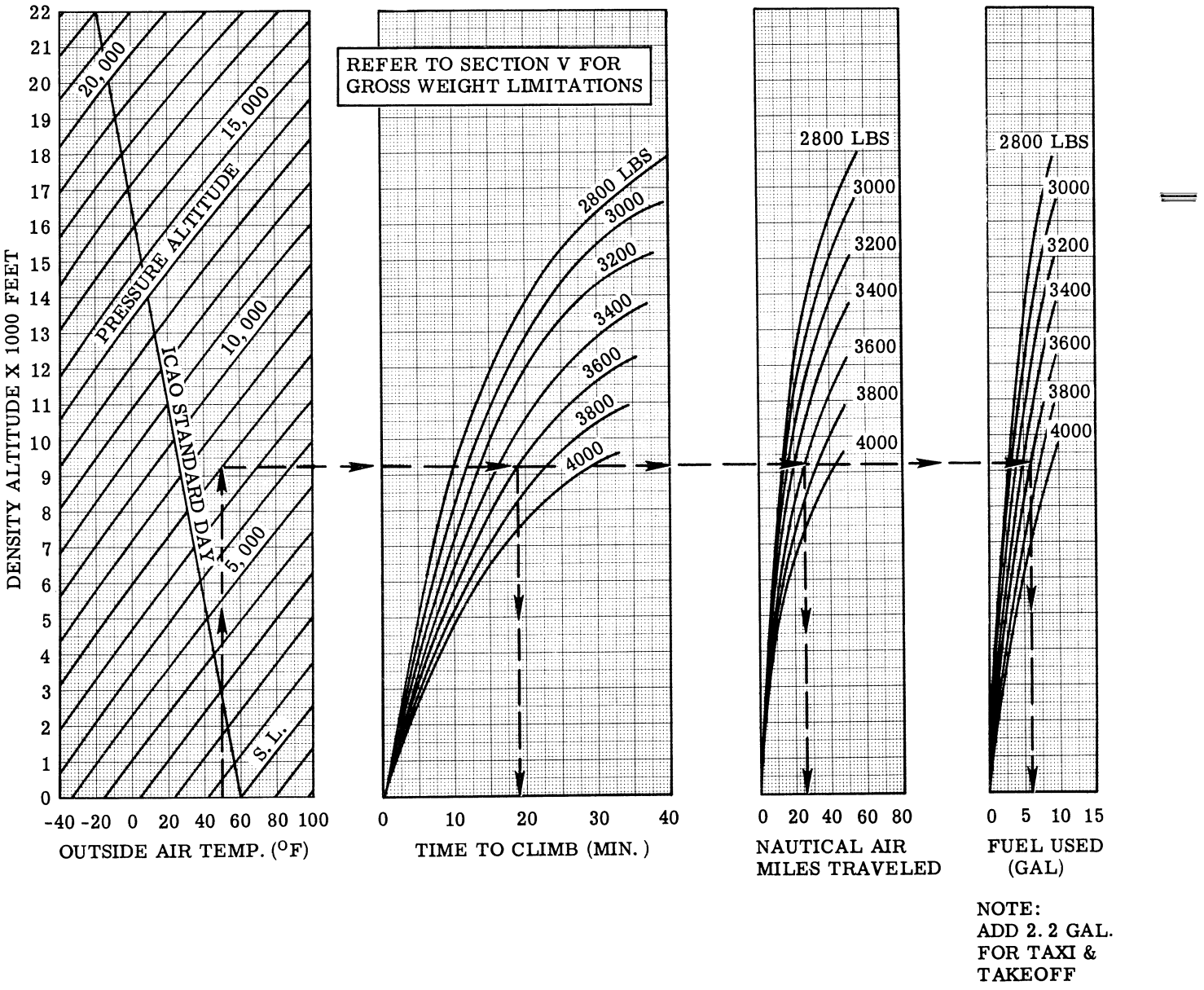


Figure F2A4-1.

RATE OF CLIMB

(FLOATPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: SEPTEMBER 1963
DATA BASIS: FLIGHT TEST

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145

CONDITIONS:

1. METO POWER
2. COWL FLAPS - CLOSED
3. MIXTURE - FULL RICH
4. FAC CONFIGURATION

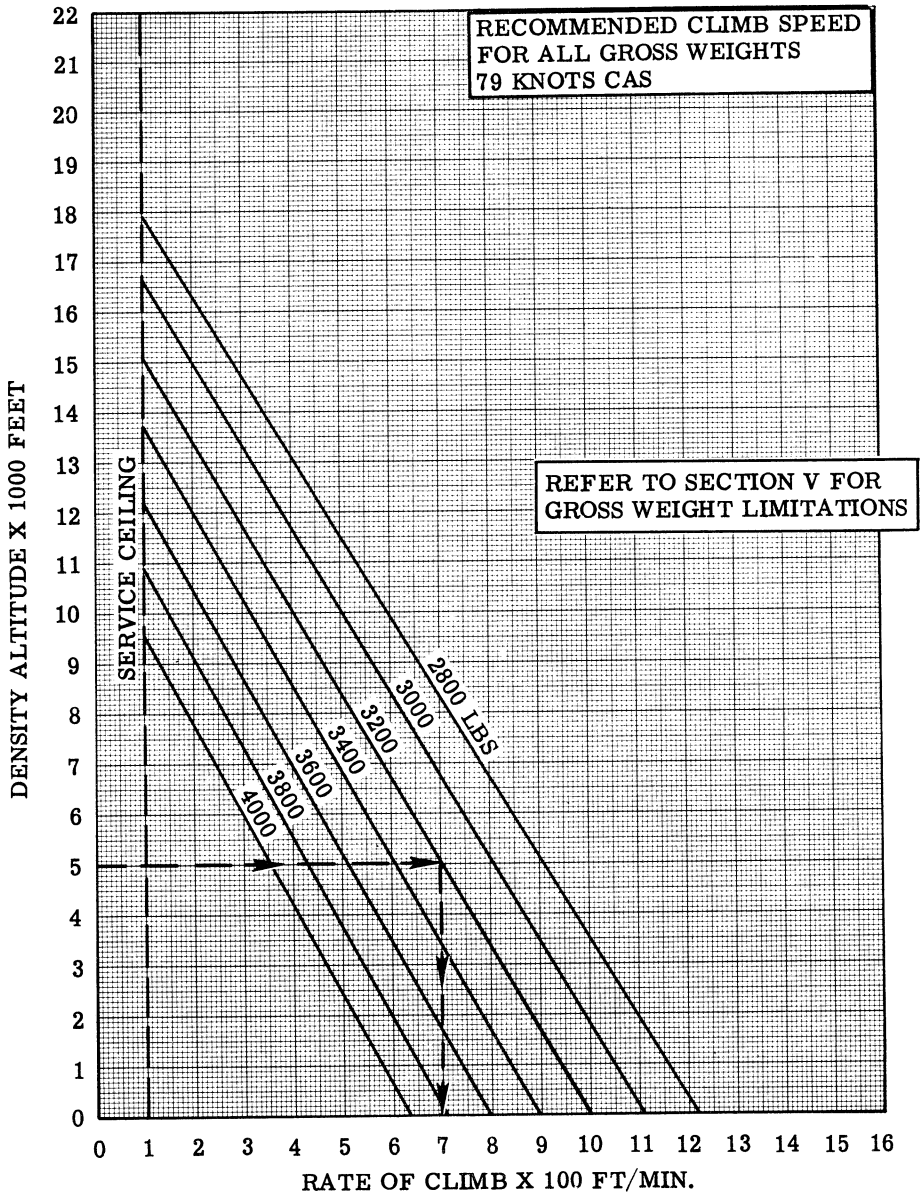


Figure F2A4-2.

PART 5 - CRUISE DATA

TABLE OF CONTENTS

DISCUSSION OF CHARTS

LEVEL FLIGHT PERFORMANCE

The Level Flight Performance Chart, Figure F2A5-1, is used to determine the brake horsepower required to cruise at a given speed and density altitude. Both calibrated and true airspeeds are included and are expressed in knots.

EXAMPLE: (see Figure F2A5-1)

Known: Cruise density altitude - 10, 000 feet
True airspeed - 90 knots
Gross weight - 3200 pounds

Find: BHP required - 118
CAS - 77 knots

CRUISE FUEL CONSUMPTION

See Figure F1A5-2 Appendix 1.

LEVEL FLIGHT PERFORMANCE

STANDARD DAY
(FLOATPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: SEPTEMBER 1963
DATA BASIS: FLIGHT TEST

CONDITIONS:
1. FAC CONFIGURATION

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145

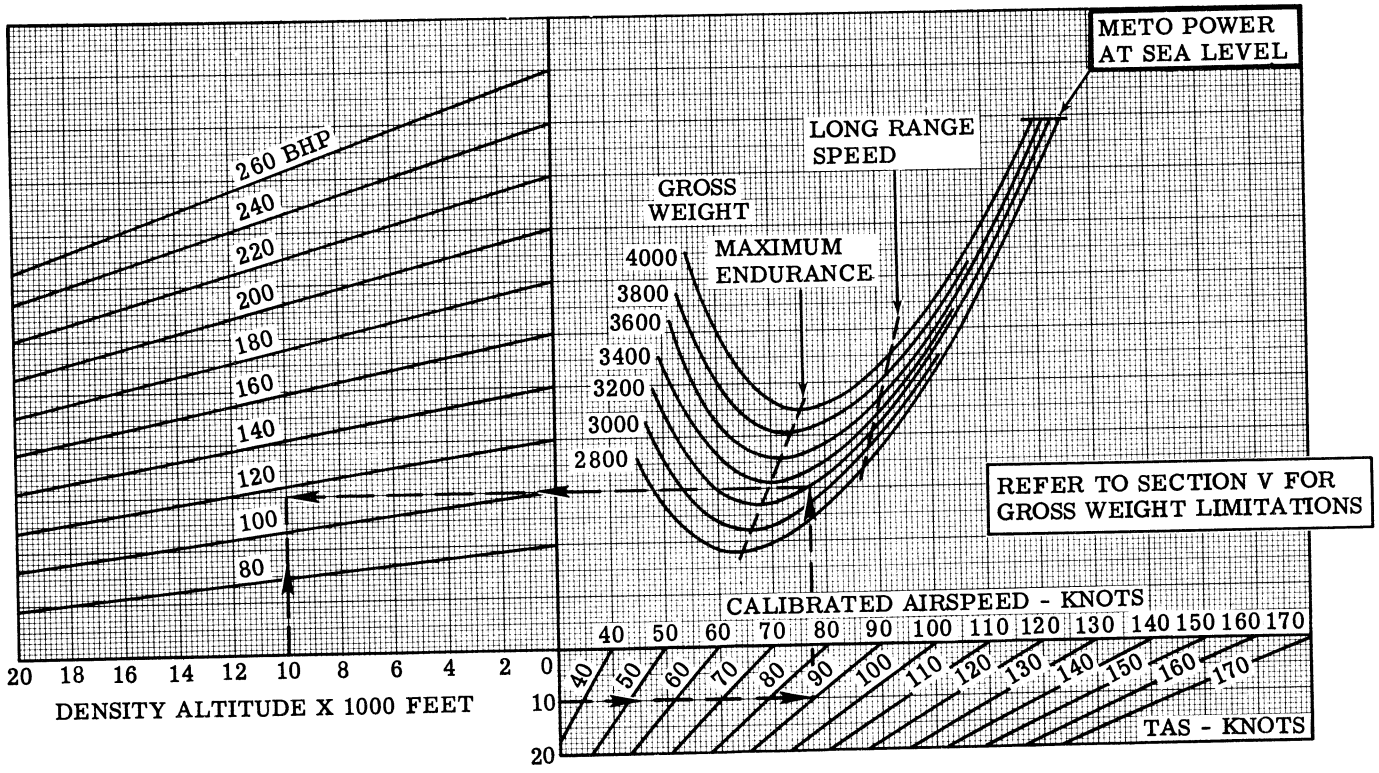


Figure F2A5-1.

PART 6 - LANDING DATA

TABLE OF CONTENTS

DISCUSSION OF CHARTS

LANDING WATER RUN

The Landing Water Run Chart, Figure F2A6-1, shows the total water run distance to stop after touchdown. The airspeed-gross weight configuration is shown on the landing airspeed table. The distance to touchdown over 50 ft. obstacle is shown on a table on the chart.

EXAMPLE: (see Figure F2A6-1)

Known: OAT - +50°F
Pressure altitude - 4000 feet
Gross weight - 3800 pounds
Headwind - 10 knots

Find: Water run to stop - 410 feet

LANDING WATER RUN

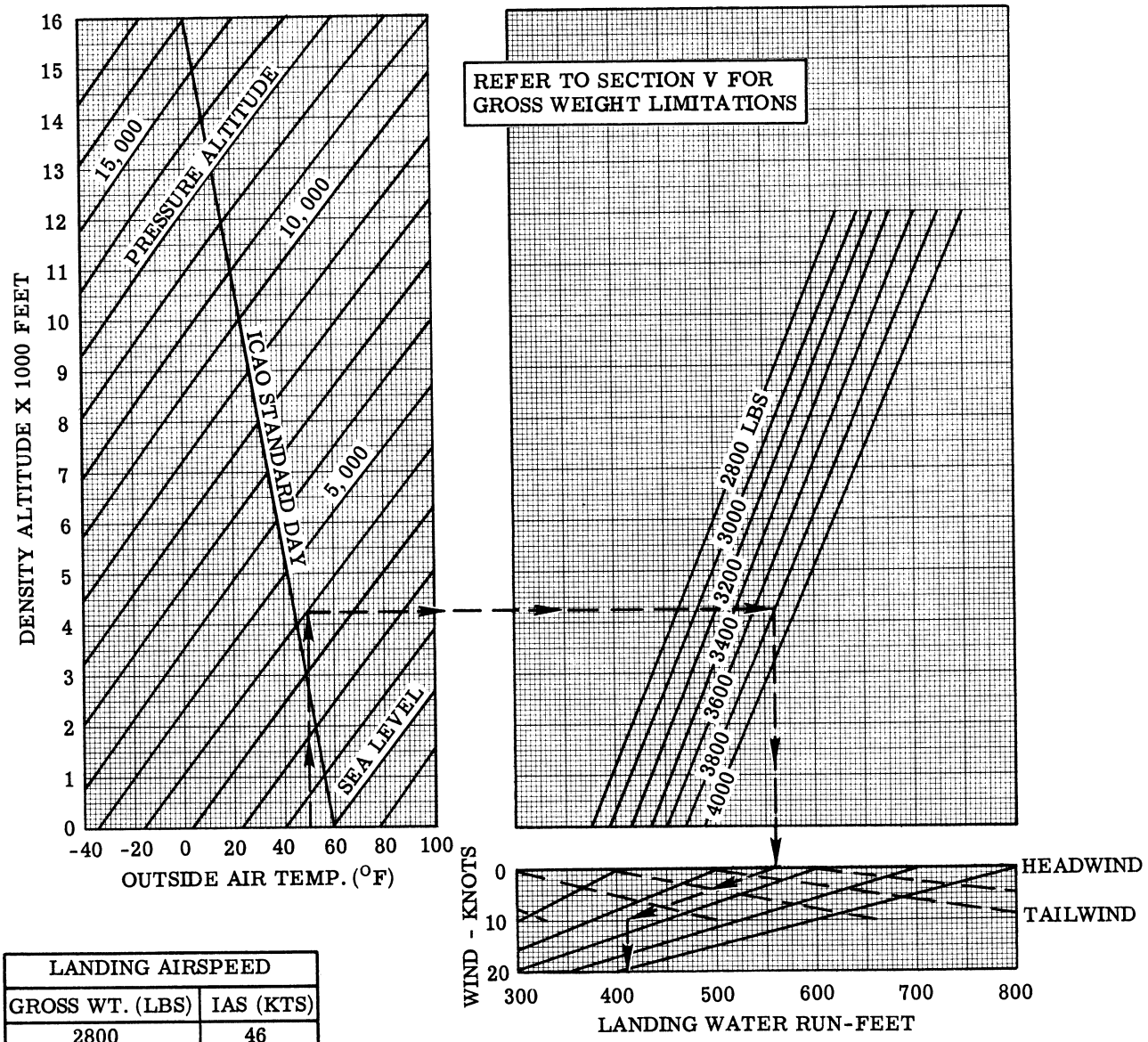
(FLOATPLANE)

MODEL: U-10A, U-10B, & U-10D
DATE: SEPTEMBER 1963
DATA BASIS: FLIGHT TEST

ENGINE: GO-480-G1D6
FUEL DENSITY: 6.0 LBS/GAL.
FUEL GRADE: 115/145

CONDITIONS:

1. MAX PERFORMANCE TECHNIQUE
2. FLAPS - 40° DN
3. LANDING SPEED AT 50 FT. OBSTACLE - SEE TABLE



LANDING AIRSPEED	
GROSS WT. (LBS)	IAS (KTS)
2800	46
3000	47
3200	48
3400	49
3600	49
3800	50
4000	50

DISTANCE TO TOUCHDOWN OVER 50'OBSTACLE				
GR. WT.	FLAPS	ALT.	50' TO TOUCHDN	TECHNIQUE
3300 Lbs	40°	S. L.	510 Ft.	Max.
3900 Lbs	40°	S. L.	400 Ft.	Max.
3300 Lbs	40°	6000 Ft.	565 Ft.	Max.
3900 Lbs	40°	6000 Ft.	425 Ft.	Max.

Figure F2A6-1.

ALPHABETICAL INDEX

*indicates illustration

*indicates illustration

G

H

I

J

L

*indicates illustration

*indicates illustration