OPERATIONAL SUPPLEMENT

FLIGHT MANUAL

USAF SERIES

T-28B, T-28C AND AT-28D

AIRCRAFT

THIS PUBLICATION SUPPLEMENTS T.O. 1T-28B-1.

COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS SUPPLEMENT TO THE ATTENTION OF ALL AFFECTED AF PERSONNEL.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

15 JANUARY 1974

1. PURPOSE.

To add information concerning the carriage and release of the LAU-3D/A Rocket Launcher on the T-28 aircraft.

2. INSTRUCTIONS.

Flight limits and drag index for the carriage and release of the LAU-3D/A Rocket Launcher are the same as those presently contained in the flight manual for the LAU-3/A Rocket Launcher. The store weight is 78 pounds empty and 469 pounds loaded.

STATUS OF FLIGHT MANUAL, SUPPLEMENTS, CHECKLISTS, AND OPERATIONAL SUPPLEMENTS

This page provides a comprehensive listing of the current flight manual, supplements, checklists, and operational supplements. If any publications listed on this page are missing from your file, requisition them in accordance with the requirements of T.O. 00-5-2. Periodically, check index T.O. 0-1-1-5 to make sure you have copies of the latest publications.

CURRENT FLIGHT MANUAL AND SUPPLEMENTS	DATE	CHANGE
T.O. 1T-28B-1	31 Oct 70	1 Apr 73

CURRENT CHECKLISTS	DATE	CHANGE
T.O. 1T-28B-1CL-1	31 Oct 70	7 Feb 72

CURRENT OPERATIONAL SUPPLEMENTS	DATE	SHORT TITLE
T.O. 1T-28B-1S-35	1 Oct 71	Takeoff Distance Chart
-36	11 Oct 71	LAU-68A/A Rocket Launcher
-37	3 Nov 71	CBU-25B/A Carriage and Release
-38	7 Jan 72	Aircraft Fuel System Nomenclature Revision
-39	21 Nov 72	Caging the Attitude Indicator
-40	15 Jan 74	Carriage and Release of the LAU-3D/A Rocket Launcher

THE END

SAFETY SUPPLEMENT

FLIGHT MANUAL

USAF SERIES

T-28B
T-28C
AT-28D

ARMAMENT MODIFIED

AIRCRAFT

THIS PUBLICATION SUPPLEMENTS T.O. 1T-28B-1, DATED 31 OCTOBER 1970, AND REPLACES INTERIM SAFETY SUPPLEMENT T.O. 1T-28B-1SS-19 DATED 20 DECEMBER 1972.

COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS SUPPLEMENT TO THE ATTENTION OF ALL AFFECTED AF PERSONNEL.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

25 JANUARY 1973

1. PURPOSE.

To impose flight restrictions on all T-28 Aircraft not modified by T.O. 1T-28-569.

2. GENERAL.

Experience, tests and studies indicate that the horizontal stabilizer on T-28 aircraft not modified by T.O. 1T-28-569, is marginal in static strength for abrupt control maneuvers in the low speed high "G" and high speed low "G" regions of the flight envelope. In order to prevent a possible inflight structural failure, certain flight limits must be imposed.

3. INSTRUCTIONS.

a. Until T.O. 1T-28-569 is complied with, the following flight restriction is added to the "PROHIBITED MANEUVERS" in the flight manual: "Pull-outs, push-overs or maneuvers exceeding 90 degrees per second rate of pitch change."

b. All other limitations stated in the flight manual remain in effect. This limitation is removed when T.O. 1T-28-569 has been complied with.

STATUS OF FLIGHT MANUAL, CHECKLISTS AND SAFETY SUPPLEMENTS

This page provides a comprehensive listing of the current flight manual, checklists and safety supplements. If any publications listed on this page are missing from your file, requisition them in accordance with the requirements of T.O. 00-5-2. Index T.O. 0-1-1-5 should be checked periodically to make sure you have copies of the latest publications.

CURRENT FLIGHT MANUAL	DATE	CHANGE
T.O. 1T-28B-1	31 October 1970	17 March 1972
CURRENT CHECKLISTS		
T.O. 1T-28B-1CL-1	31 October 1970	7 February 1972

CURRENT SAFETY SUPPLEMENTS	DATE	SHORT TITLE
T.O. 1T-28B-1SS-16	30 Sep 71	Aerodynamic Braking
-17	06 Dec 71	Extraction System Malfunction
-18	07 Feb 72	Aborted Takeoff and Generator Failure
-20	25 Jan 73	Flight Restrictions

REPLACED OR RESCINDED SAFETY SUPPLEMENTS

T.O. 1T-28B-1SS-19 (Int)	20 Dec 72	Replaced by -1SS-20

NOTE

This status sheet will be revised to comply with T.O. 00-5-1, paragraph 5.11.b., at the time of the next revision of this manual.

THE END

SAFETY SUPPLEMENT

FLIGHT MANUAL

USAF SERIES

T-28B
T-28C
AT-28D

ARMAMENT MODIFIED

AIRCRAFT

THIS PUBLICATION SUPPLEMENTS T.O. 1T-28B-1, DATED 31 OCTOBER 1970.

COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS SUPPLEMENT TO THE ATTENTION OF ALL AFFECTED AF PERSONNEL.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

25 OCTOBER 1973

1. PURPOSE.

To revise information in the basic manual concerning extraction.

2. INSTRUCTIONS.

On page 3-14B under heading EXTRACTION, after step 3. a WARNING is added to read:

WARNING

Inadvertent actuation of the secondary escape handle disengages the extraction rocket. This eliminates the possibility of extraction. The only method of escape left to the aircrew is the manual bailout.

STATUS OF FLIGHT MANUAL, CHECKLIST AND SAFETY SUPPLEMENTS

This page provides a comprehensive listing of the current flight manual, checklists, and safety supplements. If any publications listed on this page are missing from your files, requisition them in accordance with the requirements of T.O. 00-5-2. Index T.O. 0-1-1-5 should be checked periodically to make sure you have copies of the latest publication.

CURRENT FLIGHT MANUAL	DATE	CHANGE
T.O. 1T-28B-1	31 Oct 70	1 Apr 73

CURRENT CHECKLISTS		
T.O. 1T-28B-1CL-1	31 Oct 70	7 Feb 72

CURRENT SAFETY SUPPLEMENTS	DATE	SHORT TITLE
T.O. 1T-28B-1SS-20	25 Jan 73	Flight Restrictions (Not Modified by T.O. 1T-28-569)
-25	20 Sep 73	Flight Restrictions
-26	25 Oct 73	Revised Extraction

NOTE

This status sheet will be revised to comply with T.O. 00-5-1, paragraph 5.11.B., at the next revision of this manual.

THE END

SAFETY SUPPLEMENT

FLIGHT MANUAL

USAF SERIES

T-28B
T-28C
AT-28D

ARMAMENT MODIFIED

AIRCRAFT

THIS PUBLICATION SUPPLEMENTS T.O. 1T-28B-1 DATED 31 OCTOBER 1970, AND REPLACES SAFETY SUPPLEMENT T.O. 1T-28B-1SS-25 DATED 20 SEPTEMBER 1973.

COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS SUPPLEMENT TO THE ATTENTION OF ALL AFFECTED AF PERSONNEL.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

20 AUGUST 1974

1. PURPOSE.

To impose flight restrictions on certain T-28B, C and AT-28D aircraft.

2. GENERAL.

As a result of fatigue damage assessment analysis of the wing lug area, a flight restriction is being placed on certain T-28 and AT-28 aircraft.

3. INSTRUCTIONS.

Pending compliance with T.O. 1T-28-595 (formerly T.O. 1T-28-588), "Modification of Wing Spar Cap Lugs, Wing Station 0.0, T-28 Aircraft," those aircraft identified by T.O. 1T-28-597 (formerly T.O. 1T-28-589), are restricted to a maximum positive 4 "G" limitation for all configurations and maneuvers. Negative "G" limitations and all other acceleration limits remain as stated in Section V of the flight manual. This limitation is removed when T.O. 1T-28-595 has been complied with.

STATUS OF FLIGHT MANUAL, CHECKLISTS AND SAFETY SUPPLEMENTS

This page provides a comprehensive listing of the current flight manual, checklists and safety supplements. If any publications listed on this page are missing from your file, requisition them in accordance with the requirements of T.O. 00-5-2. Index T.O. 0-1-1-5 should be checked periodically to make sure you have copies of the latest publications.

CURRENT FLIGHT MANUAL	DATE	CHANGE
T.O. 1T-28B-1	31 Oct 70	1 Apr 73
CURRENT CHECKLISTS		
T.O. 1T-28B-1CL-1	31 Oct 70	7 Feb 72

CURRENT SAFETY SUPPLEMENTS	DATE	SHORT TITLE
T.O. 1T-28B-1SS-20	25 Jan 73	Flight Restrictions (Not Modified by T.O. 1T-28-569)
-26	25 Oct 73	Revised Extraction
-27	20 Aug 74	Flight Restrictions (On aircraft modified by T.O. 1T-28-597)

REPLACED OR RESCINDED SAFETY SUPPLEMENTS

T.O. 1T-28B-1SS-25	20 Sep 73	Replaced by -1SS-27

NOTE

This status sheet will be revised to comply with T.O. 00-5-1, paragraph 5.11.B., at the next revision of this manual.

THE END

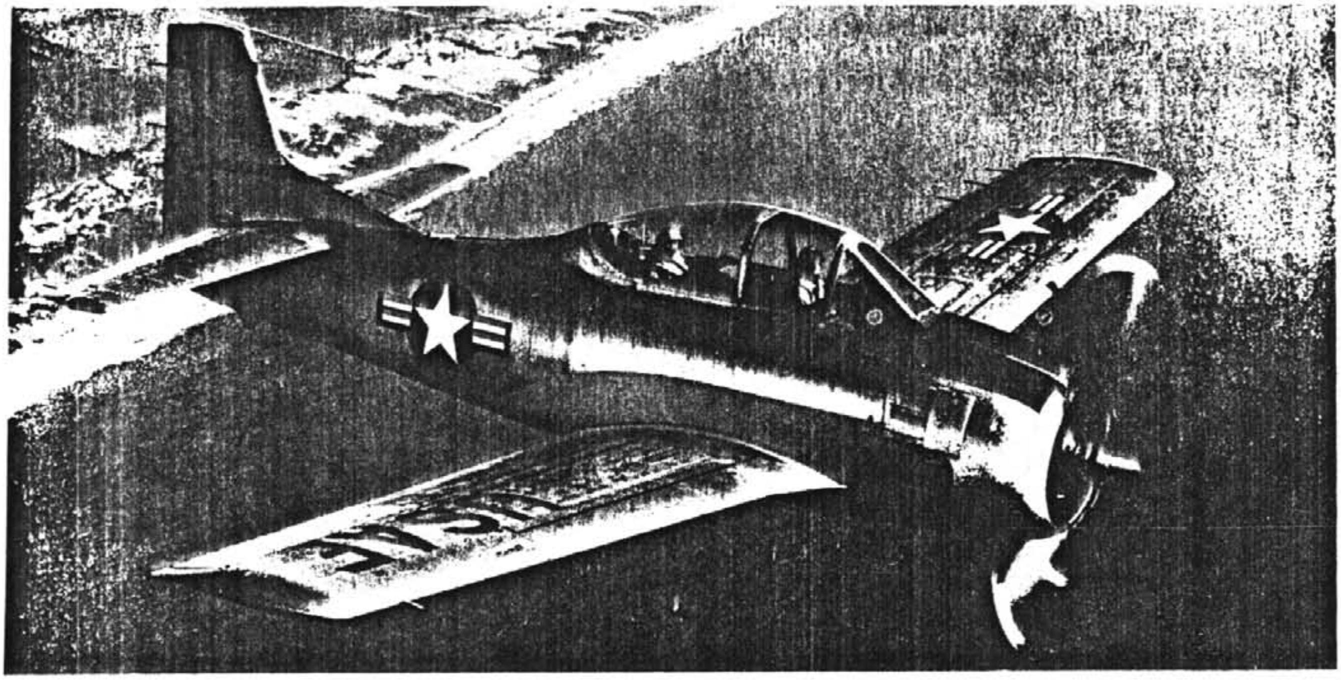
FLIGHT MANUAL

USAF SERIES

T-28B T-28C ARMAMENT MODIFIED

AT-28D

AIRCRAFT
CONTRACT AF04 (607)-6776
F04606-67-A-1920



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

This change incorporates Safety Supplement T. O. 1T-28B-1SS-16.

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

31 OCTOBER 1970

Change 4 – 1 APRIL 1973

Technical orders are normally distributed promptly after printing. Date(s) shown on the title page (lower right) are for identiification only. This is not a distribution date. Processing time sometimes causes distribution to only appear to have been delayed.

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES.

LIST OF EFFECTIVE PAGES

NOTE: The portion of the text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and changed pages are:

Change . . . 0 . . . 31 Oct 70
Change . . . 1 . . . 15 Oct 71
Change . . . 2 . . . 17 Mar 72
Change . . . 3 . . . 31 Dec 72
Change . . . 4 . . . 1 Apr 73

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 240 CONSISTING OF THE FOLLOWING:

Page No.	Change No.	Page No.	Change No.	Page No.	Change No.
Title	4	3-2	3	4-39	1
A	4	3-3	0	4-40 — 4-42	0
i	0	3-4	3	4-43	1
ii	1	3-5 — 3-6	0	4-44 — 4-50	0
iii — iv	0	3-7 — 3-8	3	5-1 — 5-7	0
1-1	4	3-9 — 3-11	0	5-8 — 5-9	3
1-2	3	3-12 — 3-13	3	5-10 — 5-11	0
1-3 — 1-5	0	3-14	1	5-12 Blank	0
1-6	3	3-14A	1	6-1 — 6-6	0
1-7	1	3-14B	3	7-1 — 7-6	0
1-8 — 1-12	0	3-15 — 3-16	0	9-1 — 9-8	0
1-13	4	3-17	3	A-1	0
1-14 — 1-15	3	3-18 — 3-19	0	A-2 Blank	0
1-16	4	3-20 Blank	0	A1-1 — A1-3	0
1-17	1	4-1	1	A1-4	3
1-18 — 1-22	0	4-2 — 4-5	0	A1-5 — A1-13	0
1-23	4	4-6	4	A1-14 Blank	0
1-24	3	4-7	1	A2-1 — A2-7	0
1-25	2	4-8 — 4-12	0	A2-8	3
1-26 — 1-28	1	4-13	4	A2-8A — A2-B Added	3
1-29	3	4-14 — 4-17	0	A2-9	3
1-30 — 1-38	0	4-18	4	A2-10 — A2-12	0
2-1 — 2-4	0	4-19	0	A3-1 — A3-7	0
2-5 — 2-6	3	4-20 — 4-21	4	A3-8 Blank	0
2-7	0	4-22 — 4-24	0	A4-1 — A4-14	0
2-8 — 2-9	1	4-25 — 4-26	3	A5-1 — A5-2	0
2-10 — 2-14	0	4-27 — 4-30	0	A6-1 — A6-3	0
2-15	4	4-31 — 4-33	1	A6-4 Blank	0
2-16	0	4-34	0	A7-1 — A7-3	0
2-17	3	4-35 — 4-38	1	A7-4 Blank	0
2-18 Blank	3	4-38A Added	1	X1 — X10	0
3-1	0	4-38B Blank Added	1		

Upon receipt of the second and subsequent changes to this technical order, personnel responsible for maintaining this publication in current status will ascertain that all previous changes have been received and incorporated. Action should be taken promptly if the publication is incomplete.

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED BY USAF ACTIVITIES IN ACCORDANCE WITH T.O. 00-5-2.

TABLE OF CONTENTS

T-28A-1-0-2C

T-28A-1-0-3

Scope.

This manual contains the necessary information for safe and efficient operation of the armament-modification T-28B, T-28C, T-28D, T-28D-5 and T-28D-10 Airplanes. These instructions provide you with a general knowledge of the airplane, its characteristics, and specific normal and emergency operating procedures. Your flying experience is recognized, and therefore, basic flight principles are avoided.

Sound Judgment.

Instructions in this manual are for a pilot inexperienced in the operation of this airplane. This manual provides the best possible operating instructions under most circumstances, but it is a poor substitute for sound judgment. 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 operations or configurations (such as asymmetrical loading) are prohibited unless specifically covered herein. Clearance must be obtained from SMAMA before any questionable operation is attempted which is not specifically permitted in this manual.

How to Be Assured of Having Latest Data.

Refer to T.O. 0-1-1-5, which lists all current Flight Manuals, Safety Supplements, Operational Supplements, and checklists. Its frequency of issue and brevity ensures an accurate, up-to-date listing of these publications.

Standardization and Arrangements.

Standardization assures that the scope and arrangement of all Flight Manuals are identical. This manual is divided into 10 fairly independent sections to simplify reading it straight through or using it as a reference manual. The first three sections must be read thoroughly and fully understood before attempting to fly the airplane. The remaining sections provide important information for safe and efficient mission accomplishment.

Supplements.

The current status of each Supplement affecting your airplane can be determined by referring to T.O. 0-1-1-5. The title page of the Flight Manual and the title block of each Supplement should be checked to determine the effect they may have on existing Supplements. You must remain constantly aware 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. Upon receiving each Supplement, file it in the front of your Flight Manual, and make reference to it on the Supplement Summary page. If existing Flight Manual information or procedures are revised, a reference to the applicable Supplement should then be written in the margin of the page opposite the affected write-up. A Safety Supplement may be replaced by an Operational Supplement or an Operational Supplement may be replaced by a Safety Supplement.

SAFETY SUPPLEMENTS. Information involving safety will be promptly forwarded to you by Safety Supplements. Supplements covering loss of life will get to you in 48 hours by TWX, and those concerning serious damage to equipment within 10 days by mail.

OPERATIONAL SUPPLEMENTS. Nonsafety requirements or airplane changes affecting flight crew information that is not timely, or that cannot be practically or adequately covered in the Flight Manual at the time of a scheduled change or revision will be forwarded to you by Operational Supplements.

Checklists.

The Flight Manual contains only amplified checklists. Abbreviated checklists have been issued as separate technical orders. (Refer to the back of the title page for T.O. number and date 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 checklist, write in the applicable change on the affected checklist page.

How to Get Personal Copies.

Each pilot is entitled to his 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. Basically, you must order the required quantities on 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.

Illustration Changes.

To help you more easily find on illustrations the technical changes that otherwise might be inconspicuous, the following identifier will be used: NEW

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. 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: 15, 25, and 40 envelopes. Check with your supply personnel for assistance in securing these items.

Warning, Cautions, and Notes.

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

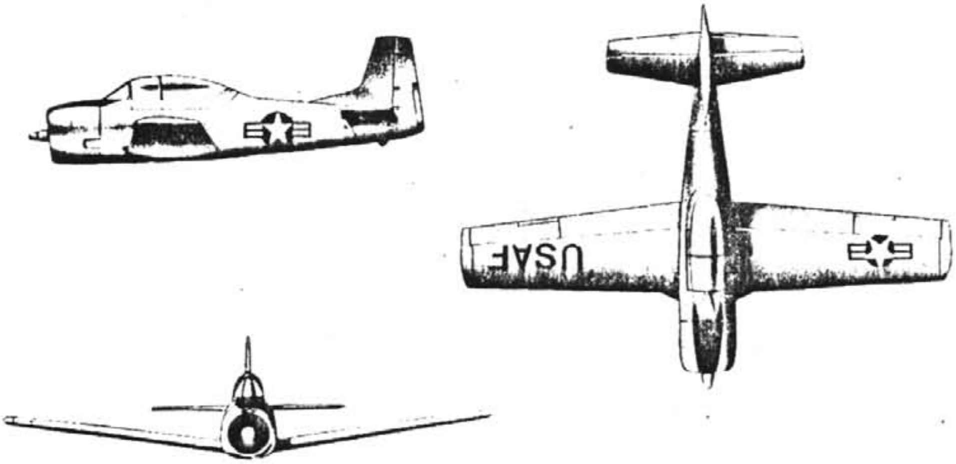
Warning Operating procedures, techniques, etc, which will result in personal injury or loss of life if not carefully followed.

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

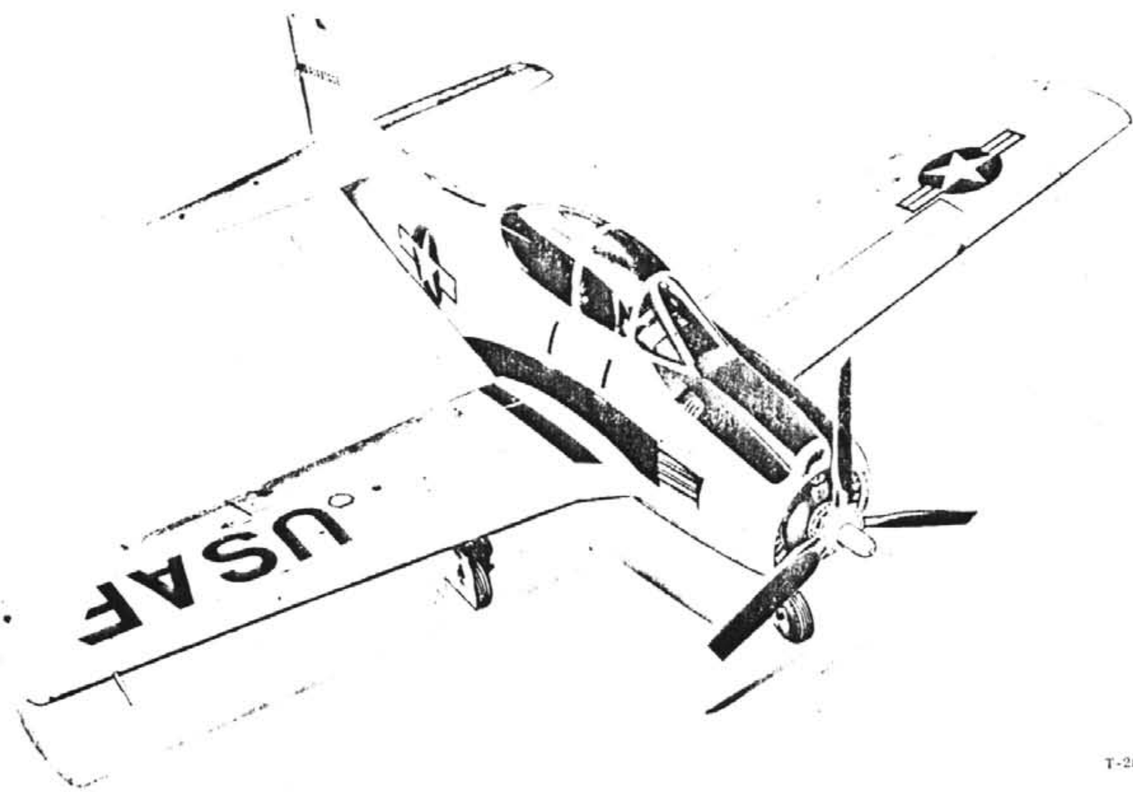
NOTE An operating procedure, technique, etc, which is considered essential to emphasize.

Your Responsibility - To 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 and questions regarding this manual or any phase of the Flight Manual program are welcomed. AF Form 847 will be used for recommending changes to the Flight Manual in accordance with instructions in AFR 60-9 and T.O. 00-5-1. These will be forwarded through Command Headquarters to SMAMA, McClellan AFB, California 95652, Attn: MMST. AF Forms 847 are routed to MMST for control purposes only. Technical content of the Flight Manual is the responsibility of the Flight Manual Manager (MMEAH), and all comments and questions transmitted by means other than AF Form 847 will be submitted directly to the Flight Manual Manager, SMAMA, McClellan AFB, California 95652, Attn: MMEAH.



T-28B/C/D



FS-787

T-28B-1-00-2

DESCRIPTION

SECTION I

TABLE OF CONTENTS PAGE

THE AIRPLANE.

The North American Rockwell Corporation-built T-28B, T-28C, and AT-28D Airplanes covered by this manual have been modified into low-altitude, close support airplanes. Some of the airplanes also have a low-altitude photographic reconnaissance capability. The basic airplane is a single-engine, two-place tandem model equipped with dual controls and tricycle landing gear. With few exceptions, both cockpits contain identical controls and instruments. A six-store armament capability is provided on the underside of the wing, with some T-28B and some AT-28D-5 Airplanes having provisions for external fuel tanks. Other features include self-sealing inboard wing fuel cells and armor plate on T-28B and AT-28D Airplanes, a hydraulically operated speed brake on the bottom of the fuselage on T-28B and T-28C Airplanes, and a steerable nose wheel on some AT-28D Airplanes. T-28C Airplanes have a cutout portion in the rear of the fuselage and bottom of the rudder to provide clearance for the tail hook which was originally installed in this model. Solo flight is made from the front cockpit only. Airplanes changed by T.O. 1T-28-542 have an escape system that uses an extraction rocket and associated equipment for canopy clearance and rapid emergency escape from either cockpit.

Although essentially similar to AT-28D and AT-28D-5 airplanes, AT-28D-10 airplanes do not have nosewheel steering. Another minor difference is that on AT-28D-10 airplanes, the fuel sump tank is found in the right main-landing-gear wheel well. To operate the AT-28D-10 airplane, use the flight limits and operating procedures currently in this T-28B/C/D flight manual and checklist as applicable.

AIRPLANE CODING.

NOTE

In accordance with T.O. 1T-28D-537, all T-28D, T-28D-5, and T-28D-10 Airplanes have been redesignated as AT-28D, AT-28D-5, and AT-28D-10 Airplanes. Therefore, all existing references to T-28D, T-28D-5, and T-28D-10 Airplanes in this manual shall be interpreted as AT-28D, AT-28D-5, and AT-28D-10, until such time as this manual is completely revised.

Throughout this manual, information concerning equipment not common to all airplanes will be coded to identify the effectivity. Where information is coded for AT-28D Airplanes, this should be interpreted to mean AT-28D, AT-28D-5, and AT-28D-10 Airplanes. (AT-28D-5 Airplanes are identified by a decal, "AT-28D-5," on the left side of the fuselage just below the windshield.) Where necessary, configuration effectivity will be coded for the three groups of AT-28D Airplanes.

AIRPLANE DIMENSIONS.

Approximate over-all dimensions of the airplane are:

Length .... 33 feet
Wing span .... 41 feet
Height (to top of rudder) .... 13 feet

AIRPLANE GROSS WEIGHT.

The approximate take-off gross weight is as follows:

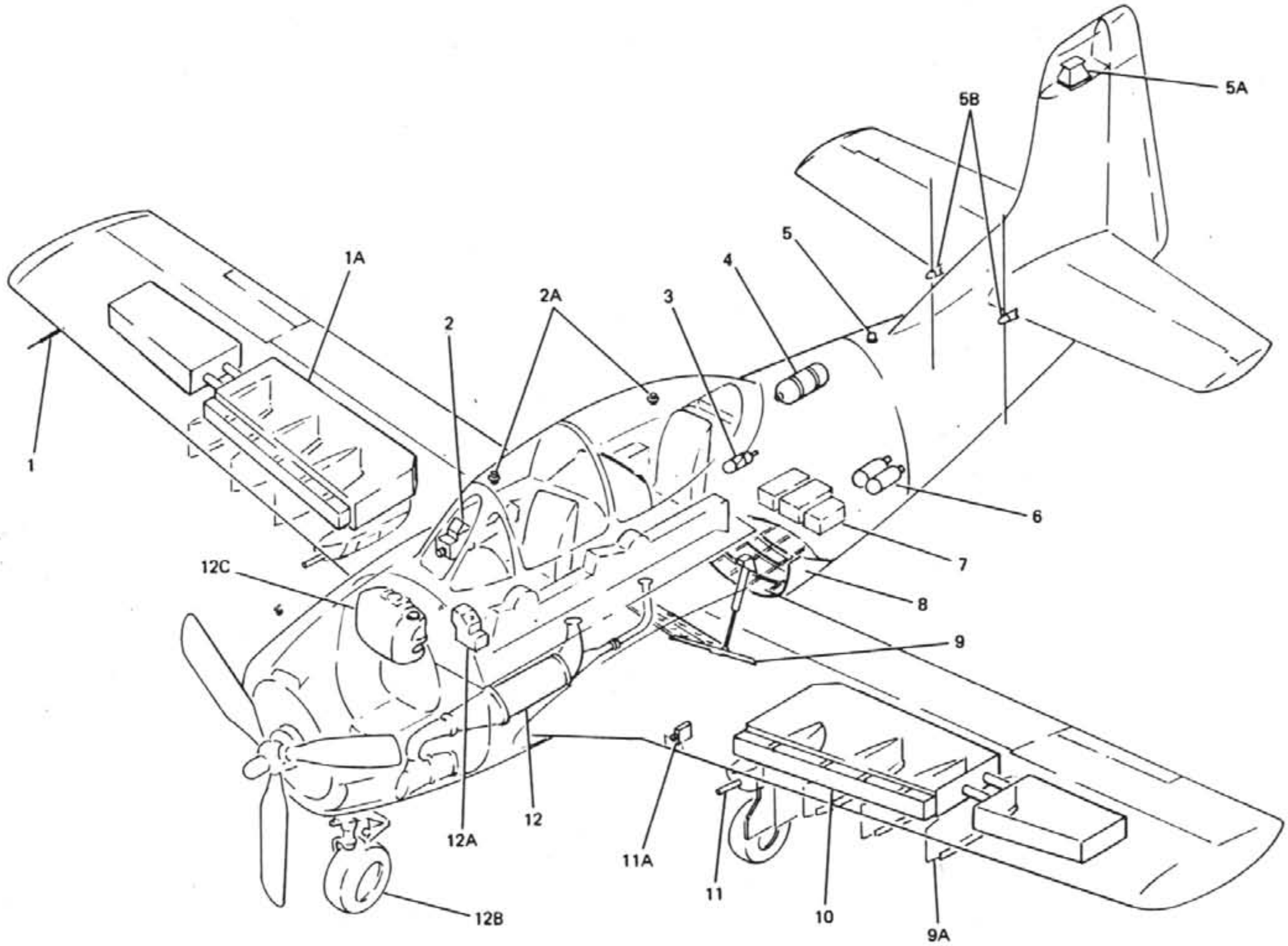
AIRPLANE		WEIGHT (POUNDS)
NO EXTERNAL STORES		
T-28B	(8,250)**	8,650
T-28C		8,400
AT-28D		8,700
AT-28D-5	(9097)**	8,750
AT-28D-10		9,097
WITH MAXIMUM ALLOWABLE WEIGHT (STORES AT SIX WING STATIONS)		
T-28B		12,150
T-28C		11,800
AT-28D		12,200
AT-28D-5	(12,783)**	12,450
AT-28D-10		12,783

NOTE These weights include two pilots and a full fuel load.

**Some Airplanes

GENERAL ARRANGEMENT

(TYPICAL)



1. PITOT TUBE
1A. SELF-SEALING FUEL CELLS - INBD
2. GUNSIGHT
2A. COCKPIT VENTILATION SYSTEM
3. OXYGEN CYLINDER (T-28C)
4. OXYGEN CYLINDER (AT-28D)
5. ANTI-COLLISION LIGHT (TOP)*
5A. UHF-VHF ANTENNA*
5B. ARA-31 ANTENNA*
6. OXYGEN CYLINDERS (T-28B)
7. RADIO EQUIPMENT
8. BAGGAGE COMPARTMENT (PHOTO RECONNAISSANCE CAMERAS*)
9. SPEED BRAKE*
9A. WING PYLONS* (TYPICAL BOTH SIDES)
10. FIXED GUN AMMUNITION CONTAINER* (TYPICAL BOTH SIDES)
11. FIXED GUN* (TYPICAL BOTH SIDES)
11A. GUN CAMERA
12. COCKPIT HEATER
12A. HYDRAULIC RESERVOIR
12B. NOSE WHEEL (NON-STEERABLE*)
12C. MODIFIED OIL TANK*

* Some airplanes (Refer to applicable text.)

Figure 1-1

INTERCOCKPIT CONTROL SHIFT.

All instruments and controls essential to flight are included in each cockpit so that the airplane can be flown by either pilot on dual flights. However, a spring-loaded control shift switch (figure 1-7) in each cockpit provides independent and complete control of certain systems by one pilot at a time. Momentary actuation of this toggle switch to the CONTROL SHIFT position transfers control of the battery, generator, inverters, starter, cowl and oil cooler flaps, speed brake, and all external lights. On T-28B** and T-28C Airplanes, the dc power and ac inverter circuits have been removed from the cockpit control transfer relay. As a result, control of the battery, generator, and inverters has been removed from the control shift relay. Momentary actuation of the intercockpit control shift switch to the CONTROL SHIFT position, therefore, only transfers control of the starter, cowl and oil cooler flaps, speed brake, and all external lights. When control is shifted, the units will operate according to the positioning of the switches in the cockpit to which control is transferred. The shift in the rear cockpit can be held on to override operation of the switch in the front cockpit. The control shift system is energized by the battery bus and functions without external power being supplied to the airplane or with the dc power switch (or battery and generator switches*) OFF in both cockpits. When the generator is on the line, and battery power becomes depleted, the generator will power the control shift system. A light adjacent to the control shift switch labeled "LT. ON CONTROL" illuminates when the switch is actuated only if the dc power switch is positioned at either BAT. & GEN. or BAT. ONLY (or the battery switch or generator switch is positioned at ON*).

ARMAMENT.

The airplane has an armament system that utilizes various armament packages at six stations on the underside of the center wing panel. The system covers a wide range of store selection. A sight is mounted above the instrument panel in the front cockpit. (Refer to "Armament Equipment" in Section IV for detailed information.)

ENGINE.

The airplane is powered by a Wright Cyclone nine-cylinder, air cooled engine, Model R-1820-86 or -86A. At Take-off Power or Military Power at sea level, the engine develops 1425 horse-power. Airplanes changed by T.O. 1T-18-519 and T-28D-5 Airplanes have a ram-air scoop on the right side of the engine cowl to purge hot air immediately forward of the fire wall.

The engine is equipped with a single-stage, two-speed, engine-driven supercharger, a direct-cranking starter, and an injection-type carburetor incorporating an electric primer valve.

ENGINE CONTROLS.

Throttle, mixture, supercharger, and carburetor air controls are on the left side of each cockpit. They are interconnected between cockpits to move simultaneously. On T-28D Airplanes, the supercharger control is in the front cockpit only. Each control is shaped differently to permit identification by feel. Engine cylinder head and oil temperature are controlled simultaneously by electrically actuated cowl and oil cooler flaps.

Throttle.

Engine power is controlled by the throttle (2, figure 1-6) mounted on the quadrant at the left side of each cockpit. From the CLOSED position, which is set at engine idle rpm, the throttle moves forward through an arc to the OPEN position, giving a power range from idle speed to full maximum manifold pressure. The throttle is connected to the carburetor by mechanical linkage. A take-off stop in the quadrant indicates by feel when the throttle has been advanced to Military Power (at sea level). Pushing the throttle through the stop at sea level causes the maximum allowable manifold pressure to be exceeded. (Refer to "Use of Military Power" in Section VII.) However, the throttle may be pushed through the stop at altitudes above sea level to obtain full throttle travel as long as the maximum allowable manifold pressure is not exceeded. The throttle grip has a call button and a microphone button. T-28B Airplanes and some T-28C Airplanes also have a speed brake switch.

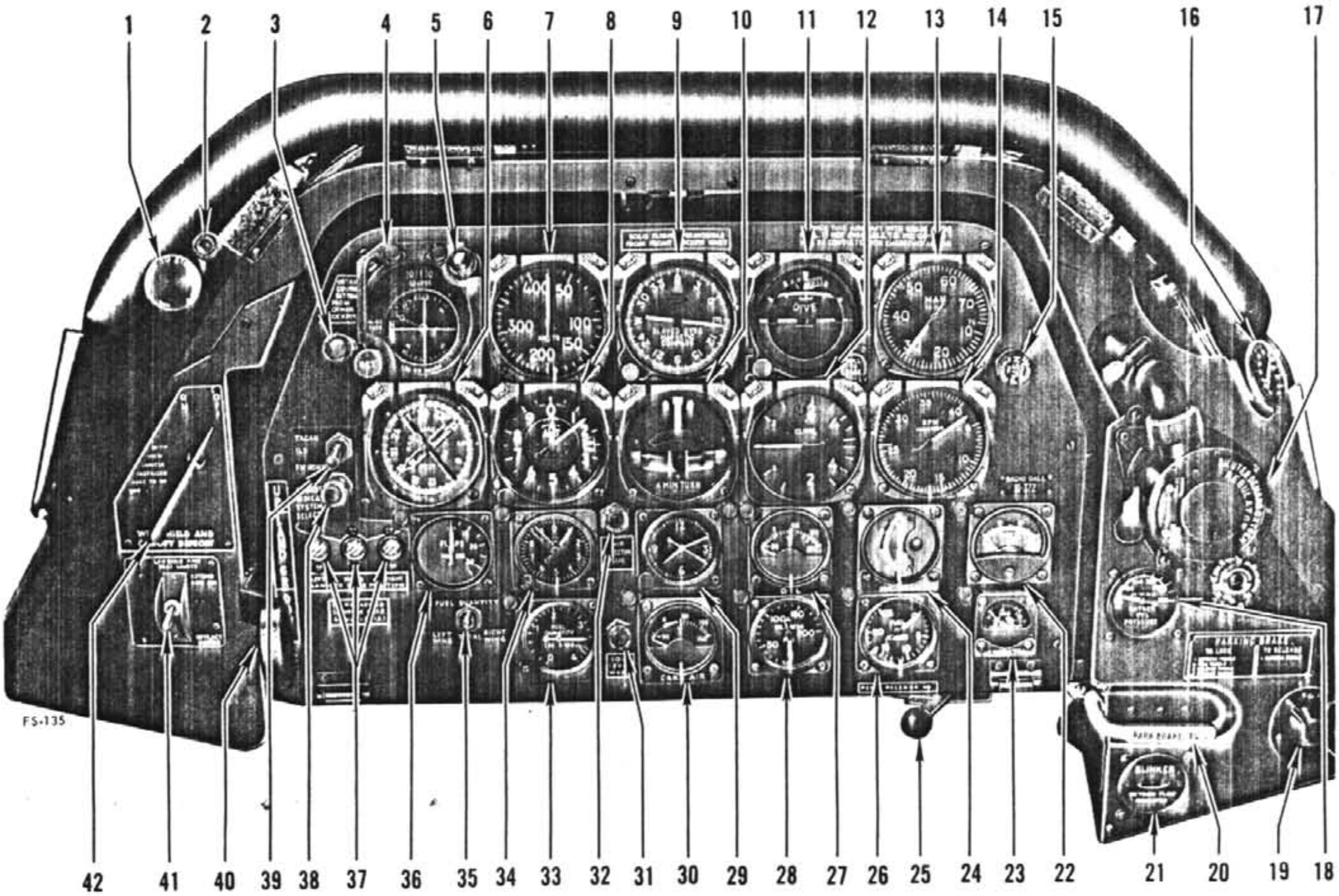
NOTE When the throttle is closed, the surface control lock also locks the throttle in the CLOSED position.

Mixture Lever.

A mixture lever (9, figure 1-6), on the throttle quadrant, permits selection of the correct fuel-air ratio for various engine power settings. The lever is connected to the carburetor by mechanical linkage. With the lever in the IDLE CUTOFF position, fuel flow is shut off at the carburetor, stopping the engine. Fuel is injected into the engine if the booster pump is operating and the mixture lever is not in the IDLE CUTOFF position. The RICH position provides correct fuel-air ratio for all ground operations, take-off, climb, combat (Military Power), descent, and landing. The

*T-28D Airplanes
**Some Airplanes

COCKPIT FORWARD VIEW
T-28D AIRPLANES
(TYPICAL BOTH COCKPITS)



1. CANOPY EMERGENCY STOP BUTTON
2. CANOPY OPEN WARNING LIGHT*
3. COURSE SETTING CHANGE INDICATOR LIGHT
4. COURSE INDICATOR
5. MARKER BEACON LIGHT
6. RADIO MAGNETIC INDICATOR (TACAN RANGE INDICATOR*)
7. AIRSPEED INDICATOR
8. ALTIMETER
9. HEADING INDICATOR (RADIO MAGNETIC INDICATOR*)
10. TURN-AND-SLIP INDICATOR
11. ATTITUDE INDICATOR
12. VERTICAL VELOCITY INDICATOR
13. MANIFOLD PRESSURE GAGE
14. TACHOMETER
15. MANIFOLD PRESSURE DRAIN VALVE BUTTON
16. FREE AIR TEMPERATURE GAGE †
17. OXYGEN REGULATOR
18. OXYGEN CYLINDER PRESSURE GAGE
19. IGNITION SWITCH
20. PARKING BRAKE HANDLE †
21. OXYGEN FLOW INDICATOR
22. VOLTMETER
23. LOADMETER
24. CYLINDER HEAD TEMPERATURE GAGE
25. RUDDER PEDAL RELEASE LEVER
26. FUEL PRESSURE GAGE
27. OIL TEMPERATURE GAGE
28. OIL PRESSURE GAGE
29. CLOCK
30. CARBURETOR AIR TEMPERATURE GAGE
31. FUEL LOW-LEVEL WARNING LIGHT
32. CHIP DETECTOR WARNING LIGHT
33. FUEL QUANTITY GAGE
34. ACCELEROMETER
35. FUEL QUANTITY TEST SWITCH*
36. WING FLAP POSITION INDICATOR
37. LANDING GEAR POSITION INDICATORS
38. COURSE INDICATOR SYSTEM SELECTOR INDICATOR LIGHT *
39. COURSE INDICATOR SYSTEM SELECTOR SWITCH
40. LANDING GEAR HANDLE
41. LANDING AND TAXI LIGHT SWITCH
42. WINDSHIELD AND CANOPY DEFROST HANDLE †

* Some airplanes (Refer to applicable text)

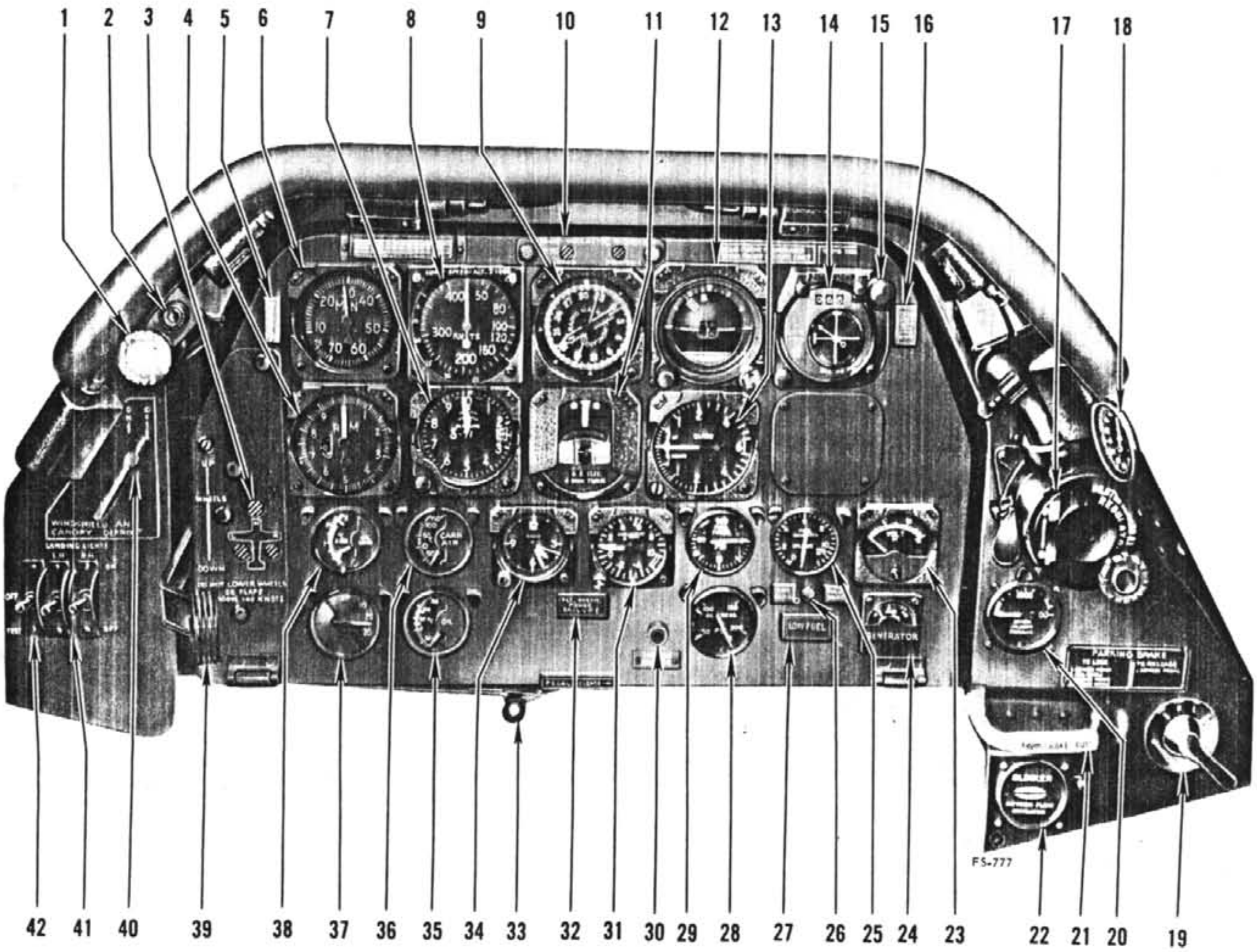
† Front cockpit only

28B-1-00-5E

Figure 1-2

COCKPIT FORWARD VIEW
T-28B AND T-28C AIRPLANES

(TYPICAL BOTH COCKPITS)



1. CANOPY EMERGENCY STOP BUTTON
2. CANOPY OPEN WARNING LIGHT *
3. LANDING GEAR POSITION INDICATORS
4. TACHOMETER
5. LANDING GEAR UNSAFE WARNING LIGHT
6. MANIFOLD PRESSURE GAGE
7. ALTIMETER
8. AIRSPEED INDICATOR
9. RADIO MAGNETIC INDICATOR
10. COMPASS ANNUNCIATOR AND LIGHT
11. TURN-AND-SLIP INDICATOR
12. ATTITUDE INDICATOR
13. VERTICAL VELOCITY INDICATOR
14. COURSE INDICATOR
15. MARKER BEACON LIGHT
16. COURSE SETTING CHANGE INDICATOR LIGHT
17. OXYGEN REGULATOR
18. FREE AIR TEMPERATURE GAGE†
19. IGNITION SWITCH
20. OXYGEN PRESSURE GAGE
21. PARKING BRAKE HANDLE†
22. OXYGEN FLOW INDICATOR
23. VOLTMETER
24. LOAD METER
25. FUEL QUANTITY GAGE
26. FUEL QUANTITY INDICATOR TEST SWITCH
27. FUEL LOW-LEVEL WARNING LIGHT
28. OIL PRESSURE GAGE
29. FUEL PRESSURE GAGE
30. SUMP PLUG WARNING LIGHT
31. ACCELEROMETER
32. FLIGHT INSTRUMENT POWER FAILURE WARNING LIGHT
33. RUDDER PEDAL RELEASE LEVER
34. CLOCK
35. OIL TEMPERATURE GAGE
36. CARBURETOR AIR TEMPERATURE GAGE
37. WING FLAP POSITION INDICATOR
38. CYLINDER HEAD TEMPERATURE GAGE
39. LANDING GEAR HANDLE
40. WINDSHIELD AND CANOPY DEFROST HANDLE†
41. LANDING AND TAXI LIGHT SWITCHES
42. STALL WARNING TEST SWITCH (T28C)†

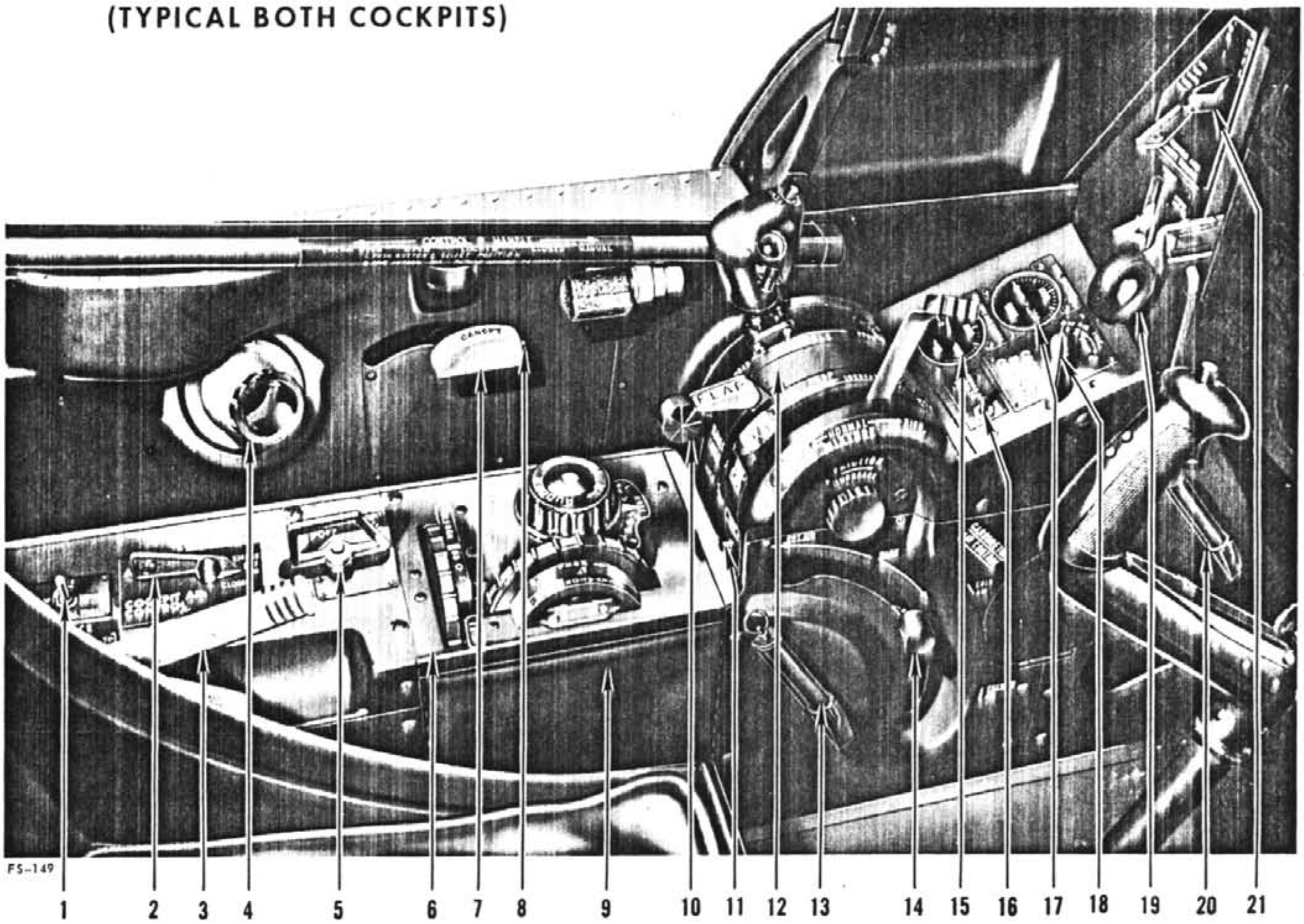
* Some airplanes (Refer to applicable text)
† Front cockpit only

28B-1-00-6A

Figure 1-3

COCKPIT LEFT SIDE

(TYPICAL BOTH COCKPITS)



1. EXTERNAL FUEL SWITCH*
2. COCKPIT AIR HANDLE
3. HYDRAULIC HAND-PUMP÷
4. AIR OUTLET
5. FUEL SELECTOR
6. TRIM TAB CONTROL PANEL
7. CANOPY HANDLE
8. CANOPY HANDLE BUTTON
9. FLIGHT REPORT HOLDER (SAFETY PIN STOWAGE POUCH*)
10. SUPERCHARGER HANDLE
11. HORN SILENCER BUTTON*
12. THROTTLE QUADRANT
13. CANOPY BREAKAWAY TOOL*
14. CARBURETOR AIR LEVER
15. CANOPY EMERGENCY AIR PRESSURE GAGE (T-28D Shown)*
16. COWL AND OIL COOLER FLAP SWITCH
17. HYDRAULIC SYSTEM PRESSURE GAGE
18. COCKPIT HEATER HANDLE÷
19. LANDING GEAR HANDLE
20. CANOPY BREAKAWAY TOOL*
21. LEFT INSTRUMENT SUBPANEL (T-28D SHOWN)

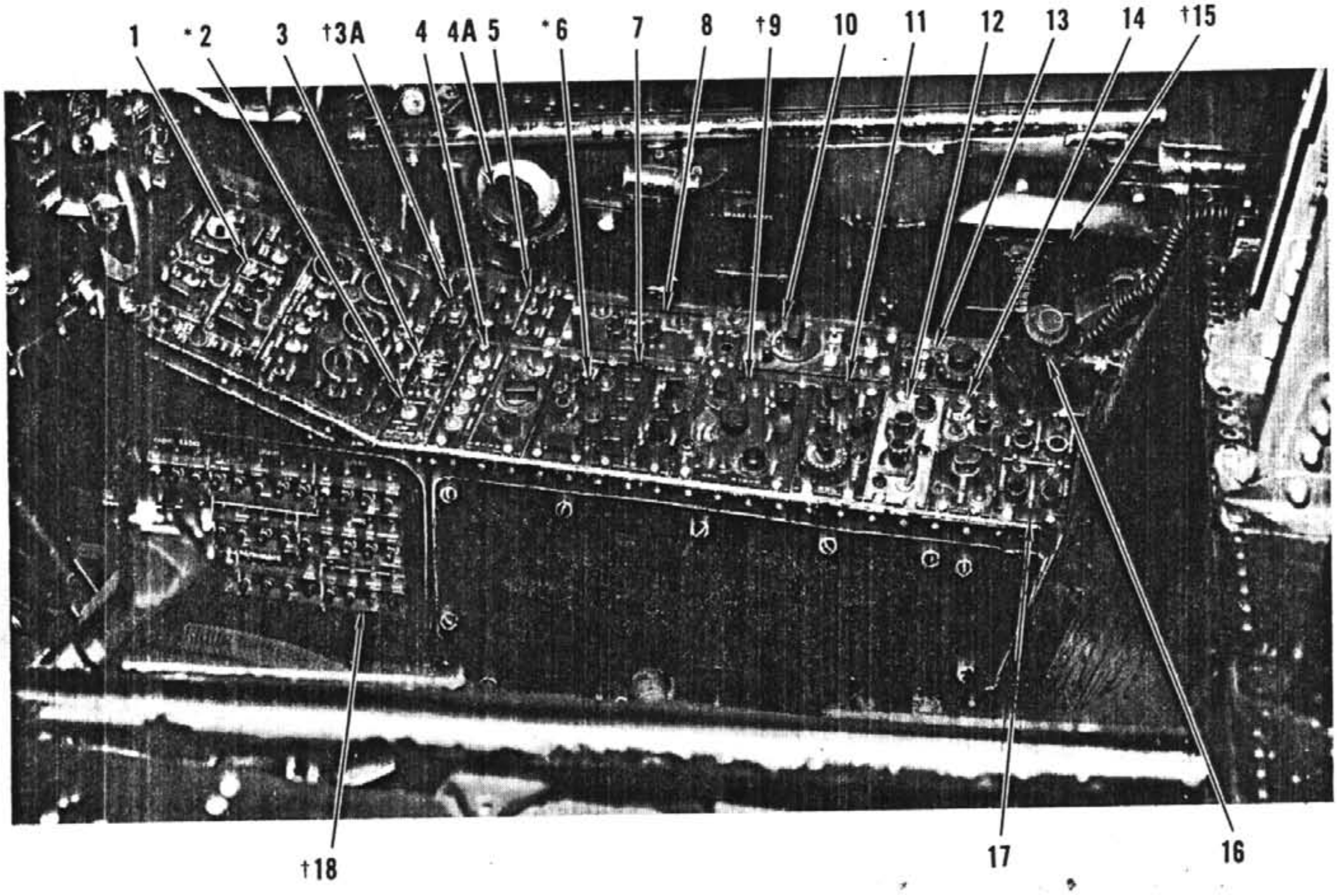
* Some airplanes (Refer to applicable text).

÷ Front cockpit only

Figure 1-4

COCKPIT RIGHT SIDE

(TYPICAL BOTH COCKPITS)



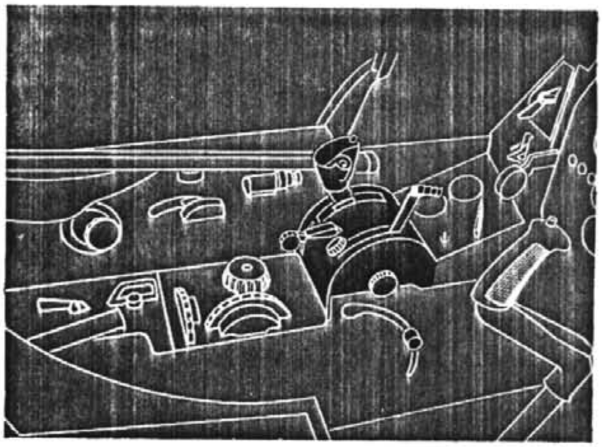
1. SWITCH PANEL
2. ADF AMPLIFIER SWITCH*
3. FUSELAGE LIGHT SWITCH
3A. FUSELAGE LIGHT CIRCUIT BREAKER†
4. INTERPHONE PANEL
4A. AIR OUTLET (Ref. AIR OUTLETS page 4-1)
5. INTERPHONE SUB PANEL
6. SECURE SPEECH CONTROL PANEL*
7. FM 622A CONTROL PANEL
8. VHF WILCOX 807 CONTROL PANEL
9. RADIO COMPASS CONTROL PANEL†
10. IFF CONTROL PANEL
11. UHF COMMAND RADIO CONTROL PANEL
12. NAV CONTROL PANEL
13. SIF CONTROL PANEL
14. ILS CONTROL PANEL
15. FUSE PANEL†
16. EXTENSION LIGHT
17. RADIO CONTROL SHIFT SWITCH PANEL
18. CIRCUIT-BREAKER PANEL†

* Some airplanes (Refer to applicable text)

† Front cockpit only

28B-1-00-8A

Figure 1-5



1. SPEED BRAKE SWITCH §
2. THROTTLE
3. INTERPHONE BUTTON
4. MICROPHONE BUTTON
5. PROPELLER LEVER
6. FRICTION LOCK KNOB
7. CARBURETOR AIR LEVER
8. HORN SILENCER BUTTON §
9. MIXTURE LEVER
10. WING FLAP HANDLE
11. SUPERCHARGER HANDLE

§ Some airplanes, refer to applicable text

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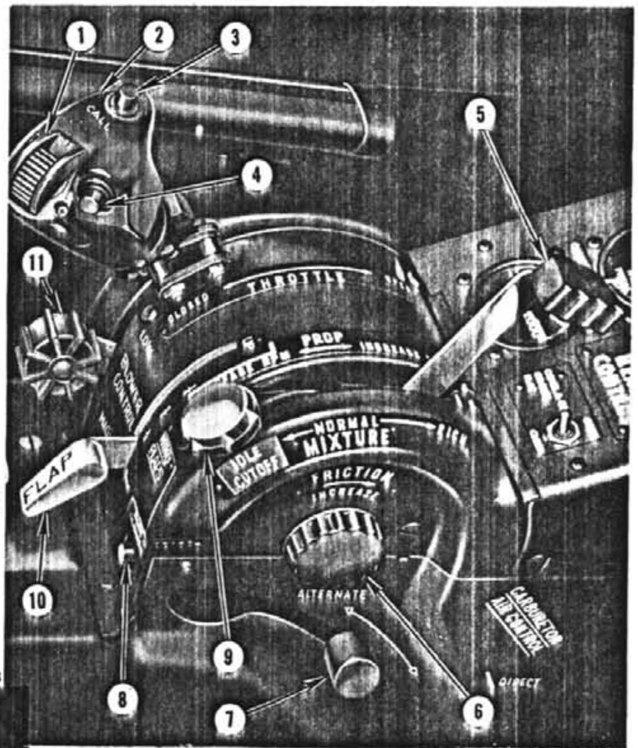
THROTTLE QUADRANT



T-28B-1-43-1

Figure 1-6

NORMAL position is used for all other flight conditions. (Refer to "Mixture Control" in Section VII for additional information.)

Friction Lock Knob.

A friction lock knob (6, figure 1-6), on the throttle quadrant (in the front cockpit only), keeps the throttle, propeller lever, and mixture lever from slipping from the desired set position. Rotating the knob clockwise increases the amount of friction.

Supercharger Handle.

The operating speed ratio of the two-speed supercharger is determined by the position of the supercharger handle (11, figure 1-6), on the throttle quadrant. When the handle is at the LOW (up) position, the engine supercharger is set at low blower. With the handle at the HIGH (down) position, the supercharger is set at high blower. The LOW position is used for ground operation and take-off, and during flight up to altitudes where it is more advantageous to operate with high blower. At the appropriate altitude, the supercharger handle can be shifted to HIGH. Manifold pressure will increase immediately; therefore, the throttle must be readjusted to prevent exceeding the maximum permissible manifold pressure for the altitude and rpm where the shift is made. The supercharger handle should be shifted to LOW during all descents.

Caution To prevent overheating of the supercharger clutch, a shift should not be made from LOW to HIGH at less than 5-minute intervals. A shift from HIGH to LOW can be made without time restriction since no heat is generated by this action.

Refer to "Supercharger" in Section VII for additional information.

Carburetor Air Lever.

The carburetor air lever (7, figure 1-6), below the throttle quadrant, has two positions: ALTERNATE and DIRECT. With the lever at ALTERNATE, the ram-air duct is closed and hot air from a shroud around the exhaust stack is drawn into the carburetor. As the lever is moved toward DIRECT, hot air is mixed with cold ram air to obtain the desired air inlet temperature. When the lever is at DIRECT, all carburetor air is admitted through the ram-air scoop in the top leading edge of the cowling.

Cowl and Oil Cooler Flap Switch.

The cowl flaps and oil cooler flap are electrically operated simultaneously by a single main-bus-powered (secondary-bus-powered*) switch (16, figure 1-4). The switch is on the left console, forward of the throttle quadrant, in each cockpit. Placing the switch in the OPEN position extends the cowl flaps and oil cooler flap to the full open position; this results in maximum engine cooling. Holding the switch at the spring-loaded CLOSE position closes the flaps. Intermediate flap settings can be selected by positioning the switch in the desired direction of travel, and then returning it to the center (OFF) position. The flaps can be operated only by the pilot who last actuated his shift control switch. The fully closed cowl flap position can be determined visually from the front cockpit only.

Ignition Switch.

A standard ignition switch (19, figures 1-2 and 1-3) is on the right instrument subpanel of each cockpit. Switch positions are BOTH, L, R, and OFF. The L position is used for checking engine operation on the left magneto ignition system; the R position, for checking engine operation on the right magneto ignition system. The BOTH position is used at all times that the engine is operating, except when the left or the right magneto ignition system is being checked individually. The OFF position stops the engine by grounding out the ignition system.

Primer Button.

The engine priming system is controlled by a push button (figure 1-7) on the switch panel (right forward console). The priming system is protected by a push-pull circuit breaker on the circuit-breaker panel. Depressing the main-bus-powered (primary-bus-powered*) primer button opens an electric primer valve mounted on the carburetor, thus permitting pressurized fuel from the carburetor to be injected into the engine blower section during starting. Releasing the button closes the primer valve and stops the priming fuel flow. Fuel pressure must be available for engine priming. The primer may be actuated from either cockpit as it operates independent of the intercockpit control shift.

Starter Button.

The direct-cranking electric starter is controlled by a guarded main-bus-powered (primary-bus-powered*) push button (figure 1-7) on the switch panel in each cockpit. However, the switch can be operated only by the pilot who last actuated his control shift switch. The starter button is protected by a push-pull circuit breaker on the circuit-breaker panel. Holding the starter button down operates the starter. The starter can be powered by the battery for starting, if external power is not available at the station or in an emergency. However, battery starts induce kickbacks and occasional backfires, which can cause crankshaft damage. Therefore, whenever external power is available, it must be used for starting.

ENGINE INDICATORS.

There are duplicate engine instruments in the two cockpits.

Manifold Pressure Gage.

The manifold pressure gage (13, figure 1-2; 6, figure 1-3) is of the absolute-pressure type. When the engine is not operating, the manifold pressure gage should indicate the field barometric pressure in inches of mercury. Manifold pressure taken when the engine is running is directed to the diaphragm. A linkage system transmits diaphragm movement to the gage needle. On T-28D Airplanes, a purge valve is installed in the manifold line to drain any condensation which might accumulate in the line. Depressing the manifold pressure drain valve button (15, figure 1-2), on the instrument panel, opens the purge valve.

Oil Pressure Gage.

The oil pressure gage (28, figures 1-2 and 1-3) is of the direct-indicating type. It registers from 0 to 200 psi. The gage has a segment and pinion movement to transmit spring deflection to the gage pointer. A line from the oil pressurized section of the engine is connected directly to the gage.

Fuel Pressure Gage.

Operation of the direct reading fuel pressure gage (26, figure 1-2; 29, figure 1-3) is similar to that of the oil pressure gage. It covers a range of 0 to 35 psi and indicates pressure directly from the carburetor.

Cylinder Head Temperature Gage.

There are two independent cylinder head temperature indicating systems, one for each cockpit. The temperature of No. 6 cylinder is indicated on the gage (24, figure 1-2; 38, figure 1-3) in the front cockpit. The temperature of the No. 5 cylinder is shown on the gage in the rear cockpit. Each system has a bayonet-type thermocouple (at the cylinder head), a resistor (aft of the fire wall), gages (in each cockpit), and interconnecting thermocouple leads. The cylinder head temperature gages are calibrated from - .5°C to 3°C x 100. They register temperatures from -50°C (-58°F) to 300°C (572°F). T-28B and C

*T-28B and T-28C Airplanes

SWITCH PANELS
(TYPICAL)

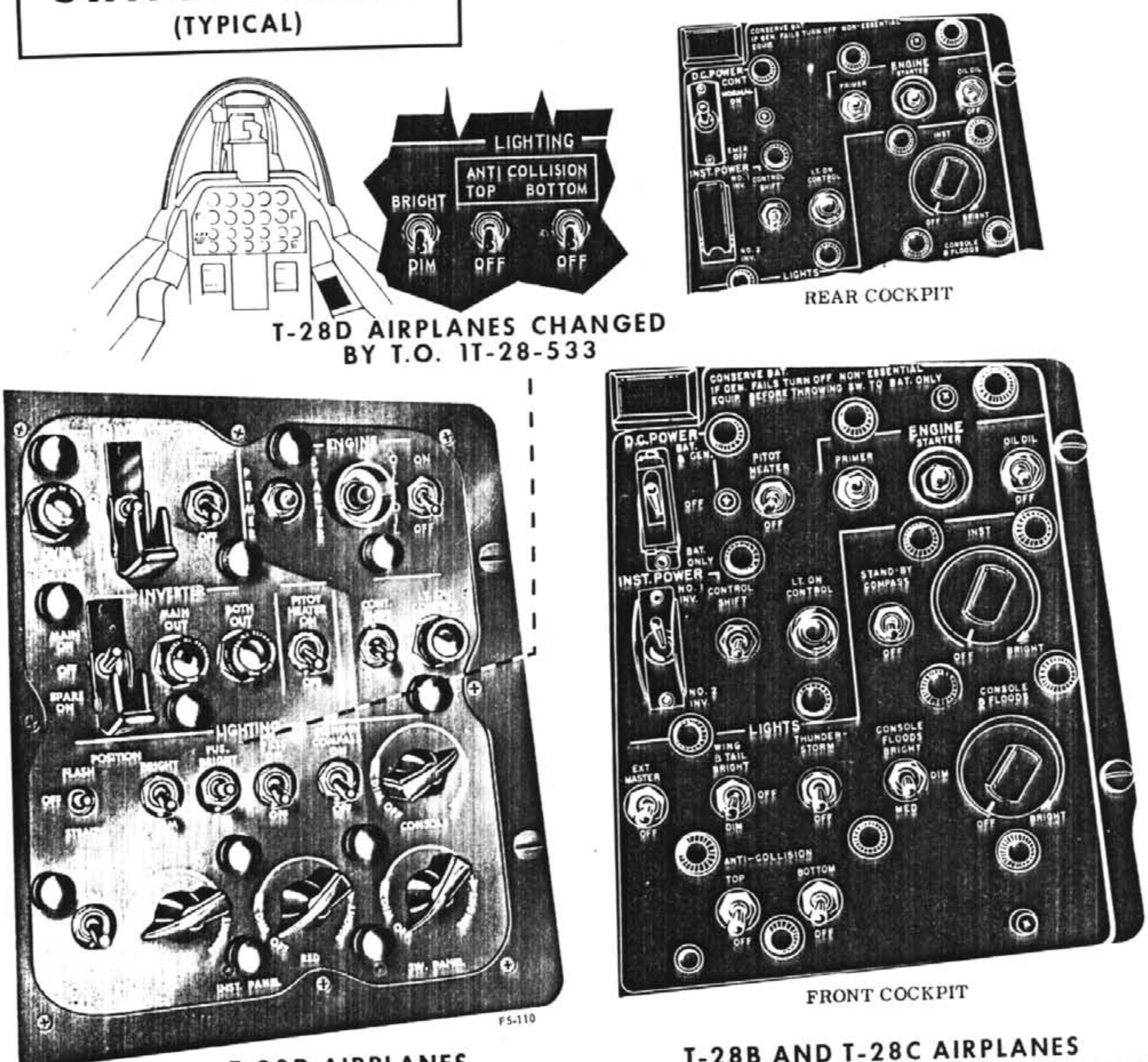


Figure 1-7

Aircraft cylinder head temperature gages are powered from the primary bus. T-28D cylinder head temperature gages are operated independent of the aircraft's dc electrical system.

Carburetor Air Temperature Gage.

On T-28B and T-28C Airplanes, the carburetor air temperature gage (36, figure 1-3) is electrically operated by the primary bus when the dc power switch is at BAT. & GEN or BAT. ONLY or external power is used. On T-28D Airplanes, the carburetor air temperature gage (30, figure 1-2) is electrically operated by the main bus when the battery switch is ON or external power is used. A circuit breaker on the circuit-breaker panel protects the system. The gage measures temperatures

**Some Aircraft

from each side of the carburetor air mixing chamber. It is calibrated from -70°C to 150°C (-94°F to 302°F).

Tachometer.

The tachometer (14. figure 1-2; 4, figure 1-3) registers the rotation speed of the engine. On T-28D Airplanes, the tachometer is marked "RPM HUNDREDS." It reads from 5 (500 rpm) to 40 (4000 rpm). On T-28B and T-28C Airplanes, the tachometer reads from 0 to 999 rpm on the face of the instrument, and rpm in thousands is read through a small window on the left side of the instrument face. The tachometer, connected to a tachometer generator in the accessory section, produces alternating current when driven by the engine. This current is transmitted to the gage rotors, that revolve at a rate directly proportional to the engine speed.

Oil Temperature Gage.

The oil temperature gage (27, figure 1-2; 35, figure 1-3) is similar in operation to the carburetor air temperature gage. It is calibrated from -70°C to 150°C. The gage is connected to the resistance bulb in the bottom of the oil tank, near the outlet fitting. Operated on the primary (main) bus, the gage is protected by a 5-ampere circuit breaker on the circuit-breaker panel.

CHIP DETECTOR (OIL SUMP PLUG) WARNING SYSTEM.

A magnetic chip detector warning system provides an indication of the presence of metal particles in the engine oil system. The system consists of a red press-to-test warning light (32, figure 1-2; 30, figure 1-3), on the instrument panel in each cockpit, and two magnetic chip detector drain plugs in the lubricating system, the system is protected by a 5 amp circuit breaker located on the circuit breaker panel. The warning light is powered by the primary (main) bus and is identified by a placard just below the light, labeled "CHIP DETECTOR PLUG" or "SUMP PLUG WARNING."* Any metal particles in the engine oil system will be attracted to the magnetic chip detector drain plugs and will cause the chip detector warning light to come on. Refer to "Chip Detector Warning Light" in Section III.

Warning

If the warning light comes on in flight, a landing should be made as soon as practical.

MANIFOLD PRESSURE DRAIN VALVE-T-28D AIRPLANES.

A manually operated manifold pressure drain valve clears the manifold pressure instrument lines of moisture or vapors so that accurate indications can be obtained on the gage. Pressing the drain valve button (15, figure 1-2) opens the drain valve. The valve should be opened only when the engine is running below ambient barometric pressure so that the vapors are carried into the engine instead of toward the gage

*T-28B and T-28C Airplanes

†T-28B Airplanes changed by T.O. 1T-28-508 or 1T-28-529

PROPELLER.

The engine drives a three-blade, constant-speed, Hamilton Standard hydromatic propeller. A propeller governor, controlled from either cockpit, maintains a selected rpm, regardless of varying airspeeds or flight attitudes. The governor adjusts propeller blade angle by directing pressurized oil to a piston in the propeller hub. The governor and oil pump are contained within the constant-speed control assembly on the nose section of the engine. The propeller is governed within the range of from 1200 to 2700 rpm.

PROPELLER LEVER.

Engine rpm is determined by the setting of the propeller lever (5, figure 1-6), on the throttle quadrant in each cockpit. The position of the propeller lever determines the setting of the propeller governor. Range is from full DECREASE RPM (high blade pitch of 1200 rpm) to full INCREASE RPM (low blade pitch of 2700 rpm).

OIL SYSTEM.

Oil for engine lubrication on T-28D Airplanes and some T-28B Airplanes† is supplied from an 18.0 U.S. gallon tank with 14.5 U.S. gallons of usable oil. T-28C Airplanes and all other T-28B Airplanes are supplied from a 12.2 U.S. gallon oil tank with 8.8 U.S. gallons of usable oil. For oil specification, see figure 1-18. Lubrication is accomplished by a pressure system with a dry sump and scavenge pump return. Oil flows by gravity from the tank to the engine pressure pump, which forces it through the engine. Two scavenge pumps force the oil through either the oil cooler warm-up jacket or through the oil cooler, depending on the temperature of the oil, and then back to the tank. An oil trap tank in the engine oil breather line prevents loss of engine oil during Negative G flight. An oil dilution system provides for diluting the oil with gasoline before engine shutdown to lower the viscosity of the oil whenever a cold-weather start is anticipated.

Caution

Negative G flight in excess of 10 seconds will cause cumulative engine damage.

OIL SYSTEM CONTROLS.

Cowl and Oil Cooler Flap Switch.

Refer to "Engine Controls."

Oil Dilution Switch.

The oil dilution switch (figure 1-7) is powered by the primary (main) bus through a push-pull circuit breaker on the circuit-breaker panel. It is on the switch panel in each cockpit. The switch is spring-loaded to the OFF position; it must be held ON while the oil system is being diluted.

FUEL QUANTITY DATA

POUNDS AND US GALLONS

NOTE

Multiply gallons by 6.0 to obtain pounds of gasoline (Standard Day only).

T-28D AIRPLANES

TANKS	NO.	USABLE FUEL (EACH) POUNDS	USABLE FUEL (EACH) US GALLONS	FULLY SERVICED (EACH) POUNDS	FULLY SERVICED (EACH) US GALLONS
LH WING TANK	1	513	85.5	517.8	86.3
RH WING TANK	1	513	85.5	517.8	86.3
SUMP TANK	1	18	3.0	18	3.0
EXTERNAL TANKS*	2	600	100.0	600	100.0
TOTAL USABLE FUEL		WITHOUT EXTERNAL TANKS			1044 POUNDS 174 GALLONS
		WITH EXTERNAL TANKS			2244 POUNDS 374 GALLONS

T-28B AND T-28C AIRPLANES

TANKS	NO.	USABLE FUEL (EACH) POUNDS	USABLE FUEL (EACH) US GALLONS	FULLY SERVICED (EACH) POUNDS	FULLY SERVICED (EACH) US GALLONS
LH WING TANK	1	522	87.0	525	87.5
RH WING TANK	1	522	87.0	525	87.5
SUMP TANK	1	18	3.0	18	3.0
TOTAL USABLE FUEL					1062 POUNDS 177 GALLONS

* Some T-28B and T-28D-5 Group II Airplanes

28B-1-48-1D

Figure 1-8

When the switch is held in the ON position, fuel (under pressure) from the carburetor enters the oil line to the engine to lower the viscosity of the oil.

FUEL SYSTEM.

Two interconnected fuel cells are installed in each wing of the airplane. Fuel flows equally by gravity from each wing to a sump tank in the fuselage. The sump tank is located in the fuselage in the AT-28D and AT-28D-5 aircraft and in the right wheel well in the T-28B, T-28C, and AT-28D-10 aircraft. A single boost pump in the sump tank pumps the fuel to the engine-driven fuel pump. The boost pump is powered by the secondary (main) bus through a push-pull circuit breaker on the circuit-breaker panel. A fuel shutoff handle shuts the fuel flow off or turns it on, with no individual tank selection possible. (See figure 1-9 or 1-10.) Fuel tank capacities are listed in figure 1-8. For fuel specification, see figure 1-18. As with most fuel systems of this type, prolonged unsymmetrical flight may prevent fuel from flowing into the sump tank. If this occurs and the engine stops due to lack of fuel, immediately revert to normal flight and the engine should start. If the engine does not start, refer to "Engine Air Start" in Section III.

FUEL SYSTEM CONTROL AND INDICATORS.

Fuel Selector.

The fuel shutoff handle (5, figure 1-4) has two positions, ON and OFF. Each position operates the shutoff valve and boost pump simultaneously. This system is designed to automatically equalize fuel load, and no action is necessary to maintain an equal fuel level in each wing. Normally, an equalized fuel flow is automatically maintained by gravity. The ON position turns on the booster pump electrically and opens the fuel shutoff valve through mechanical linkage. The OFF position turns off the fuel flow and stops the booster pump action.

Fuel Quantity Gage.

A fuel quantity gage (33, figure 1-2; 25, figure 1-3) is calibrated in 40 pound increments and is located on the main instrument panel in each cockpit. The full mark on each gage is set at 1040 pounds. It is powered by the primary (main) bus through a push-pull circuit breaker on the circuit breaker panel.

NOTE

The gage does not measure external tank fuel.

Fuel Quantity Test Switch. *

The fuel quantity test switch (35, figure 1-2; 26, figure 1-3), on the instrument panel in each cockpit, has three positions, **LEFT WING, RIGHT WING, and, on AT-28D Airplanes,** TOTAL. On T-28B and T-28C Airplanes, the center position is not labeled. The switch is spring-loaded to the TOTAL (center) position. When the switch is held at LEFT, the fuel quantity gage will show the quantity in the left tank. Holding the switch to RIGHT will give a reading of fuel remaining in the right tank. When the switch is at TOTAL (center), total fuel quantity is indicated on the gage. The fuel quantity test switch is powered by the primary (main) bus.

Fuel Low-level Warning Light.

A primary (main) bus powered low-level warning light (31, figure 1-2; 27, figure 1-3) is on the instrument panel in each cockpit. The fuel low-level warning light is connected directly to the fuel quantity gage and will come on when the gage indicates 200 pounds or less.

Fuel Boost Pump Test Switch. **

A fuel boost pump test switch is located on the electrical switch panel in the forward cockpit. The test switch is wired in series with the boost pump switch on the fuel shutoff control handle. When held in the TEST position, power to the boost pump is interrupted, allowing the engine-driven fuel pump pressure to be checked.

EXTERNAL FUEL TANKS. †

Two 100-gallon external fuel tanks may be installed, one at each inboard external store station. Each tank contains an electrically driven fuel pump and a transfer and dump valve. The pump and valve, used for transferring and dumping fuel from the external tanks, are controlled by a three-position switch on the left console. A fuel level control valve, installed in each outboard wing fuel cell, controls the fuel level during the transfer operation. There is no fuel quantity indicating system for the external tanks.

External Fuel Switch. †

A three-position, primary-bus-powered toggle switch (1, figure 1-4) is on the left console, just aft of the cockpit air control handle, to transfer or dump external fuel when the external fuel tanks are carried. Normal position of the switch is OFF. Placing the switch at TRANSFER energizes the fuel pump, closes the transfer and dump valve, and pumps fuel from the external fuel tank into the outboard wing fuel tank. Placing the switch at DUMP energizes the fuel pump and opens the transfer and dump valve, pumping the fuel from the external tanks overboard.

* **Early AT-28D-5 Airplanes, AT-28D Airplanes** changed by T.O. 1T-28D-508, most **AT-28D-5 Airplanes, AT-28D-10 and T-28B and T-28C Airplanes**
† T-28B Airplanes changed by T.O. 1T-28-508
**Some Airplanes

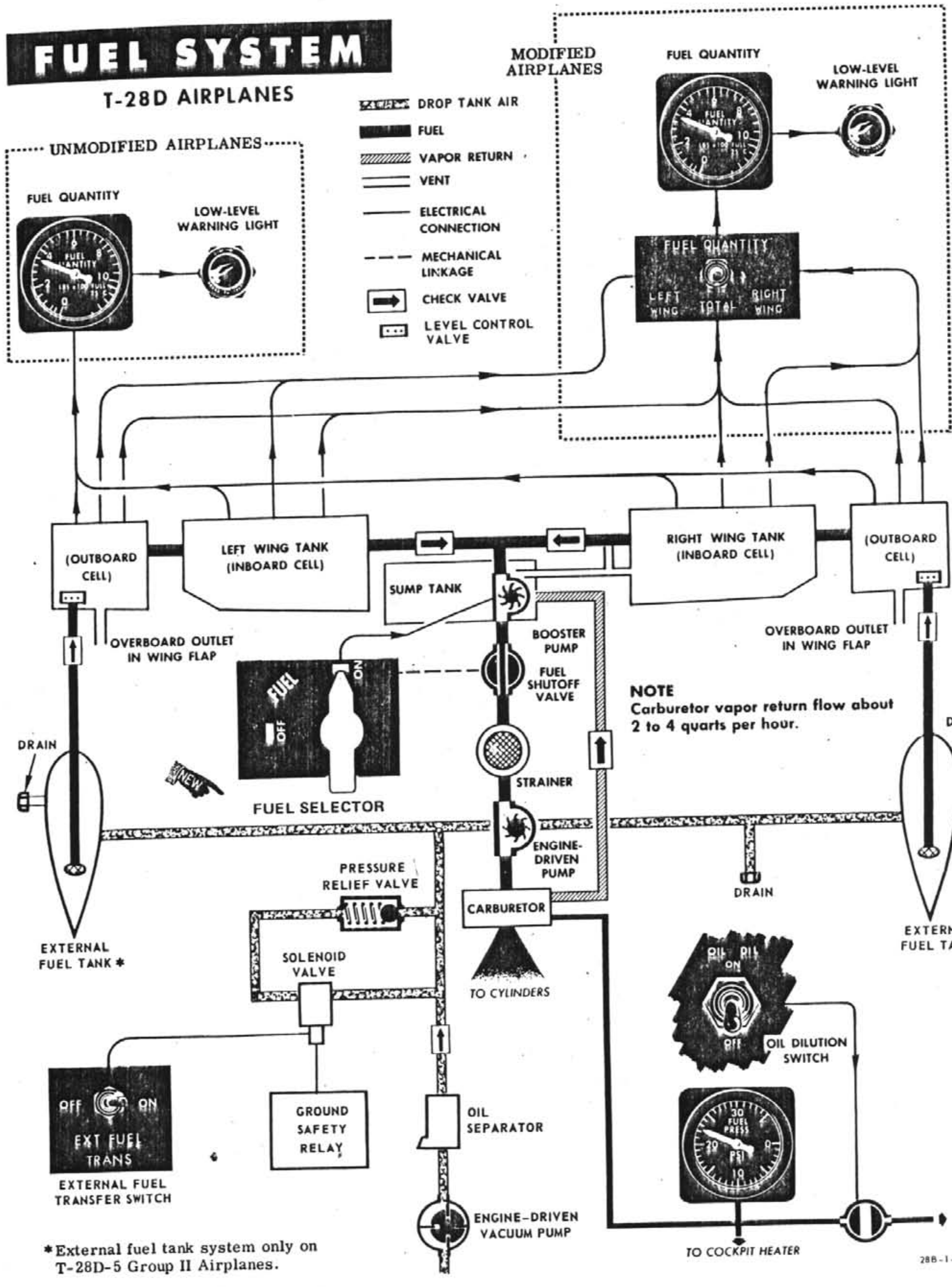

FUEL SYSTEM
T-28D AIRPLANES
UNMODIFIED AIRPLANES
FUEL QUANTITY
LOW-LEVEL WARNING LIGHT
MODIFIED AIRPLANES
FUEL QUANTITY
LOW-LEVEL WARNING LIGHT
DROP TANK AIR
FUEL
VAPOR RETURN
VENT
ELECTRICAL CONNECTION
MECHANICAL LINKAGE
CHECK VALVE
LEVEL CONTROL VALVE
FUEL QUANTITY
LEFT WING
TOTAL
RIGHT WING
(OUTBOARD CELL)
LEFT WING TANK (INBOARD CELL)
RIGHT WING TANK (INBOARD CELL)
(OUTBOARD CELL)
SUMP TANK
OVERBOARD OUTLET IN WING FLAP
OVERBOARD OUTLET IN WING FLAP
BOOSTER PUMP
FUEL SHUTOFF VALVE
FUEL
ON
OFF
NOTE
Carburetor vapor return flow about 2 to 4 quarts per hour.
DRAIN
DRAIN
STRAINER
FUEL SELECTOR
ENGINE-DRIVEN PUMP
DRAIN
PRESSURE RELIEF VALVE
CARBURETOR
EXTERNAL FUEL TANK *
EXTERNAL FUEL TANK *
SOLENOID VALVE
TO CYLINDERS
OIL ON
OFF
OIL DILUTION SWITCH
OFF ON
EXT FUEL TRANS
GROUND SAFETY RELAY
OIL SEPARATOR
FUEL PRESS PSI
EXTERNAL FUEL TRANSFER SWITCH
ENGINE-DRIVEN VACUUM PUMP
TO OIL TANK
TO COCKPIT HEATER
*External fuel tank system only on T-28D-5 Group II Airplanes.
28B-1-48-2B

Figure 1-9

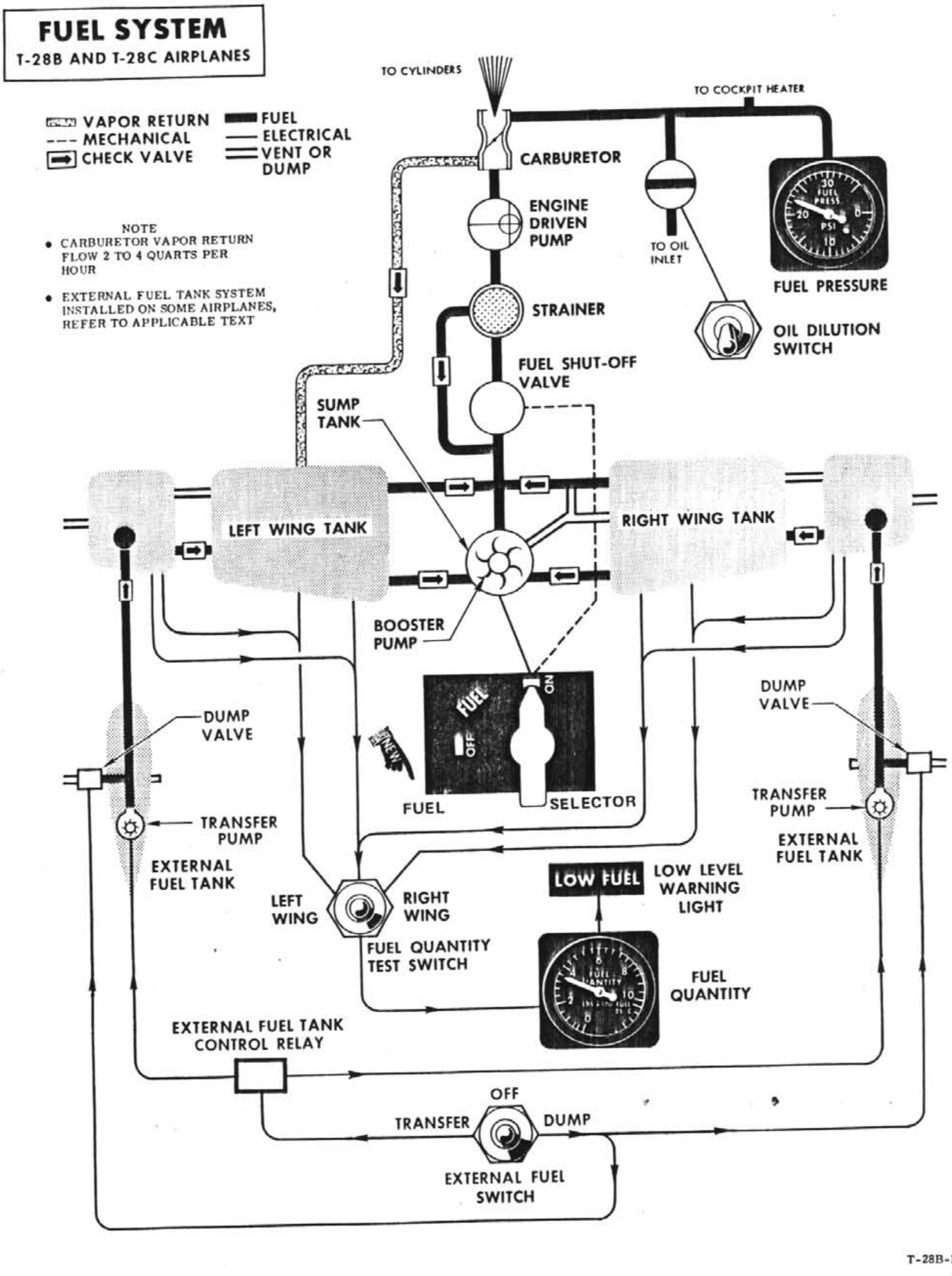

FUEL SYSTEM
T-28B AND T-28C AIRPLANES
VAPOR RETURN
MECHANICAL
CHECK VALVE
FUEL
ELECTRICAL
VENT OR DUMP
NOTE
• CARBURETOR VAPOR RETURN FLOW 2 TO 4 QUARTS PER HOUR
• EXTERNAL FUEL TANK SYSTEM INSTALLED ON SOME AIRPLANES, REFER TO APPLICABLE TEXT
TO CYLINDERS
TO COCKPIT HEATER
CARBURETOR
ENGINE DRIVEN PUMP
TO OIL INLET
FUEL PRESSURE
STRAINER
OIL DILUTION SWITCH
FUEL SHUT-OFF VALVE
SUMP TANK
LEFT WING TANK
RIGHT WING TANK
BOOSTER PUMP
FUEL
ON
OFF
FUEL SELECTOR
DUMP VALVE
TRANSFER PUMP
EXTERNAL FUEL TANK
LEFT WING
RIGHT WING
FUEL QUANTITY TEST SWITCH
LOW FUEL
LOW LEVEL WARNING LIGHT
FUEL QUANTITY
EXTERNAL FUEL TANK CONTROL RELAY
OFF
TRANSFER
DUMP
EXTERNAL FUEL SWITCH
T-28B-1-48-3

Figure 1-10

EXTERNAL FUEL TANKS.*

Two 100-gallon fuel tanks may be installed, one at each intermediate external store station. Fuel transfer pressure is provided by an engine-driven air pump, which forces air under pressure into the tank pressurization system. The air pump runs whenever the engine is operating. Pressurization air is directed to the fuel tank pressurization system or diverted overboard through the action of a solenoid-operated valve controlled from the front cockpit. The control circuit to the valve is connected through the ground safety relay, preventing external fuel transfer until the weight of the airplane is off the main landing gear. A fuel level control valve, installed in each wing inboard fuel cell, controls fuel level during the transfer operation. There is no fuel quantity indicating system for the external fuel tanks.

External Fuel Switch.*

A two-position, main-bus-powered toggle switch (1, figure 1-4), labeled "EXT FUEL TRANS," is installed on the left console adjacent to the fuel shutoff handle. Transfer of fuel from both external tanks is selected by moving the switch to ON.

NOTE In the event of electrical failure, the pressure control valve fails to the closed position, providing fail-safe transfer of external tank fuel.

- Once fuel transfer is initiated, fuel will continue to transfer after the external fuel switch is turned OFF, until tank air pressure is reduced to ambient pressure by fuel level reduction and escape of pressurization air through the control valve.

ELECTRICAL POWER SUPPLY SYSTEM - AT-28D AIRPLANES.

The airplane is equipped with direct- and alternating-current electrical power systems. The 28-volt dc system is powered by a 300-ampere engine-driven generator. A 24-volt storage battery serves as a stand-by power source for the dc system, in case of generator failure, or when the generator switch is in the OFF position. During ground operations, direct current can also be supplied to the aircraft by an external power source. Power for the ac system is furnished by a main-inverter. A spare inverter is available, should the main inverter fail.

*AT-28D-5 Airplanes changed by T.O. 1T-28A-546

DC ELECTRICAL POWER DISTRIBUTION.

Direct-current power is distributed from three electrical busses: the battery bus, the main bus, and the armament bus. The battery bus is powered directly from the battery, so that essential equipment powered by the battery bus is operable regardless of the position of the battery switch. When the battery switch is at BATT ON, the battery bus also can be energized by the generator or by an external power source. The main bus is powered by the generator. With the battery switch at BATT ON, the main bus can be powered from the battery. It also can be powered by an external power source regardless of the battery switch position. The armament bus is powered in the same manner as the main bus except that the armament master switch must be turned ON. In addition, on the ground, the armament safety disabling switch must be momentarily actuated.

AC ELECTRICAL POWER DISTRIBUTION.

Alternating current is supplied by the main inverter to the ac busses. A spare inverter provides power to the ac busses if the main inverter fails. The main inverter is powered by the main dc bus. It is selected by placing the inverter switch at MAIN ON. In case of main inverter failure, the spare inverter, also powered by the main dc bus, takes over automatically. If the automatic change-over does not take place, the spare inverter can be manually selected. Warning lights indicate failure of either inverter. Both inverters have **a capacity of 500 volt-amperes and supply power to the same equipment. On AT-28D-10 and some AT-28D-5 Airplanes, the spare inverter output is rated at 750 volt-amperes. Some airplanes have a main inverter with a capacity of 1500 volt-amperes to meet the higher demands of additional equipment. AT-28D-5 Airplanes and early AT-28D Airplanes have a 2500-volt-ampere main inverter.**

ELECTRICALLY OPERATED EQUIPMENT.

See figure 1-11.

EXTERNAL POWER RECEPTACLE.

To start the engine or to perform electrical ground checks, an external power source should be connected to the external power receptacle (figure 1-18) on the left side of the fuselage, aft of the wing.

NOTE To protect the battery, the battery switch should be OFF when external power is used.

CIRCUIT BREAKERS AND FUSES.

Most of the dc electrical circuits are protected by push-pull circuit breakers. If an overload occurs in a circuit, the resulting heat rise causes the circuit breaker to pop out, opening the circuit. The circuit breaker may be pushed in again in an attempt to re-energize the circuit. However, the

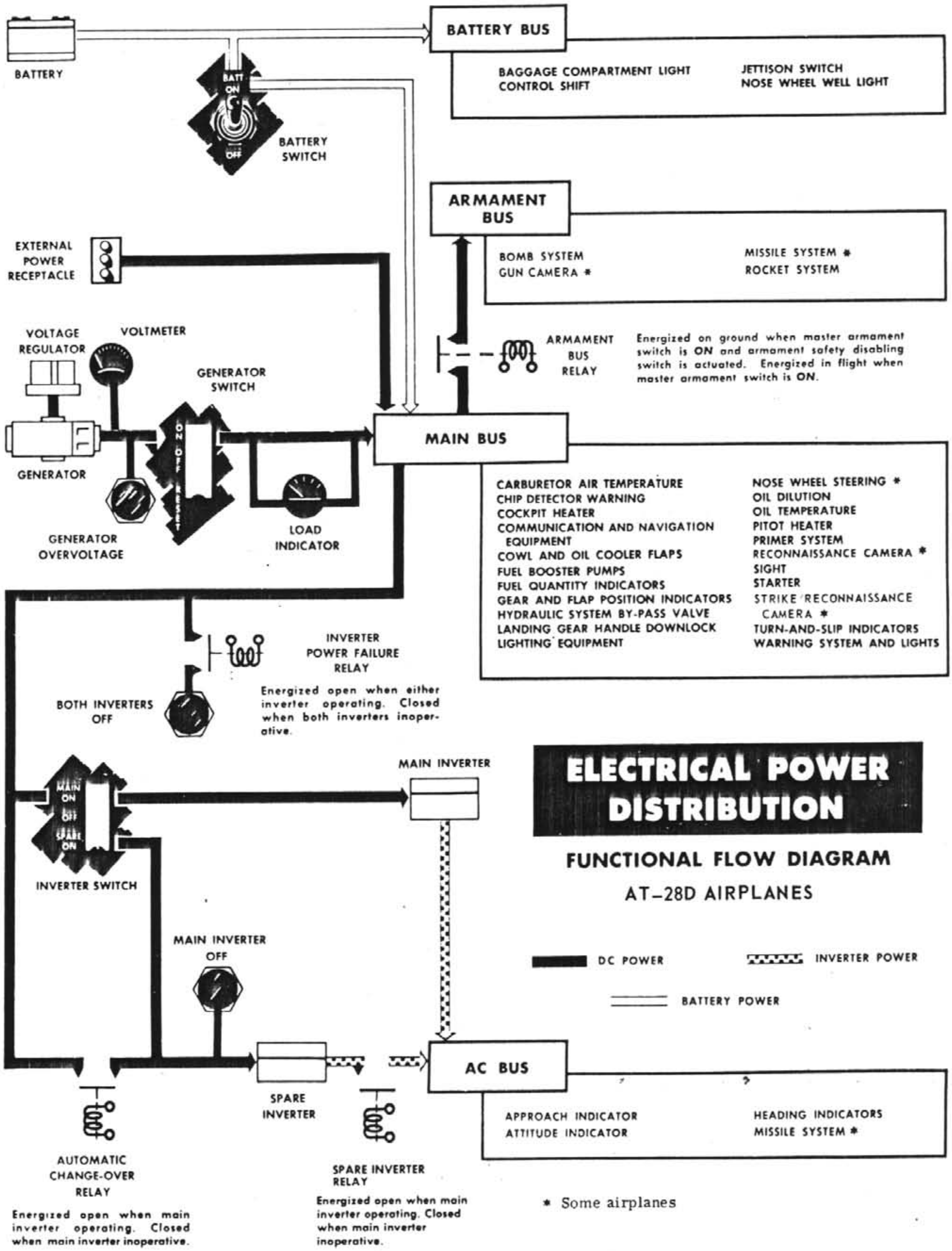

BATTERY BUS
BAGGAGE COMPARTMENT LIGHT
CONTROL SHIFT
JETTISON SWITCH
NOSE WHEEL WELL LIGHT
BATTERY
BATT ON
OFF
BATTERY SWITCH
ARMAMENT BUS
BOMB SYSTEM
GUN CAMERA *
MISSILE SYSTEM *
ROCKET SYSTEM
EXTERNAL POWER RECEPTACLE
ARMAMENT BUS RELAY
Energized on ground when master armament switch is ON and armament safety disabling switch is actuated. Energized in flight when master armament switch is ON.
VOLTAGE REGULATOR
VOLTMETER
GENERATOR SWITCH
ON OFF RESET
GENERATOR
GENERATOR OVERVOLTAGE
LOAD INDICATOR
MAIN BUS
CARBURETOR AIR TEMPERATURE
CHIP DETECTOR WARNING
COCKPIT HEATER
COMMUNICATION AND NAVIGATION EQUIPMENT
COWL AND OIL COOLER FLAPS
FUEL BOOSTER PUMPS
FUEL QUANTITY INDICATORS
GEAR AND FLAP POSITION INDICATORS
HYDRAULIC SYSTEM BY-PASS VALVE
LANDING GEAR HANDLE DOWNLOCK
LIGHTING EQUIPMENT
NOSE WHEEL STEERING *
OIL DILUTION
OIL TEMPERATURE
PITOT HEATER
PRIMER SYSTEM
RECONNAISSANCE CAMERA *
SIGHT
STARTER
STRIKE RECONNAISSANCE CAMERA *
TURN-AND-SLIP INDICATORS
WARNING SYSTEM AND LIGHTS
INVERTER POWER FAILURE RELAY
Energized open when either inverter operating. Closed when both inverters inoperative.
BOTH INVERTERS OFF
MAIN INVERTER
ELECTRICAL POWER DISTRIBUTION
FUNCTIONAL FLOW DIAGRAM
AT-28D AIRPLANES
MAIN ON
OFF
SPARE ON
INVERTER SWITCH
MAIN INVERTER OFF
DC POWER
INVERTER POWER
BATTERY POWER
AC BUS
APPROACH INDICATOR
ATTITUDE INDICATOR
HEADING INDICATORS
MISSILE SYSTEM *
SPARE INVERTER
AUTOMATIC CHANGE-OVER RELAY
Energized open when main inverter operating. Closed when main inverter inoperative.
SPARE INVERTER RELAY
Energized open when main inverter operating. Closed when main inverter inoperative.
* Some airplanes

Figure 1-11

circuit breaker should not be held in if the circuit opens a second time. The circuit-breaker panel (figure 1-13) is in the front cockpit, on the lower side of the right forward console. Direct-current armament circuits are protected by circuit breakers on the front of the armament control panel. In addition, the armament bus and jettison circuit breakers are in the battery access, and several miscellaneous circuit breakers are on the right console. Alternating-current circuits are protected by fuses. The fuse panel can be reached through an access door in the front cockpit, above the right aft console.

ELECTRICAL POWER SUPPLY SYSTEM CONTROLS.

Control of the electrical system (battery, generator, and inverters) is maintained in only one cockpit at a time. Control is obtained by operating the control shift switch.

Battery Switch.

A battery switch (figure 1-7) is on the switch panel of each cockpit. When the switch is in the OFF position, all electrical equipment becomes inoperative except the following: baggage compartment and nose wheel well lights, control shift switch, and store jettison button. However, all electrical equipment is operative if the external power supply is connected or if the generator switch is ON and the generator is operating.

Generator Switch.

Positions for the guarded switch (figure 1-7) on the switch panel of each cockpit are ON, OFF, and RESET. When the guard cover is down, the switch is held in the ON position and the generator is connected to the main bus. The OFF position disconnects the generator from the electrical system. The RESET position is for reconnecting the generator after it has been automatically disconnected because of an overvoltage condition.

Inverter Switch.

An inverter switch (figure 1-7) on the right forward console of each cockpit supplies main bus power to the main and the spare inverter. Should the main inverter fail, the spare is automatically connected into the circuit. The inverter switch is guarded at MAIN ON, but may be moved to SPARE ON for test purposes or in case the automatic change-over does not take place. Failure of the main or both inverters is indicated by warning lights. Moving the switch to OFF turns off both inverters. On later airplanes, after circuit breakers for the main and spare inverters are pushed in, 25 seconds should be allowed for vacuum tube filaments to warm up before the inverter switch is turned to MAIN ON or SPARE ON. Both the main and spare inverters are protected by circuit breakers on the circuit-breaker panel.

ELECTRICAL POWER SUPPLY SYSTEM INDICATORS.

Voltmeter.

A voltmeter (22, figure 1-2) is on the instrument panel in each cockpit. The voltmeter indicates generator voltage output. Normal voltage indication is approximately 28 volts.

Loadmeter.

A loadmeter (23, figure 1-2) is on the instrument panel in each cockpit. The loadmeter, marked "LOAD," indicates the percent of generator output being used. The loadmeter is graduated in decimal fractions of generator capacity and indicates the portion of this capacity (300 or 200* amperes) being delivered to the system and battery. An indication of .5 means the generator is delivering 150 or 100* amperes.

Generator Overvoltage Light.

A generator overvoltage red light (figure 1-7) is on the switch panel in each cockpit adjacent to the generator switch. Should generator voltage exceed the limit of approximately 33 volts, the generator is automatically disconnected from the electrical circuit and the generator overvoltage light is illuminated by main bus power. An attempt may be made to turn the generator on again by holding the generator switch at RESET position momentarily and then returning the switch to ON. The overvoltage light goes out when the switch is placed at RESET; if the light again comes on when the switch is returned to ON, the generator is still disconnected.

Inverter Warning Lights.

Two main-bus-powered inverter warning lights (figure 1-7) are on the switch panel of each cockpit, adjacent to the inverter switch. Illumination of the amber "MAIN OUT" light indicates the main inverter is off and the spare inverter is on.

*Airplanes not changed by T.O. 1T-28D-503

Illumination of the red "BOTH OUT" light indicates both inverters are off. If the red light is on when the inverter switch is at MAIN ON, it indicates the spare inverter has failed to automatically take over and the switch must be moved to SPARE ON. Illumination of both lights indicates both inverters have failed. Both lights can be dimmed by turning them clockwise.

ELECTRICAL POWER SUPPLY SYSTEM - T-28B AND T-28C AIRPLANES.

DC POWER

The 28-volt dc power system is powered by a 28-volt, 200-ampere engine-driven generator (30-volt, 300-ampere) and a 24-volt storage battery serves as standby power. DC power can also be supplied through an external power receptacle.

AC POWER

Power for the ac system is supplied by two inverters: a 750-volt-ampere inverter and a 250-volt-ampere inverter.

DC ELECTRICAL POWER DISTRIBUTION.

DC power is distributed from four buses: battery, primary, secondary, and monitored. When the Aero 1A training armament kit is installed, an armament bus is powered from the secondary bus through an armament bus control relay. The battery bus is connected directly to the battery and is energized whenever the battery is installed. All four buses are powered from the generator through the dc power switch. The primary bus is also energized by external power power, and by battery power when the DC POWER switch is in either BAT. & GEN. or BAT. ONLY position. The secondary and monitored buses are energized through the primary bus by generator or external power. The secondary bus is also energized by the battery when the DC POWER switch is in the BAT. ONLY position or when the landing gear is down and the DC POWER switch is at BAT. & GEN. The monitored bus cannot be powered from the battery alone. For dc power distribution, see figure 1-12.

AC POWER DISTRIBUTION (UNMODIFIED)

Both the main inverter, 750 volt-amperes, and the standby inverter, 250 volt-amperes, are powered from the dc distribution system. The main inverter receives power from the monitored bus and the standby inverter is powered from the primary bus. An instrument power switch is provided for manual selection of the inverters. The main inverter supplies power for the attitude gyros, the instrument power failure relay, the stall warning system (T-28C), and the radio magnetic indicator. If the main inverter fails, the standby inverter will supply power for the same equipment. For electrical power distribution, see figure 1-12.

AC POWER DISTRIBUTION (MODIFIED)

Both inverters are powered by the dc distribution system. The main inverter, 250 volt-amperes, receives power from the primary bus and the standby inverter, 750 volt-amperes, receives power from the monitored bus. An instrument power switch provides manual selection of either inverter. The standby inverter provides TACAN power and, if this inverter fails, there will be no power available to this equipment. TACAN power will also be lost if the instrument power switch in either cockpit is moved from the No. 1 to the No. 2 inverter. The front cockpit ac bus can be powered by either inverter and supplies power to the front cockpit attitude gyro and instrument power failure relay, T-28C stall warning system, and both RMI indicators. The rear cockpit ac bus can be powered by either inverter also, but only supplies power to the rear cockpit attitude gyro and instrument power failure relay. For electrical power distribution, see figure 1-12.

EXTERNAL POWER

For starting the engine or for electrical ground checks, an external power source can be connected to the external power receptacle on the left side of the fuselage aft of the wing.

NOTE There is no relay provided for the external power receptacle. Therefore, to prevent the plug from arcing, make sure the ground crew turns the power unit output off before disconnecting the external power plug.

ELECTRICAL SYSTEM CONTROLS AND INDICATORS

DC Power Switch (Unmodified)

The DC POWER switch (figure 1-7), located on the right forward console in each cockpit, has BAT. & GEN., OFF, and BAT. ONLY positions. The switch cannot be moved to the BAT. ONLY position when the guard is down. With the switch at BAT. & GEN. position and the generator operating, power is supplied to all four dc buses. With DC POWER switch OFF and the generator operating, the battery bus is energized by the battery and all other buses are inoperative. With the DC POWER switch at BAT. & GEN. and the generator not operating, the battery and primary buses are energized by the battery, and if the landing gear is extended, the secondary bus is automatically connected to the system. With the switch at the BAT. ONLY position and the generator inoperative, the battery, primary, and secondary buses are energized by the battery. Only the battery bus is energized if the switch is OFF and the generator is not operating.

MODIFIED

ELECTRICAL POWER DISTRIBUTION

T-28B AND T-28C AIRPLANES

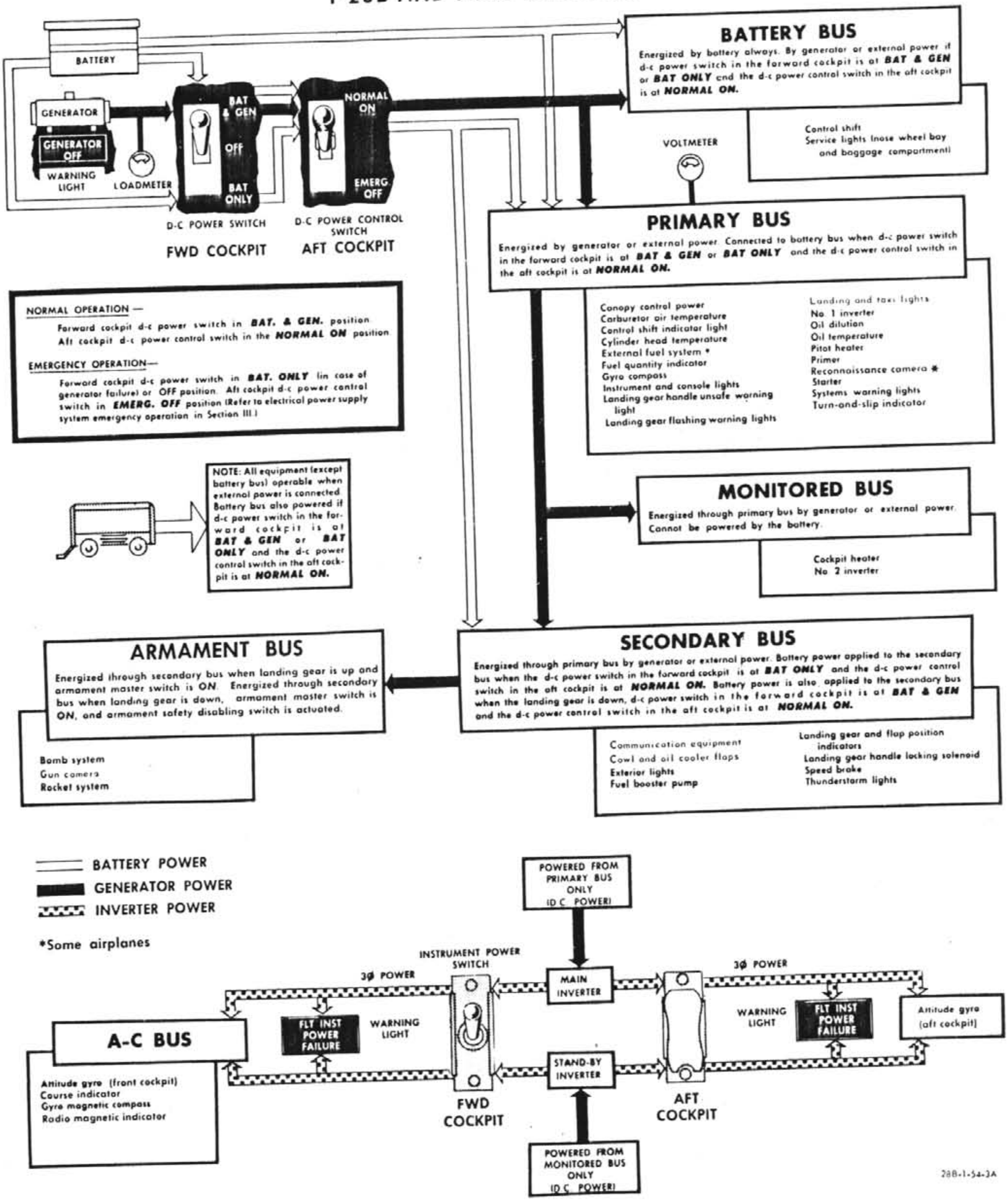


Figure 1-12 (Sheet 1 of 2)

UNMODIFIED

ELECTRICAL POWER DISTRIBUTION

T-28B AND T-28C AIRPLANES

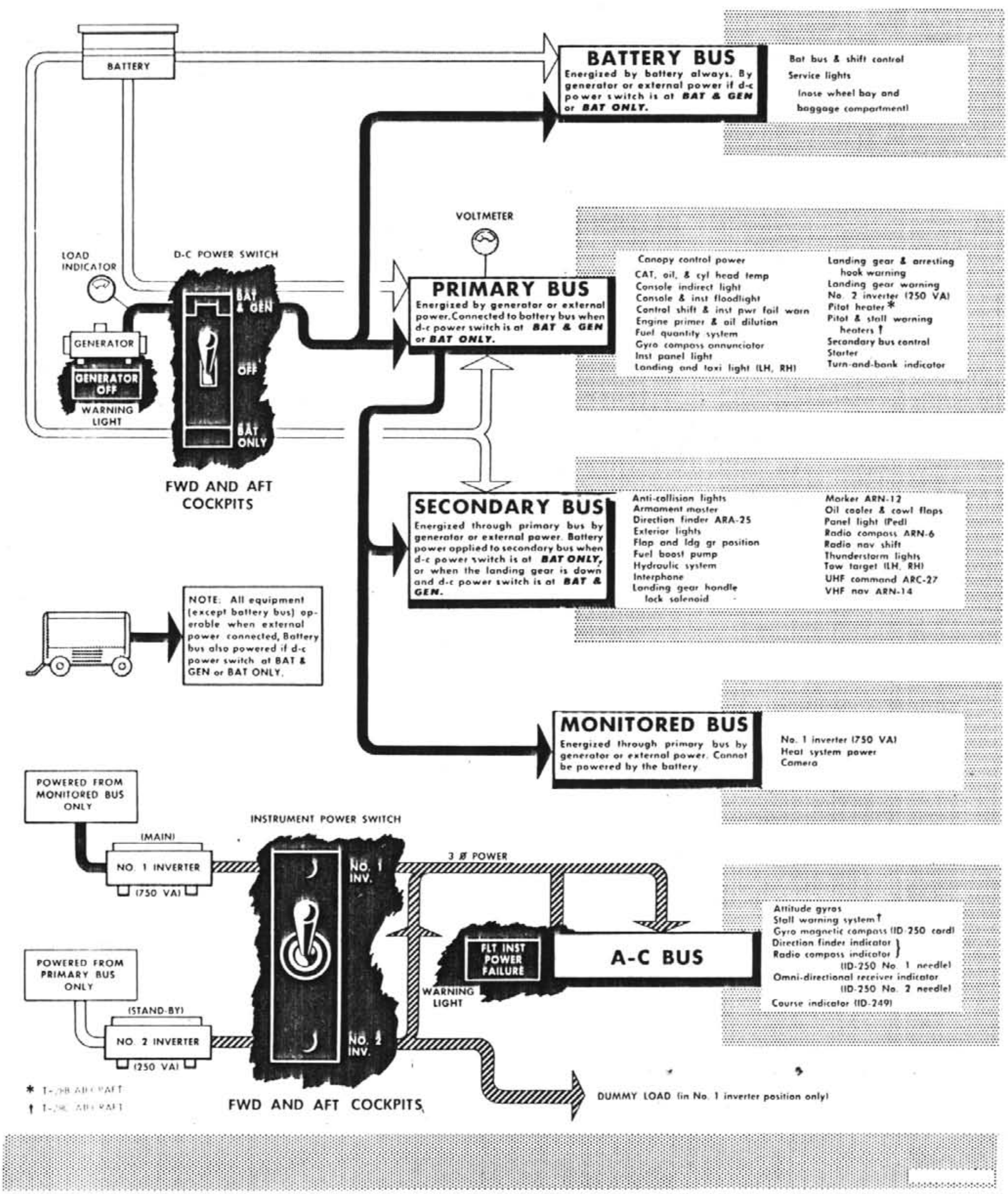


Figure 1-12 (Sheet 2 of 2)

NOTE The DC POWER switch should not be placed at BAT. & GEN. or BAT. ONLY when external power is applied.

- If it is necessary to use the battery simultaneously with external power, battery ON time should be kept to a minimum since no ground ventilation is provided.

DC Power Switch (Modified)

See figure 1-7. The front cockpit DC POWER switch is marked: BAT. & GEN., OFF, and BAT. ONLY. The rear cockpit switch is a lever-lock type with two positions marked: NORMAL ON and EMER. OFF. The front cockpit switch cannot be moved to the BAT. ONLY position unless the guard is raised. The rear switch can be moved to either position by pulling up on the toggle before moving. With the front switch at BAT. & GEN. position and the generator operating, power is supplied to all four dc buses. With this switch OFF and the generator operating, the battery bus is energized by the battery and all other buses are inoperative. With the DC POWER switch at BAT. & GEN. position and the generator not operating, the battery and primary buses are energized by the battery and, if the landing gear is extended, the secondary bus is automatically connected to the system. With the switch in the BAT. ONLY position and the generator inoperative, the battery, primary, and secondary buses are energized by the battery. With the switch OFF and the generator not operating, only the battery bus will be energized. For normal operation, the dc switch in the rear cockpit should always be in the NORMAL ON position. If an emergency occurs, placing the switch in the EMER. OFF position will cut off all dc power in the system except the battery bus.

Instrument Power Switch (Unmodified)

The two-position instrument power switch (figure 1-7), located on the right console in each cockpit, controls the bus load from the main and the standby inverters. The switch can be operated only by the pilot who last actuated his control shift switch. The main inverter supplies current to the ac bus when the switch is at the NO. 1 INV. position, and the standby inverter operates simultaneously under a dummy load. Moving the switch to NO. 2 INV. position connects the standby inverter to the ac bus, and the main inverter then operates in an open circuit.

Instrument Power Switch (Modified)

The instrument power switches have been removed from the transfer system. The aft cockpit switch cannot be moved to the NO. 2 INV. position unless the guard is lifted. The front cockpit inverter selector switch is used to select the power source, main or standby inverter, to all ac equipment except the aft cockpit attitude gyro. The aft cockpit inverter selector switch is used to select the power source to the aft cockpit attitude gyro only. If TACAN is installed, it is powered by the 750-volt-ampere standby inverter only, and controlled by a relay which is actuated when both inverter selector switches are in the No. 1 position. If either switch is moved from the No. 1 position, power to the TACAN will be interrupted and the equipment will be inoperative.

Intercockpit Control Shift Switches

An intercockpit control shift switch is mounted on both right consoles (figure 1-7). The control shift system is energized by the battery bus and will function with the DC POWER switch OFF in both cockpits. If the DC POWER switch is positioned to either BAT. & GEN. or BAT. ONLY, or if external power is supplied, a light adjacent to the control switch in either cockpit marked LT. ON CONTROL will illuminate when the related switch is operated to take control.

Circuit Breakers and Fuses

All dc circuits are protected from overloads by push-to-reset circuit breakers. Should an overload occur in a circuit, the resulting heat rise causes the circuit breaker to pop out and open the circuit. The circuit breaker may be pushed in again in an attempt to re-energize the circuit. However, the circuit breaker should not be held in if it opens the circuit a second time. The circuit-breaker panel (18, figure 1-5; figure 1-13) is located in the front cockpit below the right console. Alternating-current circuits are protected by fuses. The fuse panel can be reached through an access door in the front cockpit above the right console.

Generator-Off Warning Lights

A generator-off warning light (figure 1-7) is located on the right forward console in both cockpits. Illumination indicates that the generator is not operating and the battery or external power unit is supplying all power for the electrical system. To conserve the battery when the generator is inoperative, all unnecessary electrical equipment should be turned off or disconnected by pulling out related circuit breakers.

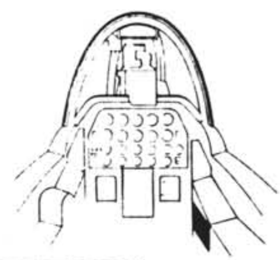
Instrument Power Failure Warning Lights

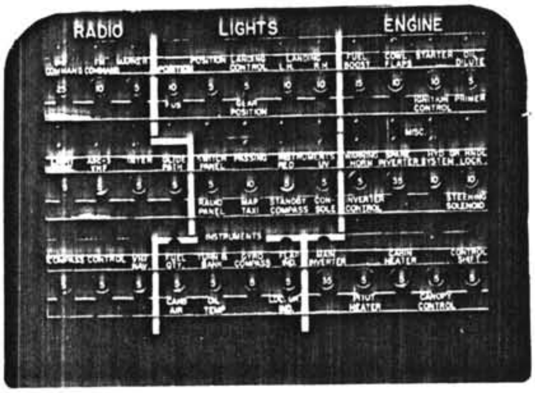
A flight instrument power failure warning light (32, figure 1-3), mounted on both instrument panels, illuminates when the ac bus is not energized. Illumination with the instrument power switch at NO. 1 INV. position indicates that the main inverter is not operating and that the attitude gyro and other ac powered equipment is inoperative. If the light goes out when the instrument power switch is moved to the NO. 2 INV. position, ac power is being supplied to the bus by the standby inverter. Failure of the standby inverter also causes the light to illuminate, providing the switch is in the NO. 2 INV. position.

Voltmeters

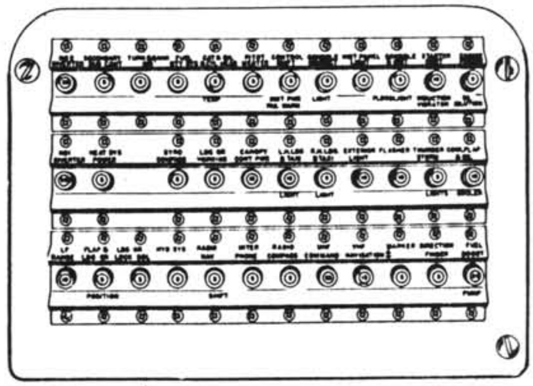
A voltmeter (23, figure 1-3), located on the instrument panel, indicates voltage output of the generator, battery,

CIRCUIT BREAKER PANELS
(TYPICAL)

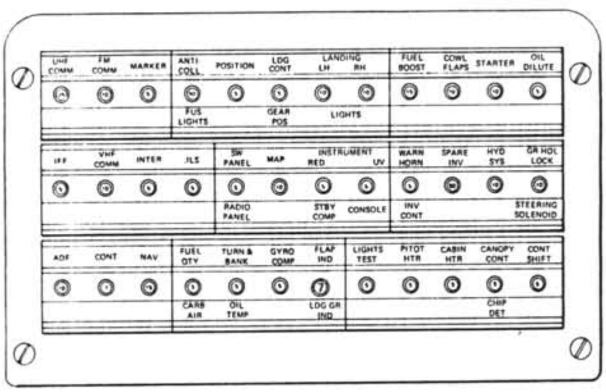




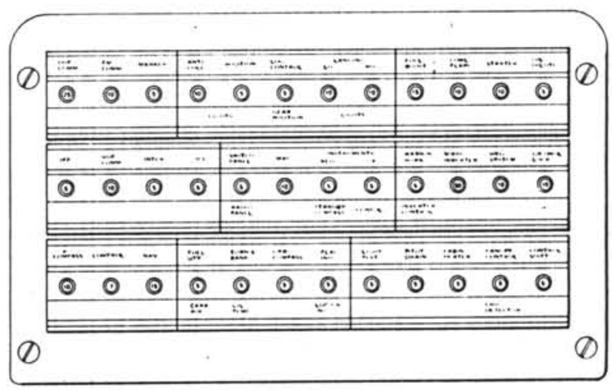
AT-28D AND AT-28D-5 AIRPLANES



T-28B AND T-28C AIRPLANES



** AT-28D-5 AIRPLANES



AT-28D-10 AIRPLANES

Figure 1-13

or external power unit. Normal voltage indication is approximately 28 volts.

Loadmeters.

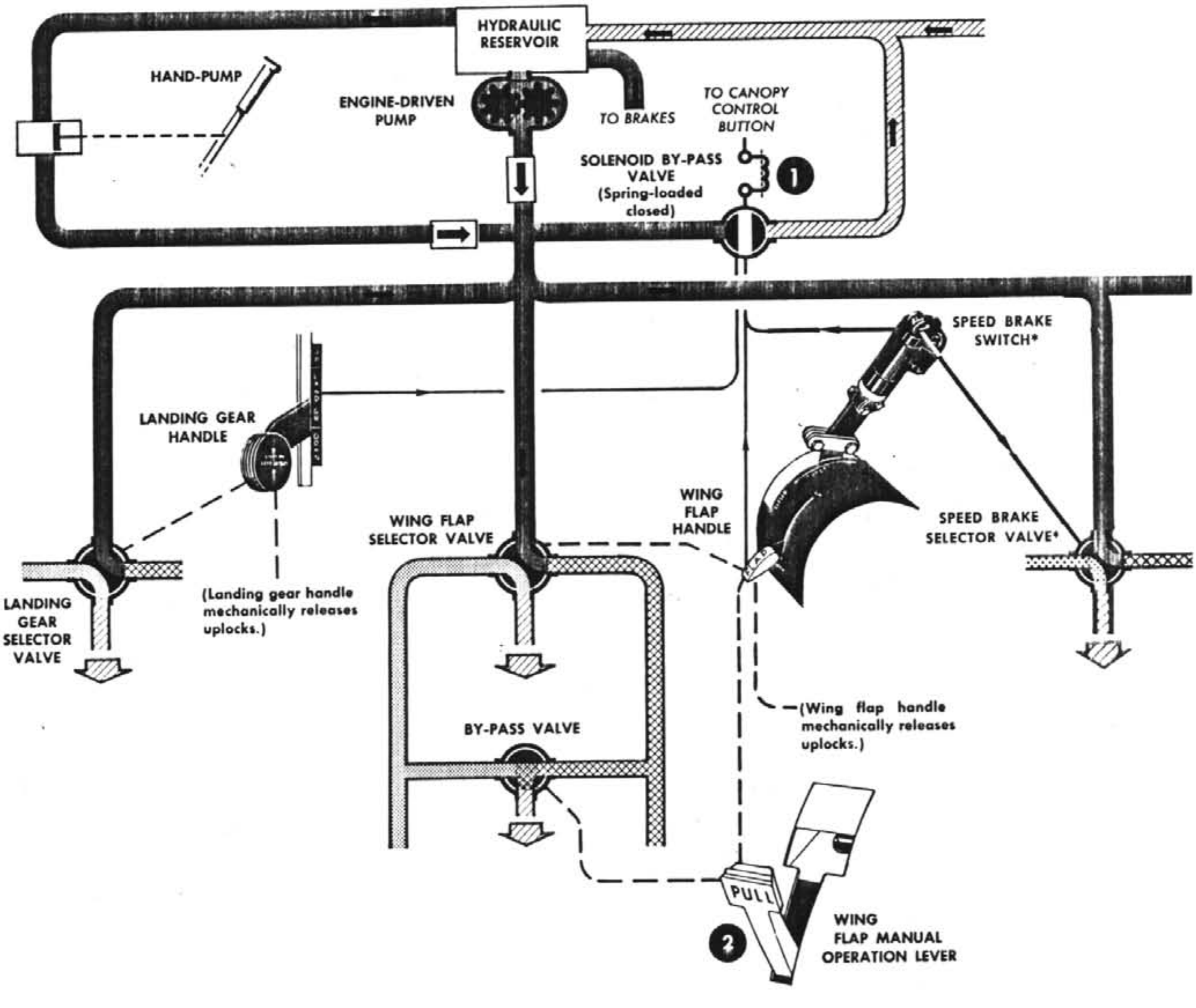
A generator load indicator (24, figure 1-3) is mounted on both instrument panels. The indicator reflects the percent of generator output being used and is graduated in decimal fractions. An indication of 0.5 means the electrical system is using one-half of rated generator capacity.

HYDRAULIC POWER SUPPLY SYSTEM.

Hydraulic power is used to operate the landing gear, wing flaps, canopy, speed brake,* and nose wheel steering.† (See figure 1-14.) A variable-displacement, engine-driven pump supplies hydraulic pressure for operation of the units. However, when no hydraulic units are being operated in flight, the entire output of the pump is automatically diverted to the hydraulic reservoir through a dc-actuated bypass valve. When any hydraulic control is operated, the bypass valve is electrically de-energized and closes, allowing the hydraulic system to build up pressure for operation of the selected unit. The bypass valve is electrically energized to open and depressurizes the system only when the units are in their normal flight position. The system is pressurized at all other times. Pressure is maintained in the system whenever the speed brake* is open and whenever the gear or flaps are down or in any position other than up and locked. Consequently, when the airplane is on the ground with the engine running, pressure is always available for operation of nose wheel steering.† In case of an electrical failure, the bypass valve automatically closes, pressurizing the system. Hydraulic brakes on the main wheels receive

* T-28B and T-28C Airplanes
** Airplanes changed by T.O. 1T-28A-560 only
† AT-28D Airplanes

HYDRAULIC



1. Electrically actuated to bypass when gear and flaps are up, speed brake closed,* and canopy handle button released.
2. For lowering flaps on ground for use as step. Also moves cockpit flap handle to **DOWN**.
3. Switch effective only if left main gear is on ground.
4. Pressure is released when canopy handle is moved from **EMERG OPEN**.

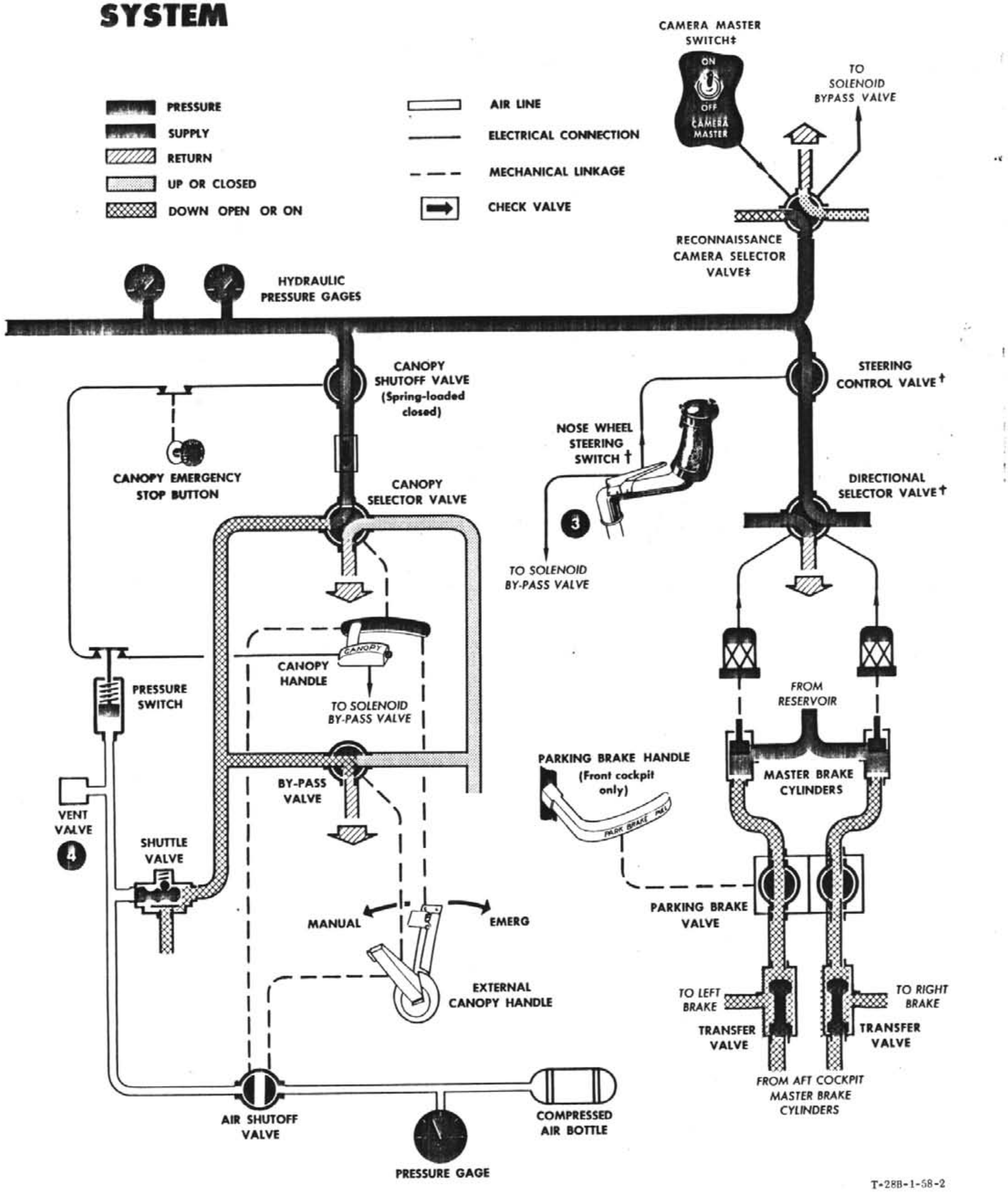
NEW

*T-28B and T-28C Airplanes
†On some AT-28D Airplanes
‡Photo-reconnaissance airplanes

T-28B-1-58-1

Figure 1-14

SYSTEM



T-28B-1-58-2

fluid by gravity from the hydraulic system reservoir. A standpipe in the reservoir retains enough fluid to supply the brakes if all fluid is lost from the system. An air system is provided as a substitute for the hydraulic system to rapidly open the canopy in an emergency. A direct reading hydraulic pressure gage is in each cockpit. For hydraulic fluid specifications, see figure 1-18.

HYDRAULIC HAND-PUMP.

A hand-pump (3, figure 1-4) in the front cockpit is primarily for ground check of the hydraulic system, but may be used in flight should the engine-driven pump fail. The hand-pump is merely a substitute for the engine-driven pump, and does not provide separate fluid supply or lines to operate any part of the system.

FLIGHT CONTROL SYSTEM.

The primary flight control surfaces (ailerons, rudder, and elevator) are operated from either cockpit through mechanical linkage with a dual set of conventional stick and rudder pedal controls. (There is no hydraulic boost for the control surfaces.)

FLIGHT CONTROLS.

Control Stick.

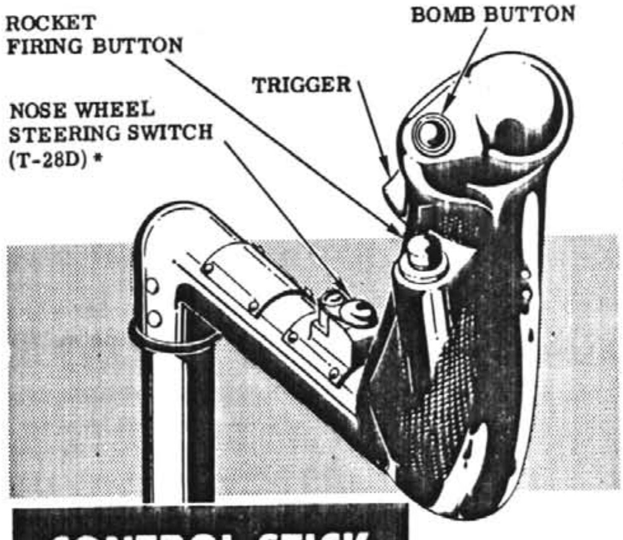
The control stick in each cockpit incorporates positive-grip handles. The control stick grip (figure 1-15) in the front front cockpit has a nose wheel steering switch,* a trigger, a rocket firing button† (rocket-firing button§), and a bomb button. The control stick grip in the rear cockpit has only a nose wheel steering switch.† The control sticks are mechanically connected to each other by a push-pull tube. The elevator system incorporates a bungee and bobweight. The bungee provides satisfactory control "feel" during low-speed flight and landing, and the bobweight assists pilot effort during accelerated flight.

Rudder Pedals.

A set of interconnected rudder pedals in each cockpit controls the rudder action through direct mechanical linkage to the rudder. The wheel brakes are actuated by pressure on the top rudder pedal plates. The rudder pedals can be adjusted for correct leg length.

RUDDER PEDAL RELEASE LEVER.

A rudder pedal release lever (25, figure 1-2; 33, figure 1-3), below the instrument panel in each cockpit, is used to unlock the pedals to permit their adjustment for desired leg length. When the release lever is moved to the right, both rudder pedals in that cockpit are released and snap to the full aft position (toward the seat). Holding the lever



CONTROL STICK (TYPICAL)

* Some Airplanes (refer to applicable text) 28B-1-52-1C

Figure 1-15

to the right and pushing the pedals forward until desired position is reached adjusts the pedals forward. An interconnecting cable between rudder pedals prevents the pedals from being adjusted individually.

Trim Tab Wheels.

Cable-operated aileron, rudder, and elevator trim tab control wheels are provided. The wheels are on the trim tab control panel (6, figure 1-4) in each cockpit. Trim tab position is shown by a scale and pointer at each wheel. When each pointer is at zero, the trim tabs are neutral. The left aileron trim tab is mechanically operated by the aileron trim tab wheel in each cockpit. The tab on the right aileron is adjustable only on the ground.

Control Lock (Throttle and Flight Controls).

All surface controls and the throttle are locked by a control lock (figure 2-3), which is stowed on the floor of the front cockpit aft of the stick. Pulling out the plunger to the right of the lock releases it from the stowed position on the floor. The lock can then be raised to engage the stick, and the plunger is released to slide into a hole in the stick. When the throttle is subsequently closed, it is locked in that position until the control lock is released.

WING FLAPS.

Hydraulically operated, semislotted-type wing flaps extend from aileron to fuselage on each wing. The flaps are operable from either cockpit, and a flap position indicator is

* Some AT–28D Airplanes
†T-28B, T-28C, and T-28D-5 Airplanes
§AT–28D Airplanes changed by T.O. 1T–28D–507

provided on each instrument panel. No emergency system is provided for operating the flaps. However, if the airplane hydraulic system fails, an attempt may be made to lower the flaps by operating the hydraulic hand-pump. The hand-pump will pressurize the system only when initial loss of pressure is caused by failure of the engine-driven pump. The flaps can be lowered on the ground from outside the airplane, and spring-loaded doors in the surface of the flaps may be used as steps up to the wing.

WING FLAP CONTROLS AND INDICATOR.

Wing Flap Handle.

The flaps are operated by means of a wing flap handle (10, figure 1-6) on the throttle quadrant in each cockpit. The handle is shaped in the form of an airfoil for easy recognition by feel. Moving the handle to UP,, 1/4, 1/2, 3/4, or DOWN electrically closes the bypass valve, which pressurizes the hydraulic system to operate the flaps, and mechanically positions the wing flap selector valve. When the desired flap position is obtained, the selector valve automatically returns to the neutral position. The flaps will lower 37 degrees when the wing flap handle is moved to DOWN. Detents hold the handle in any selected position. The flaps require approximately 7 to 12 seconds to extend and approximately 10 to 15 seconds to retract. The hydraulic system is pressurized as long as the flaps are in any position other than up and locked. The flaps are held in the up position by a mechanical overcenter lock and in any selected down position by the hydraulic lock of the selector valve in the neutral position.

Wing Flap Manual Operation Lever.

The flap manual-operation lever is on the left side of the fuselage, above the wing trailing edge. The lever is provided to release the flap uplock and to open the bypass valve at the cylinder so that the flaps can be pushed down manually, enabling the pilot to reach the steps. When the bypass valve is open, fluid is allowed to free-flow between the cylinder ports. If the engine is running when the lever is pulled, the flaps will lower to 37 degrees by hydraulic pressure, and can be manually pushed down (with the lever still held out). When the lever is released, the flaps will return to 37 degrees if hydraulic pressure is available. Lowering the flaps from the outside also moves the flap handles in the cockpit.

Caution When external fuel tanks, MAU63/A rack or GP bombs of the 500-pound or larger class with conical fins are carried, the wing flap manual operation lever should not be used, because the wing flaps or external fuel tanks, MAU63/A rack or bomb fins could be damaged if the flaps are manually lowered beyond 37 degrees. (On T-28B Airplanes and **AT-28D-5 Group II Airplanes, a mechanical stop** prevents wing flap manual operation beyond 37 degrees.)

NOTE When external fuel tanks are installed, a mechanical stop must be installed on the flap linkage to prevent the flaps from contacting the tanks when flap steps are used for boarding the airplane. Travel of flaps for flight operation is not affected.

Wing Flap Position Indicator.

A wing flap position indicator (36, figure 1-2; 37, figure 1-3), calibrated in degrees, is on the instrument panel in each cockpit.

STALL WARNING SYSTEM—T-28C AIRPLANES.

The airplane has very little aerodynamic buffet before a stall in the power approach and go-around configurations; therefore, a mechanical stall warning device is incorporated to give a stall warning approximately 7 or 8 knots above actual stall speed. This system consists of a transducer mounted on the right wing leading edge, a lift computer in the nose wheel well, a rudder pedal shaker on the right rudder pedal in each cockpit, a landing gear switch on the right main gear strut, and a test switch (42, figure 1-3) on the left forward console in the front cockpit. All electrical power is received from the primary bus. The system functions on the principle that as the attitude of the airplane changes, so does the pressure distribution on the wing. The transducer is located so that just before the stall it senses the change of pressure and actuates the circuit to the rudder pedal shakers. The lift computer balances the circuit to maintain the margin of stall warning within the range of 1.05 and 1.15 percent of the stall speed. Whenever the weight of the airplane is on the landing gear, the switch on the right gear strut disrupts the circuit to make the pedal shakers inoperative. However, actuating the test switch on the left forward console will bypass this switch and the pedal shakers will operate for a preflight check.

SPEED BRAKE—T-28B AND T-28C AIRPLANES.

The hydraulically operated speed brake is essentially an additional flight control, for descents or moderate deceleration from high speeds. The brake can be opened at any airspeed up to limit speed and although brake opening causes a nose-up pitch, the forward stick pressure necessary to maintain the desired airplane attitude is moderate up to 250 knots IAS. Above 250 knots, the opening of the speed brake causes a nose-up pitch which requires large initial stick pressures to maintain a constant dive attitude. This stick pressure can be trimmed out at all speeds by adjusting the elevator tab. Because of this excessive nose-up pitch, speed brakes should not be extended at the initiation of, or during, a high-speed pull-out. Speed brakes should be extended before entering high speed dives. Failure to observe these precautions may result in overstressing the airplane during a pull-out. Closing the brake, of course, causes a nose-down pitch.

Caution Do not operate speed brake while baggage compartment door is open, because the aft edge of the speed brake will not clear the baggage compartment door.

NOTE On the photo-reconnaissance version of the T-28C airplane, the speed brake is removed.

SPEED BRAKE SWITCH.

A secondary-bus-powered switch (1, figure 1-6) on top of the throttle grip in each cockpit controls the speed brake. The control can be operated only by the pilot who last actuated his control shift switch. The speed brake switch has only two fixed positions, OFF and ON, and no intermediate positions can be selected. When the switch is moved to ON, it energizes the speed brake selector valve, electrically closes the bypass valve, and pressurizes the hydraulic system. The hydraulic system remains pressurized as long as the brake is open. In the event of an electrical failure while the speed brake is open, the speed brake automatically closes to the trail position. Should a hydraulic failure occur while the brake is open, the brake will stay open until the speed brake switch is moved to OFF; air loads will then close the brake to the trail position.

SPEED BRAKE LIMITER VALVE.

A speed brake limiter valve is incorporated into the speed brake hydraulic system to reduce the violence of the nose-up pitch and possible overstress of the airplane when the speed brake is opened at high airspeeds.

This limiter valve reduces the pressure of the hydraulic fluid to the speed brake actuating cylinders and automatically allows the speed brake to extend to variable openings dependent upon the airspeed. Variable opening positions are maintained until the airspeed is reduced sufficiently to allow the limiter valve to overcome the force created by the high airspeed and to fully open the speed brake. Conversely, if the speed brake is fully extended and high airspeed is attained, the limiter valve will automatically adjust the degree of speed brake opening until the airspeed has been reduced. The speed brake will then fully extend. When the speed brake is in use, the pilot has no positive control over the speed brake limiter valve other than airspeed control of the airplane. Stick pressures to maintain a constant dive can be trimmed out at all speeds by adjustment of the elevator tab. When closing the speed brake, the limiter valve has no function in the system and the normal nose-down pitch will be experienced.

STRAKES—T-28C AIRPLANES.

When external stores are carried, strakes must be installed on each side of the forward fuselage. The strakes are necessary to assist in recovery if a spin is entered inadvertently.

LANDING GEAR SYSTEM.

The retractable tricycle landing gear is hydraulically operated. The main gear retracts inboard into the wing and fuselage; the nose gear retracts aft into the fuselage. Fairing doors cover the wheels in the retracted positions and are mechanically operated by gear movement. All fairing doors remain open when the gear is down. The gear is held up by mechanical locks; it is held down by overcenter side brace lockpins on each gear and also by hydraulic pressure. The lockpins will hold the gear down should the hydraulic system fail. All uplocks are released by initial movement of the landing gear handle; consequently, in event of hydraulic failure, the gear can be unlocked by the gear handle; the main gear then extends by its own weight, and the nose gear is extended fully by a spring bungee. A solenoid-operated downlock in the landing gear control system prevents inadvertent gear retraction when the airplane is on the ground. Any landing gear position other than up-and-locked de-energizes the solenoid bypass valve and causes the hydraulic system to be pressurized. The full-swiveling nose wheel is equipped with a shimmy damper and when the airplane leaves the ground, the nose wheel automatically centers itself. Brakes on the main wheels are used for directional control until the rudder becomes effective. Some AT-28D Airplanes have a hydraulically operated, electrically controlled steering unit installed in the nose gear, to provide nose wheel steering by movement of the rudder pedals. A fixed tail skid is installed under the aft section of the fuselage.

LANDING GEAR HANDLE.

The landing gear handle (40, figure 1-2; 39, figure 1-3) is at the left of the instrument panel in each cockpit. Moving the handle to either UP or DOWN operates the gear selector valve, de-energizes the bypass valve which pressurizes the hydraulic system, and mechanically positions the gear uplocks. When the airplane is on the ground, a solenoid-operated downlock (de-energized) prevents moving the gear handle inadvertently out of the DOWN position. The lock is automatically disengaged (electrically energized) when the airplane is air-borne. However, if an emergency requires gear retraction before the airplane is off the ground, pulling up very sharply on the gear handle overrides the solenoid-operated lock. In event of hydraulic failure in flight, the gear can be lowered by merely moving the gear handle to

DOWN, thereby mechanically releasing the up-locks and allowing the main gear to drop. It may be necessary to yaw the airplane to lock the main gear down. The nose gear is forced down and locked against the air load by a spring bungee. The landing gear retracts in approximately 4 to 6 seconds and extends in approximately 6 to 10 seconds. To lock the gear handle at full UP or DOWN, it must be placed firmly in its extreme position.

LANDING GEAR GROUND SAFETY LOCKS.

Landing gear ground safety locks (pins) are provided to be inserted in the side brace of each of the three landing gear struts to prevent accidental retraction of the landing gear when the airplane is on the ground. (See figure 1-16.) A long red streamer with the words "REMOVE BEFORE FLIGHT" stenciled on its is attached to the pin to readily indicate that the pin is inserted in the gear. The pin must be removed before flight or the gear will not retract.

LANDING GEAR POSITION INDICATORS.

Position of the landing gear is shown by three main-bus-powered (secondary-bus-powered*) individual indicators (37, figure 1-2; 3, figure 1-3), one for each gear, located on the instrument panel in each cockpit. Each indicator shows cross-hatching if the related gear is in any unlocked condition. The word "UP" appears if the gear is up and locked, and a wheel shows if the gear is down and locked. Cross-hatching also shows on the indicators whenever the electrical system is not energized. The landing gear position indicators may stick and not fully return to the cross-hatched de-energized position when the electrical system is turned off. However, the indicators will return to normal operation immediately after the electrical system is energized.

Landing Gear Warning Light and Horn.

Additional warning of unsafe gear position is provided by a red light in the landing gear control handle and, on T-28D Airplanes, a warning horn between the cockpits. The light comes on when the gear is in any unlocked condition. The warning horn sounds if the gear is not down and locked when the throttle is retarded below cruising power. On T-28D Airplanes, a horn silencer button (8, figure 1-6), at the base of each throttle quadrant, is provided to silence the horn. Advancing the throttle turns off the warning horn, but the horn will sound when the throttle is retarded again if the gear is not down and locked. On some T-28B and T-28C Airplanes, the landing gear warning horn and silencer button are replaced by a flashing warning light (5, figure 1-3) at the top left corner of the instrument panel. The light (one in each cockpit) comes on flashing when the throttle is in less than minimum cruise setting, with the wing flaps in any position other than full up, and the landing gear not locked down.

Caution On T-28B and T-28C Airplanes, when practicing no-flap landings, the warning lights will not flash (flaps full up) and the only unsafe landing gear indication will be the position indicator and the warning light in the landing gear control handle.

On AT-28D Airplanes changed by T.O. 1T-28-542, the landing gear warning horn is also used as a canopy-open warning signal when the gear is not down and locked. Refer to "Canopy Open Warning Light and Warning Horn – Airplanes Changed by T.O. 1T-28-542" in this section.

Landing Gear Exterior Position Lights.

To aid in determining landing gear position from the ground at night, a main-bus-powered (secondary-bus-powered*) white light is installed on each gear strut. Each light illuminates only when the related gear is down and locked and the exterior light master*/position light switch is turned on.

NOSE WHEEL STEERING SYSTEM – AT-28D AIRPLANES.

The nose wheel steering system is hydraulically operated and electrically controlled (main-bus-powered). Hydraulic pressure is supplied to the steering system through an electrically operated steering control valve, which is controlled from either cockpit. With the steering system engaged and the nose wheel on the ground, the nose wheel can be turned 30 degrees either side of center by movement of the rudder pedals. When a short turning radius is desired during low-speed taxiing, it is possible to override the steering system beyond the 30-degree limit by use of brakes, without damage to the steering system. The steering unit also operates as a shimmy damper. The nose wheel is full-swiveling when the steering switch is not engaged, and the brakes can be used for directional control. As the airplane leaves the ground on take-off, the steering system is automatically disconnected and the nose wheel centers itself.

NOSE WHEEL STEERING SWITCH. †

Depressing the steering switch (figure 1-15), below the control stick grip in each cockpit, energizes by main-bus power a solenoid-operated steering control shutoff valve, allowing hydraulic pressure to pressurize the steering system. If the nose wheel is within the 30-degree steering limit, the wheel turns to correspond to the position of the rudder pedals when the switch is engaged. The nose wheel may be turned approximately 30 degrees either side of center by pressure on the corresponding rudder pedal.

*T-28B and T-28C Airplanes
†Some Airplanes (Refer to applicable text).

LANDING GEAR GROUND SAFETY LOCKS

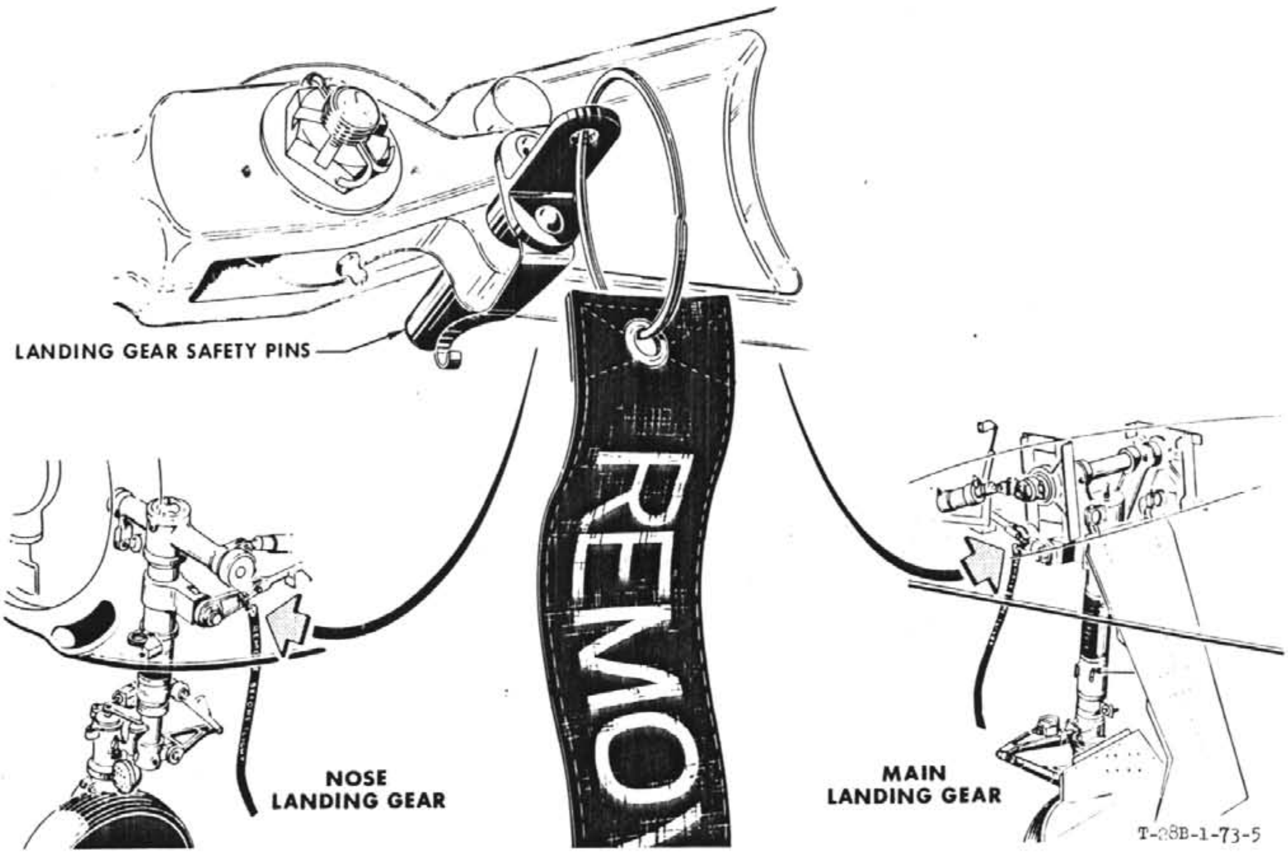


Figure 1-16

NOTE The nose wheel steering unit does not engage if the nose wheel is more than 30 degrees either side of center. If the nose wheel is headed more than 30 degrees from center, the nose wheel must be brought within the steering range with the wheel brakes.

WHEEL BRAKE SYSTEM.

Hydraulic brakes on the main wheels are the master cylinder type, operated by toe pressure on the rudder pedals. No boost is supplied by the hydraulic system of the airplane, but fluid from the airplane hydraulic reservoir supplies the master cylinders. Should all fluid be lost from the reservoir, however, there is adequate fluid remaining in the standpipe and lines to supply the brakes for normal operation. No emergency method of operating the brakes is provided. A parking brake handle (20, figure 1-2; 21, figure 1-3) is installed in the front cockpit only, to the right of the instrument panel. Parking brakes are set by applying toe pressure to the rudder pedals, rotating the parking brake handle, and then releasing the toe pressure. Brakes are subsequently released by depressing the rudder pedals.

INSTRUMENTS.

All instruments are duplicated in both cockpits, with the exception of a free air temperature gage and a magnetic compass, which are installed only in the front cockpit. For information regarding instruments that are an integral of a particular system, refer to the applicable system paragraph.

PITOT-STATIC SYSTEM.

The airspeed indicator, altimeter, and vertical velocity indicator are operated by the pitot-static system. This system measures the difference between impact air pressure entering the pitot tube, mounted on the right wing, and static air pressure obtained at static ports on each side of the fuselage, aft of the wings. The airspeed indicator is connected to the pressure and static sides of the system. The altimeter and vertical velocity indicator are connected to the static ports. Whenever the airplane is parked, a cover must be placed over the pitot head to keep the pressure tube opening clean.

AIRSPEED INDICATOR.

The conventional airspeed indicator (7, figure 1-2; 8, figure 1-3) is calibrated from 40 to 400 knots. On some airplanes, the indicator is calibrated from 50 to 650 knots and incorporates a maximum allowable airspeed pointer which indicates the maximum speed at which the airplane can be flown at any particular altitude. A vernier scale, visible through a window at the top center of the main dial, makes one revolution for each 100 knots change in airspeed. Graduations on this scale are provided for each 2 knots.

ALTIMETER.

The altimeter (8, figure 1-2; 7, figure 1-3) is the conventional three-pointer altimeter. On some altimeters, a notched disk will move to expose a set of warning stripes to give visual warning when altitudes under 16,000 feet are entered.

VERTICAL VELOCITY INDICATOR.

The conventional vertical velocity indicator (12, figure 1-2; 13, figure 1-3) is installed in this airplane.

ACCELEROMETER.

A three-pointer accelerometer (34, figure 1-2; 31, figure 1-3) indicates positive and negative accelerations. In addition to the indicating pointer, there are two recording pointers (one for positive G-loads and one for negative G-loads) which follow the indicating pointer to its maximum attained travel, and remain at the maximum travel positions reached by the indicating pointer. Pressing the knob on the instrument ring returns the recording pointers to the normal (1 G) position.

J-8 ATTITUDE INDICATOR - T-28D AIRPLANES.

A type J-8 attitude indicator system provides visual indications of dive, climb, and angle of bank. The gyro is enclosed in a sphere, a portion of which is visible through the opening on the face of the instrument. A manual caging device on the J-8 attitude indicator provides quick erection for minimizing ground operation and for correcting characteristic in-flight turn errors. Whenever the aircraft approaches a vertical climb or dive attitude, as it would in a loop, the gyro precesses a controlled 180 degrees; this action is momentary and does not interfere with the indications. Therefore, the pilot is reading the same face of the sphere regardless of attitude. Because of acceleration forces which act upon the erection mechanism during turns, up to 5-degree errors may be noted in pitch or bank upon return to straight-and-level flight. The indicator begins to correct this lag immediately, but manual caging may be used for quick erection. If errors greater than the 5-degree allowable tolerance are encountered, the instrument should be replaced.

The conventional J-8 attitude indicator (11, figure 1-2) is powered by the ac bus.

MB-1 ATTITUDE INDICATOR - T-28B AND T-28C AIRPLANES.

The Type MB-1 (H-6A) attitude indicator (12, figure 1-3) has a pitch scale that indicates pitch attitude of the airplane within a range of from 5 to 80 degrees in climb and dive. The instrument operates the same as the J-8 attitude indicator and is powered by alternating current supplied by either the main or spare inverter.

MAGNETIC COMPASS.

A magnetic stand-by compass is beneath the canopy bow to the left of the rearview mirror. A main-bus-powered (secondary-bus-powered*) switch on the right forward switch panel (figure 1-7) controls the lighting for the compass. The compass correction card is mounted on a spring-loaded overcenter hinged bracket on the forward side of the rearview mirror. When the card is not in use, it folds out of sight behind the mirror.

TURN-AND-SLIP INDICATOR.

The conventional turn-and-slip indicator (10, figure 1-2; 11, figure 1-3) is powered by the main bus (primary bus*).

FREE AIR TEMPERATURE INDICATOR.

The free air temperature indicator (16, figure 1-2; 18, figure 1-3) is in the front cockpit only, on the right side below the instrument panel shroud. (On T-28D photo-reconnaissance airplanes and T-28D-5 Airplanes with strike/reconnaissance camera, the indicator is mounted at the top of the windshield bow.) It is the direct-reading type and is calibrated to read from -50°C to 50°C.

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*T-28B and T-28C Airplanes

CLOCK.

The standard 8-day clock (29, figure 1-2; 34, figure 1-3) incorporates a sweep second hand.

EMERGENCY EQUIPMENT.

FIRST-AID KIT.

A first-aid kit, installed between the cockpits, is mounted either on the overturn truss (if installed) or on top of the shroud over the rear cockpit instrument panel.

ESCAPE SYSTEM←AIRPLANES CHANGED BY T.O. 1T-28-542.

Each cockpit contains an escape system that consists of a seat-type parachute, a back frame support, an extraction rocket, a canopy glass removal system, a restraint system, and a secondary escape system.

NOTE Some airplanes have the escape system installed in the front cockpit only. On these airplanes, dual flight is not permissible.

The escape sequence is started by pulling an extraction handle on the seat assembly. This action fires an initiator that ignites fuze lines to remove the Plexiglas from the canopy and eject the extraction rocket just aft of the seat. When the rocket reaches a height sufficient to remove all slack from two pendant lines attached to the pilot's harness, the rocket ignites to pull the pilot through the canopy opening. During extraction, the lower section of the seat folds down to ensure sufficient clearance from the airplane structure. Just before extraction rocket burnout, when the pilot is safely clear of the airplane, the pendant lines are released from the harness, and a parachute pack timer, armed in the escape sequence, fires a cartridge to deploy the parachute. The secondary escape system frees the pilot from the restraint and main escape system to permit secondary escape (bailout).

Two ground safety pins (figure 1-17), one for the extraction handle, and one for the secondary escape system pendant disconnect activator, have warning streamers attached. The pins, installed when the airplane is on the ground to prevent accidental actuation, are stowed in a pouch (9, figure 1-4) along the left console.

Warning The ground safety pins must be removed before flight, stowed, and reinstalled after flight.

CANOPY.

The hydraulically operated canopy is divided between the cockpits, making two sliding sections which move simultaneously. Normally, the canopy is operated hydraulically, but it may also be operated manually and, in an emergency, pneumatically. During manual operation of the canopy, a bypass valve is opened to allow free flow of fluid between the cylinder ports. A pneumatic system provides compressed air to open the canopy in an emergency; an air pressure gage is in each cockpit. On some T-28B and T-28C Airplanes, a single gage is in the baggage compartment. Mechanical locks automatically hold the canopy closed or full open; a hydraulic fluid lock is maintained to hold it in any selected intermediate position. The canopy is operable from either cockpit and from the left side outside the airplane by interconnected controls. The external control simultaneously moves the internal controls but is disconnected from the internal controls when it is in the stowed position. An adjustable ventilator is in the top portion of the forward and aft canopy sections. On airplanes changed by T. O. 1T-28-519 and T-28D-5 Airplanes, a hooded exhaust port is in the right skirt of the aft canopy section to ensure an adequate exchange of air throughout the cockpit. Refer to "Cockpit Heating and Ventilating System" in Section IV. There is no canopy operating limit airspeed other than the limit speed of the airplane.

On airplanes changed by T.O. 1T-28-542, the emergency escape system includes a canopy removal system that consists of cutter assemblies that encircle the periphery of the canopy Plexiglas. The fuze lines are connected to contained detonating fuze lines that are routed from ballistic manifolds and an initiator on the forward edge of the seat. In the initial phase of the escape sequence, pulling the extraction handle on the seat fires the initiator that detonates the cutter assemblies to separate the canopy glass. A canopy-open warning light and, on T-28D Airplanes, a canopy-open warning horn, help prevent an attempted extraction with the canopy open.

Warning Extraction cannot be accomplished with the canopy open because of interference of the canopy frame. If the canopy is opened during an emergency, or if an emergency develops after the canopy is opened, the canopy must first be closed before the extraction handle is pulled.

CANOPY HANDLE.

Normal or emergency operation of the canopy from inside the cockpit is controlled by a canopy handle

(7, figure 1-4) on the left side of each cockpit. The positions for each handle are EMERG OPEN, OPEN, LOCKED, CLOSED, and MANUAL. The canopy controls have a push button in each handle. For normal operation, the control must be moved to the desired operating position, OPEN or CLOSED, with the handle button depressed. If the control is moved without depressing the button, except to the EMERG OPEN position, the canopy will not respond. When operated hydraulically, the canopy opens in approximately 3 seconds and closes in approximately 6 to 10 seconds. The canopy handle must be in the LOCKED position to hold the canopy partially open.

Warning To minimize the possibility of engine exhaust fumes entering the cockpit, the canopy should be fully open when ground or flight operations are to be conducted with the canopy in a position other than fully closed.

Normal opening or closing the canopy from the cockpit, without the engine running, can be accomplished as follows: On T-28D Airplanes, place battery switch at BATT ON. On T-28B and T-28C Airplanes, place dc power switch at BAT. ONLY. Position the canopy handle as desired; then hold the canopy handle button down while the hydraulic hand-pump is operated. The canopy can be operated manually when the canopy handle is moved to MANUAL to allow hydraulic fluid in the cylinder to be bypassed. In an emergency, pulling the canopy handle all the way back to the EMERG OPEN position opens the canopy fully in 1/2 to 3/4 second. The canopy handle button does not have to be depressed to actuate the system in the EMERG OPEN position, although it is necessary to forcibly move the handle through a stop which normally prevents inadvertent operation of the emergency system. When the handle is moved to EMERG OPEN, air pressure from an air bottle is supplied to the canopy actuating cylinder through separate lines. The canopy air bottle and specification are shown in figure 1-18. To bleed the air overboard from the emergency system after pneumatic operation, the canopy handle is moved to OPEN (without pressing the canopy handle button) and left at OPEN for 30 to 45 seconds. Then, operating the canopy through several complete cycles from closed to open will bleed any air from the normal canopy hydraulic system.

Warning After an emergency air opening, the canopy should not be closed until the system has been bled. If the canopy has been closed without this precaution, a subsequent emergency opening may be violent enough to damage the airplane or cause injury to personnel in the canopy path.

NOTE When locking the canopy after closing, if the locked position is inadvertently passed, move the handle to the closed detent and press the button. This will close the canopy tightly. Then release the button and carefully move the handle to the locked position. If this procedure is not followed when the handle is pushed past the locked detent toward the open detent, the canopy may open enough to admit exhaust fumes into the cockpit. In those cases where the canopy has a tendency to creep back (1/4 to 3/8 inch), it is recommended that the handle be actuated in the CLOSED position and left there for flights with the canopy shut and that the LOCKED position be used for intermediate open settings. By following the preceding procedure, hydraulic pressure will remain trapped in the system and provide a tightly closed canopy, thus eliminating the possibility of fumes entering the cockpit.

Warning On airplanes changed by T.O. 1T-28-542 (escape system), extraction cannot be accomplished with the canopy open because of interference of the canopy frame. If the canopy is opened during an emergency, or if an emergency develops after the canopy is opened, the canopy must first be closed before the extraction handle is pulled.

Canopy Handle Button.

The canopy handle button (8, figure 1-4) on the front of the canopy handle in each cockpit is powered by the primary (main) bus. The button de-energizes the airplane hydraulic system bypass valve and energizes the canopy system shutoff valve when depressed. This permits hydraulic pressure to enter the canopy system and open or close the canopy (canopy handle at OPEN or CLOSED). Depressing the button in flight de-energizes the hydraulic system bypass valve, permitting the hydraulic system to become pressurized. (Because of the extended landing gear, the system is always pressurized on the ground with the engine running.) Releasing the button stops movement of the canopy by closing the canopy shutoff valve. When the hydraulic hand-pump is used to pressurize the canopy system, the button must be depressed to open the canopy shutoff valve. It is unnecessary to actuate the button when the canopy handle is moved to the EMERG OPEN or MANUAL position.

CANOPY EXTERNAL HANDLE.

The canopy external handle (figure 3-2) on the left side of the fuselage, above the wing trailing edge, has the same function as the internal handles for manual or pneumatic operation. (The canopy cannot be operated hydraulically by the external handle.) Pulling the canopy external handle out from the fuselage (stowed position) allows the handle to be turned forward to MANUAL for manual operation, or aft to EMERG for pneumatic emergency canopy opening.

Warning When preparing to open the canopy by use of the canopy external handle, extreme caution should be exercised. To prevent accidental pneumatic emergency opening of the canopy, pull the handle full out before rotating it forward to MANUAL. Release the handle flush against the fuselage before returning it to the stowed position. If the handle is pulled only part way out and moved forward toward MANUAL, it can be rotated beyond the operating limit of the canopy handle in the cockpit. Then, if the overtraveled external handle is held out (engaged) during its return to the stowed position, the action will be duplicated by the canopy handle. As a result, the canopy handle will be forced into the EMERG OPEN position, causing a discharge of the pneumatic emergency canopy opening system. Accidental pneumatic emergency opening of the canopy through improper operation can result in injury to personnel in the canopy path or damage to the airplane.

CANOPY EMERGENCY STOP BUTTON.

A canopy emergency stop button (1, figures 1-2 and 1-3) is on the left side of the instrument panel shroud in each cockpit. The button is used in the event it is necessary to override the canopy handle (and button) and stop movement of the canopy when it is being operated hydraulically. Pressing either button while the canopy is moving closes the shutoff valve, thus disrupting the flow of hydraulic fluid to the actuating cylinder and stopping the canopy immediately. Canopy operation continues normally after the button is released.

CANOPY EMERGENCY AIR PRESSURE GAGE.

A canopy emergency air pressure gage (15, figure 1-4) is on the left forward console of each cockpit, to indicate available emergency air pressure in the air bottle. The gage is calibrated in pounds per square inch in increments of 100 from 0 to 2000. On some T-28B and T-28C Airplanes, a single gage is in the baggage compartment.

CANOPY OPEN WARNING LIGHT AND WARNING HORN - AIRPLANES CHANGED BY T.O. 1T-28-542.

The red press-to-test type canopy open warning light (2, figures 1-2 and 1-3) comes on when the canopy is in any position other than fully closed. On T-28D Airplanes, a canopy open warning horn (between the cockpits) also sounds when the canopy is in any position other than fully closed, and the landing gear is not down and locked. The warning horn, which is also used as a landing gear warning horn on T-28D Airplanes, has a silencer button. (See 8, figure 1-6.) The warning light and horn assist in preventing the occupants from initiating the escape system with the canopy open. The light is powered by the primary bus on T-28B and T-28C Airplanes. On T-28D Airplanes, the light and horn are powered by the main bus.

CANOPY BREAKAWAY TOOL.

A canopy breakaway tool (13 or 20, figure 1-4) provides each pilot with an emergency method of exit when all normal and emergency procedures for opening the canopy fail. The tool is a short, pointed knife blade on a heavy cylindrical metal handle. It is stowed in a metal scabbard on the left side of each cockpit. The tool is removed from the scabbard by grasping the handle with one hand and pulling the handle-holder ring with the other hand. The tool can then be lifted out of the scabbard.

SEATS.

The seats are adjusted by a lever at the right side of each seat. Pulling the lever back allows the seat to be raised or lowered approximately 7 inches. When the lever is pulled back, the pilot is assisted in raising the seat by a spring which tends to force the seat up. As the seat is raised, it also moves forward. There is a seat cushion in each seat, for use when a seat pack parachute is not worn.

SEAT ASSEMBLY—AIRPLANES CHANGED BY T.O. 1T-28-542.

Each cockpit has a lightweight, adjustable seat (figure 1-17) with a seat adjustment switch, an extraction handle, a secondary escape handle, an inertia reel assembly, and a seat pack type parachute. The lower section of the seat automatically folds downward during extraction, allowing the pilot to assume a near-standing position to ensure sufficient clearance of the airplane structure. The seat remains in the airplane during extraction.

SEAT ADJUSTMENT SWITCH.

Seat height can be adjusted electrically by a three-position switch (figure 1-17) on the right forward portion of the seat. Moving the switch up raises the seat. Moving the switch down lowers the seat. Full up-down throw of the seat is approximately 5 inches, but the seat can be stopped at any intermediate position by moving the switch to the center (OFF) position. The seat adjustment switch is powered by the primary bus on T-28B and T-28C Airplanes. On T-28D Airplanes, power is supplied by the main bus.

RESTRAINT SYSTEM.

Each pilot is restrained by a safety belt, a shoulder harness, and an inertia reel strap. The safety belt is securely retained on each side of the seat by release pins. Adjustment of the belt is accomplished by pulling on an adjustment strap on the left half of the belt. The shoulder harness is attached to the parachute assembly by risers routed over the back frame support and secured to the torso restraint harness by quick-release fittings. The rear seat has a tie-down band for securing the risers for solo flight. The inertia reel straps are routed over the headrest frame and are secured by sears and a release pin below the headrest. The inertia reel take-up mechanism automatically locks when subjected to a deceleration force in excess of 2.5 G along the airplane thrust line, and is automatically placed in manual lock when the extraction handle is pulled.

SECONDARY ESCAPE HANDLE.

This loop-type handle (figure 1-17), on the right forward portion of the seat, is used for separating the pilot from the restraint and escape systems for secondary escape (bail-out) when the escape system is not used. Squeezing the trigger on the upper portion of the handle loop, and pulling the handle up and aft (full travel is about 110 degrees), actuates the emergency harness release system as follows: It releases the arming cable to the parachute timer in the parachute pack to prevent automatic parachute deployment; actuates a pendant disconnect activator that fires time-delay (0.75 second) cartridges to release the pendant line attachments connecting the torso harness to the extraction rocket; and retracts the release pins from the safety belt and inertia reel strap. These actions occur simultaneously to free the pilot, parachute, and survival gear from the restraint and escape systems.

The pendant disconnect activator arming cable separates from the pendant disconnect activator terminal on the seat lower section as the pilot leaves the seat. The secondary escape handle, the pendant cable disconnect and the harness release cable are connected by two safety wires that should be intact before flight.

EXTRACTION HANDLE.

The extraction handle (figure 1-17) is a flexible, plastic-coated cable loop secured to the forward edge of the seat. The handle is grasped with both hands, palms up, elbows tight to the sides, and pulled up and aft until the handle separates from the seat. Pulling the handle automatically locks the shoulder harness inertia reel and fires the extraction initiator that ignites the contained detonation lines and mild detonation lines to ballistically remove the glass from the canopy and eject the extraction rocket to pull pilot from the airplane. Approximately 20 to 40 pounds is required to separate the extraction handle from the seat.

SHOULDER HARNESS LOCK HANDLE.

There is a two-position (LOCKED and UNLOCKED) shoulder harness inertia reel lock handle on the left side of each seat. A latch is provided for positively retaining the control handle at either position of the quadrant. Pressing down on the top of the control handle releases the latch and allows the handle to be moved freely from one position to another. On some airplanes, the shoulder harness lock handle does not have the latch. Positioning the handle at lock or unlock is accomplished by moving the handle. A spring load requires a positive movement to move the handle from unlock to lock position. A positive pull force is necessary to release the handle from the locked position. In addition to manually locking the shoulder harness, the inertia reel automatically locks when the airplane is under a 2 to 3 G deceleration, as in a crash landing.

Warning If the pilot does not manually lock the shoulder harness before impact during a forced landing, bodily injury will be sustained if he is leaning forward for better visibility or if deceleration forces do not automatically lock the harness. Pulling the shoulder straps from the inertia reel does not serve as a check of the automatic locking feature of the reel.

Caution Before a forced landing, all switches not readily accessible with the harness locked should be "cut" before the harness lock handle is moved to the LOCKED position.

If the harness is locked while the pilot is leaning forward, as he straightens up, the harness retracts with him, moving into successive locked positions as he moves back against the seat. To unlock the harness, the pilot must be able to lean

ESCAPE SYSTEM

AIRPLANES CHANGED BY T.O. 1T-28-542

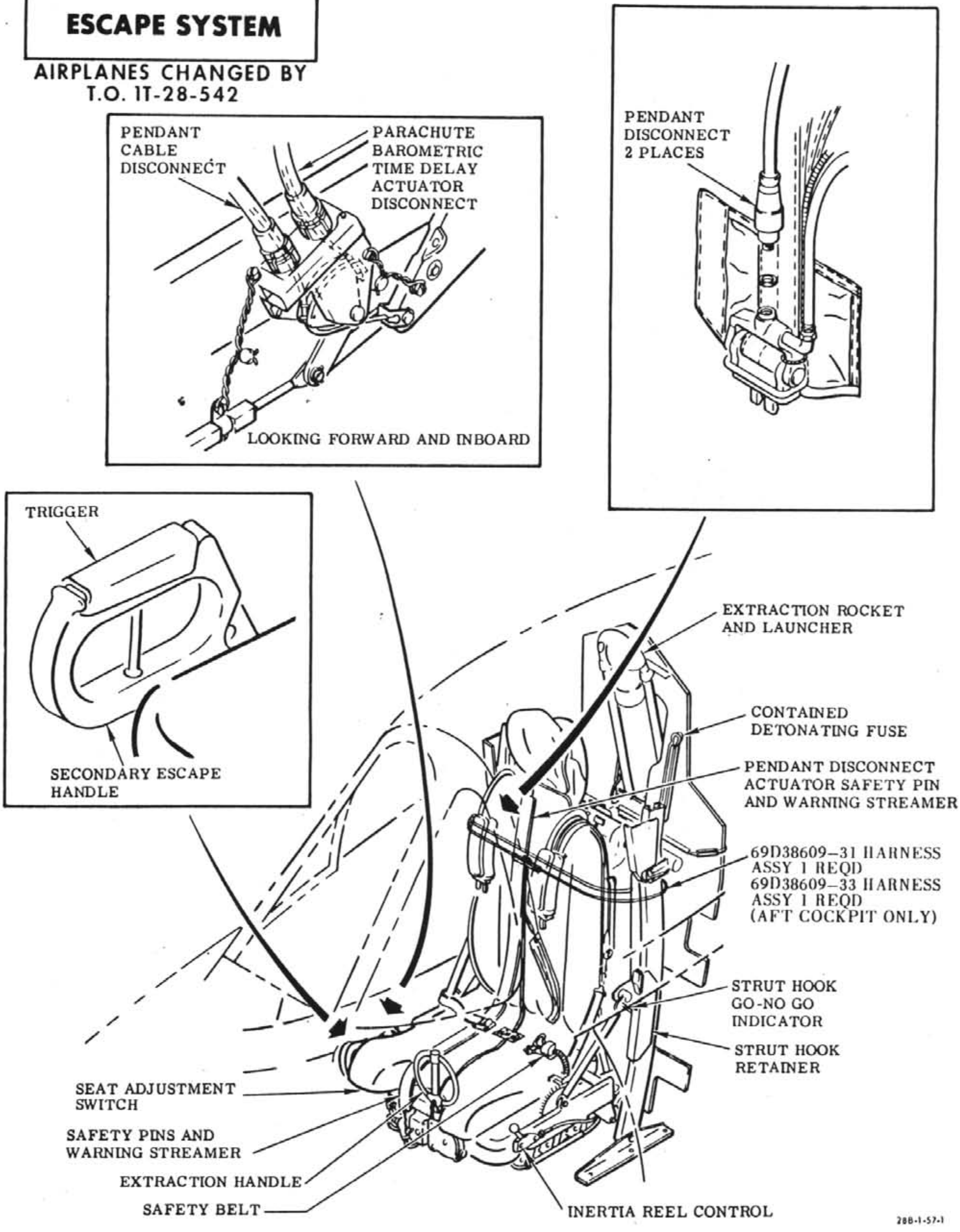


Figure 1-17

SERVICING DIAGRAM

SPECIFICATIONS

FUEL: MIL-G-5572 GRADE 100/130 or 115/145

NOTE

Fuels may be intermixed without restrictions.

ENGINE OIL: MIL-L-22851 (If not available, use commercial grade 120, either E, or W, or plain.

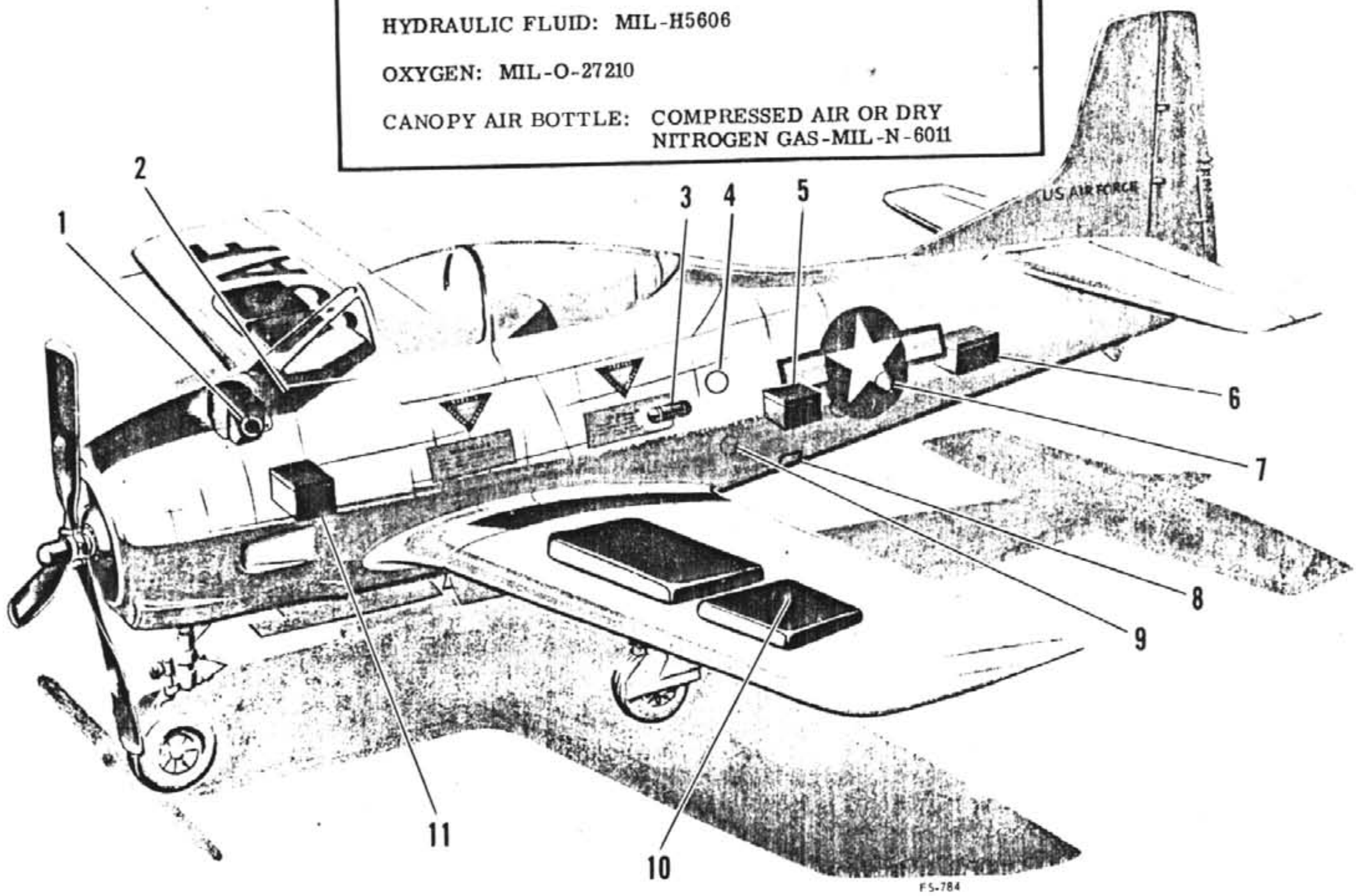
NOTE

MIL-L-6082 oil may be used or mixed with MIL-L-22851.

HYDRAULIC FLUID: MIL-H5606

OXYGEN: MIL-O-27210

CANOPY AIR BOTTLE: COMPRESSED AIR OR DRY NITROGEN GAS-MIL-N-6011



1. OIL TANK
2. HYDRAULIC RESERVOIR
3. CANOPY AIR BOTTLE RECHARGER VALVE
4. CANOPY EMERGENCY AIR PRESSURE GAGE (T-28B, T-28C AND T-28D-10)
5. BATTERY (T-28C)
6. BATTERY (T-28B AND T-28D)
7. OXYGEN FILLER VALVE (T-28B AND T-28D)
8. EXTERNAL POWER RECEPTACLE
9. OXYGEN FILLER VALVE (T-28C)
10. LH WING TANK FILLER
11. BATTERY (PHOTO RECONNAISSANCE AIRPLANES)

28B-1-00-9D

Figure 1-18

back enough to relieve the tension on the lock. Therefore, if the harness is locked while the pilot is leaning back hard against the seat, he may not be able to unlock the harness without first releasing it momentarily at the safety belt (or releasing the harness buckles, if desired). After the harness is automatically locked, it remains locked until the lock handle is moved to the LOCKED position and then back to the UNLOCKED.

AUXILIARY EQUIPMENT.

Information pertaining to the description and operation of the following auxiliary equipment is included in Section IV: heating and ventilating, defrosting, communications, Gyrosyn compass control system, lighting, oxygen, instrument-flying hood, and armament (guns, bombs, rockets, and sights).

NORMAL PROCEDURES

SECTION II

TABLE OF CONTENTS

PREPARATION FOR FLIGHT.

NOTE Where line items (or explanatory text) apply to a particular model, the applicable model letter or letters, in parentheses [(D), (B/C), (B/D), etc], will appear between the step number and step (or at or near the beginning of the explanatory text). Information which is not coded is applicable to all models.

FLIGHT RESTRICTIONS.

Refer to Section V for detailed airplane and engine operating limitations.

FLIGHT PLANNING.

Preflight planning data, such as take-off performance, fuel quantity, cruise data, and other information necessary to complete a proposed mission, must be obtained from Appendix I.

Communication requirements are determined from appropriate flight planning and flight information publications.

TAKE-OFF AND LANDING DATA CARD.

A take-off and landing data card is contained in T.O. 1T-28B-1CL-1. The use of this card will be in accordance with existing Command directives.

WEIGHT AND BALANCE.

Refer to Section V for weight and balance limitations. Before each flight, check take-off and anticipated landing gross weight and balance. Check that weight and balance clearance for Form 365F is satisfactory.

CHECKLIST.

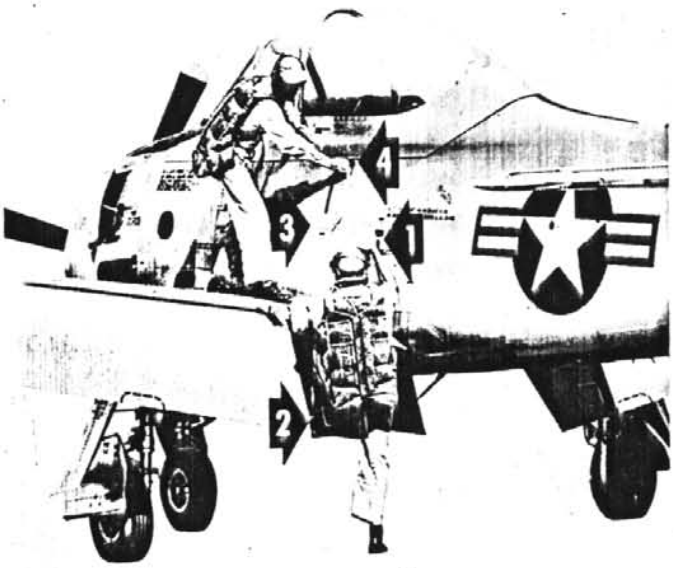
Refer to page iii for additional information on this subject. The checklist will be used in accordance with the applicable USAF directives.

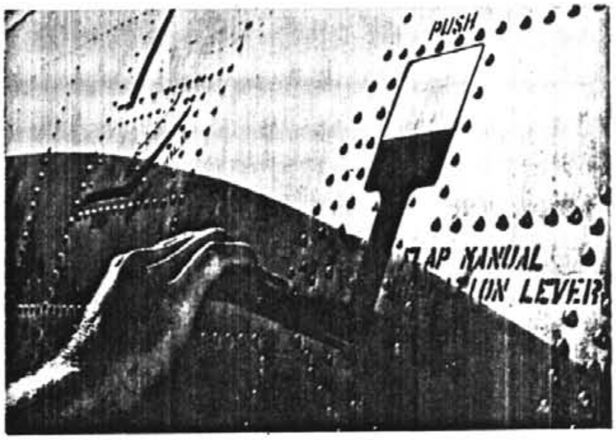
ENTRANCE.

The canopy can be opened from the left side of the airplane only. (See figure 2-1.) For access to the cockpits, pull the wing flap manual operation lever above wing trailing edge, and push flap down. Step up on wing, using steps in flap and handholds in wing and fuselage.

Caution When external fuel tanks, MAU63/A rack or GP bombs of the 500-pound or larger class with conical fins are carried, the wing flap manual operation lever should not be used, because the wing flaps or external fuel tanks, or bomb fins can be damaged if the flaps are lowered beyond

ENTERING AIRPLANE

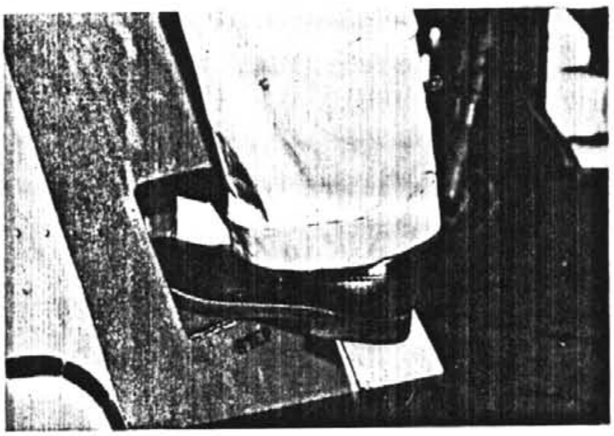




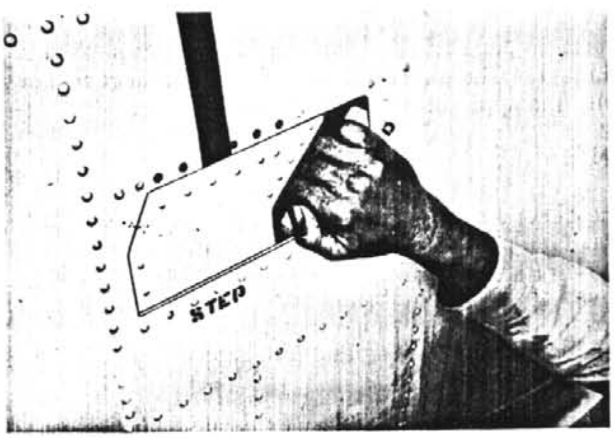
1 WING FLAP MANUAL OPERATION LEVER

Caution

- **Do not use wing flap manual operation lever as a hand hold, to prevent damaging lever and flap operating mechanism.**
- When external fuel tanks, MAU63/A rack or GP bombs of the 500-pound or larger class with conical fins are carried, the wing flap manual operation lever should not be used, because the wing flaps or external fuel tanks, racks, or bomb fins could be damaged if the flaps are lowered beyond 37 degrees. (On T-28B and T-28D-5 Group II Airplanes, a mechanical stop prevents wing flap manual operation beyond 37 degrees.)



2 STEPS IN WING FLAP



3 HANDHOLD AND STEP

4 EXTERNAL CANOPY CONTROLS

28B-1-00-16A

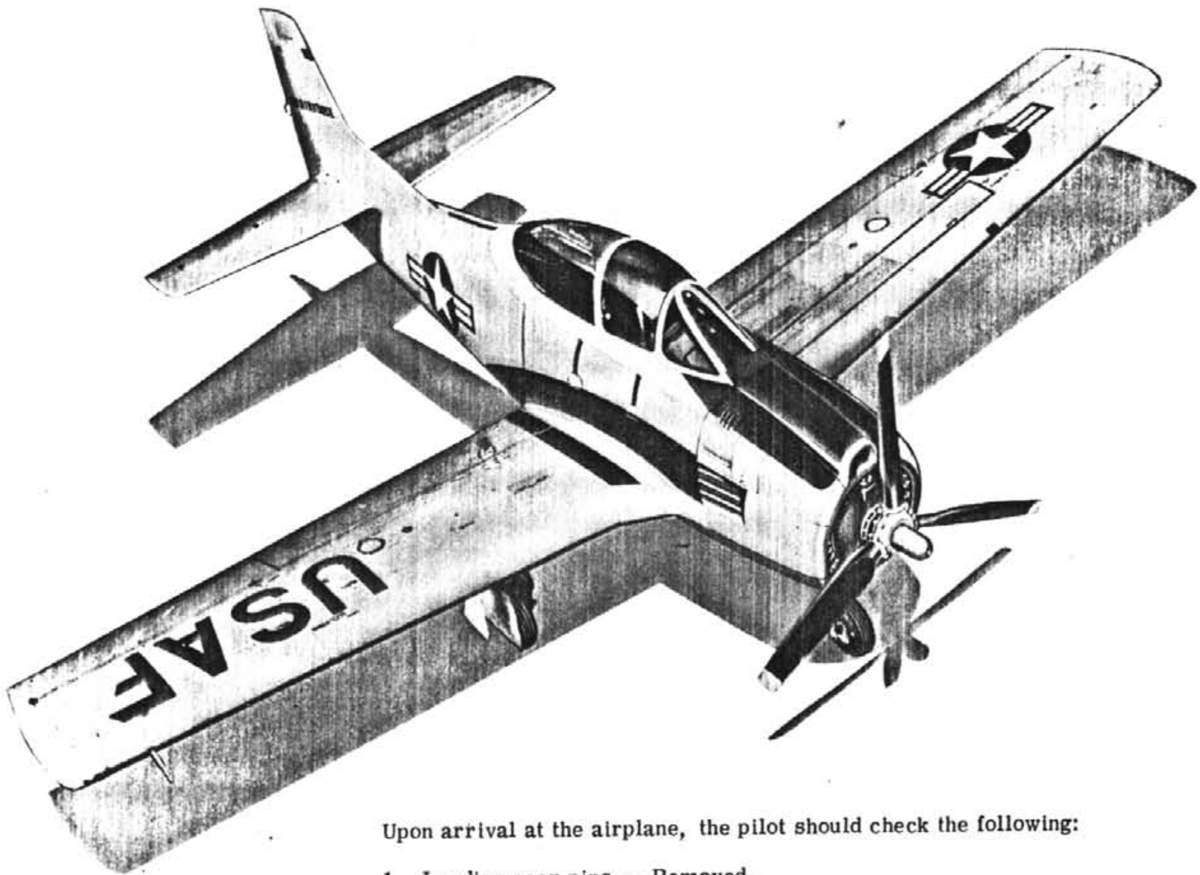
Figure 2-1

EXTERIOR INSPECTION

The exterior inspection as outlined here is based on maintenance personnel having completed all post- and pre-flight inspections required.

NOTE

Where ground personnel are not familiar with the airplane, make sure that post- and pre-flight inspections are made in accordance with existing Technical Manual of Inspection Requirements.



FS-787

Upon arrival at the airplane, the pilot should check the following:

1. Landing gear pins -- Removed.
2. Pitot cover -- Removed.
3. External loads -- Checked.

NOTE

When external fuel tanks are carried, visually check fuel quantity and ensure filler caps are secure.

4. Bomb (store) select switches (wheel wells) – – As required.
5. Cowling dowel pins – – Checked.
6. Wing ammunition doors – – Secure.

The above checks are considered as minimum, and additional checks may be made at the discretion of the flight crew.

28B-1-00-15B

Figure 2-2

37 degrees. (On T-28B Airplanes and T-28D-5 Group II Airplanes, a mechanical stop prevents wing flap manual operation beyond 37 degrees.)

- Do not use the wing flap manual operation lever as a handhold, as the lever and operating mechanism may be damaged.

To open canopy, pull out canopy external handle and push it forward to MANUAL. Slide canopy back by means of a handle on canopy frame. On (D) airplanes, steps and handhold are also in the right wing and flap.

PREFLIGHT CHECK.

BEFORE EXTERIOR INSPECTION.

1. Form 781 - Check.

   Check status of airplane and make sure airplane has been serviced with required amounts of fuel, oil, and oxygen for the intended mission.

2. Escape system safety pins* - Installed.

   Check that extraction handle safety pin and pendant disconnect activator safety pin are installed.

3. Escape system ripcord "D" ring* - Secure.
4. Escape system pendant lines and disconnects* - Properly routed and secure.
5. Seat hook indicator* - Go indication.

   Check that white pointer on hook locked indicator completely covers red (no go) line. If not, do not accept airplane for flight.

6. Secondary escape handle lockwires* - Intact.
7. Canopy removal fuze - CHECK.

   Inspect canopy fuze lines to ensure they are affixed to canopy and not dislodged. Do not pull on these lines.

8. Ignition - OFF.
9. (D) Battery - OFF.
   (B/C) DC power - OFF.
10. Armament switches - OFF or SAFE.
11. Flight controls - Unlock except in high winds.
12. Rear cockpit - Secure (solo flights).

    Secure shoulder harness, radio, and oxygen leads to safety belt; then lock and tighten belt. On airplanes changed by T.O. 1T-28-542, check safety pins installed and riser band secure. All switches positioned as required.

NOTE On modified (B/C) airplanes, make sure that the dc power switch in the rear cockpit is positioned at NORMAL ON to ensure ac and dc power will be available for operation of the electrical equipment when the forward cockpit dc power switch is positioned at BAT. & GEN. or BAT. ONLY.

EXTERIOR INSPECTION.

Perform exterior inspection as outlined in figure 2-2.

INTERIOR INSPECTION (ALL FLIGHTS).

1. Flight controls - Check (figure 2-3); check controls for freedom and proper movement.

Caution Ensure that the control lock is stowed and locked. If the control lock is not properly locked, negative G could cause the lock to become engaged in flight, resulting in loss of control.

2. Seat - Adjust.

NOTE On airplanes not changed by T.O. 1T-28-542, if a back-type parachute is worn, make sure a seat cushion is installed.

3. Safety belt and shoulder harness* - Check.
4. Torso harness and safety belt* - Fasten and adjust.

   Fasten torso harness and safety belt and check operation of shoulder harness lock handle. Adjust harness and belt as tight as possible to ensure maximum performance of escape system if needed.

5. Shoulder harness lock - Check operation.
6. Escape system safety pins* - Remove and stow.

   Remove and stow extraction handle safety pin and pendant disconnect activator safety pin.

7. Rudder pedals - Adjust.
8. Parking brakes - Set.
9. External fuel - OFF.
10. Hydraulic hand-pump - Down.
11. Cockpit air - As required.

*Some airplanes

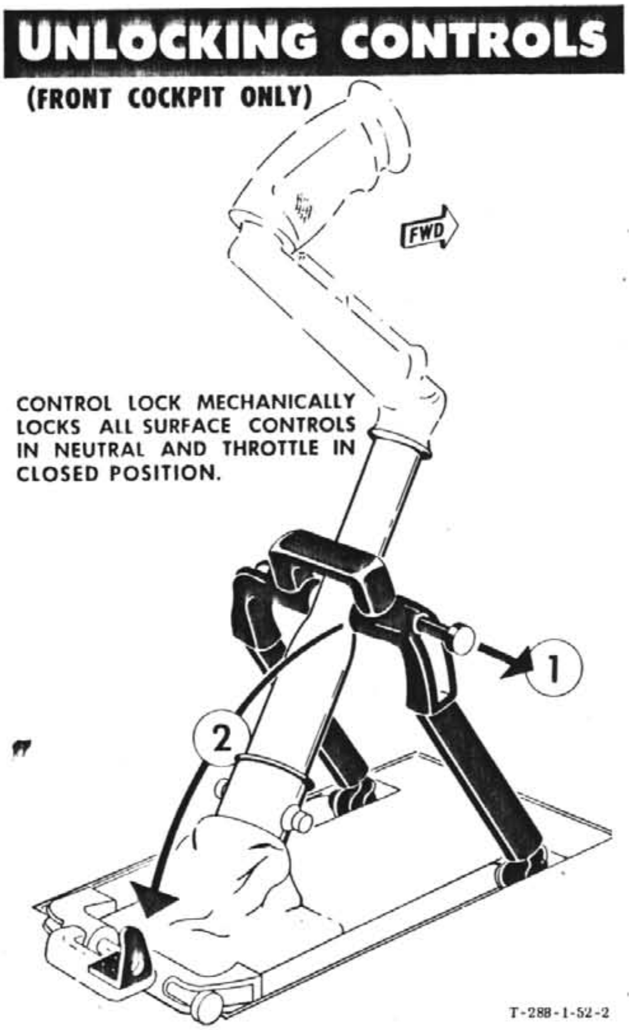


Figure 2-3

12. Fuel - ON.
13. Trim tabs - Set for take-off.

    Aileron - 0 degrees.

    Elevator - 0 degrees.

    Rudder - 5 degrees right.
14. Wing flaps - DOWN.
15. Supercharger - LOW (up).
16. Throttle - Open 1/2 to 3/4 inch.

    This will approximate 1200 to 1400 rpm.
17. (B/C) Speed brake - OFF.
18. Propeller - Full INCREASE RPM.
19. Mixture - IDLE CUTOFF.
20. Friction lock - Adjust.
21. Carburetor air - DIRECT.
22. Cowl and oil cooler flaps - OPEN.
23. Cockpit heater - OFF.

Warning The combustion heater should be off for all take-offs, because of the fire hazard involved.

24. Landing and taxi lights - RETRACT AND OFF (OFF).
25. Windshield and canopy defrost handle - As required.

    During warm weather, cool air is circulated to remove fog or moisture.
26. Landing gear - DOWN.
27. Altimeter - Set to field elevation.
28. Clock - Set and running.
29. Manifold pressure - Check.

    Note manifold pressure gage reading (field barometric pressure) for use later during engine power check.
30. Oxygen system - Check (if applicable).

    Refer to Section IV for check-out of oxygen system.
31. Ignition - OFF.
32. (D) Generator - ON.
33. (D) Inverter - OFF.
    (B/C) Instrument power - NO. 2.
34. Pitot heater - OFF.
35. Control shift - As desired.

    Hold control shift forward in the cockpit of pilot desiring control until control light comes on.
36. Communication and navigation equipment - OFF.
37. (B/C) Gyro selector - SLAVED GYRO.

38. Circuit breakers - Check.

If battery start is to be made, ensure No. 1 and No. 2 inverter circuit breakers are pulled (B/C).

39. External power - Connected (if available).

Caution To alleviate crankshaft damage and to provide smoother starting, external power must be used for all engine starts unless the aircraft is at a remote station not having the required equipment or during an emergency.

NOTE Attitude indicators caged prior to connecting external power or dc power - BAT & GEN (B/C).

40. (D) Battery switch - ON (no external power). (B/C) DC power - BAT & GEN (no external power).

41. Landing gear indicators and warning light - Check (Press horn silencer button.*)

42. Chip detector (sump plug) warning light - Test.

43. (D) Low fuel level warning light - Test.

44. Accelerometer - Reset.

45. Fuel quantity - Check.

46. Fuel pressure - Check.

With fuel ON, boost pump pressure should be 19 to 24 psi with 28-volt power source or may be as low as 13 psi with 24-volt power source or airplane battery.

47. Interior and exterior lights - Check operation (position as required).

On (B/C) airplanes, all rheostats in rear cockpit must be OFF to get full brilliancy of WARNING lights in front cockpit during day flights.

48. Interphone - Check.

STARTING ENGINE.

Start engine as follows:

1. Fire guard - Posted.

2. Propeller danger area - Clear.

Call "clear" and receive acknowledgement from fire guard.

3. Starter - Depress. (Rotate propeller through nine blades.)

Caution Do not pull engine through by hand before rotating with starter, as engine may be damaged by hydraulic lock.

4. Ignition - BOTH.

5. Primer - PRESS intermittently until engine fires.

6. Starter - Release.

If engine fails to start in 30 seconds, or if fuel is draining, refer to "Clearing Engine" in this section.

Caution The starter is limited to three consecutive starts of 30 seconds per start with a 3-minute cooling period between starts. If more than three starts are required, allow starter to cool 30 minutes before using it again.

7. Primer - Hold down, and adjust throttle to 1200-1400 rpm.

8. Mixture - Advance slowly toward RICH.

9. Primer - Release when rpm drops.

10. Oil pressure - Check.

If pressure does not indicate in 10 seconds and rise to 40 psi in 20 seconds, shut down engine and investigate.

11. External power - Disconnect (if used).

12. (D) Battery - ON (if external power was used for start).
(B/C) DC power - BAT. & GEN (if external power was used for start).

13. External fuel - TRANSFER.

If external fuel tanks are installed and contain fuel, move external fuel switch to TRANSFER.

CLEARING ENGINE.

If engine fails to start or is overprimed, clear engine as follows:

1. Mixture - IDLE CUTOFF.

2. Primer - Release.

3. Continue cranking engine.

*Some airplanes

4. Ignition - OFF.

5. Throttle - OPEN.

6. Rotate propeller through several revolutions.

7. Return the throttle to start position and repeat starting procedure after observing starter cooling period.

ENGINE GROUND OPERATION.

Before making engine performance checks, warm up engine at approximately 1200 to 1400 rpm until oil temperature indicates above 40°C and cylinder head temperature, above 120°C. Keep propeller lever in full INCREASE RPM and mixture lever in RICH. Keep cowl and oil cooler flaps open for warm-up and all ground operation. If icing conditions prevail, the carburetor air lever may be positioned toward ALTERNATE, as necessary, during engine warm-up to maintain carburetor air temperature within the continuous operating range. During cold-weather operations, if oil dilution has been used before engine shutdown, refer to "Cold-weather Operation" in Section IX for engine warm-up procedures.

Warning The carburetor air lever must be at DIRECT during all engine ignition and power checks; otherwise, erroneous indications will occur.

Caution Do not allow oil temperature or cylinder head temperature to exceed limits.

BEFORE TAXIING.

While engine is warming up, perform the following:

1. Inverters - Check.

   Attitude indicators caged prior to turning inverters on.

   On (B/C) airplanes, circuit breakers in and check that instrument power failure warning light is out. Move switch to NO. 1 INV and check loadmeter and voltmeter for normal readings.

   On (D) airplanes, move inverter switch to SPARE ON and check MAIN OUT inverter warning light on. Move switch to OFF for 3 seconds and check BOTH OUT inverter warning light on. Return switch to MAIN ON and check both warning lights out.

2. Communication and navigation equipment - ON.

3. IFF - STDBY.

4. Wing flaps - UP.

5. (B/C) Speed brakes - Check.

   Cycle speed brake at least once and signal ground crew to check operation.

6. Hydraulic pressure - Check.

   Check hydraulic pressure is between 1250 and 1550 psi.

7. Cowl and oil cooler flaps - Check operation.

   Visually check operation from open to full close. Return flaps to full open position.

8. (D) Manifold pressure drain - Press.

   Press button for 3 seconds to clear vapor from gage line. (Manifold pressure must be below field barometric pressure.)

9. Voltmeter and loadmeter - Check.

   With 1200 to 1400 rpm, the normal voltmeter reading is 28 volts and the loadmeter 0.5 or less.

10. Pitot heater - Check operation.

    Move pitot heater switch to ON. Observe increased loadmeter reading and have ground personnel confirm operation. Return switch to OFF.

11. Engine fuel pump - Check.

    Pull the fuel booster pump circuit breaker and check fuel pressure between 21 and 25 psi. Reset circuit breaker. Some airplanes have a fuel boost pump test switch installed. It is unnecessary to pull circuit breaker to test operation.

12. Communication and navigation equipment - Check.

    Check reception, operation, and indications of communication and navigation equipment and set for departure.

13. Altimeter - Set.

Check that 10,000-foot pointer is set correctly, and check error against field elevation.

14. Engine idle speed - 725 (±25) rpm with throttle CLOSED.

15. Ignition grounding - Check.

Turn ignition switch to LEFT, RIGHT then OFF momentarily. The engine should continue to run in the LEFT and RIGHT positions and should cease firing completely when the switch is OFF. If the engine does not cease firing completely when the switch is OFF, the magnetos are not grounded, or if it ceases firing in the LEFT or RIGHT positions, there is a faulty magneto. Shut down the engine and warn personnel to remain clear of propeller until the difficulty has been remedied.

Caution Perform ignition switch ground check as rapidly as possible, to prevent severe afterfire (in exhaust system) when switch is again turned to BOTH.

TAXIING.

Observe the following instructions and precautions:

1. Area - Cleared for taxiing.
2. Wheel chocks - Removed.
3. Parking brakes - Release.
4. Wheel brakes - Check.

Advance throttle and allow airplane to roll straight ahead. As soon as the airplane is moving straight forward, and with throttle CLOSED, apply brakes evenly and firmly to check for adequate braking action. (Do not allow initial taxi speed to build up without checking brakes.) Taxi slowly, using brakes to slow down or stop. (Never ride the brakes, because they will wear rapidly.) Use either brakes or nose wheel steering to maintain directional control. When the airplane is stopped, operate the engine between 1200 and 1400 rpm, to prevent spark plug fouling and to create enough propeller blast to help cool the engine.

5. *(D) Nose wheel steering - Check.

Caution If nose wheel steering is inoperative, a take-off should not be attempted. Failure of nose wheel steering may indicate failure of the shimmy damper, possibly causing severe and uncontrolled nose wheel shimmy on take-off or landing roll.

6. Flight instruments - Check.

a. Airspeed indicator - Check reading.

b. Heading indicator - Check heading pointer against magnetic compass for proper indication while taxiing.

c. Magnetic compass - Card swings freely; bowl full of fluid.

d. Attitude indicator - Set the miniature airplane on the 90-degree indices on the side of the case; check for tip error during taxi turns.

e. Turn-and-slip indicator - Check needle deflecting in the direction of turn while taxiing; ball free in the race.

ENGINE RUN-UP.

Before every flight, park airplane as near into the wind as possible for engine run-up to aid engine cooling, and perform the following checks:

1. Engine instruments - Check.

a. Oil temperature - Minimum of 40°C for engine run-up.

b. Oil pressure - Steady (above 1200 rpm).

c. Cylinder head temperature - Minimum of 120°C.

2. Carburetor air temperature - Check increase then decrease.
3. Propeller - Full INCREASE RPM.
4. Mixture - RICH.
5. Propeller operation - Check.

a. Throttle - 1600 rpm.

b. Propeller - Full DECREASE RPM.

c. Tachometer - Check for rpm stabilization drop of approximately 400 (±50) rpm.

*Some airplanes

d. Propeller - Full INCREASE RPM.

e. Repeat check through three cycles.

6. Supercharger - Check.

At 1600 rpm with propeller lever at full INCREASE RPM, move supercharger handle to HIGH. A sudden decrease in engine rpm will indicate the supercharger clutch has engaged. Advance throttle to obtain 30 in. Hg. Return supercharger handle to LOW. A sudden decrease in manifold pressure indicates that the two-speed supercharger mechanism is working properly. Checking the supercharger clutch operation is required only when the use of high blower is anticipated for that flight.

Caution To prevent overheating of supercharger clutch, do not shift from low to high blower at less than 5-minute intervals. Shift from high to low blower as desired, since no heat is generated.

7. Engine power - Check.

a. Throttle - Adjust to field barometric pressure.

b. (B/D) Tachometer - Check rpm 2250 (+50).
(C) Tachometer - Check rpm 2150 (+50).

Caution On (C) airplanes, restrictions on the propeller prohibit prolonged ground operation between 1900 and 2200 rpm.

NOTE For each 10°C below 15 C, rpm reduction of 10 rpm is permissible. For each 10 C above standard temperature, rpm increase of 10 rpm is permissible.

- If rpm is too low for given manifold pressure, engine is not developing sufficient power and should be checked before flight.

8. Ignition - Check (100 rpm drop maximum).

a. (B/D) Throttle - Adjust to field barometric pressure.
(C) Throttle - 2300 rpm.

b. Ignition - L, then BOTH.

c. Ignition - R, then BOTH.

Allow rpm to stabilize at all switch positions.

9. Engine instruments - Check.

Check all readings are in desired range.

10. Throttle - 1200 to 1400 rpm.

11. External fuel tanks* - Check fuel transfer.

If external tanks are installed and contain fuel, check fuel quantity gage. If gage shows internal fuel depletion, external fuel is not being transferred.

BEFORE TAKE-OFF.

1. Flight controls - Check.

Recheck for free and proper movement.

2. Trim - Recheck for take-off.

3. Wing flaps - Set for takeoff.

4. Supercharger - LOW (up).

5. Carburetor air - As required.

The carburetor air lever should be at DIRECT for all take-offs except if there is a danger of carburetor icing, when it may be moved toward ALTERNATE.

6. Flight instruments - Check and set.

7. Pitot heater - As required.

If take-off is to be made into areas of known or forecast icing conditions, the pitot heater switch should be ON. Pitot heat may be used to clear pitot lines of any accumulated moisture.

8. Anticollision/position lights - As required.

9. Shoulder harness - As desired.

10. Speed brake - OFF.

11. Canopy - CLOSED.

TAKE-OFF.

Plan take-off according to the following variables which will affect take-off technique: field elevation; gross weight; wind direction and velocity; air temperature; type of runway and surface condition; length of runway; and distance to, and height of, closest obstacle.

*Some airplanes

NORMAL TAKE-OFF.

NOTE The following procedures will produce results shown in Appendix I. Refer to the appropriate charts for take-off distance and speed for existing conditions.

After taxiing into take-off position, roll forward slightly to align nose wheel. For individual take-offs, the centerline of runway should be used as a directional guide. Advance the throttle to 30 in. Hg while holding brakes. Check instruments for proper indications. Release brakes and smoothly advance throttle to Maximum Power. (Refer to Section V for maximum manifold pressures.) Normally, 30 inches Hg manifold pressure will provide adequate air flow over the rudder surface for directional control. However, if extreme cross winds are encountered, a combination of nose wheel steering and light brake applications may be necessary to maintain directional control.

NOTE Brakes or nose wheel steering may be used during the initial phase of the takeoff roll to maintain direction. (Use of brakes will extend the takeoff roll slightly.)

On (D) airplanes, nose wheel steering should not be used after gaining rudder control. As elevator control becomes effective and airspeed increases to 75 knots IAS, smoothly apply back pressure to lift nose wheel and assume take-off attitude. Maintain this attitude and allow airplane to fly off at recommended speed.

MINIMUM-RUN TAKE-OFF.

A minimum-run take-off is a maximum performance directly related to slow flying. You should be familiar with this phase of flight before making a minimum-run take-off.

Complete all normal "Before Take-off" checks and take position on runway, aligning nose wheel. Check flaps 1/2 down, hold brakes, and advance throttle to Maximum Power.

NOTE Under certain runway conditions, such as wet or icy, Maximum Power may slide wheels and should not be applied until brakes are released.

Release brakes, use nose wheel steering, (D) airplanes, or minimum differential braking for directional control. Discontinue braking when rudder becomes effective. Apply back pressure to effect airplane lift-off 5 knots IAS below normal take-off speed. When definitely air-borne, retract landing gear. Raise flaps and complete transition to normal climb when clear of obstacles.

CROSS-WIND TAKE-OFF.

Refer to cross-wind chart in Appendix I for maximum cross-wind component. The following procedure is recommended for cross-wind take-off. Align the airplane straight down the runway. Advance throttle to Maximum Power and maintain directional control as in a normal take-off. During the ground run, apply aileron as necessary to maintain wings level.

To avoid skipping, leave the nose wheel on the runway until the airspeed reaches 90 knots IAS, or the computed nose wheel lift-off speed, whichever is greater. Then apply sufficient back pressure to make a positive break with the ground. This will avoid side loads on the landing gear.

After becoming air-borne, correct for drift by making a coordinated turn into the wind.

NIGHT TAKE-OFF.

The procedure for night take-off is the same as for daylight take-off; however, don't be alarmed by exhaust flames.

AFTER TAKE-OFF— CLIMB.

1. Landing gear - UP, when safely airborne.
2. Landing gear warning light and position indicators - Check.
3. Wing flaps - UP.

Caution To prevent inadvertent sink, do not retract flaps below 90 knots IAS.

4. Climb speed - Establish
5. Throttle and propeller - Adjust for climb.
6. Instruments - Check within limits.
7. Cowl and oil cooler flaps - As required.

   Adjust cowl and oil cooler flaps as necessary to maintain cylinder head and oil temperatures within prescribed operating range.
8. Carburetor air - As required.

   Position carburetor air lever toward ALTERNATE as necessary to maintain carburetor air temperature within prescribed operating range, to prevent carburetor icing.

9. Supercharger - HIGH (down).

Move the supercharger handle to HIGH when altitude requires. If operating at METO Power, best results will be obtained by shifting to high blower between 13,000 and 15,000 feet. When shifting to high blower, proceed as follows:

a. Throttle - Retard to approximately 20 in. Hg.

b. Propeller - Reduce rpm to 1600 rpm.

c. Supercharger - Move rapidly from LOW to HIGH. Adjust propeller lever and throttle to desired power setting.

Caution To prevent overheating of supercharger clutch, do not shift from low to high blower at less than 5-minute intervals. Shift from high to low blower as desired, since no heat is generated.

CLIMB.

Refer to the climb charts in Appendix I for recommended indicated airspeeds to be used during climb, for estimated rates of climb, and fuel consumption during climb.

CRUISE.

During extended cruise at low power settings, clear engine every 30 minutes. Clear the engine every hour during normal cruise power settings. For engine clearing procedures at cruise conditions, refer to "Spark Plug Fouling" in Section VII.

If external tanks* are installed and contained fuel before take-off, monitor fuel quantity gage to determine that external fuel is being transferred. When gage begins to show depletion of internal fuel, external fuel transfer has terminated. The external fuel switch should then be turned off. The time at which fuel transfer terminates should be compatible with mission planning calculations.

DESCENT.

Long distances can be covered during a descent, with throttle closed and gear and flaps up, if a glide speed of 130 knots IAS is used. Lowering either the flaps or landing gear greatly steepens the gliding angle and increases the rate of descent. Engine cowl and oil cooler flaps should be closed before descent. Because the engine cools rapidly during a descent with the throttle retarded, the engine should be cleared periodically by momentarily advancing the throttle to approximately cruise power, to maintain cylinder head temperature above minimum. If practical, manifold pressure should not be reduced below 20 in. Hg to retard rate of cylinder cooling, to provide piston cushioning, to ease load on bearings and acticulating rod, to prevent piston ring flutter, and to minimize spark plug fouling.

Caution If the nature of flying conditions in descent requires a large reduction in power, reduce rpm as well as manifold pressure. For descents or other low-power maneuvers, it is important to cushion the high inertia loads on the bearing which occur at high rpm and low manifold pressure. As a rule of thumb, for each 100 rpm, approximately one in. Hg manifold pressure should be used; for example, 21 in. Hg at 2100 rpm. Operation at high rpm and low manifold pressure should be kept to a minimum.

- Maintain carburetor air temperature between 15°C and 38°C. This will aid in fuel vaporization and possibly prevent engine cutouts when throttle is increased for level-out.
- Before starting any descent, always place mixture control lever in RICH to prevent possible engine cutout at retarded throttle settings.

NOTE To prevent possible fogging of the windshield during a descent from high altitude, turn windshield and canopy defrost handle and cockpit heater handle to ON before descent.

Before beginning a descent, accomplish the following:

1. Altimeter - Set

Set altimeter to field barometric pressure of destination.

2. Carburetor air - As required.

Position carburetor air lever toward ALTERNATE as necessary to maintain carburetor air temperature within prescribed operating range to prevent carburetor icing.

3. Supercharger – LOW (up).

Move supercharger handle to LOW at any cruise rpm to prevent the possibility of overboosting the engine at low altitude.

4. Cowl and oil cooler flaps - As required.

Adjust cowl and oil cooler flaps as necessary to maintain cylinder head and oil temperatures within prescribed operating range.

*Some airplanes

5. Mixture - RICH.

6. Throttle - 20 in. Hg or one inch/100 rpm.

7. Armament switches - OFF or SAFE.

8. (B/C) speed brakes - As required.

BEFORE LANDING.

APPROACH TO FIELD.

During the approach to the field and before entering the traffic pattern, perform the following:

1. Carburetor air - As required.

2. Mixture - RICH.

3. Propeller - 2400 rpm.

4. Cowl and oil cooler flaps - As required.

5. Cockpit heater - OFF.

Warning Turn combustion heater off for all landings because of fire hazard involved.

6. Shoulder harness - As desired.

TRAFFIC PATTERN.

1. Throttle - Retard (until warning horn sounds*).

2. Landing gear - DOWN (on downwind leg when airspeed is below 140 knots IAS).

3. Landing gear position indicators, warning horn,* and light - Indicating gear down and locked.

4. Propeller - Full INCREASE RPM.

5. Wing flaps - As required.

RECTANGULAR LANDING PATTERN.

See figure 2-4. For landing ground roll distances, refer to Appendix I.

360-DEGREE OVERHEAD LANDING PATTERN.

See figure 2-5. For landing ground roll distances, refer to Appendix I.

*Some airplanes

LANDING.

NORMAL LANDING.

Observe the following precautions in accomplishing the final approach and landing procedures outlined in figures 2-4 and 2-5. Just before reaching end of runway, start flare. Use smooth, continuous back pressure on the stick to obtain a tail-low attitude for landing. Change attitude evenly and slowly; do not jerk the controls or go down in steps.

Touch main wheels first, with tail down. Hold nose wheel off; then ease off the back pressure on the stick and lower nose slowly before losing elevator control. The canopy may be opened during the landing roll, if desired.

Caution To prevent slamming nose wheel and possibly causing damage, do not apply brakes until nose wheel is on the runway.

Use rudder for directional control and, when possible, take advantage of runway length to save the brakes. Test brakes carefully before you need them for stopping and apply them soon enough to avoid the need for abrupt braking. Refer to "Wheel Brake Operation" in Section VII for additional information on use of wheel brakes.

CROSS-WIND LANDING.

Refer to cross-wind chart in Appendix I to obtain maximum cross-wind component. Use the wing-low method of correcting for drift after turning on final approach. Allow for drift while turning on final approach, so that you will not overshoot or undershoot the approach leg. Establish drift correction as soon as drift is detected.

The velocity and direction of the cross wind will determine the amount of flaps used for landing.

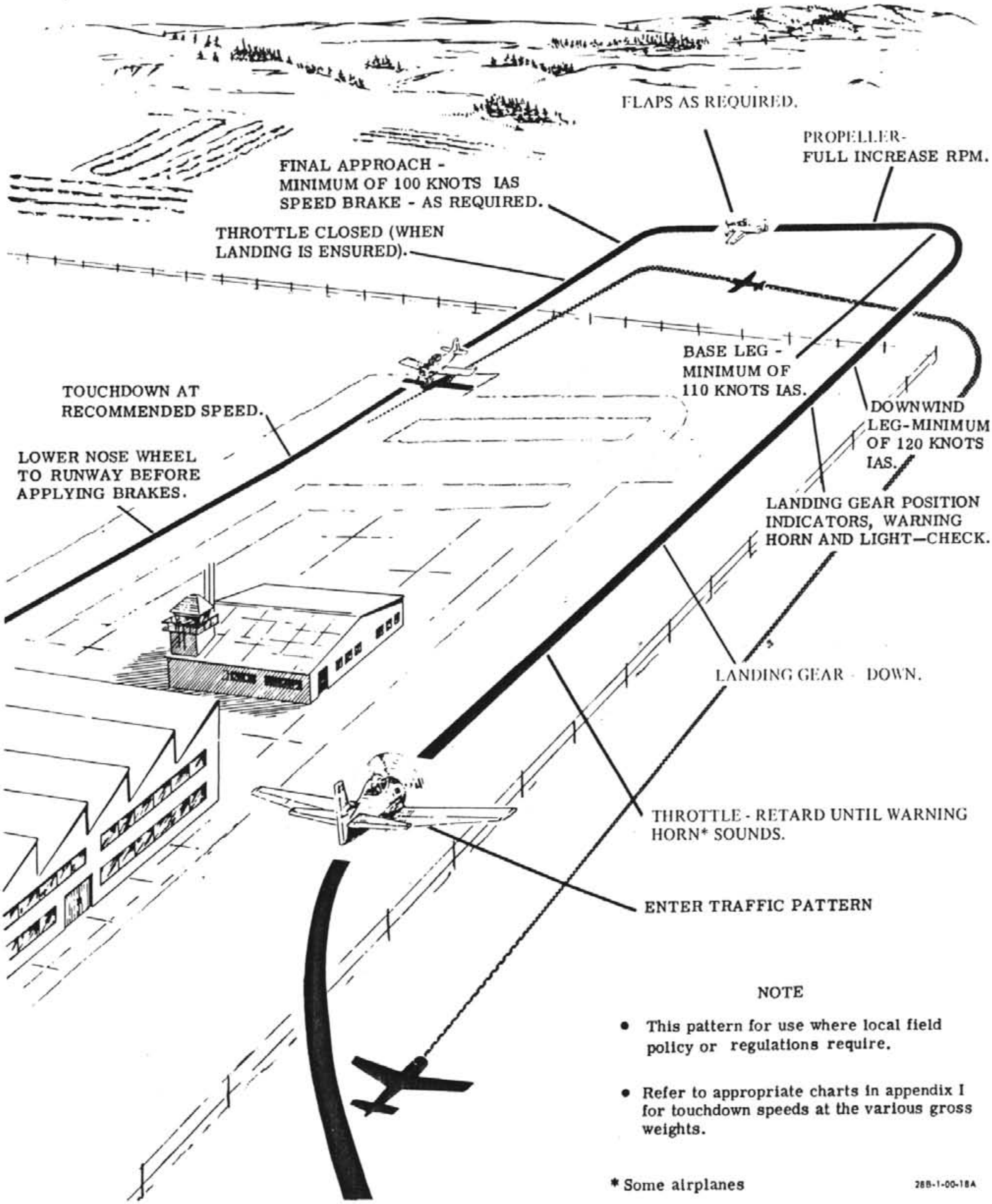
NOTE An airplane on the ground will attempt to swing into the wind like a weather vane. Flaps increase this weather-vaning tendency, so use a minimum degree of flaps in a cross wind.

Use rudder as necessary to counteract a wing-low condition during round-out and touchdown.

MINIMUM-RUN LANDING.

To perform a minimum-run landing, observe the following recommendations: Establish a flat power-on approach, maintaining airspeed slightly below normal approach speed. With gear down and flaps full down, additional drag, if necessary, can be obtained through the use of cowl flaps, open canopy, and (B/C) speed brake. Fly the airplane with power (approximately 20 to 25 in. Hg) until reaching the

RECTANGULAR LANDING PATTERN (TYPICAL)



NOTE

- This pattern for use where local field policy or regulations require.
- Refer to appropriate charts in appendix I for touchdown speeds at the various gross weights.

* Some airplanes

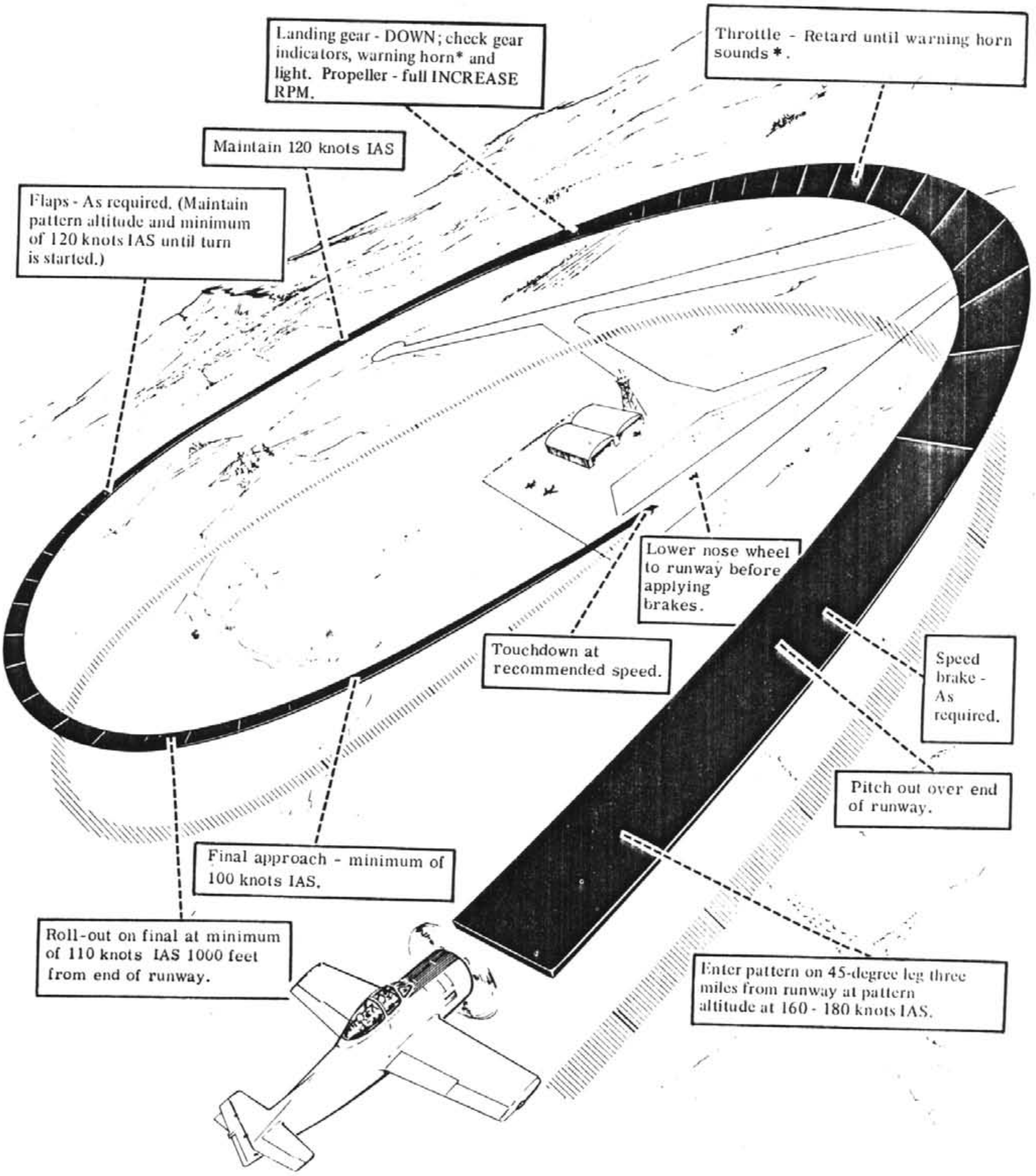
28B-1-00-18A

Figure 2-4

360-DEGREE OVERHEAD LANDING PATTERN

(TYPICAL)

NOTE
Refer to appropriate charts in Appendix I for touchdown speeds at the various gross weights.



* Some airplanes

Figure 2-5

touchdown point; then retard throttle to idle. Maximum aerodynamic braking during the initial landing roll is achieved by easing the airplane to a nose-high attitude (without ballooning) and holding this attitude.

Caution **Avoid extreme nose-high attitudes during aerodynamic braking to avoid damage caused by the tail dragging the ground, etc.**

When aerodynamic braking is no longer effective or the nose falls through, apply brakes. Brake pressure should be steady, light initially, then increasing to just below that required to lock brakes.

Caution To prevent slamming nose wheel and possibly causing damage, do not apply brakes until nose wheel is on the runway.

NOTE The technique required for minimum-run landings should be developed through familiarity and practice of each phase before attempting to achieve the maximum results.

NO-FLAP LANDING.

The most prominent characteristics of a no-flap landing are a shallower than normal approach and a higher indicated stall speed. For landing gross weights of 10, 000 pounds or less, add 5 knots IAS to final approach and landing speeds. For landing gross weights greater than 10, 000 pounds, add 10 knots IAS to final approach and landing speeds. Except for these conditions, the technique for a no-flap landing is the same as for a normal landing.

NIGHT LANDING.

The same techniques and procedures used for day landings should be applied. Do not turn on the landing lights at too high an altitude, and avoid using them at all if landing in fog, smoke, or thick haze, as reflection from the lights impedes vision and may distort depth perception. Do not look down the beam of light.

TOUCH-AND-GO LANDINGS.

Touch-and-go landings introduce an element of danger because of the rapid action which must be executed while rolling on the runway. For this reason, touch-and-go landings may be made only when authorized or directed by the major command concerned. The procedures and techniques for making touch-and-go landings in this aircraft are the same as those outlined for a go-around.

GO-AROUND.

A typical go-around is shown in figure 2-6. Decide early in the approach if it is necessary to goaround, and start a go-around before too low an altitude and airspeed are reached.

*Some airplanes

AFTER LANDING.

After completing landing roll, clear runway and accomplish the following:

1. Canopy - As desired.
2. Wing flaps - UP.
3. Cowl and oil cooler flaps - OPEN.
4. (B/C) Speed brake - OFF.
5. IFF - OFF.

   Turn the IFF off as soon after landing as possible. This will eliminate signals from taxiing or parked airplanes that would otherwise block the controller's scope and interfere with control of airborne airplanes.

6. Pitot heat - OFF.
7. Anticollision lights - OFF; Position lights - As required.
8. Landing lights - As required.
9. Extraction handle safety pin* - Install.

POSTFLIGHT ENGINE CHECK (LAST FLIGHT OF DAY).

After the last flight of the day, make the following checks:

NOTE When making engine checks, have cylinder head temperature in normal operating range.

1. Instruments - Check for proper indications.
2. Propeller - Full INCREASE RPM.
3. Mixture - Full RICH.
4. Engine idle speed - Check for 725 (± 25) rpm with throttle CLOSED.
5. Engine power - Check.
   a. Throttle - Field barometric pressure
   b. (B/D) Tachometer - Check rpm 2250 (± 50).
   (C) Tachometer - Check rpm 2150 (± 50).

Caution On (C) airplanes, restrictions on the propeller prohibit prolonged ground operation between 1900 and 2200 rpm.

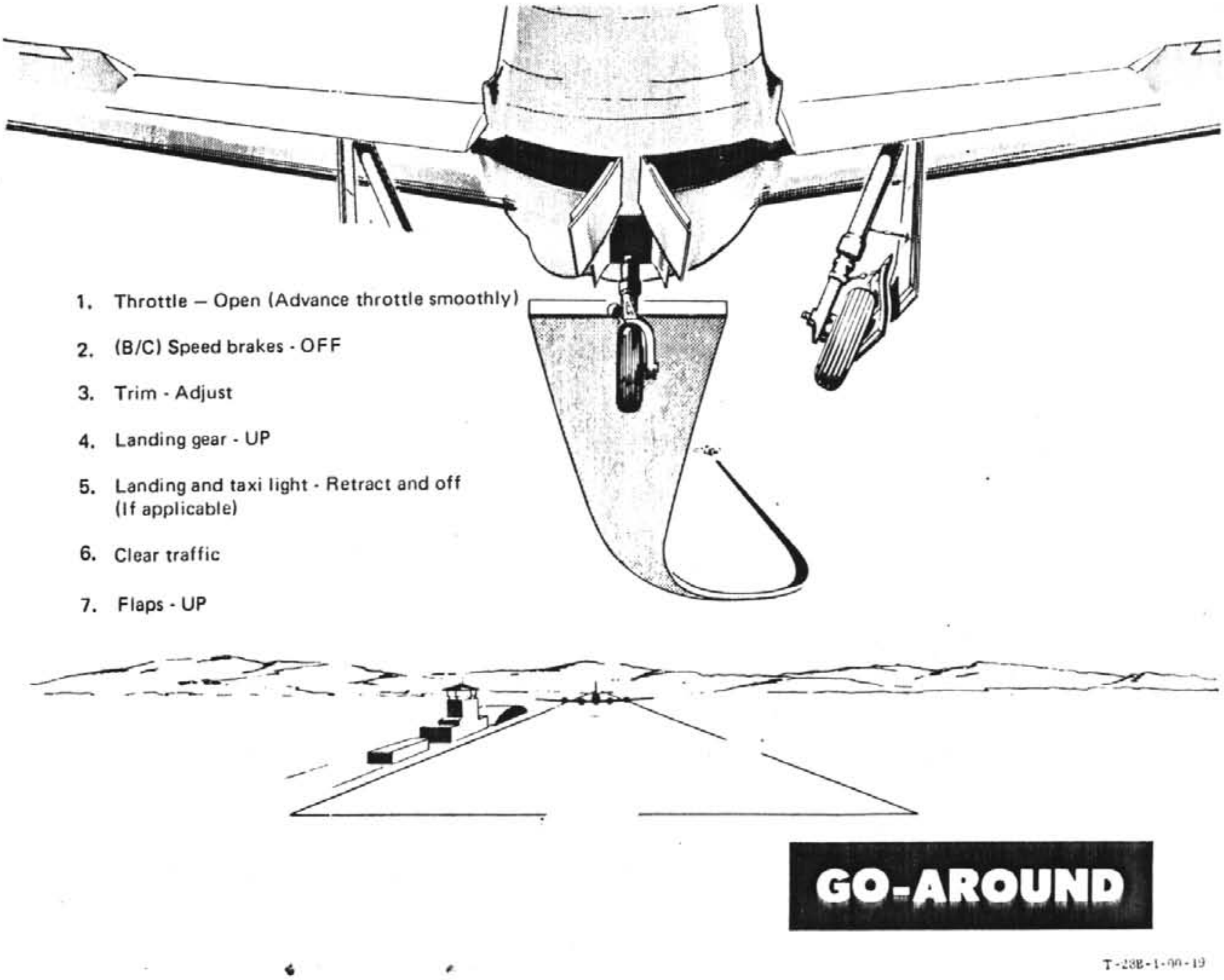


Figure 2-6

6. Ignition system - Check (100 rpm drop maximum).

   a. (B/D) Throttle - Field barometric pressure. (C) Throttle - 2300 rpm.

   b. Ignition - L, then BOTH.

   c. Ignition - R, then BOTH.

   Allow rpm to stabilize at each switch position.

ENGINE SHUTDOWN.

When a cold-weather start is anticipated, dilute oil as required by the lowest expected temperature. Refer to "Cold-weather Operation" in Section IX.

1. Parking brake - Set

2. Ignition grounding - Check.

   Turn ignition switch to LEFT, RIGHT then OFF momentarily. The engine should continue to run in the LEFT and RIGHT positions and should cease firing completely when the switch is OFF. If the engine does not cease firing completely when the switch is OFF, the magnetos are not grounded, or if it ceases firing in the LEFT or RIGHT positions, there is a faulty magneto. Shut down the engine and warn personnel to remain clear of propeller until the difficulty has been remedied.

Caution Perform ignition switch grounding check as rapidly as possible to prevent severe afterfire (in exhaust system) when switch is again turned to BOTH.

3. Throttle - 1200 rpm for 60 seconds.

   For oil scavenging.

4. Canopy - OPEN.
5. Wing flaps - DOWN.
6. (D) Inverter - OFF.

   (B/C) Instrument power - No. 2.

7. Mixture - IDLE CUTOFF.

Caution Do not open throttle while propeller is turning after mixture control is at IDLE CUTOFF, as engine may backfire.

Do not close cowl flaps immediately after shutting down engine, because engine can be damaged by excessive residual heat.

NOTE Cylinder head temperature should not be above 150° C when stopping the engine. If this temperature cannot be attained because of atmospheric conditions, stop engine when cylinder head temperature stabilizes.

8. Ignition - OFF (after propeller stops turning).
9. Throttle - CLOSED.
10. Fuel - OFF.
11. Communication and navigation equipment - OFF.
12. (D) Battery - OFF.
    (B/C) DC power - OFF.
13. Electrical switches - OFF (except generator (D)
14. Trim tab - Set to zero.

BEFORE LEAVING AIRPLANE.

1. Wheels - Chocked.
2. Pendant disconnect actuator safety pin* - Install.
3. Parking brakes - Released.

Caution Do not leave parking brakes set, because of possibility of seizure if brakes are overheated.

4. Flight controls - Locked.
5. Form 781 - Complete.

   Any discrepancies noted during postflight engine check or engine shutdown should be entered on form.

Caution Make appropriate entries in the Form 781 covering any limits in the Flight Manual that have been exceeded during the flight. Entries must also be made when, in the pilot's judgment, the airplane has been exposed to unusual or excessive operations such as hard landings, excessive braking action during aborted take-offs, long and fast landings, long taxi runs at high speeds, etc.

6. Canopy - as desired.

   When leaving airplane, hold wing flap manual operation lever out from fuselage and place foot in step in wing flap to lower flaps (mechanical stop if external fuel tanks are installed).

Caution When external fuel tanks, MAU 63/A racks, or GP bombs of the 500-pound or larger class with conical fins are carried, the wing flap manual operation lever should not be used, because the wing flaps or external fuel tanks, racks, or bomb fins can be damaged if the flaps are manually lowered beyond 37 degrees. (On T-28B Airplanes and T-28D-5 Group II Airplanes, a mechanical stop prevents wing flap manual operation beyond 37 degrees.)

7. Gear pins and pitot cover - Install.

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*Some airplanes

EMERGENCY PROCEDURES

SECTION III

TABLE OF CONTENTS

INTRODUCTION.

The procedures contained in this section are considered the best for coping with the various emergencies that may be encountered during operation of this airplane. Only single failures are considered; however, each failure presents a different problem. The procedures presented in **BOLDFACE TYPE** are the procedures that must be committed to memory, as the time factor in an emergency of this type will not allow use of a checklist except as a cleanup reference. A pilot with a thorough knowledge of these procedures will be better able to cope with the problems encountered. Even though the procedures are considered the best possible, sound judgment must be used when contronted with multiple emergencies, adverse weather, terrain clearance, etc.

NOTE Where line items (or explanatory text) apply to a particular model, the applicable model letter or letters, in parenthesis [(D), (B/C), (B/D), etc.], will appear between the stop number and step (or at or near the beginning of the explanatory text). Information which is not so coded is applicable to all models.

All odors not identifiable by the flight crew shall be considered toxic. Immediately go on 100-percent oxygen. Properly ventilate the aircraft and land at nearest suitable airfield. Do not takeoff when unidentified odors are detected.

ESCAPE SYSTEM - AIRPLANES CHANGED BY T.O. 1T-28-542.

Extraction cannot be successfully accomplished with the canopy open. In emergency procedures herein that require the canopy to be open, the pilot must decide which canopy-open procedure to use. Such a decision should be based on the probability of the emergency deteriorating to where extraction becomes the only practical action.

NOTE Extraction may be considered during all phases of an emergency if the canopy is closed.

- If canopy is open, secondary escape system must be used.

GROUND EMERGENCIES.

NOTE Extraction may be considered at any time during these emergencies if the canopy is closed.

- If canopy is open, secondary escape system must be used.
- There is no fire-extinguishing system on the airplane.

ENGINE FIRE DURING START.

During starting, engine fire can occur in the induction system or in the exhaust system. However, pilot technique for combating both types of fires is the same. The pilot should continue cranking in an effort to clear or start the engine. When this is done, the fire may be drawn through the engine or blown out the exhaust stacks and extinguished. If a fire starts in the engine accessory section, the engine should be stopped immediately. If an engine fire occurs during starting:

1. **PRIMER–RELEASE.**

   Leave mixture lever at IDLE CUTOFF; do not prime engine again.

2. **STARTER–HOLD DEPRESSED.**

   Continue cranking in an effort to clear engine. This may draw fire through engine or blow fire out exhaust stacks and extinguish it.

3. If engine does not start:

   a. Continue cranking.

   b. Ignition - OFF.

   c. Throttle - Full open.

   d. Fuel - OFF.

4. If fire continues:

   a. External power - OFF.

   b. Signal ground crew to extinguish fire and evacuate aircraft.

   Access to the engine accessory section is through an access door on the lower right side of the engine cowl.

ENGINE/FUSELAGE FIRE AFTER START.

If engine fire occurs after the engine is started, proceed as follows:

1. **MIXTURE–IDLE CUTOFF.**
2. **FUEL–OFF.**

3. Ignition - OFF.
4. (D) Battery - OFF.
   (B/C) DC power - OFF.
5. Signal ground crew to extinguish fire and evacuate aircraft.

NOTE Access to the engine accessory section is through an access door on the lower right side of the engine cowl.

- Have ground personnel open baggage compartment to combat fire. On (D) airplanes, the battery access door, on the left side of the fuselage, can also be opened for insertion of a fire extinguisher nozzle.

FUEL PRESSURE DROP - ENGINE OPERATING NORMALLY.

If the fuel pressure drops below operating limits, but the engine continues to operate normally while on the ground, stop the aircraft and shut down the engine immediately.

Warning Whenever fuel pressure drops below operating limits and the engine continues to operate normally, the mixture control must be moved to IDLE CUTOFF before throttle reduction or any other engine shutdown procedure is initiated.

LANDING GEAR EMERGENCY RETRACTION.

If it is necessary to collapse the landing gear before the airplane becomes airborne, pull the landing gear handle UP. A very hard pull is necessary to override the gear handle downlock.

CANOPY EMERGENCY OPERATION.

See figure 3-1 for procedure for opening canopy from inside either cockpit in an emergency.

CANOPY EMERGENCY OPERATION

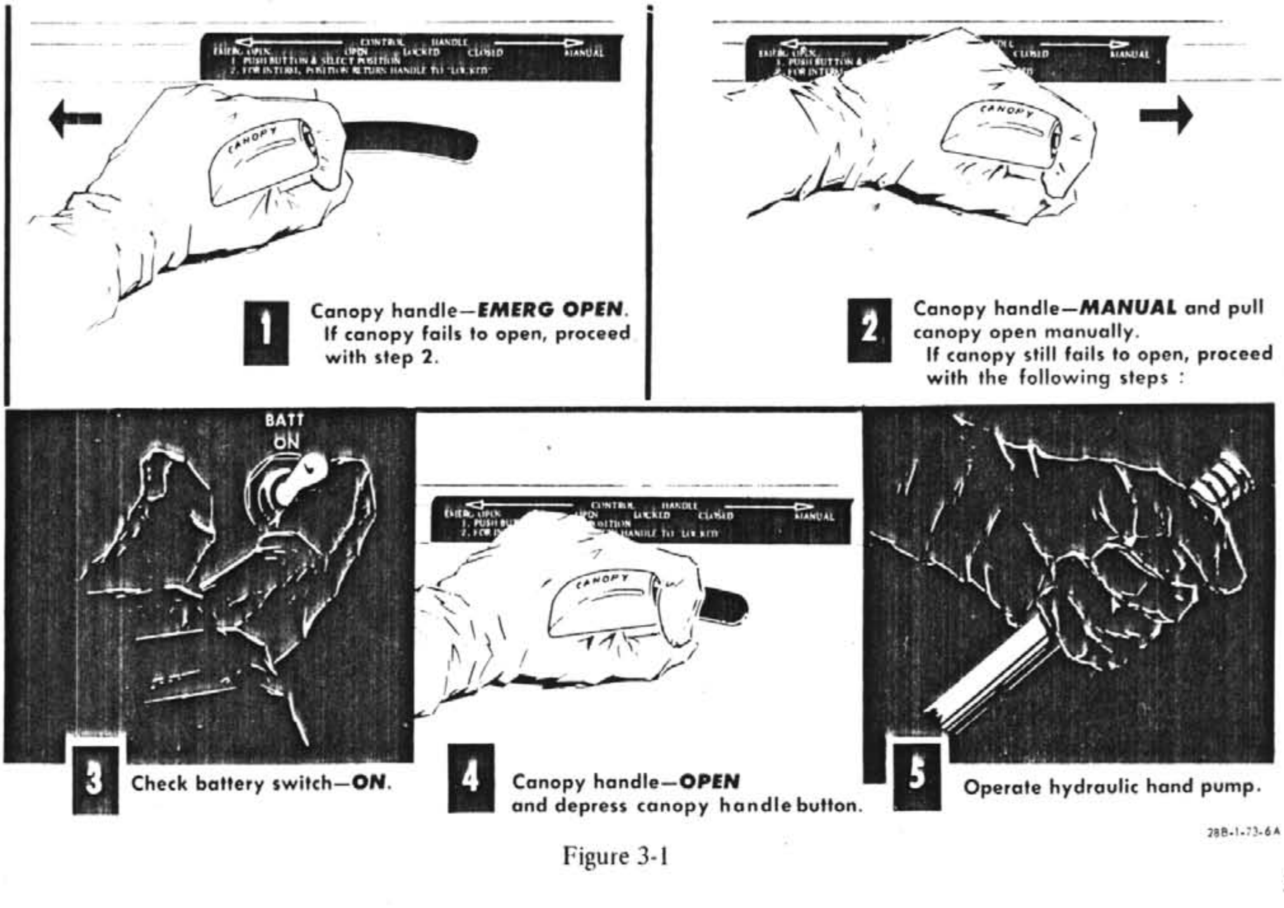


Figure 3-1

Warning After an emergency air opening, do not close the canopy until the system has been bled. A second emergency air opening without previous bleeding may be violent enough to damage the airplane.

- Procedures to bleed system are found in paragraph titled CANOPY HANDLE on page 1-32.

FAILURE OF CANOPY TO OPEN.

If the normal or emergency procedures for opening or removing the canopy fail, proceed as follows:

1. Remove canopy breakaway tool from scabbard by grasping handle of tool with one hand and pulling handle-holder ring with other hand.
2. Grasp canopy breakaway tool in one hand, with thumb and index finger resting firmly against hand-guard on blade end of handle.
3. Grasp bottom end of tool handle with other hand so that bottom of handle rests against palm of hand.
4. Aim blade point to strike perpendicular to canopy surface, using body motion in an upward thrust against canopy.

NOTE The blade of the tool should penetrate through the canopy and produce cracks leading away from the penetration point. Approximately four blows, placed so that the cracks from previous blows intercept, are necessary to open a hole large enough for escape. The approximate time to open an escape hole is 10 to 20 seconds.

EMERGENCY GROUND EGRESS

To accomplish emergency ground egress, disconnect seat belt, shoulder harness, and all personal leads, and evacuate aircraft. On aircraft modified by T.O. 1T-28-542, squeeze secondary escape handle and raise (approximately 120^{o} of travel). Disconnect all personal leads and evacuate aircraft.

EMERGENCY ENTRANCE.

See figure 3-2 for procedures on emergency entrance and safetying the escape system.

TAKE-OFF EMERGENCIES.

NOTE Extraction may be considered at any time during these emergencies if the canopy is closed.

- If anopy is open, secondary escape system must be used.

ABORTED TAKEOFF

The procedure for aborting is basically the same for any emergency; close the throttle and use the brakes as required. Other considerations, should it become apparent that the aircraft will leave the runway, are to place the mixture in Idle/Cutoff, open the canopy and retract the landing gear. MA-1A barrier engagements are not recommended.

Warning It is possible for brakes to completely fail as long as 15 minutes after hard braking. When hard braking is necessary, the airplane should be taxied clear of the runway and the engine shut down.

ENGINE FAILURE/FIRE

If engine failure/fire occurs after leaving the ground, the procedure for effecting a safe extraction or landing will depend on the position of the airplane relative to the runway, airspeed, altitude, and length of remaining runway. If the engine failure occurs a few feet off the ground and there is sufficient runway remaining, land the airplane on the runway and bring it to a stop. If the engine failure occurs when the airplane is higher, and there is insufficient runway remaining, the pilot must decide to extract* or land the airplane. Proceed as follows:

1. **EXTERNAL STORES* – JETTISON IF NECESSARY**

Warning External stores must be jettisoned if aircraft cannot be landed gear down on a prepared surface or if aircraft gross weight is a factor in aircraft control.

2. **LANDING GEAR – AS REQUIRED (UP IF UNPREPARED SURFACE)**
3. **FLAPS – AS REQUIRED**
4. **MIXTURE – IDLE CUTOFF**
5. **FUEL – OFF**
6. **CANOPY – AS REQUIRED (*CLOSED FOR EXTRACTION, EMERGENCY OPEN FOR LANDING)**

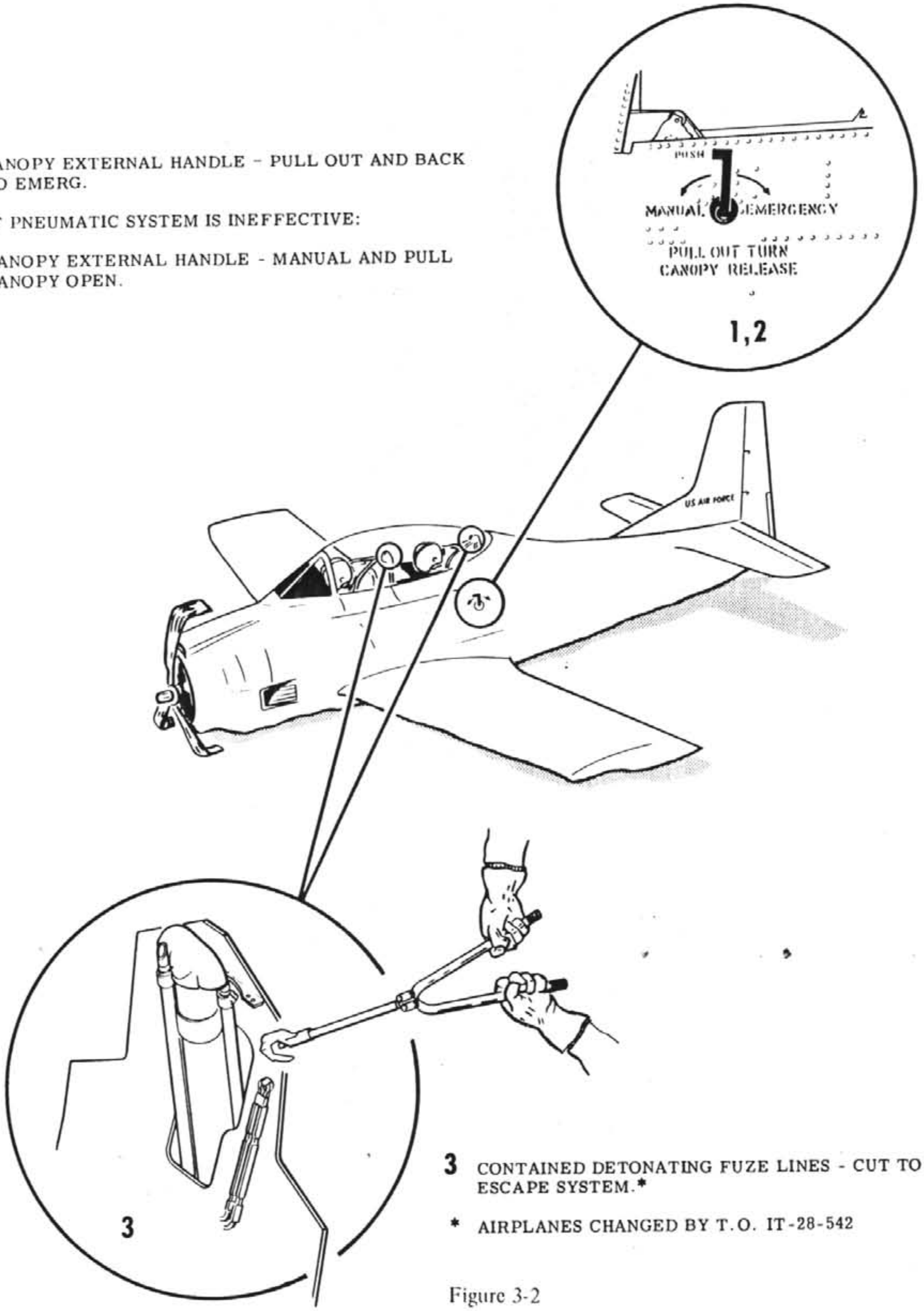
*Some airplanes.

EMERGENCY ENTRANCE

1 CANOPY EXTERNAL HANDLE - PULL OUT AND BACK TO EMERG.

IF PNEUMATIC SYSTEM IS INEFFECTIVE:

2 CANOPY EXTERNAL HANDLE - MANUAL AND PULL CANOPY OPEN.



3 CONTAINED DETONATING FUZE LINES - CUT TO SAFETY ESCAPE SYSTEM.*

* AIRPLANES CHANGED BY T.O. IT-28-542

Figure 3-2

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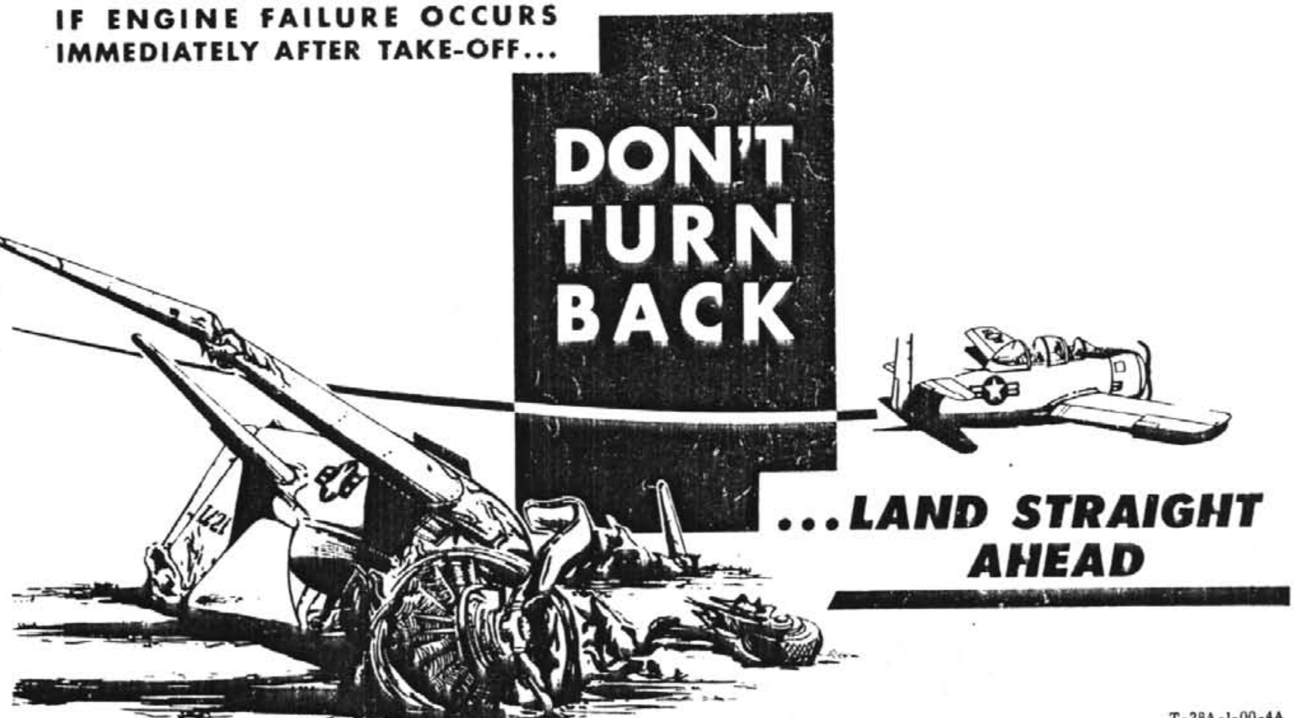


Figure 3-3

Warning With seat in raised position, lower head before moving canopy handle to EMERG OPEN. Extraction* cannot be accomplished with the canopy open because of interference of the canopy frame.

7. Ignition and battery/DC power* - OFF.

NOSE TIRE FAILURE ON TAKE-OFF.

If a nose tire fails during the initial portion of take-off, the take-off can be aborted, using brakes for directional control and back stick to ease the nose gear load.

If the failure occurs late during take-off, or airplane gross weight is high, the take-off can be continued. The continued take-off permits reducing airplane weight and utilization of entire runway which will reduce damage to nose gear. When failure occurs, lighten nose gear load slightly and maintain control with rudder. Leave landing gear extended after take-off for a visual inspection before landing.

MAIN TIRE FAILURE ON TAKE-OFF.

If a main tire fails during take-off, the speed and weight of the airplane should be used to make the decision to abort or continue. At lower weights and speeds, the take-off may be aborted. At higher speeds and weights, it may be desirable to continue take-off to reduce airplane weight before landing. Intentionally failing the second tire may or may not increase directional control, but does greatly reduce braking efficiency. Directional control, in either case, can be maintained with a combination of nose wheel steering, good tire and brake, and rudder. When take-off is continued, do not retract landing gear. If possible, have a visual check made of tire and gear area before landing.

IN-FLIGHT EMERGENCIES.

NOTE Extraction may be considered at any time during these emergencies if the canopy is closed.

*Some airplanes

ENGINE FAILURE (PARTIAL POWER FAILURE).

If a partial power failure is encountered during flight, attempt to regain normal engine operation as follows:

1. Mixture - RICH
2. Carburetor air - As required.

   Position carburetor air lever toward ALTERNATE as necessary to maintain carburetor air temperature within prescribed operating range, to prevent carburetor icing.

3. Airspeed - 130 knots IAS minimum.
4. Fuel pressure - 15 to 25 psi.
5. Throttle - 18 to 25 in. Hg. MAP

   Set to obtain smoothest operation.

6. Propeller - Full INCREASE RPM.
7. Ignition - BOTH

ENGINE FAILURE (COMPLETE POWER FAILURE).

If complete engine failure is encountered, proceed as follows:

1. Attempt engine air start.

   Refer to "Engine Air Start" in this section.

2. Make decision to force-land, or to extract* or bail out.

   If engine fails to start or fails to run after successful start, land, using forced-landing pattern, or extract* or bail out.

Warning

Extraction* cannot be safely accomplished with the canopy open. Check that canopy-open warning light is not on, and canopy-open warning horn* is not sounding. If on, or sounding, close canopy.

ENGINE AIR START.

If a definite engine structural failure occurs in flight, an attempt to restart the engine may only result in the loss of valuable altitude. However, if the engine stops firing and there is no evidence of engine structural failure, attempt an engine air start as follows:

1. Throttle - 1/4 open.
2. Mixture - RICH.
3. Propeller - Full INCREASE RPM.
4. Battery and generator - ON.
5. Check the following:
   a. Fuel - ON.
   b. Fuel pressure - Check
   c. Booster pump circuit breaker - In.

      If the booster pump is inoperative, check that booster pump circuit breaker is in. Above approximately 10,000 feet, sufficient fuel will not be supplied to the engine without booster pumps operating. (Refer to "Fuel Pressure" in Section VII.)

   d. Ignition - BOTH.
6. If engine does not start and altitude permits:
   a. Mixture - IDLE CUTOFF.
   b. Throttle - Full open to clear engine.
7. Throttle - 1/4 Open.
8. Mixture - RICH.
9. If engine fails to start - Prime 1 to 2 seconds.
10. If engine starts:
    a. Primer - Hold down.
    b. Throttle - Adjust for smooth operation.
11. If engine still fails to start - Land, or extract* or bail out.

Warning

Extraction cannot be accomplished with the canopy open Check that canopy-open warning light is not on, and canopy-open warning horn* is not sounding. If on, or sounding,* close canopy.

*Some airplanes

CHIP DETECTOR (SUMP PLUG) WARNING LIGHT.

If the chip detector (sump plug) warning light comes on, maneuver to safe altitude for forced landing, and proceed as follows:

1. Throttle - Reduce to cruise setting.

2. Propeller - Approximately 2100 rpm.

3. Mixture - RICH.

   This will reduce the possibility of detonation and help prevent high cylinder head temperatures.

4. Land at nearest suitable field.

   Closely monitor engine instruments for signs of abnormal engine operation such as erratic oil pressure or loss of oil pressure, loss of power, high temperatures, rough engine, or unusual noises.

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: engine-driven fuel pump bypass valve leakage, clogged pressure line, instrument failure, or line leakage. When fuel pressure drops and the engine continues operating normally, the first concern of the crew must be to guard against the outbreak of an engine fire. The greatest danger lies in the fact that the crew 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 compartment 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 or 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 outweigh the increase in cooling airflow. It is the objective of the pilot to eliminate the leaking fuel before any change is made to the airflow or exhaust pattern. The most effective means of accomplishing this is by moving the mixture lever to IDLE CUTOFF before any throttle reductions or any other engine shutdown procedure is initiated. An additional advantage of moving the mixture lever to IDLE CUTOFF is that it provides the most rapid means of eliminating exhaust stack flames and reducing exhaust heat.

If the fuel pressure drops below operating limits and the engine continues to operate normally during flight, proceed as follows:

1. Throttle - Leave in present position.

Warning

When fuel pressure drops below operating limits, but engine continues to operate normally and it is suspected that a fuel leak exists, the mixture lever must be moved to IDLE CUTOFF and the fuel selector turned to OFF, before airspeed is reduced, or before throttle reduction or any other engine shutdown procedure is initiated.

2. Check for indications of engine fire.

3. Check for fuel leakage and fumes.

4. Proceed to nearest suitable field.

   If fuel leakage is evidenced or suspected, fly to forced-landing key point and initiate steps in "Engine Fire In Flight" in this section.

ENGINE FIRE.

Depending upon the seriousness of the fire, either bail out immediately, extract, * or try to extinguish fire as follows:

1. **MIXTURE – IDLE CUTOFF.**

2. **FUEL – OFF.**

3. Ignition – OFF.

4. Cowl and oil cooler flaps – OPEN.

5. Battery and generator – OFF.

6. Cockpit air – EMERG. OFF.

7. Do not restart engine.

8. If fire continues - Extract* or bail out.

---

*Some airplanes

Warning Extraction cannot be accomplished with the canopy open. Check that canopy-open warning light is not on, and canopy-open warning horn* is not sounding. If on, or sounding,* close canopy.

FUSELAGE FIRE.

If a fuselage fire occurs during flight, proceed as follows:

1. Check cause by shutting off the following, one at a time:

   a. Cockpit heater – OFF.

   b. Cockpit air – EMERG. OFF.

   c. Battery and generator – OFF.

2. If fire continues, shut down engine and extract* or bail out.

Warning Extraction cannot be accomplished with the canopy open. Check that canopy-open warning light is not on, and canopy-open warning horn* is not sounding. If on or sounding,* close canopy.

3. If fire is extinguished, land at nearest suitable airfield.

WING FIRE.

If fire starts in wing:

1. **EXTERNAL LOAD – JETTISON.**
2. Exterior lights – OFF.
3. Pitot heater – OFF.
4. Master armament switch – OFF.
5. Try to extinguish fire by sideslipping airplane away from flame.
6. If fire persists, extract* or bail out.

*Some airplanes

Warning Extraction cannot be accomplished with the canopy open. Check that canopy-open warning light is not on, and canopy-open warning horn* is not sounding. If on, or sounding,* close canopy.

7. If fire is extinguished, land at nearest suitable airfield.

ELECTRICAL FIRE.

Circuit breakers isolate most electrical circuits and automatically interrupt power to prevent a fire when a short circuit occurs. However, if circuit breaker protection does not prevent an electrical fire, and if electrical power is essential (as during instrument flight), try to identify and isolate the defective circuit as follows:

1. Battery and generator – OFF.
2. All electrical equipment (except ignition) – OFF.
3. Battery and generator -- Check operation separately.
4. Isolate defective equipment.

   Turn on each circuit or piece of equipment individually and check loadmeter for abnormal reading. Allow sufficient time for the indication or recurrence of fire when restoring power to each circuit previously turned off.

5. Defective equipment switches -- OFF.
6. Land at nearest suitable airfield.

ELIMINATION OF SMOKE OR FUEL FUMES.

If smoke or fuel fumes enter the cockpit, proceed as follows:

1. **OXYGEN 100% – (if applicable).**
2. Fuel pressure – Check.

Warning If loss of fuel pressure is evident, refer to fuel pressure drop procedures.

3. Airspeed - Reduce immediately.

   Reduce airspeed to minimize spreading fire and to prepare for extraction*/bail-out if necessary.

4. Cockpit air - OPEN.

5. Air outlets Open.

6. Windshield and canopy defrost -- ON.

Warning If smoke or fumes enter cockpit from any air outlet, turn cockpit air handle to EMERG. OFF.

7. All nonessential electrical equipment – OFF.

8. Canopy -- OPEN.

   An open cockpit may aggravate a smoke or fuel fume condition. Open canopy, only as a last resort.

9. Land at nearest suitable airfield.

PROPELLER FAILURE.

If the linkage to the propeller governor fails, a centering spring in the governor automatically sets the governor to control the propeller to between 2000 rpm and 2200 rpm, depending on throttle setting. Ample power is available in this rpm range to maintain flight.

Failure to High RPM

If the propeller governor fails and the propeller goes to low pitch (high rpm), proceed as follows:

1. Throttle - Retard.

   Retard throttle to maintain rpm within limits.

2. Airspeed -- Reduce.

   Pull airplane up into climb to decelerate to lowest safe airspeed and increase load on propeller.

3. Propeller -- Move to DECREASE RPM, then INCREASE RPM, several times.

   Repeat step several times in an effort to restore governor effectiveness. Sufficient power will be available to maintain flight.

4. Land at nearest suitable airfield.

Failure to Low RPM

If the propeller governor fails and the propeller goes to high pitch (low rpm), proceed as follows:

1. Throttle -- Adjust to lowest manifold pressure to maintain flight.

2. Supercharger -- LOW.

3. Mixture -- RICH.

4. Propeller -- Move to INCREASE RPM, then DECREASE RPM, several times.

   Repeat step several times in an effort to restore governor effectiveness.

5. Land at nearest suitable airfield.

   Descending to lower altitude increases power available.

WING AMMUNITION DOORS OPEN.

1. Airspeed -- 120 to 155 knots IAS.

2. Straight-in, no-flap approach (minimum airspeed 120 knots IAS).

NOTE Extraction may be considered at any time during these emergencies if the canopy is closed.

FUEL SYSTEM FAILURE.

Engine-driven Pump Failure.

If the engine-driven fuel pump fails, the tank booster pump will supply fuel to the engine.

Booster Pump Failure

If, while operating above 10,000 feet, erratic or intermittent engine operation is encountered, failure of the fuel booster pump may be suspected. If these operating conditions are encountered, you should descend to below 10,000 feet. If the booster pump fails, the engine-driven pump will draw sufficient fuel for engine operation up to approximately 10,000 feet. Above that altitude, the low atmospheric

*Some airplanes

pressures tend to vaporize the fuel in the lines. As a result, the pump must handle a combination of vapor and fuel which greatly reduces the pumping capacity, and insufficient fuel is supplied to the engine. This condition is aggravated by high outside air temperatures.

Transfer Pump Failure — T-28B Airplanes*

A failure of a transfer pump will result in the inability to make use of any fuel in the respective external tank.

External Fuel Transfer Failure — T-28D-5 Group II Airplanes

Failure of external tank fuel to transfer can result from failure of the engine-driven air pump, failure of the solenoid-operated transfer control valve, or a failure in the ground safety relay circuit or the external fuel transfer switch. Open failures of normally closed solenoid valves are rare. Pump failure results in complete failure of external fuel transfer capability. Should external fuel fail to transfer, as seen by premature wing tank fuel level depletion, attempt to regain transfer as follows:

1. External fuel switch — Cycle OFF, ON.
2. "LTS TEST/FUEL TRANS" circuit breaker — Pull.

   Check wing fuel tank level for indication of external fuel transfer.

3. If external fuel will not transfer, land as soon as practicable, using minimum touchdown sink rate, or jettison tanks, as desired.

NOTE External fuel tanks on T-28D-5 Group II Airplanes can be released as droppable stores. To release, turn master armament switch ON, select BOMBS position for station selector switches 2 and 5, and depress the bomb button on the stick grip.

- Satisfactory separation of full and empty tanks has been demonstrated a 1 G at 120 knots IAS with one-half flaps and at 215 knots IAS with flaps retracted with no adjacent stores.

Caution Depressing the store jettison button will release all droppable stores, including external fuel tanks.

*Some airplanes

ELECTRICAL POWER SYSTEM FAILURE.

If a complete electrical failure occurs, or if it becomes necessary to turn off the battery and generator switches, only battery-bus-powered equipment will operate. Altitude should be reduced to below 10,000 feet (reference boost pump failure) and rpm reduced to maintain engine operation. An emergency landing should be accomplished as soon as possible.

Warning In case of complete electrical failure, essential flight attitude instruments, most engine instruments, and communication and navigation equipment will be inoperative.

NOTE On T-28D-5 Group II Airplanes with external fuel tanks installed, fuel will continue to transfer if the electrical power system fails.

Generator Overvoltage — T-28D Airplanes.

If the generator overvoltage warning light comes on, attempt to restore generator operation as follows:

1. Generator — RESET, then ON.

   If overvoltage light remains out and voltmeter indicates normal voltage, overvoltage was temporary.

2. If overvoltage light remains on:

   a. Generator — OFF.

   b. Nonessential electrical equipment — OFF.

   c. Land at nearest suitable airfield.

Generator Failure — T-28B and T-28C Airplanes

Illumination of the generator-off warning light indicates that the generator is inoperative and the battery is supplying all the power for the electrical system. In case of generator failure, proceed as follows:

1. Nonessential electrical equipment — OFF.

   Conserve the battery by immediately turning off all nonessential electrical equipment. If necessary, place dc power switch at OFF and pull circuit breakers.

2. Instrument power – NO. 1 INV.

   (Unmodified aircraft – NO. 2 INV.)

3. DC power – BAT ONLY (if radios and instruments are needed).

   If flight can be conducted with instruments but without radios, place the dc power switch at BAT & GEN except when radios are required and before landing.

Generator Failure – T-28D Airplanes.

In case of generator failure, proceed as follows:

1. Generator – OFF.

2. Nonessential electrical equipment – OFF.

   Conserve the battery by turning off all nonessential electrical equipment (pull circuit breakers if necessary).

3. Battery – OFF (until necessary).

   Place the battery switch at BATT ON to energize radios and instruments when required and before landing.

Warning With battery switch at OFF, all electrical equipment is inoperative except that powered by the battery bus.

Main Inverter Failure – T-28D Airplanes.

If the main inverter fails, as indciated by illumination of the main inverter out warning light, the spare inverter is automatically energized. If the automatic change-over relay fails (both inverters out warning lights on), the spare inverter should be manually connected to the circuit as follows:

1. Inverter – SPARE ON.

2. Main inverter out warning light – On.

   With the spare inverter operating, the both inverters out warning lights will be out and the main inverter out warning light on.

Main Inverter Failure – T-28B and T-28C Airplanes.

A flight instrument power failure warning light, in each cockpit, when on, indicates failure of the inverter selected by the instrument power switch for that particular cockpit. Should the main inverter fail, proceed as follows:

1. Inverter circuit breaker – Check in.

   The inverter circuit breaker may have popped because of a temporary overload. If circuit breaker is in or will not reset, proceed to step 2.

2. Instrument power – NO. 2 INV.

   Check that flight instrument power failure warning light is out.

3. Main inverter circuit breaker – Pull.

   Pull the circuit breaker for the inoperative inverter to prevent possible additional damage to the inverter or an overload generator.

HYDRAULIC SYSTEM FAILURE.

Should the hydraulic system fail during flight, press canopy handle button to lose the hydraulic system bypass valve. If pressure does not build up, the hand-pump can be used in an attempt to pressurize the system. The hand-pump is not considered an emergency system, however, as it will not supply pressure if hydraulic system failure is caused by any malfunction other than engine-driven pump failure.

WING FLAP EMERGENCY OPERATION.

If the normal flap hydraulic system fails, proceed as follows:

1. Wing flaps – As desired.

2. Hydraulic hand-pump – Operate to position flaps.

SPEED BRAKE EMERGENCY CLOSING – T-28B AND T-28C AIRPLANES.

If the engine-driven pump fails, the speed brake can be opened, using the hand-pump. No provision is made to open the speed brake in case of electrical or complete hydraulic failure. However, in event of an electrical failure when brake is open, it will automatically close. If a hydraulic failure occurs with speed brake open, positioning the speed brake switch to OFF allows air loads to close the brake to trail position.

EXTRACTION – AIRPLANES CHANGED BY T.O. 1T-28-542.

Extraction may be accomplished at any time, if the canopy is closed. A wings-level, slightly nose-up or nose-level attitude will ensure maximum escape system performance, although the escape system performs effectively under the most adverse conditions, including zero-altitude, zero-speed emergencies. Extraction should be considered the primary escape technique rather than bailout. (See figures 3-3A, 3-3B and 3-4.) Under level flight conditions, extract at least 2000 feet above the terrain whenever possible. Under spin or dive conditions, extract at least 3000 feet above the terrain whenever possible.

Warning

Do not delay extraction below 2000 feet AGL in futile attempts to start the engine or for other reasons that may commit you to an unsafe condition, accident statistics emphatically show a progressive decrease in successful ejections/extractions as altitude decreases below 2000 feet AGL.

- Extraction cannot be accomplished with the canopy open. Before initiating extraction escape, check that canopy-open warning light and horn* are not on. If either is on, close canopy immediately.

EXTRACTION SYSTEM MALFUNCTION.

Bailout is recommended only upon escape system malfunction. The basic considerations and aircraft configuration are the same as described in the following paragraphs. Should bailout be necessary, place the canopy handle to EMERG OPEN, squeeze and pull up (rotate) the SECONDARY ESCAPE HANDLE, and bail out.

PREPARATION FOR BAILOUT – AIRPLANES WITHOUT EXTRACTION SYSTEM.

The decision of whether or not to bail out is up to the pilot and should be made as soon as possible, since delay may allow speed and G-forces to build up to a point where bailout is impossible. Make all escapes from level flight from right side of the airplane to take advantage of the downward force of the propeller wash. This will greatly reduce the danger of striking the horizontal stabilizer upon leaving the airplane. This is especially true for the rear-seat pilot. The chance of striking the stabilizer is increased with higher airspeed. Within airspeed limitations, lowering the flaps may be helpful; however, the resultant increased drag will proportionately increase the sink rate. The greatest advantage in lowering the flaps is that approximately 2 feet of surface area is removed, affording more area in which to clear the tail surface. If time and conditions permit, perform the following before bailing out:

1. Follow radio-distress procedures.
2. Fly toward uninhabited areas.
3. Airspeed – Reduce as much as possible without stalling.
4. Flaps – DOWN.
5. Elevator trim – Slightly nose-down.
6. Fuel, ignition, battery and generator – OFF.
7. Personal leads – Disconnect. Disconnect radio and oxygen leads. Pull bailout bottle if at altitude.

BAIL OUT.

1. **ORDER CREW TO BAIL OUT.**
2. **CANOPY HANDLE – EMERG OPEN.**

Warning

With seat in raised position, lower head before moving canopy handle to EMERG.

3. **SAFETY BELT AND SHOULDER HARNESS – UNFASTEN.**
4. Bail out.

   Pilot in front cockpit maintains level flight until pilot in rear cockpit clears airplane.

Warning

If the airplane is spinning, warn the pilot in the other cockpit and both pilots should bail out to the outside of the spin to minimize the danger of being struck by the airplane.

- Do not stand upright in the seat at bailout. The slip stream can upset you, foul the parachute, and blow you into the tail surface. Crouch in the cockpit with one leg on the seat and the other on the floor. Make sure clothing and equipment will not foul control stick or other protrusions in the cockpit.

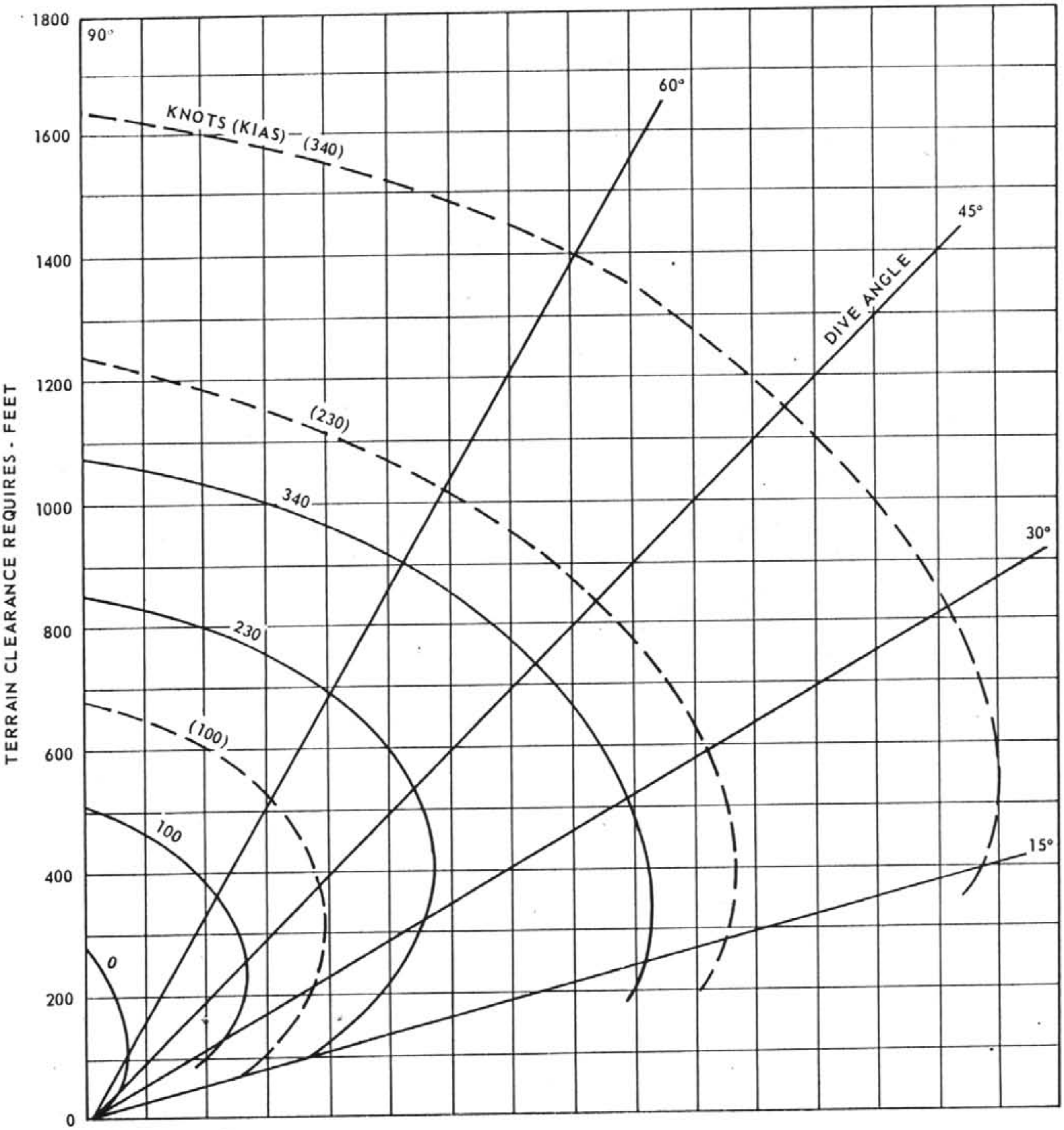
NOTE If the engine is on fire, the pilot in the rear cockpit can slip the airplane while the other pilot is leaving the front cockpit to aid him in escaping the flames.

In cases of high-speed bailout, if altitude permits, delay pulling the ripcord "D" ring until your speed has decreased to a constant "free-fall" rate.

Warning

Do not pull "D" ring until positively free of airplane.

*Some airplanes.



NOTE

THE SOLID CURVES INDICATE MINIMUM TERRAIN CLEARANCE WITH NO CREWMEMBER REACTION TIME. DASHED CURVES INDICATE MINIMUM TERRAIN CLEARANCE WITH A ONE (1) SECOND CREWMEMBER REACTION TIME. THE CURVES ARE BASED ON A WINGS LEVEL ATTITUDE.

Figure 3-3A. Minimum Extraction Altitude vs Airspeed and Dive Angle

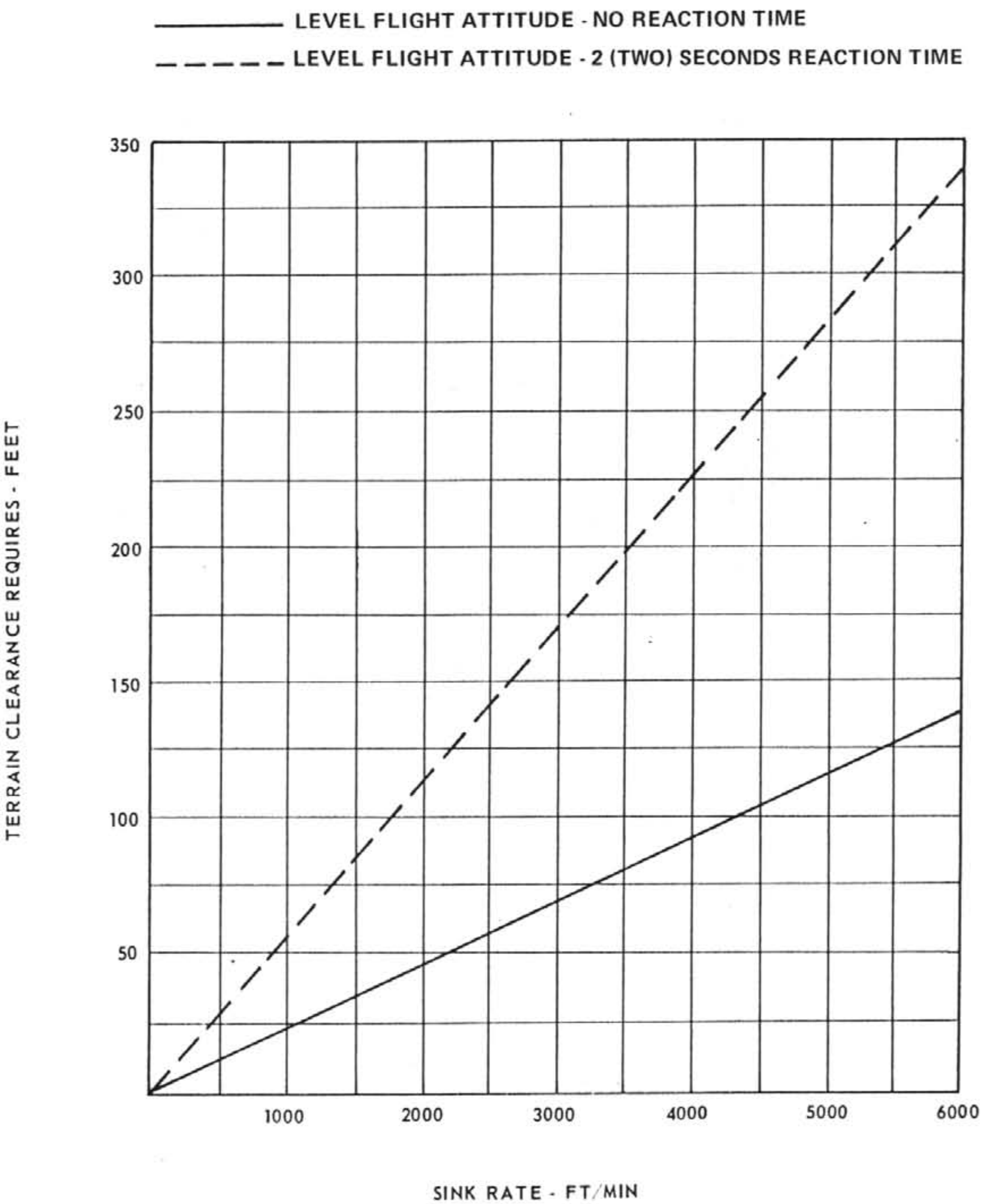


Figure 3-3B. Minimum Extraction Altitude vs Sink Rate

EXTRACTION PREPARATION: If time and conditions permit, do, before extracting, as much as possible of the following:

1. Torso harness and safety belt – Fasten and adjust.
2. Head against headrest, back erect, feet on rudder pedals.
3. Follow radio-distress procedures.
4. Fly toward uninhabited area.
5. Airspeed – Reduce.
6. Flaps – DOWN.
7. Elevator trim – Slightly nose-up or level.
8. Fuel, ignition, battery and generator – OFF.
9. Personal leads – Disconnect. Disconnect radio and oxygen leads. Pull bailout bottle if at altitude.

EXTRACTION

1. **ORDER CREW TO EXTRACT.**
2. **CANOPY – CLOSED.**
3. **EXTRACTION HANDLE – PULL.**

AFTER CLEARING COCKPIT

Grasp and pull ripcord handle. (This is a precautionary measure only, since manual reaction time will not be fast enought to override the automatic feature.)

Figure 3-4

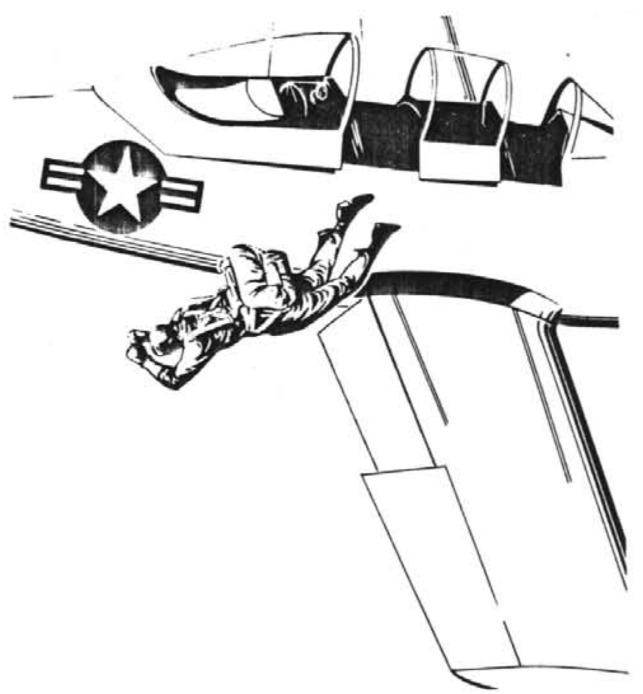


Figure 3-5

If time and conditions permit, perform the following before bailing out:

6. Follow radio distress procedures.

7. Fly toward uninhabited area.

8. Airspeed - Reduce.

   Reduce airspeed as much as possible without stalling.

9. Wing flaps - DOWN.

10. Elevator trim - Slightly nose-down.

11. Fuel, Ignition, Battery and Generator - OFF.

12. Personal leads - Disconnect.

    Disconnect radio and oxygen leads. Pull bail-out oxygen if at altitude.

EXTERNAL STORES JETTISON.

Pressing the store jettison button jettisons external loads, except the gun pods and, on T-28B airplanes, external tanks.

Warning When using store jettison button to jettison stores, if stores fail to release, jettison stores by using bomb release procedures.

- Do not jettison partially loaded MER except in an emergency as it may strike the airplane.

LANDING EMERGENCIES.

NOTE Extraction may be considered at any time during these emergencies if the canopy is closed.

MAXIMUM GLIDE.

If the engine fails during flight, maximum gliding distance can be obtained by maintaining a speed of 130 knots IAS with gear and flaps up, propeller lever full DECREASE RPM, canopy closed, and (B/C) speed brake closed. (See figure 3-6.) Engine rpm will be approximately 1150, generator output will be normal, and the hydraulic system will maintain 1500 pounds pressure at this windmill rpm.

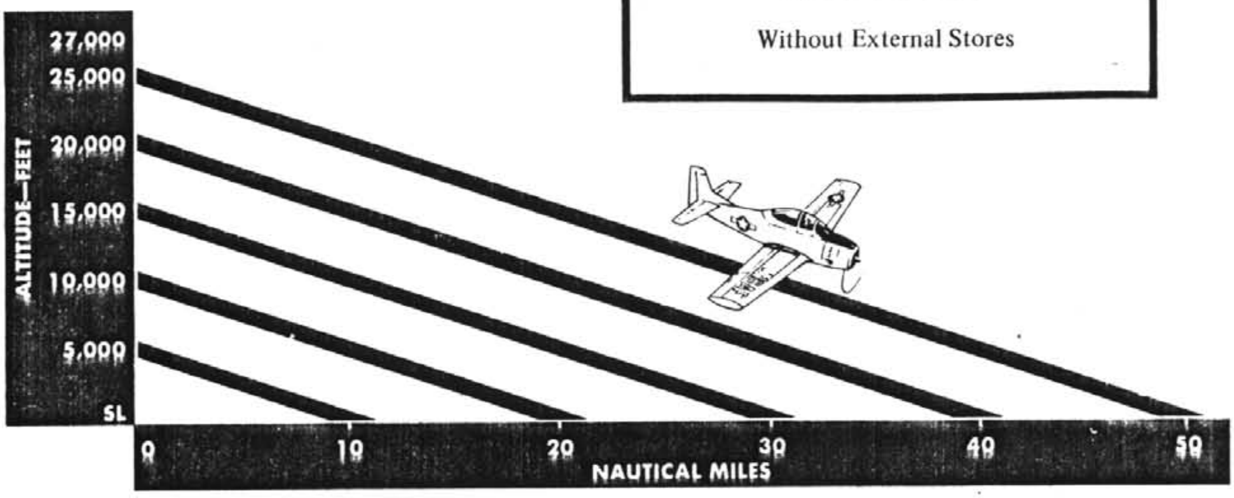
FORCED LANDING.

In event of a forced landing, follow procedure outlined in figure 3-7. If the landing is to be made on a prepared surface, a gear-down landing is recommended; if other than a prepared surface landing is anticipated, land with the gear up. During descent, play the turns to lose altitude as necessary to permit a straight-in, constant-rate-of-descent approach. If high at the 90-degree point, excess altitude can be lost by any combinations of the following: delaying the final turn, slipping on final, lowering full flaps (if not previously done), (B/C) extending speed brake, and/or advancing the propeller lever to full INCREASE RPM (to increase the drag of the propeller). The most effective way of losing altitude is the slip; it has an added advantage, since IAS errors are negligible in the slip. To correct for any errors in judgment above 600 feet, full flaps can be raised to the 1/2 position to give the best lift/drag ratio. In case of undershoorting, any or all of the following corrections can be applied: propeller lever to full DECREASE RPM (if not already there), raising flaps to 1/2, or raising landing gear. The landing gear is the highest drag item. (With the engine windmilling, the gear can be retracted in approximately 7 seconds and extended in approximately 4 seconds. It is possible to carry a gear-up approach to an altitude of 300 feet and still place the gear down for landing. Decreases in flap settings are not recommended below 600 feet.) Flare for landing should be started approximately 200 feet above the runway or terrain. Because of the higher than normal altitudes used for a dead-stick landing, there is a strong illusion that the landing will be overshot. This results in a tendency to actually undershoot. For

MAXIMUM GLIDE DISTANCES- NO WIND

130 KNOTS-IAS

Without External Stores



You will glide approximately 10 nautical miles for each 5000 feet of altitude lost by holding 130 knots. T-28B-1-00-12

Figure 3-6

this reason, aim for a point one-third down the runway or slightly beyond the intended touchdown point.

EMERGENCY/SIMULATED FORCED LANDING.

To simulate a forced landing or when in the pilot's judgment continued operation of the aircraft is questionable, proceed to the nearest suitable airfield.

NOTE Examples of questionable operation would be: engine/airframe vibration, engine temperatures out of normal operating range, etc.

The flight pattern should be the same as forced landing shown in figure 3-7. Enter the pattern at the highest key point possible and use the following procedures:

Caution. Watch carburetor air temperature for icing temperatures (-10°C to +15°C) and if encountered apply alternate air.

1. Throttle - 15 inches Hg.
2. Propeller - 1500 rpm; full INCREASE RPM at High Key.
3. Mixture - RICH.
4. Airspeed - 130 knots IAS during glide; 110 knots IAS in pattern.
5. (D) Wing flaps - ¾ down.

   Flap position simulates clean airplane.

   (B/C) Speed brake - ON.
6. Landing gear - DOWN (prepared surface).
7. Shoulder harness - LOCKED.
8. Cowl and oil cooler flaps - As required.
9. (B/C) Flaps - As required.

LANDING GEAR EMERGENCY EXTENSION.

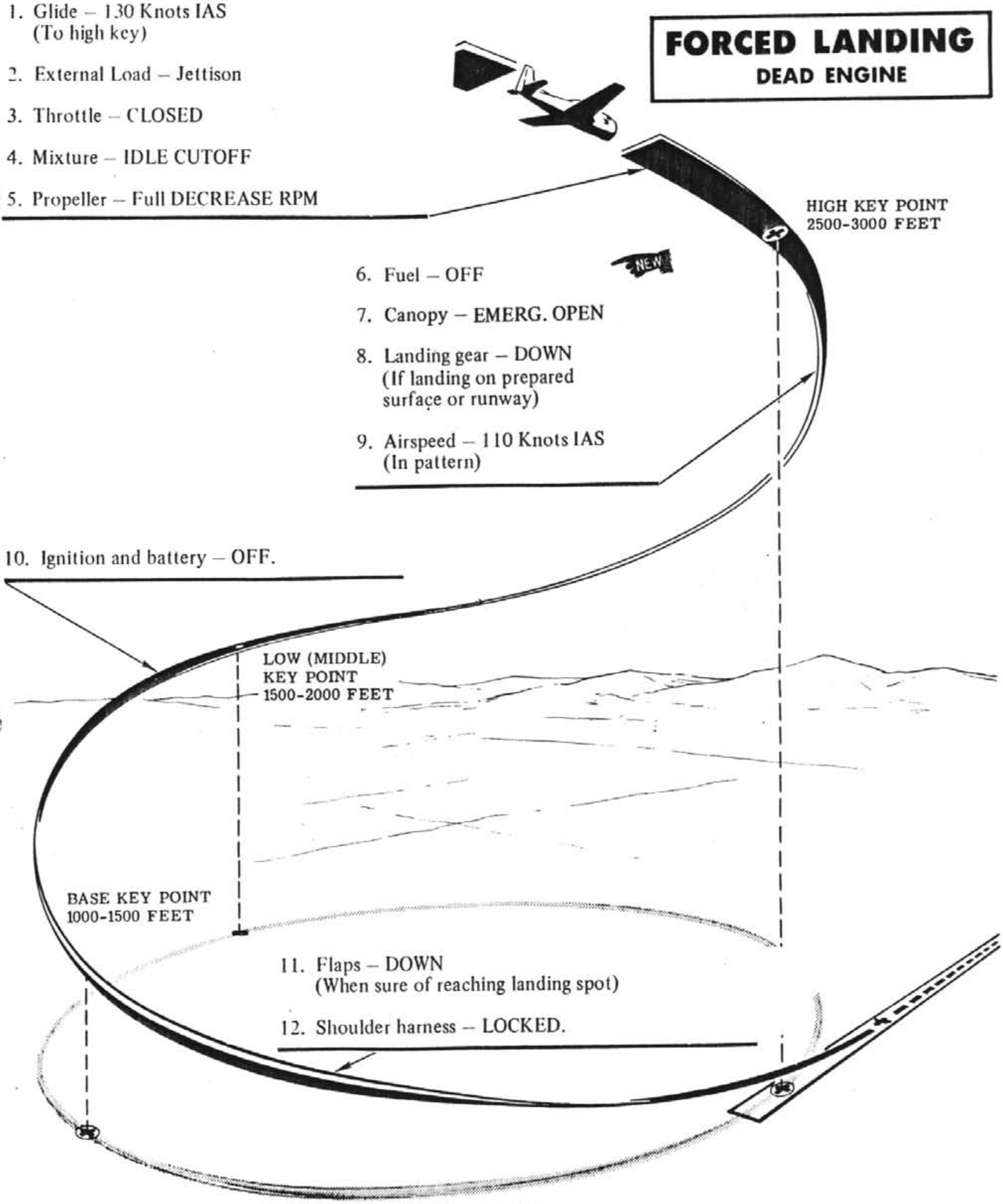
1. Airspeed - Reduce to approximately 115 knots IAS.
2. Landing gear - DOWN.
3. Yaw airplane to help lock gear down.

   After gear drops from wheel wells, yaw airplane if necessary to lock main gear down. The nose gear will be forced down by a spring on the gear.
4. Gear position indicators and landing gear warning light and horn* - Check for safe indications.

LANDING GEAR HANDLE STUCK IN UP POSITION.

If the landing gear handle will not lower when an attempt is made to move the handle to the DOWN position, the

*Some airplanes



NOTE

Since the rate of descent increases approximately 300 feet per minute with the canopy open, this should be considered when making an actual forced landing.

28B-1-00-13A

- A successful landing can be made from an entry from any key point position

Figure 3-7

cause may be a hydraulic lock. Therefore, proceed as follows:

1. Airspeed - Approximately 100 knots IAS; simultaneously accomplish steps 2 and 3.
2. Canopy - MANUAL; depress canopy button.
3. Landing gear - DOWN.
4. Gear position indicators, warning light, and horn* - Check for safe indication.
5. Leave gear down and return to field and land.

LANDING WITH GEAR RETRACTED.

If the gear fails to extend, a wheels-up landing can be made on either hard or soft ground as follows:

NOTE Jettison external stores* for all landings involving landing gear failures.

1. Final approach - normal flaps-down approach.
2. Cockpit heater - OFF.
3. Shoulder harness - LOCKED.
4. Canopy - EMERG. OPEN.
5. Flare as in normal landing.
6. Shut down engine just before touchdown.
7. Leave airplane.

   When airplane has definitely stopped, leave airplane.

Landing With One Main Gear Retracted.

When landing with one main gear retracted, land on side of runway with operational main gear. Hold wing, with malfunctioning gear, level or slightly higher than normal while maintaining directional control with nose wheel steering (if available) and rudder. As lift is lost, the wing will drop and the airplane will turn in the direction of the low wing. The use of nose wheel steering (if available) and braking on the operational gear will reduce the rate of turn. Any significant cross wind from the affected gear side will assist holding wing up if higher than normal, after touchdown. If the cross wind is from the opposite side, a weather vane effect will prevail and will reduce the rate of turn toward the gear malfunctioned side.

A wheels-up landing is preferable to a landing with one main gear retracted. However, if such a landing cannot be avoided, proceed as follows:

1. Final approach - Establish normal flaps-down approach.
2. Cockpit heater - OFF.
3. Shoulder harness - LOCKED.
4. Canopy - EMERG. OPEN.
5. Touch down on extended gear.

   Use aileron to hold up wing with retracted gear.
6. Engine - Shut down.
7. When wing tip strikes the ground, use maximum braking on extended wheel.

NOTE Nose wheel steering will operate if the left gear is extended and airplane weight is on this gear.*

- If landing area permits, a turn in the direction of the retracted gear will reduce ground speed before the wing tip strikes the ground.

Nose Gear Retracted - Main Gear Down.

If the nose gear will not extend or lock down, make a normal flaps-down approach. Tighten and lock safety belt and shoulder harness, and plan to touch down near approach end of runway. Hold the nose off the ground as long as possible. Lower nose smoothly to runway while elevator is still effective. The use of brakes will tend to slam the nose on the ground and should be avoided if possible. Shut down the engine before the propeller contacts the ground and check that the fuel shutoff handle and electrical switches are off. Leave the airplane when it has definitely stopped.

TIRE FAILURE.

Tire failures are rare when proper preflight inspections are accomplished and landing and braking procedures are followed. When a tire fails, directional control and airplane braking present the greatest problem. Related fire, airplane structural damage, and broken lines are generally lesser problems but must be considered when they occur. The degree of difficulty associated with a failure depends on variables such as airplane weight, speed, which tire, availability of nose wheel steering, and pilot ability. Because of the many conditions, the following is presented as information, not procedure, to assist each pilot in making his decision at the time and for the individual situation.

Nose Tire Failure on Landing.

When necessary to land with a failed nose tire, reduce airplane weight as much as practical. Fly a normal approach to touchdown. Hold the nose wheel off the runway initially; then lower while elevator control is still available. Brake the airplane to a stop, holding back stick to relieve nose gear load. Braking the airplane to a stop produces heavy nose gear loads for a short period as compared to lighter loads

*Some airplanes

for a long period if brakes are not used. The amount of vibration and shimmy should determine which technique to use.

Main Tire Failure on Landing.

When it is necessary to land with a failed main tire, reduce weight and land on side of runway opposite the failed tire. Lower the nose wheel and use nose wheel steering, rudder, and brake to maintain directional control. Failing the second tire may or may not increase directional control, but does greatly reduce braking efficiency.

DITCHING.

This airplane has been successfully ditched a number of times in relatively calm waters; although with the escape system,* and with most emergency equipment carried, there is no advantage in riding the airplane down.

If ditching is preferred or unavoidable, proceed as follows:

Warning

If the secondary escape handle has been pulled to its full travel to disconnect the restraint system, ditching cannot be safely accomplished. The escape system will also be disconnected and cannot be used.

NOTE Conserve fuel to have power available for approach.

- Extraction may be considered at any time during this procedure if the canopy is closed and the restraint and escape systems are intact and connected.

1. Follow radio distress procedure.
2. External load - Jettison.
3. Radio and oxygen leads - Disconnect.
4. Torso harness* and safety belt - Tightened.

NOTE The escape system parachute attachment points are an integral part of the restraint system and cannot be released until ditching is complete and the airplane has stopped forward motion. If extraction system is not installed unbuckle parachute and tighten safety belt.

Make certain life raft is securely attached.

5. Landing gear - UP.
6. (B/C) Speed brake - OFF.
7. Canopy - EMERG. OPEN.

Warning

Extraction cannot be accomplished with the canopy open.

8. Battery and generator - OFF.
9. Wing flaps - DOWN.

   Wing flaps collapse on impact and do not tend to make airplane dive.

10. Shoulder harness - LOCKED.
11. Fly power-on approach.

    Approach stall attitude at a speed at which full control of airplane can be maintained. Unless wind is high or sea is rough, plan approach heading parallel to any uniform swell pattern and try to touch down along wave crest 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 touch down on the falling side of wave.

12. Mixture - IDLE CUTOFF, just before impact.
13. Restraining equipment - Disconnect when ditching complete.

    When ditching is complete, disconnect safety belt, shoulder harness, and parachute. If installed, remove and retain life raft.

*Some airplanes

AUXILIARY EQUIPMENT

SECTION IV

TABLE OF CONTENTS

COCKPIT HEATING AND VENTILATING SYSTEM.

Air for heating and ventilating both cockpits is obtained from the oil cooler air duct just forward of the engine oil cooler. The air is heated by a combustion heater for cockpit heat and for windshield and canopy defrosting. (See figure 4-1.) Fuel for heater operation is obtained from the carburetor through a cycling shutoff valve, and combustion air is taken in through an inlet in the left wing leading edge. The heater will operate only when airflow is sufficient to provide combustion in the heater. The heater cycles on and off as necessary to maintain the temperature selected in the cockpit. If the heater overheats (above 375°F), the heater electrical circuits and fuel supply will be turned off automatically. If this occurs, the heater should not be restarted until the cause of overheating has been determined. There are no provisions for emergency operation of the heating and ventilating system.

COCKPIT HEATING AND VENTILATING SYSTEM CONTROLS.

Controls for heating and defrosting are in the front cockpit only. However, a cockpit air handle in each cockpit permits either pilot to select the amount of air entering the cockpits. The cockpit air handles must be partially open for heating operation. Because of this feature, heating can be shut off in an emergency if the cockpit air handle in either cockpit is turned to EMERG. OFF.

Cockpit Air Handle.

The cockpit air handles (figure 4-2), one on the left aft console in each cockpit, are interconnected. Control positions are EMERG. OFF, CLOSED, and OPEN. Moving the handle toward OPEN mechanically positions the system shutoff valve to increase the flow of hot or cold air to the air outlets and defrosting system in each cockpit. Turning the handle to CLOSED still permits a small amount of air to enter the cockpit for ventilation. When the handle is turned to EMERG. OFF, the heater electrical system is de-energized and the system shutoff valve is closed. The handle must be positioned between CLOSED and OPEN for heater operation.

Cockpit Heater Handle.

Heater operation is controlled from the front cockpit only, by means of a cockpit heater handle (figure 4-2) forward of the throttle quadrant. Moving the cockpit air handle to OPEN and turning the cockpit heater handle to ON starts the heater. To start the heater on the ground, the engine must be running above approximately 1300 rpm to provide sufficient airflow for combustion and to open a ram-air pressure switch. Heat output is increased by rotation of the cockpit heater handle toward INC. TEMP.

Warning The combustion heater must be off for all takeoffs and landings, because of the fire hazard involved.

Air Outlets.

Manually controlled air outlets (4, figure 1-4; 4A, figure 1-5) are on each side of the cockpits at

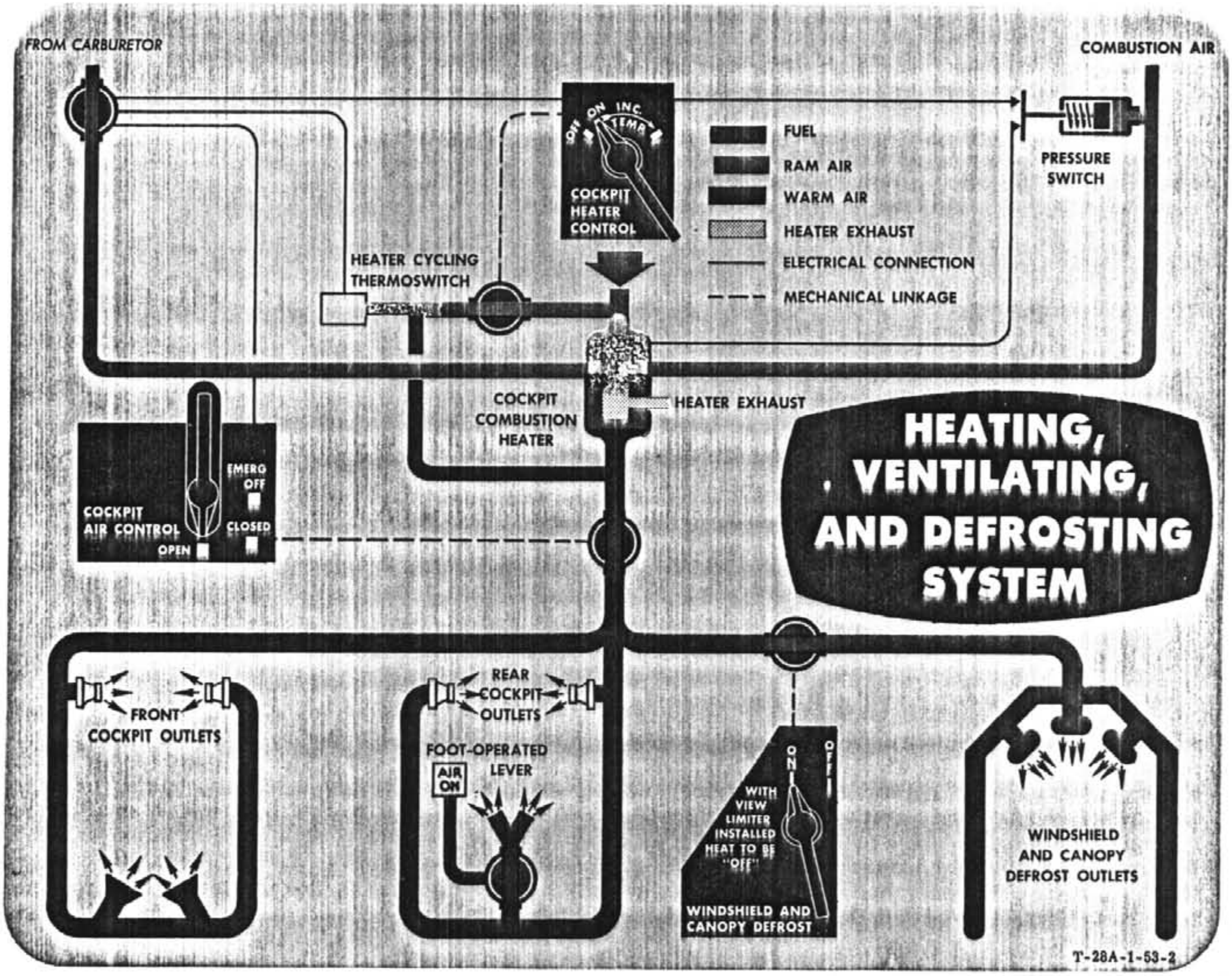


Figure 4-1

waist level. These side outlets may be adjusted for desired volume of air and direction of airflow. Floor outlets are also provided in each cockpit; one outlet is in the rear cockpit, and two outlets are in the front. The floor outlet in the rear cockpit is controlled by a foot-operated valve on the outlet. The volume of airflow from the front cockpit floor outlets is determined by position of the cockpit air handle.

CANOPY VENTILATORS.

A plastic, adjustable ventilator (figure 4-2), in the top portion of the forward and aft canopy sections, helps direct outside airflow to provide additional cockpit cooling. Moving the ventilator flow lever left or right allows a flow of air to pass through the nozzle at the bottom of the ventilator. Moving the lever aft (center) shuts off the airflow. The nozzle has a small handle that facilitates turning the flow of air in any direction.

COCKPIT VENTILATORS.

Airplanes changed by T. O. 1T-28-519, and T-28D-5 Airplanes, are equipped with two cockpit ventilators (figure 4-2), one in each side of the fuselage just forward of and below the canopy bow. These ventilators are actually air scoops that can be mechanically opened into the air stream to provide additional outside airflow throughout the cockpit. An exhaust port in the aft canopy skirt ensures an adequate exchange of cockpit air. The cockpit ventilators can be opened by turning the knob counterclockwise. Turning the knob clockwise closes the vent.

OPERATION OF COCKPIT HEATING AND VENTILATING SYSTEM.

1. For ventilation, open cockpit air handle for desired volume of air, and adjust cockpit air outlets as necessary. If additional ventilation is desired, turn windshield and canopy defrost handle to

HEATING, VENTILATING, AND DEFROSTING SYSTEMS CONTROLS

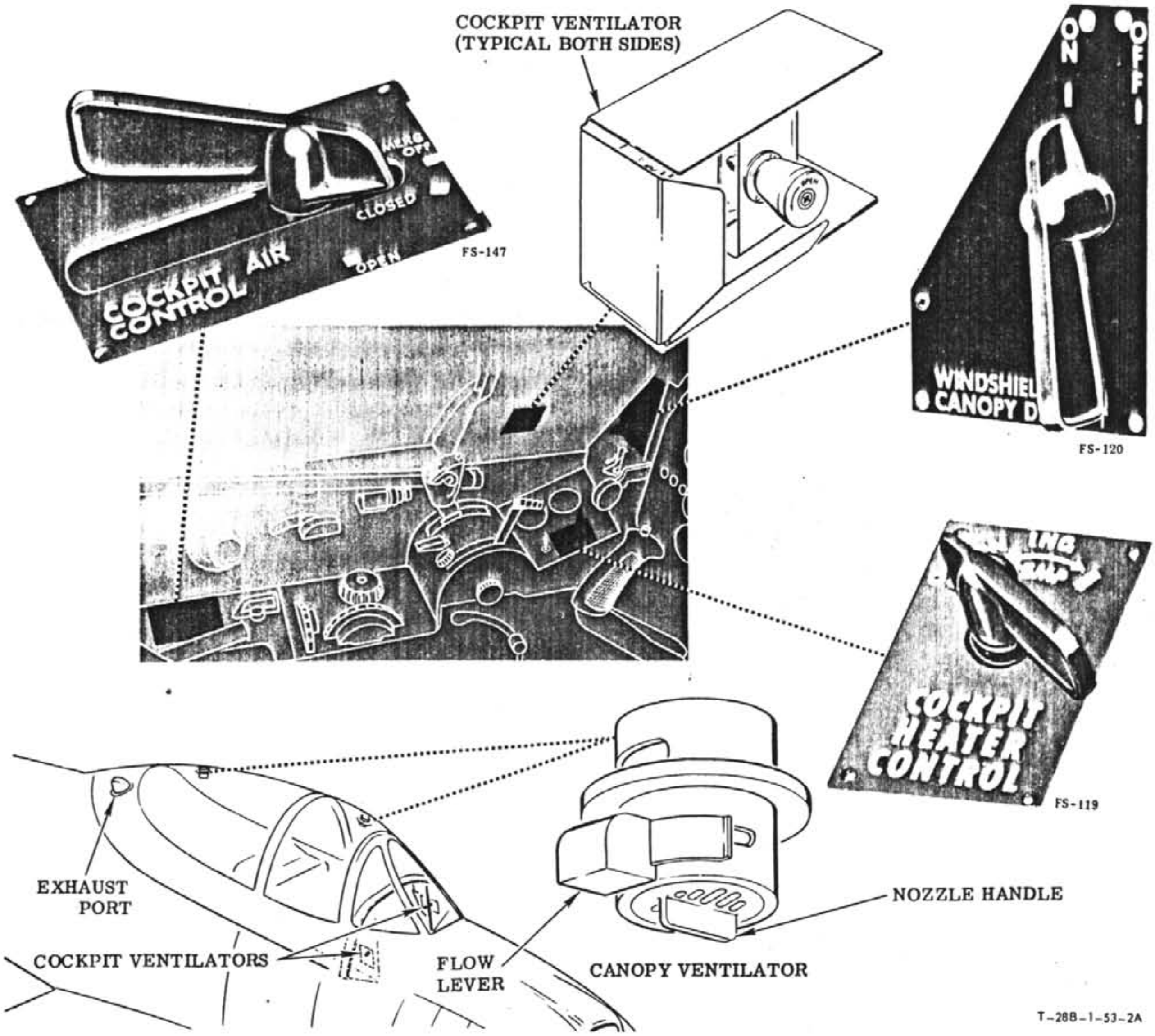


Figure 4-2

ON, open the canopy ventilator, and, on airplanes so equipped, open the cockpit ventilators.

2. To obtain cockpit heat, open cockpit air handle, and turn cockpit heater handle to ON. The heater will begin operation and will maintain the selected temperature. For ground operation of heater, maintain engine speed above approximately 1300 rpm, so that propeller will provide sufficient airflow for combustion. To increase heat, rotate cockpit heater handle toward INC. TEMP position.

NOTE To maintain adequate cockpit ventilation when the system is off, position cockpit air handle to approximately one-fourth open. Move the handle to EMERG. OFF only if the cockpit heater fails and cockpit temperature is too low for comfort.

ANTI-ICING AND DEFROSTING SYSTEMS.

There are no provisions for preventing or removing ice formation from the wing or empennage. An engine anti-icing system is provided to prevent or remove ice from the induction system. The pitot head can be electrically heated to prevent icing.

ENGINE ANTI-ICING SYSTEM.

Refer to "Carburetor Air Lever" in Section I.

PITOT HEATER.

The pitot-static head is equipped with a conventional resistance-type electrical heater to prevent ice formation within the unit. The system is powered by the primary (main) bus.

Pitot Heater Switch.

With the pitot heater switch (figure 1-7) at ON, power is supplied to the pitot heater. With the switch at OFF, the pitot heater is off.

Caution To prevent burning out the heater elements, the pitot heater switch should be at OFF when the airplane is on the ground, except for test purposes.

DEFROSTING SYSTEM.

Air for defrosting the windshield and canopy is obtained from the same source as cockpit heating and ventilating air. The cockpit air handle must be placed at OPEN to supply air to the defrosting system, and, if necessary, the cockpit heater handle can be placed at ON to heat the air. The defrosting system can be used with the cockpit heating and ventilating system, or heating and ventilating air outlets may be closed to direct most of the air to the defrosting system. There are no provisions for emergency operation of the defrosting system.

Windshield and Canopy Defrost Handle.

The windshield and canopy defrost handle (figure 4-2) is on the left instrument subpanel in the front cockpit only. Turning the windshield and canopy defrost handle to ON mechanically opens a shutoff valve and directs air (hot air if the cockpit heater handle is ON, cold air if the cockpit heater handle is at OFF) to outlets at each side of the windshield and canopy.

Operation of Defrosting System.

For windshield and canopy defrosting, turn windshield and canopy defrost handle to ON (with cockpit air handle at OPEN). If heated air is necessary for defrosting, turn cockpit heater handle to ON.

NOTE The cockpit heater control handle must be turned to ON to heat the air before descent to prevent frost or fog on the windshield or canopy.

COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT.

Because of the many configurations of the communication and associated electronic equipment that are used on T-28 Airplanes, no attempt is made to precisely define the airplane effectivity on this equipment. Each airplane must be checked to determine the exact radio equipment installed. Refer to the table of communication and associated electronic equipment in this section for general airplane effectivity.

TABLE OF COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT.

See figure 4-3.

RADIO CONTROL TRANSFER SYSTEM.

Intercockpit control of all radio equipment (except the AN/ARN-6 radio compass and AN/ARC-1 and AN/ARC-44 command radios) is obtained through switches on the radio transfer panel (17, figure 1-5; figure 4-3) in each cockpit. Control transfer is available in UHF command, VHF command (except as previously noted), VHF navigation (AN/ARN-14, gyrocompass on T-28B and T-28C Airplanes) and, on some T-28D Airplanes, NAVS (AN/ARN-21) and ILS (AN/ARN-31). Control is gained by holding the respective "CONTROL SHIFT" switch forward or aft (as necessary) until the indicator light to the left of the switch comes on. This indicates cockpit control of the respective radio. The switches are powered by the secondary (main) bus.

INTERCOMMUNICATION SET - AN/AIC-10.

The AN/AIC-10 intercommunication set enables the other pilot to select individually, or mix, command radio, radio compass, interphone, marker beacon, and range receiver signals. Controls are on the intercommunication control panel and, on some airplanes, * an AIC-10 subpanel. (See figure 4-3.) The system is powered by the primary (main) bus.

Intercommunication Controls.

MIXER SWITCHES. A set of switches on the interphone control panel and the AIC-10 subpanel control the mixed signal facility of the interphone system. When any switch or switches are moved forward (ON), the selected signal or signals can be monitored. When any of these switches are moved aft, the corresponding signal is cut out. Signal monitoring capabilities of the various configurations are as described in the following paragraphs.

On T-28D Airplanes Changed by T.O. 1T-28D-504 and 1T-28-511 and on T-28D-5 Group II Airplanes,

*Some T-28B Airplanes, T-28D Airplanes changed by T.O. 1T-28D-504, and T-28D-5 Airplanes the "INTER" switch permits interphone reception. The "UHF" switch permits reception of UHF command radio signals. The "VHF" switch permits reception of VHF command radio signals. The "ADF" switch permits reception of radio compass signals. When these airplanes are changed by T. O. 1T-28D-520, the ADF mixer switch is moved to an AIC-10 subpanel and an FM mixer switch is installed in its place, which permits reception of VHF FM command radio signals. The "MARKER" switch permits reception of marker beacon signals.

On T-28D Airplanes not changed by T. O. 1T-28D-504 and 1T-28-511, the "INTER" switch permits interphone reception. The "COMM" switch permits reception of command radio signals. The "MARKER" switch permits reception of marker beacon signals. The "ADF" switch permits reception of radio compass signals. The "VHF NAV" switch permits reception of VHF radio range signals.

On T-28D Airplanes without TACAN and on some T-28B Airplanes, the AN/AIC-10 subpanel has a "VHF NAV" switch and an "FM" switch. The "VHF NAV" switch permits reception of VHF radio range signals. The "FM" switch permits reception of VHF FM command radio signals.

On T-28D Airplanes with TACAN and on T-28D-5 Airplanes not changed by T. O. 1T-28D-520, the AN/AIC-10 subpanel has "FM," "LOCALIZER," and "TACAN" switches to permit reception of each of these signals.

On T-28D-5 Airplanes changed by T. O. 1T-28D-520, the AIC-10 subpanel has "ADF VOICE," "ADF RANGE," and "NAV & ILS" switches to permit reception of each of these signals.

On T-28B Airplanes changed by T. O. 1T-28-511, the "INTER" switch permits reception of VHF radio range signals. The "UHF" switch permits reception of UHF command radio signals. The "VHF" switch permits reception of VHF command radio signals. The "ADF" switch permits reception of VHF FM command radio signals. The "MARKER" switch permits reception of radio compass signals and marker beacon signals.

RADIO SELECTOR SWITCH - T-28D AIRPLANES CHANGED BY T. O. 1T-28D-504 AND 1T-28-511, T-28D-5 GROUP II AIRPLANES, AND T-28B AIRPLANES CHANGED BY T. O. 1T-28-511. This rotary switch has five positions: CALL, INTER, UHF, VHF, and FM. Placing the switch at CALL initiates interphone communications without the "CALL" button on the throttle being depressed. When both stations are operating at CALL, a telephone-type intercommunication results. With the switch at INTER, interphone communication is initiated by pressing either the "CALL" or the "MIKE" button on the throttle. The UHF, VHF, and FM positions select the respective command radio transmitter, and in addition, the audio output of the respective command radio receiver is heard, regardless of the position of the corresponding mixer switch. Transmission is initiated by depressing the "MIKE" button on the throttle.

RADIO SELECTOR SWITCH - T-28D AIRPLANES NOT CHANGED BY T. O. 1T-28D-504 AND 1T-28-511. This rotary switch has four positions: CALL, INTER, COMM-INTER, and COMM. Placing the switch at CALL initiates interphone communications without depressing the "INTER" button on the throttle. When both stations are operating at CALL, a telephone-type intercommunication results. With the switch at INTER, interphone communication is initiated by pressing either the "INTER" or the "MIKE" button on the throttle. With the switch at COMM-INTER, interphone communication is initiated by pressing the "INTER" button on the throttle, and in addition, command radio signals may be monitored. With the switch at COMM, command radio transmission and reception is selected. Transmission is initiated by pressing the "MIKE" button on the throttle. With the switch at COMM-INTER or COMM, the audio output of the command radio is heard regardless of mixer switch position.

AUXILIARY-NORMAL SWITCH. This switch should be at NORMAL, except when the interphone amplifier has failed. When this failure occurs, placing the switch at AUX LISTEN bypasses the interphone amplifier and permits communication on the interphone channel.

VOLUME CONTROL KNOB. This knob, when turned counterclockwise, reduces the volume of the selected signal. When turned clockwise, it increases the volume. With the knob at its mid-position, each radio set should be adjusted to approximately the same volume. Then, this knob can be used to compensate for changes in each radio set signal strength.

INTERPHONE BUTTON. When the "CALL" ("INTER") button on the throttle is pressed, interphone communication is initiated regardless of interphone control switch position.

Operation of AN/AIC-10 Interphone.

1. Place mixer switches as desired for reception.

2. Adjust volume on radio sets and make final adjustment with "VOL" knob.

3. To transmit on interphone, place radio selector switch at INTER and depress "CALL" button on throttle (or place radio selector switch at CALL).

4. To transmit on command radio, place radio selector switch at desired command radio position and depress "MIKE" button on throttle.

INTERCOMMUNICATION SET - NAA TYPE 60001-105.

The intercommunication set enables either pilot to select individually or to mix command radio, radio compass, interphone, marker beacon, and range receiver signals. The controls are on the interphone control panel (figure 4-3.) The system is powered by the dc secondary bus.

COMMUNICATION AND ASSOCIATED ELECTRONIC

TYPE	DESIGNATION	FUNCTION	RANGE	AIRPLANE
RADIO CONTROL TRANSFER SYSTEM		TRANSFER INTERCOCKPIT RADIO CONTROL		ALL T-28'S
INTERCOMMUNICATION SET	AN/AIC-10 (AIC-10 SUB-PANEL ALSO ON SOME T-28B AND T-28D AIRPLANES)	INTERSTATION COMMUNICATION AND RADIO SIGNAL AMPLIFICATION	NOT APPLICABLE	AT-28D'S AND SOME T-28B'S
INTERCOMMUNICATION SET	NAA TYPE 60001-105			T-28C'S AND SOME T-28B'S
INTERCOMMUNICATION SET	SIGNAL DISTRIBUTION			SOME T-28B'S
VHF COMMAND RADIO	AN/ARC-1	TWO-WAY VOICE COMMUNICATION	30 MILES AT 1000 FEET 135 MILES AT 10,000 FEET	SOME T-28B'S AND T-28C'S
VHF COMMAND RADIO	AN/ARC-3	TWO-WAY VOICE COMMUNICATION	30 MILES AT 1000 FEET 135 MILES AT 10,000 FEET	SOME AT-28D'S, T-28B'S AND T-28C'S
VHF COMMAND RADIO	WILCOX 807	TWO-WAY VOICE COMMUNICATION	30 MILES AT 1000 FEET 135 MILES AT 10,000 FEET	SOME AT-28D-5'S AND ALL AT-28D-10'S
UHF COMMAND RADIO	AN/ARC-27	TWO-WAY VOICE COMMUNICATION	30 MILES AT 1000 FEET 135 MILES AT 10,000 FEET	SOME AT-28D'S AND T-28B'S AND T-28C'S
VHF/FM COMMAND RADIO	AN/ARC-44	TWO-WAY VOICE COMMUNICATION	LINE OF SIGHT	SOME AT-28D'S AND T-28B'S
VHF/FM COMMAND RADIO	FM622A	TWO WAY VOICE COMMUNICATION AND HOMING	LINE OF SIGHT	SOME AT-28D-5'S AND GROUP A INSTL FOR SOME AT-28D-5'S AND ALL AT-28D-10'S
VHF/FM COMMAND RADIO	AN/ARC-54	TWO WAY VOICE COMMUNICATION AND HOMING	LINE OF SIGHT	SOME AT-28D-5'S

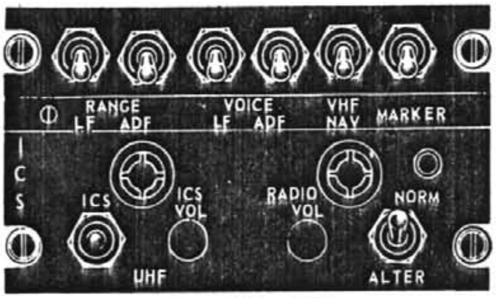
Figure 4-3 (Sheet 1 of 5)

EQUIPMENT

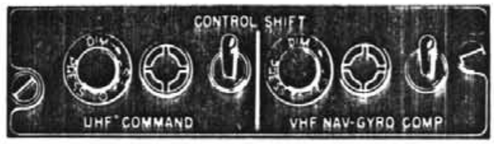
TYPE	DESIGNATION	FUNCTION	RANGE	AIRPLANE
SECURE SPEECH	—	CODE AND DECODE	RADIO TRANSMISSION	SOME AT-28D-5'S
HOMING	AN/ARA-31	RECEPTION OF VHF/FM COMMUNICATION HOMING AND DIRECTION FINDING	LINE OF SIGHT	SOME AT-28D'S AND SOME AT-28D-5'S
IDENTIFICATION RADAR	AN/APX-6	AUTOMATIC IDENTIFICATION	LINE OF SIGHT	AT-28D'S AND SOME T-28B'S
IDENTIFICATION RADAR	AN/APX-25	AUTOMATIC IDENTIFICATION	LINE OF SIGHT	SOME AT-28D-5'S
DIRECTION FINDER	AN/ARA-25	RECEPTION OF UHF COMMUNICATION; HOMING AND DIRECTION FINDING	30 MILES AT 1000 FEET 135 MILES AT 10, 000 FEET	T-28B'S T-28C'S, AND SOME AT-28D'S
RADIO COMPASS	AN/ARN-6	RECEPTION OF VOICE AND CODE COMMUNICATION; POSITION FINDING AND HOMING	20 TO 200 MILES	ALL T-28'S
MARKER BEACON	AN/ARN-12	RECEIVES MARKER SIGNALS	NOT APPLICABLE	ALL T-28'S
OMNI	AN/ARN-14	RECEIVES VOR SIGNALS	30 MILES AT 1000 FEET 135 MILES AT 10, 000 FEET	SOME AT-28D'S AND SOME T-28B'S
GLIDE SLOPE RECEIVER	AN/ARN-18	RECEPTION OF GLIDE SLOPE SIGNALS	30 MILES	SOME AT-28D'S AND SOME T-28B'S
TACAN	AN/ARN-21	DISPLAY AZIMUTH AND RANGE	LINE OF SIGHT UP TO 195 NAUTICAL MILES	AT-28D-5'S AND MODIFIED AT-28D'S
INSTRUMENT LANDING	AN/ARN-31	RECEPTION OF GLIDE SLOPE AND LOCALIZER SIGNALS	30 MILES	AT-28D-5'S AND MODIFIED AT-28D'S

28B-1-71-4B

Figure 4-3 (Sheet 2 of 5)



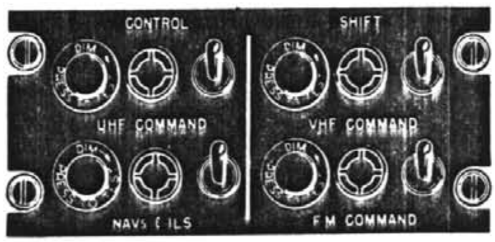
NAA 60001 - 105



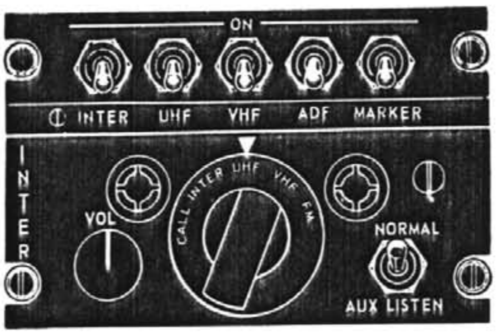
RADIO TRANSFER

RADIO TRANSFER

SIGNAL DISTRIBUTION



RADIO TRANSFER



AN/AIC-10
(TYPICAL)

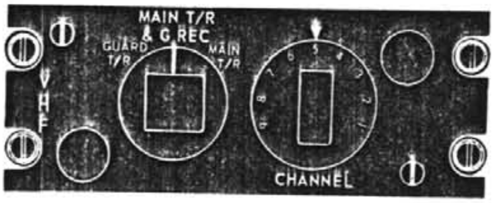
AIC-10 SUBPANEL

AIC-10 SUBPANEL

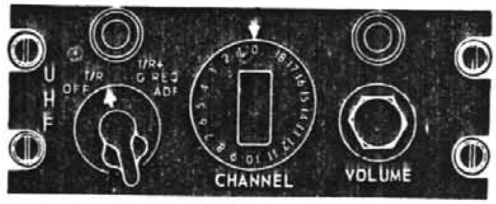
AIC-10 SUBPANEL

28B-1-71-1C

Figure 4-3 (Sheet 3 of 5)

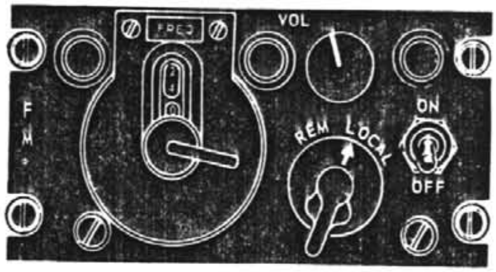


AN/ARC-1

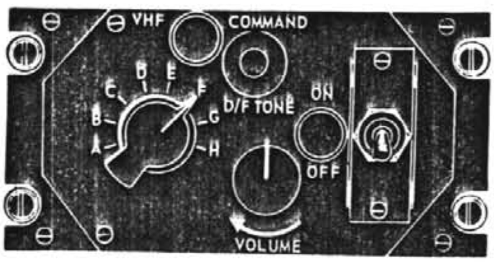


AN/ARC-27

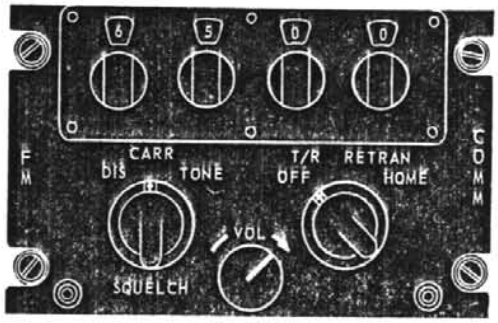
VHF CONTROL



AN/ARC-44



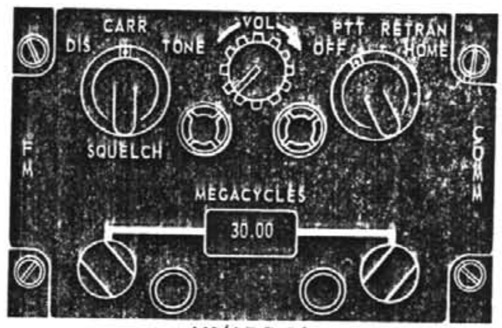
AN/ARC-3



FM622A

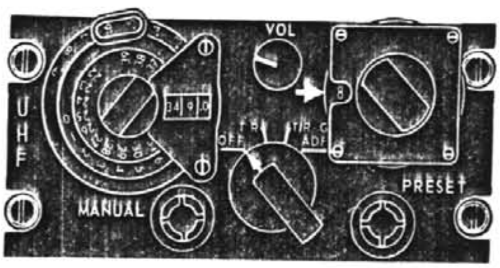
ADF AMPLIFIER SWITCH

VHF WILCOX 807

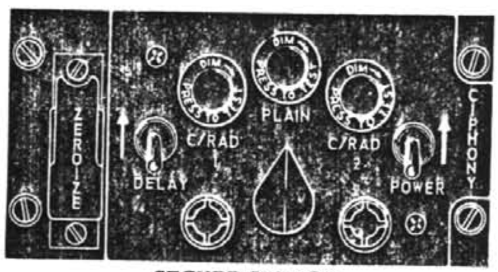


AN/ARC-54

FM SQUELCH SWITCH



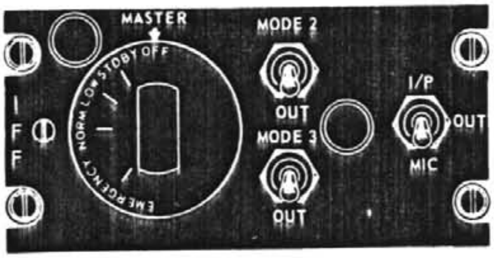
AN/ARC-27



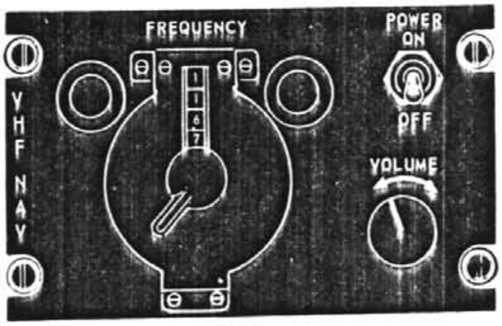
SECURE SPEECH

28B-1-71-3B

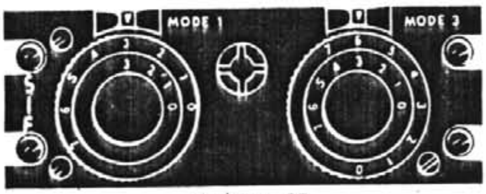
Figure 4-3 (Sheet 4 of 5)



AN/APX-6



AN/ARN-14



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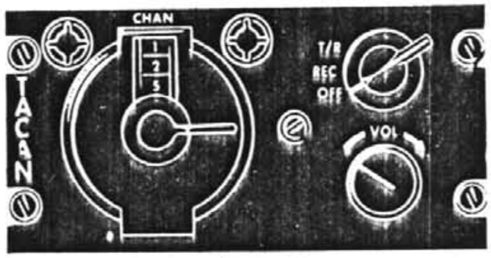

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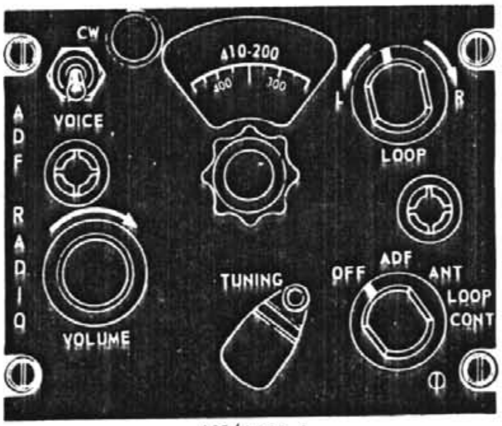
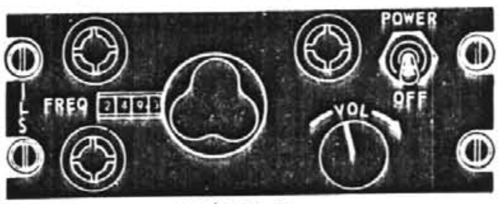
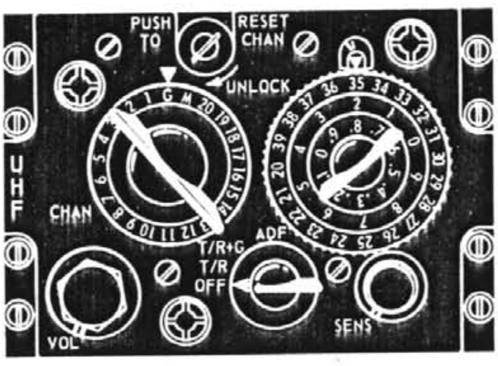


AN/ARN-6



AN/ARN-31

28B-1-71-5



AN/ARC-27

Figure 4-3 (Sheet 5 of 5)

Intercommunication Controls.

MIXER SWITCHES. Four switches control the mixed signal facility of the intercommunication system. They are on the forward section of the interphone panel and are labeled "RANGE ADF," "VOICE ADF," "VHF NAV," and "MARKER." The switches labeled "RANGE LF" and "VOICE LF" are inoperative. When any switch or switches are moved forward (ON), the selected signal or signals can be monitored. When any of these switches are moved aft, the respective signal is cut out. The "RANGE ADF" and "VOICE ADF" switches permit reception of radio compass range and voice signals, respectively. The "VHF NAV" switch permits reception of VHF radio range signals, and the "MARKER" switch permits reception of marker beacon signals.

RADIO SELECTOR SWITCH. The radio selector switch is a three-position toggle switch, spring-loaded to the center position. Holding the switch at ICS (or depressing the "CALL" button on the throttle) interrupts all command radio transmission and all incoming radio signals except for incoming signals on the command radio which are heard at a reduced level. Communication between the cockpits may then be initiated, regardless of switch position at the receiving station. When both stations are operating on ICS (or both are using the "CALL" button), a telephone-type intercommunication results. Holding the radio selector switch at UHF (or depressing the "MIKE" button on the throttle) permits command radio transmission. When the operator speaks into the microphone he will hear a side tone. The volume of this side tone cannot be adjusted by the operator. With the radio selector switch at the spring-loaded center position, simultaneous monitoring of signals may be accomplished by placing the associated mixer switches forward (ON).

"NORM-ALTER" SWITCH. For all normal operations, this switch should be at NORM. In the event of an amplifier failure, as indicated by loss of audio signal, place switch at ALTER. If all mixer switches are aft, the signal audible in the headset is that of the UHF command radio. If any mixer switch is forward (ON), the associated signal will also be heard. Volume control is ineffective when the switch is at ALTER.

"ICS VOL" KNOB. When the set is operated with the radio selector switch at ICS (or the "CALL" button depressed), the volume of the individual or combined signals of the intercommunication and command radio is controlled by the "ICS VOL" knob at the respective station. Clockwise rotation of the knob increases the volume; counterclockwise rotation decreases the volume.

"RADIO VOL" KNOB. When the set is operated with the radio selector switch at its spring-loaded center position, the volume of the individual or combined signals as selected by the mixer switches and command radio is controlled by the "RADIO VOL" knob at the respective station. Clockwise rotation of the knob increases the volume; counterclockwise rotation decreases the volume.

Operation of Intercommunication Set - NAA Type 60001-105.

1. Place "NORM-ALTER" switch at "NORM."

2. Place mixer switches as desired for reception.

3. Adjust volume on radio sets and make final adjustment with "RADIO VOL" knob on interphone panel.

4. To transmit on interphone, hold radio selector switch at ICS (or depress "CALL" button on throttle).

5. To transmit on command radio, hold radio selector switch at UHF (or depress "MIKE" button on throttle).

INTERCOMMUNICATION SET - SIGNAL DISTRIBUTION TYPE.

The intercommunication set system enables the pilot to select individually, or mix, command radio, radio compass and range receiver, interphone, and marker beacon signals. The controls are on the radio signal distribution panel. (See figure 4-3.) The system is powered by the dc secondary bus.

Intercommunication Controls.

MIXER SWITCHES. Five "RECEIVERS" switches, labeled "1," "2," "3," "MB," and "NAV," control the mixed signal facility of the intercommunication system. When any switch or switches are moved forward, the selected signal or signals can be monitored. When any of these switches are moved aft, the respective signal is cut out. The "1" switch permits reception of AN/ARC-44 VHF FM command radio signals. The "2" switch permits reception of AN/ARC-27 UHF command radio signals. The "3" switch permits reception of AN/ARC-1 VHF command radio signals. The "MB" switch permits reception of marker beacon signals and the "NAV" switch permits reception of radio compass or VHF range receiver signals.

RADIO SELECTOR SWITCH. This switch, labeled "TRANS," has four positions. The selected position appears in a window above the selector knob. When the switch is at INT, interphone communications may be initiated by depressing the "CALL" button on the throttle. When both stations are at INT and using the "CALL" button, a telephone-type intercommunication results. With the switch at INT and the hot-mike switch at ON, continuous intercommunication is available and the "CALL" button need not be depressed. The 1, 2, and 3 positions select command radio transmitters, and in addition, the audio output of the respective command radio receiver is heard, regardless of the position of the corresponding mixer switch. Transmission is initiated by depressing the "MIKE" button on the throttle. The command radio receiver-transmitters and corresponding selector switch positions are as follows:

Position 1 - AN/ARC-44
Position 2 - AN/ARC-27
Position 3 - AN/ARC-1

VOLUME CONTROL KNOB. The volume of the individual or combined signals, as selected by the mixer switches and radio selector switch (with the exception of radio compass signals), is controlled by the "VOL" knob. Clockwise rotation of the knob increases the volume; counterclockwise rotation decreases the volume.

HOT-MIKE SWITCH. This two-position switch permits continuous interphone communication without the "CALL" button on the throttle being depressed. With the radio selector switch at INT, placing the hot-mike switch at ON holds the interphone channel keyed continuously.

Operation of Intercommunication Set - Signal Distribution Type.

1. Place mixer switches as desired for reception.

2. Adjust volume on radio sets and make final adjustment with "VOL" knob.

3. To transmit on interphone, place radio selector switch at INT and depress "CALL" button on throttle (or place hot-mike switch at ON).

4. To transmit on command radio, place radio selector switch at desired command radio position and depress "MIKE" button on throttle.

VHF COMMAND RADIO - AN/ARC-1. *

The AN/ARC-1 command radio provides two-way voice communication within the frequency range of 100 to 156 megacycles on one preset channel. Transmitting and receiving on the radio are controlled by the signal distribution panel. (See figure 4-3.) Power to the radio is controlled by a "VHF" power switch. Volume control is accomplished by a volume control knob. The set is powered by the secondary bus.

Operation of VHF Command Radio - AN/ARC-1.

1. Place "VHF" power switch at ON.

2. To monitor command radio, place "3" mixer switch on signal distribution panel forward.

3. To transmit, place radio selector switch on signal distribution panel at position 3 and depress "MIKE" button on throttle.

VHF COMMAND RADIO - AN/ARC-1 - T-28C AIRPLANES.

The AN/ARC-1 command radio provides two-way voice communication within the frequency range of 100 to 156 megacycles on 10 preset channels. The controls are on the AN/ARC-1 control panel and VHF control panel. (See figure 4-3.) The set is powered by the secondary bus.

VHF Command Radio Controls - AN/ARC-1.

POWER SWITCH. This two-position switch, on the VHF control panel in both cockpits, is labeled "VHF." Moving the switch from OFF to ON turns on the AN/ARC-1 command radio.

CHANNEL SELECTOR SWITCH. This switch, on the AN/ARC-1 control panel in the front cockpit, is labeled "CHANNEL" and has numbered positions 1 through 9. Placing the switch at any one of the positions selects a preset frequency.

GUARD SELECTOR SWITCH. This three-position switch, on the AN/ARC-1 control panel in the front cockpit, selects the mode of command radio operation. Placing the switch at GUARD T/R permits transmission and reception on the guard frequency. Placing the switch at MAIN T/R & G REC permits transmission and reception on the frequency selected on the channel selector switch and, in addition, permits monitoring the guard frequency. With the switch at MAIN T/R, transmission and reception is on the frequency selected on the channel selector switch.

MICROPHONE SELECTOR SWITCH. This two-position switch, labeled "MIC SELECT," is on the VHF control panel in both cockpits. Placing the switch at VHF permits transmission on the AN/ARC-1 command radio. With the switch at UHF, transmission on the AN/ARC-27 command radio is selected.

VOLUME CONTROL KNOB. This rotary switch, labeled "VHF VOLUME," is on the VHF control panel, in both cockpits. Clockwise rotation of the knob increases the volume; counterclockwise rotation decreases the volume of the AN/ARC-1 command radio.

Operation of VHF Command Radio - AN/ARC-1.

1. Place VHF power switch at ON.

*T-28B Airplanes changed by T.O. 1T-28-511

2. Rotate guard selector switch to MAIN T/R & G REC. This allows monitoring of the guard frequency in addition to the selected frequency.

3. Place microphone selector switch at VHF.

4. Rotate channel selector switch to desired frequency channel and allow 30 to 45 seconds for set to warm up.

5. To initiate transmission on selected frequency, hold radio selector switch on interphone control panel at UHF (or depress "MIKE" button on throttle).

6. To transmit on guard frequency, place guard selector switch at GUARD T/R and hold radio selector switch on interphone control panel at UHF (or depress "MIKE" button on throttle).

7. To turn command radio off, place VHF power switch at OFF.

VHF COMMAND RADIO - AN/ARC-3.

The AN/ARC-3 VHF command radio provides two-way voice and code communication within a frequency range of 100 to 156 megacycles on eight preset channels. The radio is powered by the secondary (main) bus. The control panel (figure 4-3) has a volume control knob, a power switch with ON and OFF positions, a channel selector knob with positions A through H, and a DF tone button. The DF tone button permits transmission of code signals.

Operation of VHF Command Radio - AN/ARC-3.

1. Move power switch on command radio control panel to ON.

2. Move command radio control shift switch forward until control light comes on; then release switch.

3. Rotate channel selector knob to desired frequency channel, and allow 30 to 45 seconds for set to warm up.

4. Turn radio selector switch on interphone control panel to VHF. When the radio tone heard in the earphones stops, the radio is tuned and ready for operation.

5. Adjust volume control for desired output.

6. To transmit, depress "MIKE" button and speak into microphone; to restore reception, release microphone button.

7. To transmit code, use DF tone button. (Maximum keying speed is approximately 15 words per minute.)

8. Move power switch to OFF to turn off radio.

NOTE Do not turn off command radio immediately after moving channel selector knob, because the channel selector will not have time to complete its change cycle, and the set will be inoperative when turned on again. Should this occur, turn set on, run through the complete selection of frequencies by means of the channel selector knob, and then select desired frequency. Set will resume normal operation.

VHF COMMAND RADIO-WILCOX 807 – SOME AT-28D-5 AND ALL AT-28D-10 AIRPLANES

The Wilcox 807 VHF command radio provides two-way voice communications on 1360 separate frequencies in the range between 116 and 149.975 megacycles. The controls are on the VHF COMM panel. The set is powered by the main bus.

VHF Command Radio Controls.

POWER KNOB. The power knob is at the base of the megacycles select knob on the left side of the VHF COMM panel. Set power-on conditions are selected by moving the knurled knob clockwise until the associated white pointer moves from OFF to PWR.

VOLUME KNOB. The volume knob is at the base of the megacycle decimal select knob on the right side of the VHF COMM panel. Set audio volume is indicated by a white relative volume pointer which is geared to the volume knob.

FREQUENCY KNOBS. The frequency knobs are mounted on top of the concentric power and volume knobs. The left knob is used to select whole megacycles from 116 to 149; the right knob is used to select decimal values in increments of 0.0025 megacycle. Selected frequency is read directly on the VHF COMM panel.

"COMM TEST" BUTTON. The "COMM TEST" button allows audible test of receiver operation without transmission. With the set turned on and warmed up, depressing the button disables the receiver squelch circuits, allowing weak signals to be amplified. In the absence of signals, a background "hiss" indicates proper operation.

Operation of VHF Command Radio - Wilcox 807.

1. Rotate power knob to PWR position.

2. Select desired frequency.

3. Place "VHF" switch on AN/AIC-10 panel at ON.

4. Adjust volume as desired.

5. Position radio selector switch on AN/AIC-10 panel to VHF.

6. To transmit, depress "MIKE" button on throttle.

7. To turn off VHF COMM, rotate power knob to OFF.

UHF COMMAND RADIO - AN/ARC-27 - SOME T-28B AND T-28D AIRPLANES.

The AN/ARC-27 command radio provides two-way voice communication within a frequency range of 225.0 to 399.0 megacycles on 20 preset frequencies. The radio also has a guard frequency that can be monitored alone or with another selected frequency. In addition, manual selection of frequencies may be obtained without disturbing any of the preset frequencies. The control panel (figure 4-3) has four controls: a power switch, a preset channel selector, a manual frequency selector, and an audio volume control. The radio is powered by the main (secondary) bus.

UHF Command Radio Controls.

POWER SWITCH. This rotary switch has four positions, OFF, T/R, T/R + G, and ADF. The ADF position is inoperative*. The radio is turned on when the power switch is moved from OFF to T/R or T/R + G. When the switch is at T/R, the radio operates on the frequency selected on the channel selector switch. With the switch at T/R + G, the radio operates on the selected frequency in addition to the guard frequency.

PRESET CHANNEL SELECTOR SWITCH. This rotary switch, labeled "PRESET," has numbered positions 1 through 20, a G position, and an M position. The selected position appears in a notch to the left of the switch. Placing the switch at any one of the numbered positions, selects one of the 20 preset frequencies. The G position allows reception on the guard frequency only, and the M position places the manual frequency selector in control.

MANUAL FREQUENCY SELECTOR SWITCH. This rotary switch, labeled "MANUAL," has three concentric knobs that allow manual adjustment to any one of 1750 channels in the frequency range of 225.0 to 339.0 megacycles. The inner knob is a 10-megacycle selector, the center knob a one-megacycle selector, and the outer knob a 0.1-megacycle selector. The selected channel appears in a window that covers a portion of the knob. The preset channel selector switch must be at M when the manual frequency selector is used.

Caution Do not select frequencies below 225 megacycles because of possible damage to the equipment.

VOLUME CONTROL KNOB. This knob, labeled "VOL," controls the audio volume of the radio. Clockwise rotation of the knob increases the volume; counterclockwise rotation decreases the volume.

UHF COMMAND RADIO - AN/ARC-27 - T-28C AIRPLANES AND SOME T-28B AIRPLANES.

The AN/ARC-27 command radio provides two-way voice communications within a frequency range of 225.0 to 399.0 megacycles on 18 preset frequencies. The radio also has a guard frequency that can be monitored alone or with another selected frequency. The control panel (figure 4-3) has three controls, a power switch, a preset channel selector, and an audio volume control. The radio is powered by the secondary bus.

UHF Command Radio Controls.

POWER SWITCH. This rotary switch has four positions, OFF, T/R, T/R + G REC., and ADF. The radio is turned on when the power switch is moved from OFF to any one of the other three positions. When the switch is at T/R, the radio operates on the frequency selected on the channel selector. With the switch at T/R + G REC., the radio operates on the selected frequency in addition to monitoring the guard frequency. Placing the switch at ADF turns on the AN/ARA-25 direction finder.

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*Some airplanes

PRESET CHANNEL SELECTOR SWITCH. This rotary switch, labeled "CHANNEL," has numbered positions 1 through 18, and a G position. Placing the switch at any one of the numbered positions selects one of the 18 preset frequencies. The G position allows reception on the guard frequency only.

VOLUME CONTROL KNOB. This knob, labeled "VOLUME," controls the audio volume of the radio. Clockwise rotation of the knob increases the volume; counterclockwise rotation decreases the volume.

Operation of UHF Command Radio - AN/ARC-27.

1. Move power switch from OFF to T/R. Allow at least one minute for warm-up.

2. Move UHF command radio control shift switch and check that control light comes on.

Caution Before command radio control is shifted, make sure command radio power switch in each cockpit is moved from OFF.

3. Move power switch to T/R + G (T/R + G REC). This allows monitoring of an added independent receiver preset to a frequency that is guarded continuously throughout scheduled periods.

4. Move radio selector switch (or microphone selector switch) to UHF (position 2 on signal distribution panel).

5. Move preset channel selector to desired preset frequency. Reception and transmission will be on the selected frequency.

6. On airplanes with a manual frequency selector, if manual frequency selection is desired, place preset channel selector at M and rotate manual frequency selector knobs as required.

7. Adjust side tone with command radio volume control knob and then adjust command radio receiver volume with volume control on interphone control panel.

8. To transmit, depress "MIKE" button on throttle and speak into microphone, to receive, release microphone button.

9. To operate with separate guard receiver off, move power switch to T/R. For operation of both receivers, move power switch to T/R + G (T/R + G REC). To transmit on guard frequency, move power switch to T/R and preset channel selector to G.

10. To turn on AN/ARA-25 direction finder, place power switch at ADF.

11. To turn command radio off, place power switch at OFF.

VHF FM COMMAND RADIO - FM 622A OR AN/ARC-54 - AIRPLANES CHANGED BY T.O. 1T-28D-519 AND 1T-28D-520.

Either an FM 622A or an AN/ARC-54 VHF command radio may be installed. Both radio sets provide frequency-modulated two-way voice communication between airplanes in flight and between airplanes and ground stations, and homing capabilities on any of the remotely controlled channels. The FM 622A radio operates in the frequency range of 30.00 to 79.95 megacycles on any of the 920 discrete channels spaced at 50 kilocycles throughout the frequency range. The AN/ARC-54 radio operates throughout the frequency range of 30.00 to 69.95 megacycles on any one of 800 discrete channels spaced at 50 kilocycles. Included on either "FM COMM" panel (figure 4-3) are a mode switch, a squelch switch, a volume control knob, frequency selector knobs, and a four-digit frequency indicator. Normal operation or decoding and coding of voice communications is controlled through the secure speech control panel. (Refer to "Secure Speech System - Airplanes Changed by T.O. 1T-28D-520," in this section.) For proper operation of the respective command radio, a two-position switch labeled "VHF FM COMM SELECT SW," adjacent to the receiver-transmitter, must be positioned at FM 622A or ARC-54. System power is received from the main bus.

VHF FM Command Radio Controls and Indicator.

MODE SWITCH. The four-position rotary mode switch is used to apply power to the radio set and to select the mode of operation. In the OFF position, main bus power is removed from the receiver-transmitter. In the T/R (PTT) position, normal transmission and reception may be accomplished. The RETRAN (retransmission) position is inoperative. In the HOME (homing) position, the radio set operates as a homing facility, with homing information being displayed on the course indicator when the course indicator system select switch is at FM HOMING. For operation of the course indicator in this mode, refer to "Course Indicator" in this section.

SQUELCH SWITCH. The three-position rotary squelch switch is used to select the desired squelch mode. In the DIS (disable) position, all FM signals within the frequency band will be received regardless of the signal strength or the presence or absence of tone modulation, In the CARR (carrier) position, only signals of sufficient signal strength as determined by the setting of the squelch adjust on the receiver-transmitter will be received. In the TONE position, only signals modulated by a 150 cps tone will be received.

VOLUME CONTROL KNOB. The volume control knob, labeled "VOL," controls the audio level of the radio. Clockwise rotation of the knob increases the volume; counterclockwise rotation decreases the volume.

FREQUENCY SELECTOR KNOBS. On the FM 622A radio set, four frequency selector knobs permit selection of any one of the 920 available channels. Viewing from left to right, the first knob is used to select the tens-megacycle digit, the second knob is used to select the units-megacycle digit, the third knob is used to select the tenths-megacycle digit, and the fourth knob is used to select the hundredths-megacycle digit of the operating frequency.

On the AN/ARC-54 radio set, two frequency selector knobs permit selection of any one of the 800 available channels. The left-hand knob is used to select whole megacycle frequencies from 30 to 69 mc in one mc steps, and the right-hand knob is used to select the decimal megacycle frequencies from 0. 00 to 0. 95 mc in 0. 05 mc steps.

FREQUENCY INDICATOR. The frequency indicator displays the frequency to which the radio set is tuned.

Operation of VHF FM Command Radio FM 622A (AN/ARC-54).

1. Move FM mixer switch forward (ON).

2. Move radio selector switch to FM.

For two-way voice communication:

1. Move mode switch from OFF to T/R (PTT).

2. Move FM command radio control shift switch and hold until control light comes on; then release switch.

3. Adjust frequency selector knobs for desired operating frequency.

NOTE A changing tone should be heard in the headset while the radio set is tuning. When the tone stops, the radio set is tuned.

4. Set squelch switch at CARR. Allow 20 seconds for FM 622A radio set to warm up and allow 3 minutes for AN/ARC-54 radio set to warm up.

5. To transmit, depress "MIKE" button on throttle and speak into microphone. Note that side tone is heard in headset; adjust VOL control for comfortable volume.

For homing operation:

1. Move mode switch to HOME.

2. Move FM command radio control shift switch and hold until control light comes on; then release switch.

3. Adjust frequency selector knobs for the frequency of desired homing station. Allow 20 seconds for FM 622A radio set to warm up and allow 3 minutes for AN/ARC-54 radio set to warm up.

4. Move course indicator system selector switch to FM HOMING.

5. Squelch switch may be set at CARR or TONE; however, carrier squelch is automatically selected by an internal contact arrangement on the HOME position. Operation is possible in the DIS position; however, the course indicator flags will be inoperative.

6. Observe course indicator. If sufficient signal strength is indicated (off flags out of view), use course deviation indicator (vertical needle) for course information and use glide slope indicator (horizontal needle) for relative signal strength information. (Refer to "Course Indicator" in this section.)

SECURE SPEECH SYSTEM—AIRPLANES CHANGED BY T.O. 1T-28D-520.

The secure speech system permits either normal operation or decoding and coding of voice communications through the FM 622A (AN/ARC-54) or AN/ARC-27 command radio. On these airplanes, the AN/ARC-27 receiver-transmitter has been modified to make the AN/ARC-27 command radio compatible with the secure speech system. The decoding and coding capability prevents interception of messages when required. The system is powered by the main bus.

Secure Speech System Controls and Indicators.

POWER SWITCH. When the power switch (figure 4-3) is moved forward (ON), power is applied to the secure speech system. The FM 622A (AN/ARC-54) or AN/ARC-27 command radio can be operated in the normal manner with the power switch at aft (OFF).

FUNCTION SWITCH. This switch (figure 4-3) controls decoding and coding of FM 622A (AN/ARC-54) or AN/ARC-27 command radio voice reception and transmission. With the switch at PLAIN, normal operation of either command radio is available, and only uncoded reception and transmission is possible. With the switch at C/RAD 1, the system decodes incoming voice communications, and codes outgoing voice communications through the FM 622A (AN/ARC-54) command radio. With the switch at C/RAD 2, the system decodes incoming voice communications and outgoing voice communications through the AN/ARC-27 command radio.

FUNCTION INDICATOR LIGHTS. Three dimmable, press-to-test type lights (figure 4-3) indicate the position selected by the function switch. With power applied to the system, the left (green) light comes on when the C/RAD 1 position of the function switch is selected; the middle (amber) light comes on when the PLAIN position of the function switch is selected; the right (green) light comes on when the C/RAD 2 position of the function switch is selected.

ZEROIZE SWITCH. The zeroize switch (figure 4-3) is guarded in the normal, aft (OFF) position. If it becomes necessary to bail out, the guard should be raised and the switch held momentarily at the forward (ON) position. This zeros out the ground set codes in the secure speech system.

DELAY SWITCH. This switch (figure 4-3) has no function in these airplanes. The switch should always be aft (OFF), regardless of the position of the function switch.

Operation of Secure Speech System.

1. Turn on command radio. [Refer to "Operation of VHF FM Command Radio - FM 622A (AN/ARC-54)" or "Operation of UHF Command Radio - AN/ARC-27."]

2. Move power switch forward (ON).

3. Turn function switch to PLAIN and establish communications through normal transmission procedures where possible.

4. Turn function switch to C/RAD 1 or C/RAD 2 and listen for a steady unbroken tone in the headphones for approximately 2 seconds, followed by a double-pitched broken tone. If a prolonged steady tone is heard, it indicates an improper code setting or equipment malfunction, and the function switch should turned to PLAIN and the power switch should be moved aft (OFF).

5. Press and hold "MIKE" button on throttle for several seconds; then release. The double-pitched broken tone should stop, and no further sound will be heard in the headphones. If the broken tone continues, press "MIKE" button again and hold for several seconds. If the broken tone continues after three such attempts to clear it, move function switch to PLAIN and power switch aft (OFF).

6. Press and hold "MIKE" button. Wait 1/2 to 2 seconds for a single beep tone in the headphones. If beep tone is not heard, press "MIKE" button again and wait 1/2 to 2 seconds. If beep tone still is not heard, move power switch aft (OFF) and then forward (ON), and repeat steps 5 and 6. If this fails to produce the beep tone, turn function switch to PLAIN and position power switch aft (OFF).

7. When beep tone is heard, begin transmission.

VHF FM COMMAND RADIO - AN/ARC-44.*

The AN/ARC-44 command radio provides frequency-modulated (FM) two-way voice communication within a frequency range of 24.0 to 51.9 megacycles. The control panel (figure 4-3) has four controls: a power switch, a remote-local switch, a frequency selector switch, and an audio volume control. The set is powered by the dc main bus (dc secondary bus).

*T-28D and T-28B Airplanes changed by T.O. 1T-28-511, T-28B Airplanes changed by T.O. 1T-28-529, and T-28D-5 Group II Airplanes not changed by T.O. 1T-28D-519

VHF FM Command Radio Controls.

POWER SWITCH. Moving this two-position switch from OFF to ON applies power to the receiver-transmitter. The power switches (in each cockpit) are in parallel, allowing the set to be turned on from either cockpit. Therefore, both switches must be at OFF to turn the set off.

REMOTE-LOCAL SWITCH. This two-position rotary switch provides a means of transferring control of the radio between cockpits. Moving the switch to LOCAL and placing the power switch at ON assumes control of the radio at that station, and the remote-local switch at the other station is automatically positioned at REM. Control of the radio by the latter station is accomplished by placing its power switch at ON and moving the remote-local switch to LOCAL. Control of the radio is transferred and the remote-local switch at the first station is automatically positioned at REM. Either station may transmit and receive regardless of the position of its remote-local switch. However, frequency selection and volume control is not available at the station with the remote-local switch at REM.

NOTE The radio may not function properly if the remote-local switch is manually placed at REM. If the switch is inadvertently moved to this position, normal operation may be restored by returning the switch to LOCAL.

FREQUENCY SELECTOR SWITCH. This rotary switch, labeled "FREQ," has a large circular knob and a small handle that allows manual selection of 280 channels within a frequency range of 24.0 to 51.9 megacycles. The large circular knob is a whole-megacycle selector and the small handle a 0.1-megacycle selector. The selected channel appears in a window that covers a portion of the switch. Frequency selection is not available when the remote-local switch at that station is at REM.

VOLUME CONTROL KNOB. This knob, labeled "VOL," controls the audio volume of the radio. Clockwise rotation of the knob increases the volume; counterclockwise rotation decreases the volume. Volume control is not available when the remote-local switch at that station is at REM.

Operation of VHF FM Command Radio - AN/ARC-44.

1. Place remote-local switch at LOCAL and power switch at ON.

2. Rotate frequency selector to desired frequency and allow approximately 2 minutes for set to warm up.

3. Place applicable mixer switch up (ON) and adjust volume.

4. Move radio selector switch on interphone panel to FM (or position 1 on signal distribution panel).

5. To transmit, depress "MIKE" button on throttle.

6. To turn radio off, place power switch at OFF.

FM HOMING SYSTEM – AN/ARA-31 – SOME AT-28D-5 AIRPLANES AND ALL AT-28D-10 AIRPLANES

The AN/ARA-31 FM homing system operates with the AN/ARC-44 VHF FM set to provide aural signal direction finding and homing capability. The system consists of a keyer, two impedance matching networks, and four antenna elements. Two antenna elements and one impedance matching network make one homing antenna. An antenna is installed on the leading edge of each horizontal stabilizer and is connected to the keyer unit. The keyer applies a coded D to signals incoming from the left and a coded U to signals incoming from the right. When these signals are of equal intensity, the D and U blend into a steady 400-cycle tone which indicates the aircraft is headed directly toward or away from the station. The output of the keyer is connected to the AN/ARC-44 receiver through the "FM HOME" switch. Cockpit control, power, and frequency control for FM homing are selected through the AN/ARC-44 VHF FM control panel. "FM HOME" and "FM SQUELCH" switches are installed on the right console in the front cockpit for use in controlling the AN/ARA-31 system.

FM Homing System Controls.

"FM HOME" SWITCH. The "FM HOME" switch, when placed in the operating (outboard) position, energizes the homing circuits in the AN/ARC-44 FM set, disconnects the FM set from the communications antenna, and connects the homing antennas through the keyer unit, disabling the microphone circuits.

"FM SQUELCH" SWITCH. The "FM SQUELCH" switch, when placed in the operating (outboard) position, activates the squelch circuits in the AN/ARC-44 FM set. With the switch inboard, the squelch circuits are deactivated, and weak signals are amplified equally with strong or near signals.

Operation of FM Homing - AN/ARA-31.

1. Turn on AN/ARC-44 command radio set. (Refer to "Operation of VHF FM Command Radio - AN/ARC-44" in this section.)

2. Position "FM HOME" switch outboard.

3. Rotate FM command radio frequency selectors to desired station frequency. A coded D(-..), U(..-), or a steady 400 cps on-course tone should be heard.

NOTE Commence homing run at altitude at least 7500 feet above the terrain at not more than 35 miles from the ground station. Best results are obtained by making a descending run in the station.

4. If D(-..) is heard, turn left until a U(..-) is heard; then turn right until a steady tone is heard. The airplane is now headed toward the transmitting station.

5. If U(..-) is heard, turn right until a D(-..) is heard; then turn left until a steady tone is heard. The airplane is now headed toward the transmitting station.

6. If a steady tone is heard immediately, determine whether airplane is headed toward or away from station. Turn left or right until D(-..) or U(..-) is heard. If a right turn causes a D to be heard, or a left turn causes a U to be heard, the airplane was heading toward the station. Return to on-course (steady-tone) signal to head toward station. If a right turn causes a U to be heard, or a left turn causes a D to be heard, the airplane was headed away from the station. Return airplane to its original position (steady tone) and accomplish a 180-degree turn to head airplane toward station.

NOTE Depending on topographical and atmospheric conditions, a general steady tone may be heard at all headings relative to the transmitting station. Should this occur, changing frequencies (ground station and airplane) may result in proper operation.

Antijamming Procedure.

When it becomes apparent that the frequency tuned on the AN/ARC-44 FM set is being jammed, attempt the following procedure:

1. Externally squelch set by moving "FM SQUELCH" switch outboard.

2. Detune set slightly on either side of homing transmitter frequency (±0.5 megacycle). This may reduce the jamming to permit signal reception.

3. Vary set volume. The jamming signal may be overcome with volume extremely high or low.

4. If possible, communicate with transmitting station. Move "FM HOME" switch inboard and request that transmitter frequency be changed.

IDENTIFICATION RADAR - AN/APX-6.

The AN/APX-6 identification radar (IFF) is used to identify automatically the airplane in which it is installed when it is properly challenged by suitably equipped air or surface forces. The set also has provisions for identifying the airplane in which it is installed as a specific friendly airplane within a group of other airplanes. It has means of transmitting a special distress code when challenged. This set receives challenges and transmits replies to the source of the challenges. These replies are displayed, together with the associated radar targets, on the radar indicators of the challengers. When a radar target is accompanied by a proper reply from the IFF set, the target is considered friendly. Controls for the set are on the C-1158/APX IFF control panel. (See figure 4-3.) These controls consist of a rotary-type master switch, two mode switches, and an "I/P-MIC" switch. The master switch has five positions: EMERGENCY, NORM, LOW, STDBY, and OFF. The upper mode switch has two positions: MODE 2 and OUT. The "I/P-MIC" switch has three positions: I/P, OUT, and MIC. On some airplanes,* the "I/P-MIC" switch is inoperative. The system is powered by the ac bus and controlled by the main (primary) bus.

Operation of Identification Radar - AN/APX-6.

IFF replies are specific to the limit of replying to any of three modes of interrogation. Mode 1 operation is established when the master switch is at either LOW or NORM and both mode switches and the "I/P-MIC" switches are at OUT. In the LOW position, the sensitivity of the receiver is reduced and it replies only to strong interrogation from nearby equipment. Full sensitivity is established with the master switch at NORM. Mode and "I/P-MIC" switch positions for replying to the possible modes of interrogation are as follows:

SWITCH	POSITION	MODE
All	OUT	1
Upper mode Lower mode "I/P-MIC"	MODE 2 OUT OUT	1 and 2
Lower mode Upper mode "I/P-MIC"	MODE 3 OUT OUT	1 and 3
Upper mode Lower mode "I/P-MIC"	MODE 2 MODE 3 OUT	1, 2, and 3

*Airplanes changed by T.O. 1T-28B-508

The "I/P-MIC" switch allows ground control to single out, by radio request for identification, an individual airplane from a high air traffic density. Operation on I/P can be established by moving the "I/P-MIC" switch to I/P (identification position), or by moving the switch to MIC and depressing the microphone button on the throttle. (The command radio must be on.) The I/P reply appears as a mode 2 reply and is transmitted in response to each mode 1 interrogation. Perform the following steps for operation of the AN/APX-6 system:

1. Rotate IFF master switch to STDBY for a 3-minute warm-up period.

2. Rotate master switch to NORM, for full sensitivity and maximum performance.

NOTE The LOW position (partial sensitivity) of the master switch should not be used except on proper authorization.

3. Set mode switches and "I/P-MIC" switches at OUT, unless otherwise directed.

4. For emergency operation, press dial stop and rotate master switch to EMERGENCY, so that set will automatically transmit distress signals when challenged.

5. To turn equipment off, rotate IFF master switch to OFF.

IDENTIFICATION RADAR – AN/APX-25-AT 28D-5 GROUP II AIRPLANES.

The AN/APX-25 IFF-SIF system is formed when a coder and a control panel, labeled "SIF" (selected identification feature), are added to the basic AN/APX-6 system. The SIF system has more comprehensive identification capability than does the IFF system. It is through the improvement of the replying code that the AN/APX-25 provides a more rapid and absolute identification of the airplane. However, with the exception of the reply coding, their operation is similar. The SIF control panel is on the right console adjacent to the IFF control panel in the front cockpit. The SIF control panel has two coder dials, marked "MODE 1" and "MODE 3." These dials are rotated to set in the desired reply code for the respective IFF mode of operation as selected on the IFF control panel. The SIF system operates only when the unit "NORM-MOD" switch (on the transponder unit) is at MOD. The IFF-SIF system is powered by the main bus.

Operation of Identification Radar - AN/APX-25.

NOTE The IFF frequency counters must be set to the proper frequency channels, and the transponder switch must be at MOD.

1. Rotate IFF master switch to STDBY for a 3-minute warm-up period.

2. Rotate IFF master switch to NORM for full sensitivity and maximum performance.

NOTE The LOW position of the master switch should not be used except on proper authorization.

3. Set IFF mode switches as required and "I/P-MIC" switch at OUT, unless otherwise directed.

4. Set SIF coder dials as required.

5. For emergency operation, press dial stop, rotate IFF master switch to EMERGENCY, move lower mode switch to MODE 3, and set MODE 3 coder dial as briefed.

6. To turn equipment off, rotate IFF master switch to OFF.

DIRECTION FINDER - AN/ARA-25.

The direction finder AN/ARA-25 indicates relative bearing, or homes on radio signals received by the AN/ARC-27 command radio. The AN/ARA-25 and AN/ARC-27 combine to form a UHF automatic radio compass. Direction finding information is displayed on the No. 1 pointer of the radio magnetic indicator. Some AT-28D-5 and all AT-28D-10 Airplanes have a preamplifier and an "ADF AMPLIFIER" switch that allow effective ADF operation with weak signals.

ADF Amplifier Switch - Some AT-28D-5 and All AT-28D-10 Airplanes

The "ADF AMPLIFIER" switch (2, figure 1-5), on the forward end of the right console, has LONG RANGE and SHORT RANGE positions. The LONG RANGE position turns on a preamplifier in the AN/ARA-25 direction finder system, allowing use of station signals that are too weak for effective homing in the SHORT RANGE position. As a station is approached, the SHORT RANGE position should be reselected, effectively reducing signal amplification and narrowing ADF heading display error.

Compass Annunciator Light - T-28B and T-28C Airplanes.

When controls are properly positioned for the direction finding operation, a compass annunciator light (10, figure 1-3) at the top of the instrument panel in each cockpit comes on to read "ARA-25."

Operation of Direction Finder - AN/ARA-25.

1. Operate command radio control shift switch and note that light comes on.

NOTE When the command control shift light comes on, it indicates control has been obtained, but it does not indicate that the command set is on.

2. On AN/ARC-27 command radio panel, set power switch at ADF position. On T-28B and T-28C Airplanes, note that compass annunciator light indicates "ARA-25."

3. Set reception frequency with channel selector knob.

4. If received signal is too weak for effective homing, move "ADF AMPLIFIER" switch (if installed) to LONG RANGE.

5. To home on incoming signal, turn airplane until arrow end of No. 1 pointer is under lubber line of radio magnetic indicator. Fly airplane to keep pointer at lubber line.

6. For direction finding, observe direction of signal arrival (relative bearing of source) as indicated on azimuth scale under arrow of No. 1 pointer of radio magnetic indicator.

NOTE Command radio transmission during ADF operation is available when the "MIKE" button on the throttle is depressed. It is not necessary to move the AN/ARC-27 command radio power switch from the ADF position.

RADIO COMPASS - AN/ARN-6.

The radio compass system is a navigational aid that drives the No. 1 pointer on the radio magnetic indicator to provide a visual indication for homing and position-finding operations. The controls are on the radio compass control panel. (See figure 4-3.) On T-28B and T-28C Airplanes, when the controls are properly positioned for radio compass system operation, a compass annunciator light at the top of the instrument panel comes on to read "ARN-6."

Operation of Radio Compass.

1. Momentarily turn function selector switch to CONT; then return it to ANT. The initial movement of the switch to CONT is necessary to ensure control of the radio compass band selection in the desired cockpit. On T-28B and T-28C Airplanes, a compass annunciator at the top of the instrument panels indicates "ARN-6" when the system is turned on.

2. Refer to Instrument Flying, AF Manual 51-37, for operating procedures.

NOTE Precipitation, static, or corona discharge can prevent satisfactory receiving. During these conditions, the best reception can be obtained with the function switch at LOOP.

RADIO MAGNETIC INDICATOR.

The radio magnetic indicator (6, figure 1-2; 9, figure 1-3), on each instrument panel, is a dual-pointer instrument that receives heading information from the compass system. This results in the operation of a rotating compass card, providing a magnetic heading displayed against a fixed reference marker at the 12 o'clock position on the dial. Signals from the radio compass receiver and from the omnidirectional or TACAN receiver are fed into the instrument to drive a set of pointers; this provides radio bearing information that is read directly from the instrument as magnetic bearing to the station. The single-barred, No. 1 pointer is driven by the radio compass or UHF ADF receiver. With ADF selected, No. 1 pointer indicates ARA-25 UHF bearing. The double-barred, No. 2 pointer is driven by the omnidirectional or TACAN receiver. The radio magnetic indicator is powered by the ac bus.

"POINTER 1" Compass Annunciator Light - T-28B and T-28C Airplanes.

The mode of operation (direction finding or radio compass) of the No. 1 pointer of the radio magnetic indicator is displayed on the "POINTER 1" compass annunciator light (10, figure 1-3) at the top of the front instrument panel. The light comes on to read "ARA-25" when the AN/ARA-25 direction finder is in operation or "ARN-6" when the AN/ARN-6 radio compass system is in operation. The light is powered by the secondary bus.

COURSE INDICATOR.

Signals from the glide slope, localizer, omnidirectional, TACAN, or FM 622A (AN/ARC-54) command radio receiver are directed into the course indicator (4, figure 1-2; 14, figure 1-3) on each instrument panel. A small heading pointer shows angular difference between the airplane heading and the selected course up to 45 degrees left or right with reference to a selected radial, both "to" and "from" the selected station. A course deviation indicator (vertical pointer) provides a visual indication of the airplane heading relative to the homing station in the FM 622A (AN/ARC-54) command radio and shows positional deviation of the airplane from a selected radial, up to a maximum deflection of about 10 degrees either side of center in the TACAN system, and about 2 - 1/2 degrees either side of center in the localizer or omnidirectional system. A glide slope indicator (horizontal pointer) is operated by the glide slope receiver for descent guidance during ILS operations or by the FM 622A (AN/ARC-54) command radio receiver to provide a visual indication of relative homing signal strength. Relative signal strength is indicated by the horizontal pointer rising as signal strength increases. When over the station, the pointer will be centered in the indicator and will swing down as the station is passed. A "SET" knob on the lower left corner of the instrument is used to select a desired radial, the magnetic value of which appears in a window at the top of the instrument. A window in the upper left corner of the instrument displays a "TO" or a "FROM" indication. If the selected course is intersected and flown, the window will display whether flight is toward or away from the station. An amber light in the upper right corner of the instrument is connected to the marker beacon receiver and comes on whenever the receiver detects a 75-megacycle signal. The light is the press-to-test type. The course indicator is provided with "OFF" flags that become visible at any time a received signal is unreliable, and when the equipment is shut off, either intentionally or because of electrical power failure. The course indicator is powered by the ac bus.

Course Indicator System Selector Switch.

The two-position course indicator system selector switch (39, figure 1-2), in each cockpit, has a TACAN and an ILS position. This switch is used in the cockpit in control of the NAV and ILS systems to select which of the two systems will furnish information to the course indicators. Some airplanes* have a three-position course indicator system selector switch in each cockpit. In addition to a TACAN and an ILS position, these airplanes also have an FM HOMING position to connect FM 622A (AN/ARC-54) command radio homing signals to the course indicators. The respective front or rear cockpit switch is effective only when the course indicator system select indicator light is on.

On airplanes with either the two-position or the three-position switch, the respective transfer relays are energized by main bus power when the switch is at TACAN or FM HOMING. This ensures ILS capabilities in case of an electrical power loss to the transfer relays.

Course Indicator System Selector Indicator Light - Airplanes Changed by T.O. 1T-28D-519.

The green "COURSE INDICATOR SYSTEM SELECT" indicator light (38, figure 1-2), in each cockpit, comes on in the respective cockpit to indicate control of the course indicator input signals. The light in the front cockpit comes on when the NAV-ILS or FM command radio control transfer system switch has been actuated, placing control of any of these systems in the front cockpit. The light in the rear cockpit comes on when the NAV-ILS and FM command radio control transfer switches have been actuated, placing control of all these systems in the rear cockpit.

MARKER BEACON - AN/ARN-12.

The AN/ARN-12 marker beacon is a fixed-tuned receiver used for navigational purposes. The marker beacon indicator light (5, figure 1-2; 15, figure 1-3) is on the upper right corner of the course indicator on both instrument panels. The equipment is in the stand-by (on) condition at all times when secondary (main) bus power is available. The marker beacon light comes on when the airplane passes over a marker station. To listen to marker beacon signals, place the "MARKER" switch ("MB" switch) on the interphone control panel forward (ON).

OMNI - AN/ARN-14.

The omnidirectional navigation receiver provides navigational aids in the VHF range between 108.0 and 122 megacycles. Navigation information is displayed on the radio magnetic indicator and the course indicator. The receiver is monitored through the communication amplifier and is powered by the secondary (main) bus. The control panel (figure 4-3) contains a frequency selector switch in the form of a large circular knob and a small handle. The knob selects frequencies in hundredths, and the handle selects tenths of megacycles. A power switch, for control of the receiver, and a volume control are also on the control panel.

Operation of Omnidirectional Receiver - AN/ARN-14.

NOTE The course setting change indicator light on the instrument panel is off in the cockpit that has control of the receiver.

- When control of receiver is transferred during flight, be sure to obtain the course setting from the other pilot and set the course heading on your indicator to correspond with it.

Refer to Instrument Flying, AF Manual 51-37, for operating procedures.

GLIDE SLOPE RECEIVER - AN/ARN-18.

This receiver, powered by the dc main bus (dc secondary bus) is used in conjunction with the localizer portion of the omnidirectional receiver. Visual glide slope indications appear on each

*Airplanes changed by T.O. 1T-28D-519

course indicator by means of the glide slope indicator (horizontal pointer). The glide slope indicator is automatically turned on by proper frequency selection on the VHF navigation radio control panel, not installed in some B airplanes.

TACAN - AN/ARN-21.*

The TACAN system is a navigational aid, capable of providing bearing and slant range in nautical miles to a surface beacon. It transmits an interrogation signal from the airplane to the surface station beacon, which receives the same signal and retransmits it back to the airplane. The equipment in the airplane accepts only the answer to its interrogation signal. Slant range in nautical miles from the airplane to the surface beacon is computed by electronic measurement of elapsed time and is shown on a range indicator. The surface beacon also transmits a Morse code identification signal every 38 or 75 seconds. This system has a line-of-sight range of about 195 nautical miles.

Caution Do not select channels above 126 or below 01 because of possible damage to the equipment.

TACAN Controls and Indicators.

The TACAN control panel, on the right console in both cockpits, is shown in figure 4-3.

COURSE INDICATOR SYSTEM SELECTOR SWITCH. Refer to "Course Indicator" in this section.

FUNCTION SWITCH. When the function switch, on the TACAN control panel, is at T/R, the system transmits an interrogation signal to the surface beacon for range information and receives bearing information from the surface beacon. Moving the function switch to REC stops the transmitting of the interrogation signal, and only bearing information is received from the surface beacon. When the function switch is moved to OFF, the TACAN equipment is shutoff and a red bar drops across the range indicator. The function switch is powered by the main bus.

*T-28D-5 Airplanes and modified T-28D Airplanes

CHANNEL SELECTOR KNOBS. The channel selector knobs, on the TACAN control panel, permit selection of any of the 126 channels for air-to-ground transmissions. These channels cover 1025 to 1150 megacycles with a one-megacycle separation. Thus, any combination of channels up to 126 can be set up in the channel window. Power for the channel selector switch is from the main bus.

NOTE Allow about 12 seconds after channel selection for the No. 2 (TACAN bearing) pointer and the range indicator to correctly indicate the new information.

VOLUME CONTROL KNOB. The volume control, on the TACAN control panel, adjusts the audio signal strength of the surface beacon identification tone. Rotating the knob clockwise increases the tone. Power for the volume control is from the main bus.

BEARING POINTER. The No. 2 (bearing) pointer on the radio magnetic indicator (6, figure 1-2) indicates the relative bearing to the surface beacon from the airplane position. The pointer provides radio bearing information that is read directly from the indicator as magnetic bearing to the beacon. The indicator operates when the function switch is at either REC or T/R. If the bearing signal is lost or interfered with, as in a steep bank which might place the antenna away from the surface beacon, a memory circuit in the receiver maintains the last bearing received for about 3 seconds. If the signal is still disrupted after the time limit, the bearing pointer spins counterclockwise until the signal is picked up again. If the airplane is above a 40-degree angle from the surface beacon, the bearing pointer keeps spinning until the airplane is back within this limit. During a channel change or when the equipment is first turned on, the bearing pointer may falsely lock on momentarily to a bearing, but as the correct data is fed into the system, the pointer will swing to the correct bearing. Therefore, wait a few seconds after a lock-on before relying on the bearing indicated.

RANGE INDICATOR. The range indicator (figure 4-4) shows in nautical miles the slant range from the airplane to the surface beacon by means of figures displayed in a small window in the center

TACAN RANGE INDICATOR

FS-941 T-28B-1-72-2

Figure 4-4

of the instrument. The indicator operates only when the function switch is at T/R. When the indicator is inoperative or when the channel is being changed, a red bar drops down and covers the figures. If the return signal from the surface beacon is lost because of interference or because the airplane is beyond range of the station, a memory circuit retains for about 10 seconds the last distance before the interruption; then the red bar drops across the figures. When the airplane is back within range, the indicator corrects itself and the red bar disappears automatically. There will be a momentary false indication when the equipment is first turned on or when changing channels. However, wait a few seconds to ensure that the indication can be relied upon.

NOTE The range indicator in the front cockpit becomes inoperative when TACAN control is transferred to the rear cockpit. Likewise, when TACAN control is transferred to the front cockpit, the rear cockpit range indicator becomes inoperative.

COURSE INDICATOR. Refer to "Course Indicator" in this section.

Operation of TACAN.

Refer to Pilot's Instrument Handbook, AFM 51-37, for information on operation of TACAN.

INSTRUMENT LANDING SYSTEM (ILS) - AN/ARN-31.*

ILS provides visual guidance signals on the course indicator during instrument approaches and landings. To have ILS capabilities with TACAN, a glide slope receiver and a localizer receiver must be utilized. Twenty glide slope channels are available in the frequency range of 329.3 through 335 megacycles. ILS frequency pairings are available on a 1-for-1 basis. The glide slope receiver is tuned automatically when a localizer frequency is selected on the ILS control panel. The glide slope receiver supplies signals to the glide slope indicator of the course indicator. The localizer receiver operates in a frequency range of 108.1 through 111.9 megacycles and supplies signals to the course deviation indicator of the course indicator. The ILS system is powered by the main bus.

ILS Control Panel.

The ILS frequency is selected by rotating the frequency selector knob on the ILS control panel (figure 4-3) in each cockpit, until the desired localizer frequency appears in the indicator window to the left of the selector knob. The selector knob may be rotated in either direction. The volume control knob regulates the volume of the audible signal. The power switch, marked "POWER" and "OFF," controls power to the system.

COURSE INDICATOR SYSTEM SELECTOR SWITCH. Refer to "Course Indicator" in this section.

Course Indicator.

Refer to "Course Indicator" in this section.

Operation of ILS.

Refer to Pilot's Instrument Handbook, AFM 51-37, for information on operation of ILS.

LIGHTING EQUIPMENT.

EXTERIOR LIGHTS.

The exterior lighting system of the airplane consists of two retractable landing and taxi lights, four position lights, three landing gear position lights, a passing light, † two fuselage lights, ‡ two anticollision lights, § a flasher control unit,

*T-28D-5 Airplanes and modified T-28D Airplanes
†Replaced by AN/ARN-31 glide slope antenna on T-28D-5 Airplanes and modified T-28D Airplanes
‡T-28D Airplanes not changed by T.O. 1T-28-533
§T-28B and T-28C Airplanes and T-28D Airplanes changed by T.O. 1T-28-533

and control switches in each cockpit. All light circuits are routed through the control transfer relay so that control of the light switches may be transferred between either cockpit. On T-28D Airplanes, all exterior lights are powered by the main bus. On T-28B and T-28C Airplanes, all exterior lights except the landing and taxi lights are powered by the secondary bus. The landing and taxi lights are powered by the primary bus. The exterior lighting system is protected from overloads by push-pull circuit breakers on the circuit-breaker panel.

Exterior Light Controls and Indicator — AT-28D Airplanes.

LANDING AND TAXI LIGHT SWITCH. A two-position landing and taxi light switch (41, figure 1-2) on the left instrument subpanel, controls two retractable lights installed near the leading edge of each wing. Moving the switch to EXTEND ON causes the lights to lower from the wing and come on. When the switch is placed in the RETRACT AND OFF position, the lights retract into the wing and turn off.

POSITION LIGHT AND POSITION LIGHT DIMMER SWITCHES. A three-position position light switch controls the wing tip and rudder position lights. The switch is on the front right console switch panel in each cockpit. (See figure 1-7.) The three positions are STEADY, FLASH, and OFF. At STEADY, the lights are on continuously. At FLASH, the position lights flash at a rate of approximately 40 flashes per minute. At OFF, the lights are inoperative. The position light dimmer switch, on the switch panel (figure 1-7), just to the right of the position light switch, controls intensity of the position lights. The switch has two maintained positions: BRIGHT, to increase intensity of the lights; and DIM, to decrease intensity of the lights.

On some airplanes, an indicator is on the top surface of each wing tip to enable the pilot to check illumination of the wing tip lights. A 1/4-inch Lucite rod transmits light from the wing tip to a point on the top surface of the wing tip. The end of the Lucite rod can be seen from the front cockpit.

ANTICOLLISION LIGHT SWITCHES.* Rotating anticollision lights, on the top and bottom of the fuselage, are controlled by anticollision light switches (figure 1-7) in each cockpit.

FUSELAGE LIGHT SWITCH. Three white lights, two on the top and one on the bottom of the fuselage, are controlled by a fuselage light switch on the right console (figure 1-5) in each cockpit. The lights are turned on when the fuselage light switch is at either BRIGHT or DIM. †Some aircraft have two white lights, one on the top and one on the bottom of the fuselage controlled by a fuselage light switch on the switch panel (figure 1-7).

PASSING LIGHT SWITCH.‡ A red passing light,‡ installed in the left wing leading edge, is controlled by a passing light switch on the switch panel (figure 1-7) in each cockpit. When the switch is at ON, the passing light is on.

EXTERIOR GEAR-DOWN LIGHTS. To help ground observers see the airplane at night, a small white light on each gear strut automatically comes on when the gear is down and locked if the position light switch is on. The gear-down lights burn steadily, whether the position light switch is at STEADY or FLASH.

Exterior Light Controls and Indicators - T-28B and T-28C Airplanes.

EXTERIOR LIGHT MASTER SWITCH. The exterior light master switch on the switch panel (figure 1-7) in each cockpit, has two positions: OFF, and ON. The switch must be at ON before any of the external lights can be turned on.

LANDING AND TAXI LIGHT SWITCHES. The two landing and taxi light switches (41, figure 1-3), on the left instrument subpanel, control two retractable lights installed near the leading edge of each wing. Moving the switches to ON (exterior light master switch ON) causes the lights to lower from the wing and come on. When the switches are at OFF, the lights retract into the wing and turn off.

POSITION LIGHT SWITCH. Position lights on each wing tip and the tail are controlled by a three-position switch (figure 1-7) labeled "WING & TAIL." The lights are turned on when the switch is moved from OFF to BRIGHT or DIM as desired (exterior light master switch is ON).

NOTE The fuselage lights do not flash, but burn steadily, either bright or dim, when the exterior light master switch is ON.

An indicator on the top surface of each wing tip enables the pilot to check illumination of the wing tip lights. A 1/4-inch Lucite rod transmits light from the wing tip light to a point on the top surface of the wing tip, and the end of the rod can be seen from the cockpit.

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*T-28D Airplanes changed by T.O. 1T-28-533
†T-28D Airplanes not changed by T.O. 1T-28-533
‡Not installed on T-28D-5 Airplanes and Modified T-28D Airplanes

ANTICOLLISION LIGHT SWITCHES. Rotating anticollision lights on the top and bottom of the fuselage are controlled by individual switches (figure 1-7) in each cockpit. Operation of the anti-collision lights is independent of the exterior light master switch.

EXTERIOR GEAR-DOWN LIGHTS. To aid ground observers at night, a small white light on each gear strut automatically comes on when the gear is down and locked if the exterior light master switch is ON. The gear-down lights burn steadily.

INTERIOR LIGHTS.

On T-28D Airplanes, all interior lights are powered by the main bus. On T-28B and T-28C Airplanes, all interior lights except the thunderstorm lights are powered by the primary bus. The thunderstorm lights are powered by the secondary bus. The interior lighting system is protected from overloads by push-pull circuit breakers on the circuit-breaker panel.

Interior Light Controls - AT-28D Airplanes.

INSTRUMENT PANEL LIGHT SWITCHES AND RHEOSTATS. Two types of instrument panel lights, ultraviolet and red, are provided. The ultraviolet lights are turned on by means of a toggle switch on the switch panel (figure 1-7), and brilliancy of the lights is adjusted by a rheostat to the right of the switch. On most airplanes,* all instruments on the instrument panels are illuminated individually by red lights. On all other airplanes, the instruments are illuminated by two red floodlights on each instrument panel shroud. On all airplanes, the red lights are turned on and adjusted for brilliancy by means of a rheostat at the bottom of the right forward console. The light attachment brackets are rigid, and no attempt should be made to readjust them.

CONSOLE LIGHT RHEOSTAT. A console light rheostat is on the switch panel (figure 1-7) in each cockpit. The rheostat turns on, and regulates the brilliancy of, the lights above the consoles.

SWITCH PANEL RHEOSTAT. Indirect lights under the switch panel on the right forward console are turned on and regulated for brilliancy by a rheostat on the switch panel. (See figure 1-7.)

STAND-BY COMPASS LIGHT SWITCH. Illumination of the compass is controlled by a light switch on the switch panel (figure 1-7) in the front cockpit.

Interior Light Controls - T-28B and T-28C Airplanes.

INSTRUMENT PANEL LIGHT RHEOSTAT. Each instrument on the main instrument panel in both cockpits is illuminated individually by red lights. The lights are turned on and adjusted for brilliancy by a rheostat on the switch panel (figure 1-7) in each cockpit. Rheostat positions are OFF and BRIGHT. Only the instrument light rheostat in the front cockpit dims the magnetic compass light. Incorporated in the back of each rheostat is a switch that connects all warning and course indicator lights through dimming resistors when the rheostat is first moved from the OFF position to reduce warning light brilliancy at night.

*Airplanes changed by T.O. 1T-28D-505
†Airplanes not changed by T.O. 1T-28-514

CONSOLE AND FLOODLIGHT RHEOSTAT. Red edge lights in the Lucite panels on the right console are controlled from OFF to BRIGHT by a rheostat on the switch panel. (See figure 1-7.) Floodlights mounted above each console are turned on by the same rheostat when the rheostat is turned from the OFF position.

FLOODLIGHT CONTROL SWITCH. Brilliancy of the floodlights mounted above the consoles and the instrument panel is controlled by the three-position switch on the switch panel. (See figure 1-7.) After the console floodlights have been turned on by initial movement of the console and floodlight rheostat, the floodlight control switch, labeled "CONSOLE FLOODS," can be moved to BRIGHT, MED, or DIM as desired. When the switch is moved to BRIGHT, floodlights above the instrument panel also come on.

THUNDERSTORM LIGHT SWITCH. A high-intensity white floodlight is mounted on each side of each cockpit for use when flying in or near thunderstorms to protect the pilot's vision from lightning flashes. The thunderstorm light switch, on the switch panel (figure 1-7) in each cockpit, turns on the lights when moved from OFF to THUNDERSTORM.

STAND-BY COMPASS LIGHT SWITCH. Illumination of the magnetic compass is controlled by a switch on the switch panel (figure 1-7) in the front cockpit.

EXTENSION LIGHTS.

An extension light (16, figure 1-5) is provided in each cockpit and is turned on and adjusted for brilliance by a rheostat on the light assembly. The light has a coiled cord and swivel base which allow the light to be pointed in any direction. The red filter may be removed in case a white light is desired. The light assembly is normally located beside the pilot's right shoulder, but it can be removed and placed in a bracket on the right forward side of the cockpit above the console.

BAGGAGE COMPARTMENT LIGHT. †

A light in the fuselage rear section lights the baggage compartment. The light is controlled by a switch on the light assembly, and it is wired directly to the battery so that it will receive power regardless of the battery switch position.

OXYGEN DURATION-HOURS (TWO CREW MEMBERS)

Figures in parentheses indicate diluter lever 100% OXYGEN.
Other figures indicate diluter lever NORMAL OXYGEN.

T-28D

NOTE
Oxygen supply is insufficient to last total time airplane can remain aloft.

ALTITUDE - FEET	GAGE PRESSURE - PSI 400	350	300	250	200	150	100	BELOW 100
25,000	(1.8) 2.1	(1.5) 1.8	(1.3) 1.5	(1.0) 1.2	(0.8) 0.9	(0.5) 0.6	(0.5) 0.3	DESCEND TO ALTITUDE NOT REQUIRING OXYGEN
20,000	(1.4) 2.4	(1.2) 2.0	(1.0) 1.7	(0.8) 1.3	(0.6) 1.0	(0.4) 0.7	(0.2) 0.3	
15,000	(1.1) 2.9	(1.0) 2.4	(0.8) 2.0	(0.6) 1.6	(0.5) 1.2	(0.3) 0.8	(0.2) 0.4	
10,000	(1.0) 3.8	(0.8) 3.3	(0.7) 2.7	(0.5) 2.2	(0.4) 1.6	(0.3) 1.1	(0.1) 0.5	

T-28B & C

ALTITUDE -FEET	GAGE PRESSURE-PSI 1800	1500	1200	900	600	300	BELOW 300
35,000	(7.8) 7.8	(6.5) 6.45	(5.2) 5.2	(3.9) 3.9	(2.6) 2.6	(1.3) 1.3	DESCEND TO ALTITUDE NOT REQUIRING OXYGEN
30,000	(5.63) 5.63	(4.69) 4.69	(3.74) 3.74	(2.8) 2.8	(1.86) 1.86	(.93) .93	
25,000	(4.34) 5.47	(3.62) 4.56	(2.89) 3.64	(2.17) 2.73	(1.44) 1.82	(.72) .91	
20,000	(3.30) 6.17	(2.75) 5.15	(2.20) 4.11	(1.65) 3.09	(1.10) 2.06	(.55) 1.03	
15,000	(2.65) 7.49	(2.21) 6.24	(1.77) 5.0	(1.33) 3.75	(.88) 2.50	(.44) 1.25	
10,000	(2.12) 9.94	(1.76) 8.29	(1.42) 7.44	(1.06) 4.97	(.71) 3.72	(.35) 1.86	

T28B-1-73-1

Figure 4-5

NOSE WHEEL WELL LIGHT.

A service light is provided in the nose wheel well for use by the ground crew. The light is controlled by a switch on the light assembly, and it is wired directly to the battery so that it will receive power regardless of the battery switch position.

OXYGEN SYSTEM.

Some T-28D Airplanes have a low-pressure, gaseous oxygen system which is supplied by one oxygen cylinder, aft of the rear cockpit. Normal system pressure is between 400 and 450 psi. T-28B and T-28C Airplanes have a high-pressure, gaseous oxygen system which is supplied by two oxygen cylinders, on a shelf in the forward section of the baggage compartment. Normal system pressure is 1800 psi. Included in the system is a pressure-breathing, diluter-demand regulator; a blinker-type flow indicator; and a pressure gage in each cockpit. The oxygen system may be serviced through a valve adjacent to the bottles. See figure 1-18 for location of the oxygen filler valve and oxygen specification. An oxygen duration table is given in figure 4-5.

OXYGEN SYSTEM CONTROL AND INDICATORS.

Oxygen Regulator.

The diluter-demand oxygen regulator (17, figures 1-2 and 1-3) is on the right instrument subpanel in the front cockpit and above the right console in the rear cockpit. The regulator automatically supplies a proper mixture of air and oxygen at all altitudes. The diluter lever of the regulator should always be set at NORMAL OXYGEN, except in an emergency. With the diluter lever set at 100% OXYGEN, 100 percent oxygen is supplied at all altitudes, and oxygen supply duration will be considerably reduced. The emergency valve knob of the regulator is always safety-wired closed and should be opened only in an emergency. Turning the emergency valve knob counterclockwise opens the valve, which directs a steady stream of oxygen into the mask.

Oxygen Pressure Gage.

The pressure gage (18, figure 1-2; 20, figure 1-3) is on the right instrument subpanel in each cockpit. The pressure gage registers the oxygen cylinder pressure.

NOTE As an airplane ascends to high altitudes where the temperature is normally quite low, the oxygen cylinders become chilled. As the cylinders grow colder, oxygen pressure is reduced, sometimes rather rapidly. With a 38°C (100°F) decrease in temperature in the cylinders, oxygen pressure can be expected to drop 20 percent. This rapid fall in pressure is occasionally a cause for unnecessary alarm. All the oxygen is still there, and, as the airplane descends to warmer altitudes, the pressure will tend to rise again so that the rate of oxygen usage may appear to be slower than normal. A rapid fall in oxygen pressure while the airplane is in level flight or while it is descending is not ordinarily due to falling temperature, of course. When this happens, loss of oxygen must be suspected.

Oxygen Flow Indicator.

The oxygen flow indicator (21, figure 1-2; 22, figure 1-3) is on the right instrument subpanel in each cockpit. The oxygen flow indicator shows that oxygen is flowing through the regulator. It does not indicate how much oxygen is flowing. The "eye" of the indicator blinks with each breath. When the emergency valve is opened, the indicator does not blink, but remains open.

OXYGEN SYSTEM PREFLIGHT CHECK.

Perform the following preflight check:

1. Check oxygen pressure gage between 400 and 450 psi (or 1800 psi).

2. Check oxygen mask for fit and leakage.

3. Connect mask tube to regulator tube. Check connection for tightness. Attach tube clip to parachute harness high enough to permit free movement of head without pinching or pulling hose.

4. Check oxygen regulator with diluter lever first at NORMAL OXYGEN and then at 100% OXYGEN as follows: Remove mask and blow gently into end of oxygen regulator hose as during normal exhalation. If there is a resistance to blowing, system is satisfactory. Little or no resistance to blowing indicates a faulty demand diaphragm diluter air valve or a leaking mask-to-regulator tube.

5. Check oxygen regulator to see that emergency valve knob is safety-wired closed and that diluter lever is in NORMAL OXYGEN position.

OXYGEN SYSTEM NORMAL OPERATION.

If the oxygen system is installed, check the system in flight as follows:

1. Diluter lever at NORMAL OXYGEN.

2. Check connection of mask tube to regulator tube.

3. Check flow indicator frequently for flow of oxygen.

4. Check pressure gage frequently for oxygen system pressure and to determine how much oxygen remains.

OXYGEN SYSTEM EMERGENCY OPERATION.

With symptoms of hypoxia, or with smoke or fuel fumes entering the cockpit, set the diluter lever of the oxygen regulator to 100% OXYGEN. If the oxygen regulator should become inoperative, open the emergency valve by turning the emergency valve knob counterclockwise.

Warning After emergency is over, set diluter lever of oxygen regulator to NORMAL OXYGEN, and turn emergency valve knob full clockwise; otherwise, oxygen supply will be rapidly depleted.

NAVIGATION EQUIPMENT.

MAGNETIC COMPASS.

Refer to "Instruments" in Section I.

RADIO COMPASS - AN/ARN-6.

Refer to "Communication and Associated Electronic Equipment" in this section.

TACAN - AN/ARN-21.

Refer to "Communication and Associated Electronic Equipment" in this section.

COMPASS SYSTEM - T-28D AIRPLANES.

The slaved gyro magnetic compass system is composed of these principal units: a compass (flux valve) transmitter in the wing, an amplifier, a directional gyro control, and a heading indicator or a radio magnetic indicator in each cockpit. The gyro is slaved at either of two rates by the compass transmitter. The gyro will slave at the rate of 60 to 90 degrees per minute for the first 3 or 4 minutes after being energized. Thereafter, slaving is at the rate of 4 to 5 degrees per minute. The system is powered by the main bus and ac bus.

Heading Indicator.

The heading indicator (9, figure 1-2) in each cockpit consists of a top index mark, a compass card, a heading pointer, and a compass card set knob. Airplane heading is indicated by the heading pointer and read on the compass card. The compass card set knob allows the compass card and heading pointer to be rotated so that any heading may be placed under the top index.

Radio Magnetic Indicator.

Refer to "Radio Magnetic Indicator" in this section.

COMPASS SYSTEM - T-28B AND T-28C AIRPLANES.

Directional indication for flights at all longitudes and latitudes is presented on the radio magnetic indicator by the compass system. The system can be operated in either the magnetic mode or the free-gyro mode. When the magnetic mode is selected, the indicator compass card reflects the magnetic heading of the airplane. In the free-gyro mode, the system gyro is freed from the remote compass (flux valve) transmitter in the wing, and the compass card reflects the gyro heading of the airplane. The system is powered by the primary and ac busses.

Compass System Controls and Indicators.

RADIO MAGNETIC INDICATOR. Refer to "Radio Magnetic Indicator" in this section.

GYRO SELECTOR SWITCH. The gyro selector switch, on the compass controller panel (figure 4-6) on the aft right console in each cockpit, controls the free-gyro feature of the compass. When the switch is at SLAVED GYRO, the compass is slaved by the compass transmitter. Moving the switch to FREE GYRO electrically disconnects the slaving action of the compass transmitter, and the compass operates on free gyro. For high-latitude operation, the gyro selector switch should be set at FREE GYRO.

GYROSYN COMPASS CONTROLLER PANEL

T-28B-1-72-1

Figure 4-6

MANUAL SLAVING SWITCH. The spring-loaded manual slaving switch is on the compass controller panel (figure 4-6) adjacent to the gyro selector switch. To rapidly precess the compass to a new heading, the manual slaving switch should be momentarily held at either INC or DEC. If the null indicating meter indicates a "-" deflection, the manual slaving switch should be momentarily rotated to INC to zero the needle.

CARRIER-FIELD SWITCH. The carrier-field switch is in the fuselage aft of the cockpit and is accessible only through the baggage compartment. The switch is safety-wired in the FIELD position when the airplane is delivered. With the switch at FIELD, the switch on the landing gear strut is bypassed and the compass is free or slaved by the compass transmitter according to the position of the gyro selector switch, regardless of whether the airplane is in flight or on the ground. When the switch is at CARRIER, the compass transmitter is automatically disengaged when the weight of the airplane is on the landing gear, and the free-gyro feature is in operation.

NULL INDICATING METER. Any drift of the gyro spin axis after alignment is indicated on the null indicating meter. The null indicating meter, marked "SYNC-SIGNAL," is on the compass controller panel (figure 4-6) on the right aft console in each cockpit. Normally, the needle is centered and any drifting is corrected by the compass transmitter. Should the needle indicate sustained "+" or "-" deflections, the gyro spin axis has precessed from magnetic north and the manual slaving switch should be rotated to correct it.

COMPASS ANNUNCIATOR. The compass annunciator (10, figure 1-3), at the top of the instrument panel in each cockpit, shows the words "FREE" or "SLAVE" as determined by the operating condition of the compass system. Cross-hatching appears when power is off and the system is inoperative.

SIGHT

(FRONT COCKPIT)

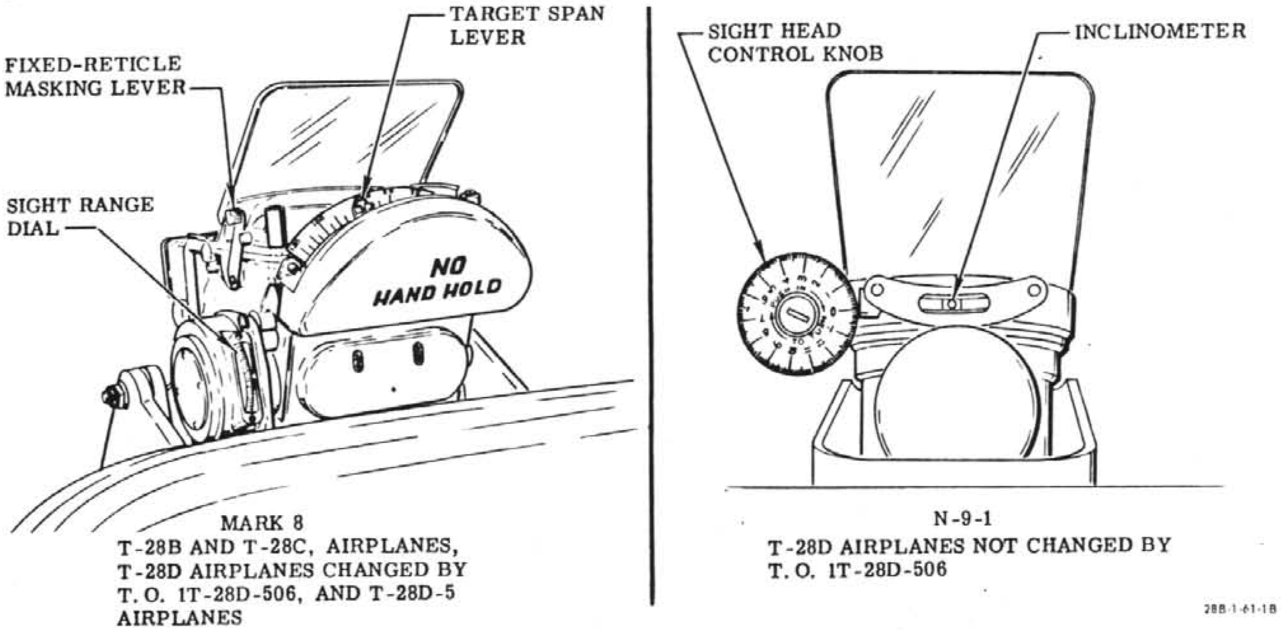


Figure 4-7

ARMAMENT EQUIPMENT.

The airplane armament includes six store stations, on the lower surface of the wing, in various complements composed of fragmentation, general-purpose, fire, and practice bombs and 2.75- and 5-inch rockets; 50-caliber gun pods, and 7.62 mm gun pods (T-28D-5 Group II Airplanes). (See figure 5-3.) The armament equipment consists of a sight above the instrument panel in the front cockpit, an armament control panel in the front cockpit, an armament control subpanel (some T-28B and T-28D Airplanes) in the front cockpit, and a gun camera. Some T-28C and T-28D Airplanes are also equipped with additional cameras for photo-reconnaissance missions. On T-28C Airplanes, strakes on each side of the forward fuselage aid spin recovery when external stores are carried. Without strakes, spin recovery would be marginal while carrying stores.

Each of the six store stations may be used for numerous stores within the store-weight limitations, and mixed combinations of stores may be carried symmetrically. For reference purposes, these stations are numbered as follows:

1. Left outboard
2. Left intermediate
3. Left inboard
4. Right inboard
5. Right intermediate
6. Right outboard

NOTE In the procedures for the various armament systems where line items apply to a particular model, the applicable model letter or letters, in parentheses [(D), (B/C), (B/D), etc], will appear between the step number and the step. Steps not so coded are applicable to all models.

MARK 6 MOD 0 FIRE CONTROL SYSTEM - T-28B AND T-28C AIRPLANES.

The Mark 6 Mod 0 is a pilot-operated fire control system providing lead angle information for precision aiming of the fixed guns, bombs, or rockets. The system uses the Mark 8 Mod 5 sight (figure 4-7) primarily as a combined lead-computing sight and also as a fixed sight. The target is viewed through a clear glass plate on which two reticle images, produced by two similar optical systems, are reflected. The reticle images are focused at infinity and appear to be projected or superimposed on the target. The cross of the fixed reticle image establishes a fixed sight line which indicates the direction in which the airplane is pointing. The center pip of the lead-computing gyro reticle image establishes a sight line which is automatically offset from the fixed sight line at the proper angle for tracking the target. Using this image, the aiming and tracking problem is simplified to flying the airplane, so the gyro reticle image remains on the target, and following the sight line toward the target until the attack is completed. When the lead-computing system of the sight is used, the reticle image consists of a center dot and an outer circle formed by six equally spaced diamond-shaped dots with the center dot establishing a sight line. When the fixed reticle sight is used, the reticle consists of a ladder pattern below a center cross. The control settings of the sight system must be changed before initiating various types of attacks, to be in accordance with the specific settings necessary for firing or release of the respective armament being carried.

Mark 8 Sight Controls - T-28B and T-28C Airplanes.

MASTER ARMAMENT SWITCH. Refer to "Gunnery Equipment Controls" in this section.

FIRE CONTROL SELECTOR SWITCH. The fire control selector switch (figure 4-9), on the armament control panel, has three positions: GUNS, ROCKETS, and BOMBS. Moving the switch to the position corresponding to the armament carried adjusts the sight reticle to the correct offset point for the particular armament. The switch is powered by the armament bus.

SIGHT RETICLE SELECTOR SWITCH. The sight reticle selector switch (figure 4-9), on the armament control panel, is used to select the desired sight reticle image. Moving the switch from OFF to GYRO causes the gyro reticle image to appear on the reflector glass. With the switch at FIXED & GYRO, both the fixed and gyro images are visible. At the FIXED position, only the fixed image is visible, and the sight is suitable only as a fixed-reticle type sight for estimating leads. The switch is powered by the armament bus.

SIGHT DIMMER KNOB. The sight dimmer knob (figure 4-9), on the armament control panel, controls a rheostat that varies the brightness of the reticle image for proper contrast with background light conditions. The knob is powered by the armament bus and can be rotated from DIM to BRIGHT as desired.

TARGET SPAN LEVER. The target span lever (figure 4-7), on the sight, is used to vary the diameter of the reticle in proportion to the span of the target so that correct range values may be obtained by the target spanning process. Graduated markings (from 30 to 120) on the scale represent the span, in feet, of the target. The lever should be set before the attack to correspond to the span of the target.

SIGHT RANGE CONTROL. A twist grip incorporated in the throttle provides range control for the computer circuits. Rotation of the twist grip varies the diameter of the sight reticle. Clockwise rotation of the grip increases the range (decreases the reticle size); counterclockwise movement decreases the range (increases reticle size). When the grip is turned to the extreme maximum-range position, the sight gyro is caged to prevent tumbling of the gyro and blurring of the gyro image.

FIXED-RETICLE MASKING LEVER. A fixed-reticle masking lever (figure 4-7) is on the left side of the sight. The fixed reticle is normal when the masking lever is in the aft position. When the lever is moved forward, all of the fixed-reticle image except the center cross is blanked out. The lever is provided to eliminate the confusion of using both the fixed and gyro images together and yet enable the fixed reticle cross to be used with the gyro reticle for indications of lead.

SIGHT RANGE DIAL. The sight range dial (figure 4-7), visible through a window on the left side of the sight, indicates the target range in hundreds of feet as determined by sight range control. The dial is graduated from 600 to 2400 feet.

MARK 8 SIGHT - AT-28D AIRPLANES CHANGED BY T.O. 1T-28D-506, AT-28D-5 AND AT-28D-10 AIRPLANES

The Mark 8 sight (figure 4-7), as installed on these airplanes, is identical to that on T-28B and T-28C Airplanes. However, there is no tracking equipment or fire control system in association with it. The sight is a noncomputing, reflex type having a single optical system containing a fixed reticle image that is projected on the reflector glass. The sight reticle image can be depressed for use during bombing and rocket-firing missions.

MARK 8 SIGHT CONTROLS - AT-28D AIRPLANES CHANGED BY T.O. 1T-28D-506, AT-28D-5 AND AT-28D-10 AIRPLANES

MASTER ARMAMENT SWITCH. Refer to "Gunnery Equipment Controls" in this section.

SIGHT DIMMER KNOB. Refer to "Mark 8 Sight Controls - T-28B and T-28C Airplanes" in this section.

TARGET SPAN LEVER. This lever (figure 4-7) has no function.

SIGHT RANGE CONTROL. The throttle twist grip control has no function.

FIXED-RETICLE MASKING LEVER. A fixed-reticle masking lever (figure 4-7) is on the left side of the sight. The fixed reticle is normal when the masking lever is in the aft position. When the lever is moved forward, all of the fixed-reticle image except the center cross is blanked out.

SIGHT RANGE DIAL. This dial (figure 4-7) has no function.

RETICLE CONTROL SWITCH. Moving the reticle control switch (figure 4-9) from OFF to SIGHT RETICLE turns on the sight upper lamp so that the fixed reticle image appears for use for gun or rocket firing or bombing. With the switch at DEPRESSION ADJUST, the sight lower lamp comes on to produce an image with a depression angle correction for bombing and rocketry. The switch is powered by the armament bus.

On T-28D-5 and T-28D-10 Airplanes changed by T.O. 1T-28D-513, the reticle control switch has been moved from the armament control panel to the top of the instrument panel shroud, just to the right of the Mark 8 sight.

N-9-1 SIGHT - AT-28D AIRPLANES NOT CHANGED BY T.O. 1T-28D-506.

The N-9-1 sight (figure 4-7) is a noncomputing reflex-type sight with a fixed reticle. Reticle brilliance can be controlled, but no other sight adjustments are provided. However, the sight head reflector glass is adjustable from a gun sighting position, in which the line of sight is parallel to the flight path of the airplane, to a bombing position, in which the line of sight may be as much as 14 degrees below the flight path. Intermediate positions permit the sight to be used for rocket firing. The principle of operation is the apparent projection of the reticle image in space, which is similar to having the reticle image superimposed on the target. Unlike the old-style ring-and-bead sight that required that the eye be carefully fixed in relation to the sight (ring and bead), slight movement of the pilot's head does not cause misalignment between the sight reticle image and the target.

N-9-1 Sight Controls.

MASTER ARMAMENT SWITCH. Refer to "Gunnery Equipment Controls" in this section.

SIGHT DIMMER KNOB. Brightness of the sight reticle is adjusted by means of the armament-bus-powered sight dimmer rheostat. The rheostat is controlled by a knob on the armament control panel. (See figure 4-9.) When the sight is not in use, the dimmer knob should be turned to OFF.

SIGHT FILAMENT SELECTOR SWITCH. A sight filament selector switch, on the armament control panel (figure 4-9), is provided to select alternate filaments (either primary or secondary) in the lamp which lights the sight reticle circle and dot. If one light filament fails, the other filament can be selected. The switch is powered by the armament bus.

SIGHT HEAD CONTROL KNOB. The angle of the reflector glass is varied by turning the sight head control knob. (See figure 4-7.) The knob, whose dial is graduated in degrees and tenths of a degree, must be pushed in before it can be turned. Four adjustable stops are provided for setting the sight head reflector glass to any predetermined sighting angle for bombing or rocket firing.

GUN CAMERA.

To photograph the target, T-28B and T-28C Airplanes have a Type N-6 or N-6A camera and T-28D Airplanes have a Type N-9 camera installed in the leading edge of the left wing. The camera, powered by the armament bus, operates automatically when the trigger, bomb button on some T-28D Airplanes (for firing rockets), or rocket-firing button, T-28B, T-28C, and some T-28D Airplanes, is pressed and, in addition, will continue to photograph the target for a period of one to 5 seconds after the trigger, bomb button, or rocket-firing button is released. The time of operation after the trigger or button is released can be varied by the ground crew. The N-9 camera can be adjusted from the front cockpit for various lighting conditions, and operating temperature is maintained within the camera housing by a heater resistor and cut out when power is applied to the airplane. A test switch adjacent to the N-9 camera is used to test camera operation on the ground.

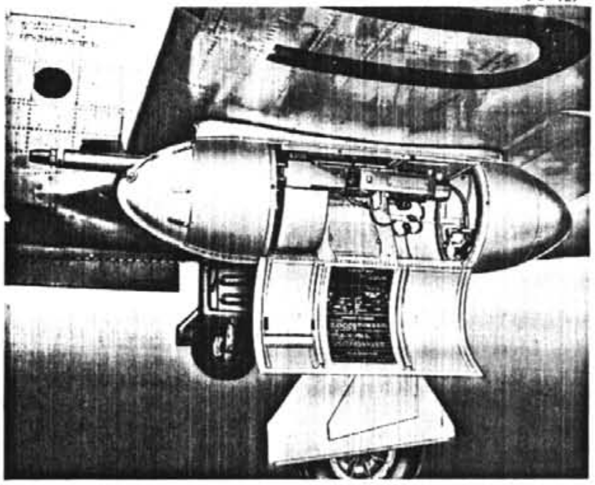
Camera Shutter Selector Switch - AT-28D Airplanes.

The lens aperture of the gun camera is adjusted by turning the armament-bus-powered, rotary, shutter selector switch on the armament control panel. (See figure 4-9.) With the switch at OFF, the gun camera is inoperative. Turning the switch to BRIGHT, HAZY, or DULL provides power to the camera, and adjusts the shutter aperture of the camera lens for existing lighting conditions.

GUN INSTALLATIONS

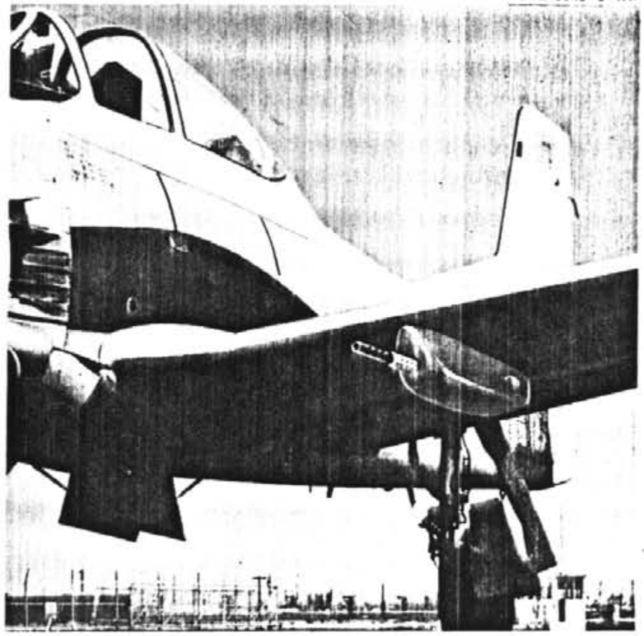
(TYPICAL)

FS-129



100-ROUND GUN POD

COL 8045-0-IN.



315-ROUND FIXED GUN

T-28B-1-61-2A

Figure 4-8

Armament Selector Switch.*

Refer to "Gunnery Equipment Controls" in this section.

GUNNERY EQUIPMENT.

A detachable 100- or 315-round gun pod containing one Type M3 .50-caliber machine gun and a pneumatic gun-charging system can be installed at each inboard wing station. On T-28D-5 and T-28D-10 Airplanes, a fixed Type M-3 machine gun with a pneumatic charging system can be bolted to the lower surface of each wing, inboard of the inboard station. 315 rounds of ammunition for each gun are contained in the wing leading edge above each gun. (See figure 1-1.) Figure 4-8 shows a typical 100-round gun pod and a 315-round fixed gun. The charging systems are controllable from the front cockpit, and each has sufficient capacity to charge its respective gun about 20 times. When the guns are fired, the charging systems are inoperative, preventing accidental simultaneous gun firing and charging. There are no heating elements in the 315-round gun pods or the fixed guns. The guns cannot be jettisoned from the airplane.

On T-28D-5 Group II Airplanes, an SUU-11A/A minigun pod can be installed at any two external store stations. The pod contains a six-barrel, GAU-2B/A 7.62 mm electrically fired gun. Each pod can be loaded with up to 1500 rounds of ammunition, which provides a firing time of 15 seconds at the nominal firing rate of 6000 rounds per minute. The SUU-11A/A gun pod does not require charging.

Gunnery Equipment Controls.

MASTER ARMAMENT SWITCH. This switch, on the armament control panel, figure 4-9 (armament control subpanel on some airplanes), is labeled "MASTER ARM" and has positive-lock ON and OFF positions. The toggle must be lifted before the switch can be moved. With the switch at ON, armament bus power is available for operation of the gun sight, guns, rockets, bombs, and gun camera.

*T-28B and T-28D Airplanes not changed by T.O. 1T-28-510, and T-28C Airplanes

ARMAMENT SELECTOR SWITCH.* The rotary-type armament selector switch on the armament control panel (figure 4-9) has four marked positions (six positions on T-28D Airplanes): OFF, GUNS, ROCKETS, BOMBS, and, on T-28D Airplanes, MISSILES and CAMERA. With the switch at OFF, all armament and gun camera systems are inoperative. To fire and drop armament stores (master armament switch at ON) the armament selector switch must be turned from OFF to the corresponding marked position. Gun camera operation is automatic when the trigger, bomb button, or rocket-firing button is pressed with the armament selector switch at any position other than BOMBS, and, on T-28D Airplanes, when the camera shutter selector switch is at any position other than OFF. When the armament selector switch on T-28D Airplane is at CAMERA, power to all other armament selector switch positions is disconnected, but power is continuously supplied to the gun camera (camera shutter selector switch away from OFF), which may then be operated by pressing the trigger or bomb button. The armament selector switch is powered by the armament bus.

GUN SAFETY SWITCH. The armament-bus-powered gun safety switch, on the armament control panel, figure 4-9 (armament control subpanel on some airplanes), simultaneously controls the gun-charging system for each gun. T-28D and T-28B Airplanes have a three-position gun safety switch marked "READY," "SAFE," and "OFF." T-28C Airplanes have a two-position gun safety switch with READY and SAFE positions. On airplanes with the three-position switch, moving the switch to SAFE causes the gun charger to retract and hold the gun bolt retracted. Moving the switch to OFF or READY allows the gun bolt to return forward, loading the breech with a live round. On airplanes with the two-position switch, the gun charging operation must also be performed twice (moving the switch to SAFE, READY, SAFE, and back to READY). Positioning the switch to READY the second time allows the retracted bolt to move forward, loading the breech with a live round. On airplanes changed by T.O. 1T-28-528, the two-position switch is replaced by a three-position switch. The guns are fired when the gun safety switch is at READY, the trigger is held depressed, and no jam or misfire occurs.

GUN SELECT SWITCH - T-28D-5 GROUP II AIRPLANES. The gun select switch on the armament control panel (figure 4-9) allows selection for firing of the fixed or podded .50-caliber wing guns (.50 CAL position), all installed SUU-11A/A gun pods (7.62 MM position), or both types of guns at once (BOTH position). The guns are ready for firing (.50-caliber guns previously charged) with the master armament switch at ON, the gun safety switch at READY, and the gun select switch positioned to either .50 CAL, BOTH, or 7.62 MM. Since the SUU-11A/A gun pod does not require charging, the gun safety switch should be positioned at OFF or SAFE to prevent inadvertent firing of guns.

GUN HEATER SWITCH - T-28B AND SOME T-28D AIRPLANES. The electric gun heaters, one on each gun, are controlled simultaneously by the gun heater switch on the armament control panel. (See figure 4-9.) To supply armament bus power to the heaters, the switch should be moved from OFF to ON if outside air temperature is 1.7°C (35°F) or below.

TRIGGER. The gun-firing and gun-camera circuits are energized, depending upon switch settings, by the trigger on the control stick grip in the front cockpit. With the gun safety switch at READY, and, on T-28B and T-28D Airplanes not changed by T.O. 1T-28-510, and on T-28C Airplanes, with the armament selector switch at GUNS, the guns are fired and the gun camera is actuated when the trigger is pressed. On T-28D Airplanes not changed by T.O. 1T-28-510, the gun camera can be operated independent of other armament systems by pressing the trigger with the armament selector switch at CAMERA.

ARMAMENT SAFETY DISABLING SWITCH. This switch, on the armament control panel (figure 4-9), allows guns to be fired on the ground. Normally, the switch is at NORMAL (switch guard down) and the armament electrical circuit is disconnected when the airplane is on the ground. When held at the momentary DISABLE position, the switch overrides the landing gear ground safety switch to energize the armament electrical circuits.

Firing Guns.

1. Master armament switch - ON.
2. (B/C/D)† Armament selector switch - GUNS.

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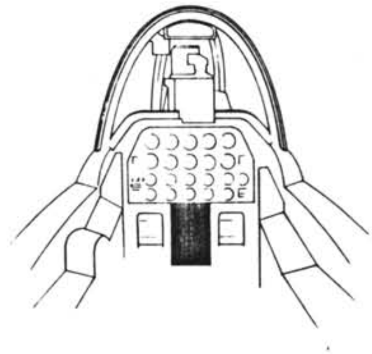
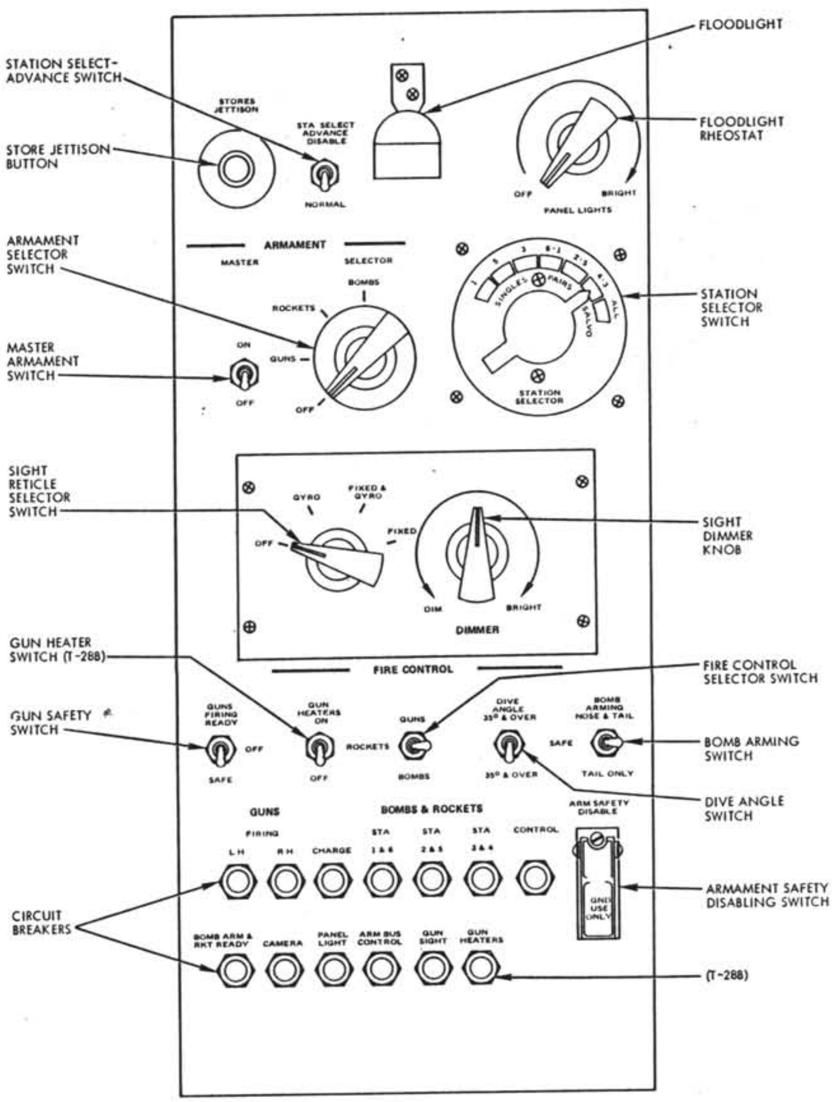
*T-28B and T-28D Airplanes not changed by T.O. 1T-28-510, and T-28C Airplanes

†T-28B and T-28D Airplanes not changed by T.O. 1T-28-510

ARMAMENT CONTROL PANEL

T-28B AIRPLANES NOT CHANGED BY T.O. IT-28-510 AND T-28C AIRPLANES



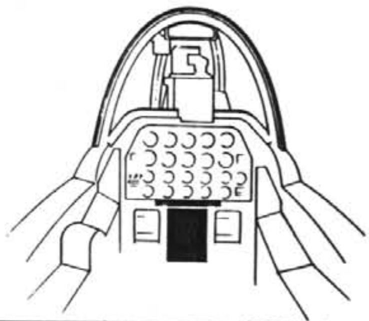


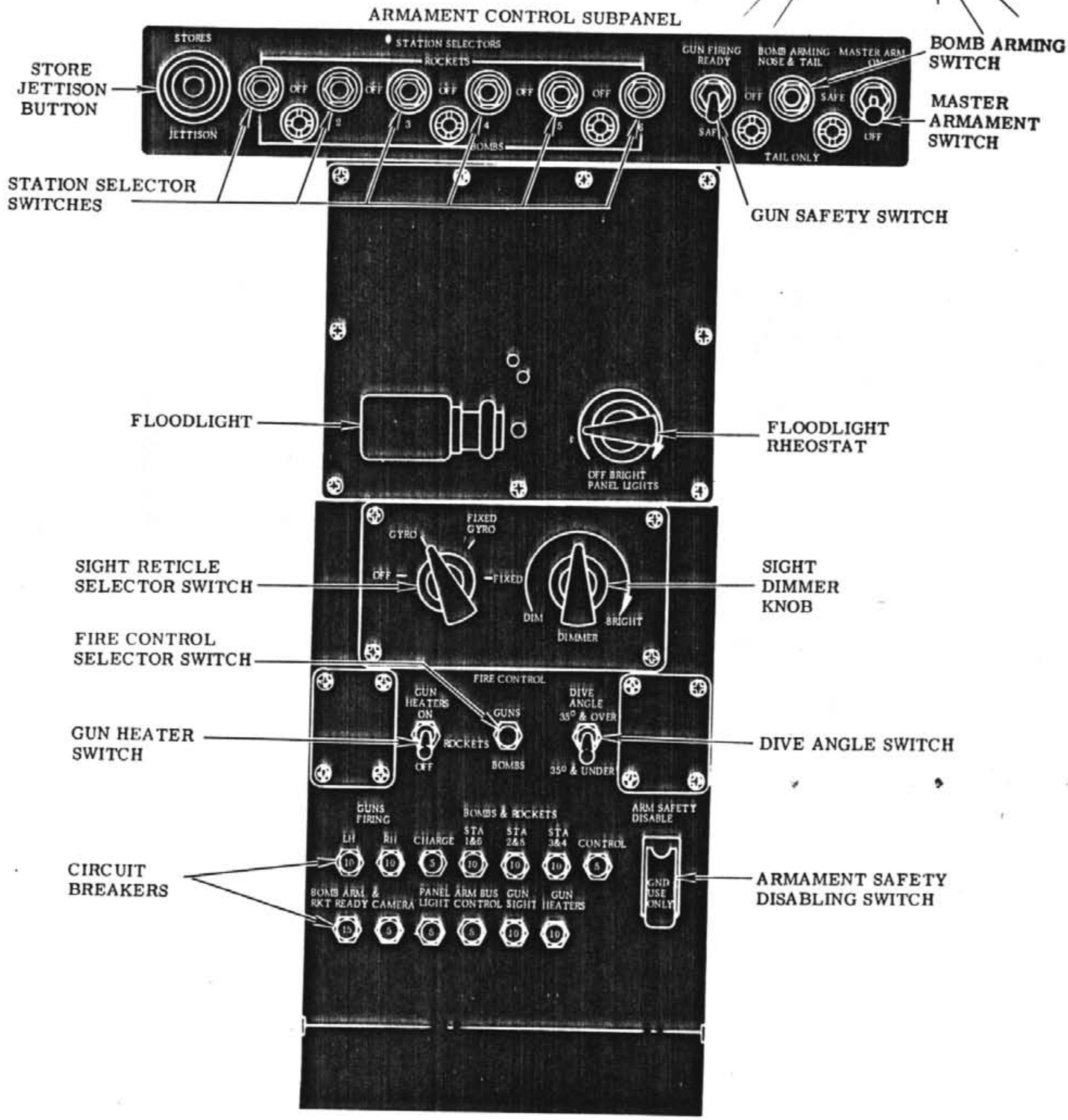
T-28B-1-60-1

Figure 4-9 (Sheet 1 of 6)

ARMAMENT CONTROL PANEL

T-28B AIRPLANES CHANGED BY T.O. 1T-28-510



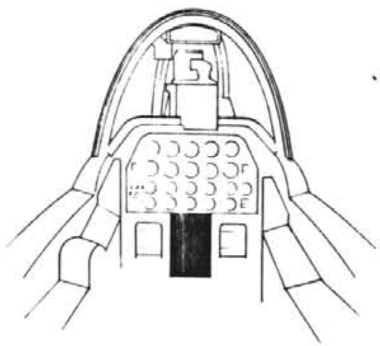


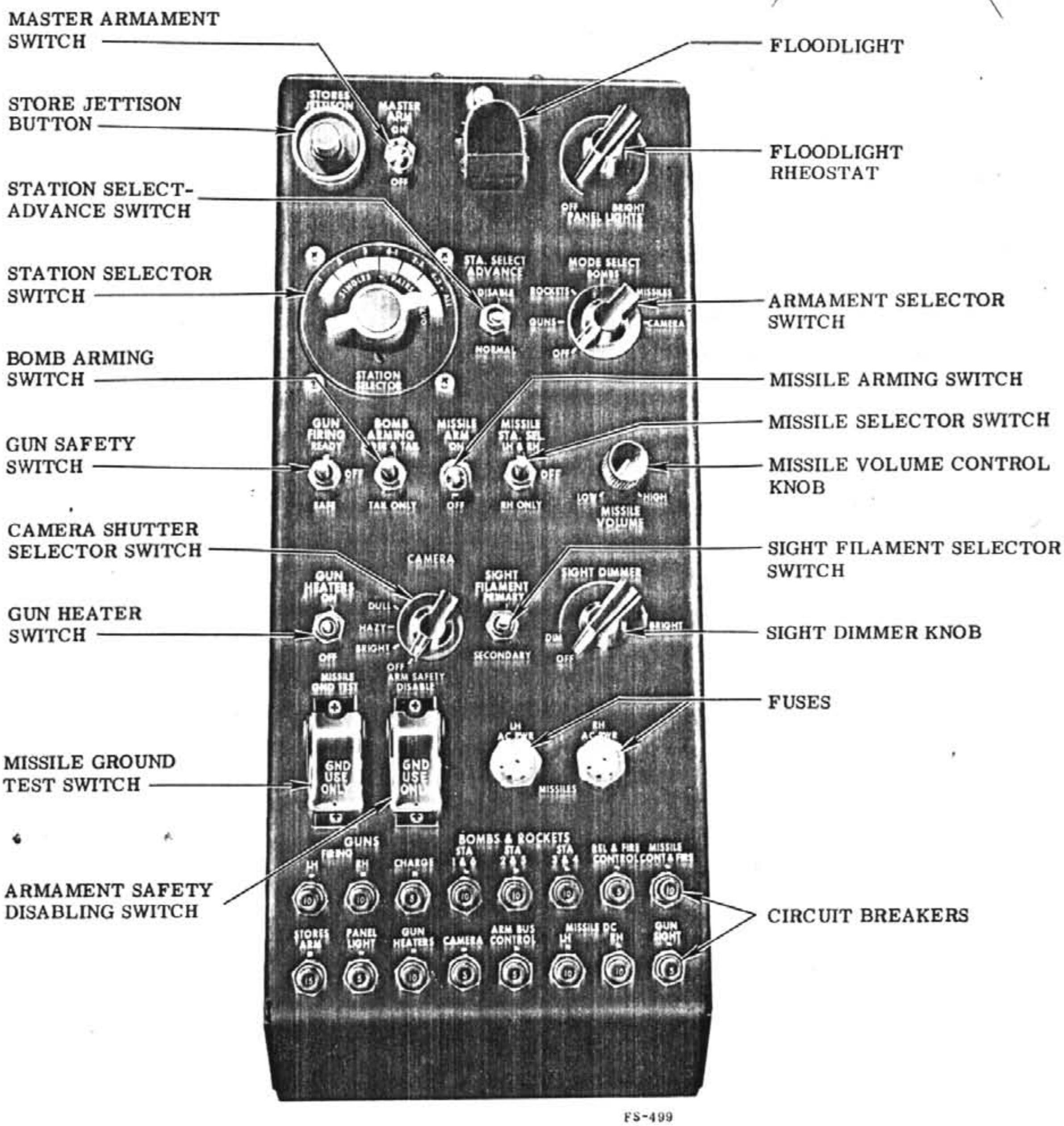
T-28B-1-60-4

Figure 4-9 (Sheet 2 of 6)

ARMAMENT CONTROL PANEL

T-28D AIRPLANES NOT CHANGED BY T.O. 1T-28-510 OR T.O. 1T-28A-546



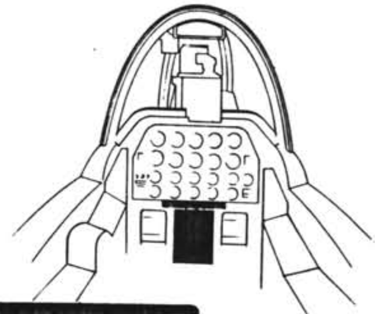


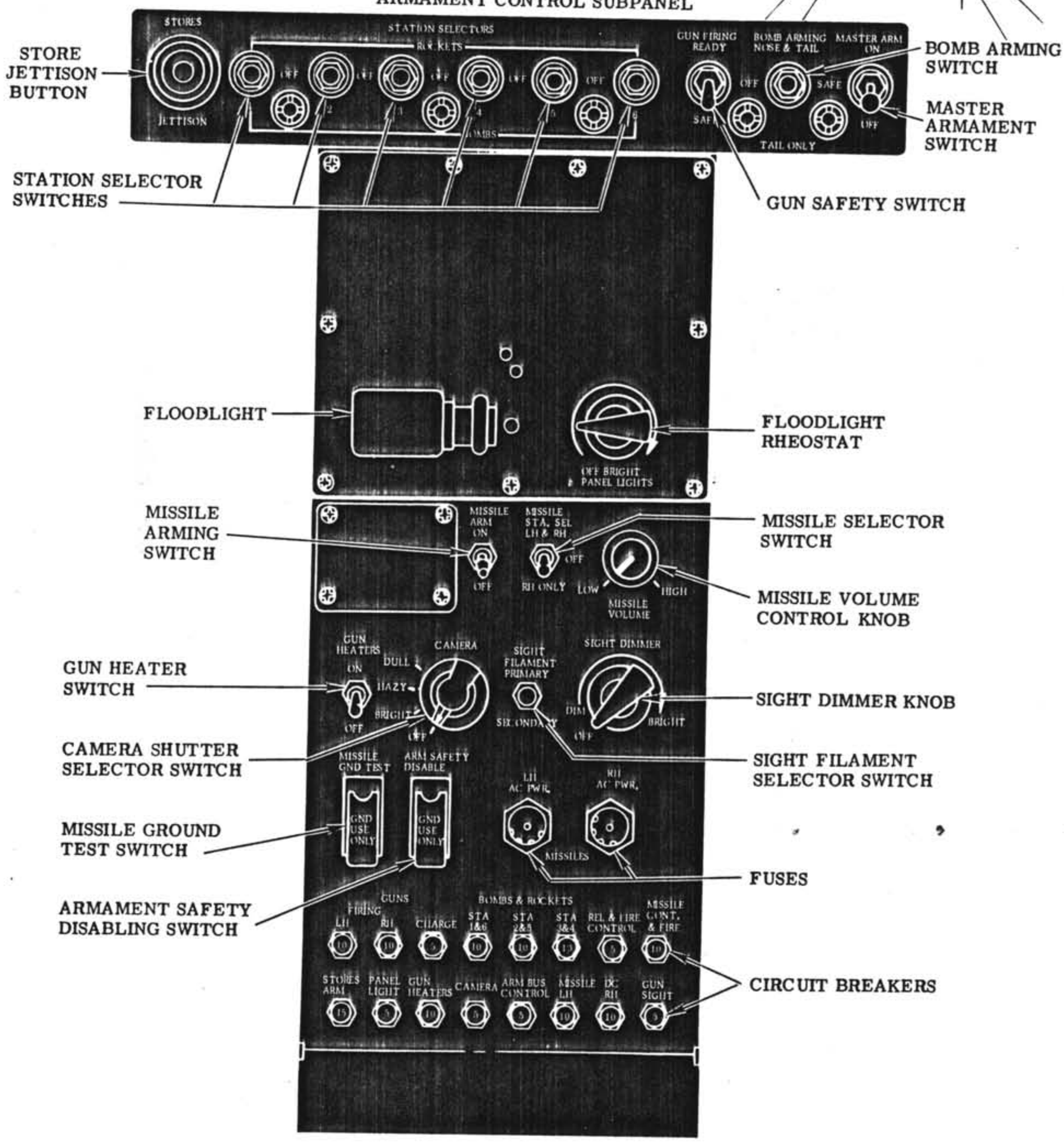
28B-1-60-2A

Figure 4-9 (Sheet 3 of 6)

ARMAMENT CONTROL PANEL

T-28D AIRPLANES CHANGED BY T.O. IT-28-510



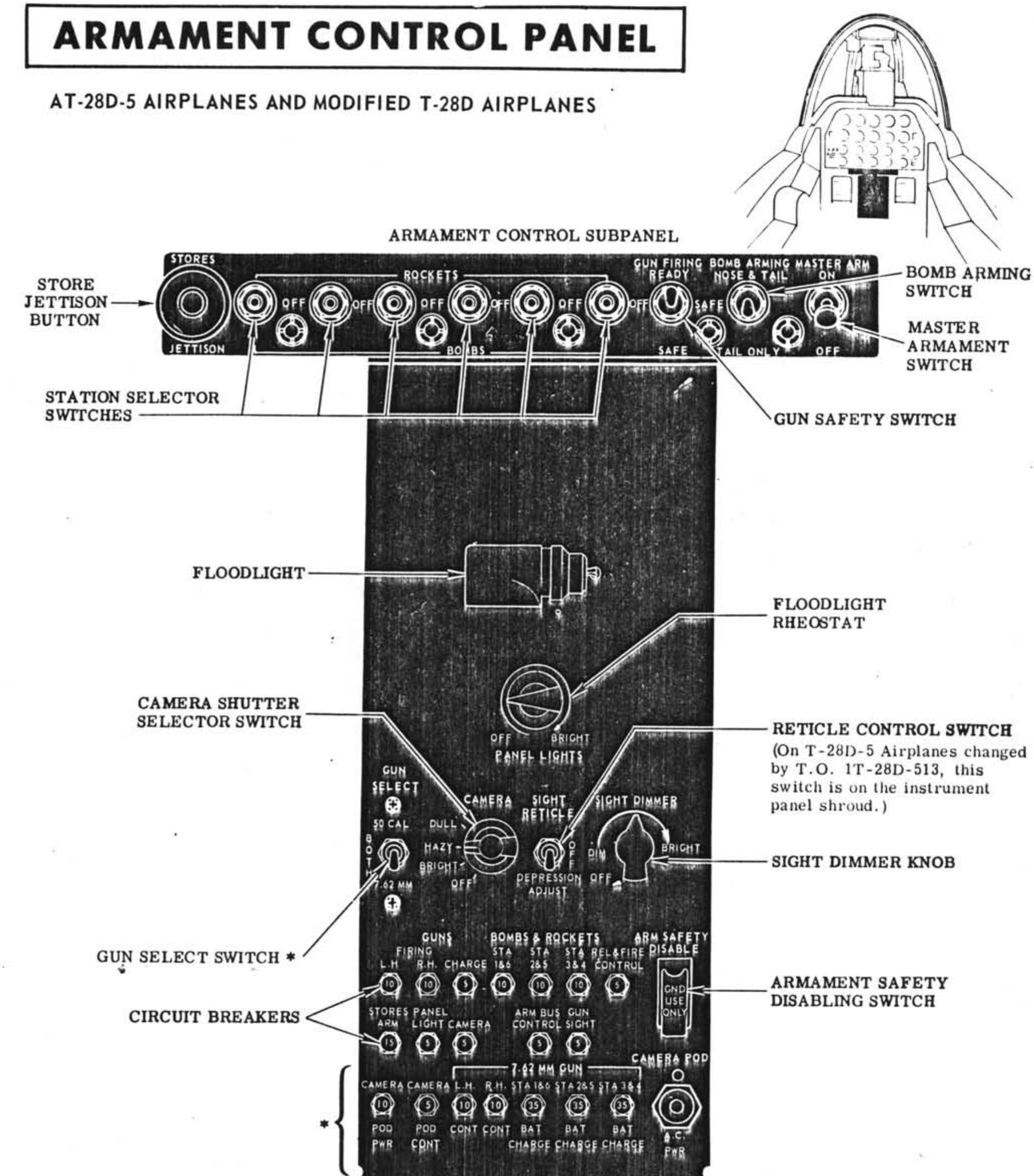


T-28B-1-60-3

Figure 4-9 (Sheet 4 of 6)

ARMAMENT CONTROL PANEL

AT-28D-5 AIRPLANES AND MODIFIED T-28D AIRPLANES



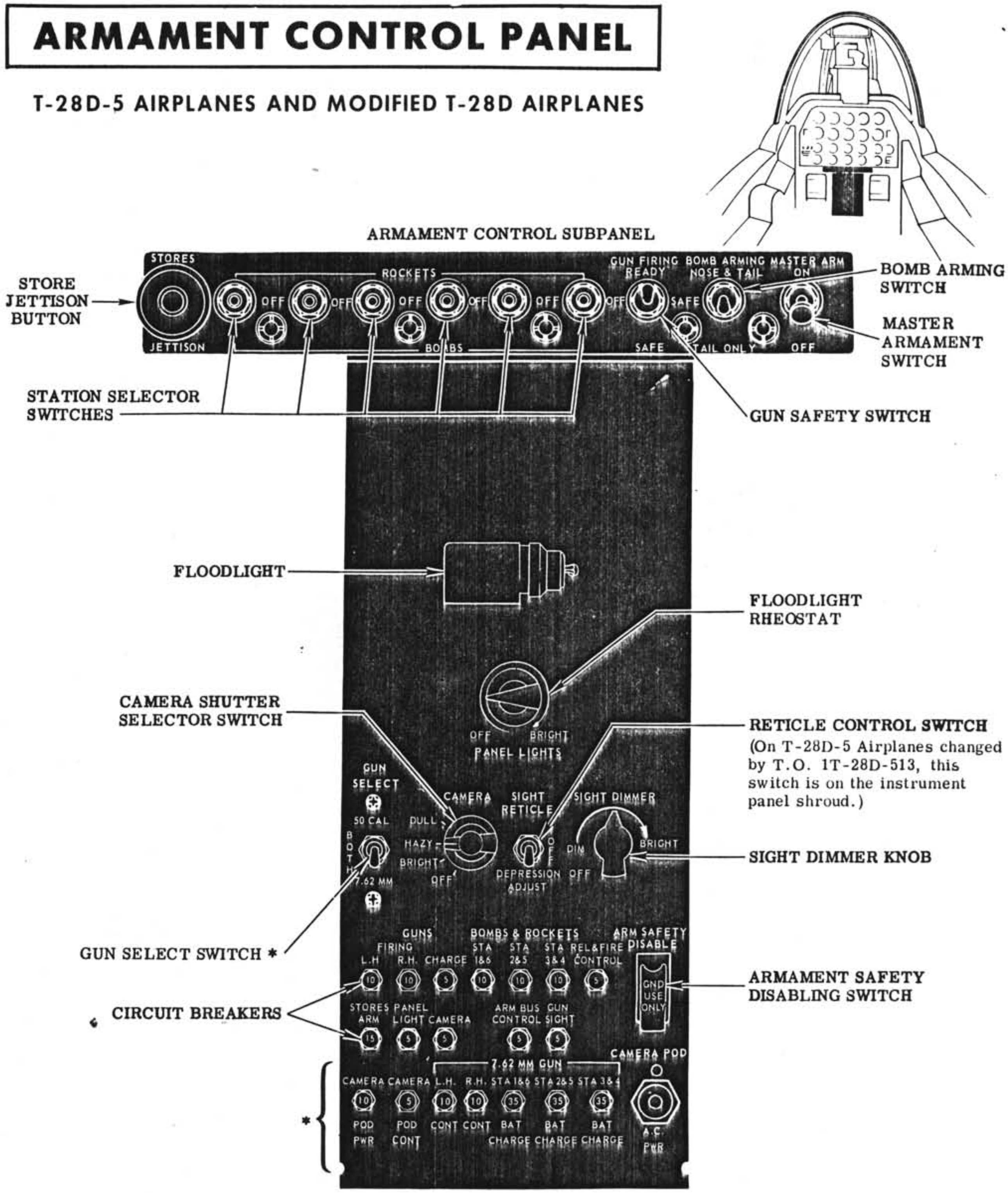
*AT-28D-5 Group II Airplanes

288-1-60-5C

Figure 4-9 (Sheet 5 of 6)

ARMAMENT CONTROL PANEL

T-28D-5 AIRPLANES AND MODIFIED T-28D AIRPLANES



* T-28D-5 Group II Airplanes

28B-1-60-5C

Figure 4-9 (Sheet 6 of 6)

3. (B/some D's) Gun heater switch - ON if outside air is 1.7°C (35°F) or lower.

4. (B/C) Fire control selector switch - GUNS.

5. Guns - Charge.

On airplanes with three-position gun safety switch, move switch to SAFE, OFF, and to READY.

On airplanes with two-position gun safety switch, move switch to SAFE, READY, SAFE, and back to READY.

6. (D-5 Group II Airplanes) Gun select switch - As desired.

.50-caliber pods or fixed guns - 50 CAL.

SUU-11A/A minigun pods - 7.62 MM.

.50-caliber pods or fixed guns and minigun pods - BOTH.

7. (D) Camera shutter selector switch - As desired.

8. (Some D's) Sight filament selector switch - PRIMARY, or SECONDARY if primary filament is out.

9. (B/C) Sight reticle selector switch - As desired.

10. (Some D's) Reticle control switch - SIGHT RETICLE.

11. Sight dimmer knob - As desired.

12. (Some D's) Sight head control knob - As desired.

13. (B/C) Fixed reticle masking lever - As desired.

14. (B/C) Target span lever - Set to target span.

15. (B/C) Twist sight range control to extreme clockwise position to cage sight gyro.

16. (B/C) Fly airplane so that target is continuously centered in reticle circle, and rotate throttle twist grip for ranging control until diameter of reticle circle corresponds to size of target.

17. (B/C) Continue operating range control, keeping target constantly framed within reticle circle.

18. Track target without slipping or skidding.

19. Press trigger.

NOTE If a stoppage is suspected, the guns can be cleared and recharged by moving the gun safety switch to SAFE and back to READY.

BOMBING EQUIPMENT.

Aero 15C-1 and 15D removable bomb racks have been adapted to the six store stations. One B-37K-1 bomb rack, containing four practice bombs, can be carried on the Aero 15C-1 or 15D rack at each intermediate station. Bomb selection, arming, and release are controlled by switches in the front cockpit. Bomb sighting is done with the Mark 8 or the N-9-1 sight.

Bombing Equipment Controls.

MASTER ARMAMENT SWITCH. Refer to "Gunnery Equipment Controls" in this section.

FIRE CONTROL SELECTOR SWITCH. Refer to "Mark 8 Sight Controls - T-28B and T-28C Airplanes" in this section.

ARMAMENT SELECTOR SWITCH.* Refer to "Gunnery Equipment Controls" in this section.

STATION SELECTOR SWITCH.* The setting of the station selector switch, on the armament control panel (figure 4-9), determines the rocket firing or bomb release sequence. The switch has seven positions (1, 5, 3, 6-1, 2-5, 4-3, and ALL) above a white blocked semicircle, and three positions (SINGLES, PAIRS, and SALVO) below the semicircle. With the switch at 1, above the SINGLES side of the semicircle, pressing the bomb button or the rocket-firing button releases bombs or fires the rockets (depending upon the setting of the armament selector switch) from wing station No. 1, and a station advance coil immediately moves the station selector switch to the next station. This sequence continues until all stations are fired or released. The rocket firing or bomb release sequence is 1, 5, 3, 6, 2, and 4. To fire or release the stations in pairs, the station selector switch should be turned to the 6-1 position above the PAIRS side of the semicircle. Pressing the bomb button or the rocket-firing button will then release the bombs in pairs or the rockets, with the station selector advancing to the next station pair until all stations are released or fired. The pairs release or firing sequence is 6-1, 2-5, and 4-3. The switch can be turned to any desired position by actuating the station select-advance

*T-28B and T-28D Airplanes not changed by T.O. 1T-28-510, and T-28C Airplanes switch. To ensure release of all rockets carried, the switch should not be moved to any intermediate position between SINGLES -1 and PAIRS 6-1 before initial firing, unless individual stations are to be selected. Practice bombs are released from the B-37K-1 rack with the selector switch set at the same position as for conventional bombs. If it is desired to drop more than one bomb from the B-37K-1 practice rack, the station select-advance switch must be turned to DISABLE before the bomb button is pressed, to prevent the station selector switch moving to the next station; then, with each depression of the bomb button, a single (or pair) of practice bombs will be released from the rack. Turning the station selector switch to SALVO ALL and pressing the bomb button simultaneously releases all (except practice) bombs and rockets. Gun pods cannot be released. The switch is powered by the armament bus.

STATION SELECT-ADVANCE SWITCH.* This switch, labeled "STA SELECT ADVANCE," is on the armament control panel (figure 4-9) and has a DISABLE and a NORMAL position. Moving the switch to DISABLE disconnects the station advance coil from the station selector switch and permits individual station selectivity. The station selector switch must then be turned to the desired station(s). The station select-advance switch is powered by the armament bus.

STATION SELECTOR SWITCHES.† Six station selector switches, on the armament control subpanel (figure 4-9), control bomb release and rocket firing from each of the wing store stations. Moving any switch from OFF to BOMBS or ROCKETS (master armament switch at ON) and pressing the bomb button or rocket-firing button releases the bomb or fires the rockets from the station corresponding to the switch moved. With any switch at ROCKETS, gun camera operation is automatic when the bomb button or the rocket-firing button is pressed. However, on T-28D Airplanes, the camera shutter selector switch must be away from OFF. A "pairs" or "salvo all" condition can be obtained by moving the switches in pairs, or moving all switches to BOMBS or ROCKETS before pressing the bomb button or the rocket-firing button.

NOTE If a station selector switch is at BOMBS, with a rocket or rocket pod at that station, the rocket or pod will be released when the bomb button is pressed, if the applicable bomb (store) select switch (in wheel well) is in the normal position. If a station selector switch is at ROCKETS, with a bomb at that station, the bomb will not release when the bomb button or the rocket-firing button is pressed.

The station selector switches are powered by the armament bus.

BOMB ARMING SWITCH. Arming of the bombs is controlled by armament bus power through the bomb arming switch on the armament control panel, figure 4-9 (armament control subpanel on some airplanes). Bombs carried on the practice bomb rack contain no explosive and are, therefore, not armed. With the arming switch at SAFE (center), the bombs are released unarmed. Setting the switch at NOSE & TAIL arms both nose and tail fuzes for detonation of the bomb on contact. With the switch at TAIL ONLY, the bombs are armed for delayed detonation.

DIVE ANGLE SWITCH - T-28B AND T-28C AIRPLANES. The dive angle switch, on the armament control panel (figure 4-9), is used during bomb release and rocket firing. For attack angles between 0 and 35 degrees, the switch is set at 35 & UNDER; for attacks of 35 degrees or more, the switch is set at 35 & OVER. For a dive angle near 35 degrees, either setting gives satisfactory results, so that accurate estimation of dive angle by the pilot is unnecessary. The switch is powered by the armament bus.

BOMB BUTTON. The bomb button is on the control stick grip (figure 1-15) in the front cockpit. On T-28B, T-28C, and T-28D-5 Airplanes, and T-28D Airplanes changed by T.O. 1T-28D-507, armament bus power is supplied to the bomb-release circuits through this button. On other T-28D Airplanes, armament bus power is also supplied to the rocket-firing circuits through this button. With the associated switches properly positioned, bombs are released (and rockets are fired on some T-28D Airplanes) when the button is pressed.

STORE JETTISON BUTTON. This ring-guarded button, on the armament control panel, figure 4-9 (armament control subpanel on some airplanes), is labeled "STORES JETTISON," and is used to jettison bombs and rockets, simultaneously. The .50-caliber gun pods cannot be jettisoned. All rocket launchers and bomb racks (except practice bomb racks) remain with the airplane. On T-28D-5 Group II Airplanes, the "STORES JETTISON" button will also jettison camera pods, external fuel tanks, and minigun pods, if installed. The store jettison button is wired directly to the battery, permitting release of bombs and rockets regardless of the position of the generator or battery switches. Pressing this button does not interrupt the bomb-arming circuits, and bombs drop armed or unarmed according to the setting of the bomb-arming switch.

*T-28B and T-28D Airplanes not changed by T.O. 1T-28-510, and T-28C Airplanes
†T-28B and T-28D Airplanes changed by T.O. 1T-28-510, and T-28D-5 Airplanes

WARNING

The bomb-arming switch should be placed at OFF before the store jettison button is pressed to prevent dropping the bombs in an armed condition. When the store jettison button is pressed, rockets drop unarmed.

- Bombs and rockets cannot be jettisoned when the weight of the airplane is on the landing gear, unless the armament safety disabling switch is at DISABLE.

- When using store jettison button to jettison stores, if stores fail to release, release stores by using bomb release procedures.

BOMB SELECT SWITCHES. Six bomb select switches, one for each store station, are on the aft side of the wheel wells. When the B-37K-1 practice bomb rack is carried, the bomb select switch corresponding to the station at which the practice bomb rack is carried must be placed at PRACTICE PACKAGE to preclude inadvertent dropping of the rack. The practice bomb racks can be jettisoned, however, by the store jettison button regardless of bomb select switch positions.

STORE SELECT SWITCHES - T-28D-5 GROUP II AIRPLANES. Six store select switches, one for each store station, are on the aft side of the wheel wells. When either B37K-1 practice bomb racks, external fuel tanks, camera pods, or minigun pods are carried, the switches corresponding to the applicable station must be positioned for that particular store to preclude an inadvertent release. All stores can be jettisoned, however, by the store jettison button regardless of the store select switch position.

Releasing Bombs.

1. Master armament switch - ON.

2. (Some D's) Sight filament selector switch - PRIMARY, or SECONDARY if primary filament is out.

3. (Some D's) Sight head control knob - As desired.

4. (B/C) Sight reticle selector switch - GYRO or FIXED & GYRO.

5. (B/C) Fixed reticle masking lever - As desired.

6. (B/C) Sight range control twist grip - Full clockwise.

7. Sight dimmer knob - As desired.

8. (B/C/D)* Armament selector switch - BOMBS.

9. (Some D's) Reticle control switch - DEPRESSION ADJUST.

10. (B/C/D)* Station selector switch - As desired.

11. (B/C/D)* Station select-advance switch - As desired.

12. (B/D)† Station selector switches - BOMBS at stations selected.

13. (B/C) Fire control selector switch - BOMBS.

14. Bomb arming switch - As desired.

15. (B/C) Dive angle switch - As desired.

16. Keep pipper on target and track target smoothly.

17. Press bomb button.

Emergency Bomb Release.

To jettison bombs in an emergency, press the store jettison button.

WARNING

The bomb arming switch should be placed at OFF before the store jettison button is pressed, to prevent dropping the bombs in an armed condition.

ROCKET EQUIPMENT.

Each of the six wing store stations can accommodate various rocket pods containing several 2.75-inch FFA rockets. The rockets and pods are mounted on an Aero 15C-1 or 15D combination bomb rack and rocket launcher. Rocket stations are fired individually, in paris, or in salvo, depending upon the setting of the station selector switch (switches). The contents of a single pod or pairs of pods are ripple-fired with each depression of the bomb button on some T-28D Airplanes, or the rocket-firing button T-28B, T-28C, and other T-28D Airplanes.

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*T-28B and T-28D Airplanes not changed by T. O. 1T-28-510, and T-28C Airplanes
†T-28B and T-28D Airplanes changed by T. O. 1T-28-510, and T-28D-5 Airplanes

Rocket Equipment Controls.

MASTER ARMAMENT SWITCH. Refer to "Gunnery Equipment Controls" in this section.

FIRE CONTROL SELECTOR SWITCH. Refer to "Mark 8 Sight Controls - T-28B and T-28C Airplanes" in this section.

ARMAMENT SELECTOR SWITCH.* Refer to "Gunnery Equipment Controls" in this section.

STATION SELECTOR SWITCH.* Refer to "Bombing Equipment Controls" in this section.

STATION SELECT-ADVANCE SWITCH.* Refer to "Bombing Equipment Controls" in this section.

STATION SELECTOR SWITCHES.† Refer to "Bombing Equipment Controls" in this section.

DIVE ANGLE SWITCH - T-28B AND T-28C AIRPLANES. Refer to "Bombing Equipment Controls" in this section.

BOMB BUTTON. Refer to "Bombing Equipment Controls" in this section.

STORE JETTISON BUTTON. Refer to "Bombing Equipment Controls" in this section.

ROCKET-FIRING BUTTON. The rocket-firing button is on the control stick grip (figure 1-15) in the front cockpit. On T-28B, T-28C, T-28D-5 and T-28D-10 Airplanes, armament bus power is supplied to the rocket-firing circuits through this button. On T-28D Airplanes changed by T. O. 1T-28D-507, armament bus power is supplied to the rocket-firing circuits through this button. With the associated switches properly positioned, rockets are fired when the button is pressed.

Firing Rockets.

1. Master armament switch - ON.
2. (Some D's) Sight filament selector switch - PRIMARY, or SECONDARY if primary filament is out.
3. (Some D's) Sight head control knob - As desired.
4. (B/C) Sight reticle selector switch - GYRO or FIXED & GYRO.
5. (B/C) Fixed reticle masking lever - As desired.
6. (B/C) Sight range control twist grip - Full clockwise.
7. Sight dimmer knob - As desired.
8. (B/C/D)‡ Armament selector switch - ROCKETS.
9. (B/C/D)‡ Station selector switch - As desired.
10. (B/C/D)‡ Station select-advance switch - As desired.
11. (B/D)§ Station selector switches - ROCKETS at stations selected.
12. (Some D's) Reticle control switch - DEPRESSION ADJUST.
13. (B/C) Fire control selector switch - ROCKETS.
14. (B/C) Dive angle switch - As desired.
15. (D) Camera shutter selector switch - As desired.
16. Keep pipper on target and track target smoothly.
17. Press bomb button or rocket-firing button.

    After the rockets are fired, on some T-28B and T-28D Airplanes, the pods can be released by moving the applicable station selector switch to BOMBS and pressing the bomb button, if the bomb (store) select switches (in the wheel wells) are in the normal position.

Emergency Rocket Release.

To jettison rockets in an emergency, press the store jettison button.

RECONNAISSANCE CAMERA SYSTEM – T-28C AND AT-28D AIRPLANES CHANGED BY T.O. 1T-28-514.

The reconnaissance camera system consists of two KA20B 6-inch lens cone cameras and one K-38 24-inch lens cone camera for low-altitude, low-speed aerial reconnaissance. The camera controls are in the front cockpit. All cameras are housed in the area formerly occupied by the baggage compartment, and are completely enclosed by a large external blister (figure 4-10) on the lower fuselage. The battery has been moved from the aft fuselage to the nose wheel well, and the speed brake has

* T-28B and AT-28D Airplanes not changed by T.O. 1T-28-510, and T-28C Airplanes
† T-28B and AT-28D Airplanes changed by T.O. 1T-28-510, and AT-28D-5 Airplanes
‡ T-28B and AT-28D Airplanes not changed by T.O. 1T-28-510
§ Airplanes changed by T.O. 1T-28-510

RECONNAISSANCE CAMERA INSTALLATION

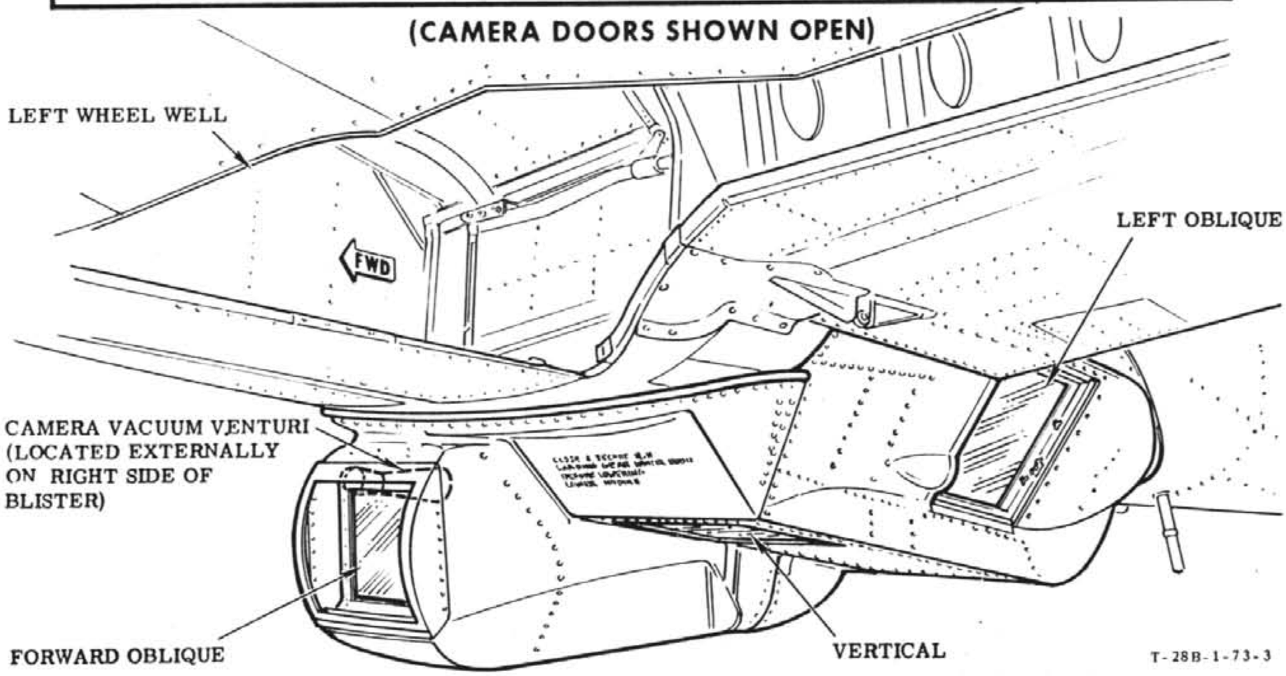

Figure 4-10

been removed from T-28C Airplanes, to accommodate this installation. One KA-20B camera is mounted in a left oblique attitude; the other, vertically. The K-38 camera is mounted in a forward oblique attitude. The camera windows are protected by electrically controlled, hydraulically operated sliding doors that are opened automatically when the camera master switch is turned on.

The left oblique and vertical cameras are controlled by a common intervalometer, and a separate intervalometer controls the forward oblique camera. An exposure counter is provided for each camera. The left oblique and vertical cameras incorporate an image motion compensation (IMC) feature that moves the film during exposure so that it is synchronized with the forward movement of the image to prevent smearing and blurring. A filtered air vacuum system creates suction within each camera magazine to hold the film flat, ensuring a true image during exposure. This vacuum is created externally through a venturi tube (figure 4-10) that extends from the camera blister.

RECONNAISSANCE CAMERA SYSTEM CONTROLS AND INDICATORS.

Camera Master Switch.

Moving the camera master switch, on the camera control panel (figure 4-11), to ON electrically energizes a hydraulic selector valve that directs hydraulic pressure to open all three camera doors. With the switch at ON, a camera "ready" light comes on and stand-by power is supplied to the camera intervalometers and IMC amplifiers. With the switch at OFF, the camera doors close and electrical power is removed from the camera system. The switch is powered by the main (primary) bus.

Caution The camera master switch should be at OFF before take-off, for all flights, to keep the camera doors closed.

Camera "Ready" Light.

This amber press-to-test light, on the camera control panel (figure 4-11), comes on when the camera master switch is moved to ON, indicating the camera doors are open and current is available to the camera system. The light is powered by the main (primary) bus.

Camera Intervalometers.

Two Type B-9A intervalometers, one for the forward oblique camera and one for the left oblique and vertical cameras, on the intervalometer control panel (figure 4-11), set up the time interval between successive camera exposures. This

RECONNAISSANCE CAMERA CONTROLS

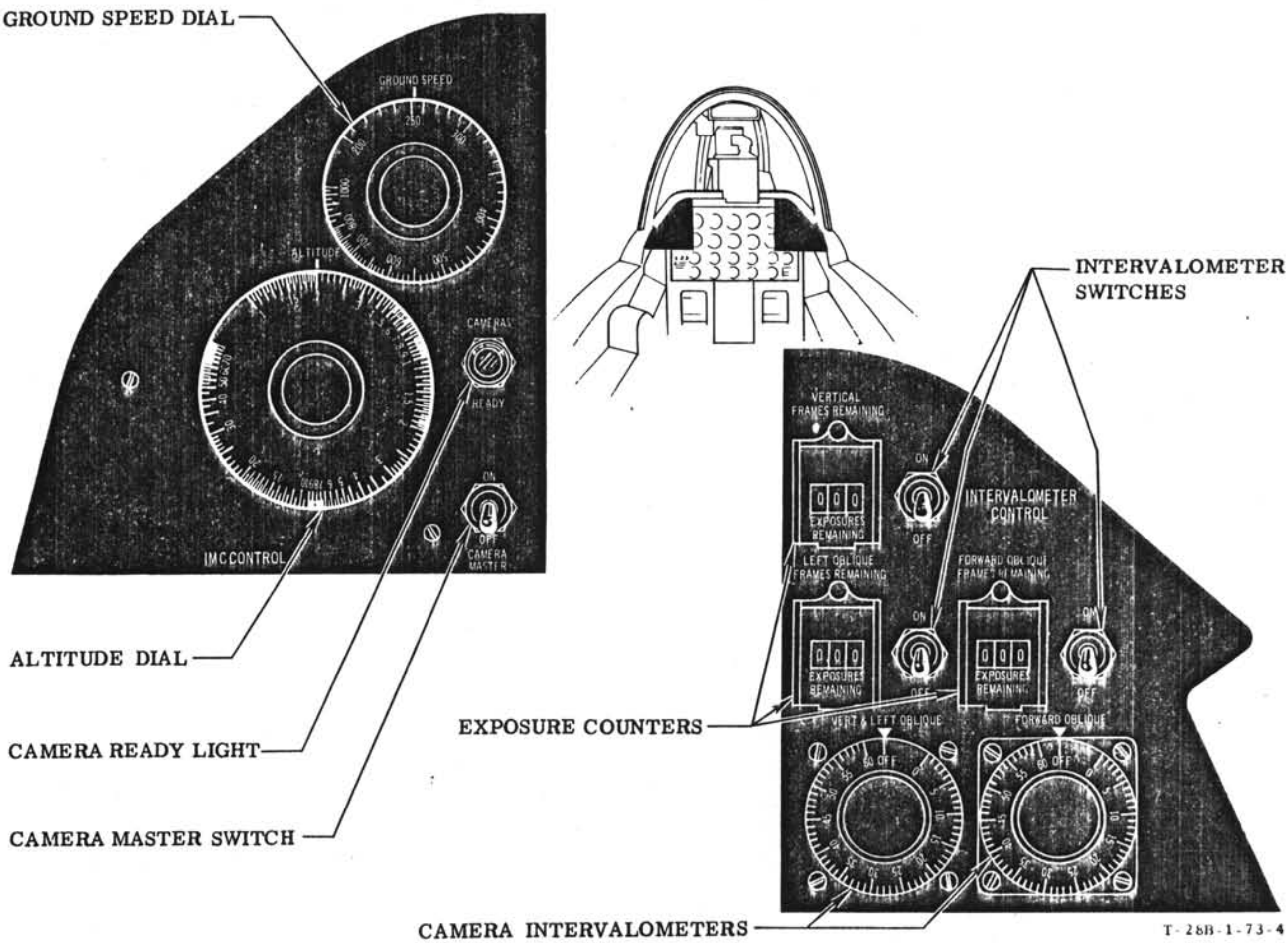

Figure 4-11

interval between successive pulses may be changed instantly at any time by turning a knob in the front of the intervalometer to the desired pulse interval. In the face of the interval knob is a rotatable, visible scanning arm to facilitate observing the progress of the timing cycle. The angular distance through which this arm is rotated from an adjustable backstop to a contact assembly determines the interval between pulses. After completion of the camera impulse, the scanning arm returns instantly to the backstop. Turning the interval knob changes the position of the backstop to which the scanning arm returns at the end of each cycle. A dial at the base of the interval knob is calibrated in seconds from 1 to 60, with numerals in 5-second increments. The range of the intervalometer is from one pulse every 1/2 second to one pulse every 60 seconds. The intervalometers may be equipped with interval knobs calibrated in seconds from 1 to 120, with numerals in 10-second increments, in which case the range is from one pulse every second to one pulse every 120 seconds. The intervalometers can be turned on (camera master switch ON) and off by switches adjacent to them, or they can be turned off by rotating the interval knob counterclockwise to OFF. The intervalometers are powered by the main (primary) bus.

Intervalometer Switches.

The intervalometers may be turned on (camera master switch ON), or operation of the intervalometers may be interrupted any time, by use of the intervalometer switches on the intervalometer control panel. (See figure 4-11.) One switch controls the forward oblique camera intervalometer, while the other two switches control the left oblique and vertical cameras through the common intervalometer. This intervalometer will function whenever either (or both) the left oblique or the vertical switch is ON, but the camera itself will not function unless its respective switch is ON. Moving the switches to OFF opens the electrical circuit from the main (primary) bus to the intervalometers and, thus, turns off the cameras. The cameras will not operate if their respective doors are not open.

Exposure Counters.

Three subtractive-type counters, one for each camera, are on the intervalometer control panel. (See figure 4-11.) The counters are energized during camera operation and indicate the remaining number of exposures for the related camera. The counters can be set by pulling outward on the lower end of the hinged cover, pressing the desired counter wheel to the right, and then moving the wheel upward or downward to the desired digit. The counters are powered by the main (primary) bus.

Ground Speed - Altitude Dials.

These dials, on the camera control panel (figure 4-11), when rotated to a predetermined setting, provide armament bus voltage inputs to the left oblique and vertical camera IMC amplifiers. This velocity-height information is then used to turn the left oblique and vertical camera motors to a speed that will move the film across the plate at a correct rate synchronous with forward image movement. The ground speed dial is graduated in knot increments from 200 to 1000. The altitude dial is graduated in thousands of feet from .1 (100 feet) to 70. There is no IMC control for the forward oblique camera.

Camera Ground Safety Disabling Switch.

This switch, in the camera blister, permits the camera system to be operated on the ground. Normally, the switch is at NORMAL (switch guard down) and the camera electrical circuit is disconnected when the airplane is on the ground. When moved to DISABLE, the switch overrides the landing gear ground safety switch to energize the camera circuits.

RECONNAISSANCE CAMERA SYSTEM OPERATION.

Preflight Check.

1. Camera doors - Check closed.
2. Camera vacuum venturi tube - Clear.
3. Camera ground safety disabling switch - NORMAL
4. Camera master switch - OFF
5. Camera "ready" light - Out.
6. Intervalometers - Set at desired interval.
7. Exposure counters - Set.

In-flight Operation.

1. Camera master switch - ON.
2. Camera "ready" light - On.
3. Ground speed-altitude dials - Set.
4. Intervalometer switches - ON.
5. Camera master switch - OFF when camera operation is completed.

STRIKE/RECONNAISSANCE CAMERA SYSTEM—T-28D-5 GROUP II AIRPLANES.

The E-3(M) camera system provides still or motion picture strike recording, damage assessment, and low-altitude reconnaissance. The system consists of the E-3(M) camera pod (figure 4-12) attached to the left outboard station store rack and the camera controls in the front cockpit. The camera pod has mounting provisions for three motion picture cameras providing coverage in forward and aft oblique or vertical positions. The P-2, 70 mm strike camera can be carried at all three pod stations, or the Milliken 16 mm camera can be carried at the forward or aft oblique stations. The P-2 camera can be mounted at angles of 10, 20, or 30 degrees below horizontal for use at the forward station, and at angles of 10, 20, or 30 degrees below horizontal at the aft station. The Milliken camera may be mounted in the forward or aft stations at a depression angle of 5 degrees. The prime angle for the vertical (P-2) camera is 90 degrees. The Milliken camera provides wide-angle coverage; the P-2 camera provides general coverage. Camera pod power is provided by the main dc bus.

FORWARD CAMERA STATION.

With either the P-2 or the Milliken camera installed, the forward oblique station is primarily for strike recording of strafing or rocket deliveries. Best results are achieved by starting the forward camera after the target is acquired and stopping during pull-out.

AFT CAMERA STATION.

With either the P-2 or the Milliken camera installed, the aft oblique station is primarily for strike recording of dive bomb deliveries, weapon impacts, and secondary explosions. Best results are achieved by operating the camera at 1.0-second intervals for 10 seconds during pull-out.

NOTE If the situation dictates that evasive action be taken following delivery, loss in camera coverage must be accepted.

E-3(M) CAMERA POD INSTALLATION

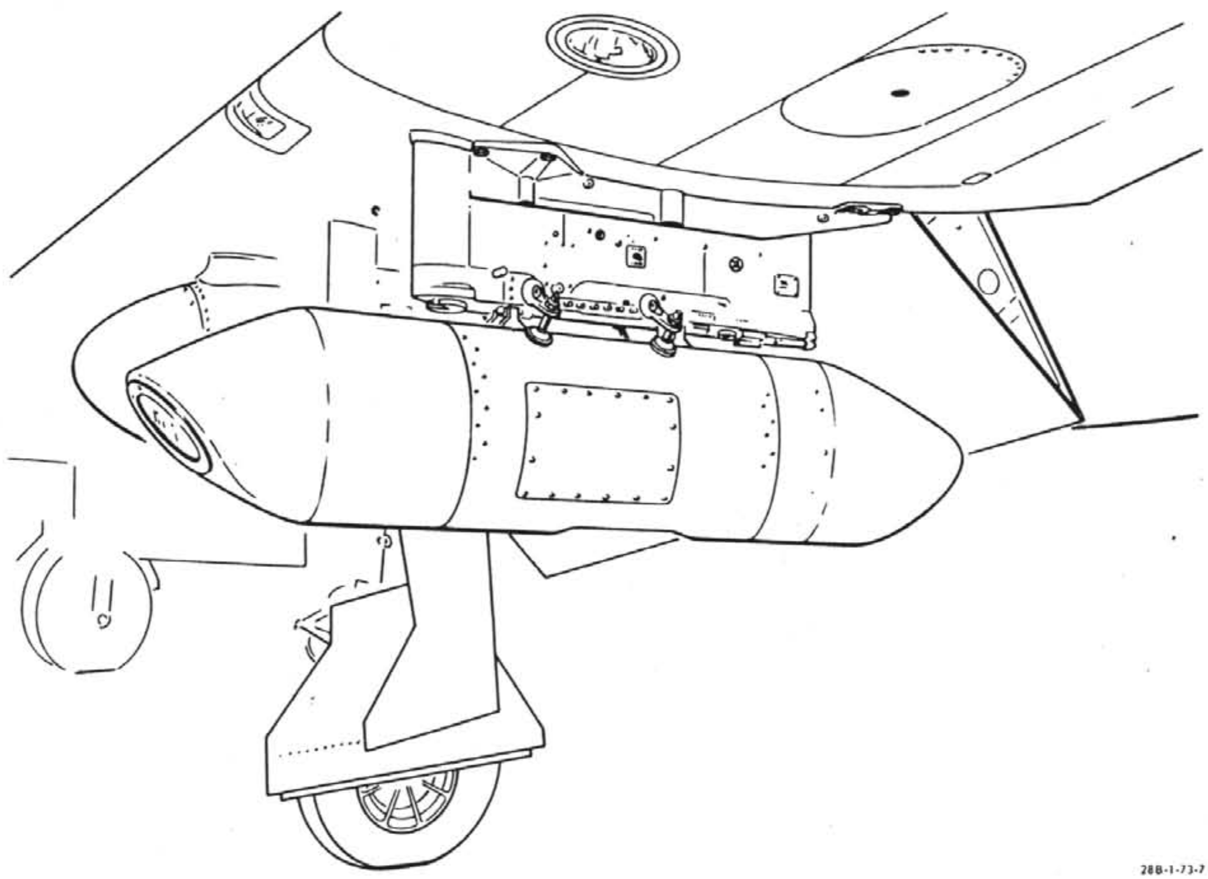

Figure 4-12

VERTICAL CAMERA STATION.

The vertical (P-2) camera is primarily for general reconnaissance coverage, but may be used with good results for strike recording damage during delivery pull-out. Best assessment is obtained by operating the vertical camera for about 10 seconds at an intervalometer setting of 1.0 during pull-out.

STRIKE/RECONNAISSANCE CAMERA SYSTEM CONTROLS AND INDICATOR.

Camera Power Switch.

The ON position of the camera power switch (figure 4-13) applies power to all cameras as selected through the camera select switches. With the switch ON, the green "CAMERA POWER" light is on.

Camera Select Switches.

Forward, vertical, or aft station camera operation can be selected or preselected through the three camera select switches. (See figure 4-13.) Recommended procedure is to set the desired switches to the required MILLIKEN CAMERA-ON or P-2 CAMERA-ON positions, and to control on-off operation through the camera power switch.

NOTE If a camera select switch is moved to the MILLIKEN CAMERA-ON position with a P-2 camera installed in the corresponding pod position, the intervalometer setting is bypassed and the P-2 camera cycles at maximum rate (five to six cycles per second).

STRIKE/RECON CAMERA CONTROLS

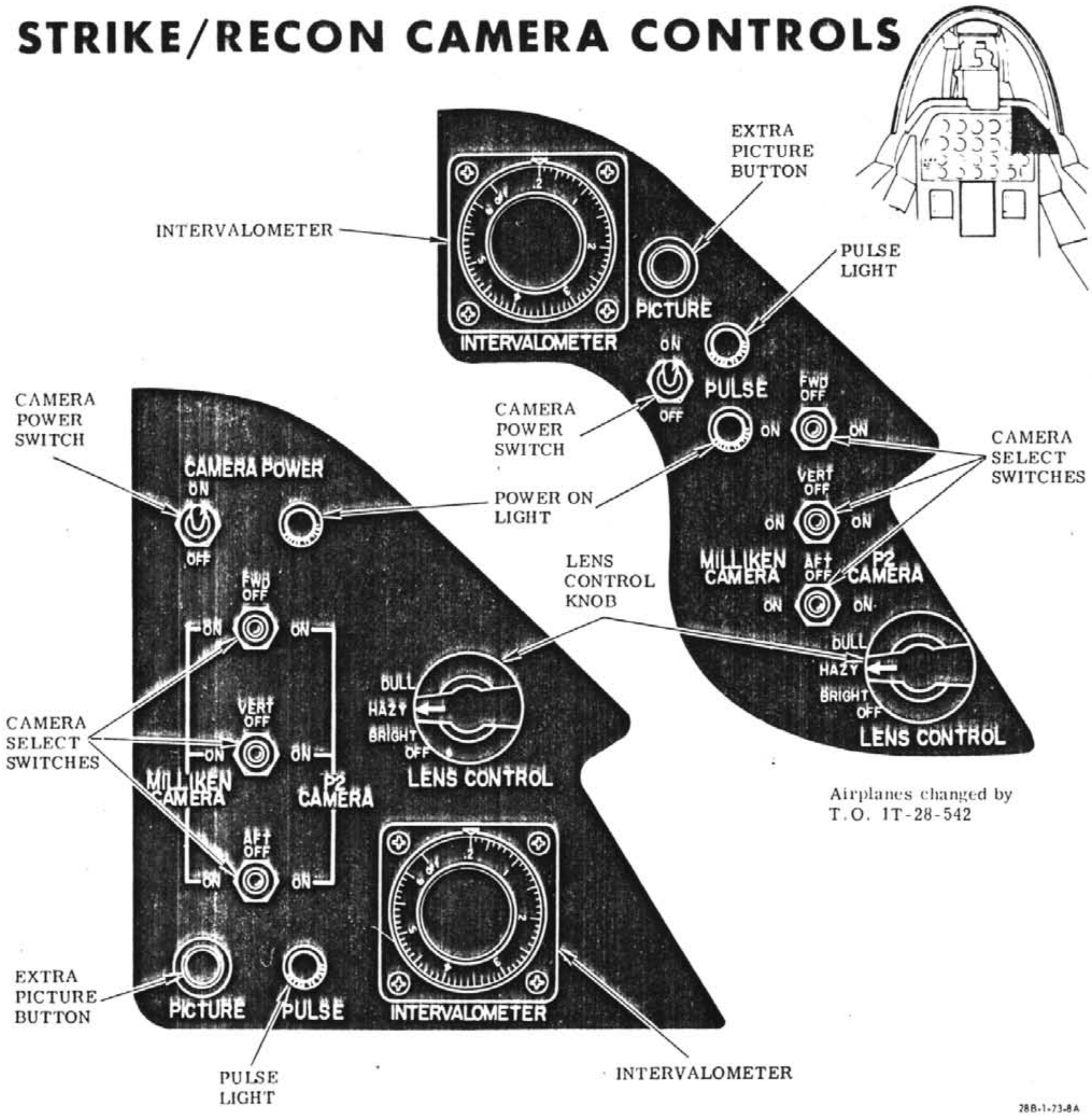

Figure 4-13

Lens Control Knob.

The lens control knob (figure 4-13) is used to preset the lens diaphragm of P-2 cameras for BRT (bright), HAZY, or DULL conditions. The knob does not operate the lens diaphragm of the Milliken camera.

Intervalometer Knob.

The intervalometer knob (figure 4-13) provides P-2 camera exposure interval settings from 0.2 to 6.0 seconds, in increments of 0.05 second. The OFF position renders the camera select switches inoperative for P-2 cameras. A setting of 0.2 second provides the maximum P-2 camera exposure rate of five per second. The Milliken camera contains an integral intervalometer and is not controlled by the intervalometer knob.

Extra-picture Button.

The extra-picture button (figure 4-13) provides the pilot with the option of taking an extra single exposure on the P-2 cameras, overriding the intervalometer knob setting for P-2 cameras.

Pulse Light.

The pulse light (figure 4-13) illuminates on each exposure signal from the P-2 camera intervalometer or when the extra "PICTURE" button is depressed for any selected camera.

NOTE The pulse light indicates operation of intervalometer pulsing or operation of the extra-picture circuit and does not directly indicate proper camera operation.

STRIKE/RECONNAISSANCE CAMERA SYSTEM OPERATION.

General Reconnaissance.

1. Approaching target, set intervalometer knob to precomputed interval for P-2 cameras.

2. Move desired camera select switches to ON (Milliken or P-2).

3. Entering target area, move camera power switch to ON and note illumination of camera power light and flasing of pulse light.

4. Depress extra-picture button as desired, noting illumination of "PULSE" light.

5. After run, move camera power switch and camera select switches to OFF.

6. Enter all target information on photo log.

Strike Recording.

1. Approaching target, set intervalometer knob as required for P-2 cameras (1.0 second for strafe and rockets, 0.5 second for dive bomb).

2. Check all camera select switches are OFF.

3. Move camera power switch to ON.

NOTE The pulse light will illuminate, but exposures will not be taken until a camera select switch is moved to ON. If only a Milliken camera is selected, the pulse light will not flash.

Strafe or Rocket Delivery.

1. After initiating pass, move "FWD" camera select switch to required ON position.

2. After initiating pull-out, move "FWD" camera select switch to OFF.

3. As nose approaches horizon, move "VERT" camera select switch to ON.

NOTE If secondary explosion is noted, place "AFT" camera select switch at ON. The airplane must be maintained in a wings-level attitude to obtain optimum coverage. If evasive action is required, do not operate the vertical and aft cameras.

4. Move all camera select switches to OFF when starting turn or after 10 seconds.

Dive/Glide Bomb Delivery.

1. After initiating pass, move "FWD" camera select switch to ON.

2. After initiating pull-out, move "FWD" camera select switch to OFF.

3. As nose approaches horizon, move "VERT" and "AFT" camera select switches to ON.

4. Move all camera select switches to OFF when starting turn or after 10 seconds.

Laydown Delivery.

1. After acquiring target during run-in, move "FWD" camera select switch to ON.

2. Immediately before release, move "AFT" camera select switch to ON and "FWD" camera select switch to OFF.

3. Move all camera select switches OFF when starting turn.

MISCELLANEOUS EQUIPMENT.

FLIGHT REPORT HOLDER.

A canvas flight report holder (9, figure 1-4) is in each cockpit on the side of the left console next to the seat.

INSTRUMENT-FLYING HOOD.

Some airplanes have an instrument-flying hood mounted behind the seat in the rear cockpit. Other airplanes have provisions only for this equipment. The hood can be stowed at the back of the cockpit when not in use. The cockpit can be enclosed for instrument-flight training by pulling the hood forward and engaging it with the snap below the handhold on the instrument panel shroud. The hood is provided with a spring (and a strap on T-28D Airplanes changed by T.O. 1T-28-517) to hold it in the stowed position.

RELIEF TUBE.

A relief tube is stowed under each seat. On airplanes changed by T.O. 1T-28-542, the relief tube in each cockpit is stowed below the right console.

ASH TRAY.

Each cockpit has an ash tray under the right canopy track.

REARVIEW MIRROR.

A rearview mirror is at the top of the windshield in the front cockpit.

BAGGAGE COMPARTMENT - T-28C AND T-28D AIRPLANES NOT CHANGED BY T.O. 1T-28-514, AND T-28B AIRPLANES.

The baggage compartment is reached through a door in the bottom of the fuselage. Two levers on the door must be pulled down to open the door. The compartment is made of fabric, with the bottom of the fuselage as the floor. Zippers in the fabric provide an entrance into the baggage compartment. A baggage tie-down loop is provided on the floor in each corner of the compartment.

MOORING KIT.

Equipment for mooring the airplane is in a kit, in the baggage compartment.

Caution Remove mooring kit before flights involving unusual flight attitudes.

OPERATING LIMITATIONS

SECTION V

TABLE OF CONTENTS

MINIMUM CREW REQUIREMENTS.

The airplane can be flown solo from the front cockpit only. Solo flight from the rear cockpit is prohibited, because of a marginal CG condition.

INSTRUMENT MARKINGS.

Careful attention must be given to the instrument markings (figure 5-1), because the limitations shown on these instruments and noted in the captions are not necessarily repeated in the text of this or any other section.

STARTER LIMITATIONS.

The starter is limited to the three consecutive starts of 30 seconds per start with a 3-minute cooling period between starts. If more than three starts are required, allow starter to cool 30 minutes before using it again.

ENGINE LIMITATIONS.

All normal engine limitations are shown in figure 5-1 and are based on Grade 115/145 or 100/130 fuel.

ENGINE POWER DEFINITIONS.

The following paragraphs define engine power ratings. If the stated limits are exceeded, the amount and duration must be entered in the Form 781.

NOTE Refer to "Use of Military Power" in Section VII for information on the effects of high power settings on engine life.

Maximum Power.

Maximum Power is defined as the maximum power which may be used during the take-off phase of flight. It is time-limited to 5 minutes continuous operation. For Standard Day, sealevel conditions, Maximum Power in low blower is obtained at 52.5 in.Hg and 2700 rpm.

Caution Although power settings for Maximum Power and Military Power are the same, the 5-minute limit for Maximum Power must be observed to prevent excessive engine wear during the unstable engine temperature conditions which exist during the take-off phase.

Military Power.

Military Power is defined as the maximum power which may be used during flight subsequent to the take-off phase. It is time-limited to 30 minutes continuous operation. Its use should be restricted to military combat operations. For Standard Day, sea-level conditions, Military Power in low blower is obtained at 52.5 in. Hg. and 2700 rpm.

METO Power.

METO Power is defined as the maximum power which can be used continuously. For Standard Day, sea-level conditions, METO Power in low blower is obtained at 47 in. Hg and 2500 rpm.

NOTE See figure 5-2 for maximum recommended manifold pressures for varying rpm and altitudes.

INSTRUMENT MARKINGS

BASED ON FUEL GRADES 100/130 AND 115/145

NOTE

Rich mixture used for ground operation, take-off, all descents, and landing.

TACHOMETER

MANIFOLD PRESSURE GAGE

1400 to 2500 rpm Continuous

NOTE

- Maximum at METO Power is 2500 rpm.
- Due to instrument configuration on T-28B/C Airplanes, the continuous range is not marked.

2700 rpm Maximum in low blower at Maximum Power (time-limited to 5 minutes) and Military Power (time-limited to 30 minutes)

NOTE

Maximum for Military Power in high blower is 2600 rpm (time-limited to 30 minutes).

- Mixture must be rich above 2300 RPM.

18 to 47 in. Hg Continuous

NOTE

- Maximum at METO Power in low blower is 47 in. Hg.
- Maximum at METO Power in high blower is 43.5 in. Hg.

52.5 in. Hg Maximum in low blower at Maximum Power (time-limited to 5 minutes) and Military Power (time-limited to 30 minutes)

NOTE

Maximum at Military Power in high blower is 50 in. Hg (time-limited to 30 minutes).

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Figure 5-1 (Sheet 1 of 3)

FUEL PRESSURE GAGE

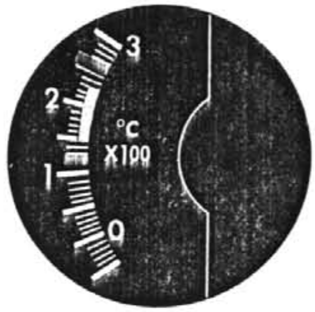
	19 psi	Minimum for flight
	21 psi to 25 psi	Continuous
	26 psi	Maximum

CARBURETOR AIR TEMPERATURE GAGE

	-10° C to 15°C	Caution. Danger of icing.
	15° C to 38° C	Continuous
	38° C	Maximum for low blower

NOTE

Maximum for high blower is 15° C.



CYLINDER HEAD TEMPERATURE GAGE

	120° C	Minimum for operation above 1400 rpm
	150° C to 230° C	Desired Continuous

NOTE

235°C is the maximum for METO Power. Operation above this temperature is time-limited.

	260° C	Maximum at take-off Power (time-limited to 5 minutes) and at Military Power (time-limited to 30 minutes)

OIL PRESSURE GAGE

	65 psi	Minimum for flight
	65 psi to 75 psi	Continuous
	90 psi	Maximum

OIL TEMPERATURE GAGE

	40° C	Minimum
	70° to 90° C	Continuous
	104° C	Maximum

28B-1-51-2A

Figure 5-1 (Sheet 2 of 3)

INSTRUMENT MARKINGS

CANOPY EMERGENCY AIR PRESSURE GAGE

1300 psi	Minimum for one operation only
1600 psi to 1800 psi	Normal
1980 psi	Maximum

HYDRAULIC PRESSURE GAGE

0 to 100 psi	Normal (system depressurized)
1250 to 1550 psi	Normal (system pressurized)
1550 psi	Maximum

AIRSPEED INDICATOR

140 knots IAS	Maximum allowable with gear and/or flaps extended
340 knots IAS	Maximum allowable below 2500 feet altitude, with no external stores, pylons or photo reconnaissance blister

NOTE

See airspeed limits tables below for limits with stores and at higher altitudes.

ACCELEROMETER

5.5 G	Maximum symmetrical positive G with no external stores
-2.0 G	Maximum symmetrical negative G with no external stores

NOTE

Refer to "Acceleration Limitations" in this section for specific limitations for various store weights at the wing stations.

- Unsymmetrical positive G-limits are two-thirds of the symmetrical limits.
- Negative G-limits, with or without external stores are:
  Symmetrical, -2.0 G
  Unsymmetrical, -1.0 G

AIRSPEED LIMITS TABLE

CONFIGURATION	BELOW 2500 FEET	2500 FEET TO 15,000 FEET	15,000 FEET TO 20,000 FEET	20,000 FEET TO 25,000 FEET	ABOVE 25,000 FEET
No pylons, external stores, gun pods or photo reconnaissance blister	340 knots IAS	315 knots IAS	310 knots IAS	275 knots IAS	225 knots IAS
With any combination of pylons, external stores, gun pods, or photo reconnaissance blister	295 knots IAS	270 knots IAS	265 knots IAS	240 knots IAS	190 knots IAS

28B-1-51-3B

Figure 5-1 (Sheet 3 of 3)

ENGINE OVERSPEED.

NOTE The amount and duration of any engine overspeed and the reason, if known, must be entered in Form 781, so that the prescribed engine inspection can be performed.

The maximum allowable engine speed is 2700 rpm. Overspeed from 2701 to 2800 rpm must be entered in Form 781, but an engine inspection is not required. Overspeed from 2801 to 3000 rpm must be entered in Form 781, and an engine inspection is required. If overspeed exceeds 3000 rpm, the engine must be changed.

Caution To prevent engine overspeed, do not perform throttle bursts at 2700 rpm. Fast throttle bursts should be made only while governing at 2500 rpm or less.

ENGINE OVERBOOST.

NOTE The amount and duration of any engine overboost, and the reason, if known, must be entered in Form 781, so that the prescribed engine inspection can be performed.

BLOWER POSITION	MAP (IN.)	DURATION (sec)	RPM RANGE AT WHICH LIMITS APPLY
LOW	4	15	Above 2500
LOW	6	15	2301 to 2500
-	-	-	No limit at 2300 and below*
HIGH	3	15	All

*Full throttle will normally be reached before manifold pressure becomes sufficiently high to cause damage to the average engine in this rpm range. Therefore, overboost limits are not applicable. However, maximum allowable manifold pressure should not be exceeded indiscriminately.

When the maximum allowable manifold pressure for any applicable power is exceeded by more than that in the foregoing table, an engine overboost inspection is required regardless of overboost duration.

When the maximum allowable manifold pressure for any applicable power is exceeded for a period in excess of that in the foregoing table, an engine overboost inspection is required.

An engine overboosted beyond the foregoing listed limits need not be rejected to overhaul unless the required inspection reveals sufficient overboost damage.

PROPELLER LIMITATIONS.

T-28C AIRPLANES.

The propeller is restricted against ground operation in the range between 1900 and 2200 rpm. Ground operation within this range should be avoided as much as possible. There are no limitations on the propeller in flight, other than the maximum overspeed of the engine.

AIRSPEED LIMITATIONS.

MAXIMUM ALLOWABLE AIRSPEEDS.

Maximum allowable airspeeds are shown in figure 5-1.

LANDING GEAR AND WING FLAP LOWERING SPEED.

The maximum allowable airspeed with the landing gear and/or wing flaps extended is 140 knots IAS. If the gear or flaps are lowered above this speed, structural damage can occur.

LANDING LIGHT EXTENSION SPEED.

The maximum allowable airspeed with the landing lights extended is 140 knots IAS. If the landing lights are extended at speeds above 140 knots IAS, structural damage can occur.

PROHIBITED MANEUVERS.

To prevent structural damage or failure, the following maneuvers must not be performed:

a. Inverted spins with landing gear or flaps down.

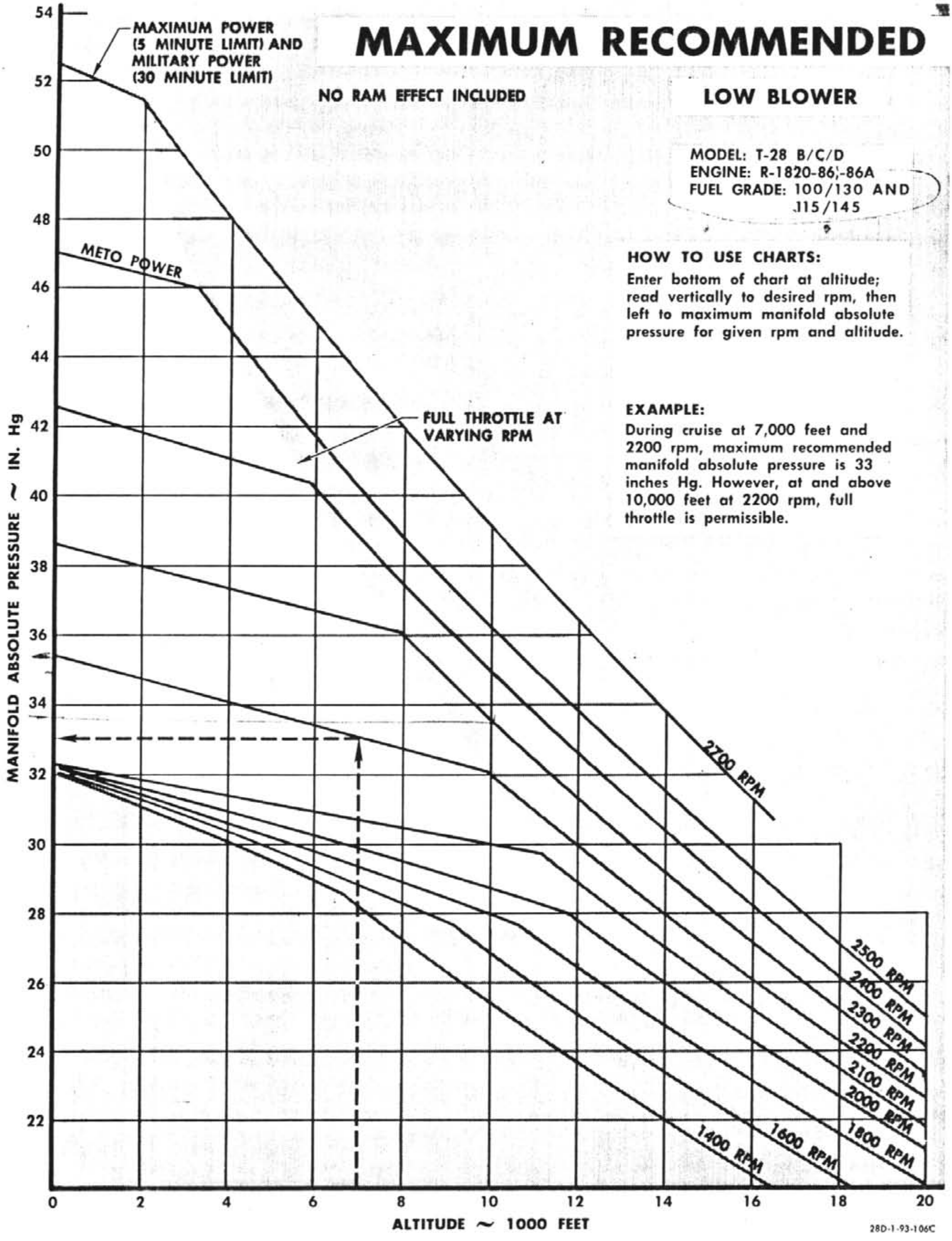
b. Snap rolls or spins with external stores (including gun pods) or photo reconnaissance blister installed.

c. Aerobatics when luggage or equipment is carried in the baggage compartment.

d. Negative-G flight exceeding 10 seconds duration.

e. Rolling pull-outs exceeding 90 degrees per second rate of roll under the following external store loading conditions:

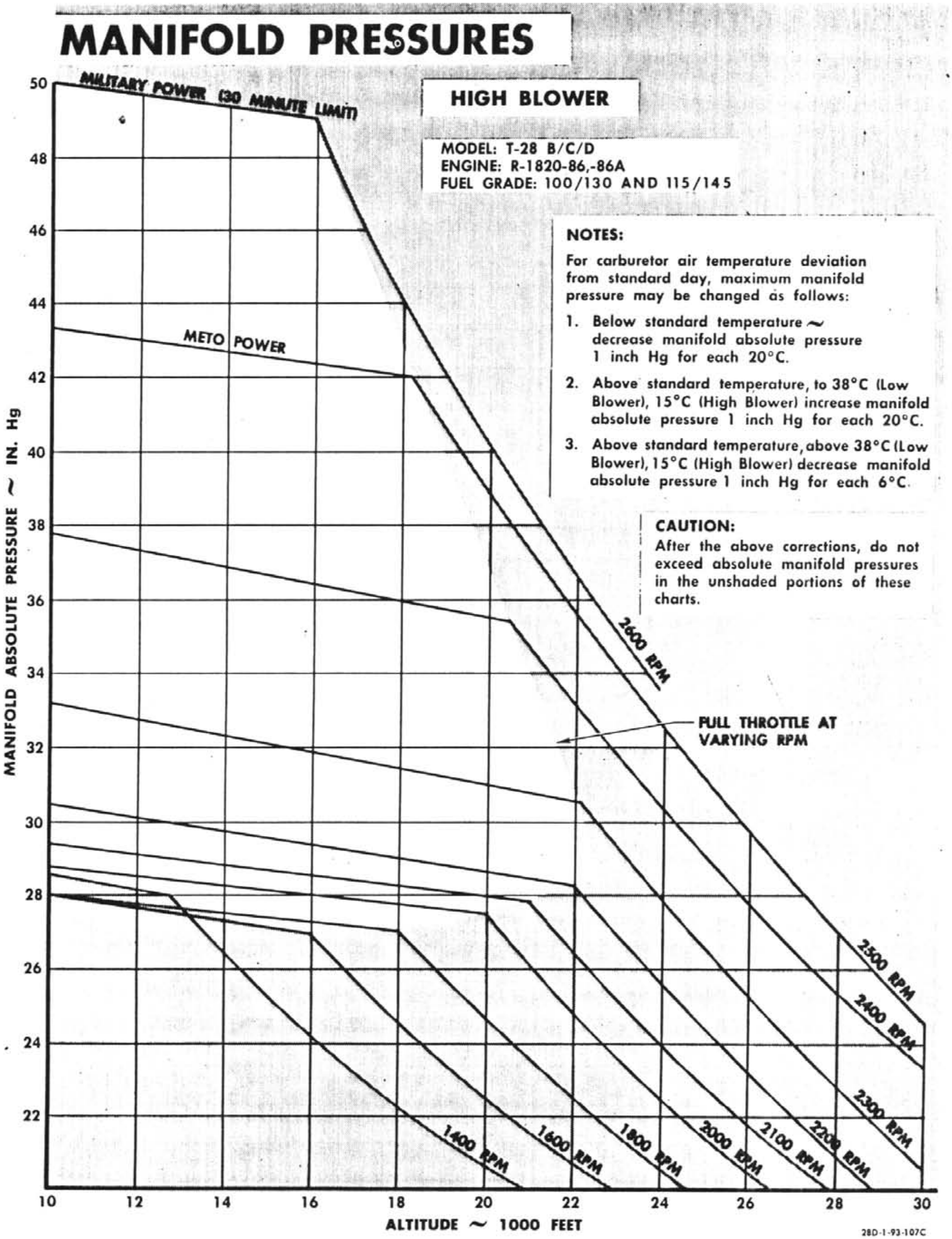
- When stores (not including pylons) weighing more than 500 pounds are installed at either or both inboard stations.
- When total external store weight (not including pylons) exceeds 1500 pounds.



MIXTURE RICH ABOVE 2300 RPM

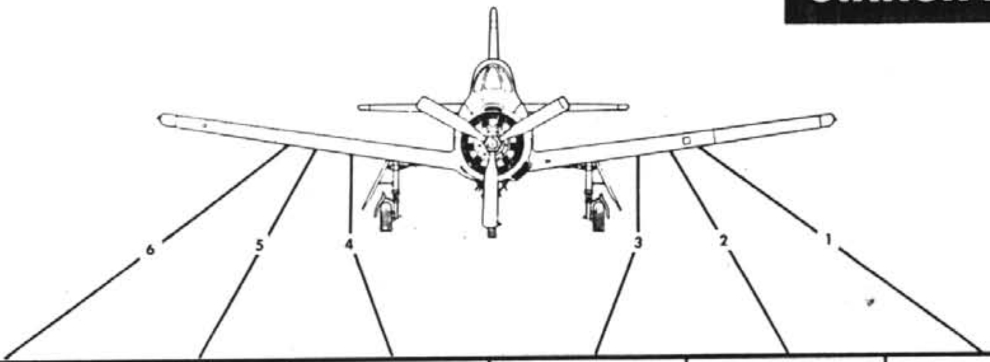
Figure 5-2

MANIFOLD PRESSURES



MIXTURE RICH ABOVE 2300 RPM

STATION LOADING



500	750	750	750	750	500	MAXIMUM LOADING (STORE CLASS)-POUNDS
AERO 15B, C, OR D PYLON	AERO 15B, C, OR D PYLON	AERO 15B, C, OR D PYLON	AERO 15B, C, OR D PYLON	AERO 15B, C, OR D PYLON	AERO 15B, C, OR D PYLON	
	BLU-1/B, BLU-1B/B, BLU-1C/B, BLU-27/B, OR BLU-27A/B	BLU-1/B, BLU-1B/B, BLU-1C/B, BLU-27/B, OR BLU-27A/B	BLU-1/B, BLU-1B/B, BLU-1C/B, BLU-27/B, OR BLU-27A/B	BLU-1/B, BLU-1B/B, BLU-1C/B, BLU-27/B, OR BLU-27A/B		
BLU-10/B, BLU-10A/B, BLU-11/B, BLU-23/B, BLU-32/B OR BLU-32A/B	BLU-10/B, BLU-10A/B, BLU-11/B, BLU-23/B, BLU-32/B OR BLU-32A/B	BLU-10/B, BLU-10A/B, BLU-11/B, BLU-23/B, BLU-32/B OR BLU-32A/B	BLU-10/B, BLU-10A/B, BLU-11/B, BLU-23/B, BLU-32/B OR BLU-32A/B	BLU-10/B, BLU-10A/B, BLU-11/B, BLU-23/B, BLU-32/B OR BLU-32A/B	BLU-10/B, BLU-10A/B, BLU-11/B, BLU-23/B, BLU-32/B OR BLU-32A/B	
M30A1 GP BOMB	M30A1 GP BOMB	M30A1 GP BOMB	M30A1 GP BOMB	M30A1 GP BOMB	M30A1 GP BOMB	
M57A1 GP BOMB	M57A1 GP BOMB	M57A1 GP BOMB	M57A1 GP BOMB	M57A1 GP BOMB	M57A1 GP BOMB	
M64A1 GP BOMB	M64A1 GP BOMB	M64A1 GP BOMB	M64A1 GP BOMB	M64A1 GP BOMB	M64A1 GP BOMB	
M81 OR M88 FRAGMENTATION BOMB	M81 OR M88 FRAGMENTATION BOMB	M81 OR M88 FRAGMENTATION BOMB	M81 OR M88 FRAGMENTATION BOMB	M81 OR M88 FRAGMENTATION BOMB	M81 OR M88 FRAGMENTATION BOMB	
B37K-1 RACK (WITH FOUR BDU-33A/B, B/B, BDU-33B OR MK-106 PRACTICE BOMBS, OR FOUR MK-24 FLARES)	B37K-1 RACK (WITH FOUR BDU-33A/B, B/B, BDU-33B OR MK-106 PRACTICE BOMBS, OR FOUR MK-24 FLARES)	B37K-1 RACK (WITH FOUR BDU-33A/B, B/B, BDU-33B OR MK-106 PRACTICE BOMBS, OR FOUR MK-24 FLARES)	B37K-1 RACK (WITH FOUR BDU-33A/B, B/B, BDU-33B OR MK-106 PRACTICE BOMBS, OR FOUR MK-24 FLARES)	B37K-1 RACK (WITH FOUR BDU-33A/B, B/B, BDU-33B OR MK-106 PRACTICE BOMBS, OR FOUR MK-24 FLARES)	B37K-1 RACK (WITH FOUR BDU-33A/B, B/B, BDU-33B OR MK-106 PRACTICE BOMBS, OR FOUR MK-24 FLARES)	
MAU-63/A RACK WITH SIX MK-24 FLARES, SIX LUU-1B OR LUU-2B FLARES	MAU-63/A RACK WITH SIX MK-24 FLARES, SIX LUU-1B OR LUU-2B FLARES	MAU-63/A RACK WITH SIX MK-24 FLARES, SIX LUU-1B OR LUU-2B FLARES, OR SIX M30A1 GP BOMBS	MAU-63/A RACK WITH SIX MK-24 FLARES, SIX LUU-1B OR LUU-2B FLARES, OR SIX M30A1 GP BOMBS	MAU-63/A RACK WITH SIX MK-24 FLARES, SIX LUU-1B OR LUU-2B FLARES	MAU-63/A RACK WITH SIX MK-24 FLARES, SIX LUU-1B OR LUU-2B FLARES	
	MAU-63/A RACK WITH FOUR M1A2, M1A3, OR M1A4 FRAG BOMB CLUSTERS **	MAU-63/A RACK WITH FOUR M1A2, M1A3, OR M1A4 FRAG BOMB CLUSTERS **	MAU-63/A RACK WITH FOUR M1A2, M1A3, OR M1A4 FRAG BOMB CLUSTERS **	MAU-63/A RACK WITH FOUR M1A2, M1A3, OR M1A4 FRAG BOMB CLUSTERS **		
M1A2, M1A3, OR M1A4 FRAG BOMB CLUSTERS	M1A2, M1A3, OR M1A4 FRAG BOMB CLUSTERS	M1A2, M1A3, OR M1A4 FRAG BOMB CLUSTERS	M1A2, M1A3, OR M1A4 FRAG BOMB CLUSTERS	M1A2, M1A3, OR M1A4 FRAG BOMB CLUSTERS	M1A2, M1A3, OR M1A4 FRAG BOMB CLUSTERS	
MK24, LUU-1/B OR LUU-2/B FLARES	MK24, LUU-1/B OR LUU-2/B FLARES	MK24, LUU-1/B OR LUU-2/B FLARES	MK24, LUU-1/B OR LUU-2/B FLARES	MK24, LUU-1/B OR LUU-2/B FLARES	MK24, LUU-1/B OR LUU-2/B FLARES	
MA3/AERO 6A ROCKET LAUNCHER	MA3/AERO 6A ROCKET LAUNCHER	MA3/AERO 6A ROCKET LAUNCHER	MA3/AERO 6A ROCKET LAUNCHER	MA3/AERO 6A ROCKET LAUNCHER	MA3/AERO 6A ROCKET LAUNCHER	
LAU-3A, LAU-32A/A, LAU-32B/A, LAU-59/A, LAU-68A/A, ROCKET LAUNCHER	LAU-3A, LAU-32A/A, LAU-32B/A, LAU-59/A, LAU-68A/A, ROCKET LAUNCHER	LAU-3A, LAU-32A/A, LAU-32B/A, LAU-59/A, LAU-68A/A, ROCKET LAUNCHER	LAU-3A, LAU-32A/A, LAU-32B/A, LAU-59/A, LAU-68A/A, ROCKET LAUNCHER	LAU-3A, LAU-32A/A, LAU-32B/A, LAU-59/A, LAU-68A/A, ROCKET LAUNCHER	LAU-3A, LAU-32A/A, LAU-32B/A, LAU-59/A, LAU-68A/A, ROCKET LAUNCHER	
		EXTERNAL FUEL TANK*	EXTERNAL FUEL TANK*			

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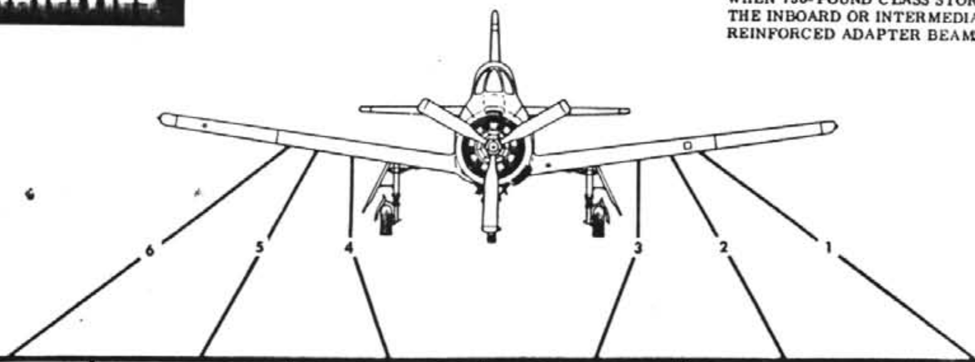
Figure 5-3

CAPABILITIES

CAUTION
WHEN 750-POUND CLASS STORES ARE CARRIED AT THE INBOARD OR INTERMEDIATE WING STATIONS, REINFORCED ADAPTER BEAMS MUST BE USED.



MAXIMUM LOADING (STORE CLASS)-POUNDS

500	750	750	750	750	500
	M116A1 OR M116A2 FIRE BOMB	M116A1 OR M116A2 FIRE BOMB	M116A1 OR M116A2 FIRE BOMB	M116A1 OR M116A2 FIRE BOMB	
	EXTERNAL FUEL TANK ‡			EXTERNAL FUEL TANK ‡	
					E-3(M) CAMERA POD
M-31 INCENDIARY BOMB CLUSTER	M-31 INCENDIARY BOMB CLUSTER	M-31 INCENDIARY BOMB CLUSTER	M-31 INCENDIARY BOMB CLUSTER	M-31 INCENDIARY BOMB CLUSTER	M-31 INCENDIARY BOMB CLUSTER
	M-32 INCENDIARY BOMB CLUSTER	M-32 INCENDIARY BOMB CLUSTER	M-32 INCENDIARY BOMB CLUSTER	M-32 INCENDIARY BOMB CLUSTER	
	M117 GP BOMB#	M117 GP BOMB#	M117 GP BOMB#	M117 GP BOMB#	
MK-81/MK-82 BOMB††	MK-81/MK-82 BOMB††	MK-81/MK-82 BOMB††	MK-81/MK-82 BOMB††	MK-81/MK-82 BOMB††	MK-81/MK-82 BOMB††
M47A4 SMOKE BOMB	M47A4 SMOKE BOMB	M47A4 SMOKE BOMB	M47A4 SMOKE BOMB	M47A4 SMOKE BOMB	M47A4 SMOKE BOMB
CBU-14/A, CBU-14A/A, CBU-22/A, CBU-22A/A, CBU-25/A, CBU-25A/A, OR CBU-25B/A	CBU-14/A, CBU-14A/A, CBU-22/A, CBU-22A/A, CBU-25/A, CBU-25A/A, OR CBU-25B/A	CBU-14/A, CBU-14A/A, CBU-22/A, CBU-22A/A, CBU-25/A, CBU-25A/A, OR CBU-25B/A	CBU-14/A, CBU-14A/A, CBU-22/A, CBU-22A/A, CBU-25/A, CBU-25A/A, OR CBU-25B/A	CBU-14/A, CBU-14A/A, CBU-22/A, CBU-22A/A, CBU-25/A, CBU-25A/A, OR CBU-25B/A	CBU-14/A, CBU-14A/A, CBU-22/A, CBU-22A/A, CBU-25/A, CBU-25A/A, OR CBU-25B/A
		315-ROUND .50 CAL GUN POD	315-ROUND .50 CAL GUN POD		
		315-ROUND .50 CAL FIXED GUN §	315-ROUND .50 CAL FIXED GUN §		
		100-ROUND .50 CAL GUN POD	100-ROUND .50 CAL GUN POD		
SUU-11A/A GUN POD¶	SUU-11A/A GUN POD¶	SUU-11A/A GUN POD¶	SUU-11A/A GUN POD¶	SUU-11A/A GUN POD¶	SUU-11A/A GUN POD¶

* Some T-28B Airplanes, tank part No. 172-48250 (installed on NAA-type pylon).

‡ T-28D-5 Group II Airplanes, tank part No. 189-484712-1 on Aero 15D Pylon. Reinforced adapter beam must be used.

§ 315-round .50 cal fixed gun mounts inboard of stations 3 and 4 on T-28D-5 Airplanes.

¶ T-28D-5 Airplanes.

** M1A2, M1A3, or M1A4 bomb clusters must be loaded at MAU-63/A bomb rack stations 1, 2, 3, and 4. Stations 5 and 6 must be left empty.

†† M1A1 Fuze extender is authorized with the MK-82 Bomb.

\# Authorized with either the M131 or MAU-103/B, A/B Fins

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ACCELERATION LIMITATIONS

POSITIVE G-LIMIT - SYMMETRICAL	MAXIMUM STORE LOADING COMBINATIONS AND STATION WEIGHT LIMITS (BY STORE CLASS)--POUNDS					
	LEFT OUTBOARD (Sta 1)	LEFT INTERMEDIATE (Sta 2)	LEFT INBOARD (Sta 3)	RIGHT INBOARD (Sta 4)	RIGHT INTERMEDIATE (Sta 5)	RIGHT OUTBOARD (Sta 6)
4.5	250	750	750	750	750	250
4.5	500	500	750	750	500	500
4.5	250	500	750	750	500	250
4.5	500	500	500	500	500	500
5.0	150	500	750	750	500	150
5.0	250	500	500	500	500	250
5.0	150	750	300	300	750	150
5.0	150	500	500	500	500	150
4.5	500	500	150	150	500	500
5.0	0	500	500	500	500	0
5.0	150	500	300	300	500	150
5.5	150	250	500	500	250	150
5.5	250	500	150	150	500	250
5.0	0	0	750	750	0	0
5.0	0	250	500	500	250	0
5.5	250	250	250	250	250	250
5.5	250	250	150	150	250	250
5.5	150	150	250	250	150	150
5.0	0	0	500	500	0	0
5.5	0	250	250	250	250	0
5.5	0	150	250	250	150	0
5.5	0	150	150	150	150	0
5.0	0	0	250	250	0	0
5.0	0	0	150	150	0	0
5.5	0	0	0	0	0	0

NOTE

- When external fuel tanks are installed at the intermediate stations, symmetrical limits are 4.0 G and -2.0 G and unsymmetrical limits are 3.0 G and -1.0 G.
- For all other external stores, unsymmetrical positive limits are two-thirds of the symmetrical limits. Negative limits are: symmetrical, -2.0 G; unsymmetrical, -1.0 G.
- Unsymmetrical positive G-limits are two-thirds of the symmetrical limits.
- Negative G-limits, with or without external stores are:
  Symmetrical, -2.0 G
  Unsymmetrical, -1.0 G

CAUTION

- When 750-pound class stores are carried, reinforced adapter beams must be used.
- Positive symmetrical G-limits must be reduced by 0.5 G for any asymmetrical store loading. Airplane must not be loaded asymmetrically by more than one store.

WARNING

- For flight in turbulent air, reduce all positive G-limits by 1.0 G.
- If photo reconnaissance blister is installed, reduce applicable positive G-limit by 0.5 G.
- If 750-pound class stores are installed at either intermediate or inboard stations, they must be released before landing.
- If a landing is to be made with 500-pound class stores installed, the stations carrying these stores must be fitted with reinforced adapter beams.
- If reinforced adapter beams are not installed at any wing station, the maximum station load for landing is 250-pound class stores.
- When operating in the negative load factor region, do not make abrupt, rapid fore or aft control stick movements.
- If buffet is encountered during positive accelerated flight, do not make abrupt longitudinal control movements.

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Figure 5-4

ACCELERATION LIMITATIONS.

Figure 5-3 shows loading capabilities for the six wing stations. Acceleration limitations are shown in figure 5-4, which shows the G-limits for the airplane as a function of location and total weight of stores to be carried. To ensure correct interpretation of the acceleration limitations presented in figure 5-4, the following definitions apply:

a. Symmetrical applies where the airplane bank angle is constant (no roll). Therefore, the airplane may be in other than a wings-level attitude but must not be rolling during the period of accelerated flight.

b. Unsymmetrical applies where the airplane is rolling during the period of accelerated flight.

CENTER-OF-GRAVITY LIMITATIONS.

As long as the maximum store loading combinations and station weight limits given in figure 5-4 are not exceeded, the airplane center-of-gravity limits will not be exceeded.

LANDING LIMITATIONS.

The landing vertical velocity (sink speed) should not exceed 480 feet per minute (8 feet per second). In addition, the following limitations must be observed:

NOTE If landing is to be attempted with a loaded or partially loaded MER, increase touchdown speed 5 to 10 KIAS to reduce sink rate.

a. The following precautions and instructions pertain to conventional munitions, bomb dispensers, and rocket launchers:

(1) Following any attempted release or jettison, any conventional munition that does not separate from the airplane should be considered armed and susceptible to inadvertent release during landing impact.

(2) Following a normal release, all bomb dispensers and rocket launchers should be considered as still containing one or more bombs or rockets. If visual examination cannot positively confirm a safe condition, the dispensers or launchers must be jettisoned before landing.

NOTE The information in the preceding paragraphs (1) and (2) does not apply to the following items:

LAU-32B/A or LAU-59/A rocket launcher
Training dispensers
Rockets with inert warheads used for training

b. Do not land with M64A1 bombs, because the lugs on these bombs are of marginal strength and may fail during landing impact.

c. If 750-pound class stores are installed at either intermediate or inboard stations, they must be released before landing.

d. If a landing is to be made with 500-pound class stores installed, the stations carrying these stores must be fitted with reinforced adapter beams.

e. If reinforced adapter beams are not installed at any wing station, the maximum station load for landing is 250-pound class stores.

WEIGHT LIMITATIONS.

The maximum store loading combinations given in figure 5-4 must not be exceeded. In addition, the total weight of all external stores to be carried at the six wing stations must not exceed 3500 pounds.

Actual weight of stores in a given class may be significantly greater than the number given for the store class designation. For example, the MAU-63/A rack with six M30A1 GP Bombs is a 750-lb class store actually weighing 967 pounds (See section A-1, Store Drag Computation).

NOTE The 3500-pound limit does not apply to the fixed guns, which can be mounted inboard of the inboard stations on T-28D-5 Airplanes.

Warning When external stores are carried at the outboard wing stations and the total weight of all external stores carried exceeds 2000 pounds, use extreme care when taxiing over rough or uneven surfaces. Under these conditions, taxi at the slowest possible speed, to prevent damage to the wing structure.

Caution Because of door latch structural limits, the baggage compartment must not be loaded in excess of 90 pounds.

FLIGHT CHARACTERISTICS

SECTION VI

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INTRODUCTION.

The airplane has excellent stability and control characteristics under all conditions of speed, power, load factor (G), and altitude. The controls are effective throughout the speed range, and airplane response to control movement is quite rapid. The trim tabs are also effective at all speeds so that the airplane may be easily trimmed to fly "hands off." Operation of the landing gear, wing flaps, canopy, and cowl flaps, as well as changes in power setting, affects longitudinal trim (causes the airplane to pitch up or down) only slightly. Therefore, minimum stick movement is required to maintain flight attitude.

STALLS.

Stall speeds for the airplane in various configurations, gross weights, and bank angles, with power on and power off, are shown in figure 6-1.

POWER-OFF STALLS.

Power-off stalls in this airplane are very mild. You will be warned of an approaching stall by a light vibration caused by airplane buffet which begins 2 or 3 knots above the actual stall. Sometimes mild pitching may accompany the buffet. When the stall occurs with flaps up, the airplane pitches nose down and straight ahead with no tendency to roll. With flaps down, a slight roll to the left may accompany the nose-down pitch.

POWER-ON STALLS.

Power-on stalls are also relatively mild. During the approach to a power-on stall, however, you will find it necessary to use a moderate amount of aileron to keep the wings level and rudder as required to maintain desired heading. No appreciable buffeting occurs before actual stall. At the stall, the airplane characteristically rolls left, although not violently, and as in the power-off stalls, pitches nose-down.

NOTE Gear position has no noticeable effect on stall characteristics.

STALL RECOVERY.

Stall recovery in this airplane is accomplished in the conventional manner as follows:

1. Drop nose immediately by releasing back pressure on the stick.

2. Use aileron and rudder as required to regain straight-and-level attitude.

3. At the same time, advance throttle smoothly. Do not exceed recommended manifold pressure for rpm setting.

4. After the nose has been lowered, speed increases rapidly. When you attain safe flying speed, raise nose with steady back pressure.

5. Retard throttle to cruising power.

PRACTICE STALLS.

To familiarize yourself completely with the stall characteristics of the airplane under various flight conditions, practice the series of stalls outlined in the following paragraphs. All practice stalls, except those with gear and flaps down, should be continued past the point of "mushing" to actual stall. Do not aggravate the stall by continuing to pull back on the stick after stall has occurred. Control should be coordinated and ailerons should not be used to excess at or near the stall. If a wing starts

STALL SPEEDS —KNOTS IAS

Based on: FLIGHT TEST DATA

		POWER ON*			POWER OFF (Windmilling Propeller)		
	ANGLE OF BANK	0°	30°	45°	0°	30°	45°
	LOAD FACTOR	1.0G	1.2G	1.4G	1.0G	1.2G	1.4G
GEAR AND FLAPS UP	GROSS WT-LB						
	7,500	69	75	89	79	85	95
	8,000	72	78	94	82	87	98
	8,500	76	82	99	84	90	101
	9,000	79	85	102	86	92	103
	9,500	82	88	107	89	95	106
	10,000	85	91	110	91	97	109
	10,500	89	95	114	93	100	112
	11,000	92	98	118	96	103	115
	11,500	95	102	123	98	105	117
	12,000	98	105	126	100	108	120
GEAR AND FLAPS DOWN	GROSS WT-LB						
	7,500	59	65	74	68	73	81
	8,000	62	67	77	70	75	84
	8,500	64	70	80	72	78	86
	9,000	67	72	83	74	80	89
	9,500	69	74	86	77	82	92
	10,000	72	77	89	79	85	95
	10,500	74	80	92	81	87	97
	11,000	77	82	95	83	90	100
	11,500	79	85	98	85	92	103
	12,000	82	88	102	88	95	106

*Gear and flaps up: METO Power.
Gear and flaps down: Approach power (2500 rpm and 28.0 in. Hg)

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Figure 6-1

to drop, apply rudder and aileron to maintain directional control. For both power-off and power-on stalls, set mixture lever at RICH and propeller lever at 2400 rpm. Retard throttle smoothly for power-off stalls; set it at 28 in. Hg for power-on stalls. Do not perform stalls from inverted flight.

Practice Stall - Gear and Flaps Up, Power Off, Straight Ahead.

This stall is least violent and provides a basic stalling speed for comparison with other stalls. Begin stall from level flight, ease throttle back to idle, raise nose of airplane to a point above horizon, and hold that attitude with wings level and nose steady. As stall approaches, observe the sluggishness of control response, attitude of airplane, and tone of engine. Notice how buffeting starts 2 or 3 knots before actual stall. When stall occurs, recover in normal manner.

Practice Stall - Gear and Flaps Up, Power On, Straight Ahead.

Use same entry and recovery as in preceding practice stall. Notice that use of power causes a nose-up attitude and a decrease in stalling speed. You will note that no appreciable buffeting occurs before actual stall. At the stall, the airplane characteristically rolls left, although not violently, and as in the power-off stalls, pitches nose-down.

Practice Stall - Gear and Flaps Up, Power On or Off, 20-degree Bank.

Establish a coordinated climbing turn with a bank of approximately 20 degrees. Raise nose well above horizon and maintain same bank until stall occurs. Make a standard recovery with a coordinated roll out of the turn and dive. Observe increased stalling speed when in a turn. This higher stall speed is the result of increased wing loading induced by centrifugal force.

Practice Stall - Gear Down, Flaps Up, Power On or Off, Straight Ahead.

Practice this stall in anticipation of an enforced flaps-up landing. Close throttle and set up a normal glide at 100 knots IAS. Raise nose of airplane into a landing attitude and hold it until stall occurs. Note that gear-down condition does not increase stall speed, but increased drag of gear does increase rate of sink and causes airplane to lose speed more rapidly. Use normal stall recovery.

Practice Stall - Gear and Flaps Down, Power Off, Straight Ahead.

This stall is, in effect, a power-off landing. Simulate a traffic pattern and make standard landing checks. Turn on final approach, make final checks, and set up approach speed of 100 knots IAS. Flare at simulated runway altitude, pull nose up to landing attitude, and hold until stall occurs. At this point, observe characteristics of airplane. Notice how use of wing flaps decreases stalling speed.

Practice Stall - Gear and Flaps Down, Power On, Straight Ahead.

This stall is also used in landing. Simulate a complete traffic pattern as in preceding practice stall. Since this stall occurs at the lowest airspeed of any of the stall series, it effectively demonstrates the slowest airspeed at which the airplane can be flown.

SPINS.

Warning

Intentional spins with external stores (including pylons, gun pods, and fixed guns) or the photo-reconnaissance pod or strike reconnaissance pod installed and inverted spins with gear or flaps down are prohibited.

NORMAL SPINS.

The airplane has satisfactory spin characteristics with gear and flaps up or down. A spin can be entered from a stall by applying full rudder in the desired direction of the spin and maintaining full back stick. If the spin is entered with power on, the power should be reduced to idle as soon as possible. Full rudder must be held in the direction of the spin, and the stick must be held full back to maintain the spin. Aileron position does not materially affect spin characteristics. You will note that the first five turns of the spin, with gear and flaps either up or down, are somewhat erratic. A stabilized spin develops after about the fifth turn. There is an average loss of approximately 500 feet per turn. During a five-turn spin, and following recovery, the airplane loses from 4000 to 4500 feet altitude. Figure 6-2 graphically illustrates spin characteristics.

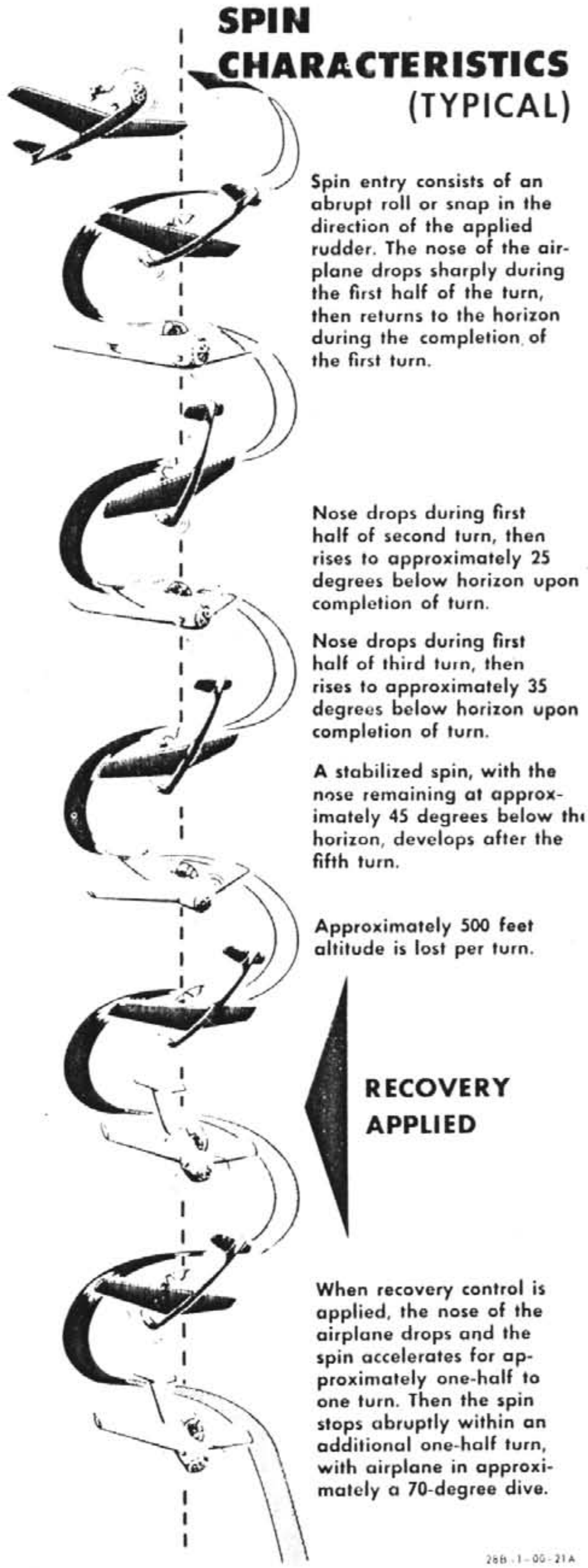


Figure 6-2

For inadvertent spins with external stores installed, recovery technique is the same as for the clean airplane. The airplane has satisfactory spin characteristics with external stores, and the stores need not be jettisoned for recovery in most cases. The spin with external stores generally will be flatter and less oscillatory in nature than for the clean airplane.

Caution When external stores are installed on T-28C Airplanes, strakes must be installed on each side of the forward fuselage, in order to assist recovery if a spin is inadvertently entered.

SPIN RECOVERY.

To obtain rapid spin recovery (about 1-1/2 to two turns) in the normal manner, briskly apply full opposite rudder, immediately followed by forward stick. Apply only enough forward stick to regain flying speed to prevent assuming too steep a diving attitude. With gear or flaps down, pull back on stick immediately after rotation has stopped and maintain about 3.0 G until level flight is attained. Use caution to prevent an accelerated stall. (At 120 knots IAS, a stall occurs at about 3.5 G.) A slightly faster recovery is effected by holding the ailerons against the spin. Recovery from a normal spin may also be obtained by holding the controls at neutral; however, recovery is slower (about two turns).

Caution Because of the steep diving attitude assumed by the airplane during recovery, be careful, when gear or flaps are down, to avoid exceeding the gear- and flaps-down limit airspeed.

INVERTED SPINS.

With the down elevator travel available, it is not possible to obtain a full inverted spin. A spin would be entered from an inverted level-flight position with power off if full forward stick were held until the airspeed decreased to the minimum obtainable, and then if full rudder were applied in the direction of the spin tendency. Full rudder and full forward stick must be held to maintain the spin. The airplane recovers from the inverted spin when forward pressure on the stick is relaxed and the rudder and ailerons are neutralized. An inverted diving attitude is assumed during recovery. Continue recovery as though completing the last half of a loop or an aileron roll. The altitude loss for a two-turn inverted spin is about 3000 feet.

Warning If an inverted spin is entered with power on, reduce throttle to CLOSED position immediately.

FLIGHT CONTROL EFFECTIVENESS.

AILERON CONTROL.

Aileron deflection stick forces are proportionate to airspeed and rate of roll. Below 190 knots IAS, these forces may be considered light and responsive until full aileron deflection is reached. Full aileron deflection (maximum rate of roll) at 190 knots IAS requires a stick force of about 30 pounds, and stick forces increase thereafter as airspeed is increased.

ELEVATOR CONTROL.

After the airplane has been trimmed properly at a given airspeed, only light stick forces are required for any longitudinal change. Changing from one configuration to another (as from a clean airplane to landing gear and flaps down) without a corresponding change in trim does not impose excessive elevator stick forces.

RUDDER CONTROL.

Rudder control is very effective for all maneuvers, including sideslips and cross-wind landings.

TRIM TAB CONTROL.

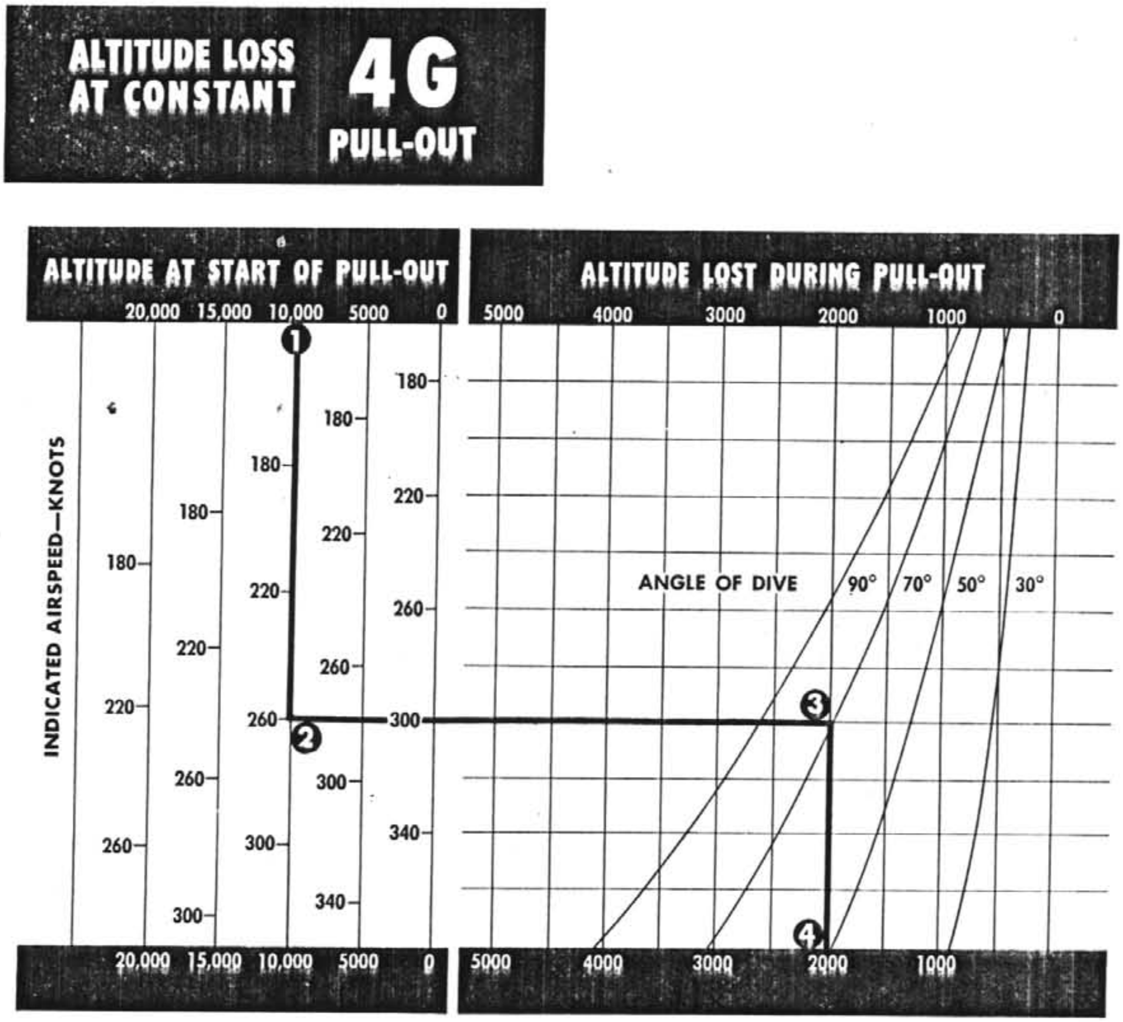
Trim tab is very effective on the airplane. The rudder, elevator, and aileron trim have full response throughout the entire speed range of the airplane. All trim tabs except the right aileron trim tab are adjustable from the cockpit, by use of the trim tab wheels. The right aileron trim tab is adjustable on the ground. The left aileron trims the airplane for lateral stability.

SPEED BRAKE - T-28B AND T-28C AIRPLANES.

The speed brake may be considered an additional flight control. It is useful for making descents and for moderate deceleration from high speed. The brake can be opened at any airspeed, but should be extended before entering high-speed dives. Although speed brake opening causes a moderate nose-up pitch, forward stick pressure necessary to maintain the desired attitude is moderate. Above 250 knots IAS, the degree of effective braking is automatically governed by a limiter valve, to prevent excessive nose-up trim change or overstressing the airplane. (Refer to "Speed Brake Limiter Valve" in Section I.) Closing the speed brake causes a nose-down trim change; however, this can easily be trimmed out.

LEVEL-FLIGHT CHARACTERISTICS.

The airplane is stable in level flight. Any marked change in airspeed during level flight requires a change in trim to continue flight with negligible stick forces. The airplane has no undesirable characteristics throughout the entire speed range from stalling speed to the limiting maximum speed.



HOW TO USE CHART

To determine altitude loss from start of pull-out to a return to level flight, using a constant 4 G pull-out:

1. Enter chart at altitude line nearest actual altitude at start of pull-out (for example, 10,000 feet).
2. On scale along altitude line, select point nearest the IAS at which pull-out is started (260 knots IAS).
3. Sight horizontally to point on curve of dive angle (70°).
4. Sight vertically to altitude lost during constant 4 G pull-out (2000 feet).

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Figure 6-3

MANEUVERING-FLIGHT CHARACTERISTICS.

The airplane responds very well to control pressures while performing aerobatics.

DIVES.

In dives to limit airspeed, the handling characteristics of the airplane are good. All control movement is easy and effective, and the airplane responds rapidly. The amount of forward stick pressure required to hold the airplane in a dive is relatively small, as is the amount of aileron pressure needed to keep the wings level. If you trim for level flight at METO Power, the tab settings will be satisfactory for diving, although some adjustment of the rudder tab may be desired during the dive so that it will not be necessary to hold the rudder. In diving the airplane, remember that maximum permissible airspeed varies with altitude and external load. Use the following procedure in a dive:

1. Check canopy closed before starting dive.

2. Adjust cowl and oil cooler flap switch to prevent too rapid cooling in dive.

3. Move carburetor air lever toward ALTERNATE, as necessary, to maintain carburetor air temperature within normal range.

4. Mixture lever RICH.

5. Decrease rpm as necessary.

6. Do not exceed maximum allowable engine speed during dive.

To make a maximum-rate letdown, roll into a dive and move throttle to CLOSED, being careful not to exceed limit airspeed for various altitudes during descent. (Refer to "Airspeed Limitations" in Section V.)

ALTITUDE LOSS IN DIVE RECOVERY.

The altitude lost during dive recovery is determined by four interdependent factors: (1) angle of dive, (2) altitude at start of pull-out, (3) airspeed at start of pull-out, and (4) G-forces maintained during pull-out. Because these factors must be considered collectively in estimating altitude for recovery from any dive, their relationship is best presented in chart form as shown in figure 6-3. Note that the chart is based on a constant 4-G pull-out. Remember that a value obtained from the chart is the altitude lost during recovery, not the altitude at which recovery is completed. Therefore, in planning maneuvers which involve dives, consider first the altitude of the terrain, and then use the charts to determine the altitude at which recovery must be started for pull-out with adequate terrain clearance.

SYSTEMS OPERATION

SECTION VII

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USE OF MILITARY POWER.

It is often asked what the consequences would be if the 30-minute limit at Military Power were exceeded. Another frequent inquiry is how long a period must be allowed after the specified time limit has elapsed until Military Power can again be used. These questions are difficult to answer, since the time limit specified does not mean that engine damage will occur if the limits are exceeded; it means the total operating time at high power should be kept to a reasonable minimum in the interest of prolonged engine life. High-power operation of an engine results in increased wear and necessitates more frequent overhaul than low-power operation. However, it is apparent that a certain percentage of operating time must be at Military Power. The engine manufacturer allows for this in qualification tests in which much of the running is done at Military Power to prove ability to withstand the resulting loads. It is established in these runs that the engine will handle sustained high power without damage. Nevertheless, it is still to the best interest of the pilot to keep within reasonable limits the amount of high power time accumulated in the field. The most satisfactory way to do this is to hold high-power operation to the shortest time each flight plan will allow, and thus keep total accumulated time at high power settings at a minimum. How the time at high power is accumulated is of secondary importance; i. e., it is no worse from the standpoint of engine wear to operate at Military Power for one hour straight than it is to operate in twelve 5-minute stretches, provided engine temperatures and pressures are within limits. In fact, the former procedure may even be preferable, as it eliminates temperature cycles which also aggravate engine wear. Thus, if flight conditions occasionally require exceeding time limits, this should not cause concern so long as constant effort is made to keep the over-all time at Military Power to the minimum practicable. Another factor to be remembered in operating engines at high power is that Military Power is to be preferred over high rpm operation with reduced manifold pressure. This procedure results in less engine wear for two reasons. First, the high resulting brake horsepower decreases the time required to obtain the objective of such high-power operation. At take-off, for example, the use of Maximum Power decreases the time required to reach an airspeed where it is safe to reduce power, and shortens the time required to reach the airspeed that will provide more favorable cylinder cooling. Second, high rpm results in high loads on the reciprocating parts due to inertia forces. As these loads are partially offset by the gas pressure in the cylinder, the high cylinder pressures resulting from use of Military Power manifold pressure will give lower net loads and less wear. Sustained high rpm is a major factor producing engine wear. It requires more "rpm minutes" and "piston ring miles" to take off with reduced manifold pressure. In addition to the engine wear factor, a take-off at reduced power is comparable to starting with about one-third of the runway behind the airplane. Therefore, full power should always be used on all take-offs.

CHANGING ENGINE POWER SETTINGS.

One of the basic limitations placed on engine operation is imposed by the amount of pressure developed in the cylinders during combustion. If this pressure becomes excessive, it can cause detonation and will result in eventual engine failure. Since improper coordination of the use of the throttle and propeller lever can cause these limitations to be exceeded, it is important to learn the correct sequence in which these controls should be used.

Whenever the engine power is to be reduced, retard the throttle first; then retard the propeller lever. Conversely, when increasing engine power, advance the propeller lever first; then advance the throttle.

DETONATION.

Detonation is the result of one type of abnormal combustion of part of the fuel-air mixture. The other prevalent form of abnormal combustion is preignition. When detonation occurs, combustion progresses normally during initial burning; then, at some point, the rate of combustion speeds up tremendously, resulting in an explosion or nearly instantaneous combustion. This explosion actually pounds the cylinder walls, producing "knock." This "knock," or pounding of the cylinder walls, can cause an engine failure. In an airplane, the "knock" is not heard because of other engine and propeller noises. However, detonation can be detected by observation of the exhaust for visible puffs of smoke; glowing carbon particles; or a small, sharp, whitish-orange flame. In addition, a rapid increase in cylinder head temperatures often indicates detonation. When detonation is evident, throttle reduction is the most immediate and sure remedy. When detonation occurs, power is lost. Contributing causes of detonation are as follows:

1. Low-octane fuel.

2. High cylinder head temperature caused by too long a climb at too low an airspeed or by too lean a mixture.

3. High mixture temperature caused by improper use of carburetor heat or by high outside air temperature.

4. Too high manifold pressure with other conditions favorable to detonation.

5. Improper mixture caused by faulty carburetor or too lean a mixture.

PREIGNITION.

Preignition is closely related to detonation. In fact, detonation often progresses into preignition. If a hot spot develops inside a cylinder, the mixture is ignited before the spark occurs. When this happens, much of the power is wasted trying to push the piston down while it is still rising in the cylinder. The power impulses are uneven, horsepower falls off, and the engine can be damaged from excessive pressures and temperatures. Preignition is indicated by backfiring through the carburetor and possibly by a rapid increase in cylinder head temperatures. When preignition is encountered, the throttle settings should be reduced immediately.

MIXTURE CONTROL.

The mixture lever on the throttle quadrant is provided with two positions (NORMAL and RICH) for use during flight. The RICH position should be used for ground operation, take-off, climb, combat (Military Power), descent, and landing. The NORMAL position should be used during all other flight conditions. The injection-type carburetor is equipped with an automatic mixture control to maintain the mixture setting selected by the mixture lever on the throttle quadrant regardless of changes in altitude or temperature. No intermediate position between RICH and NORMAL, or between NORMAL and IDLE CUTOFF, should be selected to arbitrarily adjust the mixture. The mixture position to be used is specified on all performance charts in Appendix I. Moving the lever to between NORMAL and RICH will increase fuel consumption and thus decrease the fuel reserve planned for your mission. Moving the lever to between NORMAL and IDLE CUTOFF will lean the mixture and may seriously damage the engine by causing rough engine, backfiring, overheating, detonation, loss in power, or sudden engine failure.

SUPERCHARGER.

Supercharger shifts from LOW to HIGH should be made rapidly to avoid excessive wear on the clutch. If the engine shows a tendency to run rough during shifts, this tendency will be lessened by moving the mixture control to RICH before shifting to HIGH. Do not shift from LOW to HIGH at less than 5-minute intervals. This will give the clutch time to dissipate the heat generated by the previous shift. Shifts from HIGH to LOW can be made as desired, as no heat is created when the clutch is released. When a shift is made, be sure that the control reaches the extremity of its travel to prevent clutch slippage and ensure normal operation. When shifting from LOW to HIGH, be prepared to retard the throttle to check any tendency of excessive manifold pressure rise. Since the system has no manifold pressure regulator, manual operation of the throttle is necessary to properly control manifold pressure during blower shifts.

SPARK PLUG FOULING.

Spark plug fouling is a principal cause of ignition trouble, which in turn is one of the most common engine maintenance and operating problems. Such fouling is the accumulation of deposits which cause misfiring or prevent firing across the spark plug electrodes. The most common types of fouling are lead fouling and carbon fouling, with lead fouling the main troublemaker. Cause, prevention, and cure of spark plug fouling are linked to the chemistry and physics of the combustion cycle, which in turn is subject to wide variations under different ground and flight engine operating conditions. The problem of fouling during the various phases of flight is discussed in subsequent paragraphs, along with recommended measures for prevention and elimination. Prevention of fouling obviously is the most logical attack on the problem. Tetraethyl lead is the basic cause of lead fouling. Scavenger agents, such as bromine in the tetraethyl lead, are provided to combine with the lead during combustion, removing it with the exhaust gases. However, under certain conditions of temperature and pressure, the lead will condense out on the spark plug insulator as lead oxide or lead bromide compounds. In the presence of excess carbon as a reducing agent, these may form metallic lead particles. All such deposits can prevent ignition or firing. Other pertinent factors which influence plug misfiring include the type of ignition system, spark plug characteristics and time, general engine conditioning, including the care and handling of spark plugs, operating requirements and characteristics of the particular engine installation, and the specific engine operating conditions. In general, spark plug fouling involves a build-up of deposits through prolonged operation under a fixed set of conditions. Prevention and remedy for plug fouling, therefore, depend on taking action to vary these conditions, upset the chemistry of the fouling cycle, and restore good ignition.

GROUND OPERATION.

Type and Cause.

Either lead or carbon fouling can occur during ground operation. Lead fouling may be residual from a previous flight. Carbon fouling is usually due to prolonged ground running at idle rpm, particularly when the idle mixture is richer than best power; excess carbon from the rich mixture plus engine oil in combustion tend to build up as fouling deposits. Symptoms of such fouling usually include excessive rpm drop during ignition check at field barometric pressure.

Prevention.

Prolonged or unnecessary ground running should be avoided wherever possible, to minimize flight delays. Also, engine malfunction can occur during take-off where plug fouling has occurred but is not apparent at any stage of the engine check-out. 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, and excessively rich idling mixtures are the most common cause of carbon fouling. Although this is a ground maintenance function, the importance of properly adjusting idle mixture and of frequently checking to ensure the setting is correct cannot be overemphasized.

Elimination.

Elimination of fouling during ground operation is less dependable than adequate preventive measures, and the only practical cure may be a spark plug change. However, after each 10 minutes of ground operation, the engine should be operated at a manifold pressure equal to the field barometric pressure for 30 seconds, or at ignition system check power setting for T-28C Airplanes.

Caution Because of generally poor engine cooling, avoid prolonged operation while manifold pressure is at or above field barometric pressure.

When excessive rpm drop is encountered during magneto check, the following clean-out procedure should be used:

a. Set throttle at 1200 rpm

b. Lean out mixture until it reaches its maximum and then drops off 25 rpm.

c. Maintain this power setting for a period of two (2) minutes (do not exceed 200°C cylinder head temperature); then recheck for plug fouling.

d. If fouling is still present, set throttle at 2100 rpm and move mixture to NORMAL for 15 seconds. Return mixture to RICH and recheck for plug fouling.

TAKE-OFF.

Type and Cause.

Either lead or carbon fouling can occur during take-off. The rapid change in combustion temperatures and pressures and the high power levels achieved under take-off conditions are favorable to spark plug misfiring if there is any fouling from previous flight or ground operation. The electrical resistance of residual deposits on the spark plug decreases rapidly as limiting temperatures are approached, so that the ignition spark may short circuit along the insulator rather than firing the gap. Symptoms of fouling during take-off are backfiring and a rough-running engine, and they indicate advanced stages of misfiring.

Prevention.

The preventive measures which apply to ground operation also apply for take-off. In addition, it is important to maintain cylinder head temperature within limits to take advantage of the increased power and the decreased tendency for misfiring with relatively cool cylinder head temperature during take-off. Smooth or steady throttle advancement at the start of take-off roll is preferable to rapid or "jam" acceleration to Military Power.

Cure.

Reduce manifold pressure 2 to 5 inches or as required to restore smooth engine operation.

CRUISE.

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 for maximum range. Associated contributing factors include abnormally cool cylinder head temperatures and low manifold pressure at high engine rpm.

Prevention.

A periodic change in engine power settings will usually forestall lead fouling. Here again, prevention is preferable to cure. Each hour of cruise flight should be followed by: flight in rich mixture for 5 minutes; change of 3 to 5 inches manifold pressure; or a change of 100 to 130 rpm. To clear the engine, a reduction in power, followed by an increase, appears to be the preferable approach to prevention. One or more of these procedures should prove effective, and the procedure that least affects the flight condition is most desirable.

Cure.

Cure is less certain and includes a wider variety of procedures than prevention. One technique involves a complete change in the power cycle, including use of rich mixture, a reduction of 8 to 10 inches manifold pressure, and a period of engine cooling under low-power conditions followed by gradual restoration of cruise power in increments of 2 to 3 inches manifold pressure, with several minutes of operation at each level. Another method is to gradually increase power to METO Power for several minutes. Generally, spark plugs which are misfiring or are completely fouled are apt to resume firing at lower power settings; therefore, it is preferable to reduce power and then restore it, rather than to attempt to reach a high power level with faulty plugs. High power settings may change the chemistry of the fouling deposits to the extent that a change of spark plugs is the only cure. They also introduce the possibility of destructive backfiring during application of increased power.

DESCENT.

Type and Cause.

Either carbon or lead fouling of the spark plugs may occur during descent. Contributing factors are low power conditions such as cool cylinder head temperatures, low manifold pressure with high engine rpm, and low carburetor air temperatures associated with descent, particularly at relatively high airspeed.

Prevention.

Use power settings to maintain engine conditions approximating cruise power levels. Use relatively low engine rpm and relatively high manifold pressure, consistent with letdown requirements. Keep cylinder head temperature as nearly as possible in the same range as for cruise power. Use 15°C to 20°C carburetor air temperature to aid in distribution, to avoid engine cooling and possible instability from low-charge temperatures, and to prevent icing.

Cure.

Use a rich mixture and add a substantial amount of power to restore a typical cruise or climb workload in the combustion chambers, favorable for elimination of fouling. High power levels, such as climb power, can often be used by adding drag, with gear and partial flaps extended, without adversely affecting the desired rate of descent and airspeed.

INDUCTION SYSTEM ICING.

CARBURETOR ICING AND USE OF ALTERNATE AIR.

There are several types of carburetor ice formation, and the effect of each on the engine is different. The most common form of icing occurs in the induction air passages of the engine, carburetor, or carburetor air scoop. Low air temperature and high humidity are the primary causes of this icing, and the refrigerating effect of vaporizing the fuel aggravates the condition. Ice builds up until the air passages are sufficiently restricted to cause a reduction in airflow, with a resultant loss of power. This type of icing is indicated by a gradual decrease of manifold pressure and engine power. The purpose of carburetor alternate air is to prevent ice from forming in these passages. If icing conditions are expected, move the carburetor air lever to ALTERNATE before ice is encountered. This will provide a higher carburetor air temperature and prevent ice from forming in the carburetor air passages. If ice has already accumulated, move the carburetor air lever to ALTERNATE and fly at a warmer altitude. Carburetor air temperature can be further increased by closing the cowl flaps to the greatest extent consistent with cylinder head and oil temperature limitations. Increasing rpm will also raise cylinder head temperatures, thereby providing more heat for the carburetor air supply in the alternate position.

The other forms of carburetor ice occur within the carburetor and, depending upon what portion of the carburetor is affected, can produce either extremely rich or extremely lean mixtures. If the mixture control bleeds between the carburetor air chambers become iced, a rich mixture will result. Loss of power, increased fuel flow, "torching," or black smoke out the exhaust is an indication of this condition. To control the fuel flow, it is necessary to gradually pull the mixture lever toward IDLE CUTOFF until the engine operates normally. This type of ice may be stubborn and require full alternate air for some time before it is removed. When normal engine operation is restored, as evidenced by normal power when the mixture control is placed in NORMAL, the carburetor lever should be positioned to maintain carburetor air temperature above 15°C. As long as alternate air is being used, there will be very little danger of icing even though the carburetor air temperature goes below 15°C.

Ice forming in the impact pressure tubes or at the valve seat of the automatic mixture control unit will cause the carburetor to supply a very lean mixture. This form of ice will cause decreased fuel flow, loss of power, or backfiring. To increase the fuel flow, move the mixture lever to RICH. If this does not provide a sufficiently rich mixture, intermittent priming may be used until the carburetor has thawed out. This form of ice is the most difficult to remove, since it is necessary to heat the metal of the impact tubes and the automatic mixture control unit to effect melting. The quickest relief will be to fly at a warmer altitude and use full alternate air until engine operation is normal. Free moisture (including rain and supercooled water droplets) is excluded from the carburetor, when using alternate air, by abrupt turning of the air into the carburetor mixing valve. This provides inertia separation which removes the heavier water particles from the air. Increasing or decreasing altitude will often remove the airplane from an icing level. If icing in any form is encountered and the use of alternate air will not provide sufficiently high carburetor air temperature to remove it, change altitude to get out of the icing level.

Above 10,000 feet with alternate air on, a tendency toward lean operation is exhibited during high blower operation in the METO Power and Military Power ranges. Rich mixture will eliminate this condition with no compromise of engine performance.

Use caution in the use of the carburetor air lever, as extremely high carburetor air temperatures contribute to detonation and resulting engine damage. In addition, engine power is reduced by use of alternate air, because airflow is decreased. Full engine power, therefore, is not available with the carburetor air lever at ALTERNATE. When it is necessary to use alternate air to remove carburetor ice, the carburetor air temperature limits shown in Section V should be closely observed. At all other times, the carburetor air lever should be in the DIRECT position.

FUEL PRESSURE.

The engine-driven fuel pump supplies fuel to the carburetor at a nominal pressure of 23 psi. If the engine-driven pump fails, the fuel booster pump will supply fuel to the carburetor at about 19 psi at altitudes below approximately 10,000 feet. (Exact altitude will depend upon fuel temperature.) Whenever fuel pressure is below 19 psi minimum, a descent to below 10,000 feet altitude may restore fuel pressure. However, the carburetor will function acceptably under emergency conditions, with fuel pressures as low as 11 to 12 psi.

WHEEL BRAKE OPERATION.

To reduce airplane accidents and maintenance problems caused by tire, wheel, and wheel brake failure, the following precautions must be observed insofar as is practicable.

a. Take full advantage of the length of the runway, utilizing aerodynamic braking to stop the airplane, so that brakes can be used as little and as lightly as possible.

b. Use extreme care when applying brakes immediately after touchdown, or at any time there is considerable lift on the wings, to prevent skidding the tires. Heavy brake pressure will lock the wheels more easily immediately after touchdown than when the same pressure is applied after the full weight of the airplane is on the tires. A wheel once locked in this manner immediately after touchdown will not become unlocked as load increases, as long as brake pressure is maintained. Brakes can stop the wheels from turning, but stopping the airplane depends on the frictional force between the tires and the runway. As the load on the tires increases, the frictional force increases, giving better braking action. During a skid, the frictional force is reduced, thus requiring more distance to stop.

c. If maximum wheel braking is required, lift should be decreased as much as possible by lowering the nose gear and raising the flaps before applying brakes. This procedure will improve braking action, since the load on the tires will be increased, thus increasing the frictional force between the tires and the runway. Refer to "Minimum-run Landing" in Section II for additional information.

d. When a short landing roll is required, a single smooth application of the brakes with constantly increasing pedal pressure will result in optimum braking.

e. During a series of successive landings, a minimum of 15 minutes should elapse between landings where the landing gear remains in the slip stream, and a minimum of 30 minutes with the landing gear retracted between landings, to allow adequate cooling time between brake applications. This time restriction is not applicable to touch-and-go landings when no brake application is involved.

f. The brakes should not be dragged while taxiing, and should be used as little as possible for turning the airplane on the ground.

g. At the first indication of brake malfunction, or if brakes are suspected to be in an overheated condition after excessive use, the airplane should be manuevered off the active runway and stopped. The airplane should not be taxied into a crowded parking area, and the parking brakes should not be set. Overheated wheels and brakes must be cooled before the airplane is subsequently towed or taxied.

Peak temperature in the wheel and brake assembly are not attained until 5 to 15 minutes after a maximum braking operation is completed. In extreme cases, heat build-up can cause the wheel and tire to fail with explosive force or be destroyed by fire if proper cooling is not effected. Taxiing at low speeds to obtain air cooling of overheated brakes will not reduce temperatures adequately and can actually cause additional heat build-up.

Section VIII
CREW DUTIES

Not applicable to this airplane

ALL-WEATHER OPERATION

SECTION IX

TABLE OF CONTENTS

Except where repetition is necessary for emphasis, clarity, or continuity of thought, this section contains only those procedures that differ from, or are in addition to, the normal operating procedures in Section II.

INSTRUMENT FLIGHT PROCEDURES

This airplane has the same stability and handling characteristics during instrument flight conditions as when flown under VFR conditions. However, like all single-engine airplanes, it requires constant attention to the indications of the flight instruments. The instruments and communication equipment are enough for cross-country flights under most weather conditions. Flight in icing conditions should not be attempted, as there are no provisions for wing and empennage deicing.

The following techniques are recommended under instrument or night-flying conditions.

INSTRUMENT TAKE-OFF AND INITIAL CLIMB.

Complete the normal taxi and ground tests outlined in Section II. If taxiing and take-off are to be made in visible moisture, a check for indication of carburetor icing should be made, and the pitot heat should be turned on just before rolling into take-off position.

NOTE A drop in manifold pressure and engine rpm and engine roughness are good indications of carburetor icing.

If carburetor icing is apparent or anticipated, adjust carburetor air lever to provide carburetor heat for deicing before take-off; then return lever to DIRECT just before starting take-off roll. Set the heading pointer under the top index of the heading indicator to runway heading. Check ambiguity with runway heading and magnetic compass. Advance throttle to about 30 in. Hg, release brakes, and smoothly advance throttle to Maximum Power. Use brakes or nose wheel steering to maintain directional control until rudder becomes effective at about 30 knots IAS. During the take-off run, the heading indicator is the primary instrument for directional reference; however, while runway markings remain visible, they should be used as an aid in maintaining directional control. At about 75 knots IAS, apply back pressure to the stick to establish a take-off attitude of about four horizon bar widths nose-high on the attitude indicator. As the airplane leaves the ground, the attitude indicator is the primary instrument for determining airplane pitch-and-bank attitude and continues as such until the climb is established. When the altimeter and vertical velocity indicator indicate a definite climb, retract the landing gear. When the landing gear is up and locked, raise the flaps. Adjust power and maintain a climb of 500 to 1000 feet per minute until the desired climb speed has been attained.

Caution Do not raise flaps below 90 knots IAS.

INSTRUMENT CLIMB.

Turns should not be attempted below 500 feet above the terrain, and bank angle should not exceed 30 degrees while establishing the climb. Maintain airplane heading and, as soon as the airspeed indicates 140 knots IAS, establish normal climb, maintaining 140 knots IAS until the desired altitude is reached. Adjust carburetor air as required.

INSTRUMENT CRUISING FLIGHT.

The airplane handles well on instruments within all normal speed ranges given in Appendix I. After leveling off from the climb, it may be necessary to hold climb power until cruising airspeed is established. It is seldom necessary in routine flight to exceed 30 degrees of bank; however, control can be maintained in turns up to 60 degrees of bank. For ease of cross-check when flying a constant heading for a prolonged period, it is recommended the desired heading be set under the top index of the heading indicator.

COMMUNICATION AND NAVIGATION EQUIPMENT.

Because of the various configurations possible, special attention must be given to the individual communication and navigation equipment. Preflight planning must consider these differences with regard to routing, terminal and en route communications, and approach.

Refer to Section IV for operation of radio and navigation equipment.

The radio compass is highly susceptible to precipitation and electrical static, and its reliability at high altitudes is considerably reduced by thin overcasts, haze, dust, and thunderstorm activity. Because of these characteristics, the automatic operation of the radio compass should not be relied on entirely to establish fixes. In areas of interference-type weather, TACAN provides clearer reception and more stable directional indications. VHF navigational equipment is not seriously affected by static and should be utilized for navigation when TACAN is not available. Because TACAN and VHF equipment is limited to line-of-sight reception, flights should be conducted at altitudes high enough to receive stations en route.

HOLDING.

Slow to 130 knots IAS, and maintain 1800 rpm and manifold pressure as required. Do not lower gear or wing flaps.

DESCENT.

Descend with gear and wing flaps as desired. Check mixture lever at full RICH. Adjust carburetor and pitot heat and windshield and canopy defrost air as necessary. Do the normal pre-traffic-pattern check before beginning descent. If practical, do not retard throttle below 20 in. Hg manifold pressure.

NOTE The cockpit and windshield should be kept as warm as possible before and during descents, to eliminate fogging conditions on the transparent surfaces.

INSTRUMENT APPROACHES.

Either radio range, ADF, VOR, TACAN, ILS, or radar approaches may be made. Flying instrument approaches is not difficult, because of the excellent stability and low stalling speeds, but proper trim technique is very important. With each change of power, attitude, configuration, or airspeed, it is necessary to retrim the airplane to eliminate the need for holding corrective control pressures. A typical instrument approach procedure is shown in figure 9-1.

Radar Approach.

Recommended procedure for a standard radar approach is shown in figure 9-2.

NOTE When in the landing configuration, difficulty will be experienced in maintaining heading and attitude in severe turbulence. If turbulence is encountered during thunderstorm activity, delay approach, if possible, until the storm passes.

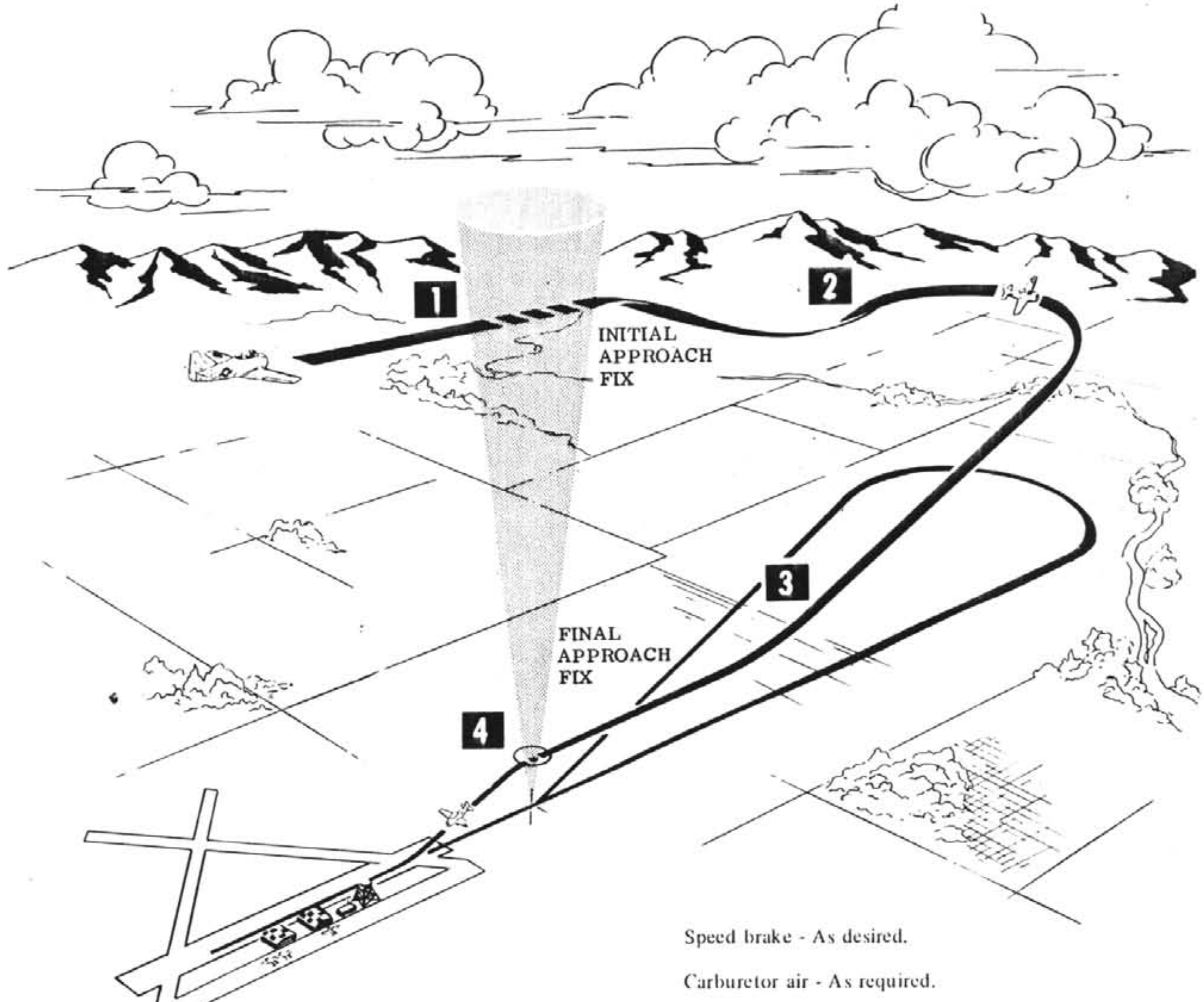
Missed Approach.

In case of a missed approach, leave the propeller lever at 2400 rpm and follow the normal go-around procedure as outlined in Section II. Adequate power is available to perform the missed approach without exceeding the maximum allowable manifold pressure for 2400 rpm.

ICE AND RAIN

Ice will normally adhere to the windshield, wing leading edge, and empennage. Altitude should be changed immediately upon the first sign of ice accumulation. The resultant drag and weight in-

TYPICAL INSTRUMENT APPROACH
APPLICABLE FOR ANY GROSS WEIGHT



1 Airspeed - 130 to 140 knots IAS.

Mixture - RICH.

Propeller - As required.

Throttle - As required

CAUTION

Refer to "Descent" in Section II for manifold pressure - rpm requirements to minimize high inertia loads on the engine during descent.

Landing gear - DOWN.

Wing flaps - As desired.

Speed brake - As desired.

Carburetor air - As required.

Cowl and oil cooler flaps - As required.

2 Complete the appropriate procedure turn while remaining within the prescribed maneuvering area and observing all published minimum altitudes.

3 Propeller - 2400 rpm.

Airspeed -110 to 120 knots IAS.

4 Throttle - As required.

Wing flaps - As required.

Airspeed - 100 - 110 knots IAS.

28B-1-00-10C

Figure 9-1

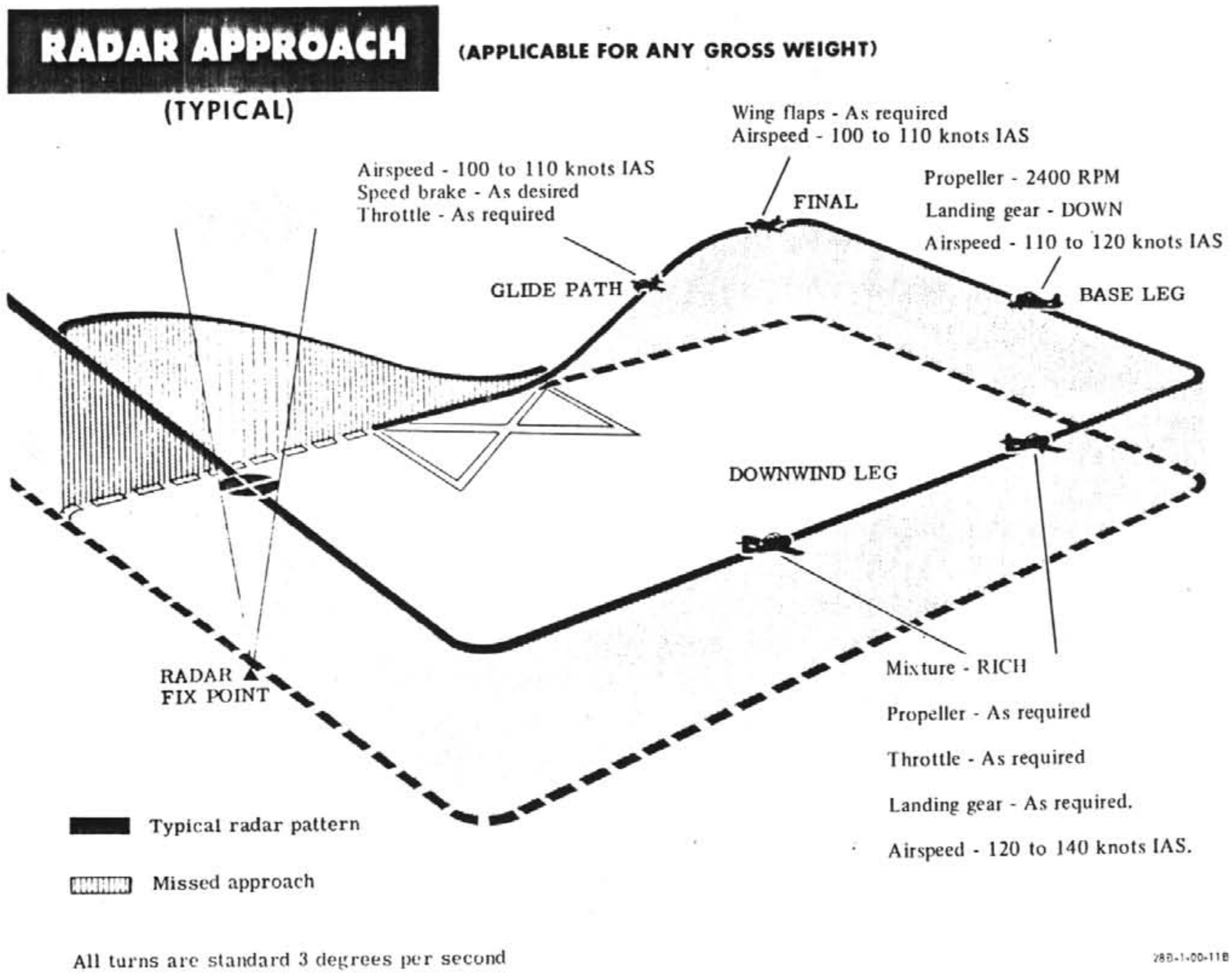


Figure 9-2

crease associated with airplane icing acts to reduce the airspeed and to increase the power requirements, with consequent reductions in range.

Warning Heavy ice accumulations can cause the stalling speed to be greatly increased; therefore, extreme caution must be used when landing under such conditions.

Carburetor icing is an ever-present possibility during operation in instrument weather, especially with temperatures near the freezing point. Normal anti-icing precautions should be taken. Carburetor heat should be applied before the actual icing conditions are encountered, if possible. (Refer to "Induction System Icing" in Section VII for additional information.) When available weather data is used, it is often possible to avoid areas of probable icing. However, if you are caught in icing conditions, immediately take the following precautions if possible:

- Change altitude rapidly by climb or descent in layer clouds (stratus), or vary course to avoid cloud formations.
- Reduce airspeed to minimize rate of ice build-up.
- Maintain carburetor heat in the range of 15°C to 38°C while in low blower and at 15°C in high blower.
- If ice or frost forms on the windshield or canopy, place the windshield and canopy defrost handle at ON. (The cockpit heater handle must be at ON to obtain heated air.)

LANDING IN RAIN.

There are no provisions for removal of rain from the windshield or canopy. At low airspeeds, such as in the landing pattern, visibility is impaired, although not to a serious extent. Braking action on wet runways is generally poor, requiring longer landing rolls. Plan to use all of the available runway when landing during wet runway conditions.

TURBULENCE AND THUNDERSTORMS

Flight in heavy turbulence or thunderstorms should be avoided if at all possible, to eliminate the hazard of airplane damage and loss of control. Under night-flying conditions, avoiding these areas may be difficult. The power settings and pitch attitude required for desired penetration speed should be established before entering the storm. The recommended penetration speed for the airplane in severe turbulence is about 160 knots IAS. The proper power setting and pitch attitude, if maintained throughout the storm, will result in a relatively constant average airspeed, regardless of false readings on the airspeed indicator.

APPROACHING THE STORM.

Be sure to check for proper operation of all flight instruments, navigation equipment, pitot heater, and instrument panel lights before attempting flight into thunderstorm areas. Adjust the throttle to obtain the recommended penetration speed of about 160 knots IAS. Be sure to check the following: pitot heater switch at ON; gyro instruments for proper indication; safety belt and shoulder harness tightened; seat adjusted for adequate head clearance; all loose equipment secured; radios which are rendered useless by static turned off; cockpit lights full bright, to minimize blinding effect of lightning.

IN THE STORM.

Maintain power setting and pitch attitude throughout the storm. Hold these constant and the airspeed will remain relatively constant regardless of airspeed indication. Devote full attention to flying the airplane. The turbulence, lightning, and precipitation may be extreme; however, do not allow these conditions to cause you undue concern. Maintain attitude, concentrating principally on holding level attitude by reference to the attitude indicator. Do not chase airspeed indicator or altimeter, because doing so could result in extreme airplane attitudes. Differential barometric pressures within the storm will make the airspeed indicator and altimeter unreliable.

Caution Do not lower gear and flaps during flight in thunderstorms, as they decrease the aerodynamic efficiency of the airplane and limit your airspeed.

NIGHT FLYING

There are no specific techniques for flying the airplane at night which differ from those required for daylight operation. Exhaust flame is visible from both cockpits but it is not distracting. If a slight amount of canopy glare is noted in the rear cockpit, it can be relieved by dimming the instrument panel lights. Eefore starting a night flight, be sure that both pilots are equipped with a flashlight.

COLD-WEATHER OPERATION

The success of low-temperature operation depends primarily upon preparations made during the postflight inspection, in anticipation of the requirements for operation on the following day. The procedures outlined must be followed to expedite the preflight inspection and to ensure satisfactory operation of the airplane and its systems during the next flight.

BEFORE ENTERING AIRPLANE.

Remove all protective covers, except engine cover, if it is necessary to preheat the engine. Check that the entire airplane is free of ice, snow, and frost. Snow and ice on the airplane surfaces constitute a major flight hazard and will result in loss of lift and dangerous stalling characteristics. Check all fuel and oil drains for free flow of fluid, and check that battery is in good condition and that it is properly installed. Use external power source, if available, for starting.

NOTE At temperatures below -18°C (0°F), heat should be applied to engine and accessories. Below -30°C (-22°F), it may be necessary to apply heat also to cockpit, master brake cylinder, and actuating cylinders. A rule of thumb to be applied in the use of preheat is that one minute of preheat should be used for each 2 degrees of temperature below 0°F. For example, 20 minutes of preheat should be adequate for starting at -40°C (-40°F), assuming that the engine oil system was properly diluted.

BEFORE STARTING ENGINE.

Before starting engine, depress starter button for a few seconds (with ignition switch OFF) and make sure engine will turn over at least 50 rpm (three propeller blades per second). If an engine cranking speed of 50 rpm cannot be maintained by the starter, insufficient oil dilution is indicated and additional preheat should be applied.

STARTING ENGINE.

Use normal starting procedure, supplemented by the following: Hold primer button depressed continuously while engine is being turned over by starter. More than normal priming will be required. After engine fires, continue priming until it is running smoothly. If oil pressure drops after a few minutes ground operation, stop engine and investigate. Use some carburetor heat after engine is started, to assist vaporization and combustion and to reduce backfiring.

TAXIING.

Warning Make sure all instruments have warmed up enough to ensure normal operation. It takes approximately 3 to 5 minutes for the heading indicator gyro to reach proper operating speed.

Do not taxi through water or slush if it can be avoided. Water or slush splashed on the wing and tail surfaces will freeze, increasing weight and drag and perhaps limiting control surface movement. If taxiing behind another airplane, maintain a greater interval to prevent ice and slush being blown on the airplane. Taxi slowly, make brake applications easy and sparingly, and use nose wheel steering if equipped.

BEFORE TAKE-OFF.

Check controls very carefully for free and proper movement. Hold brakes and run up engine to 2400 rpm until spark plugs have burned clean and until engine is operating smoothly. Check ignition system. The carburetor air lever should be at DIRECT for take-off. When outside air temperature is below -18°C (0°F), use sufficient carburetor heat to maintain carburetor air temperature near 15°C during take-off to ensure smooth engine operation. Turn pitot heater switch ON just before rolling into position for take-off.

TAKE-OFF.

At start of take-off run, advance throttle smoothly and rapidly to full OPEN and check that Maximum Power is available. If Maximum Power is not obtained, immediately discontinue take-off.

Warning The cockpit combustion heater should be off, because of the fire hazard involved.

AFTER TAKE-OFF.

After take-off from a wet snow- or slush-covered field, operate the landing gear and wing flaps through several complete cycles to prevent their freezing in the retracted position. Expect considerably slower operation of the landing gear and wing flaps in cold weather.

Caution Do not exceed gear- and flaps-down limit airspeed during these cycles.

DURING FLIGHT.

Use carburetor heat as required to prevent or eliminate icing. Under extremely cold conditions, carburetor icing is less likely to occur than when carburetor air temperature is between -10°C and 15°C (14°F and 59°F). It is a good practice to apply carburetor heat for one or 2 minutes every half hour during flight to preclude the possibility of icing. During operation in cold, clear (non-icing) air where cylinder head and carburetor air temperatures drop low enough to cause rough engine operation, increase carburetor heat just enough to eliminate roughness.

Caution Do not exceed 38°C carburetor air temperature in low blower, or 15°C in high blower, when using carburetor heat; otherwise, engine detonation may occur.

At low outside air temperatures, especially during low-power cruising operation, the fuel-air mixture may be too cold for proper vaporization and fuel economy. Use carburetor heat as necessary to obtain smooth engine operation and eliminate spark plug fouling. Occasionally increase engine rpm to 2400-2550 momentarily to throw off ice that may have accumulated on the propeller.

DESCENT.

In addition to doing the descent procedures outlined in Section II, use power as necessary to maintain adequate cylinder head temperature.

STOPPING ENGINE.

Use normal shutdown procedure, unless oil is to be diluted.

Oil Dilution.

The use of preheat is recommended. If this equipment is not available, use the following oil dilution procedure:

1. Allow oil to cool to 40°C or below.

2. Dilute oil at 1200 rpm.

Caution Do not allow oil pressure to drop below a minimum of 15 psi.

3. Shut down engine 30 seconds after dilution is completed, in order to circulate diluted oil throughout engine.

NOTE Oil dilution of 5 percent, suitable for anticipated starting temperatures of 2°C to -4°C (35°F to 25°F), can be done in 45 seconds.

Caution Oil dilution in excess of 5 percent is not recommended, because of potential severe oil loss from the engine breather.

4. At the discretion of authorized personnel, oil can be diluted in excess of 5 percent as follows:

ANTICIPATED OUTSIDE AIR TEMPERATURE	DILUTION REQUIRED (PERCENT)	DILUTION TIME (MINUTES)
2°C to -12°C (35°F to 10°F)	8	1
-12°C to -21°C (10°F to -5°F)	14	2
-21°C to -29°C (-5°F to -20°F)	19	3
-29°C and below (-20°F and below)	19	3

Caution If the oil has been diluted for 3 minutes, apply preheat before starting engine. Do not dilute for more than 3 minutes, as excessive boil-off time will be required.

BEFORE LEAVING AIRPLANE.

1. Release brakes.

2. Leave canopy partially open, to prevent cracking of canopy or windshield glass due to differential contraction. Air circulation also retards the formation of frost.

3. Have ground personnel do the following:

a. Inspect fuel and oil tank vents and breathers, and remove ice.

b. Clean dirt and ice from shock struts.

c. Install protective covers.

d. Drain oil tank sumps, "Y" drain, and fuel drains of condensate about 30 minutes after engine is stopped. If the airplane is to be idle for several days, the oil may be drained.

e. Check specific gravity of battery at least once a week. If it is less than 1.250, remove and service battery. If layover of several days is anticipated, or if temperature is below -29°C (-20°F) and airplane will be idle more than 4 hours, remove battery.

HOT-WEATHER AND DESERT PROCEDURES

In general, hot-weather and desert procedures differ from normal procedures mainly in that additional precautions must be taken to protect the airplane from damage caused by high temperatures and dust. Particular care should be taken to prevent the entrance of sand into the various airplane components and systems (engine, fuel system, pitot-static system, etc). All filters should be checked more often than under normal conditions. Units incorporating plastic and rubber parts should be protected as much as possible from excessive temperatures. Tires should be checked frequently for signs of blistering, etc.

NOTE Do not attempt a take-off in a sandstorm or dust storm. Park airplane into the wind and tie down securely. Make sure that protective covers are installed on pitot head and canopy, and around engine, and that cowl flaps are closed.

BEFORE TAKE-OFF.

During engine run-up, watch cylinder head and oil temperature for overheating. Avoid excessive use of the brakes while taxiing.

TAKE-OFF.

The increase in required take-off distances commonly associated with hot-weather operation of the airplane must be considered before starting take-off run. Expect gusts and turbulent air at low altitudes. (Refer to Take-off Distances chart in Appendix I.)

LANDING.

Maintain recommended approach and touchdown speeds very closely. Because of high outside air temperatures, your speed relative to the ground will be greater than normal. Expect a longer landing roll because of the higher ground speed at touchdown.

BEFORE LEAVING AIRPLANE.

Leave cowl and oil cooler flaps open until engine cools, to prevent engine damage caused by residual heating. Leave canopy partially open when parking in the sun, so that temperatures inside the cockpit will not become excessively high.

Caution High temperatures can cause fluid in the magnetic compasses to boil away, dry out electrical insulation, and cause inside paint to pull away from the skin.

Whenever possible, protect all air scoops, vents, operating mechanisms, and the cockpits from sand and dust.

NOTE Sand and dust in the air scoops and vents might restrict airflow during later operation.

PERFORMANCE DATA

APPENDIX I

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PART 1–INTRODUCTION

TABLE OF CONTENTS

Titles CAPITALIZED denote charts.

SCOPE AND ARRANGEMENT.

The flight performance charts in this section provide data for accurate preflight planning. The external loading capabilities of this airplane, coupled with the large variety of individual stores that may be carried, make it impractical to list flight performance data for each external configuration; consequently, the performance is presented in a configuration drag index method. Mission planning with the charts in this section requires a separate solution for each leg of the mission, and summarizing these legs determines total time, fuel, and distance.

A "part-type" arrangement groups the material as needed for planning general phases of each flight. In the descriptive text of each "part" is a discussion and explanation of the use of the charts provided. Sample charts and examples are shown for each type of chart.

PERFORMANCE DATA PRESENTATION.

The clean airplane (without external stores) is considered the basic airplane and is assigned a basic drag number. The various external stores are increments of drag to the clean airplane and are also assigned drag numbers. Figure A1-1 is a list of airplane and store drag numbers and weights. By adding the store drag numbers to the basic airplane drag number, the configuration drag index number is obtained. When using the charts, select the drag index nearest to the actual configuration drag index number. If maximum accuracy is desired and the configuration drag index number falls between two of the drag indexes, linear interpolation between the two drag indexes can be accomplished. The take-off gross weight may be determined by adding the store weights to the airplane take-off gross weight (clean wing). Examples of configuration drag index number determination are given on figure A1-1.

STORE DRAG COMPUTATION

AIRPLANE WEIGHT AND DRAG NUMBERS

T-28 B/C/D

TAKE-OFF GROSS WEIGHT (CLEAN WING) (1)	AIRPLANE DRAG NUMBER
T-28B . . . . 8650 POUNDS	T-28B 20.0
T-28C . . . . 8400 POUNDS	T-28C 20.6
T-28D . . . . 8700 POUNDS	T-28D 20.0
T-28D-5. . . . . . . 8750 POUNDS	T-28D-5. . . . . . . 20.0

STORE WEIGHTS AND DRAG NUMBERS

STORE	WEIGHT (POUNDS)		DRAG NUMBER	
	EMPTY	LOADED	SINGLE STORE (2)	MULTIPLE ADJACENT (3)
AERO 15B, 15C, OR 15D PYLON	27	—	0.2	—
EXTERNAL FUEL TANK (100 GAL. T-28B)	80	710	1.4	4.4
EXTERNAL FUEL TANK (100 GAL. T-28D-5)	99	710	1.1	4.2
B-37K RACK	86	—	1.5*	2.0*
WITH FOUR BDU-33/B, A/B PRACTICE BOMBS	—	186	1.9	3.0
WITH FOUR MK-106 MOD 1 PRACTICE BOMBS	—	106	3.0	5.0
WITH FOUR MK-24, LUU-1B OR LUU-2/B FLARES	—	182	2.3	3.5
MAU-63 RACK	145	—	2.1*	3.2*
WITH SIX M30A1 BOMBS	—	967	6.3	9.8
WITH SIX MK-24 LUU-1B OR LUU-2/B FLARES	—	289	3.3	6.6
WITH FOUR M1A2, M1A3, OR M1A4 FRAG BOMBS	—	665	5.7	6.8
MA-3/AERO 6A ROCKET LAUNCHER	21	148	0.6† 1.8*	1.3† 2.5*
LAU-3/A ROCKET LAUNCHER	75	430	0.9† 4.2*	2.9† 6.2*
LAU-32 A/A ROCKET LAUNCHER	40	165	0.6† 1.8*	1.3† 2.5*
LAU-32 B/A ROCKET LAUNCHER	50	175	0.6† 1.8*	1.3† 2.5*
LAU-59/A ROCKET LAUNCHER	41	174	0.6† 1.8*	1.3† 2.5*
M-31 INCENDIARY BOMB CLUSTER	—	571	3.8	5.5
M-32 INCENDIARY BOMB CLUSTER	—	637	5.2	8.2
MK-81 GP BOMB	—	260	0.3	0.8
MK-82 GP BOMB WITH OR WITHOUT M1A1 FUZE EXTENDER	—	531	0.4	1.2
M117 GP BOMB WITH M131 OR MAU-103/B, A/B FINS	—	823	0.8	2.9
M47A4 SMOKE BOMB	—	105	0.5	0.7
CBU-14/A, CBU-14A/A, CBU-22/A, CBU-22A/A, CBU-25/A, OR CBU-25A/A	50	250	0.9	1.5
BLU-1/B, BLU-1B/B OR BLU-1C/B FIRE BOMB FINNED	97	712	1.1	4.2
UNFINNED	82	697	1.0	3.9
BLU-10/B, BLU-10A/B FIRE BOMB UNFINNED	39	289	0.6	1.7
BLU-11/B FIRE BOMB UNFINNED	60	502	1.0	4.1
BLU-23/B FIRE BOMB FINNED	80	510	0.9	2.9
UNFINNED	60	490	0.8	2.7
BLU-27/B FIRE BOMB FINNED	125	885	1.1	4.2
UNFINNED	110	870	1.0	3.9
BLU-32/B FIRE BOMB FINNED	105	615	0.9	2.9
UNFINNED	85	595	0.8	2.7
M116A1 OR M116A2 FIRE BOMB UNFINNED	72	685	1.2	4.6
BDU-33/B OR BDU-33 A/B PRACTICE BOMB	—	25	0.1	0.4
M1A2, M1A3, OR M1A4 FRAG BOMB	—	130	0.9	1.2
M30A1 BOMB BOX FIN	—	125	0.6	1.1
CONICAL FIN	—	137	0.4	0.9
M57A1 BOMB BOX FIN	—	272	0.8	1.6
CONICAL FIN	—	289	0.6	1.3
M64A1 BOMB BOX FIN	—	561	1.0	2.5
CONICAL FIN	—	586	0.8	2.3
M81 FRAG BOMB BOX FIN	—	262	0.7	1.1
CONICAL FIN	—	275	0.5	0.9
M88 FRAG BOMB BOX FIN	—	217	0.6	1.0
CONICAL FIN	—	230	0.5	0.9
M129E1 LEAFLET BOMB	110	750	0.8	2.9
MK-24, LUU-1B, OR LUU-2/B FLARES	—	24	0.4	0.8
GUN POD, .50 CAL (100 ROUNDS)	124	154	2.8	5.8
FIXED GUN, .50 CAL (315 ROUNDS)	102	196	1.4	1.6
GUN POD, .50 CAL (315 ROUNDS)	136	231	3.3	4.3

28B-1-93-125E

*Empty

Figure A1-1

STORE DRAG COMPUTATION

T-28 B/C/D

STORE WEIGHTS AND DRAG NUMBERS				
STORE	WEIGHT (POUNDS)		DRAG NUMBER	
	EMPTY	LOADED	SINGLE STORE (2)	MULTIPLE ADJACENT (3)
SUU-11A/A GUN POD	245	325	0.6	1.7
PHOTO RECON BLISTER	–	500	4.0	–
STRIKE/RECON POD	–	78	1.0	2.2

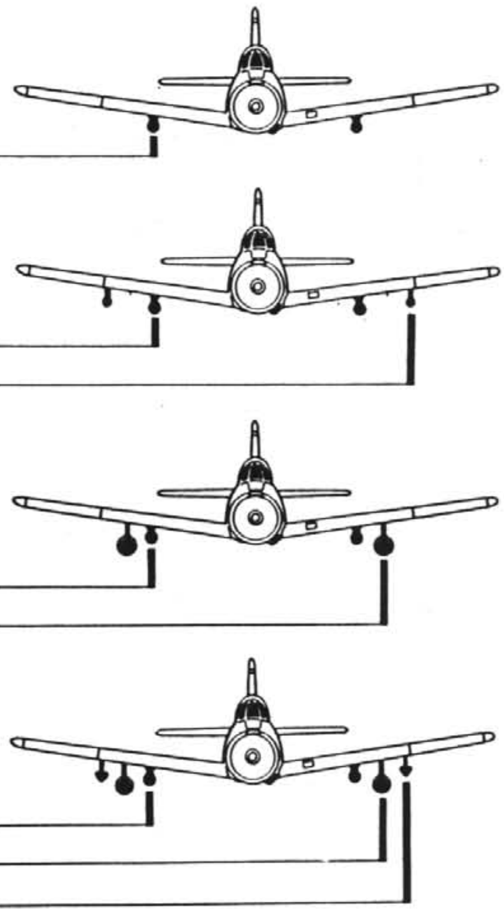
(1) GROSS WEIGHTS INCLUDE FULL FUEL, OIL, CREW(2), ARMAMENT CONTROL PEDESTAL, GUN CAMERA, GUN SIGHT AND APPLICABLE ELECTRONIC EQUIPMENT.

(2) SINGLE MOUNTED: ONE STORE ON EITHER OUTBOARD, INTERMEDIATE OR INBOARD STATION, OR ANY 4 STORES ON OUTBOARD OR INBOARD STATIONS WITH INTERMEDIATE STATION VACANT.

(3) MULTIPLE ADJACENT: ANY 4 TO 6 STORES ON ADJACENT STORE STATIONS. INTERFERENCE DRAG CAUSED BY THE PROXIMITY OF ADJACENT STORES IS INCLUDED IN THE MULTIPLE ADJACENT DRAG NUMBERS.

* EMPTY † FULL ‡ DATA NOT AVAILABLE

EXAMPLES



TWO SINGLE-MOUNTED STORES

2 GUN PODS (X 2.8) ---------------- 5.6

FOUR SINGLE-MOUNTED STORES

2 GUN PODS (X 2.8) ---------------- 5.6
2 M57A1 BOMBS (X0.6) ------------- 1.2
2 AERO 15C PYLONS (X 0.2) --------- 0.4
TOTAL STORE DRAG --------------- 7.2

FOUR MULTIPLE-ADJACENT STORES

2 GUN PODS (X 5.8) ---------------- 11.6
2 BLU-11 NAPALM (X4.1) ----------- 8.2
2 AERO 15C PYLONS (X 0.2) --------- 0.4
TOTAL STORE DRAG --------------- 20.2

SIX MULTIPLE-ADJACENT STORES

2 GUN PODS (X 5.8) ---------------- 11.6
2 BLU-11 NAPALM (X4.1) ----------- 8.2
2 M1A2 CLUSTERS (X 1.2) ------------ 2.4
4 AERO 15C PYLONS (X 0.2) --------- 0.8
TOTAL STORE DRAG --------------- 23.0

NOTE: WHEN CONFIGURATION IS DETERMINED, STORE DRAG NUMBERS ARE ADDED TO AIRPLANE DRAG NUMBER TO ARRIVE AT TOTAL DRAG INDEX NUMBER.

28D-1-93-141A

FUEL.

Where applicable, the data in this section is based on the use of aviation gasoline fuel Grade 115/145.

AIRSPEED POSITION ERROR CORRECTION.

The airspeed position error correction chart (figure A1-2) provides position error correction to be added to, or subtracted from, IAS due to installation error. For practical purposes, CAS can be considered identical to IAS except at the high end of the obtainable airspeed range.

DENSITY ALTITUDE CHART.

The density altitude chart (figure A1-3) provides density ratio and density altitude when pressure altitude and ambient temperature are shown. The Standard Day temperature lapse line is shown by the line from 23°C at the bottom of the chart to -55°C from 35,000 feet to the top of the chart. To use the chart, enter at known temperature and project vertically to the intersection of the desired pressure altitude curve. From this point, density altitude can be read by projecting directly left, and density ratio can be read by projecting directly right. True airspeed at density altitude can then be determined by multiplying equivalent airspeed by the density ratio factor.

STANDARD ALTITUDE TABLE.

The standard altitude table (figure A1-4) presents Standard Day atmospheric conditions in tabular form. This chart can be used to obtain density ratio, temperature, speed of sound ratio at altitude, atmospheric pressure, and pressure ratio. To find the value of any item on a Standard Day, read to the right of the desired altitude in the appropriate column.

TEMPERATURE CORRECTION FOR COMPRESSIBILITY.

The indicated free air temperature may be corrected for compressibility by using figure A1-5. To correct temperature for compressibility, enter the chart with CAS, advance vertically to pressure altitude, and read left to temperature correction factor. The free air temperature in degrees centigrade for a given flight speed and altitude is determined by subtracting the correction from the indicated free air temperature.

POWER SCHEDULE.

The power schedule charts (figure A1-6) present operating power schedules for both high and low blower supercharger operation.

NOTE The charts do not include the effects of ram air on horsepower.

Power settings can be determined by entering at a given brake horsepower (bhp) and projecting to the altitude at which this bhp is to be obtained. By interpolation, the recommended rpm and manifold absolute pressure (MAP) can be determined. As used with the charts in this section, power settings will be found by entering with an altitude and projecting to an rpm; by interpolation, the MAP and bhp can be determined. Power settings falling to the left of the full-throttle propeller load line are in the part-throttle region of the chart. In this region, for any given bhp, there is a specific rpm. The bhp is maintained by adjusting MAP as altitude changes. However, in the full-throttle region (to the right of the full-throttle propeller load line), the MAP can no longer be adjusted. To maintain bhp in the full-throttle region, the rpm is adjusted as altitude changes. When operating in the full-throttle region at temperatures above standard, it is necessary to adjust the power setting to maintain a given bhp. This adjustment is made by increasing the bhp by one percent for each 10°F (6°C) rise in temperature above Standard Day conditions. Enter the chart with the adjusted bhp, and the new power setting obtained will produce the desired Standard Day bhp. For power settings in the part-throttle region at temperatures above standard, increase the MAP by approximately 0.5 in. Hg for each 10°F (6°C) rise in temperature above Standard Day conditions (rpm remains constant).

NOTE The afore-mentioned correction is acceptable provided carburetor air temperature does not exceed 38°C (low blower) or 15°C (high blower). For each 6°C increase in carburetor temperature above 38°C (low blower) or 15°C (high blower), MAP should be reduced 1 in. Hg.

- The effect of humidity on in-flight bhp is negligible.

FUEL FLOW.

The fuel flow charts (figure A1-7) present fuel flow in pounds per hour for varying bhp output in high and lower blower supercharger operation. Enter the appropriate chart with the applicable bhp, read vertically to rpm, and left to resultant fuel flow.

AIRSPEED POSITION ERROR CORRECTION

DATA AS OF: 1 APRIL 1964
BASED ON: **FLIGHT TEST**

MODEL: T-28B/C/D
ENGINE: (1) R-1820-86, 86A

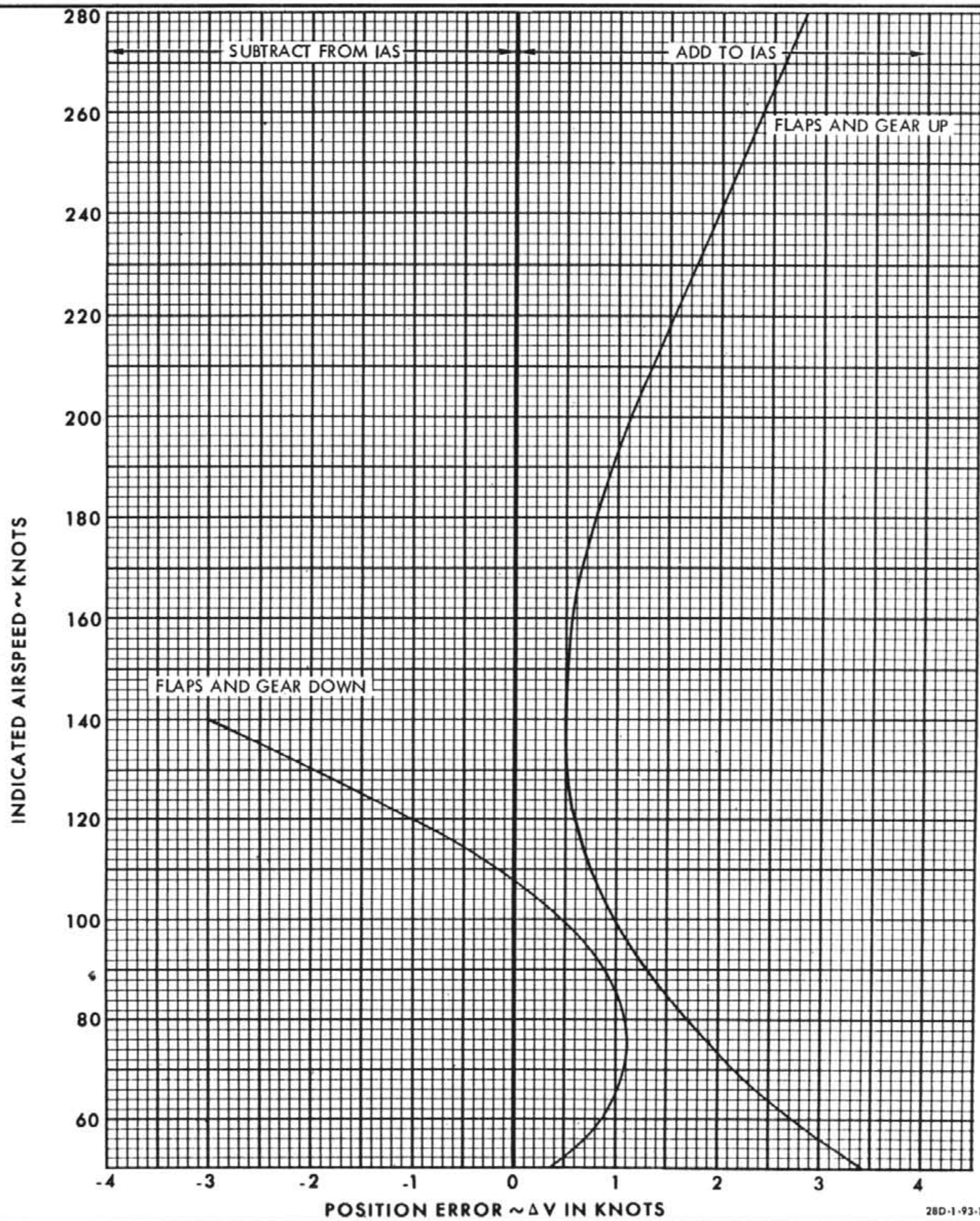


Figure A1-2

DENSITY ALTITUDE CHART

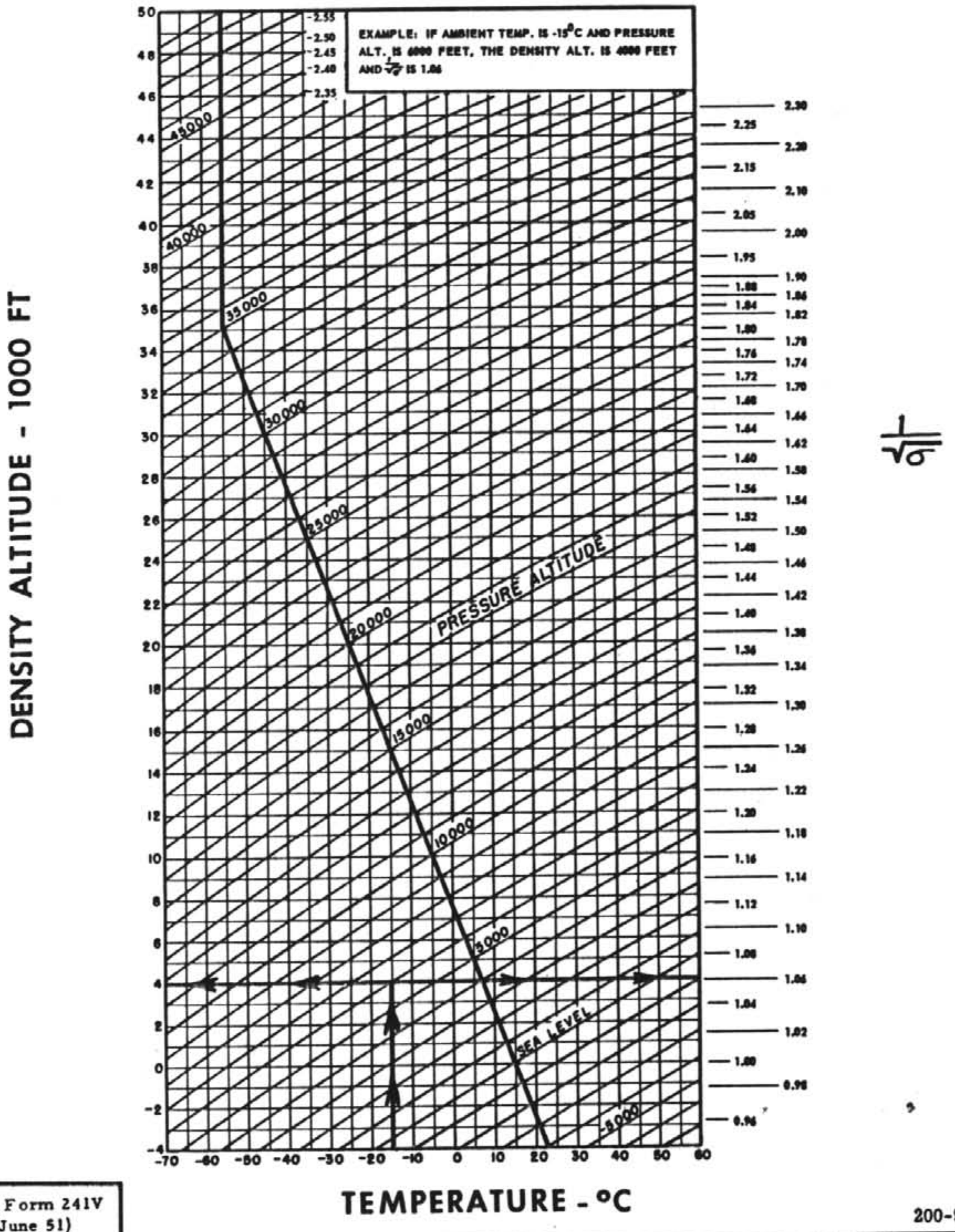


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Figure A1-3

Standard Altitude Table

Standard Sea Level Air:
T = 15° C.
P = 29.921 in. of Hg.

W = .07651 lb/cu. ft.
1" of Hg. = 70.732 lb/sq. ft. = 0.4912 lb/sq. in.

ρ_0 = .002378 slugs/cu. ft.

This table is based on NACA Technical Report No. 218 a_o - 1116 ft./sec.

Altitude feet	Density Ratio ρ/ρ_0	$\frac{1}{\sqrt{\sigma}}$	Temperature Deg. C	Temperature Deg. F	Speed of Sound Ratio a/a_o	Pressure In. of Hg.	Pressure Ratio P/Po
0	1.0000	1.0000	15.000	59.000	1.0000	29.92	1.0000
1000	.9710	1.0148	13.019	55.434	.997	28.86	.9644
2000	.9428	1.0299	11.038	51.868	.993	27.82	.9298
3000	.9151	1.0454	9.056	48.301	.990	26.81	.8962
4000	.8881	1.0611	7.075	44.735	.986	25.84	.8636
5000	.8616	1.0773	5.094	41.169	.983	24.89	.8320
6000	.8358	1.0938	3.113	37.603	.979	23.98	.8013
7000	.8106	1.1107	1.132	34.037	.976	23.09	.7716
8000	.7859	1.1280	-0.850	30.471	.972	22.22	.7427
9000	.7619	1.1456	-2.831	26.904	.968	21.38	.7147
10000	.7384	1.1637	-4.812	23.338	.965	20.58	.6876
11000	.7154	1.1822	-6.793	19.772	.962	19.79	.6614
12000	.6931	1.2012	-8.774	16.206	.958	19.03	.6359
13000	.6712	1.2206	-10.756	12.640	.954	18.29	.6112
14000	.6499	1.2404	-12.737	9.074	.950	17.57	.5873
15000	.6291	1.2608	-14.718	5.507	.947	16.88	.5642
16000	.6088	1.2816	-16.699	1.941	.943	16.21	.5418
17000	.5891	1.3029	-18.680	-1.625	.940	15.56	.5202
18000	.5698	1.3247	-20.662	-5.191	.936	14.94	.4992
19000	.5509	1.3473	-22.643	-8.757	.932	14.33	.4790
20000	.5327	1.3701	-24.624	-12.323	.929	13.75	.4594
21000	.5148	1.3937	-26.605	-15.890	.925	13.18	.4405
22000	.4974	1.4179	-28.586	-19.456	.922	12.63	.4222
23000	.4805	1.4426	-30.568	-23.022	.917	12.10	.4045
24000	.4640	1.4681	-32.549	-26.588	.914	11.59	.3874
25000	.4480	1.4940	-34.530	-30.154	.910	11.10	.3709
26000	.4323	1.5209	-36.511	-33.720	.906	10.62	.3550
27000	.4171	1.5484	-38.493	-37.287	.903	10.16	.3397
28000	.4023	1.5768	-40.474	-40.853	.899	9.720	.3248
29000	.3879	1.6056	-42.455	-44.419	.895	9.293	.3106
30000	.3740	1.6352	-44.436	-47.985	.891	8.880	.2968
31000	.3603	1.6659	-46.417	-51.551	.887	8.483	.2834
32000	.3472	1.6971	-48.399	-55.117	.883	8.101	.2707
33000	.3343	1.7295	-50.379	-58.684	.879	7.732	.2583
34000	.3218	1.7628	-52.361	-62.250	.875	7.377	.2465
35000	.3098	1.7966	-54.342	-65.816	.871	7.036	.2352
36000	.2962	1.8374	-55.000	-67.000	.870	6.708	.2242
37000	.2824	1.8818	-55.000	-67.000	.870	6.395	.2137
38000	.2692	1.9273	-55.000	-67.000	.870	6.096	.2037
39000	.2566	1.9738	-55.000	-67.000	.870	5.812	.1943
40000	.2447	2.0215	-55.000	-67.000	.870	5.541	.1852
41000	.2332	2.0707	-55.000	-67.000	.870	5.283	.1765
42000	.2224	2.1207	-55.000	-67.000	.870	5.036	.1683
43000	.2120	2.1719	-55.000	-67.000	.870	4.802	.1605
44000	.2021	2.2244	-55.000	-67.000	.870	4.578	.1530
45000	.1926	2.2785	-55.000	-67.000	.870	4.364	.1458
46000	.1837	2.3332	-55.000	-67.000	.870	4.160	.1391
47000	.1751	2.3893	-55.000	-67.000	.870	3.966	.1325
48000	.1669	2.4478	-55.000	-67.000	.870	3.781	.1264
49000	.1591	2.5071	-55.000	-67.000	.870	3.604	.1205
50000	.1517	2.5675	-55.000	-67.000	.870	3.436	.1149

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(11 Jun 51)

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Figure A1-4

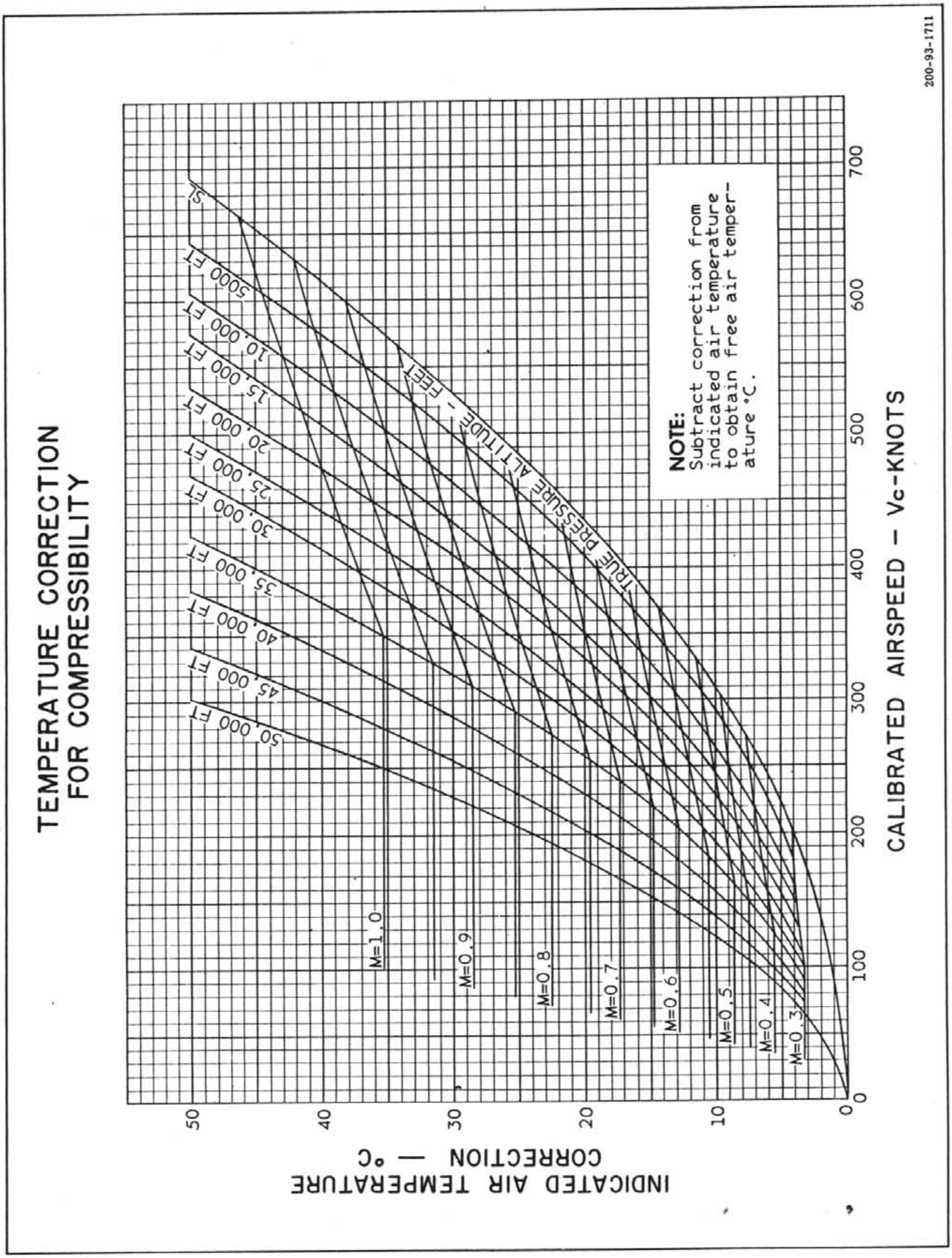
200-93-1711
TEMPERATURE CORRECTION
FOR COMPRESSIBILITY
NOTE:
Subtract correction from indicated air temperature to obtain free air temperature °C.
TRUE PRESSURE ALTITUDE - FEET
SL
5000 FT
10,000 FT
15,000 FT
20,000 FT
25,000 FT
30,000 FT
35,000 FT
40,000 FT
45,000 FT
50,000 FT
M=1.0
M=0.9
M=0.8
M=0.7
M=0.6
M=0.5
M=0.4
M=0.3
CALIBRATED AIRSPEED - Vc-KNOTS
0
100
200
300
400
500
600
700
INDICATED AIR TEMPERATURE
CORRECTION — °C
0
10
20
30
40
50

Figure A1-5

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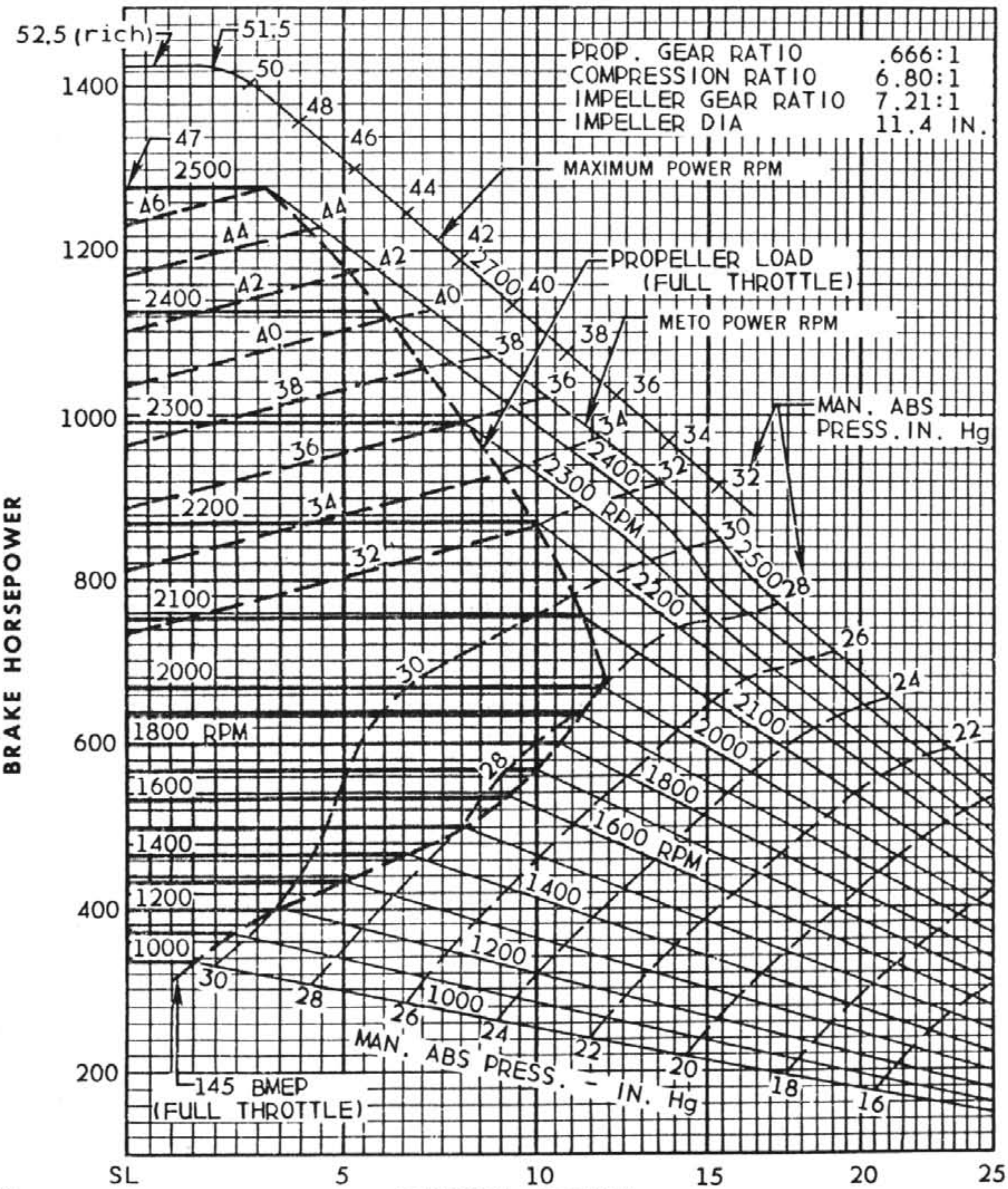
POWER SCHEDULE

LOW BLOWER

STANDARD DAY

DATA AS OF: JULY 1962
DATA BASED ON: WAD SPEC. NO. N896A

MODEL: T-28B/C/D
ENGINE: (1) R-1820-86, 86A



NOTE:

1. USE RICH MIXTURE ABOVE 2300 RPM
2. FULL THROTTLE LINES OF 2400 RPM AND LESS ARE ESTIMATED.
3. MANIFOLD ABSOLUTE PRESSURES ARE ESTIMATED.

T-28D-1-93-101

Figure A1-6

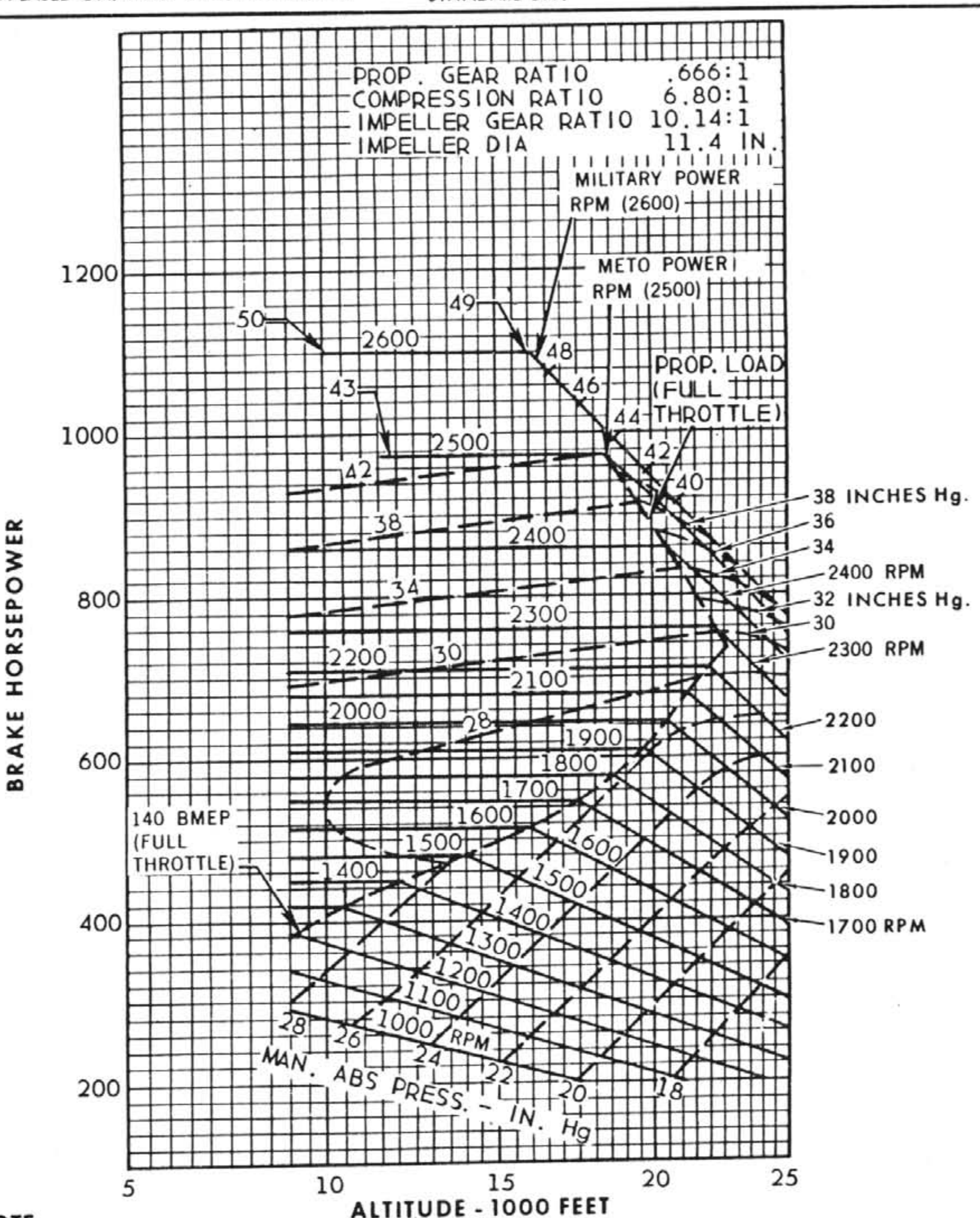
POWER SCHEDULE

HIGH BLOWER

STANDARD DAY

DATA AS OF: JULY 1962
DATA BASED ON: WAD SPEC. NO. N896A

MODEL: T-28B/C/D
ENGINE: (1) R-1820-86, 86A



NOTE:

1. Use rich mixture above 2300 RPM
2. Full throttle lines of 2400 rpm and less are estimated.
3. Manifold absolute pressures are estimated.

T-28D-1-93-100A

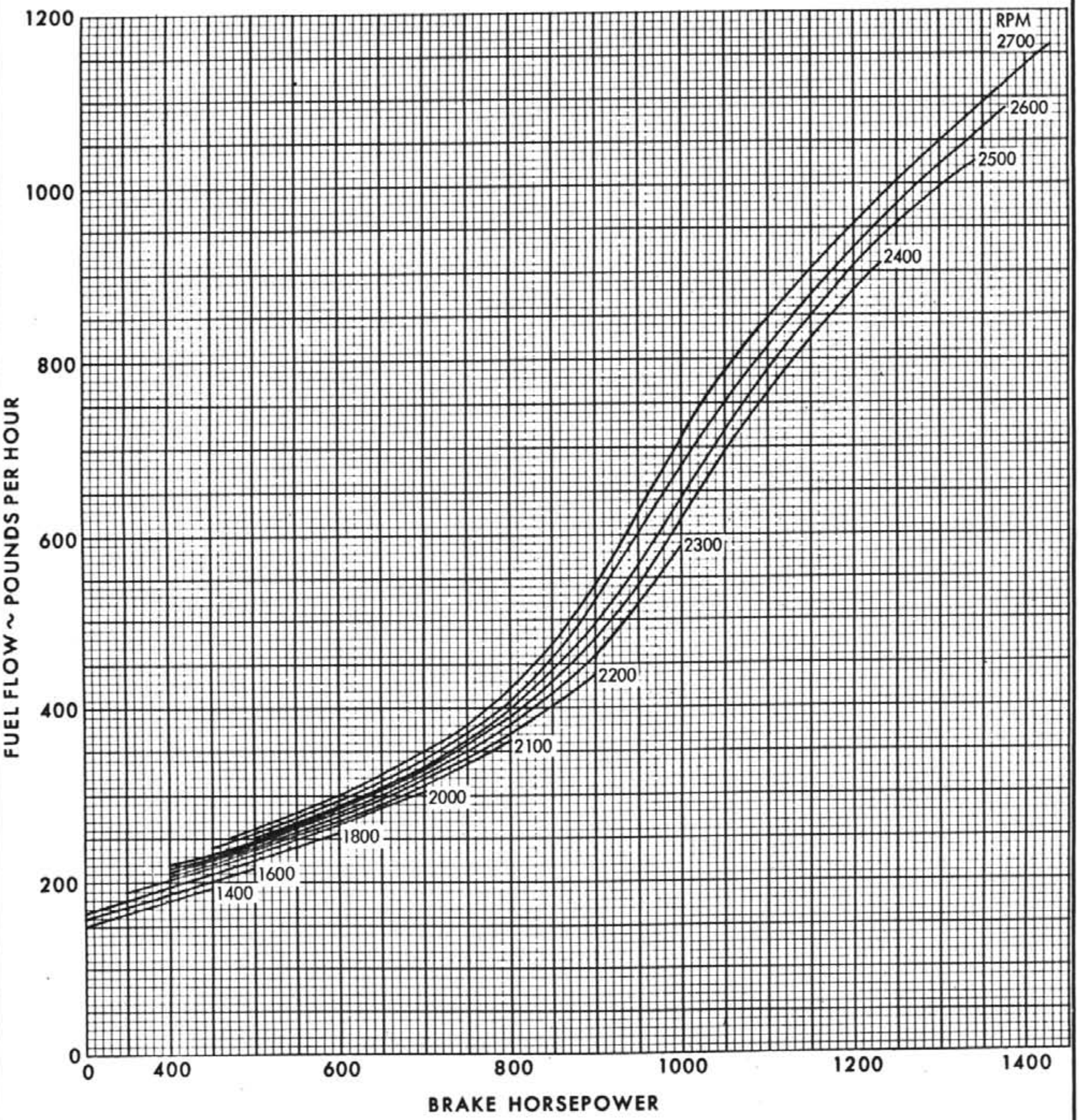
FUEL FLOW

LOW BLOWER

STANDARD DAY

DATA AS OF: 1 APRIL 1964
BASED ON: **FLIGHT TEST**

MODEL: T-28B/C/D
ENGINE: (1) R-1820-86, 86A



28D-1-93-111A

Figure A1-7

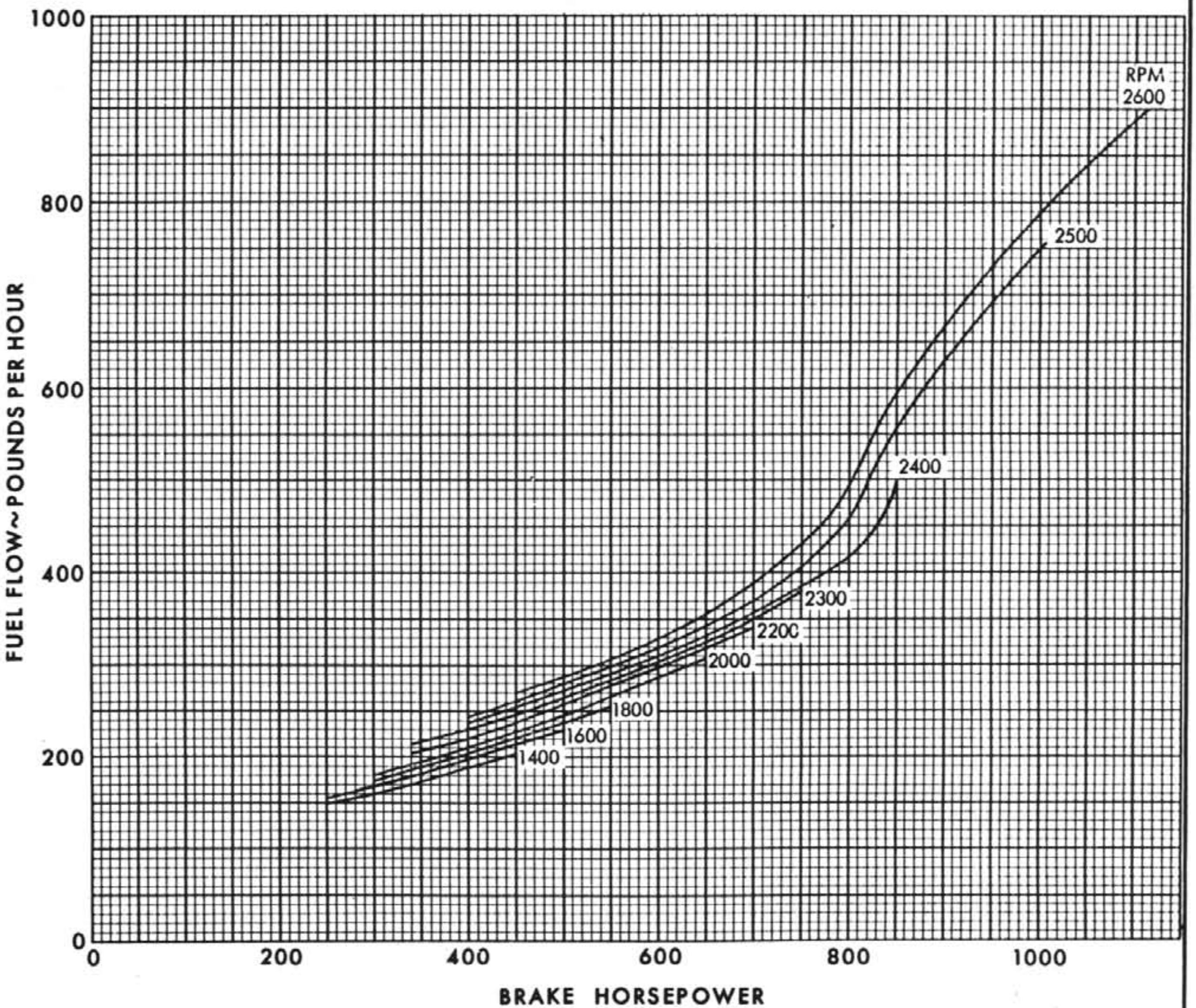
FUEL FLOW

HIGH BLOWER

STANDARD DAY

DATA AS OF: 1 APRIL 1964
BASED ON: **FLIGHT TEST**

MODEL: T-28B/C/D
ENGINE: (1) R-1820-86, 86A



28D-1-93-110A

PART 2–TAKE-OFF

TABLE OF CONTENTS

Titles CAPITALIZED denote charts.

TAKE-OFF AND LANDING CROSS-WIND CHART.

The take-off and landing cross-wind chart (figure A2-2) is used to obtain the head wind component for cross winds from 0 to 50 knots and up to 90 degrees from airplane heading. The head wind component is used in the take-off and landing charts to determine distances with wind. The crosshatched area is considered beyond airplane control capability. Refer to Section II for recommendations and suggested techniques for take-off and landing with a cross wind.

BRAKE HORSEPOWER AVAILABLE FOR TAKE-OFF.

The brake horsepower available for take-off chart (figure A2-3) presents Standard Day bhp and MAP for various pressure altitudes. Also included are charts which provide a means of correcting Standard Day take-off MAP for nonstandard temperatures and air water content. In order to achieve the performance given on the take-off distance and velocity during take-off ground run charts, the take-off MAP should be adjusted for temperature and air water vapor.

NOTE If detonation is encountered when MAP is increased, the MAP should be reduced. An MAP reduction of 1 in. Hg results in a take-off distance increase of about 150 feet.

TAKE-OFF DISTANCE.

The take-off distance charts (figures A2-4 and A2-5) are composite plots of take-off data using maximum horsepower corrected for temperature and moisture as noted on the brake horsepower available for take-off charts. The charts can be used to determine ground roll distance for head wind or tail wind components and total distance over a 50-foot obstacle.

VELOCITY DURING TAKE-OFF GROUND RUN.

The velocity during take-off ground run charts (figures A2-6 and A2-7) are used to determine the

TAKE-OFF AND LANDING DATA CARD

The use of a take-off and landing data card shall be in accordance with existing command directives. When directed, the pilot will obtain and compute all data necessary to complete a take-off and landing data card. The data is computed from the appropriate charts in this appendix. Interpretation of the data entered on the card is subject to a number of variables with which the pilot should be familiar. For example, rapid changes in weather may produce marked variations between precomputed performance and actual performance. Such factors as braking during take-off, runway surface conditions, etc, can seriously affect the performance which is precomputed and entered on the card. However, the card is very useful as a general guide to expected airplane performance, and will contribute substantially to flight safety when properly used. This example is provided as a guide for completion of the card that appears in the abbreviated checklist.

T.O. 1T-28B-1CL-1

TAKE-OFF AND LANDING DATA CARD

CONDITIONS

	Take-off	Landing
RUNWAY LENGTH (Check NOTAMS)	______	______
TEMPERATURE	______	______
WIND	______	______
PRESSURE ALTITUDE	______	______
RCR	______	______
GROSS WEIGHT	______	______

TEMPERATURE, WIND, PRESSURE ALTITUDE, RCR: From latest weather data

GROSS WEIGHT: Calculated for take-off / Calculated for landing

TAKE-OFF DATA

MAXIMUM POWER	______ In. Hg and	______ rpm
TAKE-OFF DISTANCE	______ ft at	______ Kn
STOPPING DISTANCE	______ ft at	______ Kn

MAXIMUM POWER: From brake horsepower available for take-off chart in Appendix I

TAKE-OFF DISTANCE: From take-off distance chart in Appendix I

STOPPING DISTANCE: From stopping distance chart in Appendix I

LANDING DATA

	Immediately after take-off	Final Landing
APPROACH	______ Kn	______ Kn
TOUCHDOWN	______ Kn	______ Kn
GROUND ROLL	______ ft	______ ft

APPROACH, TOUCHDOWN, GROUND ROLL: From landing distance chart in Appendix I

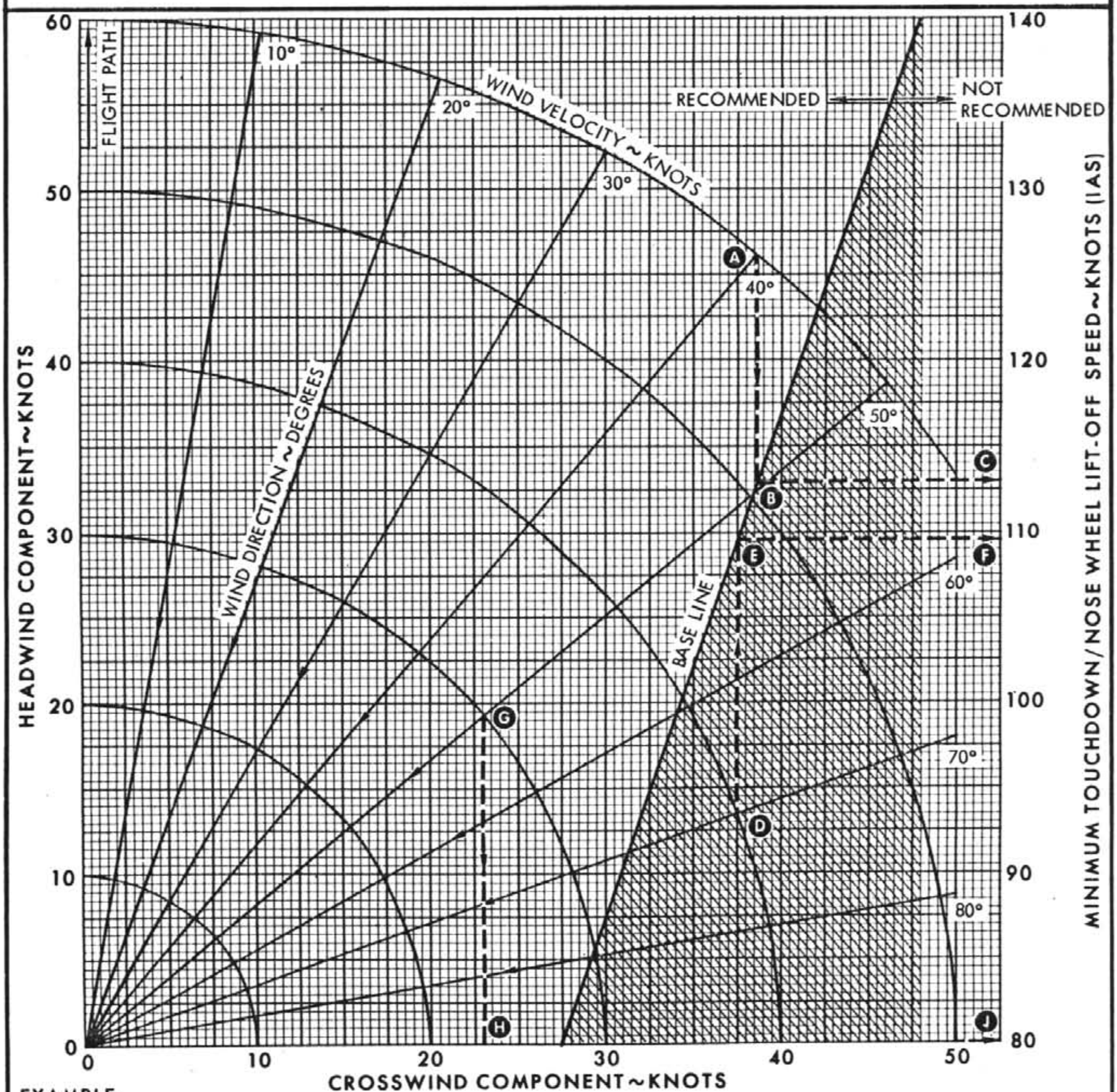
T-28D-1-93-23

Figure A2-1

TAKE-OFF AND LANDING CROSSWIND CHART

DATA AS OF: 1 APRIL 1964
BASED ON: **FLIGHT TEST**

MODEL: T-28B/C/D
ENGINE: (1) R-1820-86, 86A



EXAMPLE:

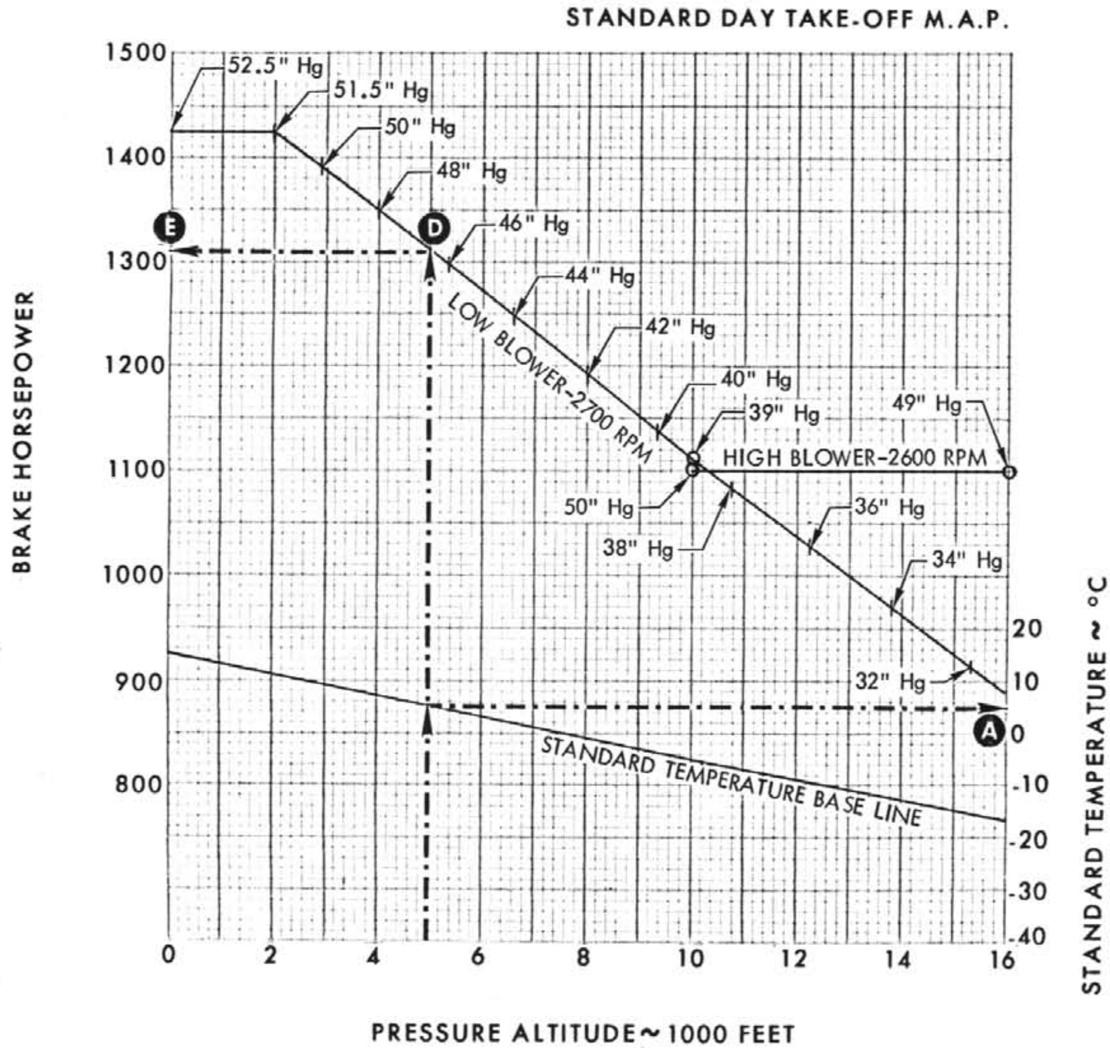
- Ⓐ WIND 40° AT 60 KNOTS, PROCEED VERTICALLY (HEADWIND COMPONENT 46 - CROSS WIND COMPONENT 38)
- Ⓑ INTERSECT BASE LINE, PROCEED HORIZONTALLY
- Ⓒ MIN. TOUCH-DOWN OR NOSE WHEEL LIFT-OFF SPEED (113 KIAS)
- Ⓓ WIND 70° AT 40 KNOTS PROCEED VERTICALLY
- Ⓔ INTERSECT BASE LINE PROCEED HORIZONTALLY
- Ⓕ MIN. TOUCH-DOWN OR NOSE WHEEL LIFT-OFF SPEED (109.5 KIAS)
- Ⓖ WIND 50° AT 30 KNOTS PROCEED VERTICALLY
- Ⓗ MIN. SPEED INTERSECTED BEFORE BASE LINE
- Ⓙ MIN. TOUCH-DOWN OR NOSE WHEEL LIFT-OFF SPEED (80 KIAS)

28D-1-93-102A

Figure A2-2

BRAKE HORSEPOWER AVAILABLE

DATA AS OF: 1 APRIL 1964
DATA BASIS: **FLIGHT TEST AND ESTIMATED**



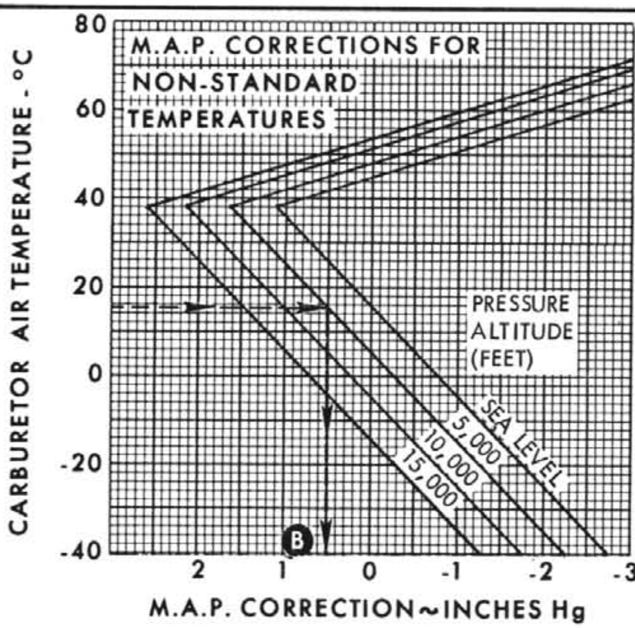
NOTE: DO NOT USE HIGH BLOWER AT ALTITUDES BELOW 10,000 FT.

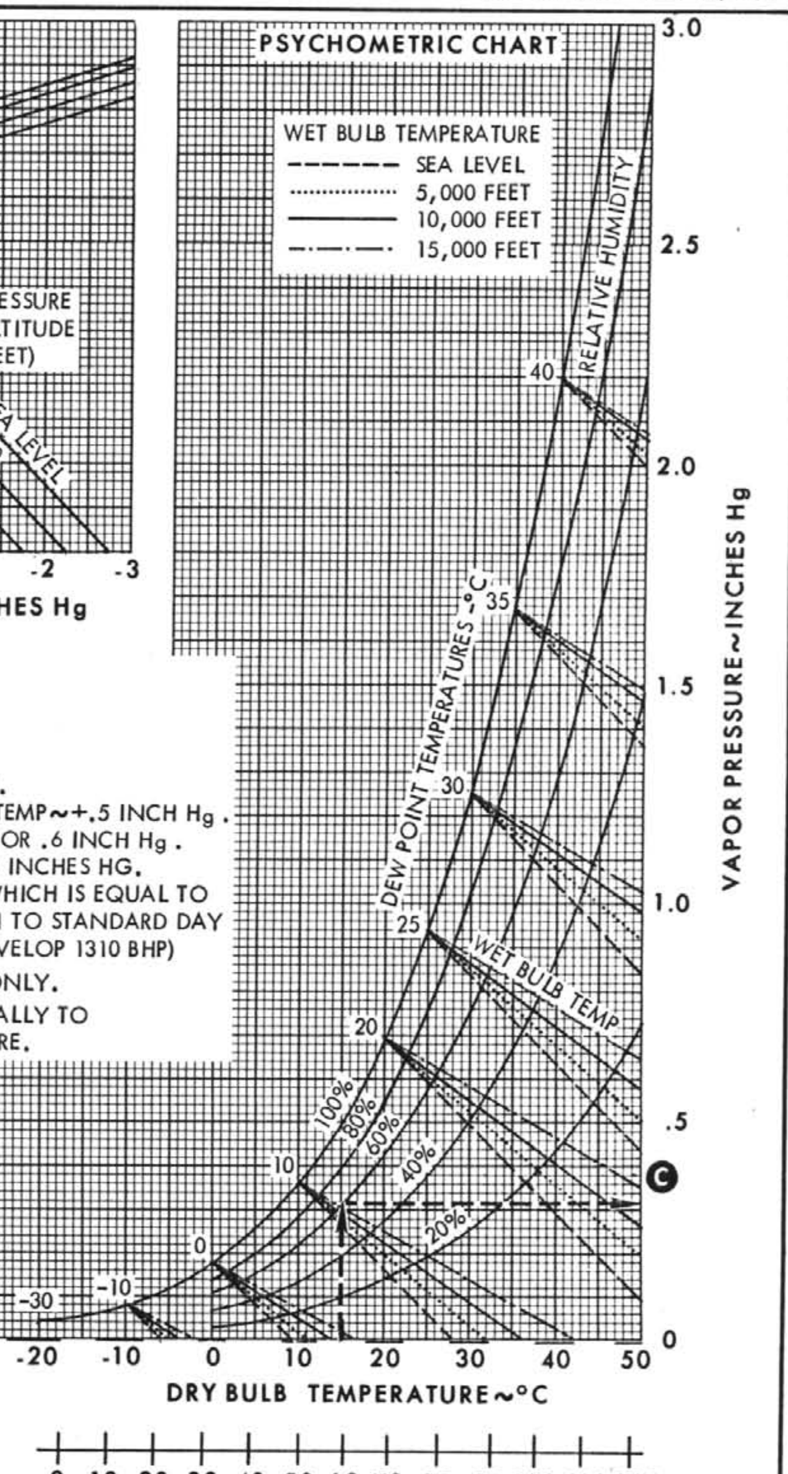
28D-1-93-112B

Figure A2-3

FOR TAKE-OFF

MODEL: T-28B/C/D
ENGINE: (1) R-1820-86, 86A





EXAMPLE

- GIVEN: PRESSURE ALTITUDE - 5000 FEET.
  AMBIENT TEMPERATURE ~ +15°C
  DEW POINT - - - - - - ~ +11°C.

A STANDARD DAY TEMP ~ + 5°C (5000 Feet).
B MAP CORRECTION FOR NON-STANDARD TEMP ~ +.5 INCH Hg.
C CORRECTION FOR WATER VAPOR ~ 2 X .3, OR .6 INCH Hg.
D TOTAL CORRECTION ~ .5 + .6, OR PLUS 1.1 INCHES HG.
E STANDARD DAY MAP ~ 46.5 INCHES Hg, WHICH IS EQUAL TO 1310 BHP AT 5000 FEET. ADD CORRECTION TO STANDARD DAY MAP. (46.5 + 1.1 = 47.6 INCHES Hg TO DEVELOP 1310 BHP)

- GIVEN: DRY BULB TEMP AND HUMIDITY ONLY.
  ENTER WITH DRY BULB TEMP, READ VERTICALLY TO HUMIDITY, READ RIGHT TO VAPOR PRESSURE.

NOTE:

- WHEN WATER VAPOR IS PRESENT IN THE AIR, A CORRECTION EQUAL TO TWICE THE ACTUAL VAPOR PRESSURE MAY BE ADDED TO THE ALLOWABLE TAKE-OFF M.A.P.
- REFER TO SECTION V OPERATING LIMITATIONS

28D-1-93-113 B

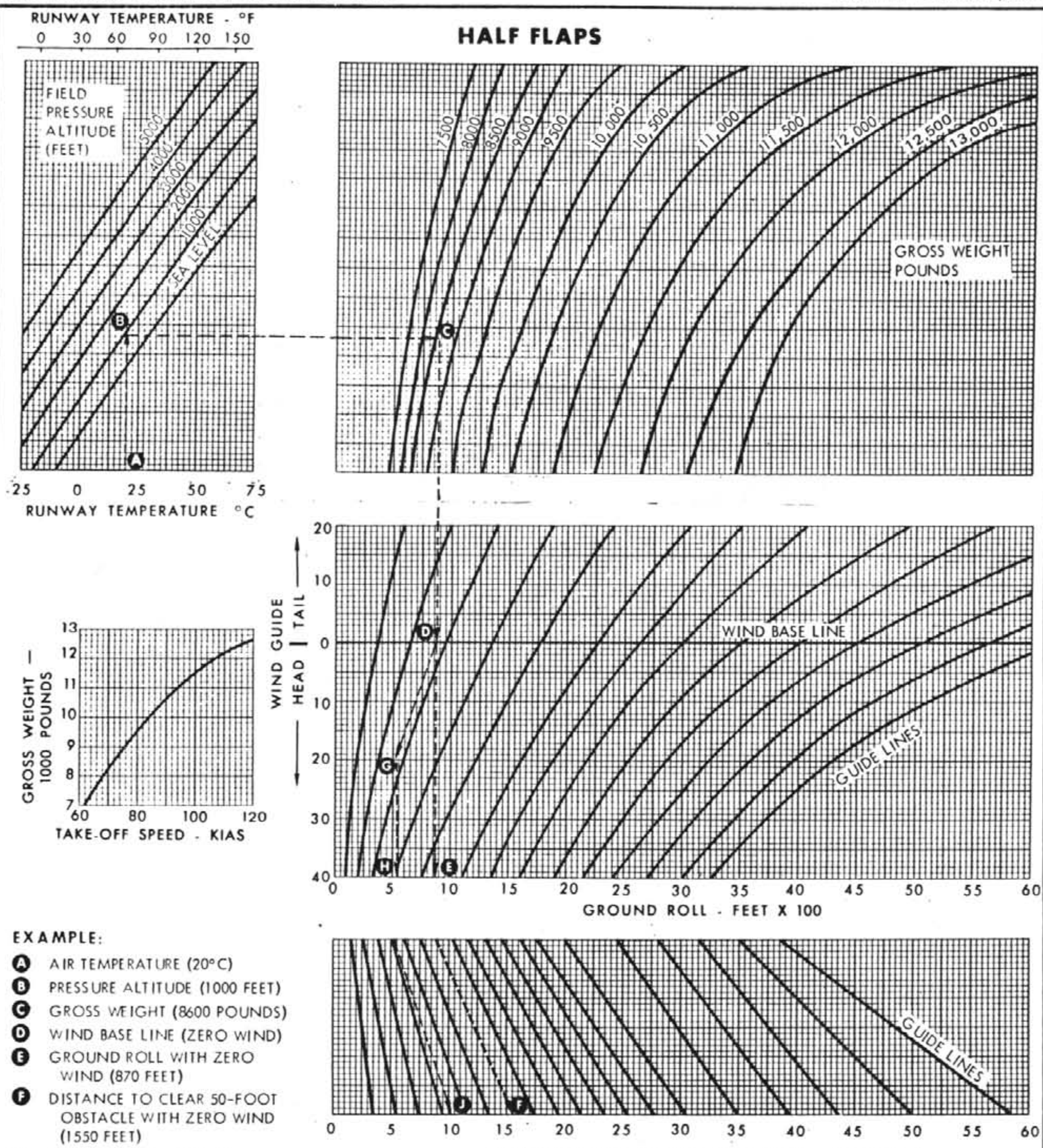
TAKE-OFF DISTANCE

HARD SURFACE RUNWAY
MAXIMUM POWER

DATA AS OF: OCTOBER 1971
DATA BASIS: FLIGHT TEST AND ESTIMATED

MODEL: T-28 B/C/D
ENGINE: R-1820-86, 86A

HALF FLAPS



EXAMPLE:

- A AIR TEMPERATURE (20°C)
- B PRESSURE ALTITUDE (1000 FEET)
- C GROSS WEIGHT (8600 POUNDS)
- D WIND BASE LINE (ZERO WIND)
- E GROUND ROLL WITH ZERO WIND (870 FEET)
- F DISTANCE TO CLEAR 50-FOOT OBSTACLE WITH ZERO WIND (1550 FEET)
- G HEAD WIND (20 KNOTS)
- H GROUND ROLL DISTANCE WITH 20 KNOT WIND (540 FEET)
- J TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE WITH 20 KNOT WIND (1045 FEET)

NOTE:

SPEEDS OVER 50-FOOT OBSTACLE ARE 15% HIGHER THAN TAKE-OFF SPEEDS.

T-28D-1-93-145

Figure A2-4

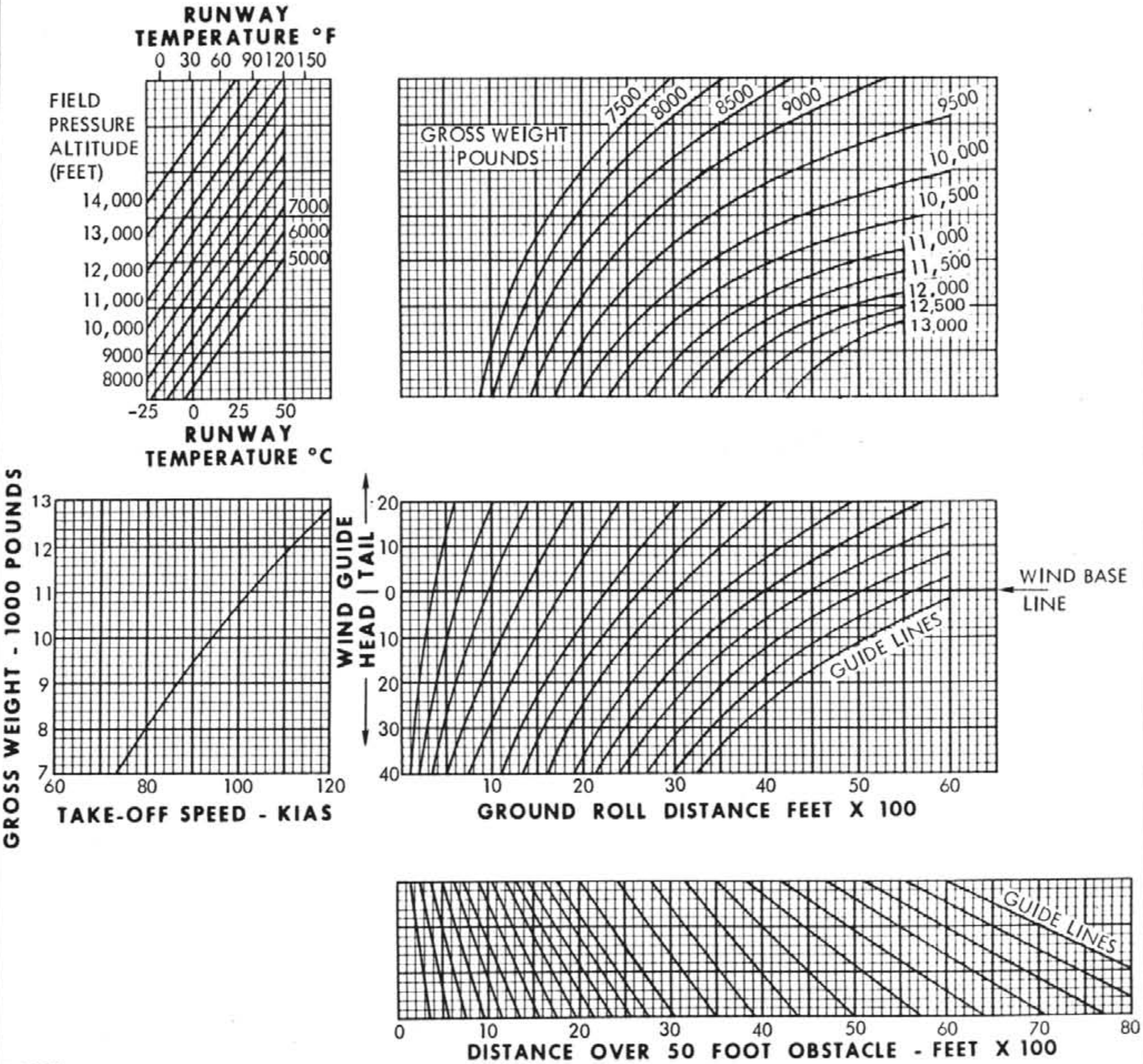
TAKE-OFF DISTANCE

DATA AS OF: OCTOBER 1971
DATA BASIS: ESTIMATED

HARD SURFACE RUNWAY
MAXIMUM POWER

MODEL: T-28 B/C/D
ENGINE: R-1820-86, 86A

HALF FLAPS



NOTE:

1. TAKE-OFF SPEEDS SHOWN HAVE BEEN INCREASED IN ORDER THAT AIRCRAFT SPEED OVER 50 FT. OBSTACLE WILL BE AT LEAST 1.2 TIMES POWER OFF STALL SPEED.
2. USE HIGH BLOWER FOR TAKE-OFFS AT FIELD PRESSURE ALTITUDES OF 11,000 FT. AND ABOVE (REFER TO SECTION V, OPERATING LIMITATIONS.

T-28D-1-93-151

Figure A2-5

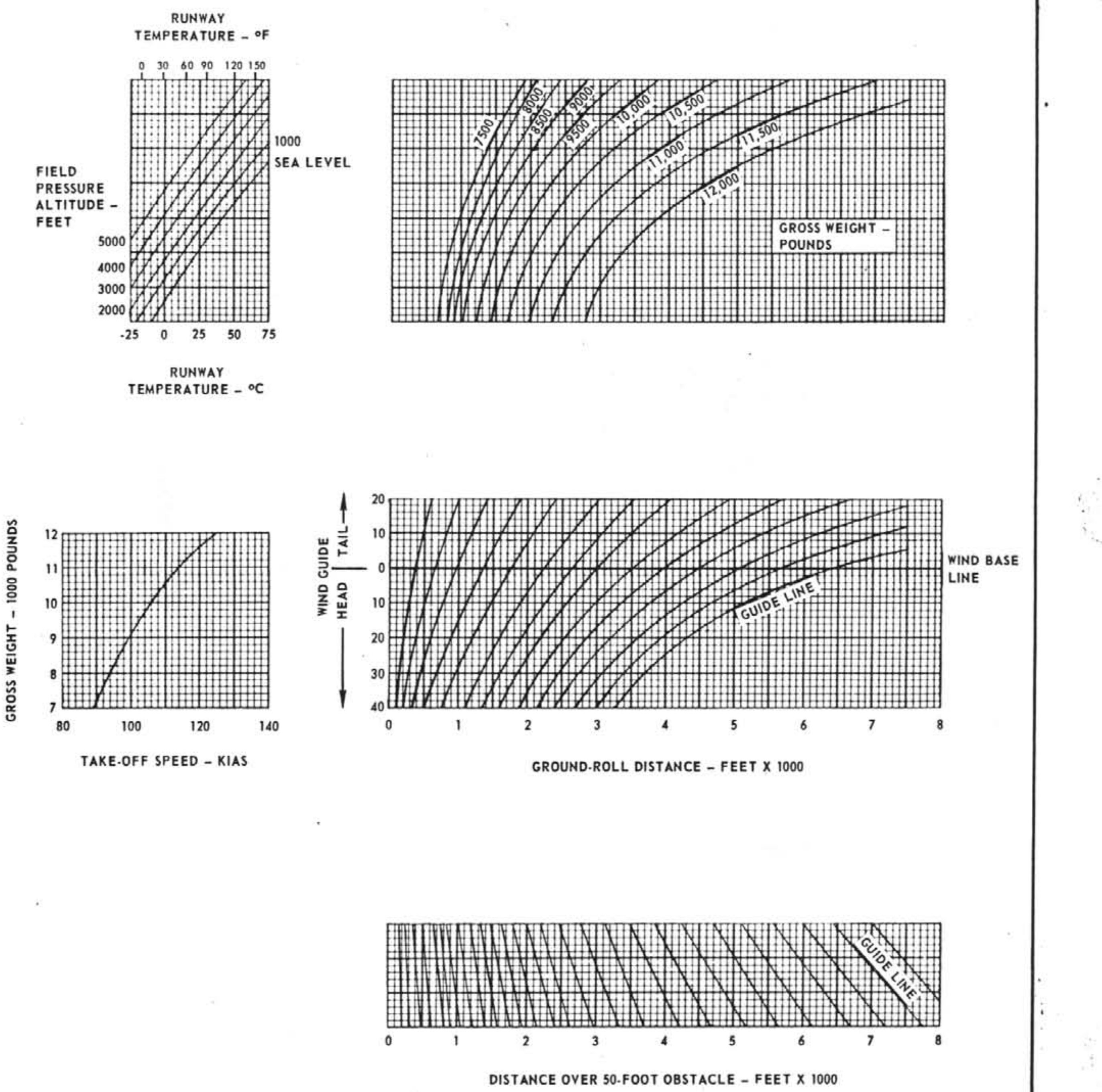
TAKE-OFF DISTANCE

DATA AS OF: 5 JULY 1971
DATA BASIS: ESTIMATED

HARD SURFACE RUNWAY
MAXIMUM POWER

MODEL: T-28 B/C/D
ENGINE: R-1820-86, 86A

ZERO FLAPS *



* FOR TRAINING USE TO SIMULATE HEAVY EXTERNAL STORES OPERATION

NOTE:
AIRCRAFT SPEEDS OVER 50-FOOT OBSTACLE ARE AT LEAST 1.2 TIMES POWER-OFF STALL SPEED.

T-28D-1-93-200

Figure A2-5A

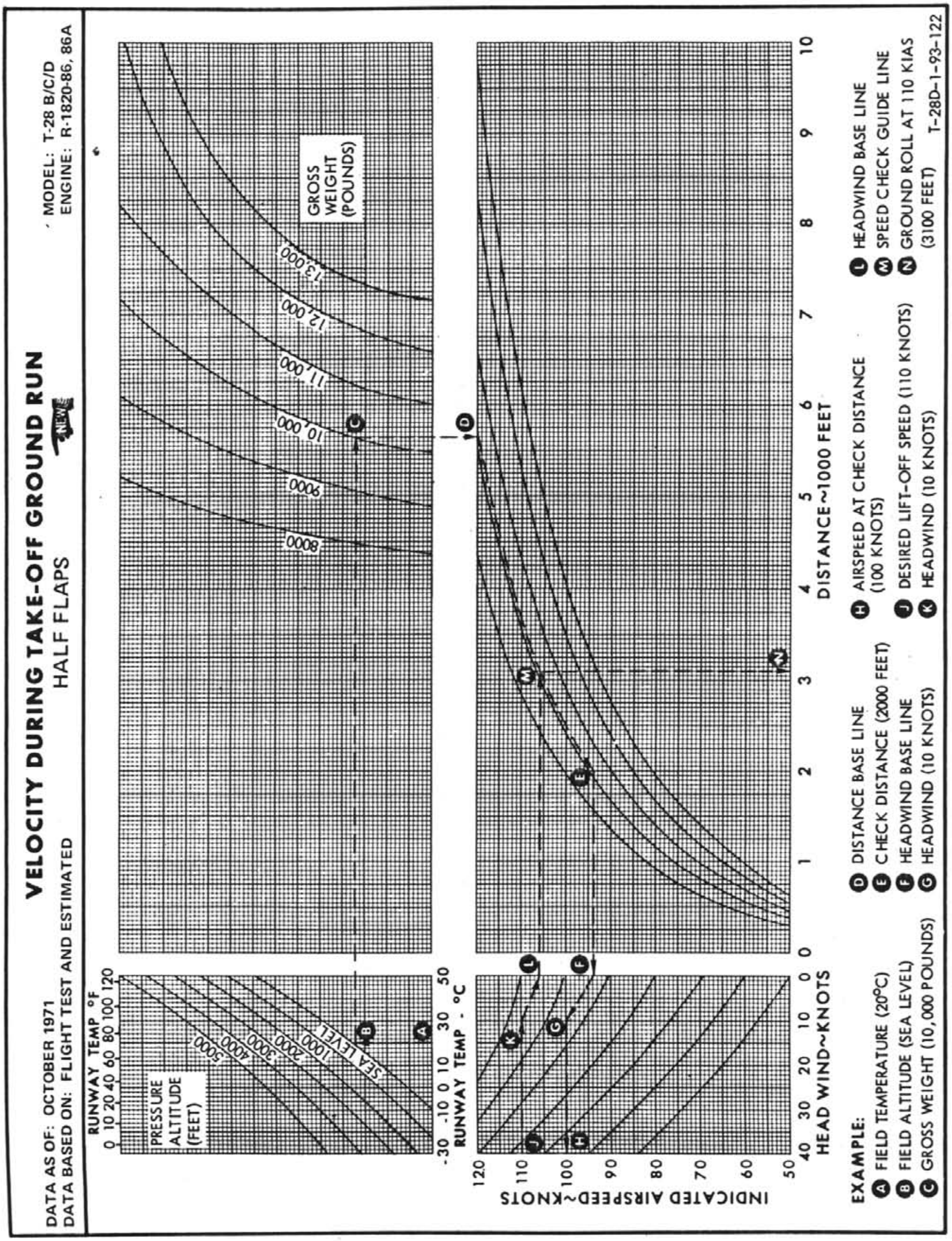

VELOCITY DURING TAKE-OFF GROUND RUN
HALF FLAPS
NEW
DATA AS OF: OCTOBER 1971
DATA BASED ON: FLIGHT TEST AND ESTIMATED
MODEL: T-28 B/C/D
ENGINE: R-1820-86, 86A
RUNWAY TEMP °F
0 10 20 40 60 80 100 120
PRESSURE ALTITUDE (FEET)
SEA LEVEL
1000
2000
3000
4000
5000
-30 -10 0 10 30 50
RUNWAY TEMP - °C
GROSS WEIGHT (POUNDS)
8000
9000
10,000
11,000
12,000
13,000
INDICATED AIRSPEED~KNOTS
120 110 100 90 80 70 60 50
HEAD WIND~KNOTS
40 30 20 10 0
0 1 2 3 4 5 6 7 8 9 10
DISTANCE~1000 FEET
EXAMPLE:
A FIELD TEMPERATURE (20°C)
B FIELD ALTITUDE (SEA LEVEL)
C GROSS WEIGHT (10,000 POUNDS)
D DISTANCE BASE LINE
E CHECK DISTANCE (2000 FEET)
F HEADWIND BASE LINE
G HEADWIND (10 KNOTS)
H AIRSPEED AT CHECK DISTANCE (100 KNOTS)
J DESIRED LIFT-OFF SPEED (110 KNOTS)
K HEADWIND (10 KNOTS)
L HEADWIND BASE LINE
M SPEED CHECK GUIDE LINE
N GROUND ROLL AT 110 KIAS (3100 FEET)
T-28D-1-93-122

Figure A2-6

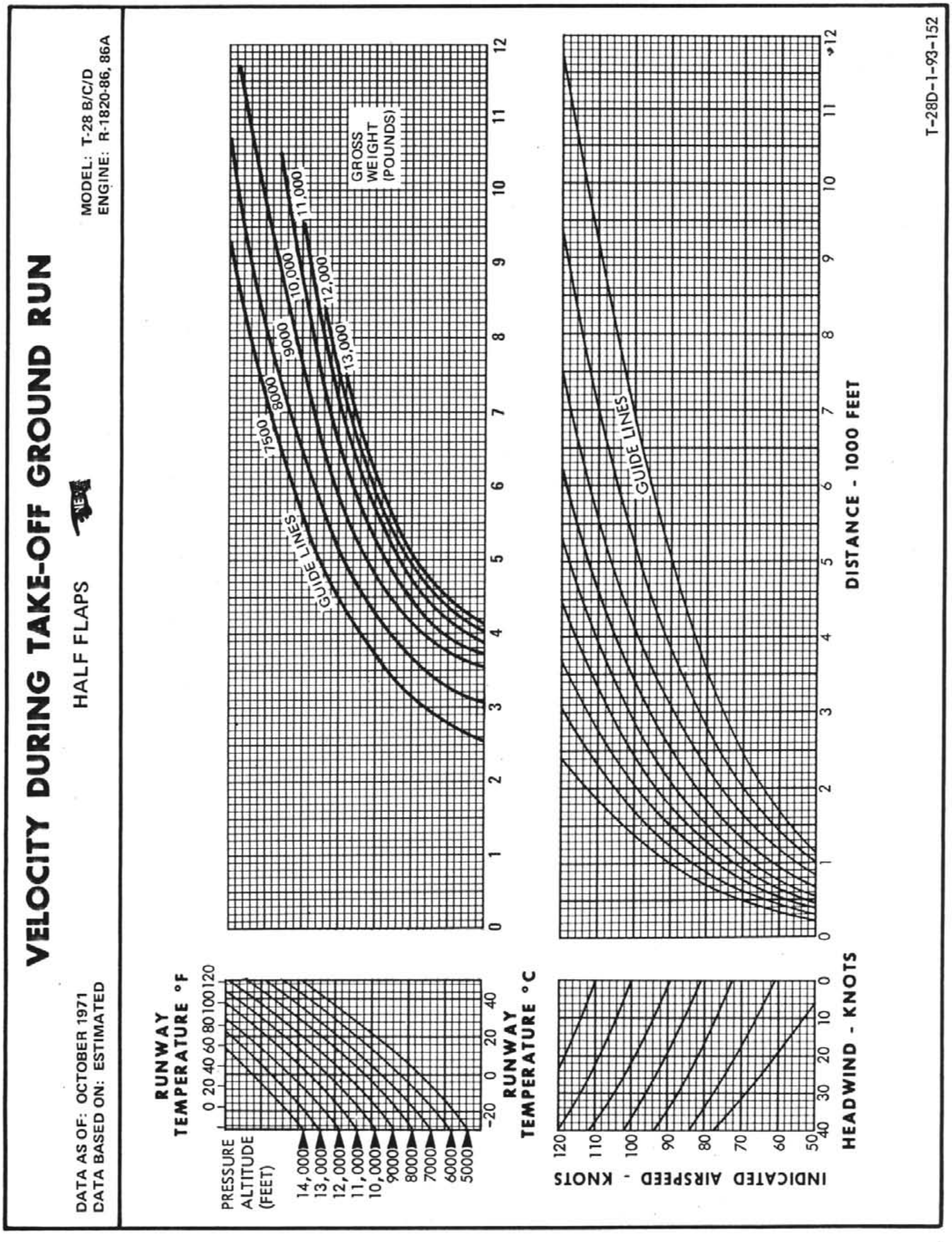

VELOCITY DURING TAKE-OFF GROUND RUN
HALF FLAPS
MODEL: T-28 B/C/D
ENGINE: R-1820-86, 86A
DATA AS OF: OCTOBER 1971
DATA BASED ON: ESTIMATED
T-28D-1-93-152
RUNWAY TEMPERATURE °F
0 20 40 60 80 100 120
RUNWAY TEMPERATURE °C
-20 0 20 40
PRESSURE ALTITUDE (FEET)
14,000
13,000
12,000
11,000
10,000
9000
8000
7000
6000
5000
GROSS WEIGHT (POUNDS)
7500
8000
9000
10,000
11,000
12,000
13,000
GUIDE LINES
HEADWIND - KNOTS
0 10 20 30 40
INDICATED AIRSPEED - KNOTS
120 110 100 90 80 70 60 50
DISTANCE - 1000 FEET
0 1 2 3 4 5 6 7 8 9 10 11 12

Figure A2-7

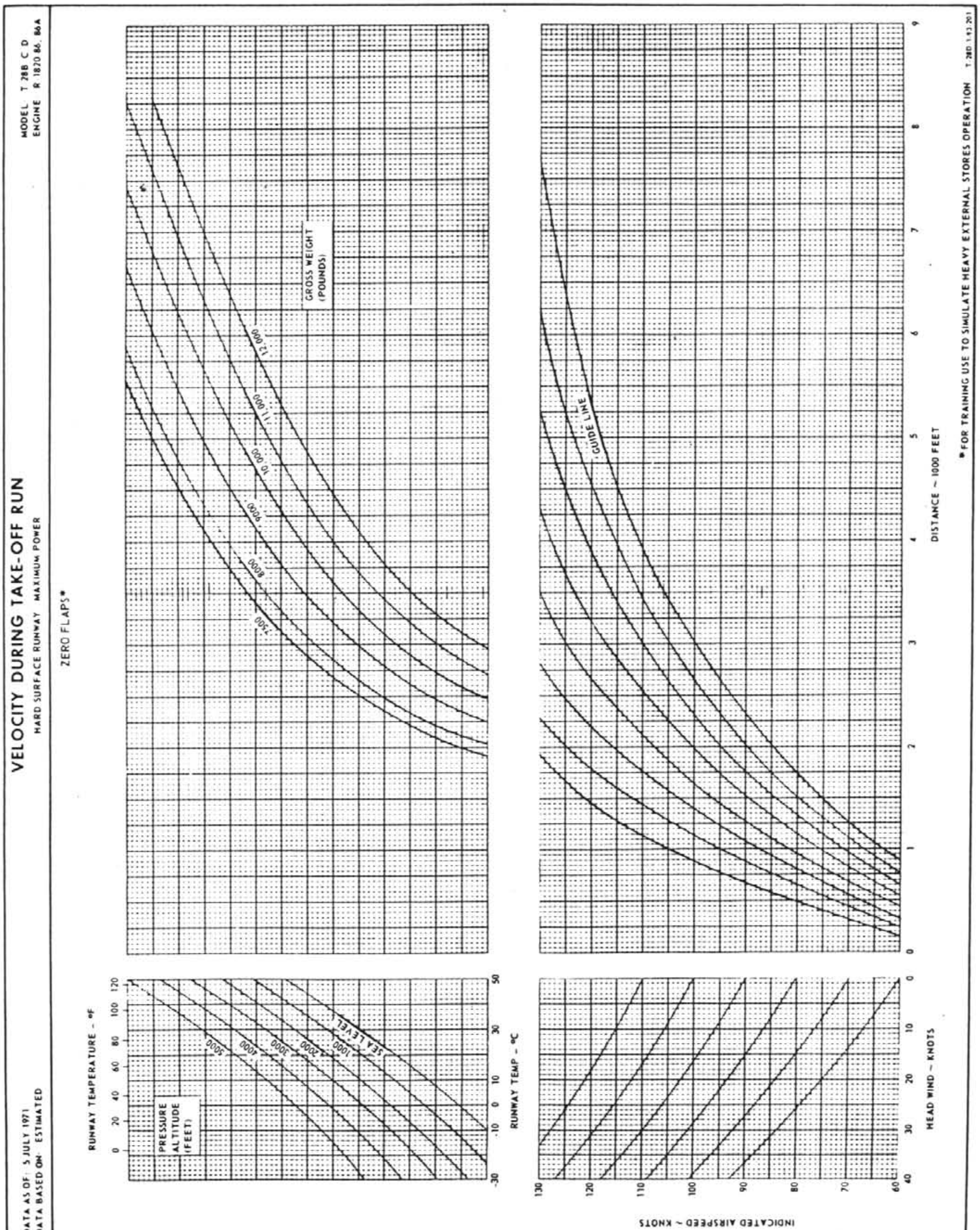

VELOCITY DURING TAKE-OFF RUN
HARD SURFACE RUNWAY MAXIMUM POWER
ZERO FLAPS*
MODEL T-28B C D
ENGINE R 1820 86, 86A
DATA AS OF: 5 JULY 1971
DATA BASED ON: ESTIMATED
GROSS WEIGHT (POUNDS)
GUIDE LINE
PRESSURE ALTITUDE (FEET)
RUNWAY TEMPERATURE - °F
RUNWAY TEMP - °C
HEAD WIND ~ KNOTS
INDICATED AIRSPEED ~ KNOTS
DISTANCE ~ 1000 FEET
*FOR TRAINING USE TO SIMULATE HEAVY EXTERNAL STORES OPERATION

Figure A2-7A

distance required to accelerate to a desired speed and, conversely, the speed at any distance.

STOPPING DISTANCE.

The stopping distance charts (figures A2-8 and A2-9) are used to determine the distance required to stop the airplane from any speed up to 80 knots IAS. Conversely, by entering the charts with a distance, a refusal speed may be determined. To accomplish this, the take-off distance must be determined and the remaining runway computed. By adjusting the remaining runway distance, a refusal speed will be derived at which the take-off may be aborted and the airplane brought to a stop in the remaining runway.

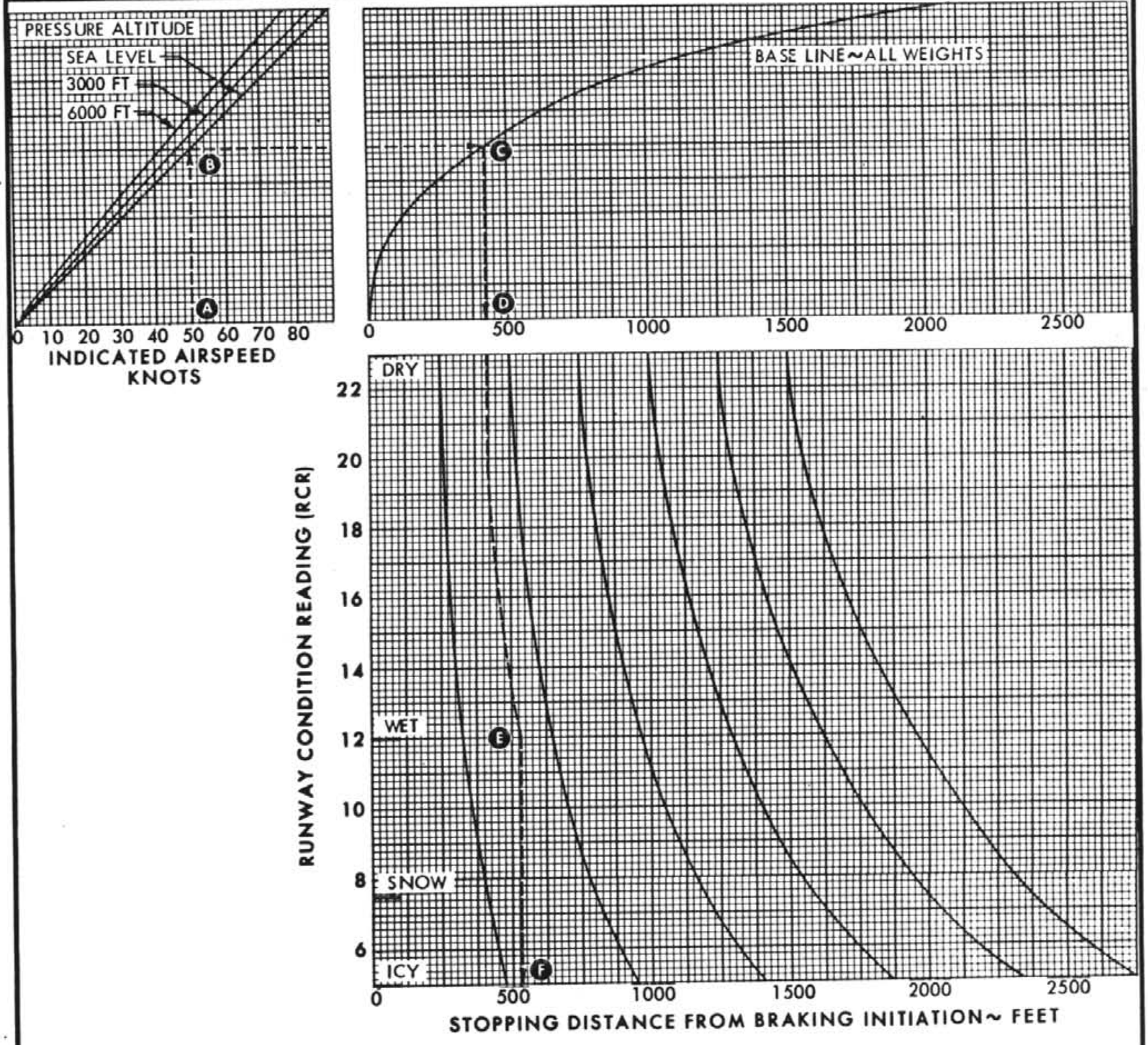
NOTE A correction grid for runway condition is included to determine the effect of runway slickness on stopping distance. Refer to Part 6 in this section for descriptive text on runway condition reading (RCR).

STOPPING DISTANCE

DATA AS OF: OCTOBER 1971
BASED ON: FLIGHT TEST AND ESTIMATED

HARD SURFACE RUNWAY
WITH OR WITHOUT EXTERNAL STORES

STANDARD DAY
MODEL: T-28B/C/D
ENGINE: (1) R-1820-86, 86A



REMARKS:

1. FLAPS HALF DOWN
2. STOPPING DISTANCE IS BASED ON HARD BRAKING, THROTTLE CLOSED.
3. NO WIND
4. DISTANCES SHOWN MAY BE USED WITH ALL GROSS WEIGHTS AND CONFIGURATIONS (EFFECT OF WEIGHTS BETWEEN 8,000 AND 13,000 POUNDS IS NEGLIGIBLE.)

EXAMPLE:

- Ⓐ INDICATED AIRSPEED (50 KNOTS)
- Ⓑ PRESSURE ALTITUDE (SEA LEVEL)
- Ⓒ STOPPING DISTANCE BASE LINE
- Ⓓ STOPPING DISTANCE (413 FEET)
- Ⓔ RUNWAY CONDITION READING (RCR = 12)
- Ⓕ STOPPING DISTANCE ON WET RUNWAY (530 FEET)

28D-1-93-104A

Figure A2-8

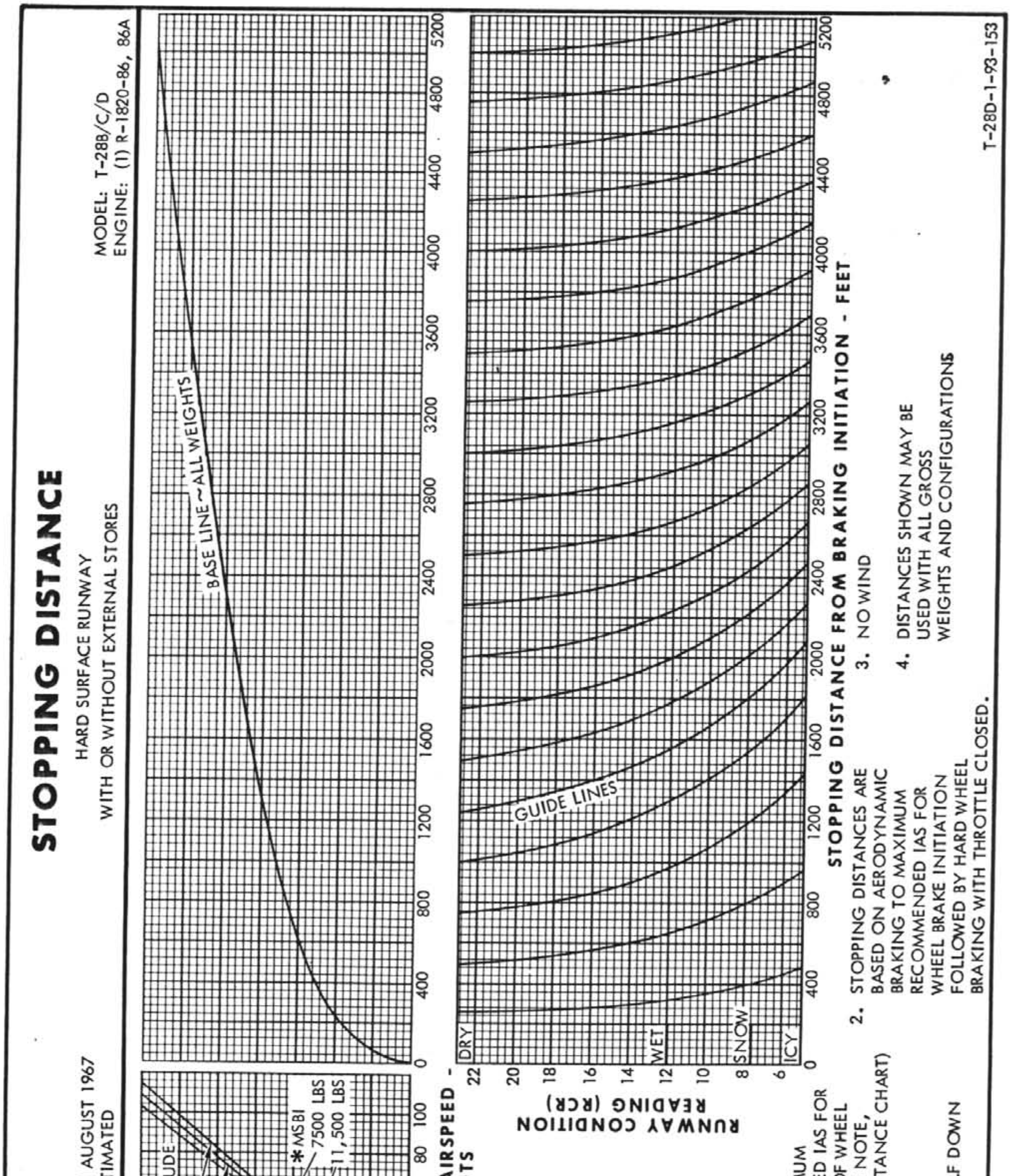

STOPPING DISTANCE
HARD SURFACE RUNWAY
WITH OR WITHOUT EXTERNAL STORES
MODEL: T-28B/C/D
ENGINE: (1) R-1820-86, 86A
DATA AS OF: 1 AUGUST 1967
BASED ON: ESTIMATED
PRESSURE ALTITUDE
6000 FT
10,000 FT
14,000 FT
*MSBI
7500 LBS
11,500 LBS
BASE LINE~ALL WEIGHTS
GUIDE LINES
INDICATED AIRSPEED - KNOTS
0 20 40 60 80 100
RUNWAY CONDITION READING (RCR)
22 20 18 16 14 12 10 8 6
DRY
WET
SNOW
ICY
0 400 800 1200 1600 2000 2400 2800 3200 3600 4000 4400 4800 5200
STOPPING DISTANCE FROM BRAKING INITIATION - FEET
* MSBI - MAXIMUM RECOMMENDED IAS FOR INITIATION OF WHEEL BRAKING (SEE NOTE, LANDING DISTANCE CHART)
REMARKS
1. FLAPS HALF DOWN
2. STOPPING DISTANCES ARE BASED ON AERODYNAMIC BRAKING TO MAXIMUM RECOMMENDED IAS FOR WHEEL BRAKE INITIATION FOLLOWED BY HARD WHEEL BRAKING WITH THROTTLE CLOSED.
3. NO WIND
4. DISTANCES SHOWN MAY BE USED WITH ALL GROSS WEIGHTS AND CONFIGURATIONS
T-28D-1-93-153

Figure A2- 9

PART 3–CLIMB

TABLE OF CONTENTS

Titles CAPITALIZED denote charts.

SPEED FOR BEST RATE OF CLIMB.

The speed for best rate of climb chart (figure A3-1) presents the indicated airspeed for best climb performance at both Military and METO power throughout the airplane drag index spectrum. Two climb schedules are required because of the aerodynamic characteristics of the T-28C propeller.

CLIMB.

The climb charts (figures A3-2 and A3-3) present time elapsed, distance traveled, and fuel used during Military and METO power climbs at various airplane gross weights and drag index numbers. The performance given on the charts is based on starting from best climb speed; therefore, allowances for taxi, take-off, and acceleration should be made, as noted on the charts. A correction grid is included on each chart for temperature deviations from standard.

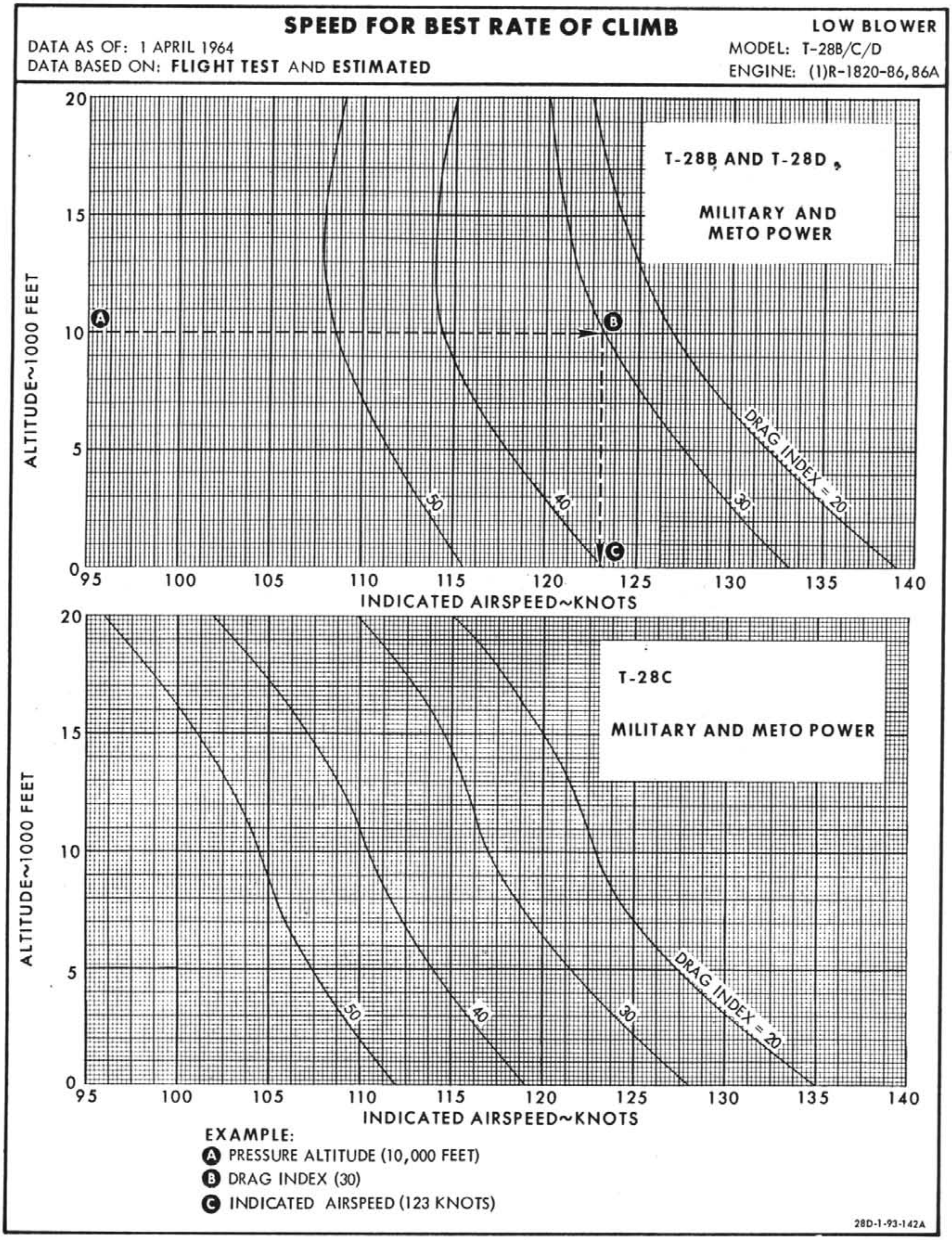

SPEED FOR BEST RATE OF CLIMB
LOW BLOWER
DATA AS OF: 1 APRIL 1964
DATA BASED ON: FLIGHT TEST AND ESTIMATED
MODEL: T-28B/C/D
ENGINE: (1)R-1820-86,86A
T-28B AND T-28D
MILITARY AND METO POWER
ALTITUDE~1000 FEET
INDICATED AIRSPEED~KNOTS
DRAG INDEX = 20
30
40
50
T-28C
MILITARY AND METO POWER
EXAMPLE:
A PRESSURE ALTITUDE (10,000 FEET)
B DRAG INDEX (30)
C INDICATED AIRSPEED (123 KNOTS)
28D-1-93-142A

Figure A3-1

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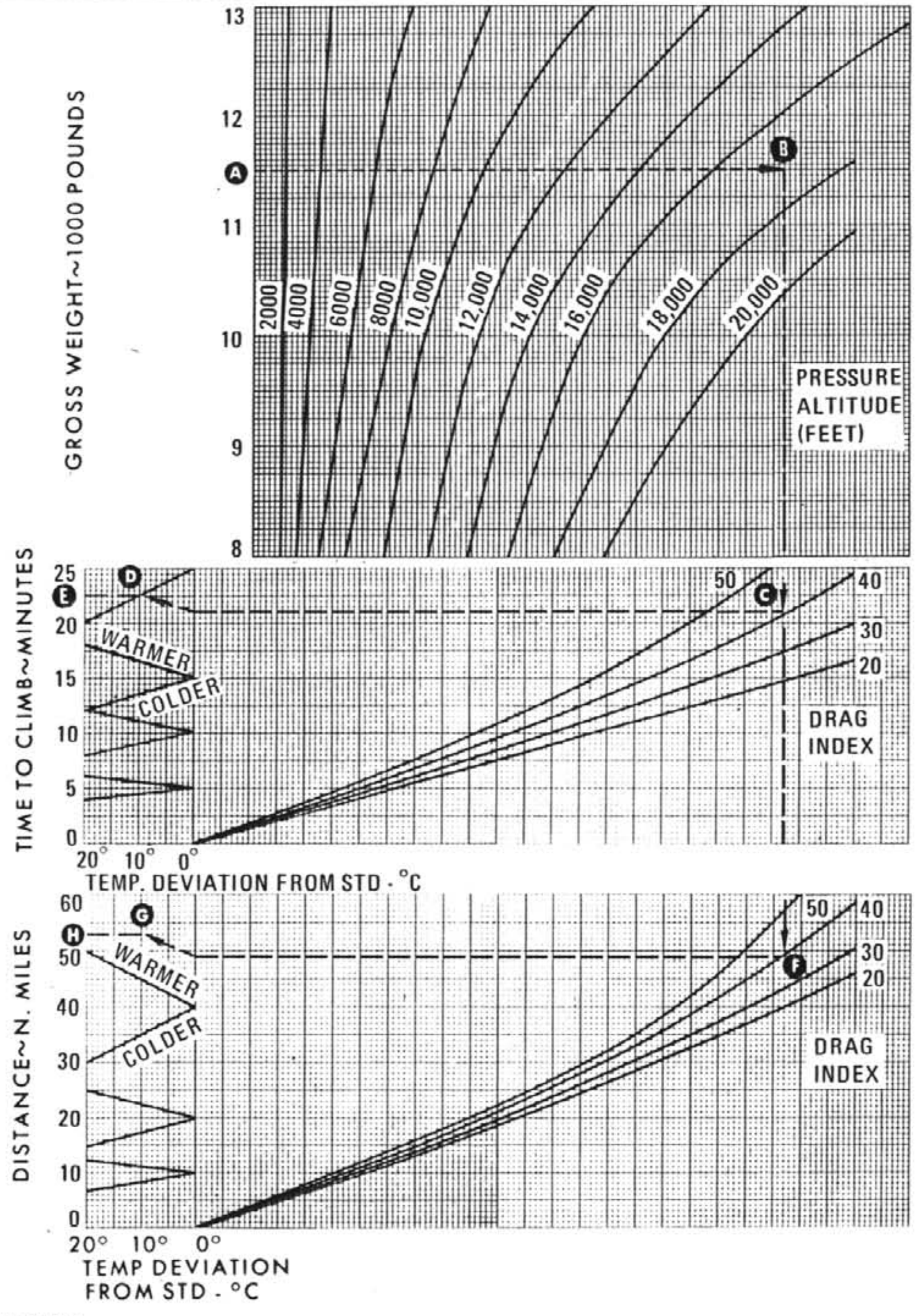
MILITARY POWER CLIMB
TIME AND DISTANCE

LOW BLOWER

DATA AS OF: OCTOBER 1971
DATA BASED ON: FLIGHT TEST AND ESTIMATED

MODEL: T-28 B/C/D
ENGINE: R-1820-86, 86A



EXAMPLE:

- A GROSS WEIGHT (11,500 POUNDS)
- B PRESSURE ALTITUDE (18,000 FEET)
- C DRAG INDEX (40)
- D TEMPERATURE DEVIATION (10°C WARM)
- E TIME TO CLIMB (22.5 MINUTES)
- F DRAG INDEX (40)
- G TEMPERATURE DEVIATION (10°C WARM)
- H DISTANCE TRAVELED (53.5 N. MI.)

T-28D-1-93-135

Figure A3-2

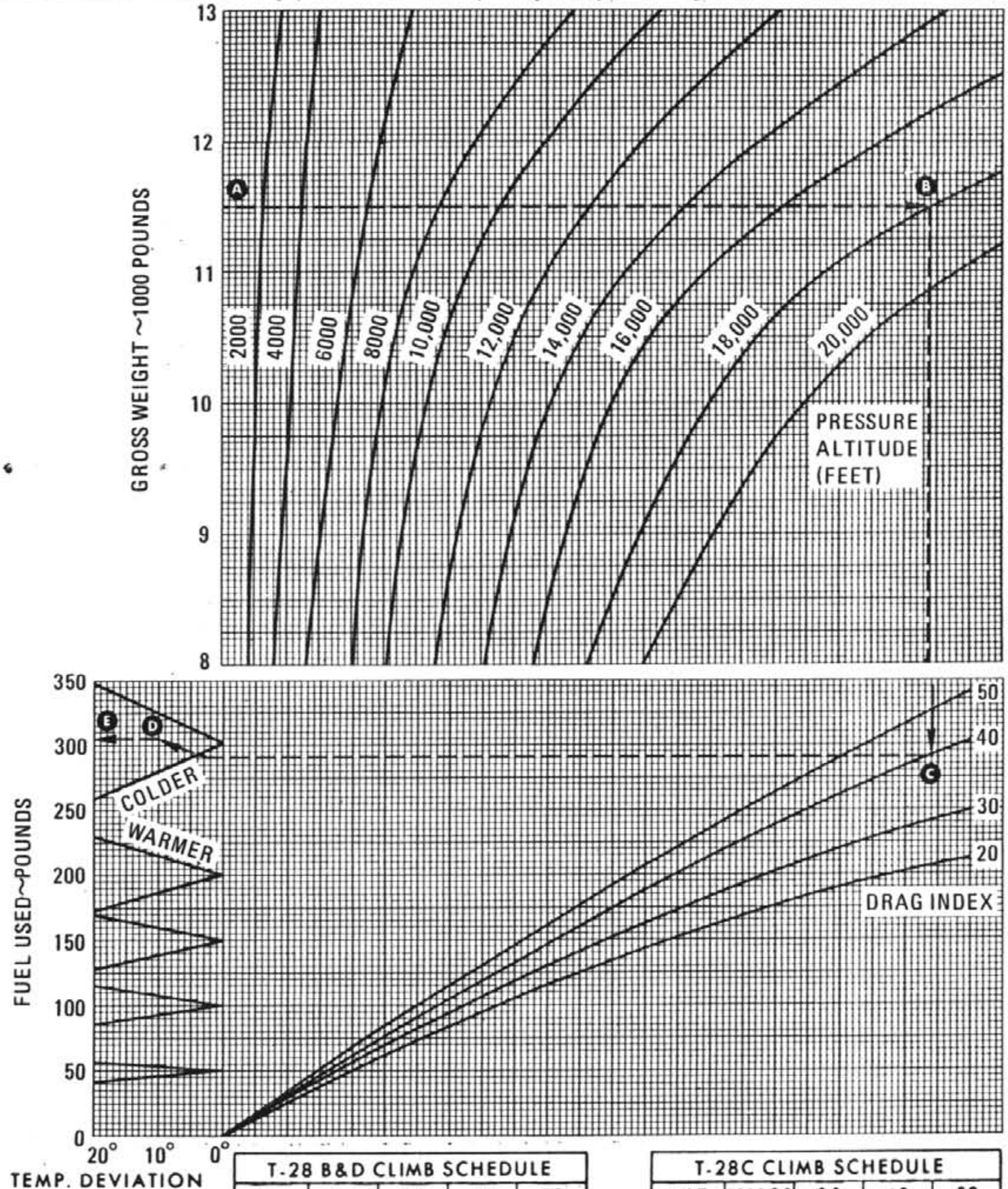
MILITARY POWER CLIMB

FUEL USED

LOW BLOWER

DATA AS OF: OCTOBER 1971
DATA BASED ON: FLIGHT TEST AND ESTIMATED

MODEL: T-28 B/C/D
ENGINE: R-1820-86, 86A



T-28 B&D CLIMB SCHEDULE				
ALT (FEET)	DRAG 20 (KIAS)	30 (KIAS)	40 (KIAS)	50 (KIAS)
SL	139	133	123	116
5,000	132	128	119	112
10,000	127	123	115	109
15,000	124	121	114	108
20,000	123	120	115	109

T-28C CLIMB SCHEDULE				
ALT (FEET)	DRAG 20 (KIAS)	30 (KIAS)	40 (KIAS)	50 (KIAS)
SL	135	128	119	112
5,000	127	122	114	107
10,000	123	117	110	104
15,000	120	114	107	101
20,000	115	110	102	96

NOTE:
ALLOW 64 POUNDS FUEL FOR GROUND TIME PLUS ACCELERATION TO CLIMB SPEED.

BASED ON 16 POUNDS FUEL FOR EACH MINUTE OPERATION DURING CLIMB.

EXAMPLE:

Ⓐ GROSS WEIGHT - (11,500 POUNDS)
Ⓑ PRESSURE ALTITUDE (18,000 FEET)
Ⓒ DRAG INDEX (40)
Ⓓ TEMPERATURE DEVIATION (10°C WARM)
Ⓔ FUEL USED (305 POUNDS)

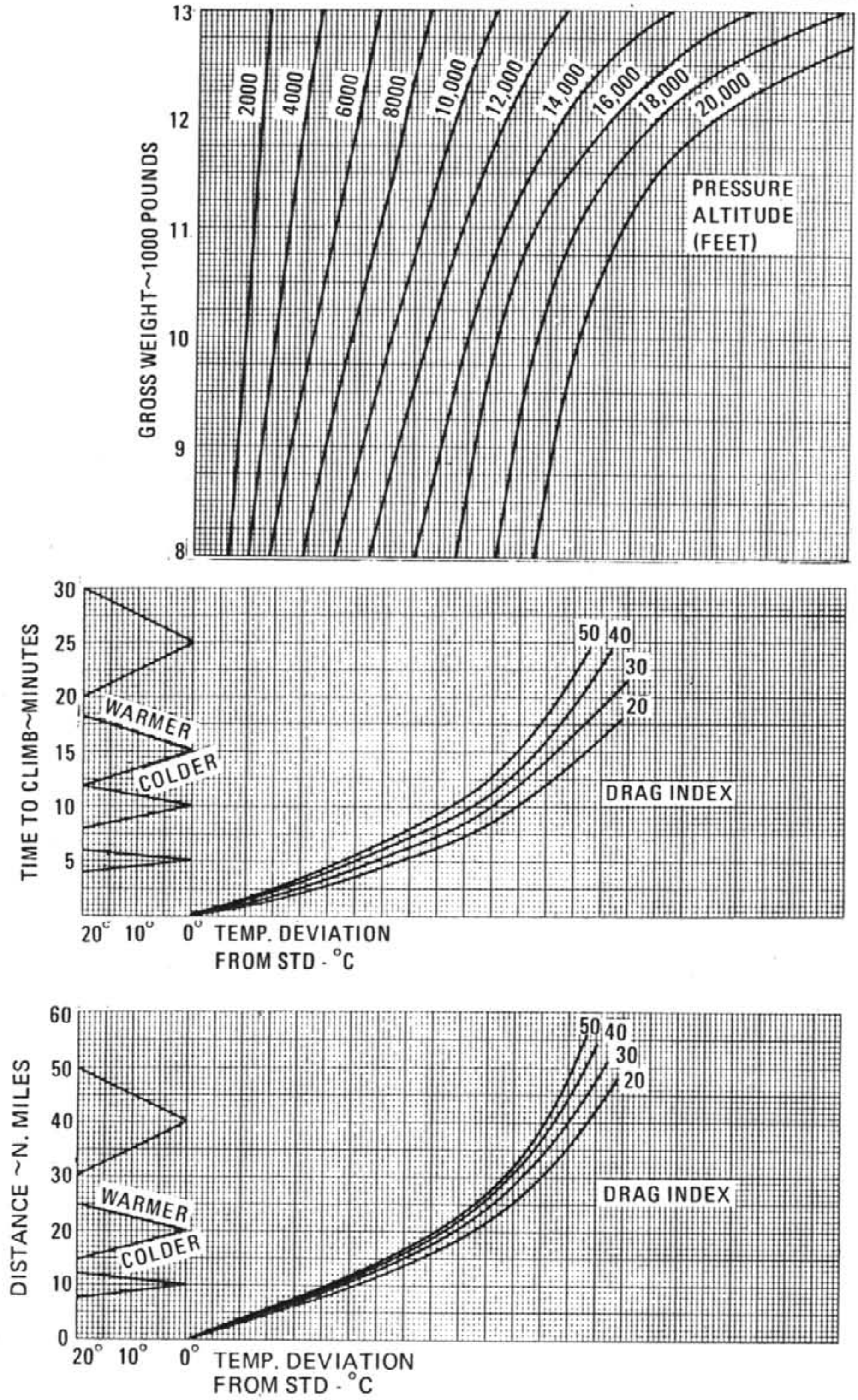
28D-1-93-136A

METO POWER CLIMB
TIME AND DISTANCE

LOW BLOWER

DATA AS OF: OCTOBER 1971
DATA BASED ON: FLIGHT TEST AND ESTIMATED

MODEL: T-28 B/C/D
ENGINE: R-1820-86, 86A



T-28D-1-93-137

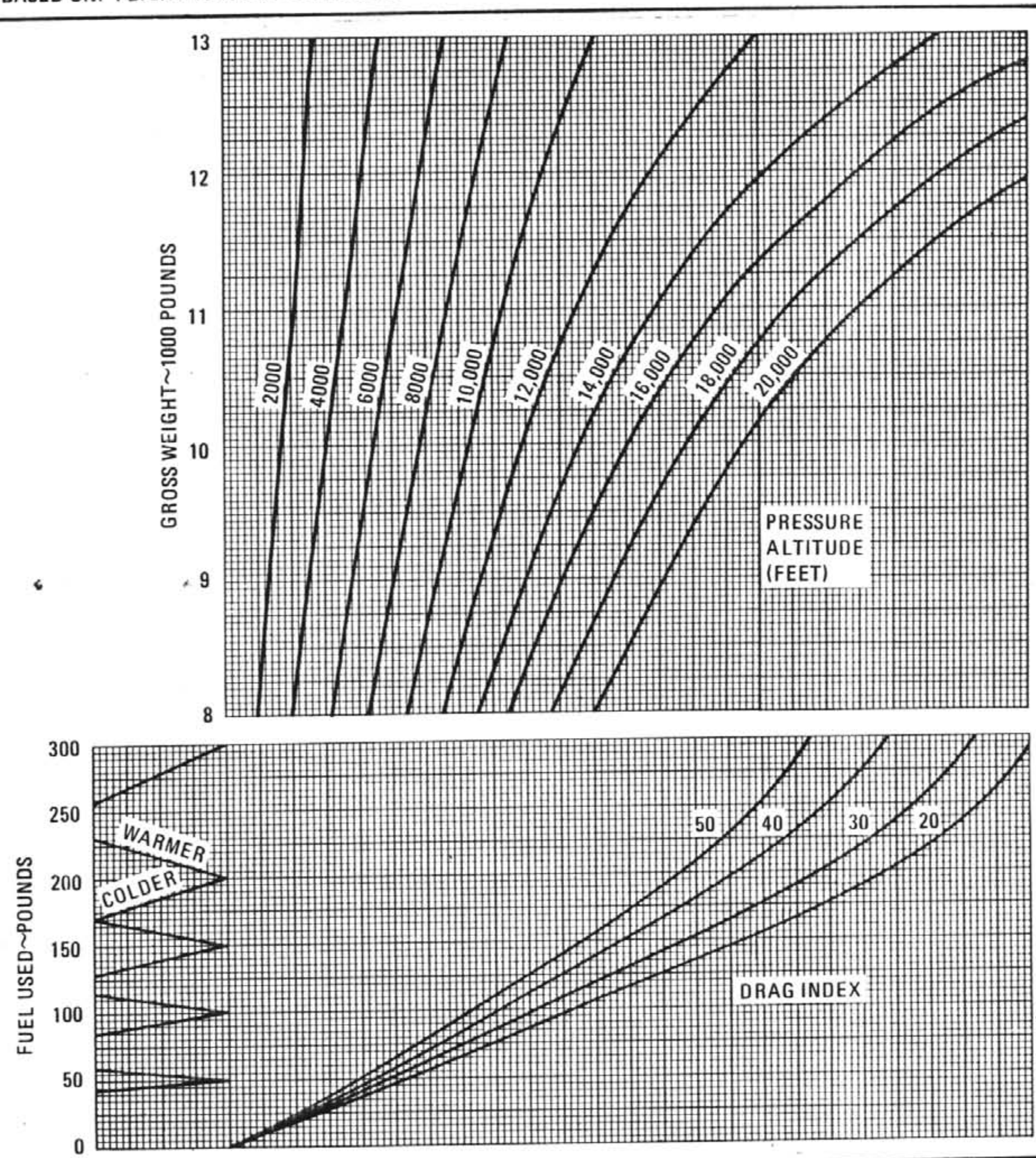
Figure A3-3

METO POWER CLIMB
FUEL USED

LOW BLOWER

DATA AS OF: OCTOBER 1971
DATA BASED ON: FLIGHT TEST AND ESTIMATED

MODEL: T-28 B/C/D
ENGINE: R-1820-86, 86A



T-28B&D CLIMB SCHEDULE				
ALT. (FEET)	DRAG 20 (KIAS)	30 (KIAS)	40 (KIAS)	50 (KIAS)
SL	139	133	123	116
5,000	132	128	119	112
10,000	127	123	115	109
15,000	124	121	114	108
20,000	123	120	115	109

T-28C CLIMB SCHEDULE				
ALT (FEET)	DRAG 20 (KIAS)	30 (KIAS)	40 (KIAS)	50 (KIAS)
SL	135	128	119	112
5,000	127	122	114	107
10,000	123	117	110	104
15,000	120	114	107	101
20,000	115	110	102	96

NOTE:
ALLOW 64 POUNDS FUEL FOR GROUND TIME PLUS ACCELERATION TO CLIMB SPEED.

BASED ON 16 POUNDS FUEL FOR EACH MINUTE OPERATION DURING CLIMB.

PART 4–RANGE

TABLE OF CONTENTS

Titles CAPITALIZED denote charts.

CRUISE AT CONSTANT ALTITUDE.

The cruise at constant altitude chart (figure A4-1) may be used to determine time elapsed, speed, and fuel used for any desired distance increment at various altitudes, drag index numbers, and atmospheric conditions. A head-wind/tail-wind plot allows determination of en route time for specific cruise distances. A plot is included which is used to determine the rpm required to realize the cruise at constant-altitude performance. The MAP for the applicable rpm and altitude is obtained from the power schedule charts in this section.

NAUTICAL MILES PER POUND FUEL.

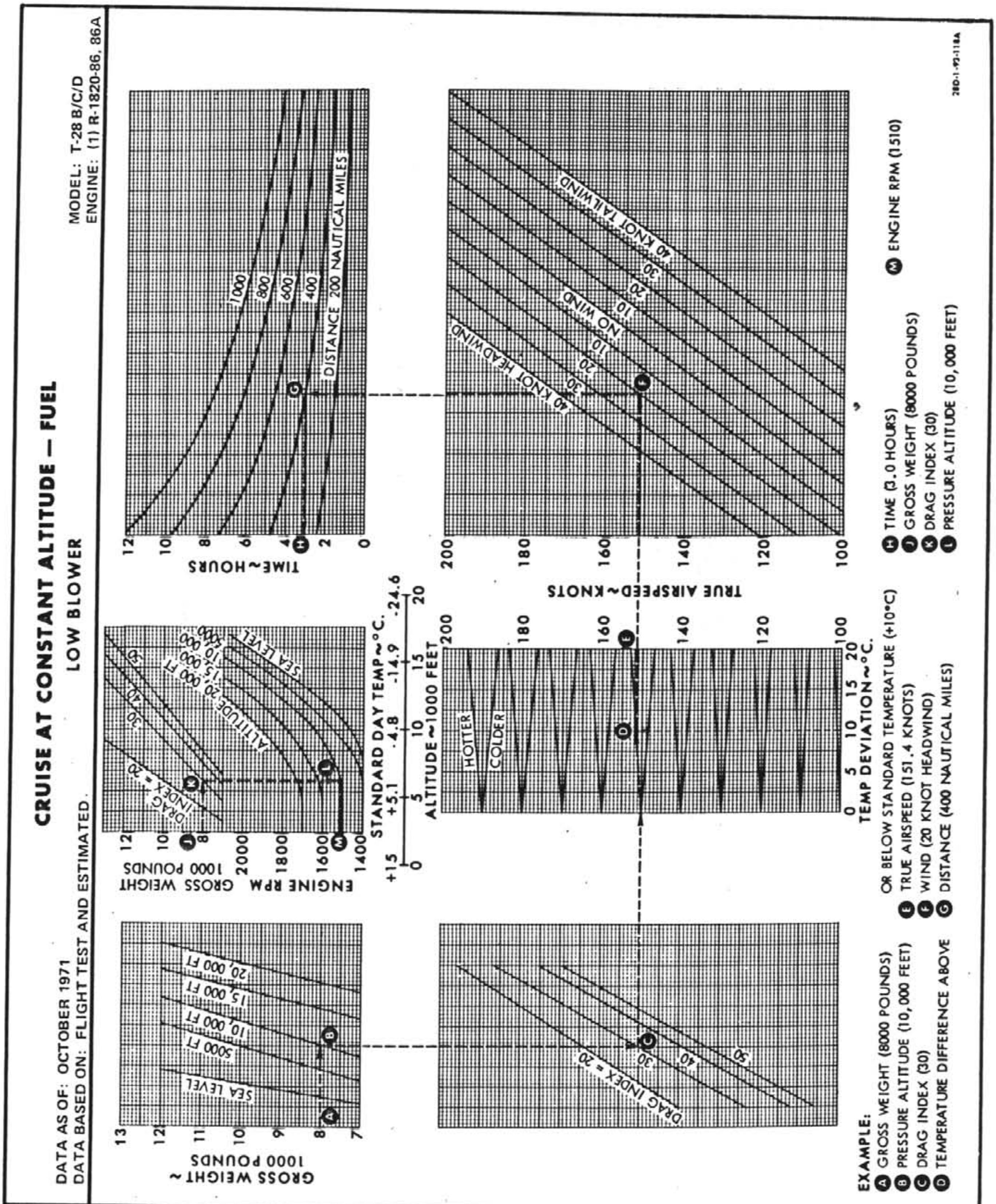
The nautical-miles-per-pound-fuel charts (figures A4-2 through A4-5) provide cruise data for all usable power settings from Maximum Endurance to Military Power for the entire range of airplane configurations and atmospheric conditions.

NOTE For high speeds and power settings, maximum accuracy is obtained by using the combat allowance charts.

The nautical-miles-per-pound-fuel charts are arranged by configuration drag index numbers: 20, 30, 40, and 50. For maximum accuracy, data for a drag index falling between two charts may be obtained by linear interpolation. The charts can be used for complete preflight cruise planning or to extract such data as may be desired. The charts may be entered with either a gross weight and altitude to determine best cruise performance or a gross weight, altitude, and airspeed (TAS or IAS) to determine cruise performance for the desired airspeed. The best cruise line on the charts is a baseline, and when cruise performance is being computed for other than best cruise, the guide lines are followed from this baseline to the desired point. The required MAP for the resultant rpm and altitude is obtained from the power schedule charts in this section. Use of the charts is explained by the following "chase-through" sample problem.

Problem.

Determine cruise data for a 10,000-pound gross weight airplane cruising at 200 knots TAS (no wind) at 10,000 feet altitude. The configuration drag


CRUISE AT CONSTANT ALTITUDE — FUEL
LOW BLOWER
MODEL: T-28 B/C/D
ENGINE: (1) R-1820-86, 86A
DATA AS OF: OCTOBER 1971
DATA BASED ON: FLIGHT TEST AND ESTIMATED.
GROSS WEIGHT ~ 1000 POUNDS
SEA LEVEL
5000 FT
10,000 FT
15,000 FT
20,000 FT
DRAG INDEX = 20
30
40
50
GROSS WEIGHT 1000 POUNDS
ENGINE RPM
ALTITUDE 20,000
15,000
10,000
5000
SEA LEVEL
STANDARD DAY TEMP ~ °C.
+15 +5.1 -4.8 -14.9 -24.6
ALTITUDE ~ 1000 FEET
HOTTER
COLDER
TEMP DEVIATION ~ °C.
TRUE AIRSPEED ~ KNOTS
TIME ~ HOURS
DISTANCE 200 NAUTICAL MILES
400
600
800
1000
40 KNOT HEADWIND
30
20
10
NO WIND
10
20
30
40 KNOT TAILWIND
EXAMPLE:
A GROSS WEIGHT (8000 POUNDS)
B PRESSURE ALTITUDE (10,000 FEET)
C DRAG INDEX (30)
D TEMPERATURE DIFFERENCE ABOVE OR BELOW STANDARD TEMPERATURE (+10°C)
E TRUE AIRSPEED (151.4 KNOTS)
F WIND (20 KNOT HEADWIND)
G DISTANCE (400 NAUTICAL MILES)
H TIME (3.0 HOURS)
J GROSS WEIGHT (8000 POUNDS)
K DRAG INDEX (30)
L PRESSURE ALTITUDE (10,000 FEET)
M ENGINE RPM (1510)

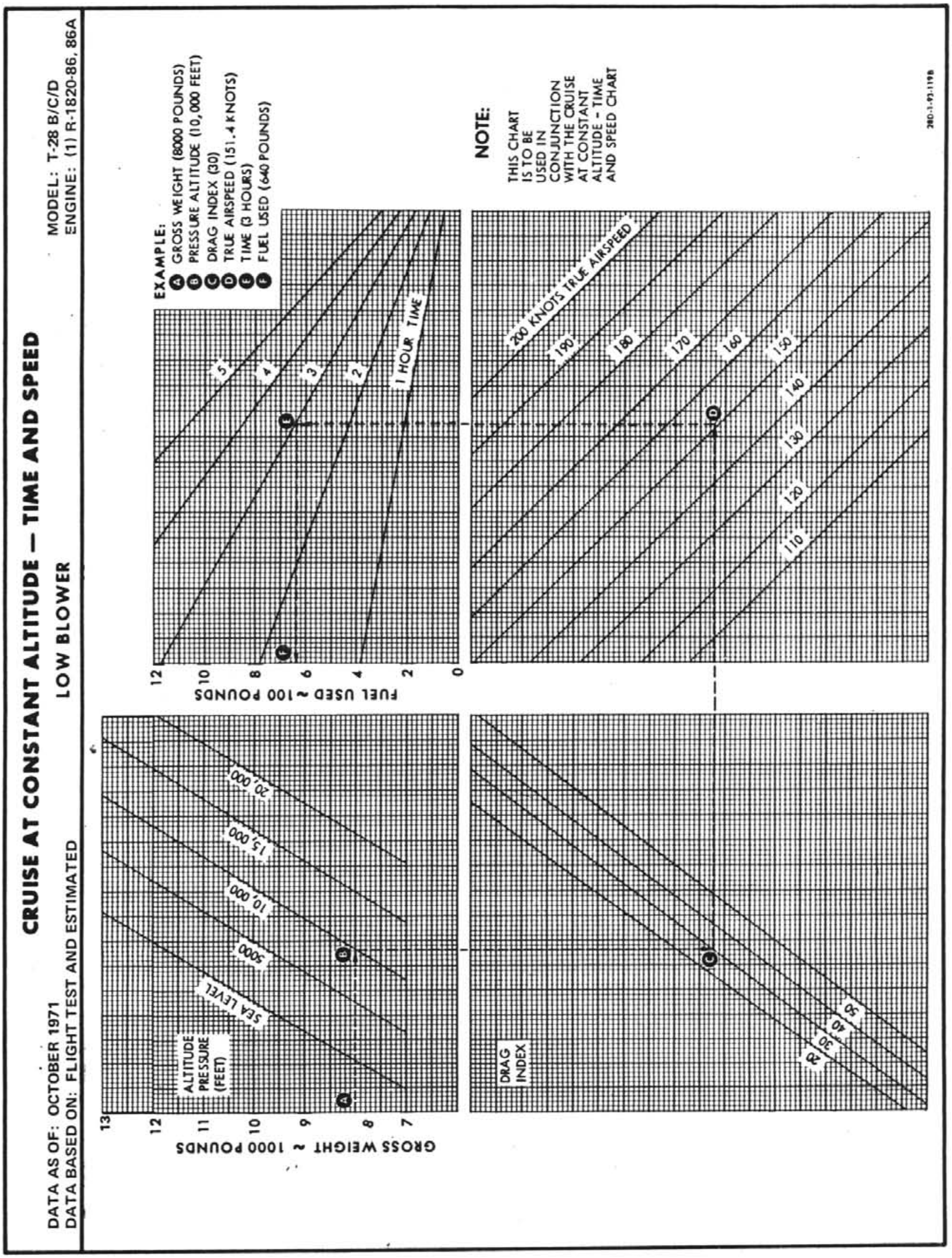
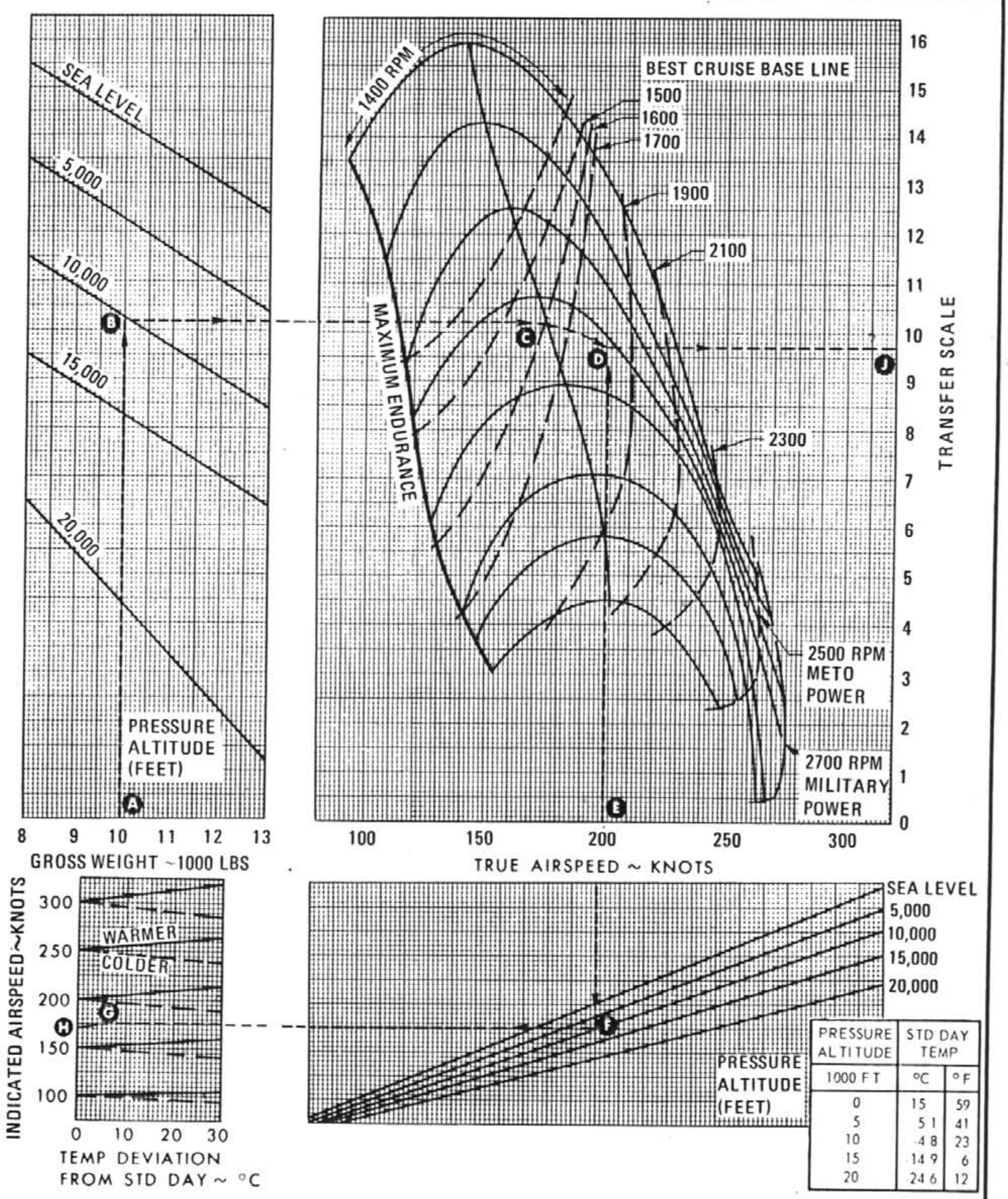

CRUISE AT CONSTANT ALTITUDE — TIME AND SPEED
LOW BLOWER
MODEL: T-28 B/C/D
ENGINE: (1) R-1820-86, 86A
DATA AS OF: OCTOBER 1971
DATA BASED ON: FLIGHT TEST AND ESTIMATED
EXAMPLE:
A GROSS WEIGHT (8000 POUNDS)
B PRESSURE ALTITUDE (10,000 FEET)
C DRAG INDEX (30)
D TRUE AIRSPEED (151.4 KNOTS)
E TIME (3 HOURS)
F FUEL USED (640 POUNDS)
NOTE:
THIS CHART IS TO BE USED IN CONJUNCTION WITH THE CRUISE AT CONSTANT ALTITUDE - TIME AND SPEED CHART
ALTITUDE PRESSURE (FEET)
SEA LEVEL
5000
10,000
15,000
20,000
GROSS WEIGHT ~ 1000 POUNDS
13
12
11
10
9
8
7
FUEL USED ~ 100 POUNDS
12
10
8
6
4
2
0
5
4
3
2
1 HOUR TIME
200 KNOTS TRUE AIRSPEED
190
180
170
160
150
140
130
120
110
DRAG INDEX
20
30
40
50

Figure A4-1

NAUTICAL MILES PER POUND FUEL

DATA AS OF: OCTOBER 1971
DATA BASED ON: FLIGHT TEST AND ESTIMATED

DRAG 20
LOW BLOWER



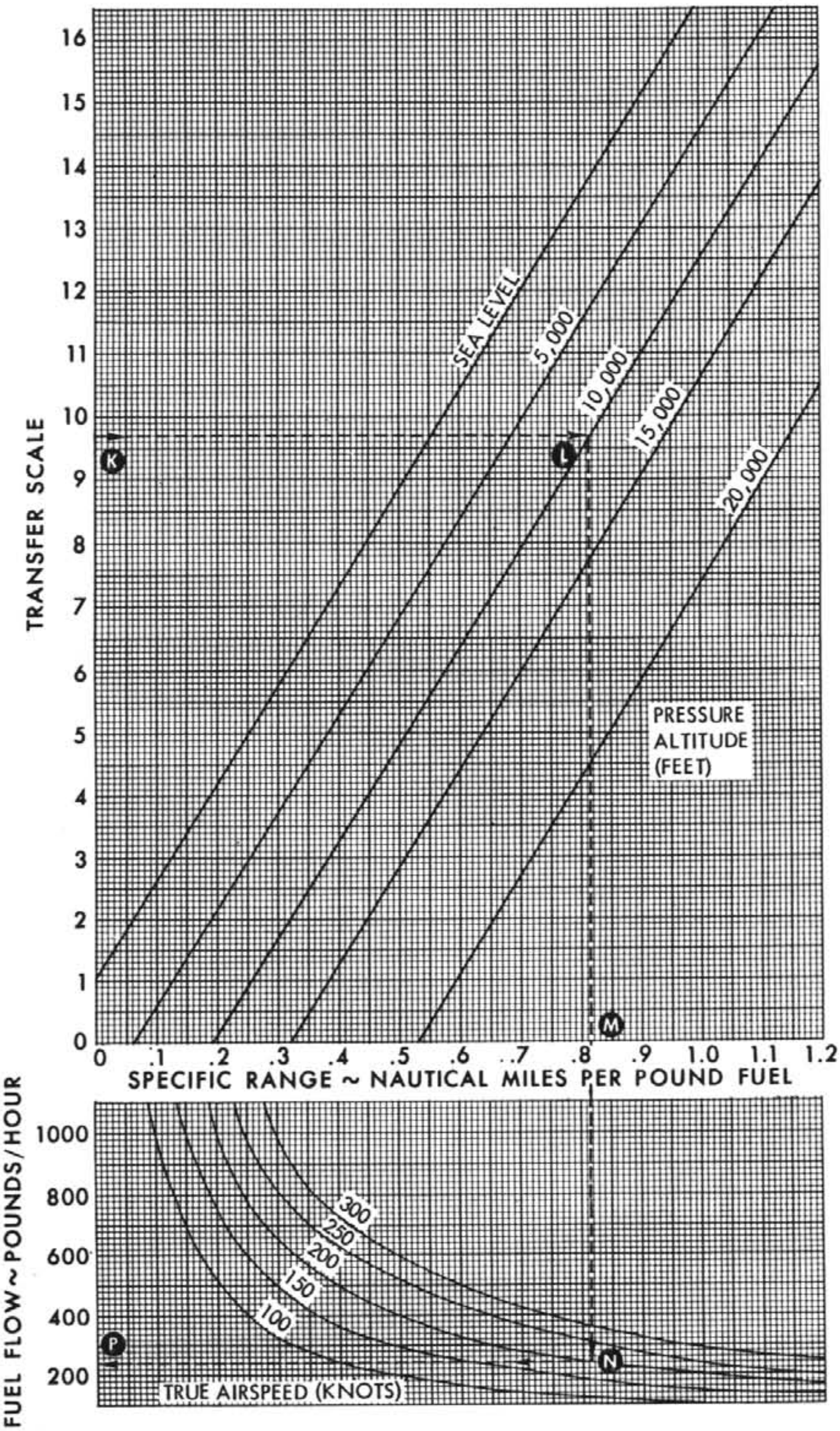
PRESSURE ALTITUDE	STD DAY TEMP	
1000 FT	°C	°F
0	15	59
5	5.1	41
10	-4.8	23
15	-14.9	6
20	-24.6	12

Figure A4-2

NAUTICAL MILES PER POUND FUEL

DRAG 20
LOW BLOWER

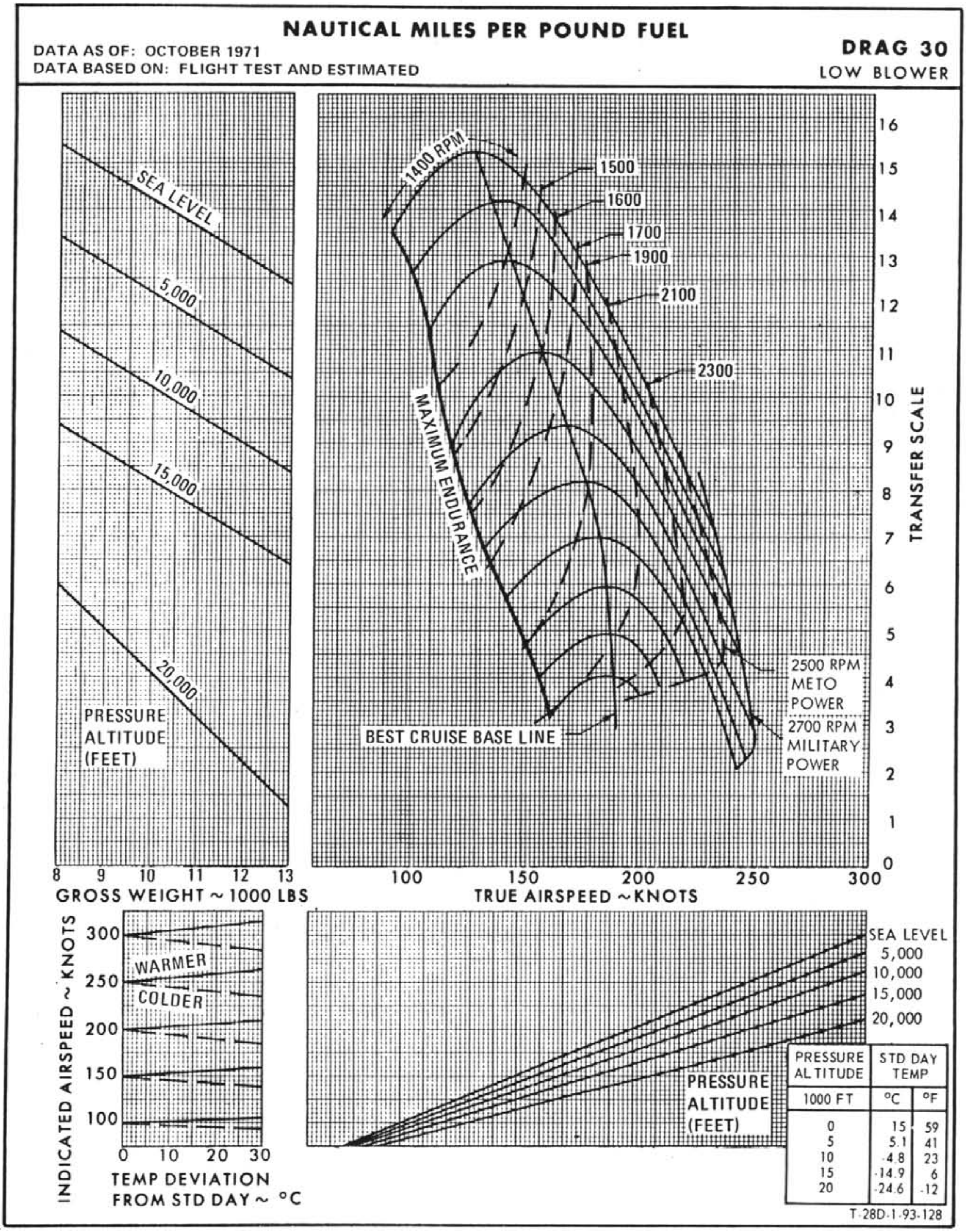
MODEL: T28 B/C/D
ENGINE: R 1820-86, 86A



NOTE:

1. REFER TO POWER SCHEDULE CHART FOR MANIFOLD PRESSURE.

28D-1-93-127A



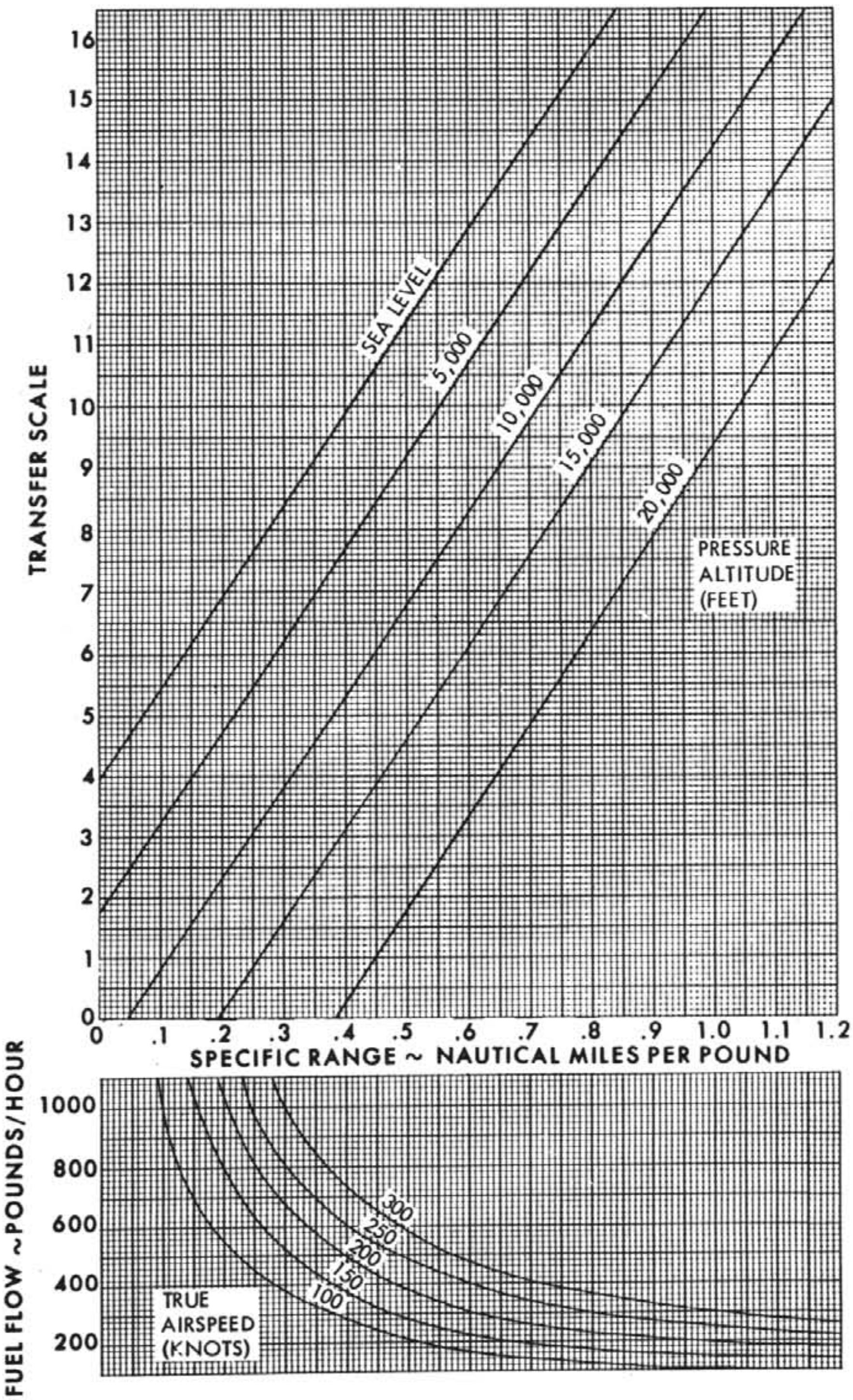
PRESSURE ALTITUDE	STD DAY TEMP	
1000 FT	°C	°F
0	15	59
5	5.1	41
10	-4.8	23
15	-14.9	6
20	-24.6	-12

Figure A4-3

NAUTICAL MILES PER POUND FUEL

DRAG 30
LOW BLOWER

MODEL: T28 B/C/D
ENGINE: R 1820-86, 86A



NOTE:

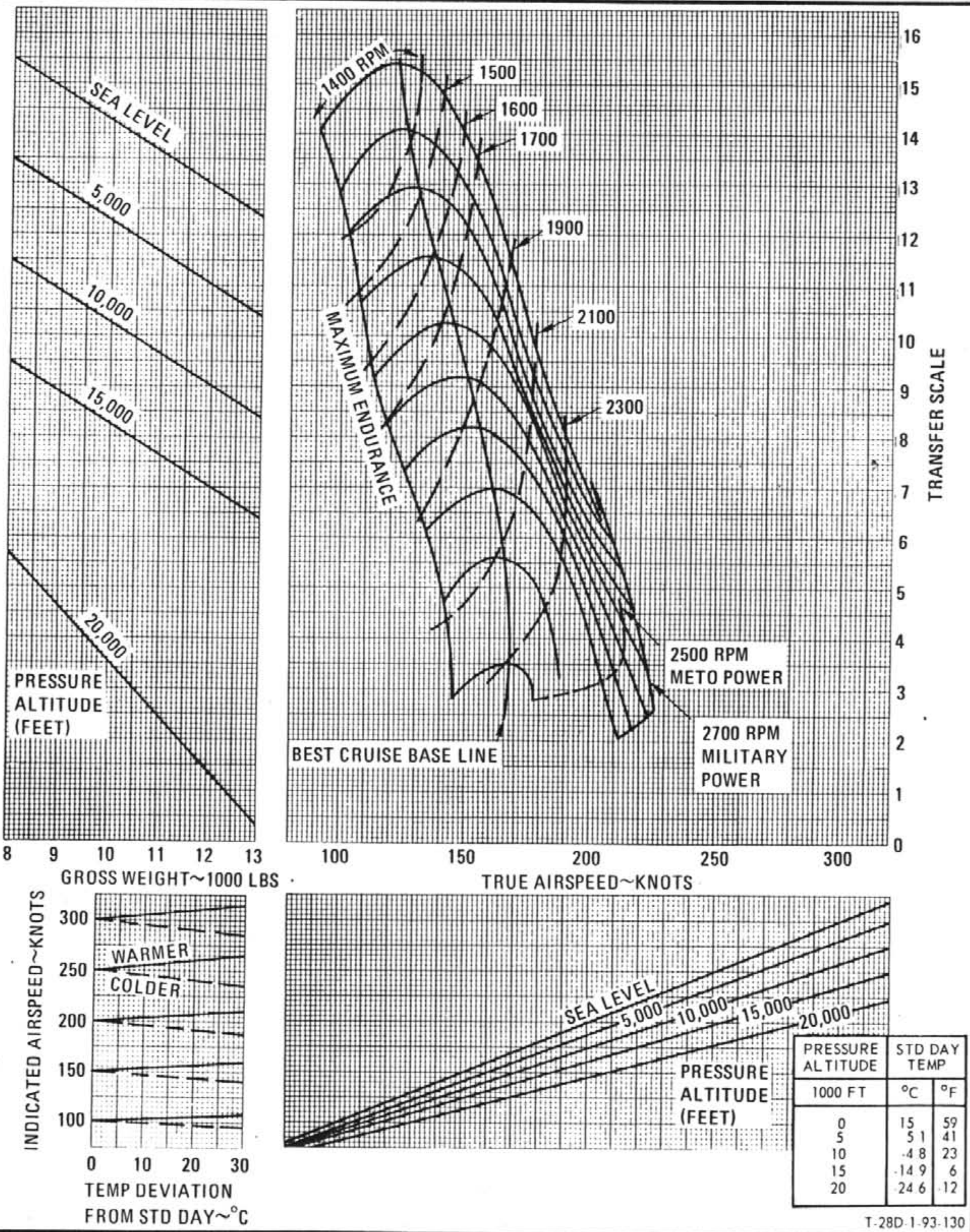
1. REFER TO POWER SCHEDULE CHART FOR MANIFOLD PRESSURE.

28D-1-93-129A

NAUTICAL MILES PER POUND FUEL

DATA AS OF: OCTOBER 1971
DATA BASED ON: FLIGHT TEST AND ESTIMATED

DRAG 40
LOW BLOWER



PRESSURE ALTITUDE	STD DAY TEMP	
1000 FT	°C	°F
0	15	59
5	5.1	41
10	-4.8	23
15	-14.9	6
20	-24.6	-12

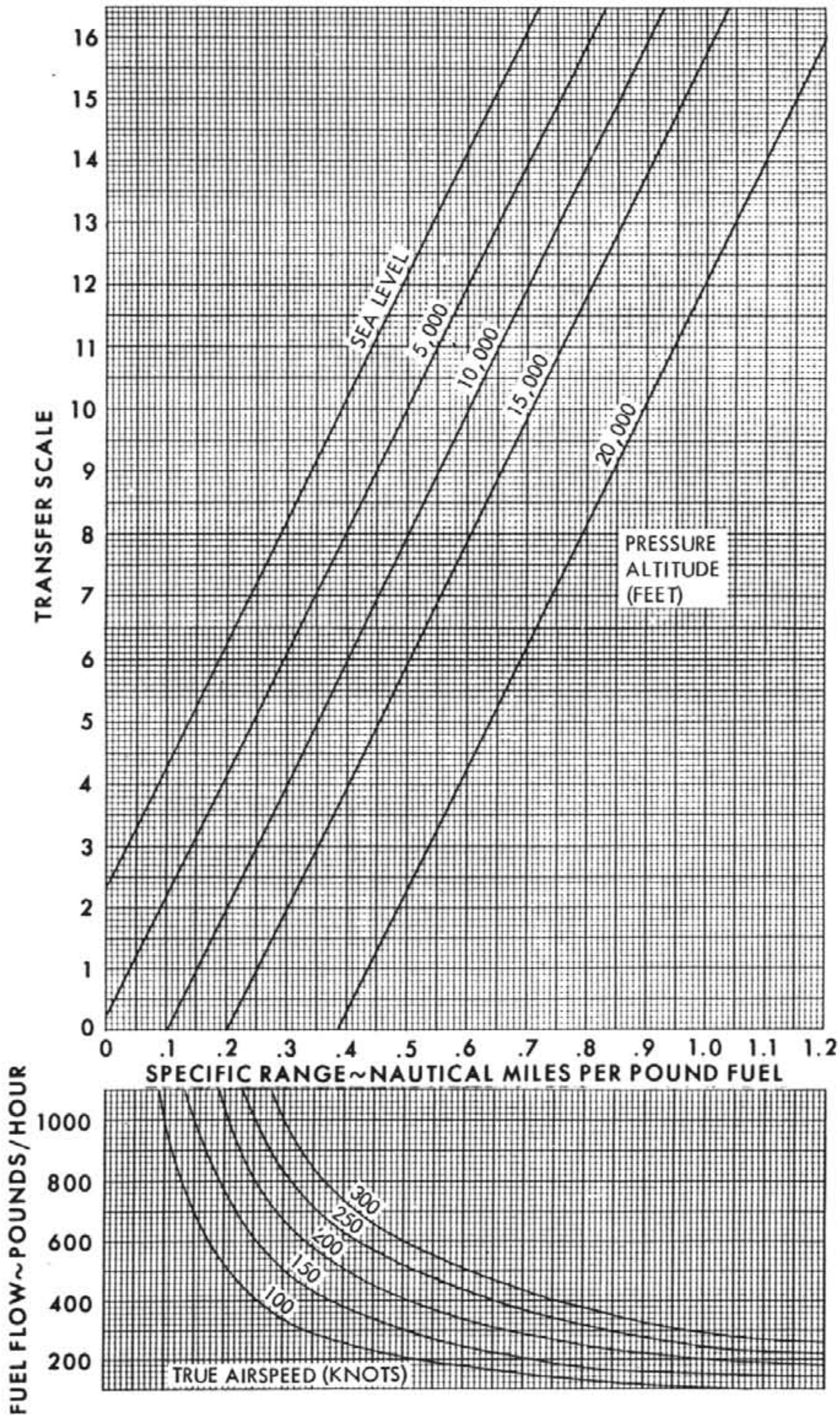
T-28D-1-93-130

Figure A4-4

DRAG 40
LOW BLOWER

NAUTICAL MILES PER POUND FUEL

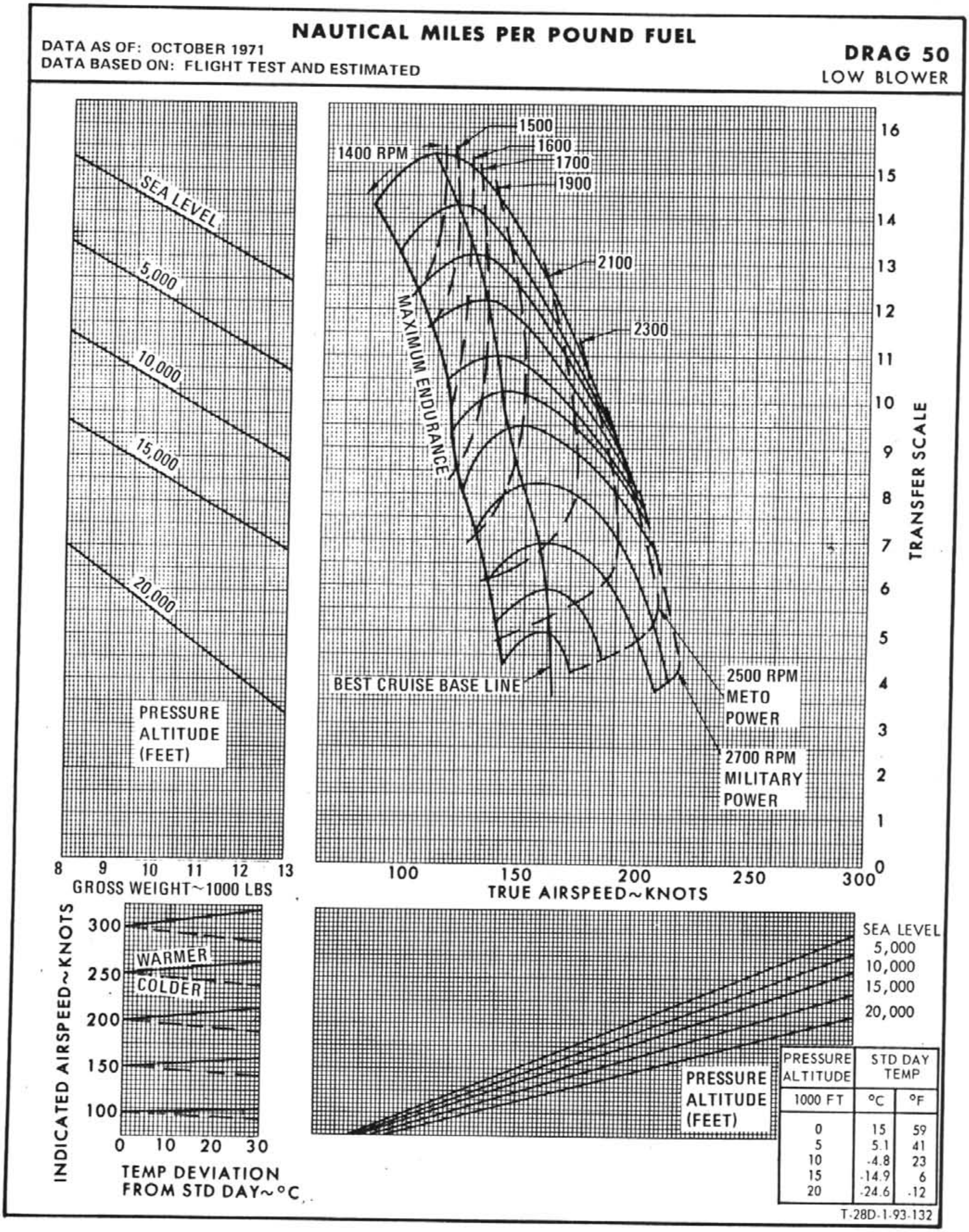
MODEL: T28 B/C/D
ENGINE: R 1820-86, 86A



NOTE:

1. REFER TO POWER SCHEDULE CHART FOR MANIFOLD PRESSURE.

28D-1-93-131A



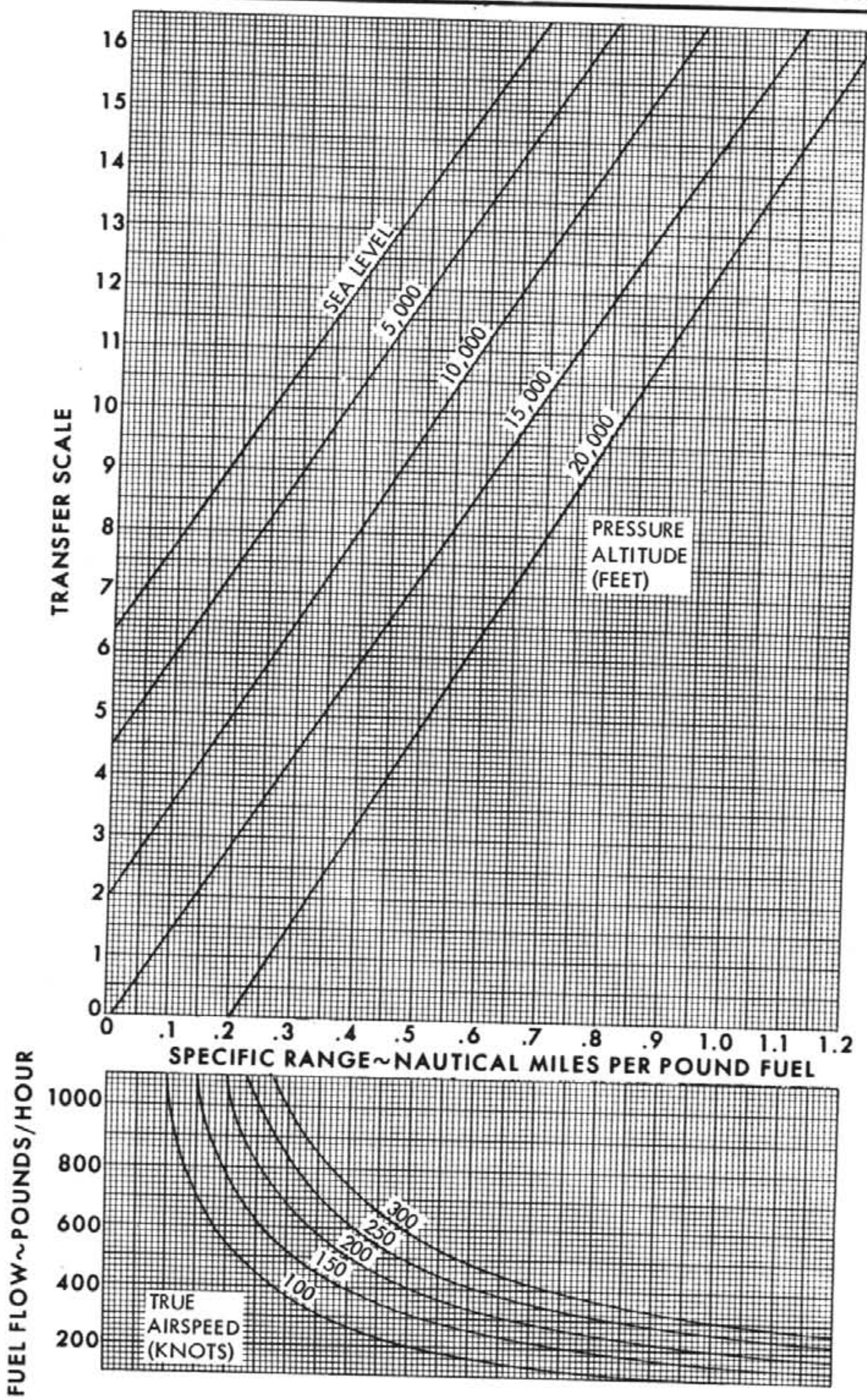
PRESSURE ALTITUDE	STD DAY TEMP	
1000 FT	°C	°F
0	15	59
5	5.1	41
10	-4.8	23
15	-14.9	6
20	-24.6	-12

Figure A4-5

DRAG 50
LOW BLOWER

NAUTICAL MILES PER POUND FUEL

MODEL: T28 B/C/D
ENGINE: R 1820-86, 86A



NOTE:

1. REFER TO POWER SCHEDULE CHART FOR MANIFOLD PRESSURE.

28D-1-93-133A

index is 20, and the temperature at flight altitude is given at 0°C.

Solution (see figure A4-2):

- Ⓐ is gross weight (10,000 pounds).
- Ⓑ is pressure altitude (10,000 feet).
- Ⓒ is best cruise baseline.
- Ⓓ is intersection of following guideline from best cruise baseline and line from 200 knots TAS (1825 rpm).
- Ⓔ is TAS (200 knots).
- Ⓕ is pressure altitude (10,000 feet).
- Ⓖ is temperature deviation from standard (5°C warmer).
- Ⓗ is indicated airspeed (170 knots).
- Ⓙ is transfer scale number (9.7).
- Ⓚ is transfer scale number on sheet 2 of figure A4-2 (9.7).
- Ⓛ is pressure altitude (10,000 feet).
- Ⓜ is specific range (0.815 nautical miles per pound fuel).
- Ⓝ is the TAS (200 knots).
- Ⓟ is the fuel flow (240 pounds/hour).

NOTE If it is desired to compute cruise data for an IAS, the chart will be entered at Ⓗ and traced in reverse order as shown on the sample problem.

MISSION PROFILE.

The mission profile (figure A4-6) presents time fuel, and distance versus altitude for a constant 160 knots IAS cruise when carrying two .50-caliber gun pods. The fuel-used curves include a 164-pound allowance for start, ground time, take-off, and acceleration to climb speed. Fuel reserve for descent and landing is not included. The time lines include time required in climbing to altitude, but do not include ground time. The initial climb path is based on a METO power climb, and power settings for cruise are as noted in the cruise data block. Use of the chart is explained by the following sample problem.

Problem:

Find no-wind range and cruise data for a 600-nautical-mile navigation mission at 6000 feet.

1. Enter the chart at 600 nautical miles and project vertically to 6000 feet. Fuel required is approximately 910 pounds, and time in-flight is approximately 3 hours and 30 minutes.

2. Interpolating data shown in the cruise data block, an indicated airspeed of 160 knots results in TAS of about 175 knots, fuel flow of about 195 to 205 pounds per hour at 1500 rpm, and approximately 29 Hg MAP.

3. The effect of wind can be solved by adding or subtracting equal incremental effects in time and fuel. For best results in determining cruise data with known wind conditions, use the cruise at constant-altitude chart in this section.

MISSION PROFILE

TWO .50 CAL 100 ROUND GUN PACKAGES

TAKE-OFF GROSS WEIGHT: 8900 POUNDS

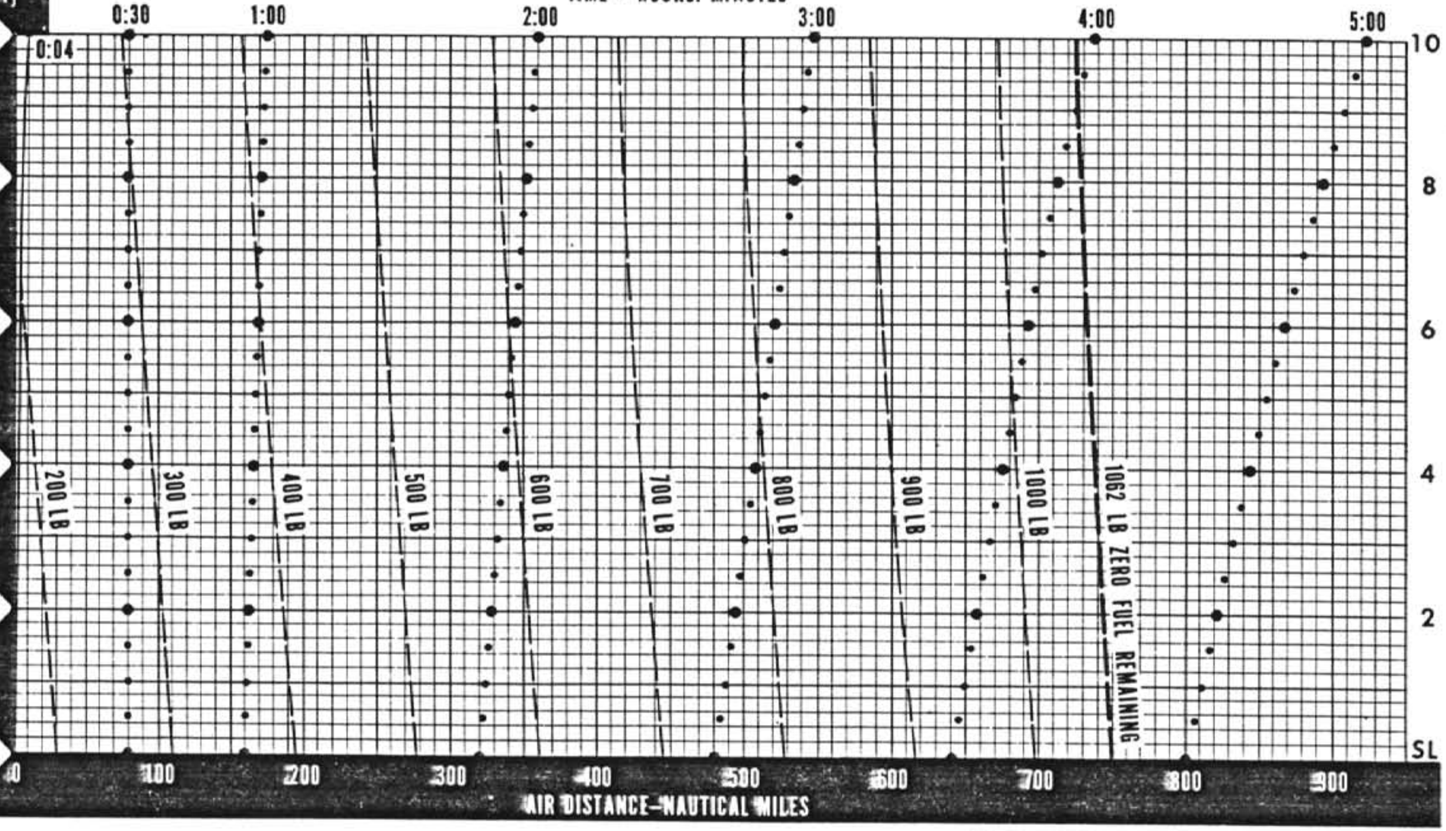
DRAG INDEX 26

STANDARD DAY
MODEL: T-28 B/C/D
ENGINE: R-1820-86, -86A
LOW BLOWER

DATA AS OF: 1 APRIL 1964
DATA BASIS: FLIGHT TEST AND ESTIMATED

METO POWER CLIMB*

MANIFOLD PRESSURE (IN. Hg)	IAS	PRESSURE ALTITUDE (1000 FT)
36	120	10
39	120	8
42	124	6
44	127	4
46	132	2
47	136	SL



* 2500 RPM～RICH MIXTURE

REMARKS:

1. FUEL ALLOWANCE INCLUDES 10 MINUTES GROUND TIME FOR START AND TAXI PLUS TAKE-OFF AND ACCELERATION TO CLIMB SPEED. FUEL ALLOWANCE BASED ON 16 POUNDS FUEL FOR EACH MINUTE OF OPERATION DURING CLIMB.
2. USE METO POWER FOR CLIMB (SEE METO POWER CHART FOR DETAILED INFORMATION)
3. CRUISE AT RECOMMENDED IAS (160 KNOTS).
4. NO ALLOWANCE OR RESERVE FOR DESCENT OR LANDING.
5. USE NORMAL MIXTURE FOR CRUISE.

LEGEND:

— — — FUEL CONSUMED

• • • • • TIME (START, TAXI AND TAKE-OFF NOT INCLUDED)

——— CRUISE PATH

CRUISE

ALTITUDE FEET	IAS	APPROXIMATE TAS	APPROXIMATE LB/HR	APPROXIMATE RPM	APPROXIMATE MANIFOLD PRESSURE (IN. Hg)
10,000	160	186	220-230	1600	27
5000	160	172	190-200	1400	29.5
SEA LEVEL	160	160	190-200	1400	31.0

28D-1-93-134B

Figure A4-6

DIVERSION RANGE SUMMARY

A diversion range summary chart for drag numbers 26 and 48 is contained in the pilot's checklist. This chart enables determination of range and time when fuel quantity is 1000 pounds or less. The range in nautical miles and time in minutes are read at the intersection of fuel remaining and initial (optimum) altitude. The cruise airspeed is shown for each altitude of each configuration. The point at which descent is begun, to arrive at Sea Level with the stated fuel reserve, is given in terms of fuel remaining for altitudes other than Sea Level. The percentage of reduction in range and time for airplanes with photo reconnaissance pod is stated to the right of each summary table.

DIVERSION RANGE SUMMARY
STANDARD DAY ZERO WIND
BEST CRUISE
200 LB RESERVE AT SEA LEVEL

DATA AS OF 1 APRIL 1964
DATA BASIS: **FLIGHT TEST** AND **ESTIMATED**

MODEL: T-28B C D
ENGINE: R 1820 86, 86A

Sample Chart
NOT FOR MISSION PLANNING

DRAG NO. 26 — **TWO (2) .50 CAL GUN PACKAGES (100 ROUNDS)**

FUEL (LBS)	INITIAL (OPTIMUM) ALTITUDE					
	FEET	SEA LEVEL	2500	5000	7500	10,000
400	RANGE - N MI (1) MINUTES	165 [illegible]	[illegible]	[illegible]	186 74	192 74
600	RANGE - N MI MINUTES	[illegible]	[illegible]	[illegible]	[illegible] [illegible]	364 139
800	RANGE - N MI MINUTES	[illegible]	[illegible]	[illegible]	526 206	535 203
1000	RANGE - N MI MINUTES	[illegible]	[illegible]	[illegible]	694 271	704 266
CRUISE AIRSPEED KIAS		134	140	146	153	159
START DESCENT (2)		FUEL REM	205	205	210	215

REDUCE RANGE 9 PERCENT, TIME 6 PERCENT FOR PHOTO POD

DRAG NO. 48 — **TWO (2) BLU-10 FOUR (4) BLU-11 FIRE BOMBS**

FUEL (LBS)	INITIAL (OPTIMUM) ALTITUDE					
	FEET	SEA LEVEL	2500	5000 (B)	7500	10,000
(A) 400	RANGE - N MI (1) MINUTES	110 54	113 53	117 53 (C)	123 54	128 55
600	RANGE - N MI MINUTES	218 107	220 103	2[illegible]4 1[illegible]1	231 101	237 101
800	RANGE - N MI MINUTES	325 159	325 152	3[illegible]0 1[illegible]9	337 147	345 147
1000	RANGE - N MI MINUTES	430 210	430 201	4[illegible]4 1[illegible]5	442 192	451 191
CRUISE AIRSPEED KIAS		123	128	133 (D)	137	142
START DESCENT (2)		FUEL REM	205	205 (E)	210	215

REDUCE RANGE AND TIME 9 PERCENT FOR PHOTO POD

NOTES:

(1) RANGE AND TIME INCLUDES CRUISE AND DESCENT ON COURSE TO ARRIVE AT DESTINATION WITH 200 LBS FUEL RESERVE

(2) DESCENT BASED ON 130 KIAS, 1600 RPM, 18 INCHES HG MAP

EXAMPLE:

(A) is 400 pounds of fuel remaining.

(B) is 5000 feet initial (and optimum) altitude.

(C) is range of 117 nautical miles and time of 53 minutes (as defined by NOTE 1).

(D) is cruise airspeed of 133 knots indicated airspeed.

(E) is 205 pounds of fuel remaining and starting point for descent (as defined by NOTE 2).

28D-1-93-22A

Figure A4-7

PART 5–ENDURANCE

TABLE OF CONTENTS

Titles CAPITALIZED denote charts.

MAXIMUM ENDURANCE (LOITER).

The requirement to stay aloft and "hold" because of weather, traffic control, or adverse runway conditions necessitates remaining air-borne for long periods on a limited amount of fuel, which requires that the airplane be flown at a minimum rate of fuel consumption. Generally it is a requirement that the "hold" be accomplished in turning flight rather than in level flight. To accurately determine endurance in turning flight requires that only the bank angle and the airplane gross weight be known. Steady-state flight, turning or level, requires a balance of weight with lift, and drag with thrust. When an airplane is banked, the lift force is acting at an angle to the vertical. The vertical component of the lift must equal the weight. In banked flight, greater lift is required than in level flight, and because of this increased lift, drag is also increased. This means that more thrust is required. The constant-altitude maximum endurance chart (figure A5-1) provides a means of reading directly from the chart the effect of bank angle on endurance. When maximum endurance is to be performed in level flight, the average gross weight and the effective gross weight may be considered the same.

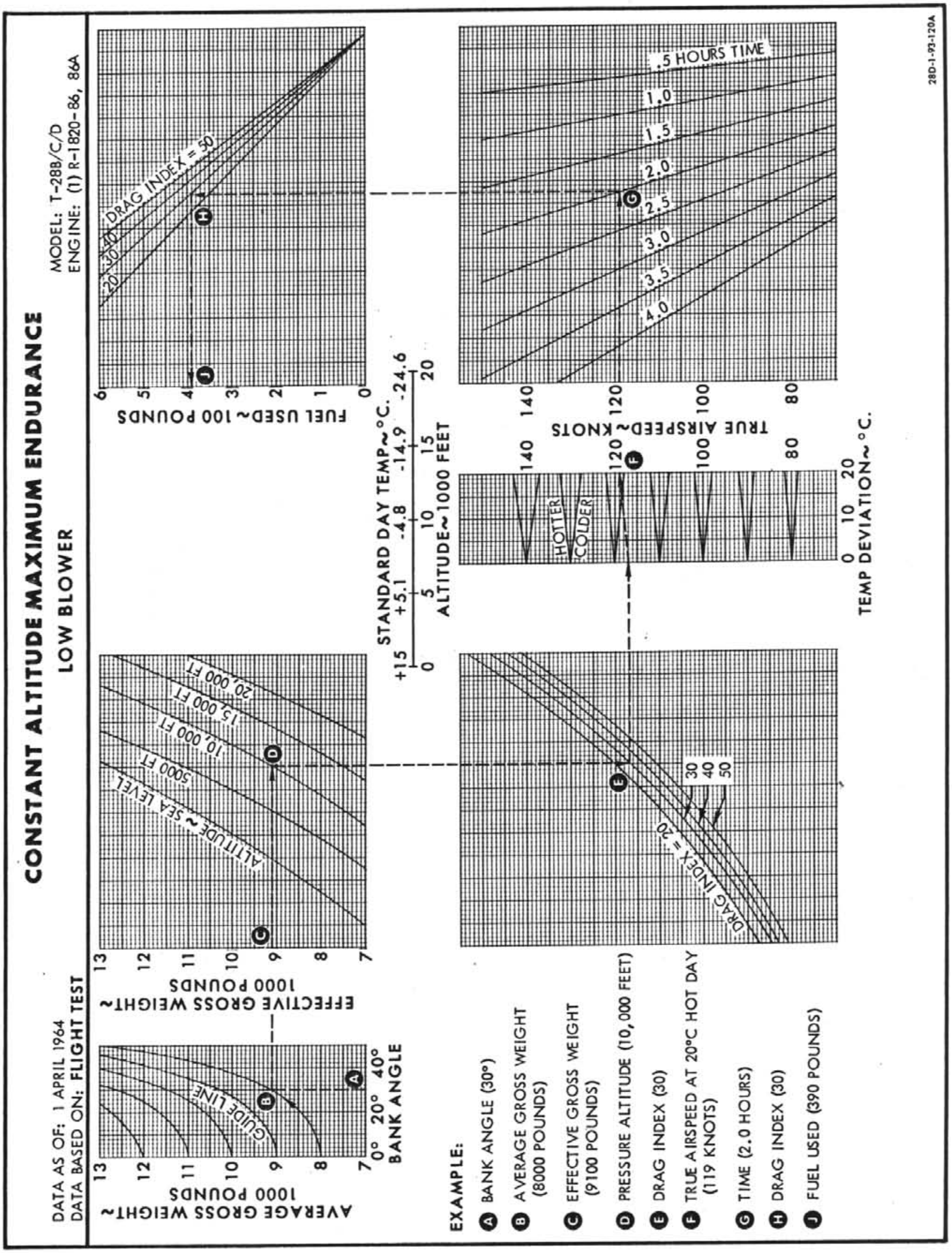

CONSTANT ALTITUDE MAXIMUM ENDURANCE
LOW BLOWER
DATA AS OF: 1 APRIL 1964
DATA BASED ON: FLIGHT TEST
MODEL: T-28B/C/D
ENGINE: (1) R-1820-86, 86A
AVERAGE GROSS WEIGHT~ 1000 POUNDS
BANK ANGLE
GUIDE LINE
EFFECTIVE GROSS WEIGHT~ 1000 POUNDS
ALTITUDE ~ SEA LEVEL
5000 FT
10,000 FT
15,000 FT
20,000 FT
STANDARD DAY TEMP~°C.
+15 +5.1 -4.8 -14.9 -24.6
ALTITUDE~1000 FEET
DRAG INDEX = 20
30
40
50
HOTTER
COLDER
TEMP DEVIATION~°C.
TRUE AIRSPEED~KNOTS
.5 HOURS TIME
1.0
1.5
2.0
2.5
3.0
3.5
4.0
FUEL USED~100 POUNDS
DRAG INDEX = 50
EXAMPLE:
A BANK ANGLE (30°)
B AVERAGE GROSS WEIGHT (8000 POUNDS)
C EFFECTIVE GROSS WEIGHT (9100 POUNDS)
D PRESSURE ALTITUDE (10,000 FEET)
E DRAG INDEX (30)
F TRUE AIRSPEED AT 20°C HOT DAY (119 KNOTS)
G TIME (2.0 HOURS)
H DRAG INDEX (30)
J FUEL USED (390 POUNDS)
28D-1-93-120A

Figure A5-1

PART 6–LANDING

TABLE OF CONTENTS

Titles CAPITALIZED denote charts.

LANDING DISTANCE.

NOTE See figure A2-2 for cross-wind landing data.

Landing ground-roll distances are shown in figures A6-1 and A6-2 for the recommended landing configuration of flaps down. Temperature, altitude, gross weight, and runway condition compensations are included.

RUNWAY CONDITION.

When other than dry conditions exist on active runways, a correction must be applied to the ground roll distance obtained from the charts. This correction is obtained by using the runway condition grid in the same manner as the wind grid. The relative slickness of the runway will be transmitted as part of the teletype weather sequence, appearing as the RCR (runway condition reading) number. An example on the chart shows how this correction is applied.

NOTE If no RCR number is available, use RCR12 for wet runways and RCR5 for icy runways.

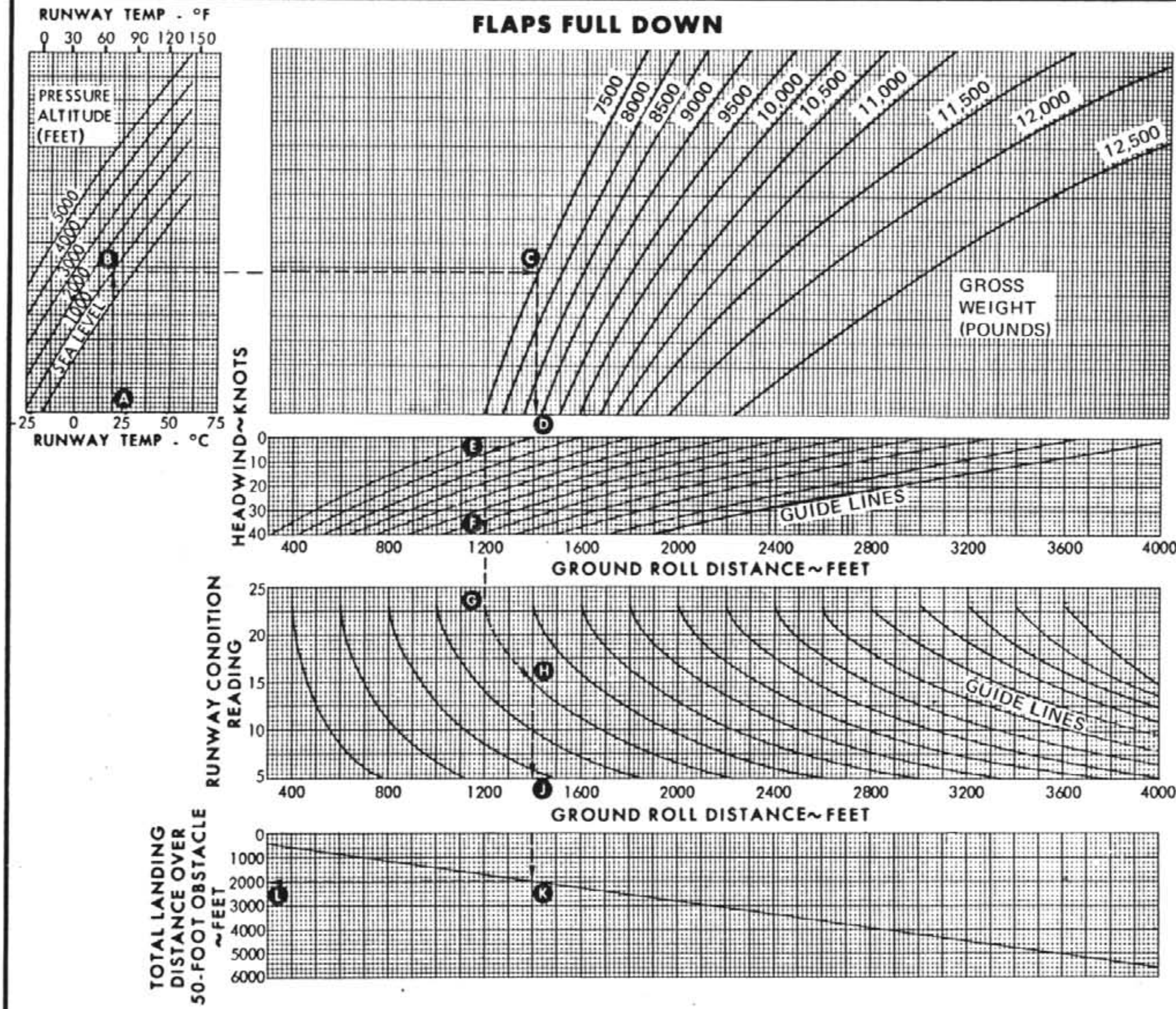
LANDING DISTANCE

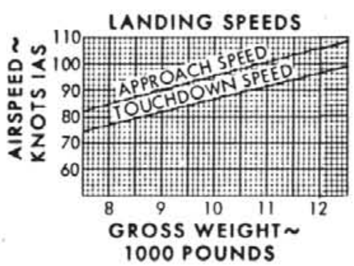
HARD SURFACE RUNWAY

DATA AS OF: OCTOBER 1971
DATA BASIS: FLIGHT TEST AND ESTIMATED

MODEL: T-28 B/C/D
ENGINE: R-1820-86, 86A

FLAPS FULL DOWN





EXAMPLE:

- A RUNWAY TEMPERATURE (20°C) (68°F)
- B PRESSURE ALTITUDE (1000 FEET)
- C GROSS WEIGHT (7500 POUNDS)
- D GROUND ROLL NO WIND (1400 FEET)
- E HEAD WIND (10 KNOTS)
- F GROUND ROLL WITH 10 KNOT HEADWIND (1200 FEET)
- G RUNWAY CONDITION BASE LINE
- H RCR (15)
- J GROUND ROLL WITH RCR (1400)
- K BASE LINE FOR 50-FOOT OBSTACLE DISTANCE
- L TOTAL DISTANCE OVER 50-FOOT OBSTACLE (2000 FEET)

REMARKS:

FOR LANDINGS WITHOUT FLAPS:

1. INCREASE APPROACH AND TOUCHDOWN SPEEDS 5 KNOTS
2. INCREASE GROUND ROLL DISTANCE 20 PERCENT
3. INCREASE TOTAL DISTANCE 35 PERCENT

28D-1-93-105A

Figure A6-1

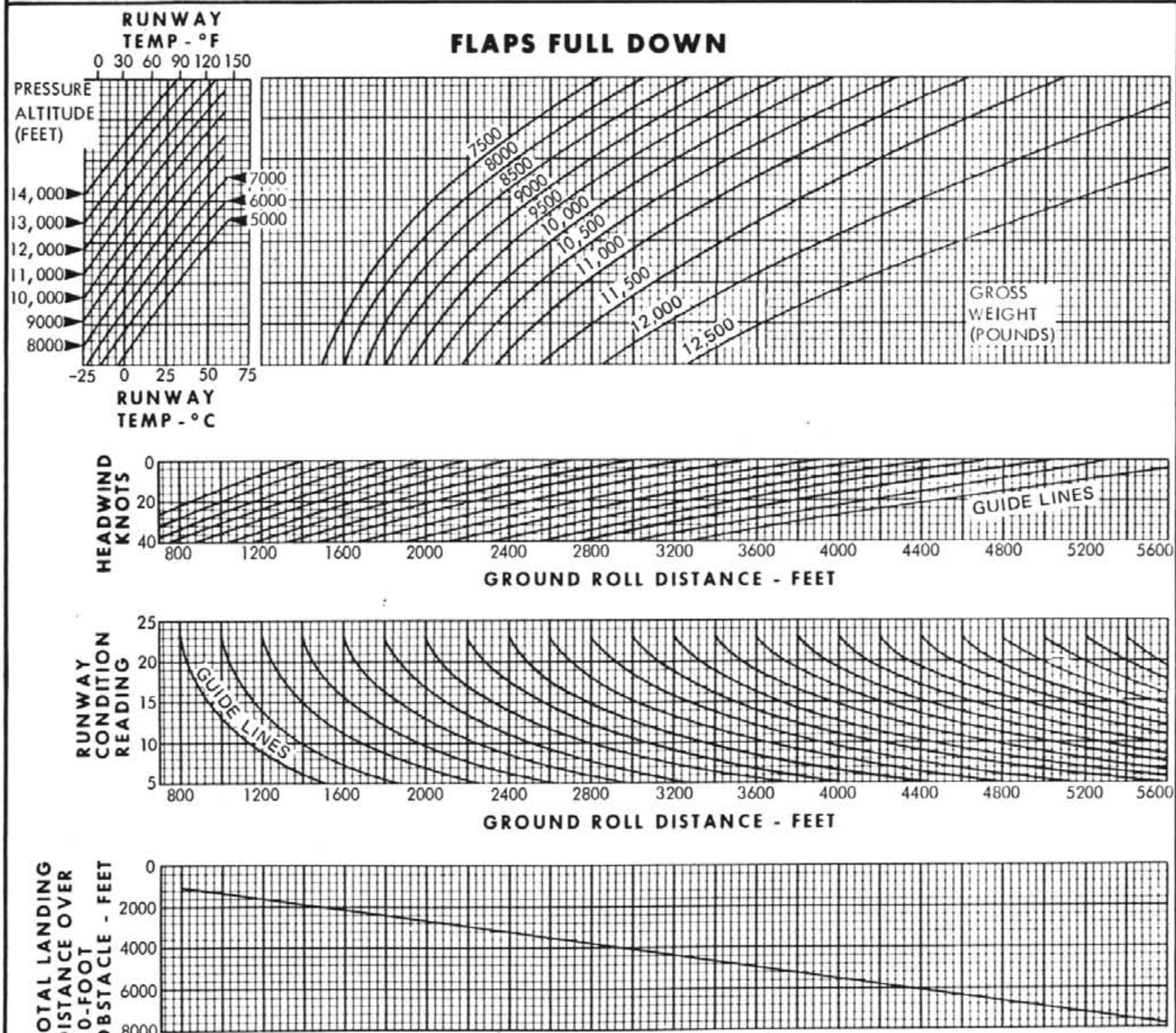
LANDING DISTANCE

DATA AS OF: OCTOBER 1971
DATA BASIS: ESTIMATED

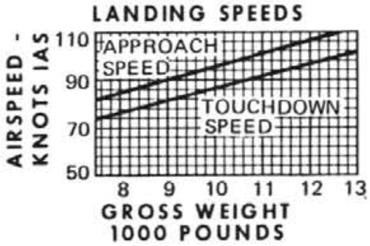
HARD SURFACE RUNWAY

MODEL: T-28 B/C/D
ENGINE: R-1820-86, 86A

FLAPS FULL DOWN



LANDING SPEEDS



NOTE:

Ground speeds at touchdown increase with field elevation due to higher true airspeeds required with aircraft operation in less dense atmosphere. Brake fading will occur unless aerodynamic braking is used to reduce airspeed prior to wheel brake application. The maximum recommended speed for wheel brake initiation, for the range of landing conditions presented, is 38 KIAS at 12,500 pounds gross weight and 53 KIAS at 7500 pounds. Nose high attitude for maximum aerodynamic braking should be maintained until the nose falls through.

REMARKS

FOR LANDINGS WITHOUT FLAPS:

1. INCREASE APPROACH AND TOUCHDOWN SPEEDS 5 KNOTS
2. INCREASE GROUND ROLL DISTANCE 20 PERCENT
3. INCREASE TOTAL DISTANCE 35 PERCENT

T-28D-1-93-154

Figure A6-2

PART 7—COMBAT PERFORMANCE

TABLE OF CONTENTS

Titles CAPITALIZED denote charts.

COMBAT.

The climax of all mission planning is with the successful accomplishment of combat. An understanding of the performance capabilities of the airplane and an honest evaluation of the combat phase of the mission will certainly be key factors in the over-all success of the combat mission.

COMBAT ALLOWANCE.

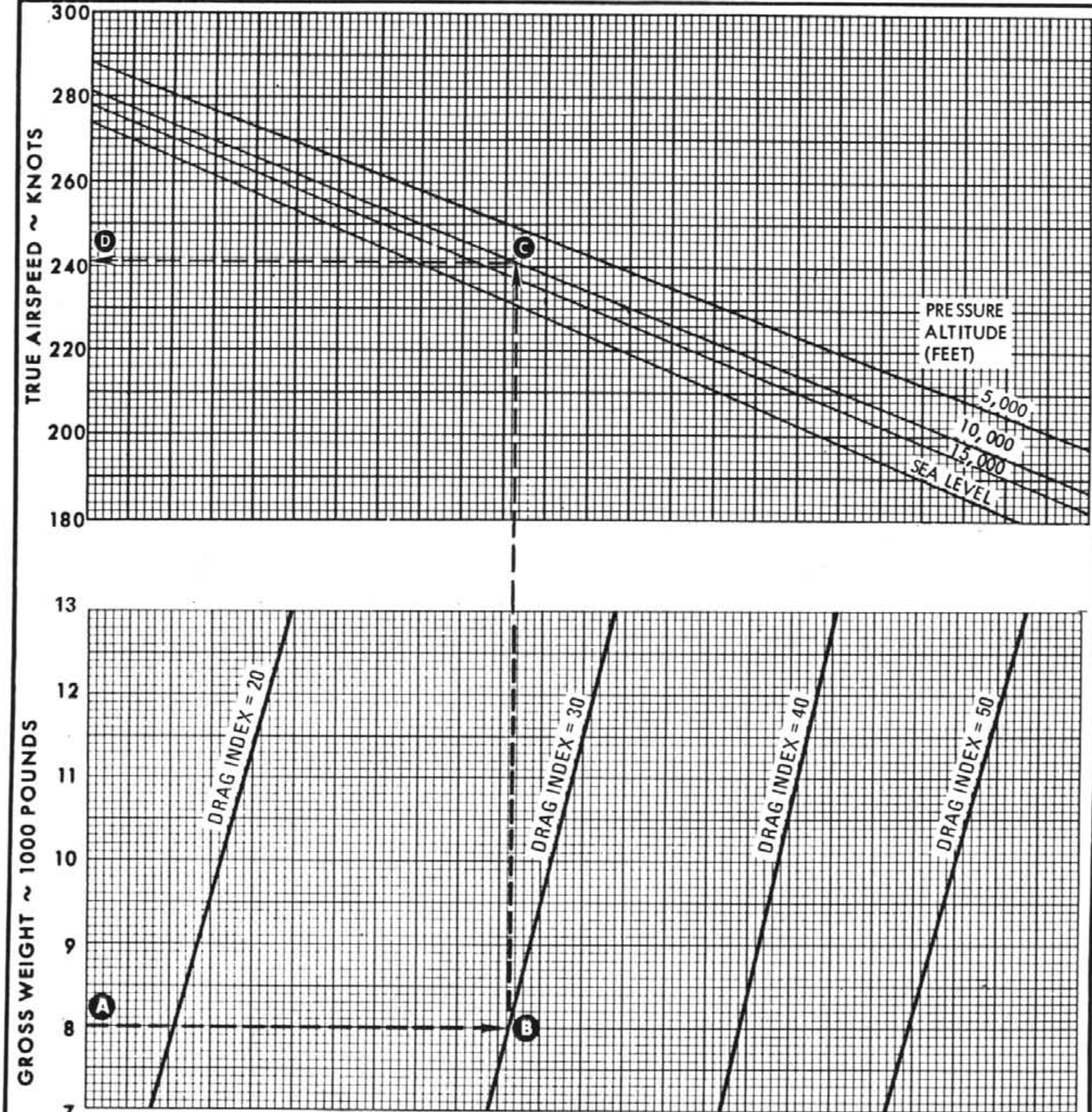
Charts are provided which enable the pilot to determine combat allowance for either Military or METO power. The charts may be entered with a combat altitude and fuel allowance to determine the combat time, or with a combat altitude and time to determine the fuel required. Also included are charts to determine the combat true airspeed.

COMBAT ALLOWANCE — SPEED

MILITARY POWER (30 MIN LIMIT)
LOW BLOWER

DATA AS OF: OCTOBER 1971
DATA BASED ON: FLIGHT TEST AND ESTIMATED

MODEL: T-28 B/C/D
ENGINE: (1) R-1820-86 86A



EXAMPLE:

- Ⓐ GROSS WEIGHT (8000 POUNDS)
- Ⓑ DRAG INDEX (30)
- Ⓒ PRESSURE ALTITUDE (10,000 FEET)
- Ⓓ TRUE AIRSPEED (240 KNOTS)

T-28D-1-93-114

Figure A7-1

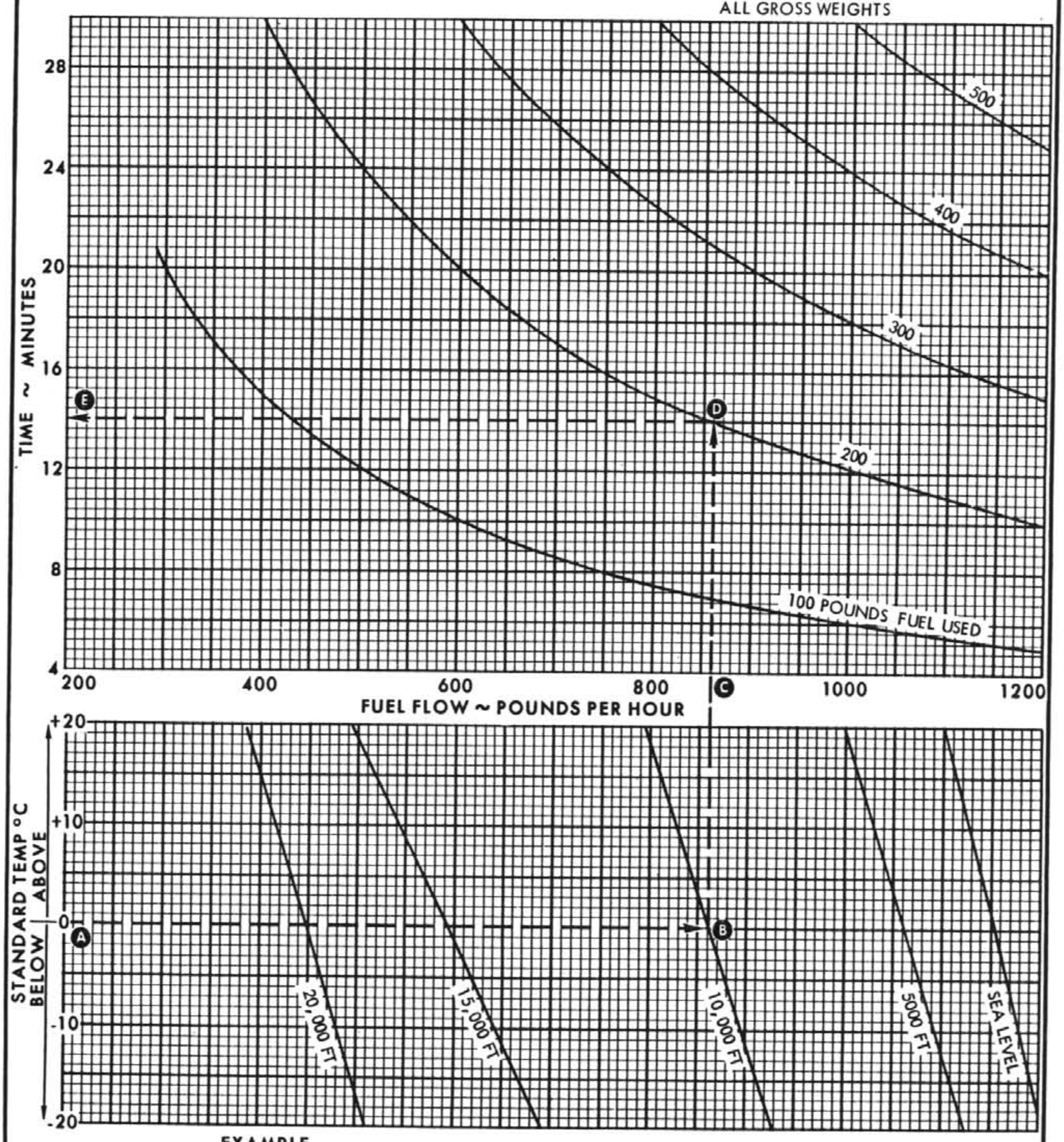
COMBAT ALLOWANCE — TIME AND FUEL

MILITARY POWER (30 MIN LIMIT)

DATA AS OF: 1 APRIL 1964
DATA BASED ON: **FLIGHT TEST**

LOW BLOWER

MODEL: T-28B/C/D
ENGINE: (1) R-1820-86, 86A



EXAMPLE:

- Ⓐ TEMPERATURE DEVIATION (°C)
- Ⓑ PRESSURE ALTITUDE (10,000 FEET)
- Ⓒ FUEL FLOW (860 POUNDS PER HOUR)
- Ⓓ FUEL USED (200 POUNDS)
- Ⓔ TIME (14 MINUTES)

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ALPHABETICAL INDEX

PAGE NUMBERS UNDERSCORED DENOTE ILLUSTRATIONS

A

B

C

PAGE NUMBERS UNDERSCORED DENOTE ILLUSTRATIONS

PAGE NUMBERS UNDERSCORED DENOTE ILLUSTRATIONS

PAGE NUMBERS UNDERSCORED DENOTE ILLUSTRATIONS

D

E

PAGE NUMBERS UNDERSCORED DENOTE ILLUSTRATIONS

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