299 -EH -EJ

FLIGHT MANUAL

USAF SERIES

F-86H

AIRCRAFT

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

PUBLISHED UNDER AUTHORITY OF THE
SECRETARY OF THE AIR FORCE

This change replaces Safety of Flight Supplements -1EF and-1EG. See Basic Index, T.O. 0-1-1, and Weekly Index, T.O. 0-1-1A, for current status of Safety of Flight Supplements.

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F-86H-1-0-62A

AF SMAMA Apr 60, 2300

25 JUNE 1959

CHANGED 26 FEBRUARY 1960

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TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 356, CONSISTING OF THE FOLLOWING:

Page No.	Issue	Page No.	Issue
*Title	26 Feb 60	4-23 thru 4-29	Original
*A	26 Feb 60	*4-30 thru 4-31	26 Feb 60
i thru iv	Original	4-32 thru 4-36	Original
1-1 thru 1-7	Original	5-1 thru 5-7	Original
*1-8	26 Feb 60	*5-8	26 Feb 60
1-9 thru 1-15	Original	5-9 thru 5-12	Original
*1-16	26 Feb 60	6-1 thru 6-14	Original
1-17 thru 1-18	Original	7-1 thru 7-6	Original
*1-19	26 Feb 60	9-1 thru 9-10	Original
1-20 thru 1-27	Original	*9-10A thru 9-10B	26 Feb 60
*1-28	26 Feb 60	9-11 thru 9-14	Original
1-29 thru 1-38	Original	A-1 thru A-128	Original
*1-39 thru 1-41	26 Feb 60	*X-1	26 Feb 60
1-42 thru 1-50	Original	X-2	Original
2-1 thru 2-2	Original	*X-3 thru X-9	26 Feb 60
*2-3 thru 2-5	26 Feb 60	X-10	Original
2-6 thru 2-8	Original		
*2-9 thru 2-10	26 Feb 60		
2-11 thru 2-14	Original		
*2-15 thru 2-16	26 Feb 60		
2-17 thru 2-19	Original		
*2-20	26 Feb 60		
2-21 thru 2-22	Original		
*2-23	26 Feb 60		
2-24	Original		
*2-25 thru 2-26	26 Feb 60		
2-27 thru 2-28	Original		
*2-29	26 Feb 60		
2-30 thru 2-31	Original		
*2-32	26 Feb 60		
2-33 thru 2-36	Original		
*2-37 thru 2-38	26 Feb 60		
3-1	Original		
*3-2 thru 3-2B	26 Feb 60		
*3-3	26 Feb 60		
3-4 thru 3-7	Original		
*3-8	26 Feb 60		
3-9 thru 3-11	Original		
*3-12	26 Feb 60		
3-13	Original		
*3-14 thru 3-14B	26 Feb 60		
3-15 thru 3-16	Original		
*3-17 thru 3-19	26 Feb 60		
3-20 thru 3-22	Original		
*3-23	26 Feb 60		
3-24 thru 3-27	Original		
*3-28	26 Feb 60		
3-29 thru 3-33	Original		
*3-34	26 Feb 60		
3-35 thru 3-36	Original		
4-1 thru 4-9	Original		
*4-10 thru 4-12	26 Feb 60		
4-13 thru 4-21	Original		
*4-22	26 Feb 60		

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F-1
USAF

TABLE OF CONTENTS

F-86H-1-00-10E

F-86H-1-0-58A

Scope. This manual contains all the information necessary for safe and efficient operation of the F-86H Airplane. These instructions do not teach basic flight principles, but are designed to provide you with a general knowledge of the airplane, its flight characteristics, and specific normal and emergency operating procedures. Your flying experience is recognized, and elementary instructions have been avoided.

Sound Judgment. The instructions in this manual are designed to provide for the needs of a pilot inexperienced in the operation of this airplane. This book 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 make it necessary to modify the procedures given in this manual.

Permissible Operations. The Flight Manual takes a "positive approach," and normally tells you only what you can do. Any unusual operation or configuration (such as asymmetrical loading) is prohibited unless specifically covered in the Flight Manual. Clearance must be obtained from ARDC before any questionable operation is attempted which is not specifically covered in the Flight Manual.

Standardization. Once you have learned to use one Flight Manual, you will know how to use them all. Closely guarded standardization ensures that the scope and arrangement of all Flight Manuals is identical.

Arrangement. The manual has been divided into ten sections, each with its own table of contents. This makes it easy to read the book straight through when it is first received and then to use it as a reference manual. The independence of each section makes it possible for the user to rearrange the book to satisfy his personal taste and requirements. The first three sections cover the minimum information required to get the airplane safely into the air and back down again. Before flying any new airplane, these three sections must be read thoroughly and fully understood. Section IV covers all equipment not essential to flight but which permits the airplane to perform special functions. The contents of Sections V and VI are obvious from their titles. Section VII covers lengthy discussions on any technique or theory of operation which may be applicable to the particular airplane in question. The experienced pilot will probably not need to read this section, but he should check it for any possible new information. The contents of the remaining sections are obvious from their titles.

Your Responsibility. These Flight Manuals are constantly maintained current through an extremely active revision program. Frequent conferences with operating personnel and constant review of UR's, accident reports, flight test reports, etc, ensure that the latest data is included in these manuals. In this regard, it is essential that you do your part! If you find anything you don't like about the book, let us know right away. We cannot correct errors we don't know exist.

Personal Copies, Binders, and Tabs. In accordance with provisions of AFR 5-13, each pilot is entitled to have a personal copy of the Flight manual. Flexible binders and loose-leaf tabs have been provided to hold your personal copy of the Flight Manual. These good-looking, simulated-leather binders will make it much easier for you to revise your manual as well as to keep it in good shape. These tabs and binders are secured through your local Materiel Staff and Contracting Officer.

How to Get Copies. If you want to be sure of getting your manual on time, order them before you need them. Early ordering will ensure that enough copies are printed to cover your requirements. Technical Order 00-5-2 explains how to order Flight Manuals, classified supplements thereto, and Safety of Flight Supplements so that you automatically will get all original issues, changes, and revisions. Basically, all you have to do is order the required quantities in the Publication Requirements Table (T.O. 0-3-1). Talk to your Senior Materiel Staff Officer—it is his job to fulfill your Technical Order requests. Establish some system that will get the books and Safety of Flight Supplements to pilots rapidly, once the books are received on the base.

Safety of Flight Supplements. Safety of Flight Supplements are used to get information to you in a hurry. Safety of Flight Supplements use the same number as your Flight Manual, except for the addition of a suffix letter. Supplements covering loss of life will get to you in 48 hours; those concerning serious damage to equipment will make it in 10 days. You can determine the status of Safety of Flight Supplements by referring to the Index of Technical Publications (T.O. 0-1-1) and the Weekly Supplemental Index (T.O. 0-1-1A). This is the only way you can determine whether a supplement has been rescinded. The title page of the Flight Manual and title block of each Safety of Flight Supplement should also be checked to determine the effect that these publications may have on existing Safety of Flight Supplements. It is critically important that you remain constantly aware of the status of all supplements. You must comply with all existing supplements but there is no point in restricting the operation of your airplane by complying with a supplement that has been replaced or rescinded. Technical Order 00-5-1 covers some additional information regarding these supplements.

Warnings, Cautions, and Notes. For your information, the following definitions apply to the "Warnings," "Cautions," and "Notes" found throughout the handbook:

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

Caution Operating procedures, practices, etc, which if not strictly observed will result in damage to equipment.

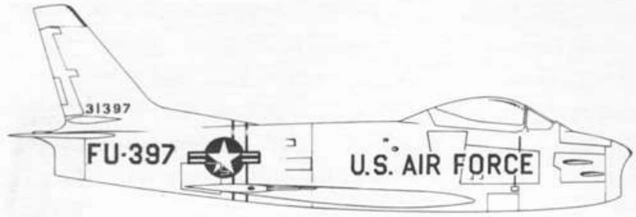
NOTE An operating procedure, condition, etc, which it is essential to emphasize.

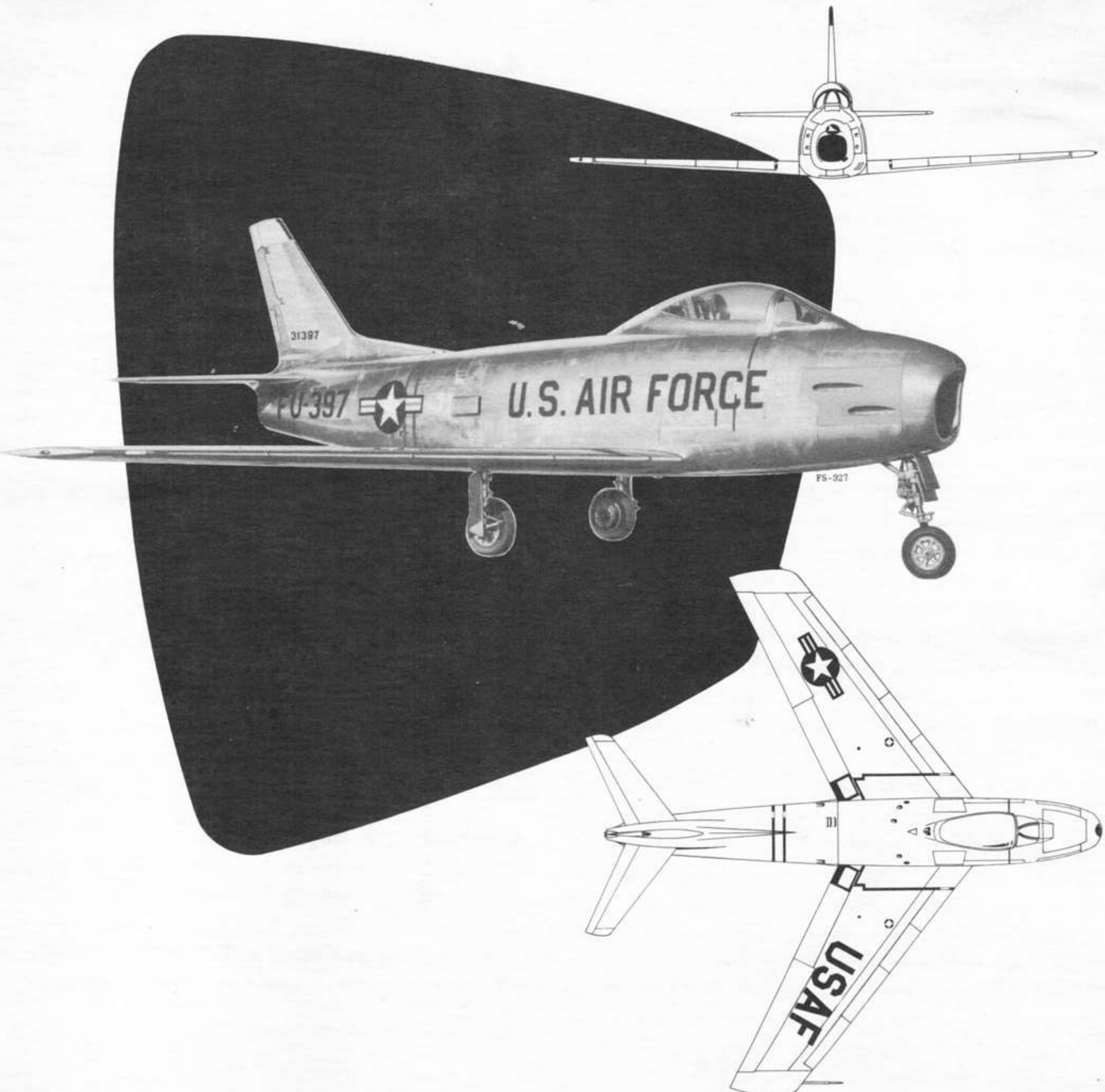
Maintenance Technical Manual. If you desire more detailed information on the various airplane systems and components than is provided within the scope of the Flight Manual, refer to the Maintenance Technical Manual (T.O. 1F-86H-2 Series) for your airplane.

MB-8 Flight Computer. The MB-8 flight computer for this airplane is presently available. This computer provides compact cruise control data to aid in preparation of flight plans, in-flight operation, and emergency in-flight planning and operation. The computer is a five-disc, metal and plastic circular computer with a canvas carrying case. Three of the discs can be used with any airplane and are referred to as "standard discs." The remaining discs contain data only for this airplane and are described as "data discs." The standard discs and carrying cases are carried in Class 05-A and are available through normal supply channels. The data discs are distributed automatically to all bases having this airplane. New or revised discs are issued each time the performance data in the Flight Manual is changed. The performance data in the computer and the manual is always kept current and consistent. If you have not yet received your computer, see your Base Operations Officer or refer to T.O. 5F5-1-1. Reference should also be made to T.O. 5F5-1-1 and Appendix I of this manual for information on the operation of the computer.

Comments and Questions. Comments and questions regarding any phase of the Flight Manual program are invited and should be forwarded through your Command Headquarters to Commander, Sacramento Air Material Area, McClellan AFB, McClellan, California, attention: Weapons Engineering Division (SMMH).

F-86H





F-86H-1-00-25C

TABLE OF CONTENTS

AIRPLANE.

The North American F-86H Sabre is a single-place, high-performance fighter-bomber, powered by an axial-flow turbojet engine. The familiar swept-back wing and empennage, typical of all F-86 Series Airplanes, is retained in this version. Design features of the airplane include the hydromechanical engine fuel controller, the self-sufficient engine starting system, and the fuselage-mounted speed brakes. In addition, the elevator and stabilizer are interconnected and controlled as one unit, with the result that the entire horizontal tail assembly is a primary control surface, known as the controllable horizontal tail. To provide desirable handling characteristics throughout the speed range of the airplane, the ailerons and horizontal tail are actuated by an irreversible hydraulic control system. Use of this irreversible control system necessitates an artificial-feel system to simulate desired aerodynamic feel, and has the advantage of providing comfortable stick forces. The airplane is equipped with slats on the wing leading edge to provide more favorable low-speed characteristics and to improve maneuverability, particularly at high altitude.

AIRPLANE DIMENSIONS.

The over-all dimensions of the airplane (airplane on landing gear at normal weight and with tire inflation and gear strut inflation as specified) are as follows:

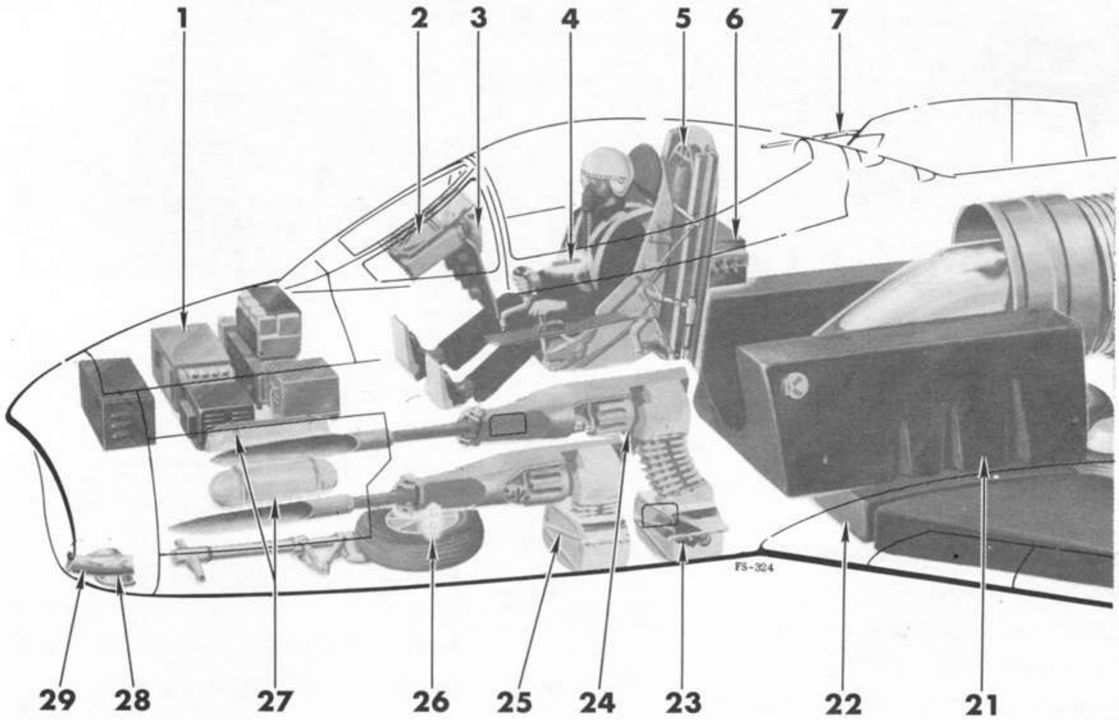
Wing span	39 feet 1 inch
Length	38 feet 6 inches
Height	14 feet 11 inches

AIRPLANE GROSS WEIGHT.

The approximate take-off gross weight of the airplane, including full internal load and pilot, is as follows:

NO EXTERNAL LOAD

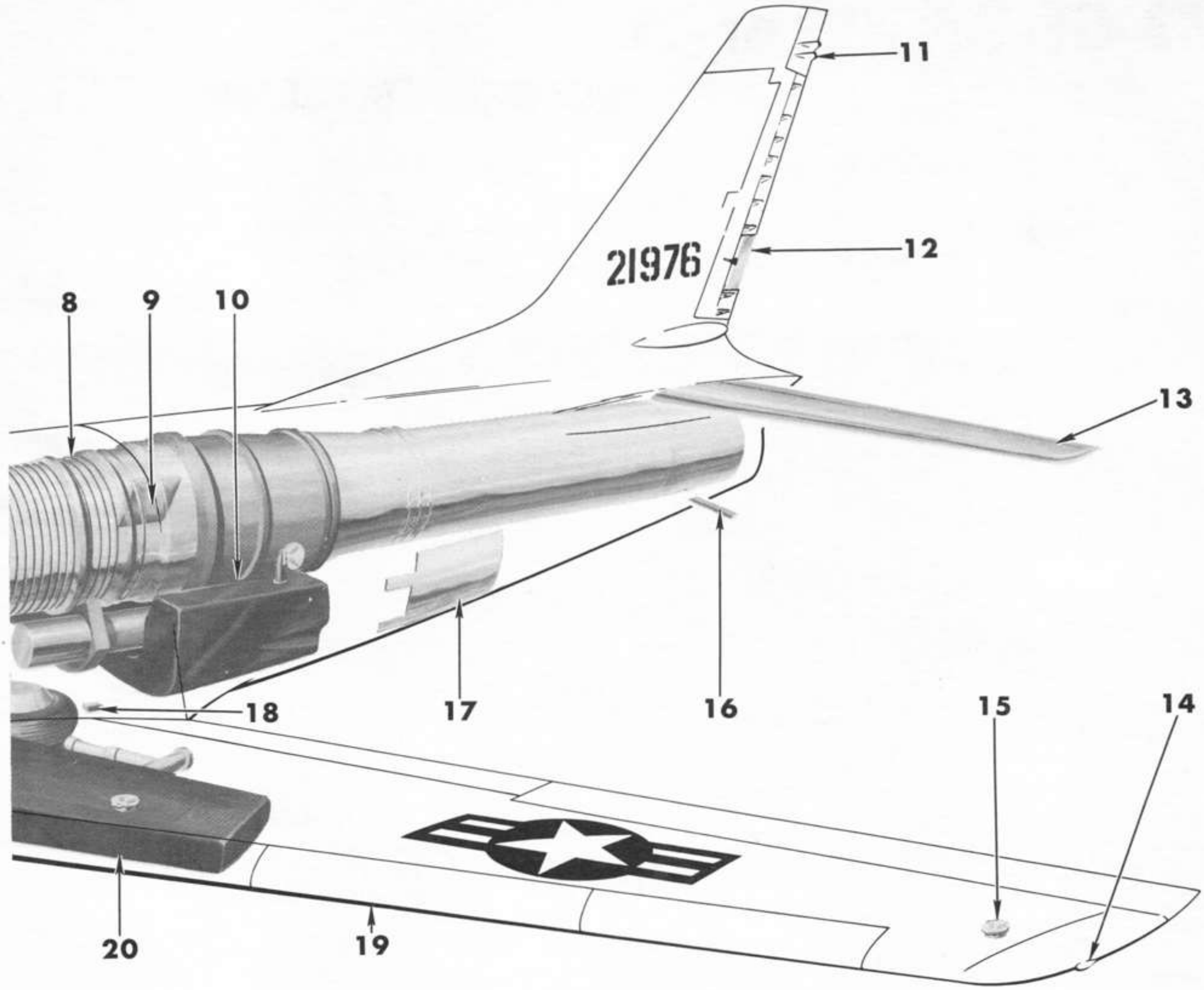
F-86H-1	18,750 pounds
F-86H-5 and F-86H-10	18,900 pounds



1. AN/APG-30 Radar Ranging Equipment
2. A-4 Sight
3. Gun Camera
4. Canopy External Emergency Release
5. Ejection Seat
6. Battery
7. Pitot-Static Boom
8. J73-GE-3 Series Engine
9. Data Case
10. Aft Fuselage Fuel Tank
11. Navigation Lights
12. Rudder Trim Tab
13. Controllable Horizontal Tail
14. Navigation Light (Left and Right Wing)
15. Directional Indicator Transmitter
16. Fuel Tank Vent Bayonet
17. Speed Brake
18. External Power Receptacle
19. Wing Slats
20. Outer Wing Fuel Tank
21. Forward Fuselage Fuel Tank (Upper Cell)
22. Forward Fuselage Fuel Tank (Lower Cell)
23. Strike Camera
24. Gun Compartment (20 MM Guns Shown)
25. Ammunition Compartment
26. Canopy External Control Buttons
27. D-2 Oxygen Cylinders
28. Retractable Landing and Taxi Lights
29. Cockpit Ram-air Inlet

F-86H-1-00-61H

Figure 1-1

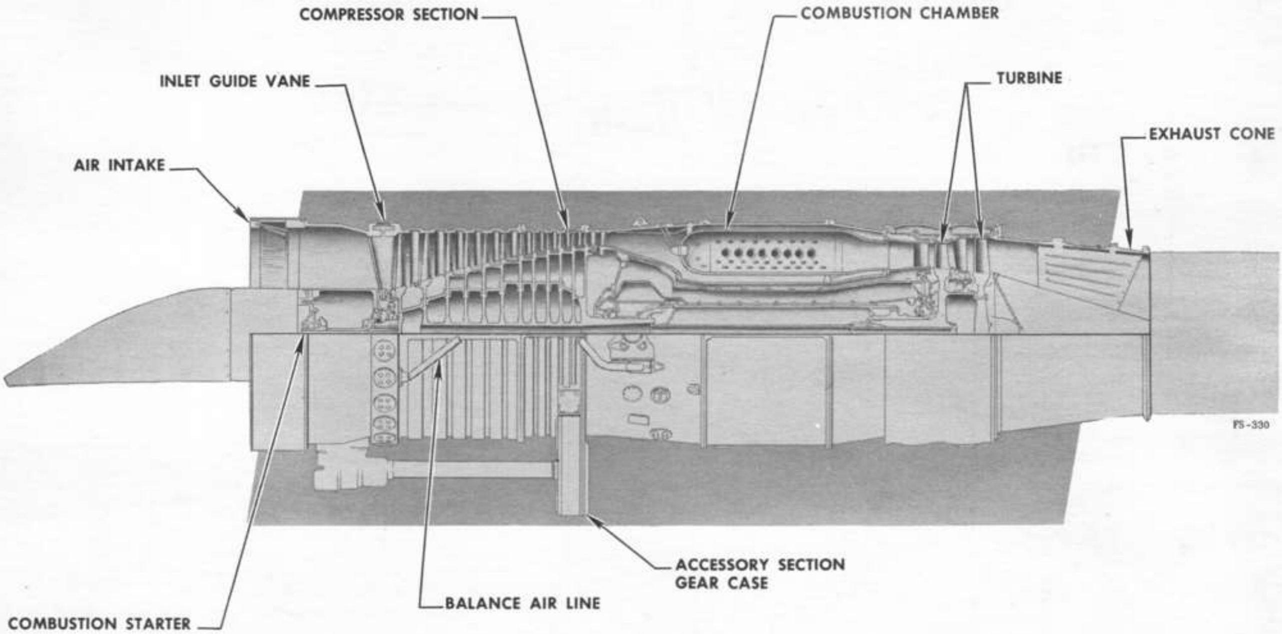


GENERAL ARRANGEMENT

F-86H-1-00-62B

J73-GE-3A*, -3D† or -3E†

TURBOJET ENGINE



NOTE
T.O. No. 1F-86H-513, when accomplished, modifies airplanes with -3A engines to airplanes with -3D engines.

* F-86H-1 and F-86H-5 Airplanes
† F-86H-10 and later airplanes

F-86H-1-41-4

Figure 1-2

WITH TWO 200-GALLON DROP TANKS PLUS TWO EX-10 BOMBS

F-86H-1 ....23,900 pounds
F-86H-5 and F-86H-10....................24,050 pounds

NOTE These gross weights are average values. For the gross weight of a particular airplane, refer to the Handbook of Weight and Balance Data, T.O. 1-1B-40, assigned to the airplane.

ARMAMENT.

Some airplanes have six .50-caliber machine guns, while other airplanes have four 20 mm guns. In addition, bombs or rockets can be carried on the lower surface of the wings. An automatic lead-computing sight, coupled with radar ranging equipment, is installed for gun and rocket firing and bomb release. (Refer to "Armament Equipment" in Section IV.)

BLOCK NUMBER DESIGNATIONS.

The block number designations for this airplane are:

F-86H-1	AF52-1975 through -2089
F-86H-5	AF52-2090 through -2124
	AF52-5729 through -5753
F-86H-10	AF53-1229 through -1528

ENGINE.

The airplane is powered by a General Electric J73-GE-3A, -3D, or -3E axial-flow turbojet engine. (See figure 1-2.) At Military Power, the rated sea-level static thrust of the engine is 8920 pounds. During engine operation, ram air from the intake duct passes under the cockpit to the engine compressor, where it is progressively compressed through 12 stages. This compressed air then flows to 10 combustion liners (encased in a single cannular combustion chamber), where it mixes with the atomized fuel injected into each liner. This mixture

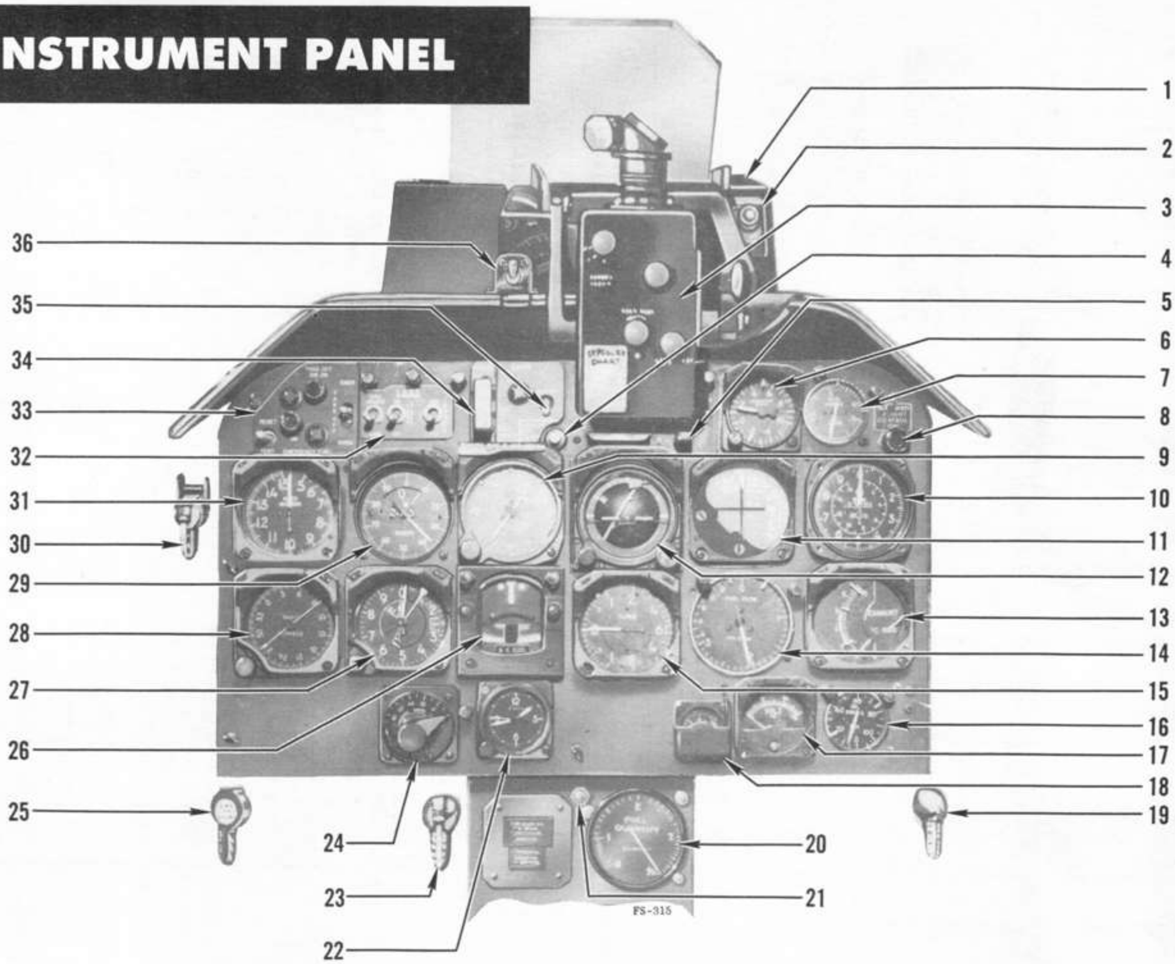
MAIN DIFFERENCES TABLE

F-86 SERIES ITEM	A	D, K, and L	E	F	H
Engine	J47-GE-7 or -13	J47-GE-17, -17B, or -33 with afterburner	J47-GE-13	J47-GE-27	J73-GE-3 Series
Engine Control	Mechanical	Electronic	Mechanical	Mechanical	Hydromechanical
Automatic Pilot	No	Yes	No	No	No
Horizontal Tail	Conventional	Single, controllable surface	Controllable stabilizer and elevator	Controllable stabilizer and elevator	Controllable stabilizer and elevator
Aileron & Horizontal Tail Control	Conventional and hydraulic boost	Full-power hydraulic irreversible control	Full-power hydraulic irreversible control	Full-power hydraulic irreversible control	Full-power hydraulic irreversible control
Aileron & Horizontal Tail Artificial Feel System	No	Yes	Yes	Yes	Yes
Armament	Machine guns, bombs, rockets, or chemical tanks	F-86D AND F-86L: Rockets in fuselage package F-86K: 20mm guns	Machine guns, bombs, rockets, or chemical tanks	Machine guns, bombs, rockets, or special store	Machine guns, bombs, rockets, or special store
Windshield	"V"	Flat	"V" or flat	Flat	Flat
Canopy Ejection Control	Right handgrip on seat Either handgrip (some airplanes)	Right handgrip on seat Either handgrip (some airplanes)	Right handgrip on seat Either handgrip (some airplanes)	Right handgrip on seat Either handgrip (some airplanes)	Either handgrip on seat
Canopy	Sliding	Clamshell	Sliding	Sliding	Clamshell
Oxygen Regulator	A-14 or D-2	D-1, D-2, D-2A, or MD-1	A-14 or D-2	D-1, D-2, or D-2A	D-2

F-86H-1-00-94B

Figure 1-3

INSTRUMENT PANEL



1. A-4 Sight
2. Special Store T/O Reset Light
3. Gun Camera
4. Directional Indicator (Slaved) Fast Slaving Button
5. Hydraulic Pressure Gage Selector Switch
6. Accelerometer
7. Hydraulic Pressure Gage
8. Alternate-on Warning Light (Flight Control Alternate Hydraulic System)
9. Directional Indicator (Slaved)
10. Tachometer
11. LABS Dive-and-Roll Indicator*
12. Attitude Indicator (J-8 Shown)
13. Exhaust Temperature Gage
14. Fuel Flow Indicator
15. Vertical Velocity Indicator
16. Oil Pressure Gage
17. Voltmeter
18. Loadmeter
19. Landing Gear Emergency Release Handle
20. Fuel Quantity Gage
21. Fuel Quantity Gage Test Button
22. Clock
23. Emergency Jettison Handle
24. Bomb-Target Wind Control
25. Flight Control Emergency Change-over Handle
26. Turn-and-Slip Indicator
27. Altimeter
28. Radio Compass Indicator
29. Airspeed Indicator
30. Special Store Jettison Handle
31. Machmeter
32. LABS Control Panel*
33. Engine Fuel Control Panel
34. Gun Safety Switch
35. Gun Selector Switch*
36. LABS Gyro Angle Selector Switch*

*Some airplanes. (Refer to applicable text.)

F-86H-1-00-93A

Figure 1-4

burns continuously once ignition has been established during engine starting. From the combustion chamber, the hot exhaust gases pass through the two-stage turbine and out the tail pipe, to provide high-velocity jet thrust. The two-stage turbine, which is rotated by exhaust gas, is directly connected to and drives the compressor. The engine-driven accessories are on a gearbox beneath the compressor casing and are driven by the compressor rotor assembly. The engine is equipped with modulated inlet guide vanes. Airplanes changed by T.O. 1F-86H-636 have an electronic temperature control amplifier which controls fuel flow during automatic starts, to maintain engine operation within the limit temperature. The J73-GE-3D engine, an advanced version of the J73-GE-3A, has an improved automatic start system, including a fuel manifold priming line which bypasses a major part of the engine fuel system to prime the small-slot manifold during starting. The J73-GE-3E engine is a lightweight version of the -3D engine. On all engines, the guide vanes are automatically actuated and limit compressor airflow within certain engine speed ranges. The engine compartment is divided by a fire wall. The forward compartment contains the relatively cool compressor and accessory sections of the engine; the aft compartment includes engine combustion liners and turbine section and tail pipe.

ENGINE ANTI-ICE PROVISION.

All parts of the engine that have a frontal area exposed to the inlet air stream have icing protection. The inlet guide vanes and three of the four engine front frame struts are heated continuously and automatically by air bled from the engine compressor. However, the bled air furnishes effective anti-icing protection only when the engine speed is above 95% rpm. The fourth frame strut is heated by a continuous flow of engine lubricating oil.

VARIABLE-INLET GUIDE VANE SYSTEM.

The automatically actuated, variable-inlet guide vane system permits fast engine accelerations without surge or compressor stall. The guide vanes are mounted at the inlet of the engine compressor section. They are modulated through the transient range (about 6000 to 7000 rpm) as function of corrected engine speed. The modulated inlet guide vane system uses a hydraulic actuator which follows a schedule of corrected engine speed taken from the computer section of the engine fuel controller. The system provides maximum-rate, stall-free acceleration with little thrust discontinuity.

ENGINE FUEL SYSTEM.

Fuel supply to the engine passes through, and is regulated by, the hydromechanical fuel controller, which is mechanically linked to the throttle. The fuel controller includes a main fuel system for all normal operation and an emergency fuel system, which is selectively engaged, for use when the main system fails or functions improperly. The emergency system can be selectively engaged or armed for automatic engagement during take-off. Only manual starts on the emergency fuel system can be made. On airplanes changed by T.O. 1F-86H-636, automatic starts must be made on the main fuel system. However, manual starts must be made on the emergency fuel system on all airplanes. Fuel from the airplane fuel system is routed to the engine-driven booster and dual fuel pump, which boosts fuel pressure to the pilot-controlled fuel selector valve in the engine fuel controller. On airplanes with the -3D or -3E engine, a fuel manifold priming line is incorporated in the engine fuel system to provide optimum automatic starts. The priming line bypasses a major portion of the engine fuel system and serves as a rapid means of priming the small-slot fuel manifold during starting. The engine fuel control system is shown schematically in figure 1-7.

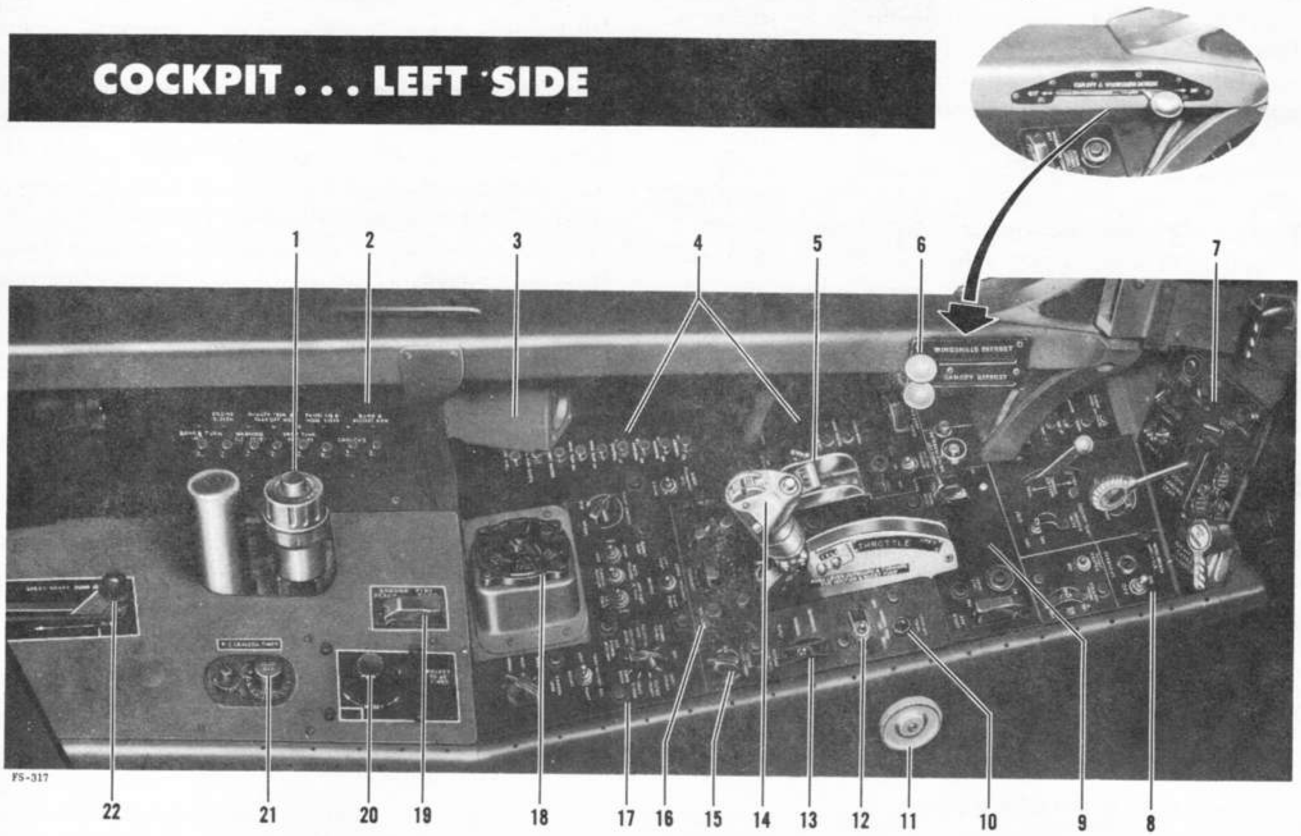
Warning Automatic starts are prohibited until the airplane has been changed by T.O. 1F-86H-636.

Engine Fuel Controller.

The engine fuel controller unit meters fuel for all engine operation through either the main or emergency fuel system incorporated within the unit. The fuel controller is a completely hydraulic (engine oil) unit except for connections for an electronic temperature control amplifier which senses exhaust gas temperature. Control oil for operation of the fuel controller is supplied from the engine oil system. The hydromechanical unit consists of various components, including a solenoid fuel selector valve, a main fuel system (metering valve, pressure-regulating valve and metering head detector, and computer), an emergency fuel system (metering valve and regulating valve), and a fuel stopcock. These components are regulated (by throttle setting and signal output from the computer and metering head detector) to maintain the fuel flow necessary for desired engine operation. Any excess fuel (fuel not required by the engine) is bypassed back to the dual fuel pump, and minimum fuel flow is limited to preclude the possibility of flame-out. The fuel stopcock, incorporated in the controller, is connected to the throttle. When the throttle is OFF, the stopcock is closed, shutting off all fuel from the controller to the engine. On airplanes changed by T.O. 1F-86H-636, engine overtemperature control is provided during automatic starts by the engine electronic

F-86H-1 Airplanes AF52-1975 through -1990

COCKPIT . . . LEFT SIDE



1. Anti-G Suit Pressure-regulating Valve
2. Circuit-breaker Panel
3. Thunderstorm Light
4. Circuit-breaker Panel
5. Wing Flap Handle
6. Canopy and Windshield Defrost Handle
7. Left Forward Switch Panel
8. Air Conditioning Control Panel
9. Engine Control Panel
10. Take-off Trim Indicator Light
11. Throttle Friction Wheel
12. Rudder Trim Switch
13. Flight Control Switch
14. Throttle
15. Radar Range Sweep Rheostat
16. UHF Command Radio Control Panel
17. Armament Control Panel
18. Sight Function Selector Unit
19. Ground Fire Safety Switch*
20. Rocket Projector Release
21. Strike Camera Timer
22. Speed Brake Dump Valve Lever*

*Some airplanes. (Refer to applicable text.)

F-86H-1-00-78C

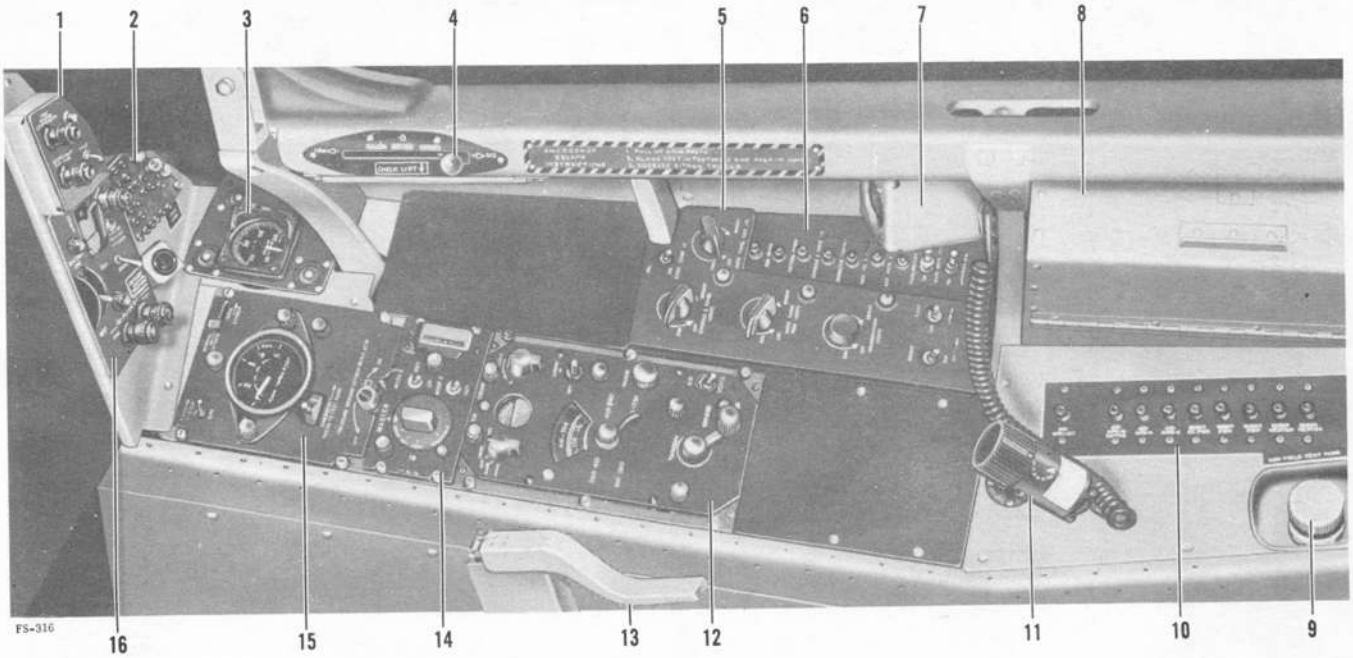
Figure 1-5

temperature control amplifier which is connected to thermocouples in the exhaust area. In the event of overtemperature, fuel flow is reduced until engine operation is within the limit temperature. The engine ignition and starter circuits cannot be energized for automatic starts on these airplanes until the temperature control amplifier is operative. (A 30-second warm-up period is required for the amplifier to become operative.) This safety feature prevents automatic start attempts without overtemperature control. The amplifier is powered from the three-phase ac bus.

Main Fuel System.

In normal operation, the main fuel system of the fuel controller meters fuel to the engine, compensating automatically for changes in airspeed, altitude, and outside air temperature to maintain engine speed constant at each throttle setting. During rapid acceleration, the maximum allowable rate of fuel flow can be obtained under all flight conditions. During rapid deceleration, minimum fuel flow is scheduled to prevent flame-out. Fuel is supplied to the metering valve of the main fuel system

COCKPIT . . . RIGHT SIDE



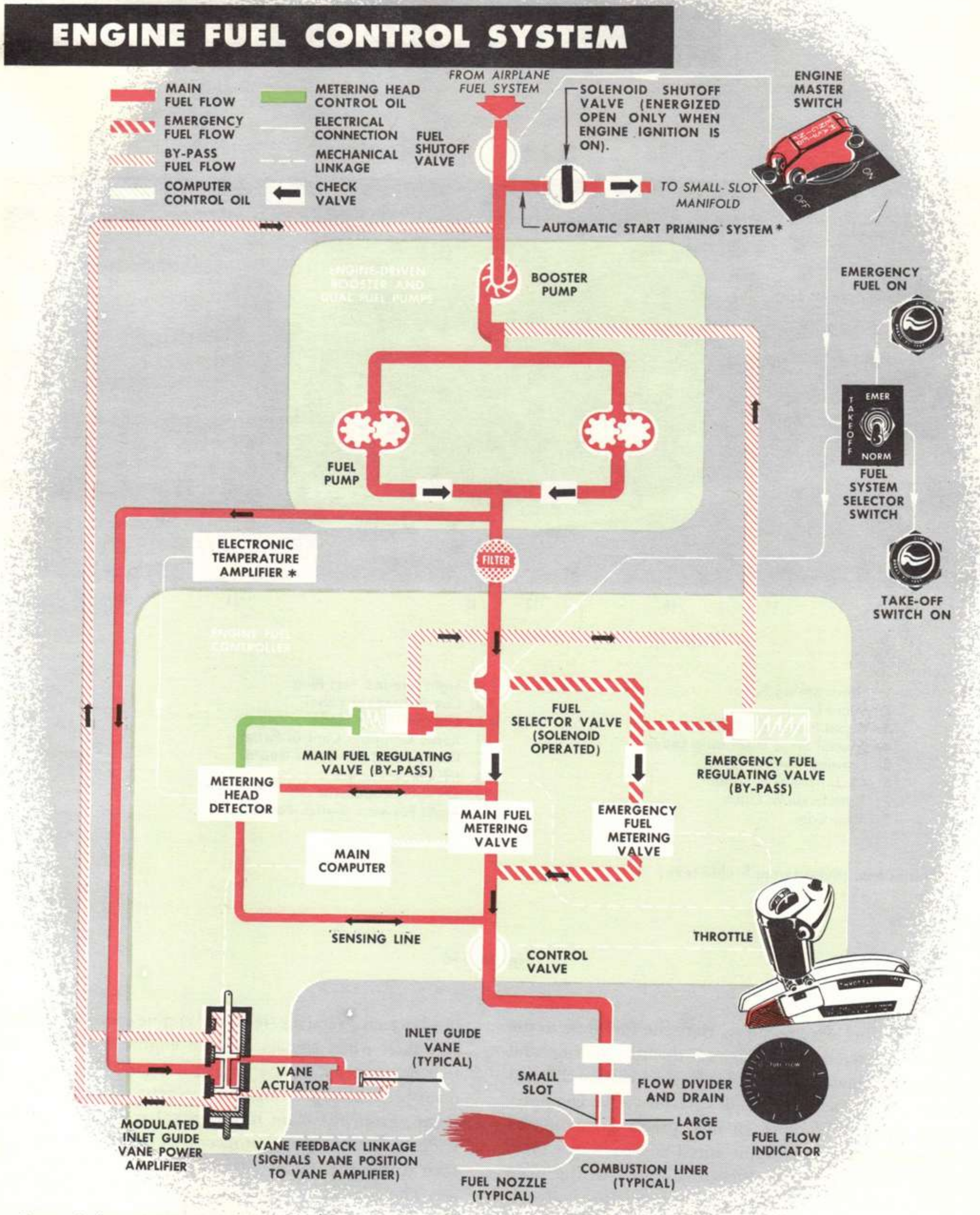
1. Fire-warning Panel
2. Spare Lamps
3. Cabin Pressure Altimeter
4. Special Store Disarming Lever *
5. Lighting Control Panel
6. Circuit-breaker Panel
7. Thunderstorm Light
8. Map Case
9. Sight Ground Test Plug
10. Circuit-breaker Panel
11. Cockpit Utility Light
12. Radio Compass Control Panel
13. Canopy Initiator Lever Guard
14. IFF Control Panel
15. Oxygen Regulator
16. Right Forward Switch Panel

*Some airplanes. (Refer to applicable text.)

F-86H-1-00-79B

Figure 1-6

through the fuel selector valve. Here the fuel flow to the engine is metered according to throttle setting and engine requirements as called for by the hydromechanical computer and metering head detector. The computer receives signals of compressor inlet pressure, compressor inlet temperature, and engine speed and combines them into one mechanical (oil pressure) signal to the main metering valve. The main pressure-regulating valve is actuated by the metering head detector to maintain the desired fuel pressure drop across the main metering valve, thus controlling fuel flow to the engine. The metering head detector receives signals of engine speed and reduces fuel flow when signals indicate engine overspeed. The fuel not metered to the engine is bypassed through the main pressure-regulating valve to return to the dual fuel pump. From the main metering valve, the metered fuel is directed through the stopcock to the flow divider and then to the fuel manifolds and into the combustion liners. The controller provides metered fuel for starting at all altitudes. Operation on the fuel control system protects the engine against compressor stall, overtemperature, and overspeed.



* Some airplanes (refer to applicable text).

F-86H-1-48-5D

Figure 1-7

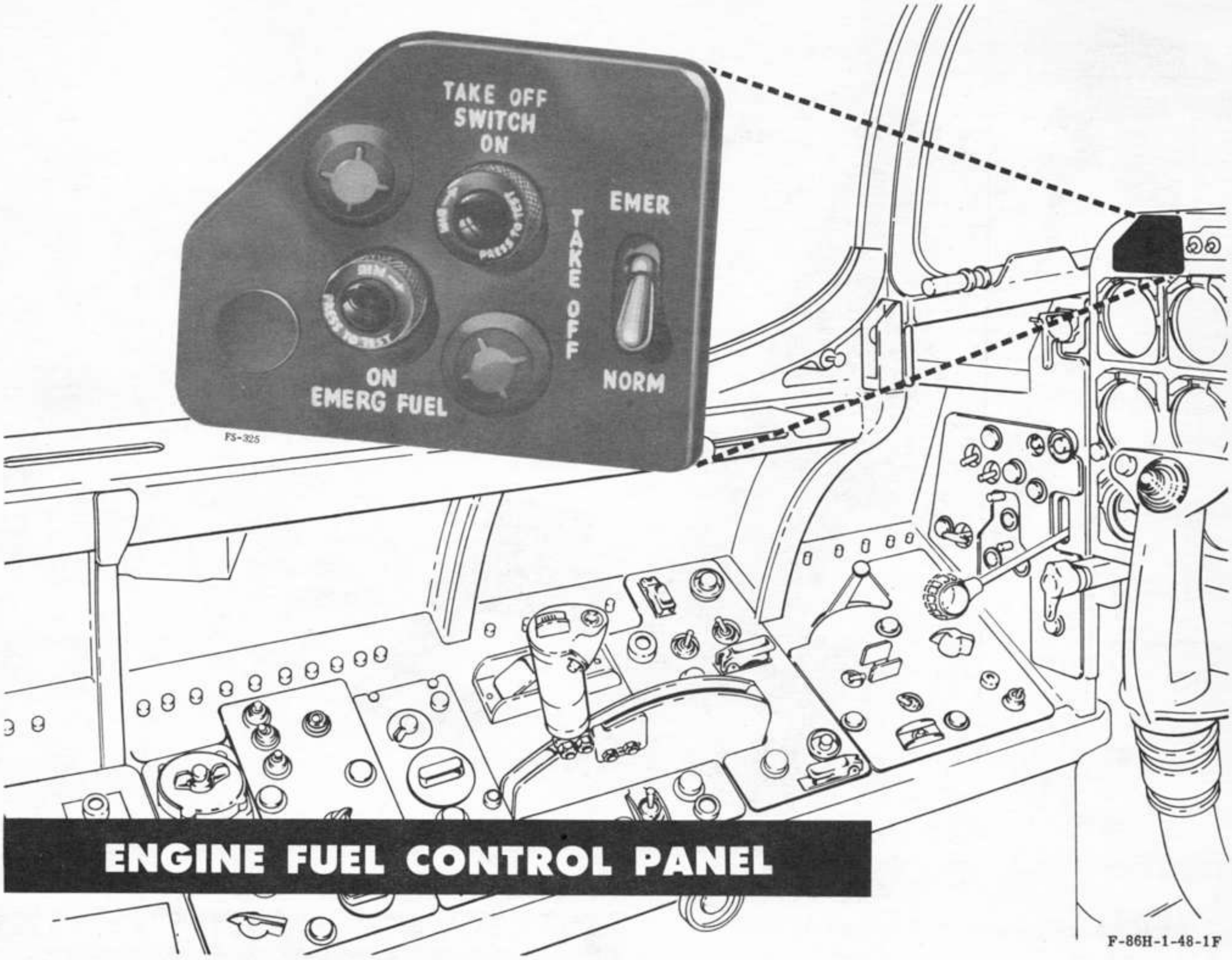


Figure 1-8

Emergency Fuel System.

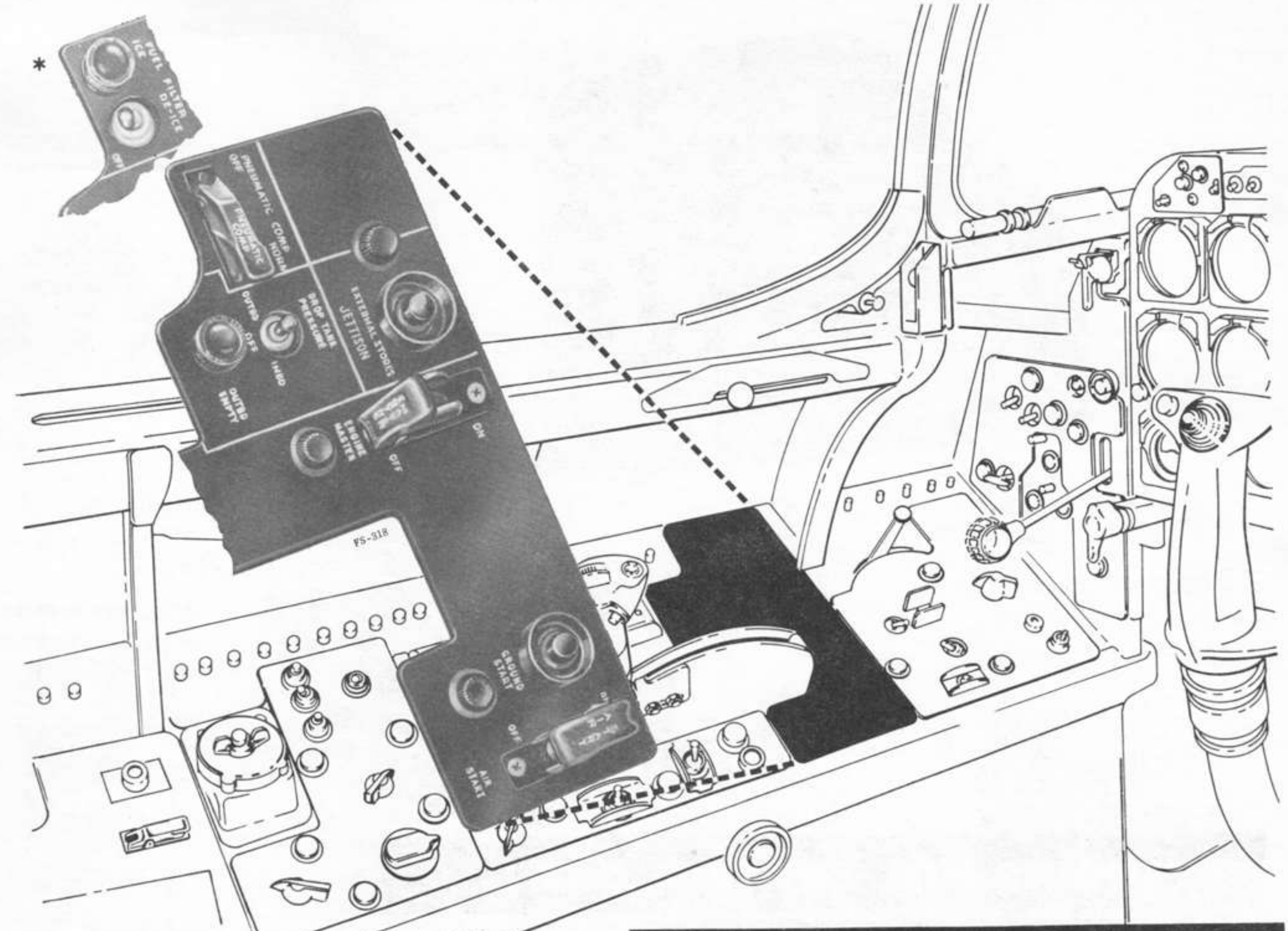
The emergency fuel system of the controller regulates fuel flow to the engine when selected manually, or automatically when the main system fails and the fuel system selector switch is at TAKE OFF. When the emergency system is selected, the fuel selector valve is positioned so that fuel is directed through the emergency metering valve instead of through the main metering valve. The emergency metering valve is mechanically controlled by throttle position only and is not connected to the computing unit of the hydromechanical controller. The emergency system meters fuel flow to engine according to throttle setting and altitude only, and therefore does not offer overtemperature, compressor stall, overspeed, and engine flame-out preventive features.

Caution When the emergency fuel system is engaged, the fuel is manually controlled and the throttle should be moved cautiously; otherwise, overtemperature operation, compressor stall, or engine overspeed is likely to occur, especially at high altitudes.

Fuel not needed by the emergency fuel system is bypassed back to the fuel pump through the emergency pressure-regulating (bypass) valve, which receives signals from compressor inlet pressure to control metered fuel to the engine. An amber indicator light comes on when the emergency fuel system is selected manually or automatically. Operation of the emergency system can be checked before take-off by the fuel system selector switch.

Dual Fuel Pump.

The engine-driven centrifugal booster and a duel fuel pump provides the fuel pressure boost required by the engine fuel controller and fuel nozzles. Should either element of the dual fuel pump fail, the remaining element will produce enough fuel flow to maintain satisfactory engine operation.



*F-86H-1 Airplanes AF52-1975 through -1983

F-86H-1-43-1F

ENGINE CONTROL PANEL

Figure 1-9

Flow Divider.

The engine fuel flow divider is downstream of the engine fuel controller. It automatically directs fuel to one or both engine fuel manifolds, depending on engine operating conditions. A duplex fuel nozzle with a large slot and small slot is in each combustion liner to atomize the fuel. The flow divider pressurizes only the small-slot manifold during periods when flows are low, as in starting and high-altitude operation. This gives the proper spray pattern and atomization for combustion. For operation when fuel pressure is in excess of 50-60 psi, the flow divider routes fuel through both the small- and large-slot manifolds. To make starting easier, the flow divider directs fuel through the small-slot manifold when fuel pressure is below 40 psi. For normal operation, the flow divider routes fuel through the large-slot manifold, as well as through the small-slot manifold, when fuel pressure is above 40 psi. When the fuel stopcock in the engine fuel controller is closed, a drain valve in the flow divider opens to permit residual fuel in both manifolds to drain overboard. On airplanes with the -3D or -3E engine, the drain valve is in the small-slot manifold.

ENGINE FUEL SYSTEM CONTROLS.

Engine Master Switch.

The guarded engine master switch (figure 1-9), on the left console, supplies primary bus power for controlling various engine and fuel system units. When the switch is ON, the electric-motor-operated fuel shut-off valve is opened. Moving the switch to ON also completes the electrical circuit to the starter button (battery switch ON, or external power connected) and the emergency fuel selector switch, and permits the throttle-acuated limit switch to operate the tank-mounted primary fuel booster pump when the throttle is moved from OFF. (The secondary fuel pump will also operate if secondary bus power is available.) On airplanes changed by T.O. 1F-86H-636, the starter circuit cannot be energized for automatic starts until the temperature control amplifier is warmed up. When the engine master switch is OFF (switch guard raised), the fuel system shutoff valve is closed and the fuel booster pump circuit is de-energized.

Caution Do not turn engine master switch OFF, during any shutdown, before the engine has coasted down to 5% rpm or less; otherwise, starter fuel will be depleted. This will necessitate ground servicing before a later start. If a later start is attempted without ground servicing under this condition, a hot start may result.

Throttle.

Engine power is controlled by the throttle (14, figure 1-5), which is on a quadrant on the left console. The throttle is mechanically connected to the hydromechanical engine fuel controller. To move the throttle forward from the OFF position, it must first be moved outboard past a mechanical stop. Once forward of the mechanical stop, the throttle need not be held outboard for further forward movement. When the engine master switch is ON, initial outboard movement of the throttle from OFF starts the primary fuel booster pump and permits ignition to be turned on when the starter system is energized. On airplanes changed by T.O. 1F-86H-636, the starter circuit cannot be energized for automatic starts until the temperature control amplifier is warmed up. Initial forward throttle movement opens the fuel stopcock in the fuel controller to permit fuel to flow to the nozzle manifolds. (Ignition is automatically cut off when engine speed reaches about 38% rpm.) When operating on the main fuel system, starting fuel flow is controlled to a fixed value regardless of throttle position. With the engine running, further throttle advancement actuates the engine fuel controller to increase engine rpm. The throttle contains the microphone switch, speed brake switch, and electrical caging button for the gun sight. Rotation of the throttle grip supplies manual range data to the sight. Throttle friction is adjusted by a disk-type wheel (11, figure 1-5) on the inboard side of the left console. To prevent accidentally shutting off fuel supply when throttle is retarded, a stop is provided on the quadrant at the IDLE position.

Fuel System Selector Switch.

The three-positioned fuel system selector switch, on the engine fuel control panel (figure 1-8) on the instrument panel, permits selection of either main or emergency fuel system operation of the engine fuel controller. The switch is energized by primary bus power only when the engine master switch is ON. The fuel system selector switch should be at NORM during all normal in-flight conditions; the switch should be at EMER for in-flight conditions only when the main system fails, and at TAKE OFF only during take-off and initial climb. For manual starting on all airplanes, the switch *must* be at EMER. For automatic starts, the switch must be at NORM. When the switch is at NORM, the solenoid-operated fuel selector valve is de-energized, allowing all fuel from the dual fuel pump to be directed to the main fuel system. Setting the fuel system selector switch at EMER energizes the fuel selector valve, so that all fuel is directed to the emergency fuel system of the engine fuel controller. An amber indicator light comes on whenever the emergency system is engaged.

Caution To prevent overtemperature operation, compressor stall, or engine overspeed, especially at high altitudes, rapid throttle bursts should not be made when the emergency fuel system is engaged.

- If, during engine operation, primary bus power fails or the battery switch is OFF when generator output is not available, the fuel selector valve will be de-energized, thus engaging the main fuel system regardless of the fuel system selector switch position.

Placing the switch at TAKE OFF above 95% to 97% engine rpm de-energizes the fuel selector valve to the main fuel system position. However, if for any reason engine rpm drops into the speed range of about 85% to 97%, an electrical circuit is automatically energized, allowing the fuel selector valve to change over and supply fuel to the emergency fuel system. Before the switch is moved to TAKE OFF, the engine must be operating above about 96% rpm with the switch at NORM to engage the automatic change-over circuit. A green indicator light comes on when the switch is at TAKE OFF.

Warning Since engine characteristics are such that stall-free throttle bursts cannot be accomplished on the emergency fuel system at low engine speeds, a lockout circuit is employed to prevent operation of the emergency system if engine speed is blow 86% rpm when the selector switch is at TAKE OFF. Should the main fuel system fail with the switch at TAKE OFF and the engine operating above 95% to 97% rpm, the emergency fuel system will take over automatically. However, if the throttle is retarded below 85% to 88% engine rpm, the main system will take over and flame-out may occur. Because of this, the fuel system selector switch must be moved to EMER before any throttle movement if the main fuel system fails during take-off.

After take-off and initial climb, the fuel system selector switch must be returned to NORM before the throttle is retarded from Military Power. Otherwise, the emergency fuel system will take over when engine speed is reduced to about 95% to 97% rpm.

ENGINE FUEL SYSTEM INDICATORS.

Fuel Flow Indicator.

A fuel flow indicator (14, figure 1-4), on the instrument panel, shows the rate of fuel consumption in pounds per hour. The flow indicator is electrically operated by single-phase ac power obtained through a step-down transformer from the three-phase (instrument) inverter.

Emergency Fuel-on Indicator Light.

An amber indicator light, on the engine fuel control panel (figure 1-8) on the instrument panel, comes on during emergency fuel system operation of the engine fuel controller. The indicator light receives power from the primary bus.

Take-off Switch-on Indicator Light.

A green indicator light, on the engine fuel control panel (figure 1-8) on the instrument panel, comes on when the fuel system selector switch is positioned at TAKE OFF. The engine master switch must be ON before the indicator light receives power from the primary bus.

ENGINE STARTER AND IGNITION SYSTEMS.

Starter System.

The engine has a self-sufficient starter of the fuel-air combustion type, capable of starting the engine without any external source of power. The starter is a complete unit, located on the front of the engine, and incorporates its own fuel and ignition system, combustion chamber, turbine, and overrunning clutch. Fuel for each starter operation (about 4 seconds duration) is supplied by the starter fuel accumulator, which is replenished from the airplane fuel system at the end of each starter cycle. Compressed air for operating the starter is contained in an air storage bottle (two bottles on F-86H-5 and later airplanes). To enable two successive start attempts, pressure must be 3000 psi initially. For maximum starter performance on a single start, pressure must be 1900 psi minimum. A safe start can be obtained at pressures above 1700 psi. The air bottle is behind an access door aft of the nose wheel door on F-86H-1 Airplanes; on F-86H-5 and later airplanes, the bottles are behind an access door forward of the right-hand ammunition door. In flight, the air storage bottle is replenished by an air compressor, which is operated by utility hydraulic system pressure. On most airplanes,* the compressor motor may be selectively disabled through the air compressor switch. The starter unit is controlled by the ground start push button, which opens the starter fuel and air shutoff valves and energizes starter ignition. The starter will accelerate the engine to about 20% rpm, at which time the fuel supply in the accumulator is exhausted and the starter automatically disengages, then resets for the next starting operation. An external air receptacle is provided to refill the air storage bottle (high pressure). The starting system also has connections for attaching an external ground air supply (low pressure) for operating the starter. A push-button switch, which must be held down for motoring operation, is on the starter pneumatic panel. It is accessible through the camera access door on the lower fuselage on early airplanes,† and through the pneumatic system access door on the right side of the fuselage just ahead of the ammunition access door on all other airplanes. If the engine does not start during the initial attempt, a second starting cycle can be made one minute after the first firing. Where the time interval between the first and second firings is less than 15 minutes, the two firings are defined as a double start. If a double start is made, the third firing may be made only after 45 minutes or more from the time of the first firing. All subsequent starts require a 30-minute interval between firings. A double start may be repeated only if the starter is allowed to cool to outside temperature (about 3 hours unless artificial cooling is applied). If the time interval between the first and second attempted starts is greater than 15 minutes, the starts are defined as single starts. Additional single starts after the second starting attempt require a time interval of 30 minutes minimum between firings, and may be repeated indefinitely.

Engine Ignition.

The engine has a capacitor discharge ignition system with two igniter plugs. Ignition is energized only during engine starting, as combustion is continuous after the engine has been started. During ground start, with the engine master switch ON, the battery switch ON or external dc power connected, and the throttle moved from OFF, the ignition circuit to the spark plugs in combustion liners 4 and 7 is armed. Pressing the ground start button then energizes the ignition circuit and, on airplanes with the -3D or -3E engine, opens the fuel manifold priming solenoid valve. Ignition will remain energized until the

***F-86H-1 Airplane AF52-2070 and all later airplanes**
†F-86H-1 Airplanes

generator-off warning light goes out. If a start is aborted, the ignition circuit is disarmed when the throttle is retarded to full OFF position. For an air start, ignition is supplied by the air start switch when the engine master switch is ON, the battery switch is ON, and the throttle is moved from OFF.

STARTER AND IGNITION SYSTEM CONTROLS.

Throttle.

Refer to "Engine Fuel System Controls" in this section.

Battery Switch.

Refer to "Electrical Power Supply System Controls" in this section.

Engine Master Switch.

Refer to "Engine Fuel System Controls" in this section.

Ground Start Button.

The ground start push button is on the engine control panel (figure 1-9) on the left console. With the battery switch at ON, the engine master switch at ON, and the throttle moved from OFF, in that order, momentarily pressing the ground start button supplies dc power to the starter and ignition unit. An electrical holding relay keeps the ignition circuit energized until the engine reaches about 38% rpm and the generator is operating. If the engine does not start, ignition can be de-energized by moving the throttle to OFF.

Air Start Switch.

To provide ignition during an air start, there is a two-position switch (figure 1-9) on the left console. When the switch is moved from the guarded OFF position to ON (with engine master and battery switches ON, and throttle moved from OFF), ignition is energized by battery bus power (primary bus power on late airplanes*). Moving the air start switch to ON also cuts the generator out of the circuit (de-energizing the secondary bus) to reduce battery loads. When the air start switch is at ON, the generator-off warning light will come on. The switch *must be* moved to OFF to de-energize ignition and reconnect the generator for normal operation.

Caution Use of the air start ignition circuit is limited to 3 minutes per start. Longer continuous periods of use will damage ignition vibrator units.

Air Compressor Switch.†

The starter air compressor motor may be selectively disabled by a guarded, two-position "PNEUMATIC COMP" switch (figure 1-9) on the engine control panel. When the primary bus powered switch is at NORM (guard down), a solenoid valve allows utility hydraulic system pressure to operate the compressor motor, provided the generator is operating, air storage bottle pressure is below 2700 psi, and the speed brakes or landing gear are *not* being operated. (Switches in the speed brake and landing gear control circuits open the circuit to the air compressor solenoid valve when either system is being operated. Utility pressure is then cut off from the compressor motor.) With the compressor motor switch at OFF, the circuit to the air compressor solenoid valve is open, regardless of other conditions.

PRIMARY ENGINE INDICATORS.

Exhaust Temperature Gage.

The exhaust temperature gage (13, figure 1-4), on the instrument panel, shows engine exhaust temperature in degrees centigrade. Gage indications are received from thermocouples in the engine tail cone. The temperature indicator system is of the self-generating type and, therefore, does not require power from the airplane electrical system.

Tachometer.

The tachometer (10, figure 1-4), on the instrument panel, registers engine speed in percentage of maximum rated rpm (7950). This indication, when used in conjunction with that of the exhaust temperature gage, permits setting engine power accurately without exceeding engine limitations. The tachometer receives its power from a tachometer generator geared to the engine accessory section and driven by the compressor rotor and is, therefore, independent of the airplane electrical system.

Oil Pressure Gage.

The oil pressure gage (16, figure 1-4), on the instrument panel, registers engine oil pressure in pounds per square inch. Electrically operated, the gage is applied with single-phase ac power obtained through a step-down transformer from the three-phase (instrument) inverter.

***F-86H-10 Airplane AF53-1289 and all later airplanes**
†F-86H-1 Airplane AF52-2070 and all later airplanes

OIL SYSTEM.

Lubrication is supplied from a 5-gallon tank of oil by a recirculating, pressure-type oil system with scavenge pump return. To allow for expansion, an additional 2-gallon expansion tank is used. A regulator valve permits the return oil to bypass or go through a fuel-cooled oil cooler, depending on the oil temperature. No manual control is provided, as operation of the system is fully automatic. The oil system also supplies control oil for operation of the hydromechanical engine fuel controller. Although the oil tank has a 5-gallon capacity, the oil tank dip stick will indicate full at the 4-gallon mark, and the tank should be serviced with a maximum of 4 gallons. See figure 1-30 for oil specification.

AIRPLANE FUEL SYSTEM.

The airplane fuel system (figure 1-10) includes four self-sealing tanks, two in the fuselage and one in each wing outer panel. With the exception of the forward fuselage tank, which consists of two cells (upper and lower), the fuel tanks are of the single-cell type. All tanks are connected to the lower cell of the forward fuselage tank, and no selection of internal tanks is necessary, as the system functions as a single source of fuel. During normal operation, fuel from all internal tanks flows by gravity to the forward fuselage tank lower cell. Normal flow from the aft fuselage tank is accomplished by an electrical transfer pump within the tank that is actuated automatically when fuel level in the forward fuselage tank upper cell drops to about 173 gallons (159 gallons on early airplanes* changed by T.O. 1F-86H-575; 69 gallons on late airplanes† and on most airplanes‡ changed by T.O. 1F-86H-575). The transfer pump forces fuel into the forward fuselage tank lower cell until the level in the forward fuselage tank upper cell increases to 180 gallons (167 gallons on early airplanes* changed by T.O. 1F-86H-575; 91 gallons on late airplanes† and on most airplanes‡ changed by T.O. 1F-86H-575); then the pump is automatically turned off. In event of transfer pump failure, all but 50 gallons of fuel will flow by gravity from the aft fuselage tank to the forward fuselage tank lower cell when the airplane is in cruise attitude. To prevent a backflow of fuel to the aft fuselage or wing tanks, check valves are installed in the system. Two tank-mounted electric booster pumps supply fuel under pressure to the engine from the lower cell of the forward fuselage tank. Individual filler openings are on all internal tanks except the forward fuselage tank lower cell, which is filled through the upper cell. In addition, a single-point refueling system is included to reduce ground servicing time. The system permits all internal tanks to be filled through a single filler receptacle in about 5 minutes. During gravity refueling, the forward fuselage tank must be filled first in order to use full fuel capacity; if the wing tanks or aft fuselage tank is filled first, fuel will drain slowly into the forward fuselage tank lower cell while the forward fuselage tank is being serviced. The access doors at the fuel filler receptacles cannot be closed unless the filler caps are secured in the locked position. Fuel tank capacities are shown in figure 1-11; fuel specifications are shown in figure 1-30.

Drop Tanks.

Internal fuel can be augmented by installation of drop tanks on the undersurface of the wing outer panels. The airplane can carry two 200-gallon combat tanks, two 120-gallon ferry tanks, or a combination of two 120-gallon and two 200-gallon tanks. (The 200-gallon tanks can be installed on the outboard tank mounting station only.) Type I and II tanks are of knockdown construction and are designed so that final assembly can be accomplished by maintenance personnel in the field. Type III and IV tanks are completely assembled for installation and provisions for disassembly are not required. Types II and IV are limited service tanks and always have lower operating limitations than Type I and III tanks of corresponding size. Types I and III are general service tanks. Type II and IV tanks generally have a "TYPE II" or "TYPE IV" stenciled on the tank, as applicable, and the stencil is so located that it can be seen from the cockpit. Type I and III tanks generally have no identifying stencil. (See figures 5-4 and 5-5 for flight and release restrictions for all types of tanks.) Each type of tank may be 120- or 200-gallon capacity. Controls permit selection of drop tank fuel; however, the fuel in the drop tanks should be used before internal fuel. When the drop tank system is turned on, compressed air from the engine compressor forces fuel from the selected drop tanks into the forward fuselage tank upper cell through a fuel level control valve.

Fuel Booster Pumps.

Two electric fuel booster pumps (primary and secondary), submerged in the lower cell of the forward

***F-86H-1 Airplanes**
†F-86H-10 Airplanes AF53-1439 and all later airplanes
‡F-86H-5 Airplanes and F-86H-10 Airplanes AF53-1229 through -1438

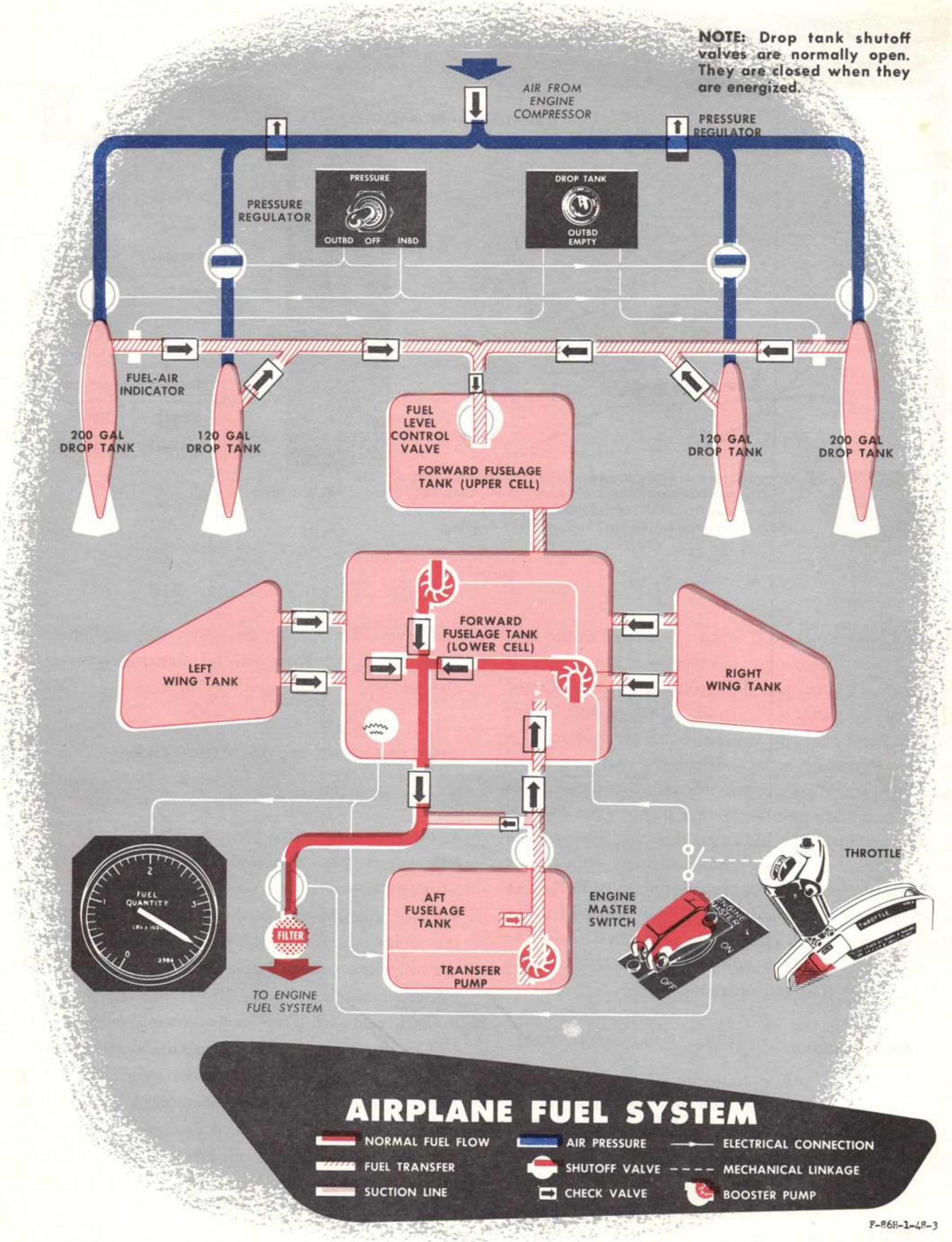
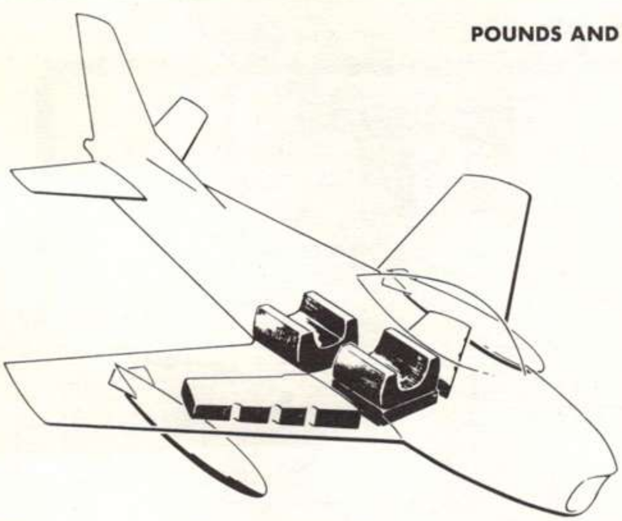

NOTE: Drop tank shutoff valves are normally open. They are closed when they are energized.
AIR FROM ENGINE COMPRESSOR
PRESSURE REGULATOR
PRESSURE
OUTBD OFF INBD
DROP TANK
OUTBD EMPTY
PRESSURE REGULATOR
FUEL-AIR INDICATOR
200 GAL DROP TANK
120 GAL DROP TANK
FUEL LEVEL CONTROL VALVE
FORWARD FUSELAGE TANK (UPPER CELL)
120 GAL DROP TANK
200 GAL DROP TANK
LEFT WING TANK
FORWARD FUSELAGE TANK (LOWER CELL)
RIGHT WING TANK
FUEL QUANTITY
THROTTLE
AFT FUSELAGE TANK
TRANSFER PUMP
ENGINE MASTER SWITCH
ENGINE MASTER
ON
OFF
FILTER
TO ENGINE FUEL SYSTEM
AIRPLANE FUEL SYSTEM
NORMAL FUEL FLOW
FUEL TRANSFER
SUCTION LINE
AIR PRESSURE
SHUTOFF VALVE
CHECK VALVE
ELECTRICAL CONNECTION
MECHANICAL LINKAGE
BOOSTER PUMP
F-86H-1-48-3

Figure 1-10

FUEL QUANTITY DATA

NOTE
Multiply gallons by 6.5 to convert JP-4 fuel to pounds (Standard Day only).



POUNDS AND US GALLONS

	NO.	USABLE FUEL IN LEVEL FLIGHT (EACH)	FULLY SERVICED (EACH)
FORWARD FUSELAGE TANK	1	1800 LB (277 GAL)	1807 LB (278 GAL)
AFT FUSELAGE TANK	1	968 LB (149 GAL)	968 LB (149 GAL)
OUTER WING TANKS	2	442 LB (68 GAL)	442 LB (68 GAL)
DROP TANKS (120-GALLON)	2	780 LB (120 GAL)	780 LB (120 GAL)
DROP TANKS (200-GALLON)	2	1300 LB (200 GAL)	1300 LB (200 GAL)

TOTAL FUEL

- TOTAL USABLE FUEL WITHOUT DROP TANKS, 3653 POUNDS (562 GALLONS)
- TOTAL USABLE FUEL WITH TWO 200-GALLON DROP TANKS, 6253 POUNDS (962 GALLONS)
- TOTAL USABLE FUEL WITH TWO 200-GALLON DROP TANKS AND TWO 120-GALLON DROP TANKS, 7813 POUNDS (1202 GALLONS)

F-86H-1-93-4D

Figure 1-11

fuselage tank, supply fuel under pressure from the tank to the engine. The pumps are energized when the engine master switch is ON and the throttle is moved outboard from the OFF position to pass the idle stop. Both pumps are powered by the primary bus; however, the secondary pump is controlled by secondary bus power and, therefore, is operable only when this bus is energized. For ease in ground-testing the booster pumps (and the fuel transfer pump in the aft fuselage tank), test switches are on the canopy deck. Before the test switches are operated, the engine master switch should be in the OFF position and external power should be connected to the airplane. Each pump can then be tested individually by holding its respective test switch at the TEST position while listening for pump operation.

Fuel Shutoff Valve.

The fuel shutoff valve, upstream of the low-pressure filter, is electrically controlled by the engine master switch. When the switch is ON, primary bus power opens the valve, allowing fuel to feed to the engine fuel control system.

Fuel Filter Deicing System.

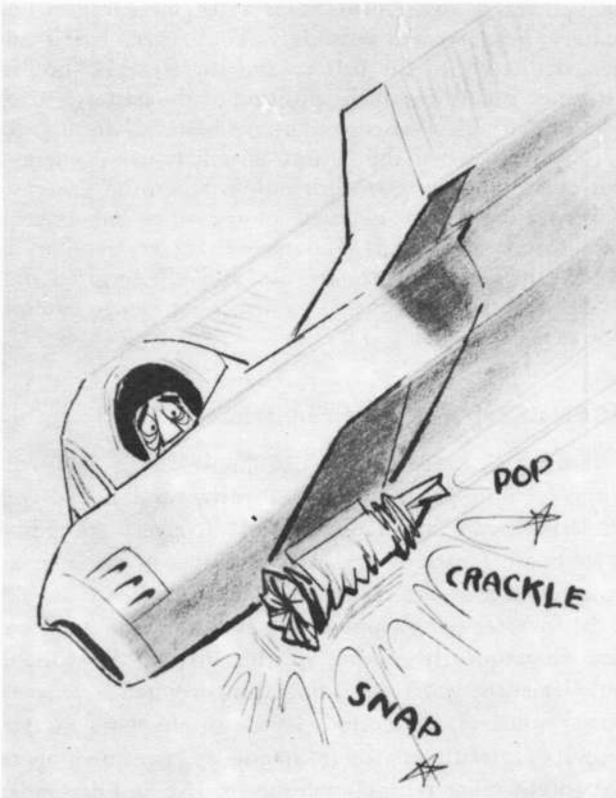
A fuel filter deicing system is incorporated to accomplish fuel filter deicing on some airplanes.* Refer to "Defrosting and Rain and Ice Removal Systems" in Section IV.

AIRPLANE FUEL SYSTEM CONTROLS.

Drop Tank Pressure Switch.

A three-position switch (figures 1-9 and 1-12), on the left console, controls pressurization of the drop tanks. Through secondary bus power, the switch actuates the solenoid shutoff valves in the air pressure lines between the engine compressor section and the drop tanks. When the switch is at OUTBD, the normally open air valves to the inboard tanks are closed; all air pressure is directed to both outboard drop tanks, forcing outboard tank fuel to the forward fuselage tank upper cell through a fuel level control valve. With the switch set at INBD, both inboard drop tanks are pressurized. Fuel from the outboard tanks should be used first, and then fuel from the inboard tanks, because the inboard drop tanks should not be jettisoned until after the outboard tanks have been released.

***F-86H-1 Airplanes AF52-1975 through -1983**



CAUTION

If only one pair of drop tanks is retained, the drop tank pressure switch should be left at INBD or OUTBD (as appropriate) to maintain pressurization to prevent possible tank collapse during descent. If empty tanks are to be retained at both inboard and outboard stations, the pressure switch should be positioned at INBD to direct pressure to the inboard tanks.

F-86H-1-0-11B

Warning If inboard tanks are dropped before outboard tanks, they may strike the airplane or the outboard tanks.

After all fuel is transferred from the drop tanks, fuel from the internal tanks will be used automatically.

Drop Tank Release.

Drop tanks may be dropped individually or in pairs by positioning the master armament selector switch (figure 4-9) to INB'D TANKS or OUTB'D TANKS and positioning the tank release selector switch to LEFT, SALVO, or RIGHT. The selected tank or pair of tanks will drop when the bomb-rocket release button is pressed. Emergency jettisoning of the drop tanks and other external stores can be accomplished electrically (battery bus power), regardless of armament selector switch positioning, by the external stores jettison button on the left console.

F-86H-1-48-6

Figure 1-12

Warning When tanks are dropped in pairs, outboard tanks must be dropped before inboard tanks are released, to prevent tanks from striking the airplane or outboard tanks.

- To prevent accidental explosion of drop tanks, they must not be installed, removed, or given an operational drop test (either manually or electrically) unless the airplane and drop tanks are electrostatically grounded.

Emergency Jettison Handle.

In case of an electrical release failure, the drop tanks can be jettisoned mechanically by the emergency jettison handle (23, figure 1-4), to the left of the instrument subpanel. When the handle is turned clockwise 45 degrees and then pulled out about 3½ inches, only the outboard tanks are jettisoned. When the handle is pulled straight out to its full extension (about 6⅛ inches), all external stores (drop tanks, bombs, or rockets) are released at the same time.

FUEL SYSTEM INDICATORS.

Fuel Quantity Gage and Test Button.

The fuel quantity gage (20, figure 1-4) is on the center pedestal and shows the total internal fuel supply in pounds, as determined by a capacitance-type indicating system. The system operates on power from the three-phase (instrument) inverter. It automatically compensates for changes in fuel density so that the quantity gage registers the actual number of pounds of fuel, regardless of type of fuel or fuel expansion or contraction caused by temperature changes.

NOTE Before drop tank is used, approximately 143 pounds of internal fuel is consumed. After showing this decrease, the fuel quantity gage remains stationary until all fuel from the drop tanks is consumed and the engine begins to use internal fuel.

The fuel quantity gage test button (21, figure 1-4), on the center pedestal, is provided to determine whether the fuel quantity gage is operating. Holding the test button down unbalances the fuel indicating bridge circuit and causes the fuel quantity gage needle to move counterclockwise at the rate of about one revolution per minute. If the needle does not move when the button is pressed, the indicating system is not functioning properly.

Outboard-Drop-Tank-Empty Indicator Light.

The outboard-drop-tank-empty indicator light (figure 1-9) is on the left console, outboard of the throttle. With the drop tank pressure switch positioned at OUTBD, the indicator light will come on (secondary bus power) when the outboard drop tanks are empty. The drop tank pressure switch then should be moved to INBD if inboard tanks are carried, or to OFF if they are not installed. Either movement of the switch will turn off the outboard-drop-tank-empty indicator light which is of the push-to-test type.

Caution If empty inboard drop tanks are retained, the pressure switch should be left at INBD to maintain pressurization to prevent possible tank collapse during descent.

ELECTRICAL POWER SUPPLY SYSTEM.

The airplane is equipped with ac and dc electrical power systems. The 28-volt dc system is powered by a 400-ampere, engine-driven generator, which becomes operative at about 38% engine rpm. A 24-volt, 36-ampere-hour battery serves as a stand-by for dc power. During ground operation, direct current can also be supplied through a receptacle by an external power source. Power for the ac system is supplied by a single-phase inverter and two three-phase inverters.

DC Electrical Power Distribution.

DC power is distributed from three electrical busses: battery, primary, and secondary. The battery bus is connected directly to the battery and therefore is "hot" at all times, regardless of the position of the battery switch. The primary bus is energized by the battery (through the battery bus) when the battery switch is ON (generator not operating), by generator output when the generator is operating, or by external power when an external power source is used. The secondary bus receives its power through the primary bus and is energized only when generator output is available or when external power is connected.

AC Electrical Power Distribution.

Alternating current is normally supplied by a 1500-volt-ampere single-phase (radar) inverter and a 250-volt-ampere three-phase (instrument) inverter. An added three-phase (instrument) inverter serves as an alternate power source if the main instrument inverter fails. The radar inverter (single-phase) is powered by the secondary bus. Consequently, output of this inverter is available only when the generator is operating or when an external power source is connected. If the single-phase inverter output is interrupted, the following will become inoperative: sight radar ranging equipment, IFF and SIF radar, special store controls, strike camera timer,* and cockpit air conditioning control system. The main and alternate instrument (three-phase) inverters are powered by the primary bus. The main instrument inverter serves the engine temperature control amplifier, attitude indicator, and K-4 attitude indicating system, directional indicator, the fuel flow, oil pressure, hydraulic pressure, and fuel quantity indicating systems, and the 20 mm guns. If the main instrument inverter fails, the units normally powered by it can be transferred to the alternate instrument inverter by a manually controlled transfer switch. Warning lights show when instrument or radar inverter power is not available.

Electrically Operated Equipment.

See figure 1-13.

External Power Receptacles.

External power receptacles (dc and, on late airplanes,† ac) are within an access panel on the left side of the fuselage, below the wing trailing edge, for use during ground electrical checks. Neither dc nor ac external power is required for starting; however, to conserve

***F-86H-1 Airplanes and F-86H-5 Airplanes AF52-2090 and -2091**
†F-86H-10 Airplane AF53-1439 and all later airplanes

battery current, external dc power should be connected to supply the various electrical systems.

Circuit Breakers.

Most of the dc electrical circuits are protected by push-pull type circuit breakers or circuit-breaker switches. Circuit breakers, accessible to the pilot, are on panels on each side of the cockpit. A number of circuit breakers, not accessible from the cockpit, are on the canopy deck and in the nose wheel well. Trip-free circuit breakers are installed on F-86H-10 and later airplanes. This type of circuit breaker is designed to prevent the pilot from holding the push button in against the circuit fault which caused it to open, and thus sustaining a potentially dangerous overload condition. On F-86H-1 and F-86H-5 Airplanes, nontrip-free circuit breakers are installed; therefore, on these airplanes, it is possible to reset the push-pull circuit breakers against the circuit fault. The ac circuits are protected by fuses, the majority of which cannot be replaced in flight. The main and alternate instrument inverters are protected by on-off, switch-type circuit breakers, so that the inverters may be turned off during ground testing of the dc electrical system. These switch-type circuit breakers are on the right console. (See 6, figure 1-6.)

Caution It is considered highly undesirable to reclose a circuit breaker (on F-86H-1 and F-86H-5 Airplanes) that has opened in flight. Reclosure in general should be attempted only in cases of emergency, and then only with full realization of the hazards involved and a careful evaluation of the advantages versus the disadvantages. (Since F-86H-10 and later airplanes are equipped with trip-free circuit breakers, the circuit breakers on these airplanes cannot be reclosed.)

ELECTRICAL POWER SUPPLY SYSTEM CONTROLS.

Battery Switch.

The battery switch (figure 1-14) is on the right forward switch panel. When the switch is ON, the battery bus is connected to the primary bus, and the battery bus can be energized by generator output or by power applied through the external power source. When the switch is OFF, battery power is supplied only to those units connected to the battery bus.

Generator Switch.

The three-position generator switch (figure 1-14), on the right forward switch panel, uses primary bus power to control generator operation. When the switch is in the guarded ON position, the generator is connected; when it is in the OFF position, the generator is "off the line." The switch is spring-loaded from its RESET position to OFF. If an overvoltage condition occurs when the switch is ON, the generator is automatically cut out, as shown by illumination of the generator-off warning light. The switch should then be momentarily held at RESET and then to OFF. If normal voltage is shown on voltmeter, return switch to ON. This will reset the circuit so that the generator will be automatically reconnected if the malfunction no longer exists and the system has reverted to normal operation.

Instrument AC Power Switch.

The instrument ac power switch (figure 1-14) is on the right forward switch panel and is used to select the source of three-phase ac power. With the switch at MAIN, the main instrument inverter supplies three-phase ac power; with the switch at ALTERNATE, the alternate instrument inverter supplies the power. A warning light comes on when the output of the selected inverter is not satisfactory. The instrument power switch operates on power from the primary bus.

ELECTRICAL POWER SUPPLY SYSTEM INDICATORS.

Voltmeter.

The voltmeter (17, figure 1-4), on the instrument panel, shows generator voltage output.

Loadmeter.

The loadmeter (18, figure 1-4), on the instrument panel, is marked "LOAD" and shows percentage of total system amperage being used.

Generator-off Warning Light.

The generator-off warning light (figure 1-14), on the right forward switch panel, is illuminated by primary bus power whenever generator failure occurs, if the voltage drops below that required to close the reverse-current relay, or if the generator switch is OFF. Should generator voltage output become excessive (over 31 volts), the generator will be automatically cut out of the circuit and the generator warning light will come on. Illumination of the warning light (except when external power is connected) shows that the equipment powered by the secondary bus is inoperative and that the battery is powering the primary bus; therefore, all nonessential

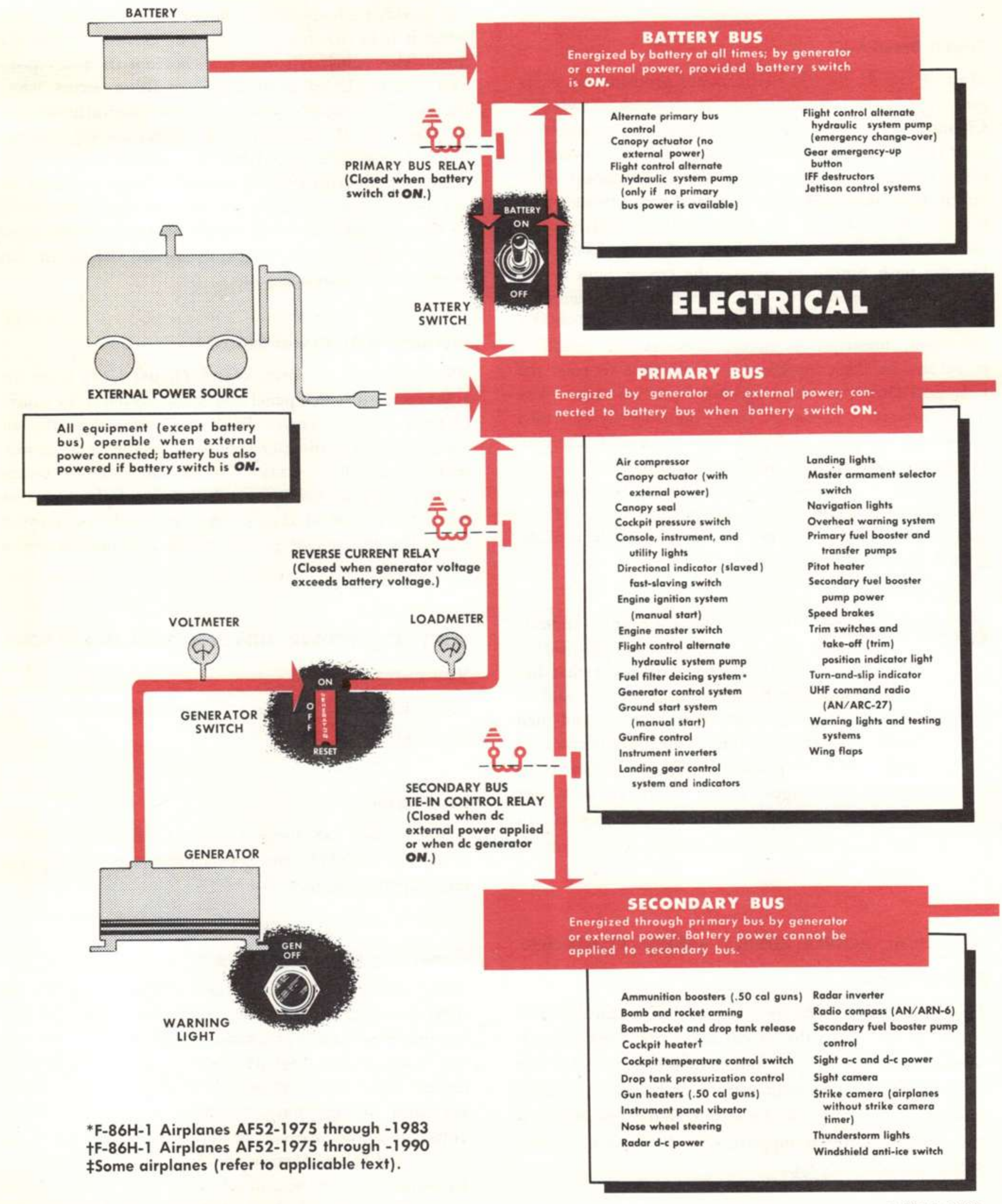

BATTERY
BATTERY BUS
Energized by battery at all times; by generator or external power, provided battery switch is ON.
Alternate primary bus control
Canopy actuator (no external power)
Flight control alternate hydraulic system pump (only if no primary bus power is available)
Flight control alternate hydraulic system pump (emergency change-over)
Gear emergency-up button
IFF destructors
Jettison control systems
PRIMARY BUS RELAY (Closed when battery switch at ON.)
BATTERY ON
OFF
BATTERY SWITCH
ELECTRICAL
EXTERNAL POWER SOURCE
All equipment (except battery bus) operable when external power connected; battery bus also powered if battery switch is ON.
PRIMARY BUS
Energized by generator or external power; connected to battery bus when battery switch ON.
Air compressor
Canopy actuator (with external power)
Canopy seal
Cockpit pressure switch
Console, instrument, and utility lights
Directional indicator (slaved) fast-slaving switch
Engine ignition system (manual start)
Engine master switch
Flight control alternate hydraulic system pump
Fuel filter deicing system*
Generator control system
Ground start system (manual start)
Gunfire control
Instrument inverters
Landing gear control system and indicators
Landing lights
Master armament selector switch
Navigation lights
Overheat warning system
Primary fuel booster and transfer pumps
Pitot heater
Secondary fuel booster pump power
Speed brakes
Trim switches and take-off (trim) position indicator light
Turn-and-slip indicator
UHF command radio (AN/ARC-27)
Warning lights and testing systems
Wing flaps
REVERSE CURRENT RELAY (Closed when generator voltage exceeds battery voltage.)
VOLTMETER
LOADMETER
ON
OFF
RESET
GENERATOR SWITCH
SECONDARY BUS TIE-IN CONTROL RELAY (Closed when dc external power applied or when dc generator ON.)
GENERATOR
GEN OFF
WARNING LIGHT
SECONDARY BUS
Energized through primary bus by generator or external power. Battery power cannot be applied to secondary bus.
Ammunition boosters (.50 cal guns)
Bomb and rocket arming
Bomb-rocket and drop tank release
Cockpit heater†
Cockpit temperature control switch
Drop tank pressurization control
Gun heaters (.50 cal guns)
Instrument panel vibrator
Nose wheel steering
Radar d-c power
Radar inverter
Radio compass (AN/ARN-6)
Secondary fuel booster pump control
Sight a-c and d-c power
Sight camera
Strike camera (airplanes without strike camera timer)
Thunderstorm lights
Windshield anti-ice switch
*F-86H-1 Airplanes AF52-1975 through -1983
†F-86H-1 Airplanes AF52-1975 through -1990
‡Some airplanes (refer to applicable text).
F-86H-1-54-3J

Figure 1-13

electrical equipment should be quickly turned off to conserve battery power. The light is of the push-to-test type.

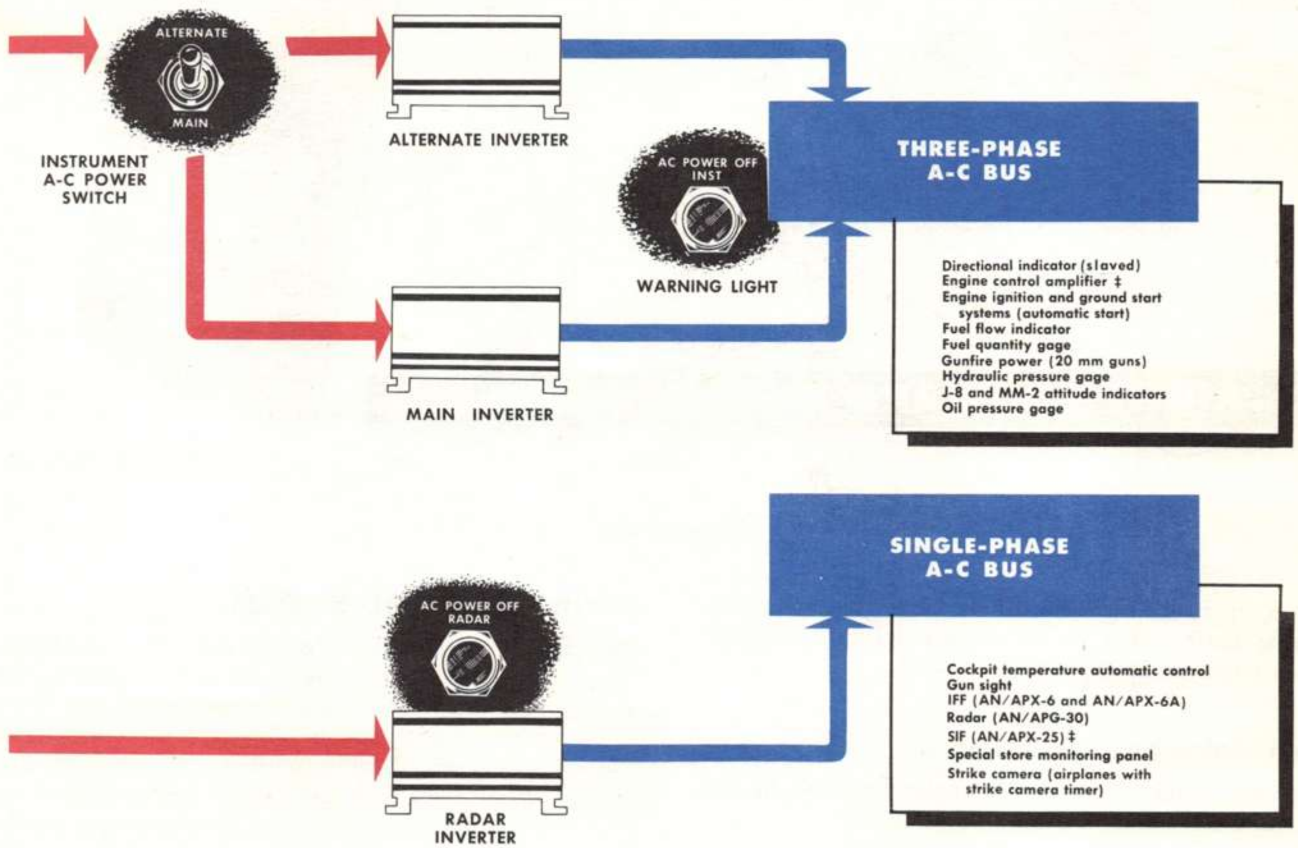
AC Power-off Warning Lights.

Two push-to-test type inverter failure warning lights are on the right forward switch panel and operate by means of primary bus power. A red warning light (figure 1-14) comes on to show failure of the main or alternate three-phase instrument inverter, whichever is selected. If the light remains on after the stand-by power source is selected, then both inverters are inoperative. An amber indicator light (figure 1-14) comes on when the single-phase radar inverter fails. There is no alternate source of single-phase power.

HYDRAULIC POWER SUPPLY SYSTEMS.

The airplane has three separate and independent constant-pressure type hydraulic systems: a utility hydraulic system, a flight control normal hydraulic system, and a flight control alternate hydraulic system. The three systems are completely isolated and independent of one another. Pressure in any one of the three hydraulic systems can be selectively read on a single hydraulic pressure gage, according to the position of the pressure gage selector switch. For hydraulic fluid specification, see figure 1-30.

POWER DISTRIBUTION ..... FUNCTIONAL FLOW DIAGRAM



F-86H-1-54-4C

Utility Hydraulic System.

The utility hydraulic system (figure 1-15) is a constant-pressure type system. It supplies power for normal operation of landing gear, wheel brakes, nose wheel steering, speed brakes, purge doors,* and air compressor for the pneumatic system. Fluid is supplied to the system from

*F-86H-5 and later airplanes

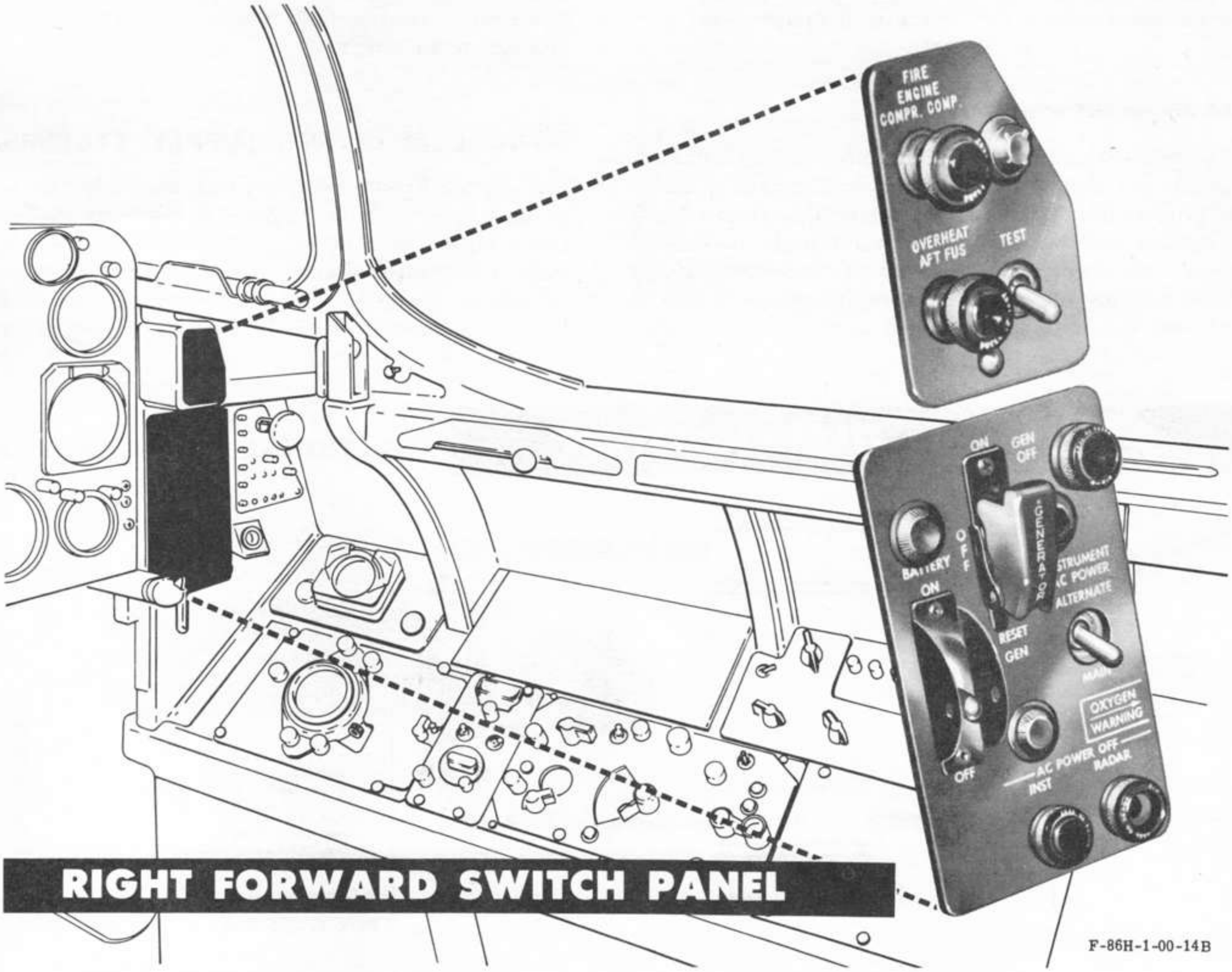


Figure 1-14

a reservoir in the right side of the fuselage; system pressure is maintained by an engine-driven, variable-displacement pump at 3000 psi.

Flight Control Hydraulic Systems.

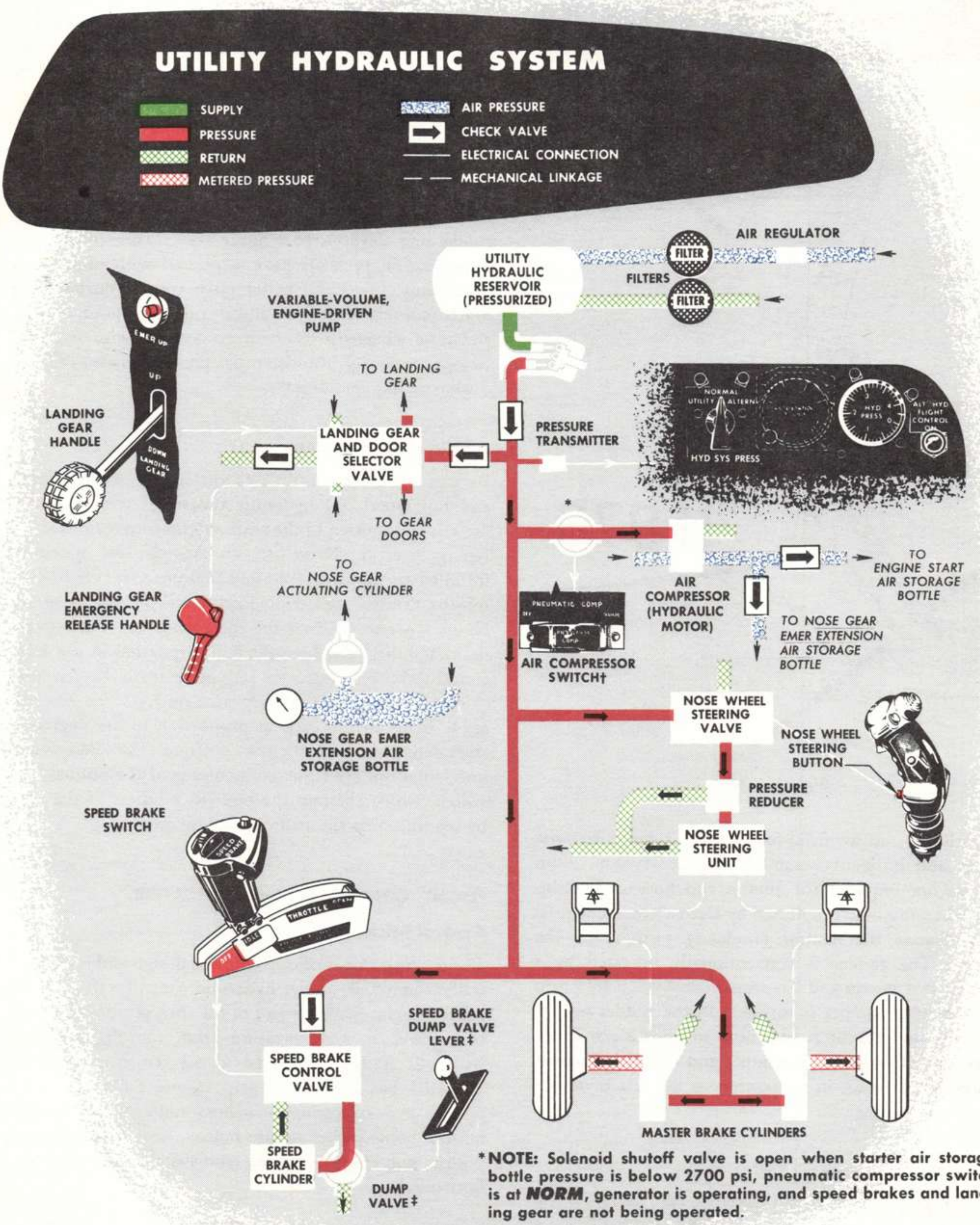
Refer to "Flight Control Hydraulic Systems" in this section.

HYDRAULIC PRESSURE GAGE AND SELECTOR SWITCH.

The hydraulic pressure gage and selector switch (7 and 5, figure 1-4), are on the upper part of the instrument panel. When the three-position pressure gage selector switch is at UTILITY, NORMAL (flight control normal hydraulic system), or ALTERN (flight control alternate hydraulic system), the pressure of the respective system is shown by the pressure gage. The hydraulic pressure indicating system is operated by three-phase ac power.

FLIGHT CONTROL SYSTEM.

The flight control system has several unique features. The entire horizontal tail acts as one primary control, the elevator and stabilizer being interconnected and both units moved by stick action. This type of longitudinal control system affords more positive action and greater control effectiveness with less control surface movement than a conventional control system. Airplanes changed by T.O., incorporate a splitter-type rudder and elevator (figure 1-16) to prevent the buzz associated with high Mach dives. The horizontal tail and the ailerons are actuated by a constant-pressure hydraulic system; movement of the control stick mechanically positions hydraulic control valves, which direct pressure to the actuating cylinder of the respective control surface. The irreversible characteristics of the hydraulic control system holds the control surfaces against any forces that do not originate from control stick action, and prevents these forces from being transmitted back to the stick. Thus, aerodynamic loads of any kind cannot reach the pilot. Because of this



NOTE:** Solenoid shutoff valve is open when starter air storage bottle pressure is below 2700 psi, pneumatic compressor switch is at ***NORM, generator is operating, and speed brakes and landing gear are not being operated.

†F-86H-1 Airplane AF52-2070 and later airplanes
‡F-86H-1 Airplanes AF52-1975 through -1980

F-86H-1-58-2D

Figure 1-15

SPLITTER RUDDER AND ELEVATOR

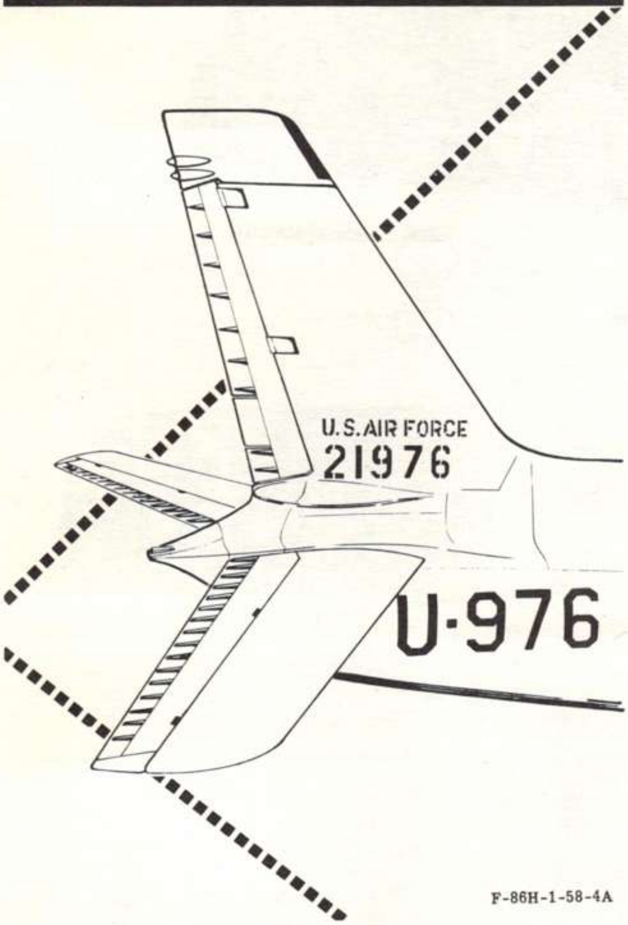


Figure 1-16

irreversibility, an artificial-feel system is built into the aileron and horizontal stabilizer control system. Trim tabs are not required for aileron and horizontal stabilizer; trimming is accomplished by electric trim actuators, which change the neutral (no-load) position of the surfaces. The rudder is conventionally operated by a cable control system and has an electrically actuated trim tab. A rudder damper is installed in the rudder on the hinge line to prevent rudder buzz in high Mach dives. This unit is a viscous-type damper and results in increasing the pedal forces in proportion to the rate of movement of the rudder.

Controllable Horizontal Tail.

The elevators and horizontal stabilizer are controlled and operated as one unit, known as the controllable horizontal tail. The horizontal stabilizer is pivoted at its rear spar so that the leading edge is moved up or down by normal control stick action. The elevator is connected to the stabilizer by mechanical linkage and moves in a definite relationship to stabilizer movement. Travel of the elevator is slightly greater than that of the stabilizer. This type control surface eliminates many of the undesirable effects of high speed, such as loss of control effectiveness at high Mach numbers due to compressibility.

Splitter Rudder and Elevator.

Airplanes changed by T.O. incorporate an improved rudder and elevator. (See figure 1-16.) This splitter-type configuration prevents buzz associated with high Mach dives while providing better pitch control during high Mach pull-out conditions and during low-speed landing and nose wheel lift-off, with no occurrence of overcontrol or sensitivity. Rudder pedal pressure is also reduced during taxiing and flight.

Artificial-feel System.

Because of the irreversible characteristics of the aileron and horizontal tail hydraulic control system, air loads are not transmitted to the stick and no conventional stick feel is present. Therefore, an artificiai-feel system is installed to supply the desired feel under all flight conditions. Control surface air loads are simulated by spring bungees connected into the control system. To improve flight stability, a bobweight is incorporated in the horizontal stabilizer system to provide a force directly proportional to normal gravity acceleration. The bungees apply loads to the stick in proportion to the degree of stick deflection from the trim position. The ailerons and horizontal tail are trimmed by means of the normal trim switch, which changes the no-load position of the stick by repositioning the artificial-feel bungees.

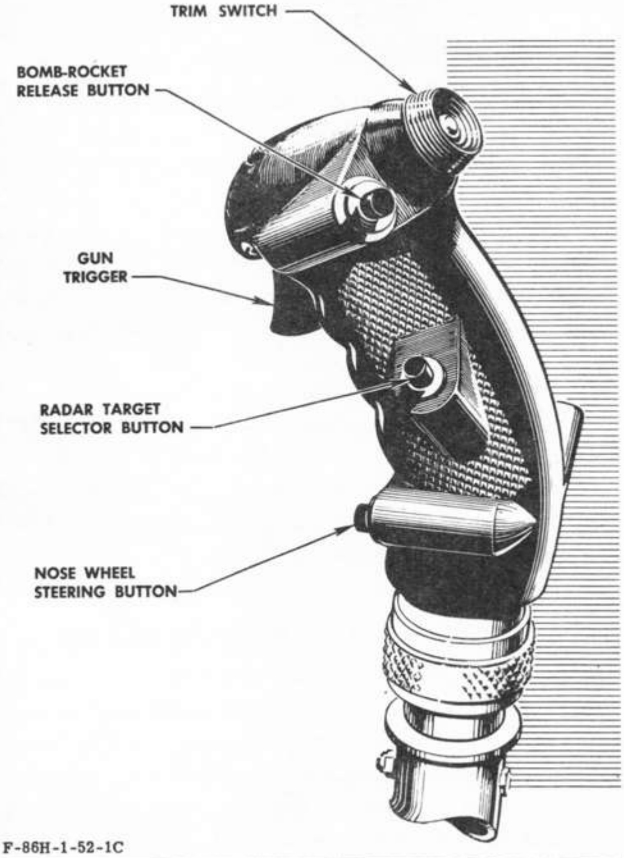
FLIGHT CONTROLS AND INDICATOR.

Control Stick.

The control stick is of conventional design and is mechanically connected to the hydraulic control valves at the control surfaces. Movement of the stick positions the control valves so that pressure from the flight control hydraulic system is directed to the actuating cylinders. The stick has a Type B-8 grip (figure 1-17) that incorporates the following switches: radar target selector button, bomb-rocket release button, nose wheel steering button, gun trigger, and the trim switch for ailerons and horizontal tail.

Rudder Pedals.

The rudder is controlled by a cable system from conventional hanging-type rudder pedals, which are adjustable



STICK GRIP

Figure 1-17

fore and aft by a lever on the outboard side of each pedal assembly. A position indicator on the outboard side of each pedal aids in exact alignment of the pedals during adjustment. Each indicator consists of a numbered dial; when the visible dial numbers correspond, the pedals are adjusted evenly. Toe action on the rudder pedals operates the wheel brakes.

Control Surface Locks.

Gust locks are not necessary for the aileron and horizontal tail, as these surfaces are locked against externally applied loads at all times because of the irreversible characteristics of the flight control hydraulic system. The cable-operated rudder can be locked by a latch-type lock provided for each rudder pedal. The locks are recessed in the cockpit floor, one aft of each rudder pedal. To lock the rudder, the pedals must be adjusted to the full aft position and the locks should be opened by pushing down on the aft portion of each lock. The pedals should then be rotated aft to engage the locks. It is necessary to slide the lock aft and then to allow it to return forward so that it will engage the pedal. To release the pedals, the lock is slid aft until the pedal is disengaged. The pedals should be returned to their normal position, and the locks should be pushed down until flush with the floor.

NOTE Rudder locks need not be engaged after flight, since the viscous-type damper installed in the rudder will prevent gust damage.

Trim Switch.

Ailerons and horizontal tail are trimmed by a five-position, thumb-actuated switch (figure 1-17) on top of the control stick grip. Trimming is accomplished by means of the trim switch, to remove or reduce stick loads after the stick is positioned to maintain the desired flight attitude. Holding the trim switch to either side energizes the electric lateral trim actuator. Holding the switch forward or aft energizes the longitudinal trim actuator. The trim actuators, when energized, reposition the artificial-feel bungees. The bungees, in turn, apply the necessary force to establish a new neutral (no-load) position of the stick, thereby eliminating or reducing control stick loads. The trim circuit is powered by the primary bus. The trim switch is spring-loaded to the OFF (center) position; when released, it automatically returns to this position and trim action stops.

Caution The trim switch is subject to sticking in any or all of the actuated positions, resulting in application of extreme trim. If the switch sticks in any actuated position during ground checks, the airplane must not be flown. The deficiency must be entered on Form 781 with a red cross.

Rudder Trim Switch.

The electrically (primary bus) actuated rudder trim tab is controlled by a three-position switch (12, figure 1-5) on the left console, inboard of the throttle quadrant. The switch is held at LEFT or RIGHT for corresponding rudder trim and is spring-loaded from these positions to the OFF position.

Take-off Trim Indicator Light.

An amber light (10, figure 1-5) on the left console shows take-off trim position of the ailerons, horizontal tail, and rudder. The light comes on whenever any one of these control surfaces is trimmed to its take-off position and goes out when the respective trim switch is released; it comes on again as each subsequent control is trimmed for take-off. The take-off trim position for the ailerons and rudder is neutral; horizontal tail take-off trim position is that used for a minimum-run take-off. (The leading edge of the horizontal stabilizer is set with the leading edge down about 3 degrees, to induce an airplane nose-up condition.) The light operates on primary bus power.

NOTE The take-off trim setting of the horizontal tail is visually identified by a white triangle painted on the left side of the fuselage, just forward of the horizontal stabilizer. During preflight check of the trim system, have ground crew check that the leading edge of the stabilizer is aligned with rear point of the triangle when the airplane is trimmed to take-off position.

FLIGHT CONTROL HYDRAULIC SYSTEMS.

Two completely independent hydraulic systems (figure 1-18) provide alternate sources of power for the ailerons and horizontal tail. A constant-pressure hydraulic system, powered by an engine-driven pump, serves as the normal flight control hydraulic system. An alternate constant-pressure hydraulic system is pressurized by an electrically powered pump and operates the controls should the normal hydraulic system fail. The transfer from normal to alternate system is automatic in case of normal system failure, but also may be selected manually by the pilot. Automatic change-over is accomplished electrically by pressure switches and solenoid-operated transfer valves. When normal system pressure drops to about 650 psi, the pressure switch actuates the transfer valves. A warning light on the instrument panel comes on when flight controls are operated on the alternate system. A selector switch permits the pilot to electrically change over from one system to the other for test purposes or for actual operation. If the automatic or selective electrical transfer systems fail, actuation of the emergency change-over handle mechanically positions the transfer valves to select the alternate system, regardless of pressure, and connects the alternate pump motor directly to the battery bus. Hydraulic control valves, positioned mechanically by the control stick, direct pressure to the respective tandem-type actuating cylinders. One is supplied by the normal hydraulic system; the other, by the alternate system. Each is hydraulically independent of the other.

NOTE Automatic or pilot-controlled electrical transfers to the alternate system are prevented if pressure in the alternate system is below the minimum operating pressure. Pilot-controlled transfer from the alternate to the normal system is also prevented if normal system pressure is low. Manual transfer to the flight control alternate hydraulic system can be accomplished regardless of alternate system pressure.

Flight Control Normal Hydraulic System.

The flight control normal hydraulic system has a separate reservoir and is pressurized by an engine-driven, variable-volume pump. Normal system pressure is about 3000 psi, but pressure may be lower during control stick movement. The pump is supplemented by an accumulator for sudden high rates of demand. The accumulator air pressure gage, in the engine accessory well, behind an access door on the bottom of the fuselage just aft of the main gear doors, should be checked by ground personnel before flight for 600 to 650 psi air precharge with hydraulic pressure depleted. The system reservoir is behind an access door on the right side of the fuselage, just forward of the fuselage break. The fluid level indicator pin should extend out from the reservoir to within 1/4 inch of the top of the pin gage.

Flight Control Alternate Hydraulic System.

The flight control alternate hydraulic system has a separate reservoir, an electrically driven pump, and an accumulator to provide an alternate source of control power. The accumulator air pressure gage, just to the left of the normal system accumulator gage in the engine accessory well, should be checked by ground personnel before flight for 600 to 650 psi air precharge with hydraulic pressure depleted. The system reservoir is behind an access door on the left side of the fuselage, just forward of the fuselage break. The fluid level indicator pin should extend out from the reservoir to within 1/4 inch of the top of the pin gage. The system has separate hydraulic lines to each cylinder, and system pressure is automatically maintained by pressure switches that operate the pump motor, as required, to supply the system and keep the accumulator charged.

NOTE When the flight control alternate system is in operation, rapid movement of flight controls for prolonged periods may result in a slightly lower rate of control surface response than when the normal system is in operation. This is accompanied by a reduction in indicated alternate system pressure.

Caution The flight control alternate hydraulic system is engaged automatically when external power is connected for engine start, as normal system pressure is not built up until after the engine is running. Therefore, the flight control switch should be held at RESET to effect change-over to the normal system after engine start.

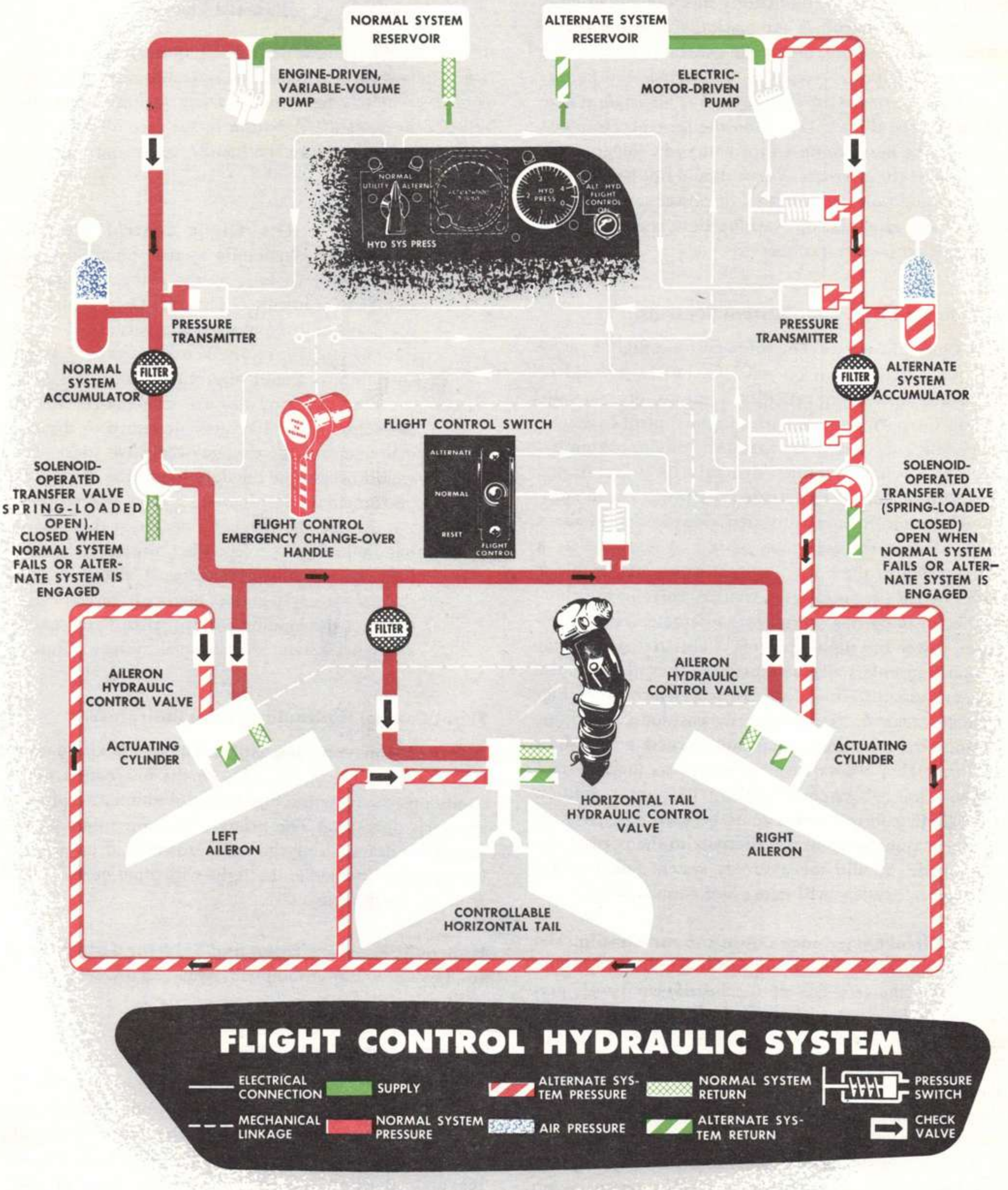

NORMAL SYSTEM RESERVOIR
ALTERNATE SYSTEM RESERVOIR
ENGINE-DRIVEN, VARIABLE-VOLUME PUMP
ELECTRIC-MOTOR-DRIVEN PUMP
HYD SYS PRESS
PRESSURE TRANSMITTER
PRESSURE TRANSMITTER
NORMAL SYSTEM ACCUMULATOR
ALTERNATE SYSTEM ACCUMULATOR
FILTER
FLIGHT CONTROL SWITCH
ALTERNATE
NORMAL
RESET
FLIGHT CONTROL
SOLENOID-OPERATED TRANSFER VALVE SPRING-LOADED OPEN). CLOSED WHEN NORMAL SYSTEM FAILS OR ALTERNATE SYSTEM IS ENGAGED
FLIGHT CONTROL EMERGENCY CHANGE-OVER HANDLE
SOLENOID-OPERATED TRANSFER VALVE (SPRING-LOADED CLOSED) OPEN WHEN NORMAL SYSTEM FAILS OR ALTER-NATE SYSTEM IS ENGAGED
AILERON HYDRAULIC CONTROL VALVE
AILERON HYDRAULIC CONTROL VALVE
ACTUATING CYLINDER
ACTUATING CYLINDER
HORIZONTAL TAIL HYDRAULIC CONTROL VALVE
LEFT AILERON
RIGHT AILERON
CONTROLLABLE HORIZONTAL TAIL
FLIGHT CONTROL HYDRAULIC SYSTEM
ELECTRICAL CONNECTION
SUPPLY
ALTERNATE SYSTEM PRESSURE
NORMAL SYSTEM RETURN
PRESSURE SWITCH
MECHANICAL LINKAGE
NORMAL SYSTEM PRESSURE
AIR PRESSURE
ALTERNATE SYSTEM RETURN
CHECK VALVE
F-86H-1-58-3B

Figure 1-18

During flight, the alternate system pump motor is normally powered by the primary bus. If the primary bus fails during flight, the alternate system circuit is automatically transferred to the battery bus. On the ground, the pump motor circuit is automatically powered by the primary bus. Therefore, unless the generator is operating or an external power source is connected, the battery switch must be ON to provide power for alternate system operation when the airplane is on the ground. However, because of the heavy drain on the battery by the alternate pump motor, the alternate system should not be operated on the ground unless an external dc power source is connected or the generator-off warning light is not on when external dc power is not connected.

Flight Control Hydraulic System Controls.

Flight Control Switch. The three-position flight control switch (13, figure 1-5), on the left console inboard of the throttle quadrant, provides a means of manually selecting the normal or alternate flight control hydraulic system. With the switch at NORMAL (engine running), the normal system supplies hydraulic pressure to the flight controls, and the alternate system will cut in automatically should the normal system pressure fall to about 650 psi. When the switch is moved to ALTERNATE, a transfer valve in the normal system is actuated to block normal system pressure, and a transfer valve in the alternate system is opened, permitting alternate system pressure to power the flight controls. (This transfer cannot be completed unless adequate pressure is available in the alternate system.) When the switch, which is spring-loaded to NORMAL, is momentarily positioned at RESET, it de-energizes both the normal and alternate system shutoff valves. This allows them to return to their normal positions (normal system operating). The RESET position of the flight control switch must be used whenever an intentional transfer from the alternate to the normal system is made. Should the alternate system fail, transfer to the normal system will take place automatically.

Flight Control Emergency Change-over Handle. The flight control emergency change-over handle (25, figure 1-4), below the left side of the instrument panel, permits the flight control alternate hydraulic system to be engaged if the automatic or selective electrical transfer systems fail. Pulling the handle aft to its full out position (about 4 inches) mechanically actuates two transfer valves (normally solenoid-operated) to transfer flight control operation to the alternate system and connects the alternate system pump directly to the battery bus, thus bypassing pressure switches that normally control pump operation. As a result, when the handle is extended, pump operation is continuous, regardless of system pressure.

NOTE Since the automatic pressure control of the alternate system is bypassed when the emergency change-over handle is extended, alternate system pressure will exceed 3200 psi.

If the handle is returned to its normal position, the alternate system will remain in operation until the flight control switch is held momentarily at RESET and then released to NORMAL. A button in the face of the handle must be pressed before the handle can be pushed in to the stowed position.

Caution The flight control alternate hydraulic system pump operates continuously as long as the manual emergency change-over handle is actuated. Decreased pump life may result from excessive periods of operation; also, drain on the battery in case of generator failure would appreciably shorten battery life. In addition, manual change-over to the alternate system may prevent return to the normal system if the change-over valve sticks. This would necessitate the duration of the flight to be performed on the alternate system. Therefore, do not actuate the manual emergency change-over handle in flight, except when the normal system fails and automatic (electrical) change-over to the alternate system does not occur, or just before entering the landing pattern when flying on the alternate system after normal system failure.

Flight Control Hydraulic System Indicators.

Alternate-on Warning Light. The amber alternate-on warning light (8, figure 1-4), on the instrument panel, comes on whenever the flight control alternate hydraulic system is operating. The primary bus normally provides power for illuminating the light. However, if no primary bus power is available, the light will come on by power from the battery bus.

Hydraulic Pressure Gage and Selector Switch. Refer to "Hydraulic Power Supply Systems" in this section.

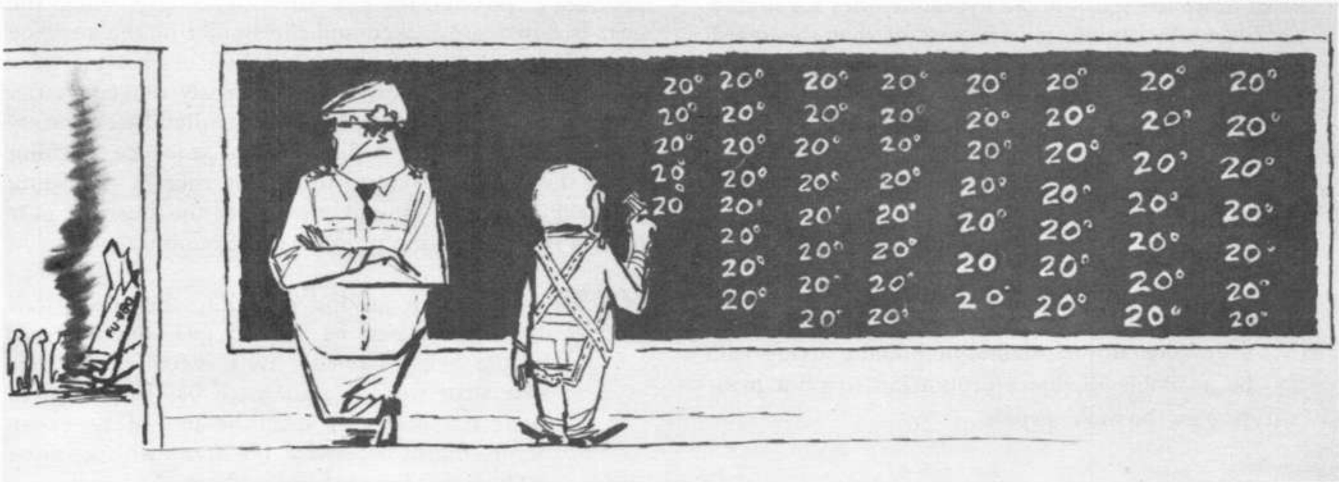
WING LEADING EDGE.

The airplane has a slatted leading edge wing. (See 19, figure 1-1.) Wing slats improve low-speed characteristics and high-altitude maneuverability. The slats on each wing are divided into four segments. Aerodynamic force acting upon the slats causes them to open and close automatically, depending on the airspeed and the attitude of the airplane. Upon opening, the slats move forward along a curved track to create a slot in the wing leading edge. This slot formation controls the airflow over the upper surface of the wing and increases lift, resulting in lower stalling speeds. At higher airspeeds in unaccelerated flight, the slats close automatically to offer minimum drag for maximum flight performance.

Warning

Because of restricted clearances, do not lower wing flaps more than 20 degrees (MID position of wing flap handle) when EX-10 bombs or 1000-pound GP bombs with the T-142 fin are carried.

F-86H-1-0-12A



WING FLAP SYSTEM.

Electrically controlled and operated (dc) slotted-type wing flaps extend spanwise from the fuselage to the aileron on each wing panel. An individual electrical circuit and individual electric motor actuate each flap. The flaps are mechanically interconnected so that if one actuating motor or electrical circuit fails, the respective flap will be actuated through mechanical interconnection with the opposite flap. This mechanical interconnection also prevents individual or uneven flap operation, and a brake within each actuator prevents air loads from moving the flaps. No emergency system is provided, as enough protection is afforded in the normal system by the mechanical interconnection, the individual actuator motors, and the individual actuator motor circuits. There is no flap position indicator.

WING FLAP HANDLE.

The wing flap handle (5, figure 1-5), outboard of the throttle on the left console, controls flap actuation by primary bus power. To position the flaps, the flap handle is moved to the selected UP, MID, or DOWN position. Moving the handle to UP will raise the flaps to the streamlined position. With the handle at DOWN, the flaps will lower to the full down position (about 38 degrees). When the handle is moved from UP to MID position, the flaps will lower to mid-position of their travel (about 20 degrees). To raise the flaps from full-down position or mid-position, the flap handle must be placed at the UP position. A spring-loaded sliding bolt, next to the flap handle, can be moved to limit the flap handle travel to the MID position (from the UP position) for certain airplane load conditions.

NOTE The MID position is not a neutral position. The flaps will move to mid-position only from the full up position.

SPEED BRAKE SYSTEM.

Hydraulically operated speed brakes are on each side of the fuselage, below the dorsal fin. Each speed brake consists of a panel hinged at the forward edge; the panel, when open, extends forward into the air stream. Pressure for normal operation of the speed brakes is supplied by the utility hydraulic system through a solenoid-operated selector valve. The speed brakes open in about 2 seconds with high engine rpm. About 4½ seconds is needed to close the brakes on the ground with high engine rpm. There is no speed brake position indicator. If the solenoid-operated selector valve fails, a dump valve, installed on early airplanes,* may be mechanically positioned to allow air loads to close the speed brakes.

SPEED BRAKE SYSTEM CONTROLS.

Speed Brake Switch.

A serrated switch, on top of the throttle, controls speed brake operation, using power from the primary bus. The switch has three fixed positions: IN, OUT, and a HOLD (neutral) position shown by a white alignment mark on the switch guide. The speed brakes can be stopped at

***F-86H-1 Airplanes AF52-1975 through -1980**

any position by movement of the switch to neutral. After the speed brakes have been opened or closed, the switch should be returned to the neutral position. Should the switch be left in the IN position, for example, the click into the neutral position may be mistaken for the OUT position, and the expected braking action will not occur.

NOTE Since the speed brake hydraulic lines are routed near the engine, it is important that the speed brake switch be kept in the neutral position to cut off hydraulic pressure and minimize the fire hazard in case of a damaged line.

Caution If the speed brakes are actuated during taxiing, hydraulic boost pressure will not be available for applying the wheel brakes until speed brake operation is completed and system pressure is restored. However, conventional hydraulic braking action will be available in direct proportion to pilot pressure on the brake pedals.

Speed Brake Dump Valve Lever.*

To provide a means of closing the speed brakes if normal operation fails, an emergency lever (22, figure 1-5) is installed on the left aft console. Normally, the lever is forward. When pushed aft, the lever mechanically opens a dump valve, which relieves hydraulic pressure from the speed brake actuating cylinders and permits air loads to close the brakes to a slightly open trail position which offers very little drag.

LANDING GEAR SYSTEM.

The fully retractable tricycle landing gear, as well as the gear and wheel fairing doors, are hydraulically actuated and electrically (dc) controlled and sequenced. A pneumatic system is provided for emergency lowering of the nose gear. The main gear retracts inboard into the lower surface of the wing and fuselage; the nose gear retracts aft into the fuselage, pivoting 90 degrees so that the nose wheel is horizontal when retracted. After the gear is down and locked, the wheel fairing doors are retracted to the closed position to prevent mud, dirt, etc, from entering the wheel wells during landing, taxiing, and take-off. Landing gear and wheel fairing door extension and retraction time is about 8 seconds. A hydraulic steering unit is built into the nose gear assembly and serves as a conventional shimmy damper when the steering mechanism is not engaged. The main wheels are equipped with hydraulically operated, segmented rotor-disk type brakes.

***F-86H-1 Airplane AF52-1975 through -1980**

LANDING GEAR SYSTEM CONTROLS.

Landing Gear Handle.

The landing gear handle (figure 1-19), on the left forward switch panel, electrically (primary bus) controls the gear and gear door hydraulic selector valve. Moving the handle to UP or DOWN causes utility hydraulic system pressure to position the gear correspondingly. When the gear is down and locked and the weight of the airplane is on the gear, two ground safety switches prevent gear retraction if the control is inadvertently moved to UP. The wheel fairing doors are not controlled by the safety switch; they will follow their normal sequence, opening when the handle is moved to UP and thereby providing a warning to the ground crew that the landing gear handle is in the wrong position for ground operation.

NOTE For ease in ground servicing, the wheel well cover doors may be opened (without the gear handle being moved) by a switch in the left gear strut well. If the switch has been used to open the doors, it must be moved to CLOSE before flight; otherwise, the doors will not close after gear is lowered for landing.

The wheel portion of the handle glows red to serve as the landing-gear-unlocked or door-unlocked warning light.

Landing Gear Emergency Release Handle.

If the utility hydraulic system or electrical system fails, the gear may be lowered by the landing gear emergency release handle (19, figure 1-4), to the right of and below the instrument panel. Pulling the release handle out fully mechanically unlocks all gear and fairing doors, positions the gear and door hydraulic selector valves to neutral, and opens an air selector valve. The main gear then falls free, and air pressure is directed from the emergency air bottle to extend the nose gear. This air pressure is sufficient for one extension only. A pressure switch de-energizes the landing gear selector electrical circuit at any time air pressure is in the nose gear cylinder, to prevent return of the high-pressure air to the utility hydraulic reservoir.

Caution The emergency release handle must be pulled to the full extension of about 11 inches to ensure release of all gear uplocks and proper positioning of the hydraulic selector valves. A pull force on the handle of about 45 pounds is enough to release the landing gear.

- Landing gear cannot be retracted in flight after being lowered by the landing gear emergency release handle. Therefore, to restore normal operation, the emergency extension reset button must be reset before the next flight if the gear emergency release handle has been used.

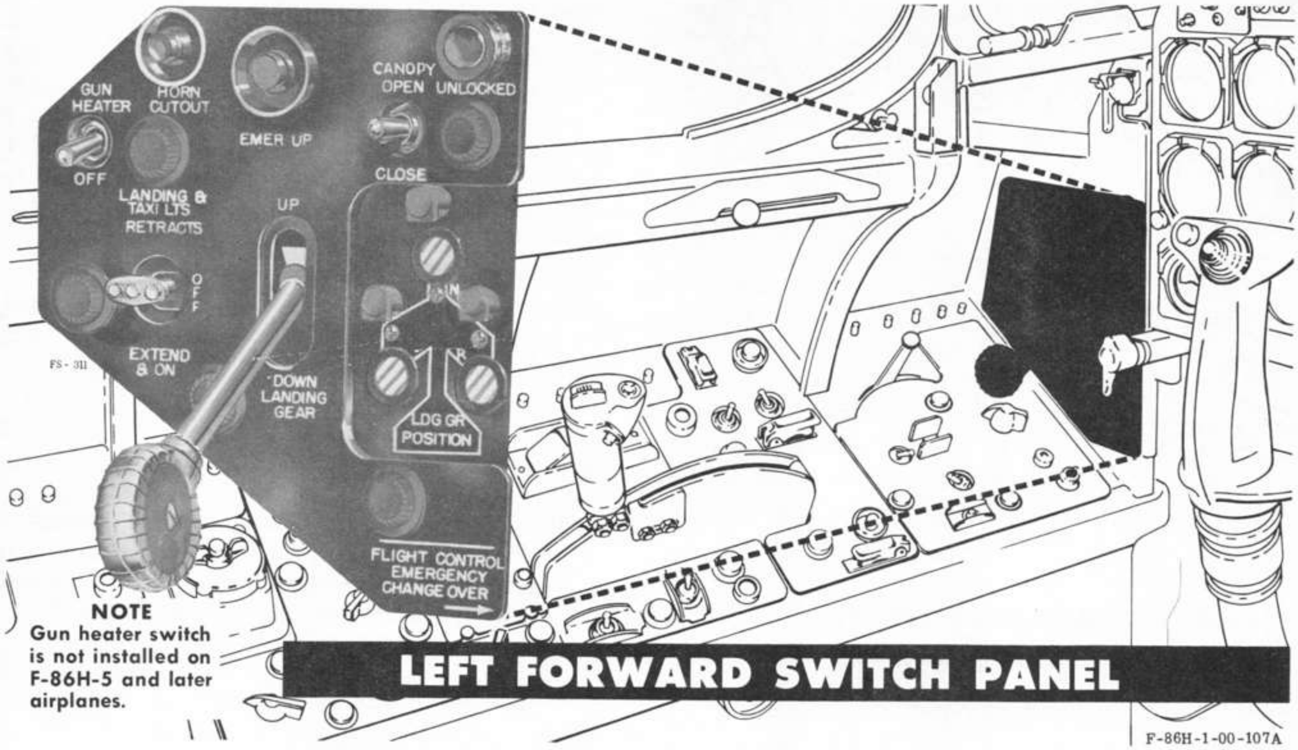


Figure 1-19

Landing Gear Emergency-up Button.

Use of the guarded emergency-up button (figure 1-19), which overrides the landing gear ground safety switches, permits the gear to be retracted on the ground if necessary. When the landing gear handle is at UP, holding the emergency-up button down bypasses the ground safety switches and directs battery bus power to the gear and door selector valve, so that the gear is retracted hydraulically. Retraction is normal, except that the wheel well doors may not have enough time to fully open. To ensure positive gear retraction, the button must be held down until the gear completely retracts, or at least 5 seconds.

NOTE When the emergency-up button is used, gear retraction time can be reduced if the airplane is yawed by alternately applying wheel brakes or by engaging nose wheel steering and applying rudder alternately. (Yawing relieves the load on the main gear downlock pins.)

Emergency Extension Reset Button.

A red emergency extension reset button is located externally on the right side of the fuselage nose section, just forward of the external canopy control buttons. The button is linked to the selector valve in the nose gear hydraulic system. As the selector valve moves to allow compressed air to enter the nose wheel actuating cylinder when emergency release handle is used to lower the nose wheel, the reset button protrudes from the side of the fuselage. Once the emergency system has been used to lower the nose wheel, the air must be released from the actuating cylinder before the nose wheel will again retract. Pushing the reset button repositions the selector valve, releasing the air from the actuating cylinder.

LANDING GEAR SYSTEM INDICATORS.

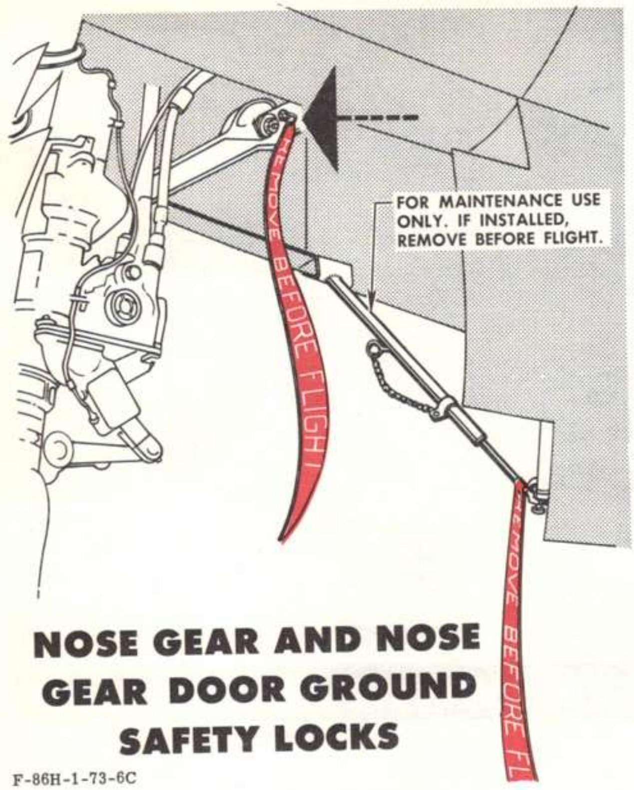
Landing Gear Position Indicator.

The position of the landing gear is shown by an indicator (figure 1-19) on the left forward switch panel. The indicator consists of three windows, one for each gear. Each window displays a simulated wheel when its respective gear is down and locked, the word "UP" when the gear is up and locked, and red and yellow diagonal lines when the respective gear is in an unlocked condition.

NOTE Since the indicator is actuated by primary bus power, the diagonal lines also appear when the primary bus is not energized.

Landing Gear Unsafe Warning Light.

The red warning light in the wheel of the landing gear handle (figure 1-19) comes on (primary bus) when any



NOSE GEAR AND NOSE GEAR DOOR GROUND SAFETY LOCKS

F-86H-1-73-6C

Figure 1-20

gear is in any unlocked condition. This light also comes on if the gear is up and locked when the throttle is retarded below minimum cruising rpm, if the gear is up and locked and any gear door is not completely closed, or if the landing gear handle is moved to UP when the airplane is on the ground. The warning light is dimmed automatically when the instrument panel primary light rheostat is more than 30 degrees from the OFF position. Operation of the warning light may be tested on the ground by pressing the horn cutout button when throttle is at OFF.

Caution If the switch in the landing gear handle should fail, the landing gear unsafe warning light and the landing gear warning horn would not operate, and the landing gear could not be raised or lowered (except by emergency lowering method). For this reason, you must use the landing gear position indicator as the primary indication of gear position.

Landing Gear Warning Horn.

If the gear is not down and locked when the throttle is retarded below cruising rpm, a warning horn in the cockpit sounds automatically. Depressing the horn cutout button (figure 1-19) on the left forward switch panel silences the horn. Advancing the throttle resets the horn circuit, which is powered by the primary bus.

Nose Gear Ground Safety Lock.

A removable ground safety lock (figure 1-20) should be inserted in the nose gear assembly when the airplane is on the ground to prevent collapsing of the nose gear. The lock has a conventional warning streamer and must be removed before flight. No provisions are made for main gear ground safety locks, as the weight of the airplane on the main gear prevents accidental gear release while the airplane is motionless.

NOSE WHEEL STEERING SYSTEM.

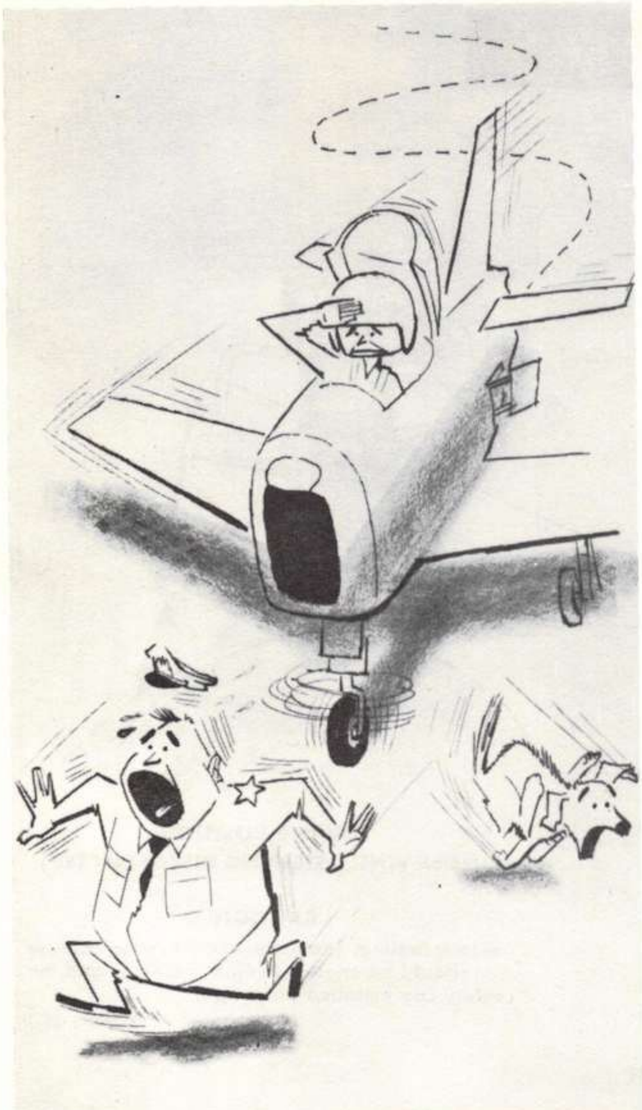
Nose wheel steering is electrically engaged (dc), hydraulically powered, and controlled by the rudder pedals. Steering is accomplished when a switch on the control stick grip is depressed and the rudder pedals are operated to control a hydraulically operated nose wheel steering unit. This unit permits the wheel to be turned about 40 degrees each side of center by pressure on the respective rudder pedal. When not engaged for steering, the unit serves as a conventional hydraulic shimmy damper. A safety switch, on the nose wheel strut torque link, prevents engagement of the steering unit when the weight of the airplane is off the nose gear. Utility system pressure is reduced by the pressure reducer valve for operation of the steering system.

Nose Wheel Towing Release Pin.

The nose wheel towing release pin (figure 1-21) on the forward side of the nose gear strut, just above the wheel fork, must be disengaged from the strut before the airplane is towed, to allow the nose wheel fork to swivel. When the pin is engaged, as required for normal steering operation, the pin handle is held downward in the vertical position by a detent and by a retaining cap screwed on the pin assembly. The downward extension of the pin handle prevents the tow bar from being attached to the towing lugs on the nose wheel fork until the pin is disengaged. The pin is disengaged, to permit tow bar attachment, by unscrewing the retaining cap. The pin can then be pulled forward and rotated 180 degrees to the upward vertical position, where it is held by a detent. On late airplanes,* the nose wheel strut also has provisions for attaching a standard Army-Navy tow bar to the axle. The towing release pin handle does not prevent attachment of this type tow bar; however, the pin must be disengaged to permit the nose wheel fork to swivel.

Caution The nose wheel towing release pin should be disengaged after shutdown; otherwise, the steering unit will be damaged if the airplane is towed.

***F-86H-5 and later airplanes**



F-86H-1-0-13A

CAUTION

If speed brakes are actuated during taxiing, hydraulic pressure will not be available for nose wheel steering until speed brake operation is completed.

NOSE WHEEL STEERING BUTTON.

The push-button type nose wheel steering button (figure 1-17), on the control stick grip, actuates a shutoff valve (secondary bus power) to supply hydraulic pressure to the nose wheel steering unit. To engage the steering unit, the switch must be depressed and the rudder pedals aligned in the direction the nose wheel is turned. When the nose wheel and rudder pedals are coordinated in this manner, the nose wheel steering unit is automatically engaged by a hydraulically actuated clutch within the steer-damp unit.

NOTE The nose wheel steering unit will not engage if the nose wheel is more than about 40 degrees either side of center. Should the nose wheel be turned more than this, it must be brought into the steering range by use of the wheel brakes.

WHEEL BRAKE SYSTEM.

The segmented rotor-disk type hydraulic wheel brakes are conventionally operated by toe action on the rudder pedals. Brake pressure is supplied from the brake master cylinders and supplemented by power boost from the utility hydraulic system. A brake reservoir* retains a quantity of return fluid from each brake. If utility system pressure fails or is reduced, the master cylinders will operate as manual brakes with fluid from the reservoir.

Caution Because of light brake forces required, care should be exercised to prevent sliding wheels.

- If the speed brakes are actuated during taxiing, hydraulic boost pressure will not be available for applying the wheel brakes until speed brake operation is completed and system pressure is restored. However, conventional hydraulic braking action will be available in direct proportion to pilot pressure on the brake pedals.

NOTE This airplane is not equipped with parking brakes.

Refer to "Wheel Brake Operation" in Section VII for additional information.

INSTRUMENTS.

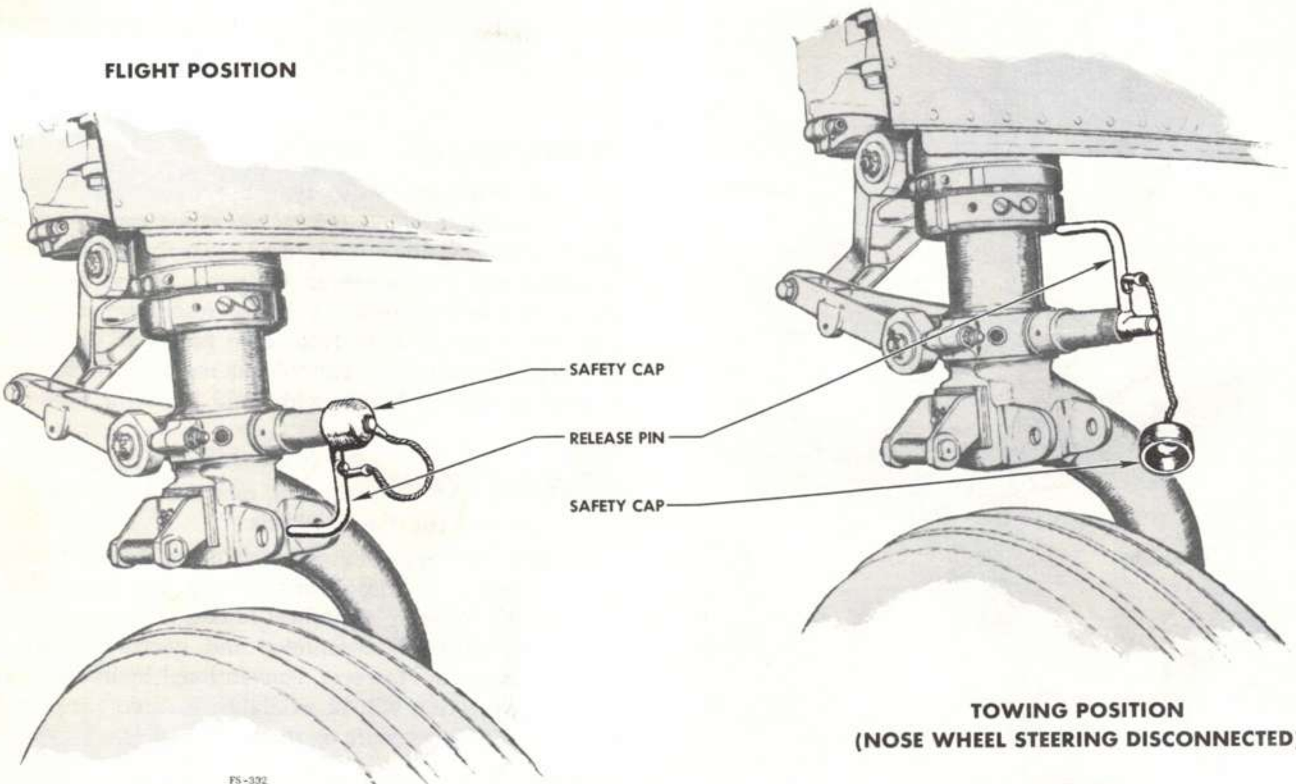
Only instruments which are not part of a complete system, such as fuel system, engine, etc, are discussed in the following paragraphs. Most of these instruments are on the instrument panel and are powered by the ac or dc electrical system. An automatic electric vibrator, powered by the secondary bus, is on the forward side of the instrument panel. This automatic vibrator prevents instrument lag or sticky pointer indications. Refer to the applicable system for information on instruments not discussed in the following paragraphs.

AIRSPEED INDICATOR.

The airspeed indicator (29, figure 1-4) is conventional, with the addition of a red and yellow limiting pointer. This pointer has two adjustments. The first permits setting the pointer to indicate the airspeed corresponding to

*F-86H-1 Airplanes

NOSE WHEEL TOWING RELEASE PIN



TOWING POSITION
(NOSE WHEEL STEERING DISCONNECTED)

CAUTION

Before taxiing, the nose wheel towing release pin should be engaged (flight position) and the safety cap installed hand-tight.

F-86H-1-34-1

Figure 1-21

a limit Mach number. This adjustment is indicated by the position of a small index pointer on the Mach scale on the circumference of the dial. The second prevents clockwise movement of the pointer beyond a limit airspeed. The index pointer will indicate the airspeed corresponding to a limit Mach number or limit airspeed, whichever is less, for a given external loading configuration. (Refer to "Airspeed Limitations" in Section V.) If there is no airspeed or Mach number limit for the airplane, the limiting pointer will be set to show at any altitude the airspeed corresponding to Mach 1.0, the design limit of the instrument. In addition, the instrument is equipped with a vernier drum which permits reading of airspeed to the nearest knot. The pitot-static head is installed in a boom on the right wing tip, and installation error is negligible, as far as the pilot is concerned.

MACHMETER.

The Machmeter (31, figure 1-4) serves as a primary flight instrument for indicating speed. It interprets indicated (pressure) altitude and indicated airspeed to show indicated Mach number. The instrument is extremely valuable, particularly at high altitudes, as its reading is more closely related to true airspeed than is indicated airspeed. (Refer to "Mach Number" in Section VI.)

ACCELEROMETER.

A three-pointer accelerometer (6, figure 1-4) shows positive and negative G-loads. In addition to the normal indicator pointer, there are two movable recording pointers (one for positive G-loads and one for negative G-loads) that follow the indicator pointer to its maximum travel. The recording pointers remain at the respective maximum travel positions, thus providing a record of maximum G-loads encountered. To return the recording pointers to the normal (1 G) position, it is necessary to press the knob on the lower left corner of the instrument ring.

STAND-BY COMPASS.

A conventional magnetic compass, mounted on the windshield bow to the right of the armor glass, is furnished for navigation in the event of instrument or electrical system failure. Illumination of the stand-by compass is controlled by a switch on the right console, and brilliancy of illumination is controlled by the console lighting rheostat.

J-8 ATTITUDE INDICATOR.*

On most airplanes, visual indication of the flight attitude of the airplane in pitch and roll is provided by the gyro-controlled J-8 attitude indicator (12, figure 1-4 and figure 1-22) on the instrument panel. The unit is electrically operated (three-phase ac) and has an "OFF" indicator flag, which appears in the upper right arc of the dial whenever power is not being supplied or the gyro is not up to speed. Within a range of 27 degrees in a climb or dive, the pitch attitude of the airplane is presented on the indicator by displacement of the horizon bar in relation to the miniature indicator airplane. When the pitch attitude of the airplane exceeds 27 degrees, the horizon bar remains in the extreme position, and the sphere then serves as the reference. If the climb or dive angle is further increased, with the airplane approaching a vertical position, the attitude is shown by graduations on the sphere. During extreme maneuvers, when pitch angle approaches and passes 90 degrees in a dive or climb, a controlled precession of the gyro occurs, causing the sphere and horizon bar to rotate 180 degrees about the roll axis. Thus, correct attitude indication is provided throughout the maneuvering range of the airplane. In a roll, the attitude of the airplane is shown by the angular setting of horizon bar with respect to miniature indicator airplane and by the relation of the bank index to the degree markings on the bezel mask. After certain maneuvers, the attitude indicator will "lag" about 5 degrees upon return to straight-and-level flight. The unit begins to correct these errors immediately.

Warning

A slight amount of pitch error in the indication of the J-8 attitude indicator will result from accelerations or decelerations. It will appear as a slight climb indication after a forward acceleration and as a slight dive indication after deceleration when the airplane is flying straight and level. This error will be most noticeable at the time the airplane breaks ground during the take-off run. At this time, a climb indication error of about 1½ bar widths will normally be noticed; however, the exact amount or error will depend upon the acceleration and elapsed time of each individual take-off. The erection system will automatically remove the error after the acceleration ceases.

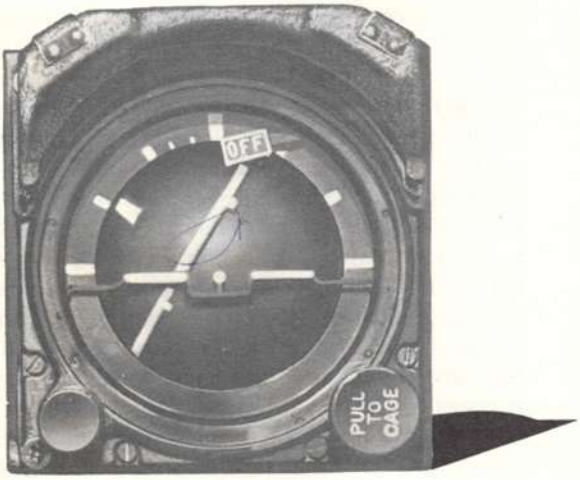
The gyro may be manually caged by use of the caging knob on lower right side of the bezel. Caging is accomplished by *smoothly* pulling the knob away from the instrument and releasing it *quickly* as soon as it reaches the limit of travel. The manual caging feature permits fast gyro erection for scramble take-offs or for correcting in-flight errors caused by turns or aerobatics. For scramble take-offs, 30 seconds should be allowed after power is applied to bring the gyro up to speed, and then the gyro should be caged immediately. When the gyro is caged to correct in-flight errors, caging should be used only when the airplane is in straight-and-level flight as determined by visual reference to a true horizon, since the indicator cages to the attitude of the airplane. A knob on the lower left side of the bezel permits the miniature indicator airplane to be adjusted to compensate for longitudinal trim changes.

MM-2 ATTITUDE INDICATOR.†

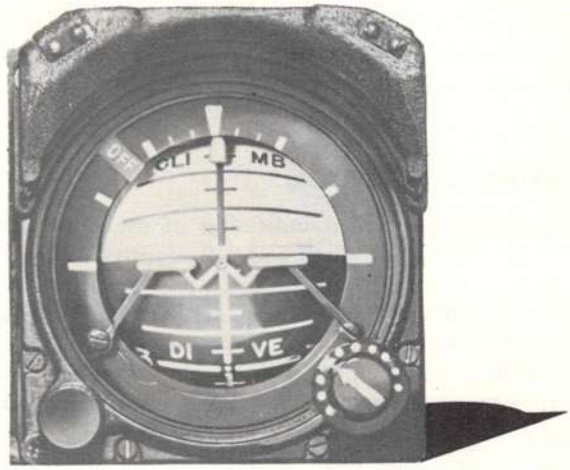
On late airplanes, a visual indication of the flight attitude of the airplane in pitch and roll is provided by the MM-2 attitude indicator which is part of the K-4 attitude indicator system. The synchro-type MM-2 indicator (figure 1-22), on the instrument panel, is electrically controlled by a remote gyro in the K-4 control assembly. The gyro establishes the vertical reference line from which pitch-and-roll deviation is measured. Electrical signals caused by airplane attitude change are relayed to the indicator through the K-4 control assembly. The signals cause displacement of the indicator sphere and horizon bar in relation to a miniature airplane, which is fixed to the indicator case. The amount of displacement is directly proportional to actual airplane attitude change from level flight. The K-4 system is powered from the dc and three-phase ac busses. Erection of the gyro requires between 2 and 2½ minutes after application of power and can be observed by disappearance of the "OFF" power failure flag which is visible through the cover glass of the MM-2 indicator. If more than 2½ minutes is required for the "OFF" flag to disappear and for the indicator to settle down to a steady presentation, the indicator may not be reliable. In addition, any minor oscillation noted in the indicator after the "OFF" flag

***F-86H-1 and F-86H-5 Airplanes, and F-86H-10 Airplanes AF53-1229 through -1468**
†F-86H-10 Airplane AF53-1469 and all later airplanes

J-8 AND MM-2 ATTITUDE INDICATORS



J-8 ATTITUDE INDICATOR
(EARLY AIRPLANES)



MM-2 ATTITUDE INDICATOR
(LATE AIRPLANES)

F-86H-1-51-6C

Figure 1-22

disappears should warrant rejection and denotation in the Form 781. The "OFF" flag will appear in the event of complete dc or three-phase ac power failure.

Warning It is recommended that airplanes not changed by T.O. 1F-86H-620, that are equipped with the MM-2 attitude indicator, not be flown under IFR conditions because a slight reduction in three-phase ac or dc power, or failure of certain components in the K-4 system will not cause the "OFF" flag to appear, even though the indicating system is not functioning properly. If IFR flight is required, periodically check the attitude indications given by the MM-2 against other flight instruments, such as the directional indicator and turn-and-slip and vertical velocity indicators. If malfunction is suspected when flying under IFR conditions, disregard indications of the attitude indicator and attempt to alter the flight path to an area of VFR conditions.

The indicating system is operative through 360 degrees of pitch and roll and is not likely to tumble, even during extreme maneuvers. It is so designed that, as the airplane approaches and passes through 90 degrees of dive or climb, the gyro (and consequently the indicator) precesses 180 degrees about the airplane roll axis. Thus, correct attitude indication is provided throughout the maneuvering range of the airplane. Indication error for the system is less than ½ degree in level flight, and, up to a turn rate of 40 degrees per minute, the indication error compares to that of a conventional attitude indicator. In turns of more than 40 degrees per minute, a compensating mechanism in the system limits turn error indication to 2 degrees.

Warning A slight amount of pitch error in the indication of the MM-2 indicator will result from accelerations or decelerations. It will appear as a slight climb indication after a forward acceleration and as a slight dive indication after deceleration when the airplane is flying straight and level. This error will be most noticeable at the time the airplane breaks ground during the take-off run. At this time, a climb indication error of about 1½ horizon bar widths will normally be noticed; however, the exact amount of error will depend upon the acceleration and elapsed time of each individual take-off. The erection system will automatically remove the error after the acceleration ceases.

The gyro does not have a manual caging knob. When power is turned off, a snubber automatically grips the gimbal and keeps it from tumbling. When power is turned on, the snubber is released after a 15-second time delay. As level-flight pitch attitude of the airplane varies with different loadings and speeds, a pitch trim knob is provided on the indicator for the pilot to center the horizon bar and sphere after the airplane has been trimmed for level flight.

ALTIMETER.

The altimeter (figure 1-23) has three pointers: 100-foot, 1000-foot, and 10,000 foot. The 10,000-foot pointer incorporates an extension, which cannot be obscured by the other pointers, and a notched disk. At altitudes below 16,000 feet, the notched disk will move to expose a set of warning stripes. Thus, the altimeter offers improved readability and warns visually when altitudes under 16,000 feet are entered.

TURN-AND-SLIP INDICATOR.

The conventional turn-and-slip indicator (26, figure 1-4), on the instrument panel, is electrically driven by power from the primary bus.

DIRECTIONAL INDICATOR (SLAVED).

Refer to "Navigation Equipment" in Section IV.

EMERGENCY EQUIPMENT.

ENGINE FIRE AND OVERHEAT DETECTOR SYSTEM.

Two fire and overheat detector systems detect and show fire or overheat conditions in the forward or aft engine compartment. (The forward engine compartment, which includes the compressor section, and the aft compartment, which includes the combustion chambers and the tail pipe, are divided by a fire wall at the engine mid-frame.) The system consists of overheat detector units, mounted throughout the engine and engine compartments, and warning lights and a test switch in the cockpit. No fire extinguisher system is installed.

Overheat Warning Lights.

An abnormal temperature rise in the engine compressor compartment is shown by illumination of a red warning light labeled "FIRE ENGINE COMPR. COMP." (See figure 1-14.) An unsafe overheat temperature in the aft engine compartment is shown by illumination of an amber light labeled "OVERHEAT AFT FUS." (See figure 1-14.) The two lights are on the right forward switch panel. Operation of the system and the lights can be checked by a switch next to the lights. When the switch is held at the TEST position, the warning lights should come on. The switch is spring-loaded to the unmarked position. The lights are of the push-to-test type, permitting a check of bulb illumination independent of the system operation check, and are powered from the primary bus.

ALTIMETER

F-86H-1-51-7B FS-67

Figure 1-23

CANOPY.

The electrically operated clamshell canopy, which opens and closes by rotating about a hinge point at the rear, may be controlled either from the cockpit or outside of the airplane. From the closed position, the canopy slides aft about one inch to clear the canopy hold-down hooks before rising to the open position (32 degrees); when closing, the reverse is true. The reversible electric actuator is powered from the primary bus if external power is connected to the airplane or the engine is running; otherwise, it is powered from the battery bus, so that the canopy is operable regardless of the battery switch position. Provision is made also for manual operation of the canopy. In flight, emergency release of the canopy is accomplished by a remover, which fires the canopy up and aft from the airplane. If the canopy does not jettison, the seat may be ejected through the canopy. The airplane may be taxied at speeds up to 50 knots IAS with the canopy open. A warning light comes on whenever the canopy is in any position except latched fully closed.

Canopy Seal.

Pressure for inflation of the canopy seal, which seals the canopy in the closed position, is provided by air from the engine compressor section and is automatically controlled by a pressure regulator. The seal is automatically inflated whenever the canopy is fully latched and the engine is running. When the canopy is unlocked, the seal is automatically deflated to allow the canopy to move. The seal is automatically deflated before canopy ejection.

CANOPY CONTROLS AND INDICATOR.

Canopy External Control Buttons.

The canopy is operated externally by means of two electrical spring-loaded push buttons (26, figure 1-1) on each side of the fuselage, about 3½ feet below and in line with the windshield bow. One button is marked "OPEN," and the other, "CLOSE." Pressing either button results in corresponding operation of the canopy.

Canopy Switch.

The canopy is controlled from within the cockpit by a three-position toggle switch (figure 1-19), on the left forward switch panel. The switch is spring-loaded to the OFF position. To close the canopy, the switch must be held at the CLOSE position until the canopy-unlocked warning light goes out. This will ensure that canopy is fully closed and hold-down hooks are engaged. (Limit switches cut off the power when the canopy locks.) Holding the switch at the OPEN position energizes the actuator to open the canopy; switch must be held at OPEN until the canopy reaches the fully open position, when limit switches automatically cut off power to the canopy actuator. When the switch is at its OFF (center) position, the canopy is safe for taxiing, whether open, partly open, or closed.

Canopy Manual Release Handle.

A handle (figure 1-24) on the right side of the cockpit, recessed in the canopy frame, is used for pulling the canopy open on the ground if it cannot be opened electrically. The handle releases the canopy from the hold-down hooks and from the actuator with the canopy in any position. When the handle is pulled out from the recessed position, the hooks are released from the drag rollers and actuator so that the canopy can be manually pulled back and lifted to the open position or off the airplane. The canopy will latch and remain open, when opened manually, if raised slightly above the normal open position.

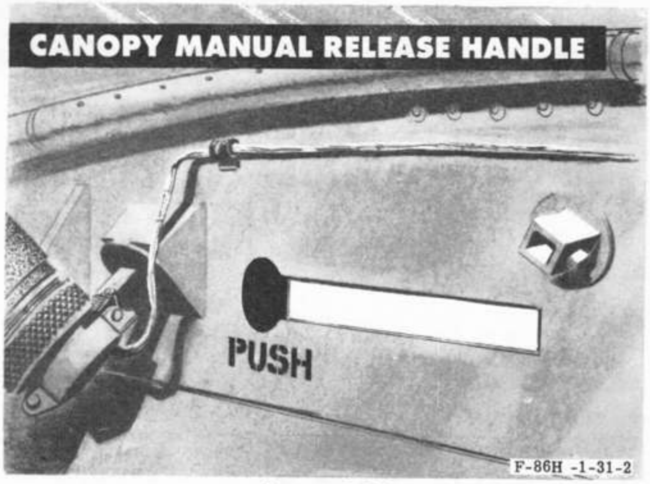


Figure 1-24

Canopy Emergency Release (Ejection Seat Armrests).

When the armrest on the ejection seat is pulled full up in preparation for seat ejection, the canopy remover is fired to jettison the canopy for emergency bail-out. (The canopy can be jettisoned at any airspeed or airplane attitude.) The canopy remover is actuated by an initiator and exactor system. Raising either armrest to its full up position moves the canopy initiator lever which fires a cartridge within the initiator unit located in the right console. The expanding gases thus produced are discharged to the exactor unit on the canopy remover catapult. A piston in the exactor is moved by the gas pressure and pulls the sear pin from the canopy remover, causing the remover to fire and jettison the canopy.

Warning A ground safety pin in the canopy initiator (in the right console) prevents the canopy remover from being fired accidentally while the airplane is on the ground. The pin must be removed before flight and stowed in the fabric container aft of the seat headrest. After flight, the safety pin must be replaced in the initiator.

Canopy External Emergency Release Handle.

If electrical operation of the canopy fails or cannot be used, the canopy can be opened on the ground from the outside of the airplane by the canopy external emergency release handle. The handle releases the canopy from the hold-down hooks and from the actuator with the canopy in any position. The emergency release handle is painted yellow and is recessed in the canopy frame on the left side. When opened, the handle can be pulled back to release the hooks from the drag rollers, and the canopy can then be lifted to the open position or off the airplane. The canopy will latch and remain open, when opened manually, if raised slightly above the normal open position.

Canopy-Unlocked Warning Light.

Whenever the canopy is in any position except locked closed (battery switch ON, generator operating, or external power connected), the canopy-unlocked warning light (figure 1-19), on the left forward switch panel, comes on. The warning light, marked "UNLOCKED," operates on primary bus power.

EJECTION SEAT.

An ejection seat (figure 1-25) permits emergency ejection at any speed or flight attitude. An explosive-cartridge-type catapult is mounted vertically behind the seat and, when fired, supplies the necessary propulsion to eject the seat and pilot from the airplane. The seat is adjustable vertically. If additional height in the seat is needed when the one-man life raft or survival kit is carried, use a solid filler block, provided the combined thickness does not exceed 5 inches.

Warning Do not use the A-5 seat cushion, or any other sponge rubber cushion, when equipped with a one-man life raft or survival kit. If ejection is necessary, serious spinal injuries can result when the ejection force compresses the cushion and enables the seat to gain considerable momentum before exerting a direct force on the pilot. Also with additional padding, the chance of injury during a forced landing is increased.

Raising the seat armrests, which are mechanically connected and rise at the same time, locks the shoulder harness, lifts both triggers to cocked position, and fires the canopy. When either trigger is squeezed, an initiator on the respective armrest is actuated mechanically and delivers gaseous pressure to the pneumatically operated catapult firing mechanism, firing the catapult. The seat has an automatic-opening safety belt, and accommodates a back-type parachute. The radio lead and the anti-G suit and oxygen hoses are fitted into a single disconnect on the forward edge of the seat, between the footrests. The airplane is equipped with a high-impedance headset adapter that provides the impedance necessary to allow the use of the P-4 helmet with existing radio equipment. If a P-3 helmet is worn, the radio lead from the P-3 helmet must be plugged into an MX-1615 adapter jack above the left armrest on the ejection seat. When the seat is ejected, these connections are automatically disconnected at the disconnect assembly.

EJECTION SEAT CONTROLS.

Seat Armrests.

When either armrest is raised to its full up position, the canopy is ejected by the canopy remover. The armrests are connected so that when one armrest is raised, the other rises at the same time. Raising the armrests also locks the shoulder harness and cocks the triggers. Each armrest has a spring-loaded latch which prevents the armrest from accidentally rising out of its stowed (full down and latched) position and possibly jettisoning the canopy and exposing the ejection trigger. The restraining action of the latch can be readily overcome if ejection is necessary. To help you determine that the armrests are full down and latched, there is a white stripe on each end of the front face of the seat bucket and a matching white stripe on the inner face of each trigger guard. When these stripes are in perfect alignment, the armrests are full down and latched. In addition, the inside face of each armrest bracket is painted with alternate red and white stripes. If these stripes are not visible above the top of the seat bucket, the armrests are full down and latched.

Seat Catapult Triggers.

A seat catapult trigger is located within a guard in the lower portion of each seat armrest. As the armrests are raised to the full up position, the triggers are raised out of the guards. The armrests locks in the full up position, and the triggers are then in the firing position, within

EJECTION SEAT

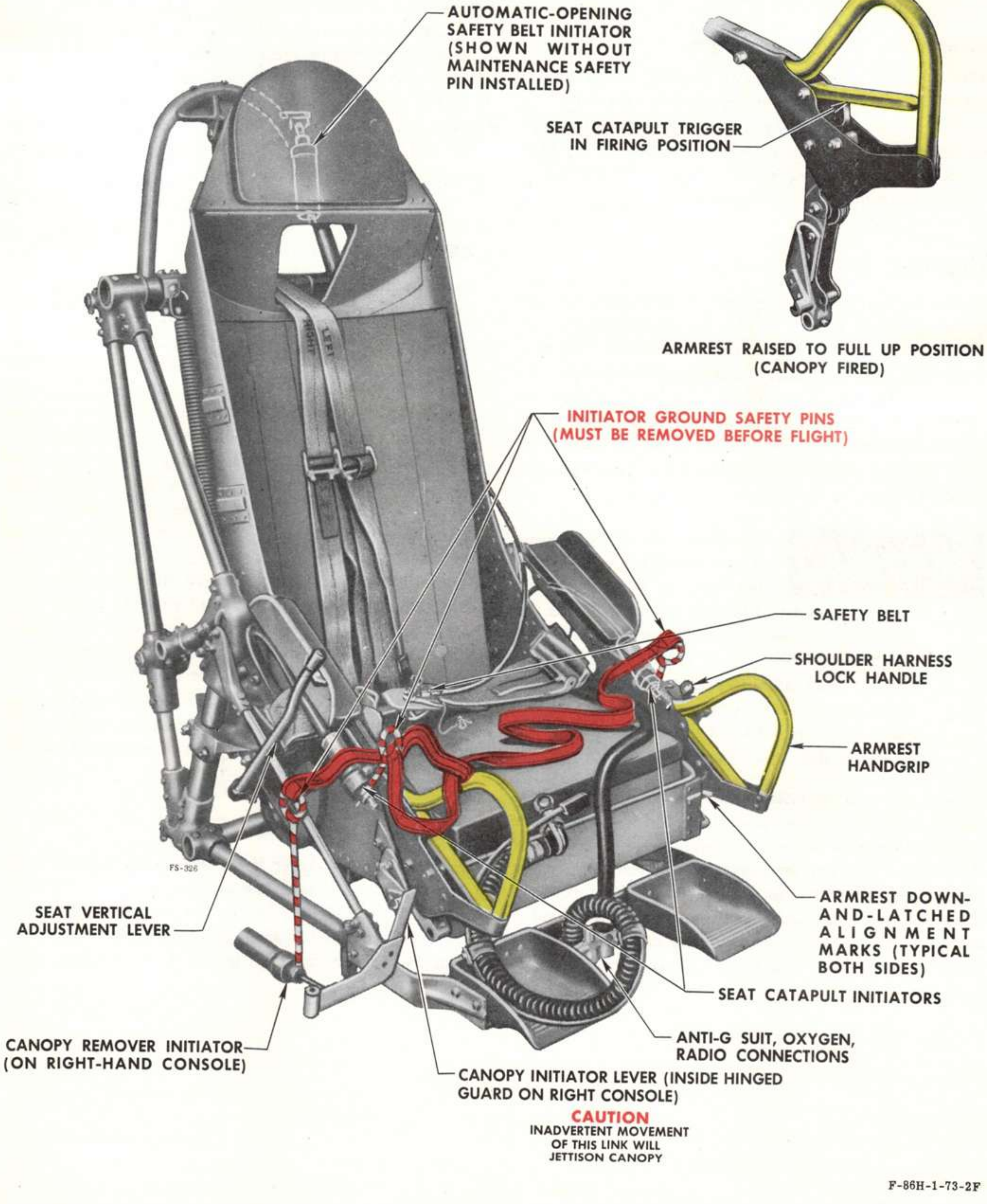


Figure 1-25

reach of the fingers. Squeezing the trigger in either handgrip fires a cartridge in its respective initiator. The gases produced by this action are transmitted to the ejection seat catapult. The pressure of the expanding gases actuates the striker pin, which fires the seat catapult cartridge, ejecting the seat.

Warning

Ground safety pins in the initiators, located on either side of the seat armrests, prevent the seat catapult from being fired accidentally while the airplane is on the ground. The pins must be removed before flight and stowed in the pouch behind the seat headrest. After flight, the safety pins must be replaced in the initiators.

- The seat catapult is armed whenever an initiator ground safety pin is removed.

The seat ejection system is independent of the canopy jettison system. If raising the armrests fails to release the canopy, the seat will be ejected through the canopy when the trigger is squeezed.

Seat Vertical Adjustment Lever.

Seat adjustment is accomplished mechanically by operation of the seat vertical adjustment lever, located on the right side of the seat. Pushing the lever forward to the unlocked position releases the seat for adjustment. With the lever at this position, the spring-loaded seat is raised when the pilot lifts his weight off the seat by using the handhold on the windshield bow, left of the armor glass. When the desired adjustment is obtained the lever should be moved aft to the locked position which is shown by the alignment of the white pin on the adjustment lever with the white index marker on the armrest side panel.

Warning

When adjusting the seat on the ground, the handle must not be moved to the unlocked position if the seat is not occupied. Release of the empty seat may cause the handgrips to spring up and jettison the canopy if the ground safety pin is not in the canopy initiator.

- After adjusting seat, check that adjustment lever is locked (white pin on lever and white index marker on armrest side panel aligned). If seat is not locked, G-loads in flight may cause it to move, possibly allowing armrests to raise and jettison canopy.

Shoulder Harness Lock Handle.

The shoulder harness inertia reel lock handle, on the left side of the seat, outboard of the left armrest, is used to manually lock and unlock the shoulder harness. The

F-86H-1-0-14A

CAUTION

Before a forced landing, cut engine master, generator, and battery switches, which are not readily accessible with the shoulder harness locked.

shoulder-harness inertia reel is actuated mechanically when the top of the handle is moved fore and aft. Forward is the locked position; aft is unlocked. It is recommended that the shoulder harness be locked manually during maneuvers and flight in rough air, or as a safety precaution in event of a forced landing. The shoulder harness is locked automatically when either handgrip on the seat is raised during seat ejection.

NOTE Because of the design characteristics of the shoulder-harness inertia reel, there is no preflight check to be made. The shoulder harness inertia reel will automatically lock under a 2 to 3 G forward deceleration, as in a crash landing. Pulling on the shoulder harness straps by hand will not check the inertia reel.

If the harness is manually locked while the pilot is leaning forward, the harness will retract with him as he straightens up, moving into successive locked positions as he moves back against the seat. To unlock the harness, the pilot must be able to lean 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. After automatic locking of the harness, it will remain locked until the handle is moved to LOCKED (forward) position and then back to UNLOCKED.

SAFETY BELT.

The airplane is equipped with an MA-1, MA-3, MA-4, MA-5, or MA-6 automatic-opening safety belt. The primary purpose of the automatic belt is to raise the maximum and lower the minimum altitudes at which escape may be successfully accomplished with the ejection seat. In high-altitude ejections (above 15,000 ft), use of the automatic belt *in conjunction with the automatic-opening parachute* avoids parachute deployment at an altitude where sufficient oxygen would not be available to permit safe parachute descent. In a low-altitude ejection, use of the automatic belt greatly reduces the time required for separation from the seat. If an automatic parachute is used in conjunction with the automatic belt, the time for full parachute deployment also is reduced. Consequently, use of the automatic belt and automatic parachute would lower the altitude required for safe ejection. Until you have become thoroughly familiar with the automatic belt and have been convinced that the automatic belt has been designed to save your life, you may have a tendency to distrust the automatic feature and feel that you can only be sure of its operation by manually operating it. However, the automatic belt has been thoroughly tested and is completely reliable. *Under no circumstances should the automatic belt be manually opened prior to ejection, regardless of altitude.* No matter how fast your reactions are, you cannot beat the automatic operation. Prior to the use of automatic belts, instructions were issued that when ejection was necessary below 2000 feet above the terrain the conventional safety belt should be opened manually prior to ejection. However, manual release of automatic belts is not only undesirable, but dangerous. The escape operation using the automatic feature is not only faster, since the belt automatically opens 2 seconds after ejection, but it also protects the pilot from severe injury at high speeds. (If the airplane is equipped with an M-12 automatic belt initiator, the belt opens one second after ejection.) Since the drag-to-weight ratio of the seat is considerably greater than that of the pilot, immediate separation would result if the belt were opened manually prior to ejection. This could result in accidental opening of the parachute due to the pack being blown open, and the high opening shock of the parachute could cause serious or fatal injuries. So remember, *the automatic operation can't be beaten.*

MA-1, MA-3, and MA-4 Automatic Safety Belts.

The Type MA-1, MA-3, or MA-4 automatic safety belt is a cartridge-operated device designed for use with the same webbing and fittings as used with the standard B-18 (manual) safety belt, but differs in the center section or release portion of the belt. Release of the MA-1, MA-3, or MA-4 belt is accomplished either by manual operation by the pilot or by gas pressure from a separate automatically controlled source, the M-4 (or M-12) initiator on the back of the seat. The initiator supplies approximately 1500 psi pressure through a high-pressure hose which actuates a piston inside the belt, retracting the latch tongue and releasing the link. The release incorporates a key which is attached to a lanyard leading to the automatic rip cord release. The key provides an anchor for the static line to the timer of the automatic parachute. The release is so designed that the belt cannot be locked until the key is first inserted into the belt locking mechanism. This is a feature of the design so that the pilot will not neglect to tie in the automatic parachute into the system. Use of the key is necessary for proper operation of the automatic belt. If the automatic parachute is used, the key attached to the parachute lanyard is inserted into the belt locking mechanism. If the automatic parachute is not used, a spare key which is attached to the automatic belt must be inserted into the belt locking mechanism. (This spare key must not be removed from the belt.) When the belt is manually opened, the key is ejected automatically so that inadvertent actuation of the automatic parachute will not occur. During automatic operation of the safety belt, the key remains firmly locked in the belt release, thereby arming the automatic parachute timer as the pilot separates from the seat. Manual operation of the automatic belt can override the automatic function at any time. For example, it is possible to manually open the belt even though initiator action has started. The parachute automatic feature may likewise be overridden by manually pulling the "D" ring even though the automatic parachute rip cord release has been actuated.

Warning

If the safety belt is opened manually, the parachute must be opened manually (for automatic-opening parachutes, the aneroid-timer arming lanyard should be pulled to open parachute if above 14,000 feet).

Figure 1-26 shows the MA-1 automatic belt closed with shoulder harness attached, automatically opened, and manually opened. Figure 1-27 shows the MA-3 or -4 automatic belt for the same conditions.

MA-5 and MA-6 Automatic Safety Belts.

The MA-5 and MA-6 automatic safety belts are similar in design and function to the MA-1, MA-3, and MA-4 belts. However, the MA-5 and MA-6 belts have a swivel link. When the belt is fully locked, the swivel is attached on one end to the manual release lever and on the other end to the automatic release. The swivel link is detached from the automatic release by actuation of the automatic release initiator. In addition, the MA-5 and MA-6 belts are designed to retain a ring-type anchor for actuating the automatic parachute, in place of a key. It is not mechanically necessary that the anchor, which slips over the manual release end of the swivel link, be used to close the belt. However, when the MA-5 or MA-6 belt is used in conjunction with an automatic parachute, the ring-type anchor *must* be attached to the parachute arming lanyard and then slipped over the swivel link in order for the parachute to function automatically when ejection is necessary. Figure 1-28 shows the MA-5 or MA-6 belt closed with shoulder harness and automatic parachute anchor attached, automatically opened, and manually opened. Manual operation of the automatic belt can override the automatic function at any time. For example, it is possible to manually open the belt even though initiator action has started. The parachute automatic feature may likewise be overridden by manually pulling the "D" ring even though the automatic parachute rip cord release has been actuated.

Warning If the safety belt is opened manually, the parachute *must* be opened manually (for automatic-opening parachutes, the aneroid-timer arming lanyard should be pulled to open parachute if above 14,000 feet).

LOW-ALTITUDE ESCAPE EQUIPMENT.

To provide an improved low-altitude escape capability, a system incorporating a one-second safety belt initiator and a zero-second parachute (1-0 system) has been developed. The zero-second parachute delay is accomplished by means of a hook and lanyard which is attached to the parachute arming lanyard at one end and can be attached to the parachute "D" ring. (See figure 1-29.)

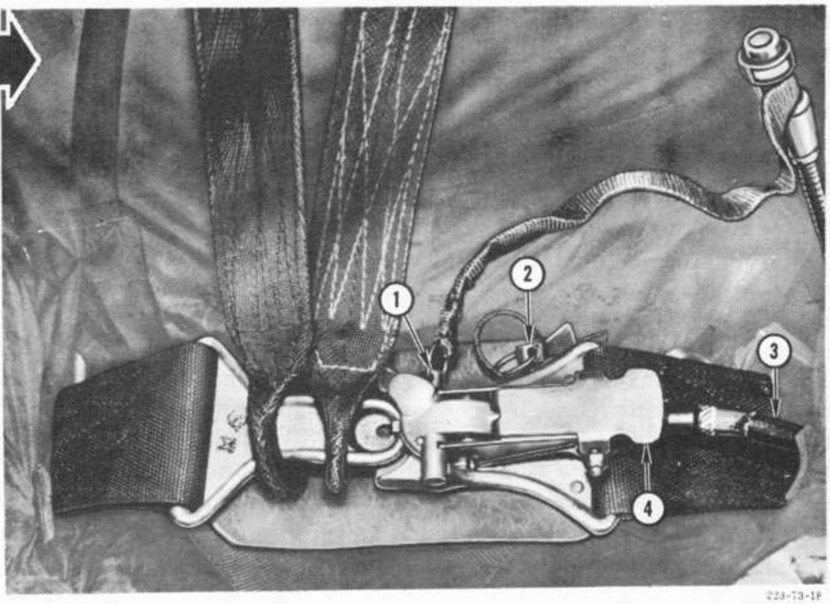
NOTE The "D" ring hook and lanyard may be installed on the parachute before the one-second safety belt initiator is installed on the airplane. This will temporarily provide a 2-0 system, with higher minimum safe ejection altitudes.

The 1-0 system makes use of a detachable hook and lanyard that connects the parachute timer lanyard to the parachute "D" ring. At very low altitude and airspeeds, the hook must be connected to the "D" ring, thus providing parachute actuation immediately after separation from the ejection seat. At other altitudes and airspeeds, the hook must be disconnected from the "D" ring, thus allowing the parachute timer to actuate the parachute below the critical parachute opening speed and below the parachute timer altitude setting. A ring attached to the parachute harness is provided for stowage of the hook when it is not connected to the "D" ring. This hookup must be done manually. The hook configuration shown in figure 1-29 is one of several which will be in service use. Although each configuration differs in appearance, the attaching positions are the same. Figure 3-5 shows a plot of three parameters: altitude, speed, and sequence time of the parachute—automatic safety belt combination. The graph indicates safe ejection speeds with regard to parachute capability and body injury because of parachute opening shock. The sequence lines (slanting lines) indicate the limits above which the parachute will probably be damaged on opening or the pilot will probably suffer body injury resulting from deceleration effects. The lower chart of figure 3-5 shows the minimum altitude for a successful ejection with different combinations of automatic safety belt and automatic parachute timing sequence.

AUXILIARY EQUIPMENT.

Information concerning the following auxiliary equipment is supplied in Section IV: cockpit air conditioning and pressurization system; defrosting and rain and ice removal systems; communication and associated electronic equipment; lighting equipment; oxygen system; navigation equipment; armament equipment; and miscellaneous equipment.

MA-1 AUTOMATIC-OPENING SAFETY BELT



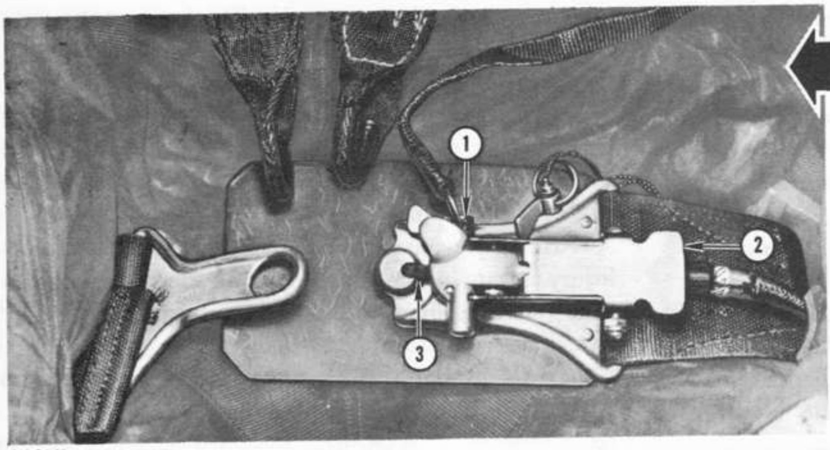
LOCKED

1. Belt locking key (attached to automatic parachute arming lanyard) inserted in belt locking mechanism.

WARNING

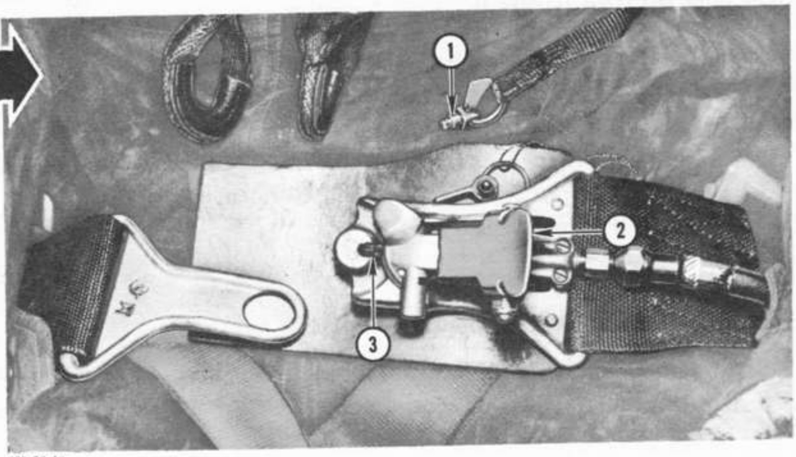
- This key must be used when an automatic parachute is worn, in order for the parachute to function automatically if ejection is necessary. Be sure the key is properly inserted and will not pull out.
- Lanyard must be outside parachute harness and not fouled on any equipment, to permit clean separation from seat.

2. Belt locking key (attached to belt). Used to close belt only when automatic parachute is *not* worn.
3. Initiator hose.
4. Manual release lever closed (shown with NAA type handle extension).



AUTOMATICALLY OPENED

1. Belt locking key (from automatic parachute arming lanyard) retained in belt locking mechanism.
2. Manual release lever closed.
3. Belt latch opened by gas pressure from initiator.



MANUALLY OPENED

1. Belt locking key ejected from locking mechanism when manual release lever is opened.

WARNING

If automatic parachute is worn and belt is manually opened during ejection, parachute will *not* open automatically upon separation from seat.

2. Manual release lever opened.
3. Belt latch opened by manual release lever.

NOTE

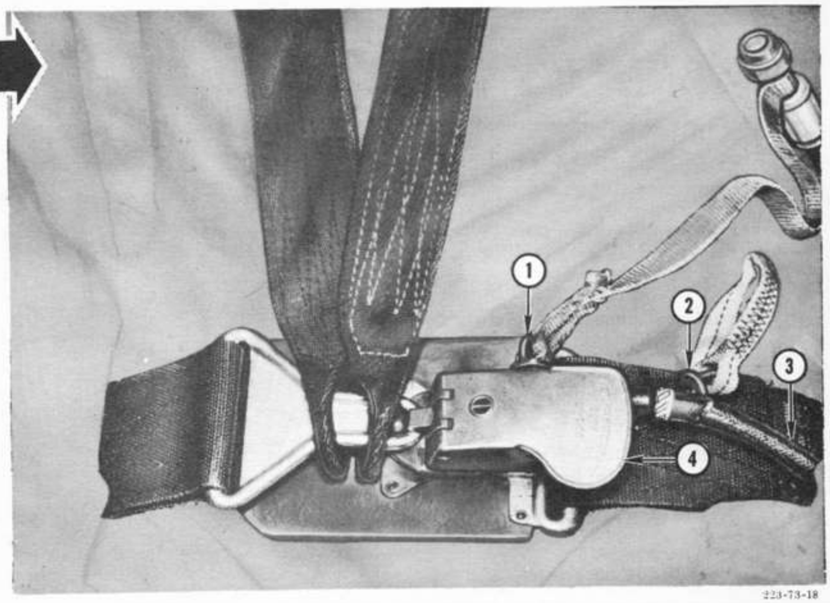
Manual release lever can be used to unlock belt at any time, even if automatic-opening sequence already has been initiated.

F-86H-1-73-13A

Figure 1-26

MA-3 OR MA-4 AUTOMATIC-OPENING SAFETY BELT

LOCKED

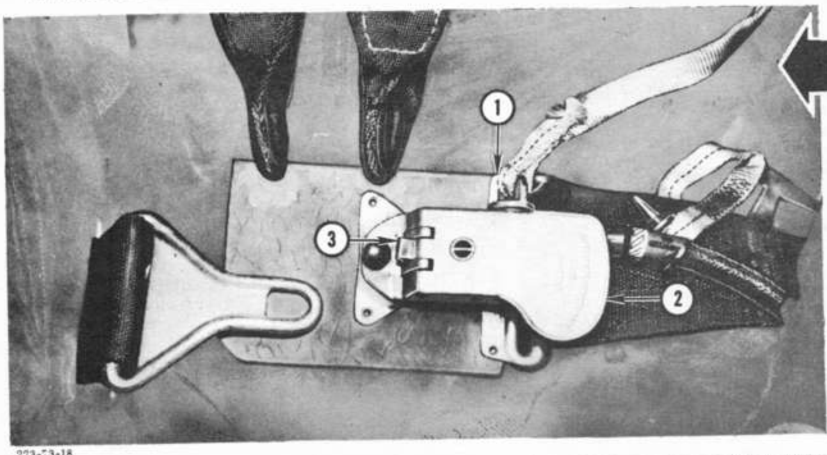


1. Belt locking key (attached to automatic parachute arming lanyard) inserted in belt locking mechanism.

WARNING

- This key must be used when an automatic parachute is worn, in order for the parachute to function automatically if ejection is necessary. Be sure the key is properly inserted and will not pull out.
- Lanyard must be outside parachute harness and not fouled on any equipment, to permit clean separation from seat.

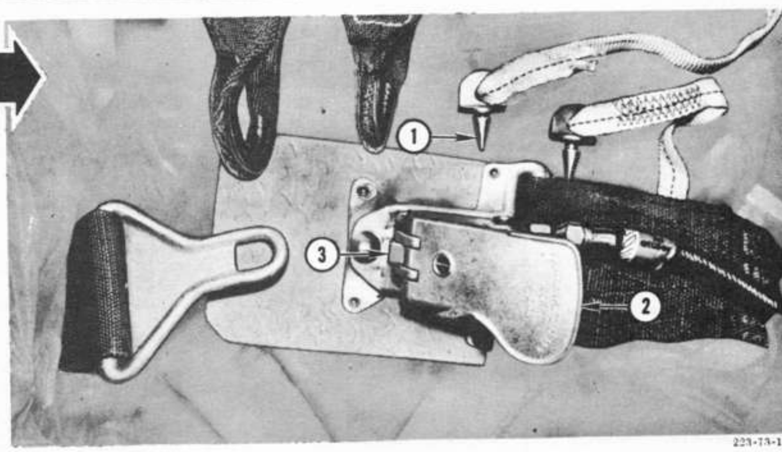
2. Belt locking key (attached to belt). Used to close belt only when automatic parachute is *not* worn.
3. Initiator hose.
4. Manual release lever closed.



AUTOMATICALLY OPENED

1. Belt locking key (from automatic parachute arming lanyard) retained in belt locking mechanism.
2. Manual release lever closed.
3. Belt latch opened by gas pressure from initiator.

MANUALLY OPENED



1. Belt locking key ejected from locking mechanism when manual release lever is opened.

WARNING

If automatic parachute is worn and belt is manually opened during ejection, parachute will *not* open automatically upon separation from seat.

2. Manual release lever opened.
3. Belt latch opened by manual release lever.

NOTE

Manual release lever can be used to unlock belt at any time, even if automatic-opening sequence already has been initiated.

F-86H-1-73-14A

Figure 1-27

MA-5 OR MA-6 AUTOMATIC-OPENING SAFETY BELT

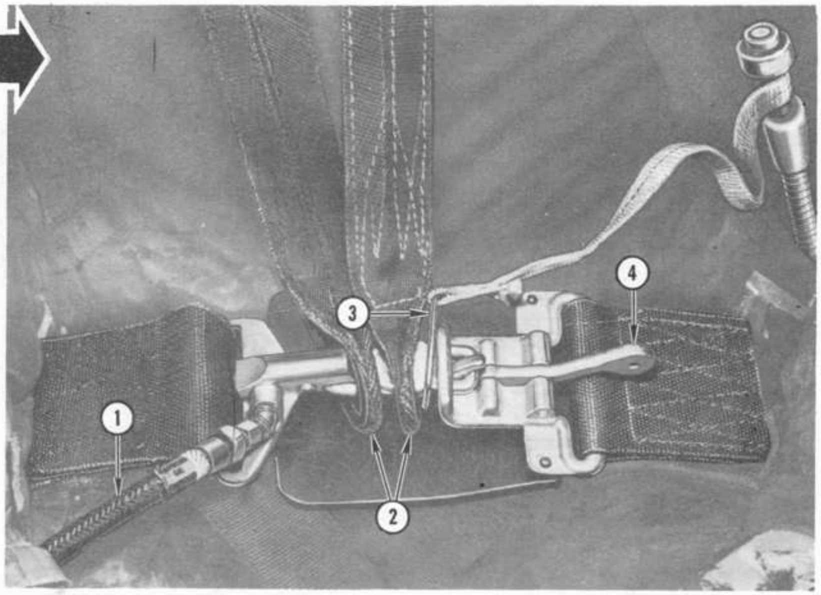
LOCKED

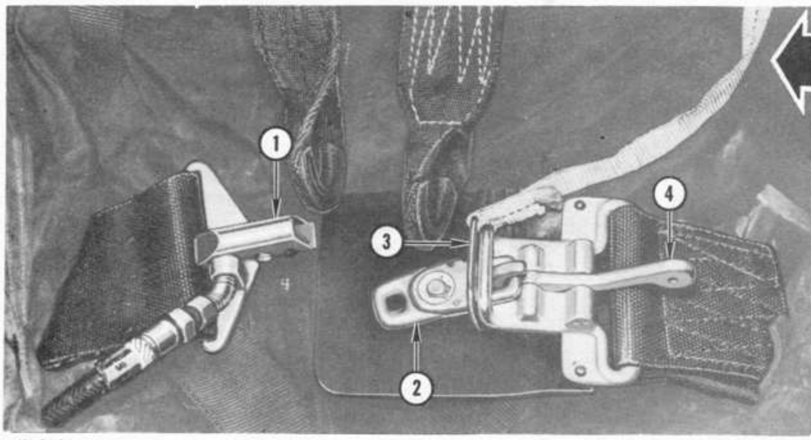
1. Initiator hose to automatic release mechanism.
2. Shoulder harness loops over swivel link.
3. Anchor (from automatic parachute arming lanyard) slipped over swivel link.

WARNING

- Although not necessary to close belt, anchor must be installed, when automatic parachute is worn, so that parachute will function automatically if ejection is necessary.
- Lanyard must be outside parachute harness and not fouled on any equipment, to permit clean separation from seat.

4. Manual release lever closed.





AUTOMATICALLY OPENED

1. Automatic release mechanism actuated by gas pressure from initiator, detaching swivel link on automatic release side.
2. Swivel link retained by manual release lever.
3. Anchor (from automatic parachute arming lanyard) retained by swivel link.
4. Manual release lever closed.

MANUALLY OPENED

1. Swivel link released by manual release lever (automatic release mechanism not actuated).
2. Anchor (from automatic parachute arming lanyard) freed from swivel link.

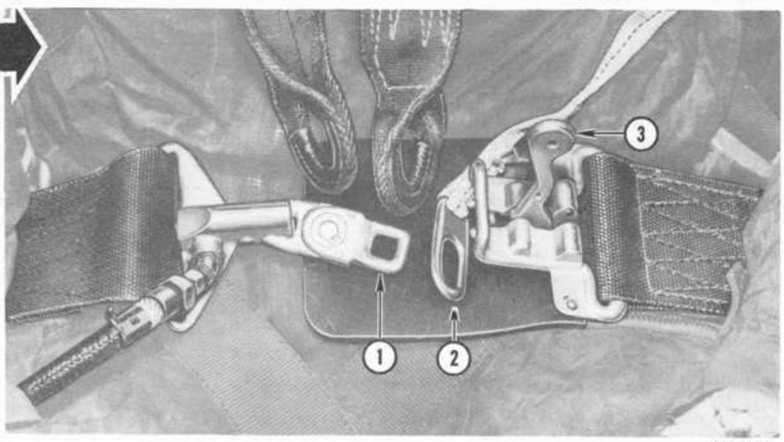
WARNING

If automatic parachute is worn and belt is manually opened during ejection, parachute will not open automatically upon separation from seat.

3. Manual release lever opened.

NOTE

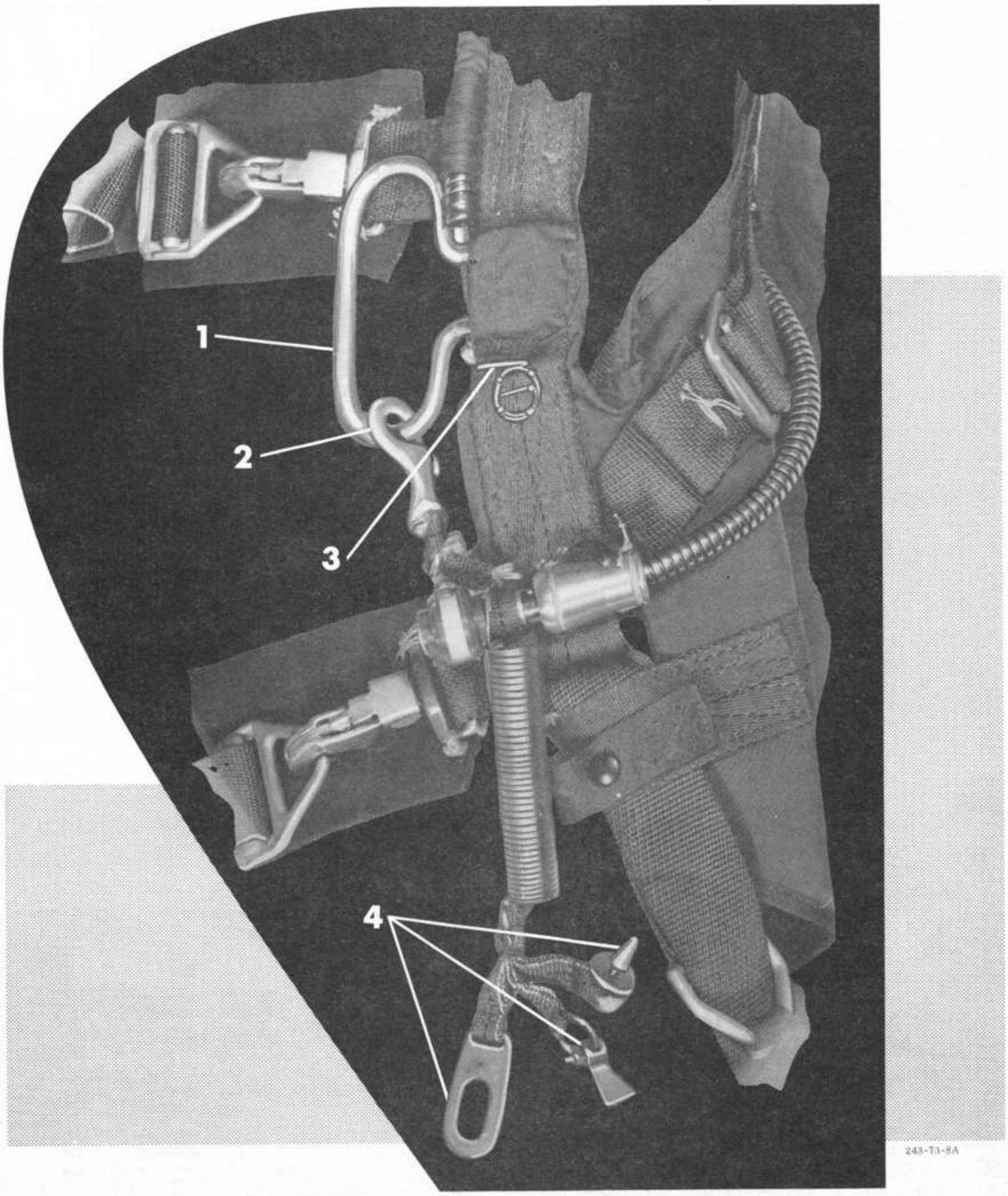
Manual release lever can be used to unlock belt at any time, even if automatic-opening sequence has been initiated.



F-86H-1-73-12

Figure 1-28

PARACHUTE ARMING LANYARD AND "D" RING HOOKUP



NOTE

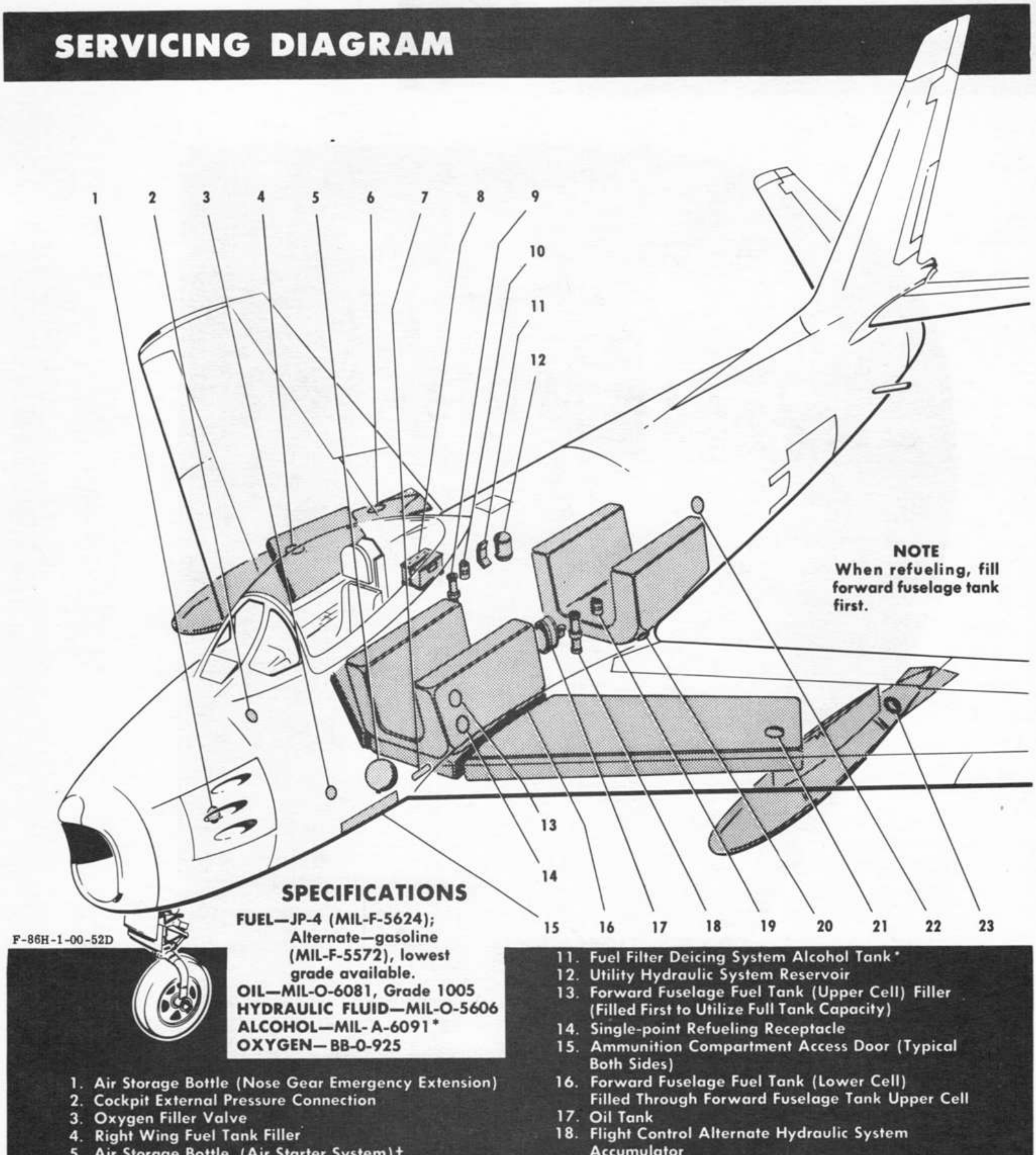
If manual parachute is used, zero-second hookup is accomplished with a special lanyard which hooks to parachute "D" ring at one end and attaches to belt (by anchor or key) at the other end.

F-86H-1-73-16

1. Parachute "D" ring.
2. Hook attached to "D" ring before take-off and landing.
3. Retain hook in this ring after take-off.
4. Automatic safety belt keys and anchor.

Figure 1-29

SERVICING DIAGRAM



NOTE
When refueling, fill forward fuselage tank first.

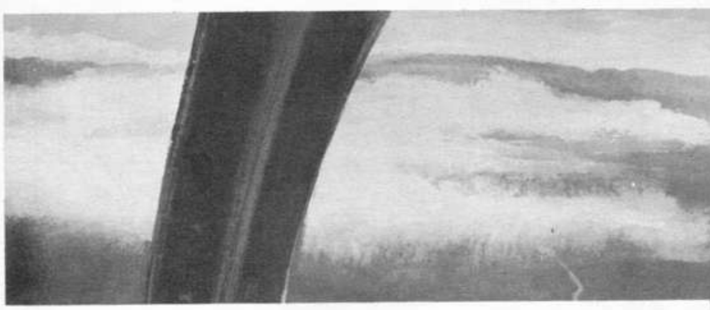
SPECIFICATIONS

FUEL—JP-4 (MIL-F-5624); Alternate—gasoline (MIL-F-5572), lowest grade available.
OIL—MIL-O-6081, Grade 1005
HYDRAULIC FLUID—MIL-O-5606
ALCOHOL—MIL-A-6091*
OXYGEN—BB-0-925

1. Air Storage Bottle (Nose Gear Emergency Extension)
2. Cockpit External Pressure Connection
3. Oxygen Filler Valve
4. Right Wing Fuel Tank Filler
5. Air Storage Bottle (Air Starter System)†
6. Right Drop Tank Filler
7. Starter External Air Supply Connection
8. Battery
9. Flight Control Normal Hydraulic System Accumulator
10. Flight Control Normal Hydraulic System Reservoir
11. Fuel Filter Deicing System Alcohol Tank*
12. Utility Hydraulic System Reservoir
13. Forward Fuselage Fuel Tank (Upper Cell) Filler (Filled First to Utilize Full Tank Capacity)
14. Single-point Refueling Receptacle
15. Ammunition Compartment Access Door (Typical Both Sides)
16. Forward Fuselage Fuel Tank (Lower Cell) Filled Through Forward Fuselage Tank Upper Cell
17. Oil Tank
18. Flight Control Alternate Hydraulic System Accumulator
19. Flight Control Alternate Hydraulic System Reservoir
20. Electrical External Power Receptacle
21. Left Wing Fuel Tank Filler
22. Aft Fuselage Fuel Tank Filler
23. Left Drop Tank Filler

*F-86H-1 Airplanes AF52-1975 Through -1983
†F-86H-5 and later airplanes have two air storage bottles, located forward of the ammunition compartments.

Figure 1-30



NORMAL PROCEDURES

TABLE OF CONTENTS PAGE

PREPARATION FOR FLIGHT.

FLIGHT RESTRICTIONS.

Refer to Section V for airplane and engine operating limitations.

FLIGHT PLANNING.

Refer to Appendix I for performance data necessary in systematically planning the proposed flight.

TAKE-OFF AND LANDING DATA CARDS.

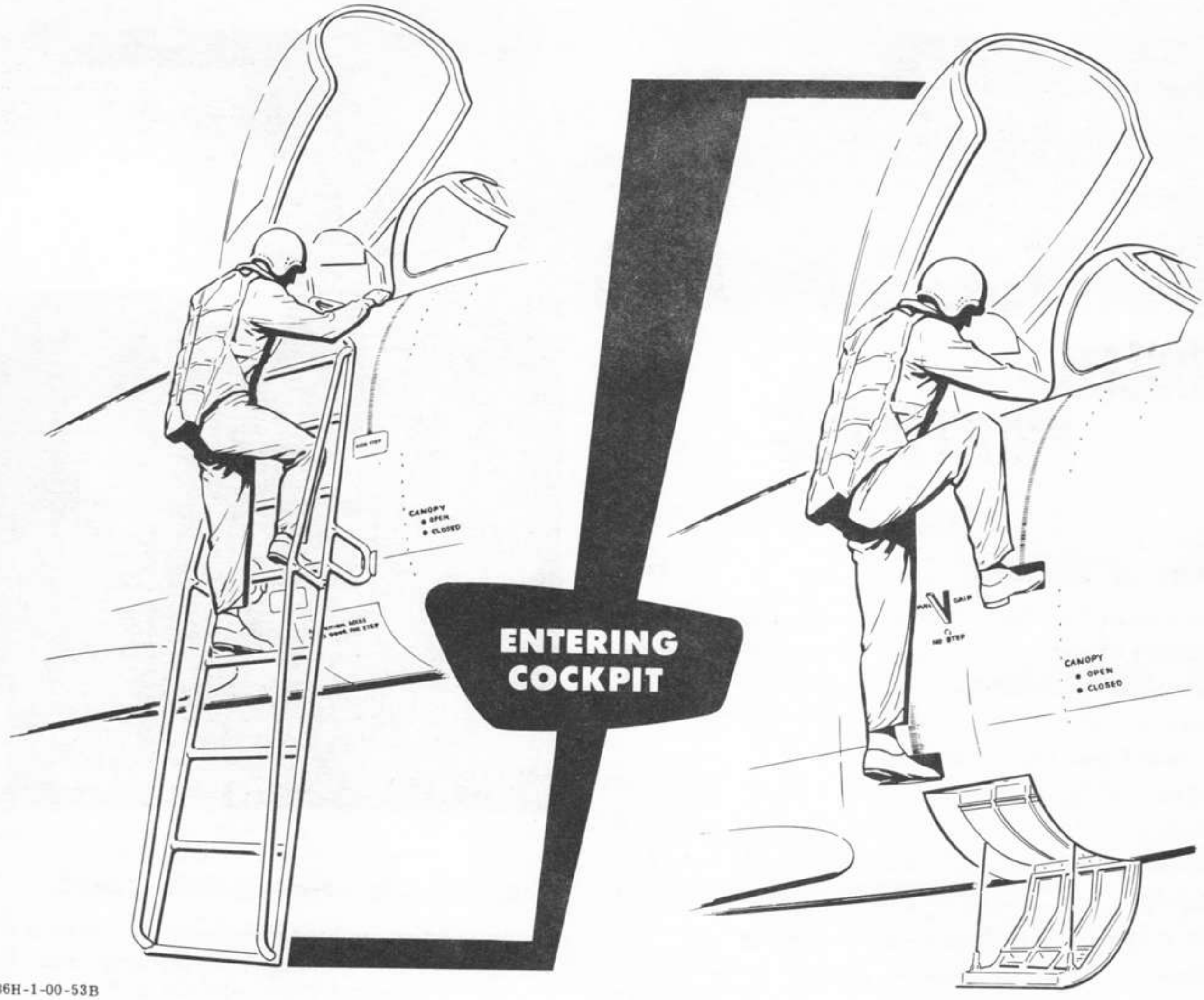
Refer to Appendix I for information necessary to fill out the Take-off and Landing Data cards for each flight.

WEIGHT AND BALANCE.

Refer to Section V for weight and balance limitations. Refer to Handbook of Weight and Balance Data, T.O. 1-1B-40, for loading information. Before each mission, check take-off and anticipated landing gross weight and balance, and check that weight and balance clearance Form 365F is satisfactory. If guns or ammunition are not installed, check for proper ballast installation. Make sure that fuel, oil, armament, oxygen, and special equipment carried is sufficient for mission to be accomplished.

ENTRANCE.

The cockpit can be entered from either side of the airplane. (See figure 2-1.) Normally, entry should be made with the aid of the ladder. If the ladder is not available, entry can be made by using the ammunition compartment door, hinged and kick-in steps, and a retractable handgrip. The ammunition compartment access door on each side of the fuselage hinges down to serve as a step. A retractable hinged step is located above each access



F-86H-1-00-53B

Figure 2-1

CAUTION F-86H-1-0-20A

Handgrip on fuselage side must not be used for a step, as it may break and cause injury.

door, and a kick-in step is recessed in the fuselage, forward of each gun compartment door. A retractable hinged handgrip is provided in the gun compartment door on each side of the airplane.

NOTE The ammunition compartment access door, hinged step, and handgrip cannot be closed from the cockpit; they must be closed by the ground crew.

PREFLIGHT CHECK.

BEFORE EXTERIOR INSPECTION.

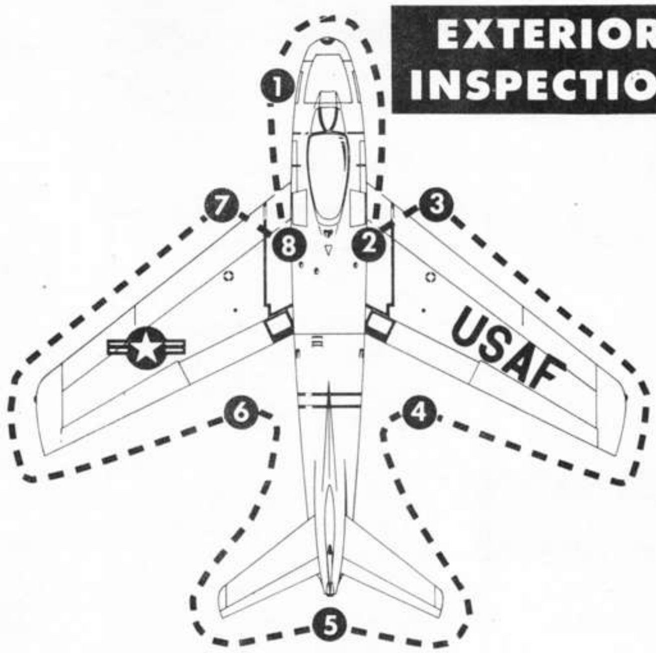
1. Form 781—Check.

   Check Form 781 for engineering status, and make sure the airplane has been properly serviced. See figure 1-30 for complete servicing data.

NOTE

- While making exterior inspection, check all surfaces for cracks, distortion, loose rivets, and indications of damage; check for leaks of hydraulic fluid, fuel, and oil; check all access doors and panels and all filler caps secured; check tires for general condition, slippage, and proper inflation; check position of gear doors, gear strut extension, and condition of wheels.
- Accumulator gage pressures (given on placard next to each gage) are for 70°F; pressure will be higher on hotter days.

EXTERIOR INSPECTION



1 NOSE

Nose wheel chock—Removed.
Nose gear ground safety lock—Removed.
Tow pin safety cap—Tight.
Nose gear emergency extension air bottle (in nose wheel well) pressure—Within limits.
Nose gear emergency extension reset button—Flush position.
Landing and taxi lights—Retracted.
Intake duct clear (except nose screen installed).
Gun port plugs—Removed, if on firing mission.

2 UPPER RIGHT WING

Canopy deck circuit breakers—IN.
Utility hydraulic system reservoir sight gage*—Check for proper level.
Flight control normal hydraulic system reservoir fluid level indicator pin—Check within 1/4 inch of top of gage.*
Access panel—Secure.

3 FORWARD FUSELAGE AND RIGHT WING LEADING EDGE

Starter air storage bottles (access door forward of right ammunition door on F-86H-5 and later airplanes; access door aft of nose wheel door on F-86H-1 Airplanes)—3000 psi for two starts; 1900 psi minimum for start.*
Main gear wheel—Chocked.
Slats—Check for freedom of movement.
Navigation light and wing tip—Check general condition and security of mounting.
Pitot head—Uncovered.

4 RIGHT WING TRAILING EDGE AND AFT FUSELAGE

Aileron and flap—Check general condition.
External load—Check for proper installation and security of mounting. If drop tanks are carried, visually check each tank for fuel level and amount. If quantity is questionable, measure with a dip stick. Check filler cap secure.
Speed brake—Check general condition.
Flight control normal and alternate system accumulator gage pressure*—Within limits.

5 EMPENNAGE

Tail pipe cover—Removed.
Tail cone and navigation lights—Check general condition and security of mounting.

6 AFT FUSELAGE AND LEFT WING TRAILING EDGE

Speed brake—Check general condition.
External load—Check for proper installation and security of mounting. If drop tanks are carried, visually check each tank for fuel level and amount. If quantity is questionable, measure with a dip stick. Check filler cap secure.
Aileron and flap—Check general condition.

7 LEFT WING LEADING EDGE AND FORWARD FUSELAGE

Navigation light and wing tip—Check general condition and security of mounting.
Landing gear door ground control switch (in left gear strut well)—CLOSE.

(Deleted)

Main gear wheel—Chocked.
Slats—Check for freedom of movement.

8 UPPER LEFT WING

(Deleted)

Flight control alternate hydraulic system reservoir fluid level indicator pin—Check within 1/4 inch of top of gage.*
Access panel—Secure.

*You may rely on your crew chief to check these items, if you desire. However, if preflight inspection or servicing is performed at a base where ground personnel are not completely familiar with your airplane, then you should check these items yourself.

F-86H-1-00-54K

Figure 2-2

EXTERIOR INSPECTION.

The exterior inspection should be made as shown in figure 2-2.

CANOPY AND EJECTION SEAT CHECK.

Before entering the cockpit, open canopy fully and check catapult mechanism and ejection seat as follows:

1. Safety pins—Check.

   Check that canopy remover initiator safety pin and two seat ejection initiator safety pins are installed. Check that safety belt initiator safety pin is removed.

Warning If any safety belt or ejection system maintenance safety pin is installed, do not remove it until you have checked the status of the ejection system with maintenance personnel.

- Do not place miscellaneous equipment, such as maps, Form 781, tools, etc, between either side of seat and cockpit vertical consoles; if you do, later vertical adjustment of the seat may move the canopy jettison mechanism and cause accidental jettisoning of the canopy.

2. Armrests and triggers—Check.

   Check that both seat armrests are full down and latched by applying a moderate downward force on each armrest. Check linkage from armrests and triggers to initiators. Check tubing and hose fittings from initiators to ejectors. Check that white stripes on front face of seat bucket and inner face of each trigger guard are in perfect alignment. Also check that tops of red and white stripes on inside face of each armrest bracket do not extend above top of seat bucket.

Warning Do not pull up on armrests to determine whether latches are engaged, because the canopy may jettison.

3. Lead Seal—Check.

   Check that lead seal on canopy remover is not broken.

4. Seat quick-disconnects—Check.

   Check that seat quick-disconnects for oxygen, radio, and anti-G suit are properly mated. Check bail-out bottle connection.

5. Shoulder harness routing—Check.

   Make sure shoulder harness passes over upper tubular cross-member of seat, below headrest.

INTERIOR CHECK.

NOTE If external dc power is not available, the battery switch should be turned ON just before engine is started, and checks that require electrical power should not be made until after the engine has been started and the generator is supplying power. Otherwise, battery life may be impaired.

1. Ground fire safety switch (20 mm guns)—SAFE.
2. Armament switches—OFF.
3. Stick grip—Check.

   Check stick grip for security of mounting.

4. Safety belt (shoulder harness and lanyard to safety belt—Secured (shoulder harness lock handle unlocked).

Warning The safety belt must be properly fastened to ensure safe operation if ejection is necessary. (See figures 1-26, 1-27, and 1-28, for proper methods to secure the safety belt and automatic parachute.)

5. Zero-second parachute hook—Attach to parachute "D" ring.
6. Seat—Adjust.

Warning When the seat is being adjusted on the ground, the handle must not be moved to the unlocked position if the seat is not occupied. Release of the empty seat may cause the handgrips to spring up and jettison the canopy if the ground safety pin is not in the canopy initiator.

- After adjusting seat, check that adjustment lever is locked (white pin on lever and white index marker on armrest side panel aligned). If seat is not locked, G-loads in flight may cause it to move, possibly allowing armrests to raise and jettison canopy.

7. Rudder pedals—Unlock and adjust.
8. Engine master, air start, and battery switches—OFF.
9. External power—Connected.

NOTE Starting can be accomplished without external dc power. However, external dc power is recommended for use if available, to conserve battery life. The following temperature limits apply to starting without external power: Below 0°F, external power should always be used; between 0°F and 31°F, only one start should be attempted without external power; and at 32°F and above, two starts can be attempted without external power. External power units suitable for use on this airplane are the A3, A4, C-21, C-22, C-26, C-27, NC5, and V-1.

10. Circuit breakers—IN; (instrument inverter circuit-breaker switches—ON).
11. Speed brake dump valve lever*—NORMAL (forward).
12. Anti-G suit pressure-regulating valve—Check.
    Set anti-G suit pressure regulating valve HI or LO, as desired.
13. Camera lens selector switch—As desired.
14. Bomb release selector switch—MANUAL RELEASE.
15. Command radio—Check for proper channelization and readability.
16. Radar range sweep switch—MIN.
17. Flight control switch—NORMAL.
18. Rudder trim switch—OFF.
19. Throttle—OFF (adjust friction).
20. Speed brake switch—HOLD (neutral).
21. Wing flap handle—UP.
22. Drop tank pressure switch—INBD if only inboard tanks installed—OUTBD if outboard tanks installed—OFF if tanks not installed.
23. Air compressor switch†—NORM.
24. Fuel filter deice switch‡—OFF.
25. Cockpit pressure switch—As desired.
26. Cockpit temperature master switch—AUTO.
27. Cockpit temperature rheostat—As desired.
28. Cockpit console airflow lever—DECR.
29. Pitot heater switch—ON, then OFF.
    Check operation of pitot heater with crew chief while switch is ON.
30. Windshield anti-icing (rain and ice removal) switch—OFF.
31. Canopy and windshield defrost handle (handles)—OFF.
32. Landing gear handle—DOWN.
33. Landing gear position indicators—Check.
    Make sure gear position indicators are showing down and locked. Test operation of landing gear unsafe warning light by pressing horn cutout button while throttle is OFF. Light should come on.
34. Landing and taxi light switch—OFF.
    Check with crew chief that lights are retracted.
35. Gun heater switch (.50-caliber guns)—OFF.
36. Canopy switch—OFF (center).
37. Special store jettison handle—IN.
38. Flight control emergency change-over handle—IN.
39. Emergency jettison handle—IN.
40. Fuel quantity—Check.
    Momentarily depress fuel quantity gage test button and watch movement of fuel quantity gage needle.
41. Clock, altimeter, and accelerometer—Set.
42. Directional indicator—Check against stand-by compass.
    Check for stabilization of needle and for 180-degree ambiguity.
43. Vertical velocity indicator—Set.
44. Attitude indicator—Check.
    Check erection and retraction of warning "OFF" flag. For quick erection during scramble operation, cage and uncage gyro 30 seconds after power has been turned on.
45. Fuel system selector switch—NORM.
46. Sight mechanical caging lever—CAGE.
47. Hydraulic pressure gage selector switch—NORMAL.
48. Gun selector switch (some airplanes)—UPPER or ALL, as required.
49. Landing gear emergency release handle—IN.
50. Special store disarming lever (some airplanes)—DIS.
51. Warning lights and indicators and test warning systems—Check.
52. Generator switch—ON.
53. Instrument ac power switch—ALTERNATE, then MAIN; ac power warning light—Out.
54. Oxygen regulator—Check.
    Oxygen regulator diluter lever at NORMAL OXYGEN, emergency toggle lever at center position, and oxygen supply lever safetied ON. Oxygen system checked for operation. (Refer to "Oxygen System Preflight Check" in Section IV.)

Warning If the airplane is to be operated on the ground under possible conditions of carbon monoxide contamination, such as directly behind another operating jet airplane or during operation with tail into the wind, place oxygen diluter lever at 100% OXYGEN.

***F-86H-1 Airplanes AF52-1975 through -1980**
†F-86H-1 Airplane AF52-2070 and all later airplanes
‡F-86H-1 Airplanes AF52-1975 through -1983

NOTE If external dc power source is not plugged in, check oxygen system immediately after battery switch is turned ON.

55. Radio compass—Check.
    Check frequency alignment, antenna reception, manual loop rotation, and ADF operation. Tune in low-frequency range or homer that serves field of departure, identify it, turn function selector switch to COMP, and check compass indicator for correct bearing reading.
56. Lighting controls—As required.
    Check operation of all interior and exterior lights (night flights).
57. Map case—Flight Manual, Radio Facility Charts, Pilot's Handbook—Jet, and other necessary publications and charts available.
58. Flashlight—Check.
    Check that a properly operating flashlight is included in personal gear (night flights).
59. Flight controls—Check.
    Check rudder, ailerons, and horizontal tail for proper response to control action.
60. Trim switch—Check.
    Operate trim switch on stick grip in all actuated positions, and note that it automatically returns to the OFF (center) position when released.

Caution The trim switch is subject to sticking in any or all of the actuated positions, resulting in application of extreme trim. If the switch sticks in any actuated position during ground checks, *the airplane must not be flown.* The deficiency must be entered on Form 781 with a red cross.

NOTE The flight control alternate hydraulic system becomes operative automatically when external power is connected. The flight control normal hydraulic system must be manually engaged after the engine has started, by moving the flight control switch momentarily to the RESET position.

- The flight control alternate hydraulic system change-over valve may stick in the closed position after the airplane has been sitting overnight with the valve under system pressure. If control stick cannot be moved while alternate system pressure is available, pull manual emergency change-over handle one time to manually position valve. Then return change-over handle to stowed position. Investigation shows that the valve will not stick again in the closed position for the balance of the day.

BEFORE STARTING ENGINE.

Warning Make sure main gear wheels are securely chocked and that rotational plane of engine turbine wheel and danger areas fore and aft of airplane are clear of personnel, aircraft, and vehicles. (See figure 2-3.)

- Make sure nose screen is installed, to reduce possibility of engine damage due to entrance of foreign objects into the intake duct, and to protect personnel from being drawn into the intake duct.
- Danger aft of the airplane is created by the high exhaust temperature and blast from the tail pipe.

Caution When operating within the jet blast of another F-86H Airplane, maintain a minimum of 70 feet distance to prevent heat damage to the canopy.

- Whenever possible, start and run up engine on a paved surface to minimize the possibility of dirt and foreign objects being drawn into the compressor and damaging the engine.
- Start engine with airplane heading into, or at right angles to, the wind whenever possible, as a tail wind may increase exhaust temperature and aggravate an engine fire during starting. An external power source is not required for combustion starter operation; however, to conserve battery current, external power should be connected to supply the various electrical systems. The fuel-air starter is self-sufficient for two starting cycles; if start is not obtained, an external air source may be connected.

STARTING ENGINE.

AUTOMATIC START.

The following automatic start is the procedure normally used on airplanes changed by T.O. 1F-86H-636. However, if it becomes necessary, the manual start may be made on these airplanes.

NOTE Before entering airplane, check for a minimum of 1900 psi air storage bottle pressure.

1. Battery switch—ON.
2. Engine master switch—ON.

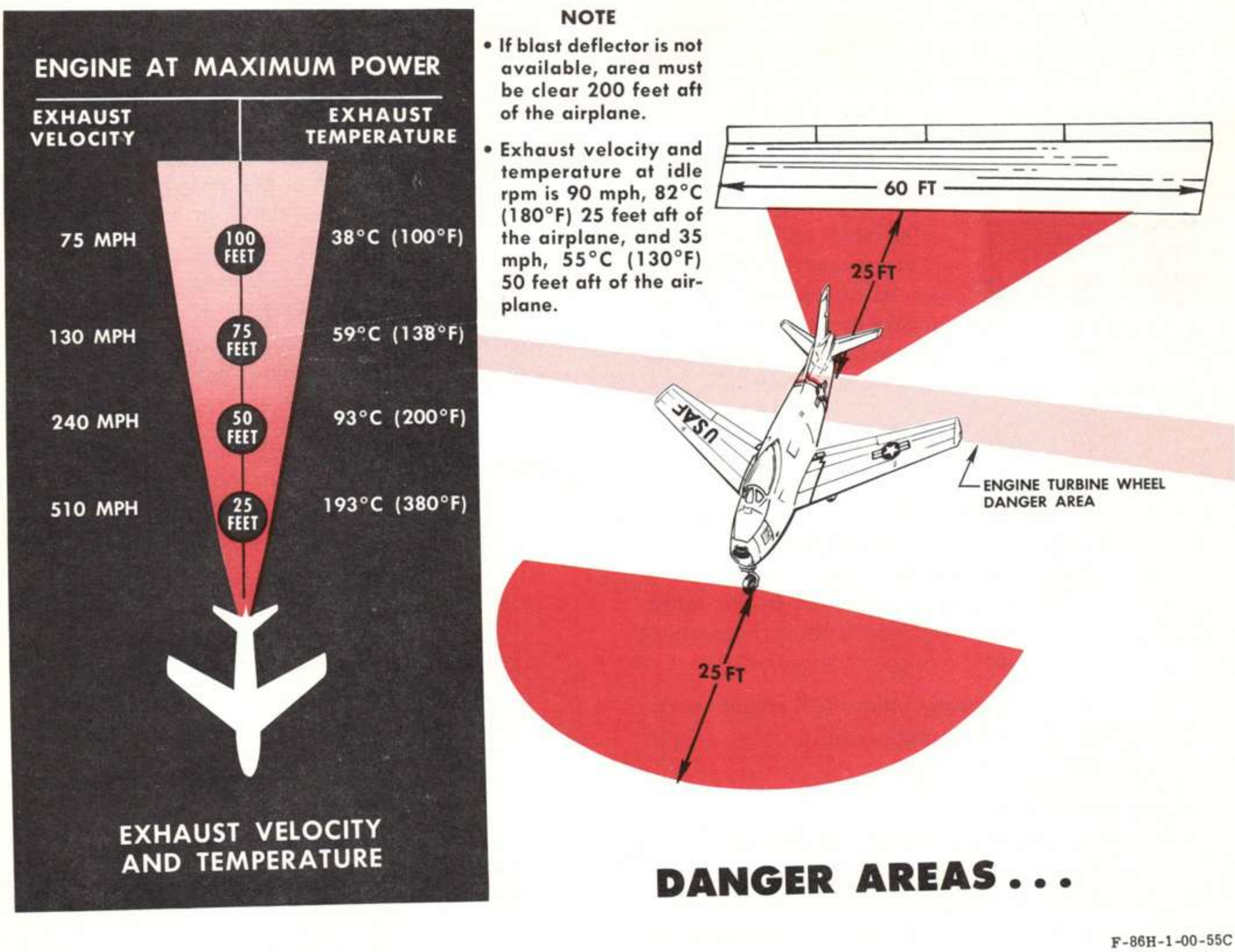


Figure 2-3

3. Fuel system selector switch—NORMAL.

NOTE The starter will not fire unless the temperature control amplifier is warmed up; therefore, wait 30 seconds after the inverter warning light goes out to insure that the temperature control amplifier warm-up period is complete.

4. Throttle—IDLE.
5. Ground start button—Depress momentarily.

NOTE The starter should fire and run about 4 seconds; at the end of this time, the starter fuel supply will be exhausted. The engine should attain a speed of at least 16% rpm, and should ignite immediately after completion of the starter combustion cycle.

Caution Starter normally fires in 0.2 of a second and is audible in the cockpit. If starter fails to fire, move throttle to OFF and have ground personnel check for fire in the air intake duct.

- Retard throttle to OFF if any of the following occurs:

  Engine does not attain 16% rpm.

  Engine ignition does not occur before engine coasts down to 16% rpm.

  Fuel flow is less than 500 pounds per hour or exceeds 1500 pounds per hour.

NOTE If engine start is not obtained, retard throttle to OFF and wait one minute for combustion chamber to drain before attempting second start. Air storage bottle pressure must be at least 1700 psi in order to make a second start attempt. If second start is not successful, starter air storage bottle must be refilled or an external air source connected. To avoid damaging the starter by overheating, observe the prescribed cooling periods. (Refer to "Starter System" in Section I.)

Warning Temperature and duration of all overtemperature operation must be entered on Form 781. If either of the following overtemperature conditions occurs, the engine must be removed for inspection.

During starting (30% engine rpm or less):

- Exhaust temperature exceeds 975°C, even if only momentarily.
- Exhaust temperature stabilizes at any temperature within the range of 875°C to 975°C. (Momentary peaking in this range is permissible as long as exhaust temperature gage pointer is in constant motion.)

Transient operation (above 30% engine rpm):

- Exhaust temperature exceeds 875°C, even if only momentarily.

6. Oil pressure—Check.
   If there is no indication of oil pressure within 30 seconds, shut down engine and investigate.
7. Engine instruments—Check.
   Engine rpm, 41% to 43%; oil pressure, 20 to 30 psi; fuel flow, 1000 to 1300 pounds per hour; and exhaust temperature, 300°C to 600°C.
8. Generator-off warning light—Out.
9. External power—Disconnected.

MANUAL START.

Caution The following is a manual start procedure, and particular care should be exercised to manually operate the throttle to prevent an overtemperature condition.

1. Throttle—OFF.
2. Battery switch—ON.
3. Engine master switch—ON.
4. Fuel system selector switch—EMER.

Caution Do not proceed with start until the instrument ac power-off light goes out, as there will be no fuel flow indication by which to gage the start.

5. Throttle—IDLE and outboard, to clear idle stop.
6. Starter button—Depress momentarily.

Caution The starter normally fires in 0.2 second and is audible in the cockpit. If starter fails to fire, retard throttle to OFF position and have ground personnel check for fire in the air intake duct.

7. Fuel flow—Check for indication.
8. Throttle—Adjust to establish and maintain 1100 pounds per hour fuel flow until engine ignition occurs.

Caution If engine does not obtain 16% rpm, if engine ignition does not occur by the time engine has coasted down to 16% rpm, or if fuel flow is less than 500 pounds per hour or more than 1500 pounds per hour, retard throttle immediately to full OFF position. Do not turn engine master switch OFF until engine has coasted down to 5% rpm or less; if you do, starter fuel may be depleted. This will necessitate ground servicing before a later start. If a later start is attempted without ground servicing under this condition, starter drop-out speed will be low and a hot start may result.

9. Throttle—Adjust for proper exhaust temperature.
   After exhaust temperature has stabilized, advance throttle slowly to obtain 50% engine rpm. Maintain exhaust temperature of about 750°C during this initial acceleration. Exhaust temperature will drop as engine accelerates.

NOTE If engine start is not obtained, retard throttle to OFF and wait one minute before attempting second start. If the second start is not successful, the starter air storage bottle must be refilled or an external air source connected. To avoid damaging the starter by overheating, adhere to starter operation limits. (Refer to "Starter System" in Section I.)

Warning Temperature and duration of all overtemperature operation must be entered on Form 781. If either of the following overtemperature conditions occurs, the engine must be removed for inspection.

During starting (30% engine rpm or less):

- Exhaust temperature exceeds 975°C, even if only momentarily.
- Exhaust temperature stabilizes at any temperature within the range of 875°C to

975°C. (Momentary peaking in this range is permissible as long as exhaust temperature gage pointer is in constant motion.)

Transient operation (above 30% engine rpm):

- Exhaust temperature exceeds 875°C, even if only momentarily.

10. Oil pressure—Check.
    If there is no indication of pressure within 30 seconds, shut down engine and investigate.
11. Throttle—Retard to IDLE.
12. Fuel system selector switch—NORM.
13. Engine instruments—Check.
    Check engine rpm 41% to 43%; oil pressure 20 to 30 psi.
14. External power—Disconnected.
15. Generator-off warning light—Out.

GROUND OPERATION.

No engine warm-up is necessary. As soon as the engine stabilizes at idling speed, with normal gage readings, the throttle may be slowly opened to full power. Idle rpm should be 41% to 43% rpm, but will vary with field altitude.

FLIGHT CONTROL HYDRAULIC SYSTEM CHECK.

To ensure that the flight control hydraulic system is operating normally, perform the following check:

1. Throttle—IDLE.

Caution If engine run-up is made during ground tests, hold toe brakes, to prevent airplane from moving if chocks fail to hold. The airplane is not equipped with parking brakes.

2. Hydraulic pressure gage selector switch—NORMAL.
3. Flight control switch—RESET (check alternate-on warning light out).
   Engage flight control normal hydraulic system by holding flight control switch at RESET momentarily. Check that alternate-on warning light is out.

Caution When checking control surface movement on both normal and alternate systems, check rate of travel of control stick by rapid, full-throw movements of the stick. If rate is slower than normal, as determined by experience, have ground personnel check systems to determine malfunction. Refer to "Hydraulic Systems," Section VII.

4. Flight control normal hydraulic system—Check.
   a. Flight control switch—NORMAL.
   b. Control stick—Move and visually check for proper control surface movement.
   c. Pressure—After 5 seconds, 2850 to 3200 psi (control stick not in motion).
5. Flight control alternate hydraulic system—Check.
   a. Flight control switch—ALTERNATE.
   b. Alternate-on warning light—On.
   c. Hydraulic pressure gage selector switch—ALTERN.
   d. Control stick—Move and visually check for proper control surface movement.
   e. Pressure—2550 to 3200 psi (control stick not in motion).

NOTE The alternate system pressure should slowly fluctuate between the maximum limits of 2550 and 3200 psi because the designed leakage in the flight control actuators causes the alternate system hydraulic pump to cycle on and off.

   f. Flight control switch—RESET.
   Momentarily hold flight control switch to RESET and then release. Check that alternate-on warning light is out.
6. Flight control manual emergency change-over system—Check.

NOTE The following check is to be made before the first flight of the day, and when advised by ground personnel that mechanical or hydraulic maintenance has been performed on the flight control hydraulic system.

   a. Hydraulic pressure gage selector switch—ALTERN.
   b. Flight control switch—Hold at RESET.
   c. Flight control emergency change-over handle—Pull to full extension.

NOTE With the emergency change-over handle pulled full out, flight control alternate hydraulic system pressure should not change when the flight control switch is held at RESET or released to NORMAL.

Holding flight control switch at the RESET position opens the electrical circuit to the flight control system transfer valves. This ensures that the normal system transfer valve is held in the closed position and the alternate system transfer valve is held in the open position by the mechanical emergency override handle only. The alternate-on warning light should not be on.

d. Control stick—Move and visually check for proper control surface movement. Check pressure drop on hydraulic pressure gage.

e. Flight control switch—NORMAL.

f. Alternate-on warning light—On (indicating electrical circuit complete).

g. Pressure—3050 to 4000 psi.

Pressure should remain constant (except for momentary surges) at a value between the maximum limits of 3050 and 4000 psi (control stick not in motion).

7. Flight control emergency change-over handle—IN.
8. Pressure—2550 to 3200 psi.

NOTE Because of the tolerances of the alternate system relief valves and the pressure indicating system, the pressure may exceed the red limit value (3200 psi) and may even reach 4000 psi when the emergency change-over handle is actuated. These pressures are considered normal for this part of the alternate system operation.

9. Automatic return to flight control normal system—Check.

a. Control stick—Move rapidly.

b. Alternate-on warning light—Out.

Check that light goes out, indicating that the normal system is again in control.

c. Hydraulic pressure gage selector switch—NORMAL.

d. Pressure—2850 to 3200 psi.

UTILITY HYDRAULIC SYSTEM CHECK.

To ensure that the utility hydraulic system is operating normally, perform the following check:

1. Throttle—60% rpm.
2. Hydraulic pressure gage selector switch—UTILITY.
3. Speed brake switch—OUT, IN, then HOLD (neutral).

Operate speed brakes through one complete cycle.

Warning Before operating speed brakes, check that aft fuselage area is clear, as speed brakes operate rapidly and forcibly and could injure any personnel in their path.

4. Pressure—2850 to 3200 psi for static (no-flow) condition.

If air compressor motor is running, pressure will be less than 2850 psi.

5. Hydraulic pressure gage selector switch—NORMAL.

Switch shall be at NORMAL except when periodic pressure checks of the hydraulic systems are made.

BEFORE TAXIING.

1. Safety pins—Remove.

Remove ground safety pins from canopy initiator on left side of seat and seat initiators outboard of each armrest; show pins to crew chief, and then stow pins in an accessible place.

Warning After seat and canopy initiator pins are removed, the seat and canopy are fully armed.

2. Main gear wheel chocks—Removed.
3. Altimeter—Set to field pressure.

Check that 10,000-foot pointer is set correctly and note error against field elevation. This error should be considered when resetting altimeter during flight.

Caution If the altimeter error is more than 75 feet, do not accept the airplane.

TAXIING.

1. Throttle—Advance; then return to IDLE.

To obtain initial taxi roll, open throttle to approximately 60% rpm; then retard throttle immediately. Once the airplane is rolling, it can be taxied at idling rpm on hard surface.

Caution When the special store is installed (alone or with any combination of drop tanks), taxiing must be done at low speeds, and short-radius turns must be avoided. Brakes must be applied slowly to prevent sudden stops. Operation from relatively smooth and hard surfaces is mandatory (concrete or "black-top" surfaces are preferred). As initial taxi roll is started, test brakes for proper braking action.

- To prevent damage to canopy operating mechanism, do not exceed 50 knots IAS while taxiing with canopy open.

2. Pitot heater switch—As required.

Warning Warm-up time for the pitot heater is approximately one minute at 32°F. Allow sufficient heating time if taking off into freezing rain or other visible moisture with surface temperature at or near freezing.

3. Nose wheel steering button—Depress (for directional control).

   Hold steering switch depressed continuously while taxiing, maintaining directional control through the steerable nose wheel by use of rudder pedals. Nose wheel and rudder pedals must be coordinated before steering mechanism will engage. Use nose wheel steering during slow taxiing.

NOTE Avoid excessive or rapid jockeying of throttle during taxiing.

- Minimize taxi time, as airplane range is considerably decreased by high fuel consumption during taxiing and ground run. Fuel consumption with the engine operating at 42% rpm is about 2½ gallons (17 pounds) per minute.

4. Turn-and-slip indicator—Check deflection of turn needle during turns.
5. Radio compass—Check relative bearing to selected station.
6. Directional indicator—Check actual changes of heading against the instrument indications.

BEFORE TAKE-OFF.

PREFLIGHT AIRPLANE CHECK.

After taxiing to take-off position, complete the following checks:

1. Nose screen—Removed.

Warning Nose screen must be removed with engine at idle rpm before preflight engine check. Ground personnel removing screen must not wear articles of loose clothing or carry equipment likely to be drawn into intake duct.

2. Safety belt—Tighten; shoulder harness—Adjust.
3. Shoulder harness lock handle—UNLOCKED (aft).
4. Armament switches—OFF.

   If external loads must be jettisoned on take-off, they may be jettisoned unarmed by means of the external store jettison button on the left console or by the emergency jettison handle.

5. Trim for take-off—Check.

   Horizontal tail, rudder, and aileron trimmed individually until take-off trim indicator light glows.

6. Wing flap handle—DOWN.

Caution When carrying EX-10 bombs and 1000-pound GP bombs with the T-142 fin, do not lower wing flaps more than 20 degrees (MID position of flap handle) because of the adverse clearance condition.

7. Canopy switch—CLOSE; check canopy unsafe warning light out.
8. Oxygen regulator diluter lever—NORMAL OXYGEN (100% OXYGEN if carbon monoxide suspected).

   If carbon monoxide contamination is suspected, use 100% OXYGEN as long as necessary.

Warning Oxygen diluter lever must be returned to NORMAL OXYGEN as soon as possible, because use of 100% oxygen will deplete the oxygen supply to a hazardous level.

9. Take-off position—Align nose wheel.

   Make sure airplane is headed straight down runway with nose wheel centered.

10. Toe brakes—Hold.

PREFLIGHT ENGINE CHECK.

Complete the following emergency fuel system check in the take-off position, making sure airplane does not move forward and cause nose wheel to cant.

Caution An indication of compressor stall during rapid throttle advancement may be due to inlet guide vane failure in the open position. Guide vane failure in the closed position is indicated by the following simultaneous instrument readings with the throttle in full open position:

Tachometer—99% to 100% rpm

Exhaust temperature—520°C to 560°C

Fuel flow—4000 to 5000 pounds per hour

If guide vanes fail in closed position, do not switch to emergency fuel system or attempt an emergency fuel system check while at full throttle on main fuel system, since a destructive engine overspeed will result.

- If either of the afore-mentioned inlet guide vane failures is indicated, retard throttle immediately and investigate. Under no circumstances attempt a take-off. (Refer to "Inlet Guide Vane Failure" in Section III.)

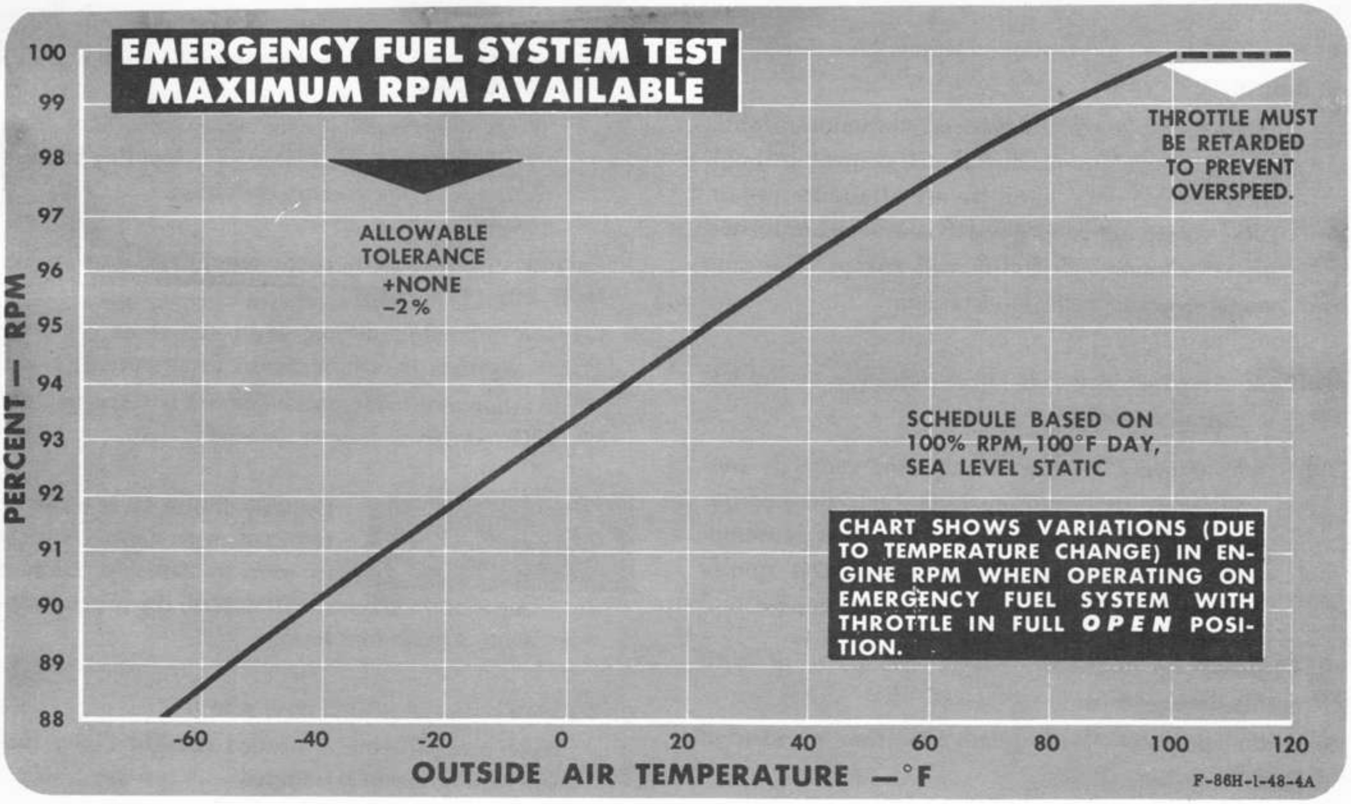


Figure 2-4

1. Fuel system selector switch—Recheck at NORM.
2. Throttle—Full OPEN, to maintain 100% rpm.

   Do not exceed 100.5% engine rpm. If any of the following overtemperature conditions occur, the engine must be removed for inspection:

   Transient operation (30% engine rpm or above)

   - Exhaust temperature exceeds 875°C, even if momentarily.

   Steady-state operation

   - Exhaust temperature exceeds 650°C.

NOTE Steady-state exhaust temperature operating limit is 640°C. If temperature drifts into the range of 640°C to 650°C, retard throttle as required to maintain temperature within operating limit.

- White smoke from the engine may escape through the fuselage in the engine area at high engine rpm. This condition is normal and does not indicate a hazardous condition.

3. Fuel system selector switch—TAKE OFF.
4. Take-off switch-on indicator light—On.
5. Throttle—Retard to below 95% rpm.
6. Emergency fuel-on indicator light—On.
7. Throttle—FULL OPEN.

   RPM obtained on emergency fuel system should conform to the limits shown in figure 2-4.
8. Engine rpm—Check.

NOTE If the throttle is retarded to the 86% engine rpm setting, a cycling of fuel control between main and emergency systems occurs, resulting in unstable engine operation (rpm and thrust surges). The lockout circuit (used to prevent inadvertent operation on the emergency system in the low range of engine rpm) returns fuel control to the main system below 86% rpm. The main system, with its higher fuel schedule, accelerates the engine above 86% rpm, and control then is restored to the emergency system. As rpm drops because of the lower emergency system schedule, lockout again occurs. The cycling will continue unless the throttle is advanced. The cycling condition is not dangerous; however, the throttle should be advanced to avoid prolonged operation under this condition.

9. Fuel system selector switch—NORM, until engine stabilizes at 100% rpm.
10. Fuel system selector switch—TAKE OFF.
11. Emergency fuel-on indicator light—Out.

12. Take-off switch-on indicator light—On.

Caution A slight change in engine rpm may be noted when the main fuel system is re-engaged, depending on ambient air temperature. If the emergency fuel-on indicator light does not go out, the system should be checked before flight.

Warning If it is necessary to retard the throttle to below 95% rpm (either before or after take-off), the fuel system selector switch should be first moved to NORM. Otherwise, emergency fuel system will take over when throttle is retarded below 95% and will remain in control until main system is manually re-engaged.

ENGINE INSTRUMENT CHECK.

1. Throttle—Full OPEN.
2. Engine instruments—Check.

   Tachometer, not less than 99% and not more than 100.5%; exhaust temperature, 600°C to 640°C; oil pressure, 25 to 45 psi; and fuel flow, 5000 to 9000 pounds per hour.

NOTE Exhaust temperature limit for fully stabilized engine operation at 100% rpm is 640°C. However, exhaust temperature at take-off will be about 600°C when normal take-off technique is used. (Refer to "Ground Temperature Stabilization Characteristics" in Section VII.)

Warning Should the following overtemperature condition occur during transient operation (30% engine rpm or above), the engine must be removed for inspection:

- Exhaust temperature exceeds 875°C, even if momentarily.

Should the following overtemperature condition occur during steady-state operation, the engine must be removed for inspection:

- Exhaust temperature exceeds 650°C.

NOTE Steady-state exhaust temperature operating limit is 640°C. If temperature drifts into the range of 640°C to 650°C, retard throttle as required to maintain temperature within operating limit.

- The temperature and duration of all overtemperature operation must be entered on Form 781.
- Engine speeds of more than 104% rpm necessitate engine overhaul.

TAKE-OFF.

NORMAL TAKE-OFF.

NOTE The procedures set forth will produce the results shown in the take-off distances chart in Appendix I.

For normal take-off with or without external load, proceed as follows:

1. Throttle—Full OPEN.
2. Toe brakes—Release.
3. Maintain directional control.

   Maintain directional control by use of nose wheel steering during early part of run until rudder becomes effective. Rudder becomes effective at about 60 knots IAS.
4. Maintain near-level attitude until take-off speed is attained.

   During take-off, the airplane should be held in a near-level attitude at nose wheel lift-off. In this attitude, the nose wheel will be just slightly off the runway. This attitude should be held until the recommended take-off speed is attained, at which time the nose of the airplane should be pulled well up and the airplane flown off the ground.

Warning Do not assume a nose-high attitude before recommended take-off speed. Any attempt to take off at lower than recommended speeds can bring about a stalled condition. This could be disastrous because of the resultant excessively long take-off run. If a ground stall does occur, shown by failure of the airplane to lift off and loss of acceleration, the nose must be lowered to a three-point attitude to eliminate the stalled condition of the wings.

5. Assume nose-high attitude when take-off speed is attained.

   At take-off speed, a nose-high attitude must be maintained for take-off. (After take-off, the airplane will assume a more normal attitude as airspeed increases and the flaps are raised.)

Caution Because airspeed will increase rapidly after the airplane breaks ground, retract gear and flaps as soon as possible after take-off to prevent exceeding gear- and flap-down limit speed. Hold the nose as high as practicable after take-off until gear and flaps are completely retracted, to hold airspeed build-up to a minimum.

Warning Abrupt or excessively steep pull-ups immediately after take-off must be avoided; otherwise, stall may occur.

NOTE See take-off distance charts in Appendix I, for required take-off distances at various temperatures and wind velocities.

- Nose wheel lift-off and airplane lift-off speeds with full flaps are as follows:

CONFIGURATION	NOSE WHEEL LIFT-OFF SPEED (KNOTS IAS)	AIRPLANE LIFT-OFF SPEED (KNOTS IAS)
No external load	110	125
With two 200-gallon drop tanks	120	135
With two 200-gallon drop tanks plus two 120-gallon drop tanks	125	140

TAKE-OFF WITH HIGH OUTSIDE AIR AND RUNWAY TEMPERATURES.

Caution must be used to prevent premature nose wheel and airplane lift-off during take-off with high outside air and runway temperatures. Since take-off roll distance is increased under these conditions, it is imperative that the recommended take-off speed be followed.

MINIMUM-RUN TAKE-OFF.

A minimum-run take-off is a maximum-performance maneuver with the airplane lifting off near the stalling speed. It is closely related to slow flying with the airplane in a high angle-of-attack attitude. Consequently, you should be familiar with the characteristics of this maneuver in order to be able to maintain the necessary safe margin above stall. The complete before-take-off check should be made. The initial take-off run is the same as for normal take-off except that the stick is in the full aft position (full nose-up trim). It is necessary to pull about 20 pounds stick force before lift-off when full nose-up trim is used. This force is reduced to 0 pounds to maintain the proper attitude when the airplane breaks ground. Therefore, as the airplane lifts off, reduce back pressure enough to maintain minimum airspeed build-up and maximum climb angle to effect the shortest air run that will clear all obstacles. The landing gear should not be retracted until the airplane accelerates to normal take-off speed. Minimum run take-off speed for the particular gross weight and external loading is about 5 knots less than that for normal take-off.

Warning When the airplane is close to stall speed, retracting the landing gear may cause a nose-up pitch sufficient to cause a stall. Waiting until normal take-off speed is reached or exceeded eliminates this hazard.

After all obstacles are clear, retrim airplane to reduce stick forces and accelerate to best climb speed.

FORMATION TAKE-OFF.

If formation take-off is to be made, the procedure is the same as for a normal take-off, except that the fuel system selector switch must be at NORM. Formation take-off requires some throttle movement. With the fuel system selector switch at TAKE OFF, the emergency fuel system would take over control of fuel flow to the engine when the throttle is retarded to engine speeds below 95% to 97% rpm. Thus, the remainder of the take-off would be conducted on the emergency fuel system, with its inherently lower maximum power setting and lack of overspeed and overtemperature protection.

Warning Monitor engine instruments during formation take-off, being watchful for power loss and placing fuel system selector switch at EMER if main fuel system failure is indicated.

CROSS-WIND TAKE-OFF.

In addition to the procedures used in a normal take-off, be prepared to counteract airplane drift at lift-off by lowering upwind wing or crabbing into the wind. Also, increase nose wheel lift-off speed approximately 10 to 15 knots IAS by holding nose wheel down a little longer during ground run. To compute the effective cross wind during take-off, refer to take-off and landing cross-wind chart in Appendix I.

NOTE Increased speed is necessary to counteract reduced controllability.

AFTER TAKE-OFF—CLIMB.

When airplane is definitely air-borne:

1. Landing gear handle—UP.

   Landing gear handle UP below gear-down limit speed. Check gear position indicators.

Caution Do not retract landing gear while airplane is yawing or slipping, as damage to gear doors may result.

- If landing gear unsafe warning light remains on, have tower check gear on a fly-by, or have a formation member check it before moving handle.

2. Wing flap handle—UP.

   Wing flap handle UP, above 155 knots IAS. Rapid acceleration will prevent any tendency for airplane to sink.

Caution Raise gear and flaps below the gear- and flap-down limit airspeed; otherwise, excessive air loads may damage gear or flap operating mechanism and prevent later operation. If flaps do not fully retract, land as soon as possible. Failure of the flap actuating mechanism may occur if the flaps are not supported against the up-stop (fully retracted) during accelerated maneuvers at high speed.

3. Zero-second parachute hook—Detach from parachute "D" ring and attach to stowage ring.

   Parachute hook must be stowed after reaching minimum safe ejection altitude for your particular escape system. Refer to "Ejection" in Section III for minimum safe ejection altitudes.

Warning The lanyard must be disconnected whenever operating at high altitudes or airspeeds so that the safety delay provided by the parachute timer-aneroid will not be overridden.

4. Trim—As required.
5. Level off and accelerate to best climb speed.

NOTE Exhaust temperature may exceed 640°C at full throttle after take-off. If this occurs, retard throttle to maintain exhaust temperature within prescribed limits. The condition of exceeding the Military Power maximum exhaust temperature of 640°C at full throttle after take-off is not abnormal.

6. Fuel system selector switch—NORM, with engine at 100% rpm.

   After safe altitude is reached and with engine operating at 100% rpm, move fuel system selector switch to NORM. If the amber emergency fuel-on indicator light is on before fuel system selector switch is moved to NORM, and it is unknown whether main fuel system failure or throttle movement caused the emergency fuel system to take over, proceed as follows:

   a. At a safe altitude, with engine operating at full throttle, move fuel system selector switch to NORM. Transfer to the main fuel system will be shown by a momentary drop in fuel flow followed by an immediate rise and engine acceleration to 100% rpm.

   b. If engine rpm does not rise but continues to fall, position fuel system selector switch to EMER before rpm drops to 95%.

Warning If engine falls below 95% rpm, retard throttle to IDLE before switching to EMER; readvance throttle carefully to prevent overtemperature.

7. Oxygen regulator diluter lever—NORMAL OXYGEN (100% OXYGEN if carbon monoxide suspected).

   If 100% oxygen was used for take-off, return oxygen regulator diluter lever to NORMAL OXYGEN, unless carbon monoxide contamination still is suspected. If such is the case, continue use of 100% oxygen as long as necessary.

Warning Oxygen regulator diluter lever must be returned to NORMAL OXYGEN as soon as possible, because continued use of 100% oxygen will so deplete the oxygen supply as to be hazardous.

- After each time seat is adjusted in flight, check seat adjustment lever locked (white pin on lever and white index marker on armrest side panel aligned). If seat is not locked, G-loads in flight may cause it to move, possibly allowing armrests to raise and jettison canopy.

8. Reset altimeter climbing through 23,500 feet—29.92 in. Hg, or as required.

CLIMB.

Climb at Military Power (time limit 30 minutes). Refer to climb graphs in Appendix I, for recommended indicated airspeeds to be used during climb and for estimated rates of climb and fuel consumption.

CRUISE.

Refer to performance charts in Appendix I.

FLIGHT CHARACTERISTICS.

Refer to Section VI.

DESCENT.

Circumstances may arise which require a descent from high altitude in the shortest possible time. This may be accomplished by increasing the dive angle until limit airspeed or Mach number is reached. Refer to "Cockpit Air Conditioning and Pressurization System" in Section IV for minimum throttle settings at various altitudes to maintain cockpit pressurization during descent. See descent charts in Appendix I.

Caution The windshield and canopy defrosting system provides sufficient heating of the transparent surfaces to effectively eliminate formation of frost or fog during descent.

1. Reset altimeter descending through flight level 240—Altimeter setting at point of descent.

BEFORE LANDING.

For complete approach and landing procedures, see figure 2-5. When properly followed, these procedures will produce the results given in Appendix I. During the approach to the field, before entering the traffic pattern, perform the following checks:

1. Safety belt and shoulder harness—Tighten.
2. Shoulder harness lock handle—UNLOCKED (aft).
3. Gun safety switch—OFF.

3A. Circuit breakers—Check.

4. Bomb release selector switch—MANUAL RELEASE.
5. Bomb arming, master armament selector, and rocket fuze (arming) switches—OFF.
6. Sight mechanical caging lever—CAGE.
7. Hydraulic pressure—Normal.
8. Fuel system selector switch—NORM.

   Do not position fuel system selector switch to TAKE OFF during approach and landing, as the emergency fuel system will take over when throttle is retarded below 95% rpm.

9. Oxygen regulator diluter lever—NORMAL OXYGEN.
10. Windshield anti-icing (rain and ice removal) switch—ON, if vision is impaired by rain.

NOTE Rain removal airflow over the windshield on late airplanes* is sufficient to clear rain from a large area of the windshield under most rain conditions at traffic-pattern speeds. Anti-icing airflow over the windshield on early airplanes† is sufficient to improve forward vision under moderate rain conditions if a minimum of 75% engine rpm is maintained. If rain is still encountered as power is reduced, vision through the windshield side panels may be necessary.

Caution On early airplanes,† if windshield overheat light comes on, try to extinguish it by reducing power if possible or move cockpit pressure switch to RAM DUMP. The anti-icing system may be left on, if necessary to improve forward vision, even though the overheat light comes on.

11. Speed brake switch—OUT.
12. Landing gear and wing flap handles—DOWN; position indicators—Check.

NOTE Rapid increases in thrust are possible only above about 60% engine rpm, Military Power being reached in about 8 seconds from this power setting. Therefore, to fly the pattern at power settings above 60% engine rpm, thus ensuring adequate engine acceleration in case of an emergency, it is desirable to use speed brakes and, after the landing gear is lowered, full flaps as early in the traffic pattern as possible. Use of speed brakes improves deceleration and shortens ground roll. Use power as required on final approach to maintain a rate of descent less than 1500 feet per minute at the recommended final approach speed.

Caution Do not lower landing gear in turns or pull-ups, above gear- and flaps-down limit speed, or while airplane is yawing or slipping, as damage to gear operating mechanism or gear doors may result.

13. Zero-second parachute hook—Attach to parachute "D" ring.

    Parachute hook must be attached to "D" ring prior to descent below the minimum safe ejection altitude for your particular escape system.

14. Downwind leg—Hold recommended speed.
15. Final approach—Hold recommended speed.
16. Throttle—IDLE when landing ensured.
17. Touchdown—At recommended speed.

***F-86H-1 Airplane AF52-1991 and all later airplanes**

†F-86H-1 Airplanes AF52-1975 through -1990

LANDING.

NORMAL LANDING.

See figure 2-5 for landing pattern procedures.

Caution Do not attempt a full-stall landing, since the angle of attack is so high at stall that the tail will drag.

- After touchdown, do not apply brakes hard before nose wheel has touched down and speed diminished enough for effective braking.

NOTE The full length of the runway should be used during the landing roll so that the brakes can be used as little and as lightly as possible when bringing the airplane to a stop.

Maintain directional control by nose wheel steering during last part of landing roll, if desired. If nose wheel steering has not been engaged by then, engage it after clearing runway and when slow taxiing becomes necessary.

HEAVY-WEIGHT LANDING.

The same technique for normal landing applies for heavy-weight landing except for necessary increases in power settings. As gross weight increases, approach and touchdown speeds should be increased accordingly. A stall landing should be avoided, if at all possible, in an attempt to keep G to a minimum at point of touchdown.

NOTE If a hard heavy-weight landing is made, the airplane should be checked for signs of overstress before the next flight.

CROSS-WIND LANDING.

Adequate control is available for landing in a direct cross wind with a velocity of 25 knots. However, it is recommended that another runway be used if the cross-wind component is above that of a direct 25-knot cross wind. If that is not available, and fuel permits, a landing should be made at an airfield with more favorable wind conditions. In performing a cross-wind landing, maintain about 205 knots IAS in turn onto final approach. On final approach, crab or drop wing to keep lined up with runway.

Caution The approach and touchdown speed should be increased about 5 knots for each 10 knots of direct cross wind.

If crabbing, align airplane with runway before touchdown. If using wing-down approach, lift wing before touchdown. At touchdown, lower nose wheel to runway as quickly and smoothly as possible.

MINIMUM-RUN LANDING.

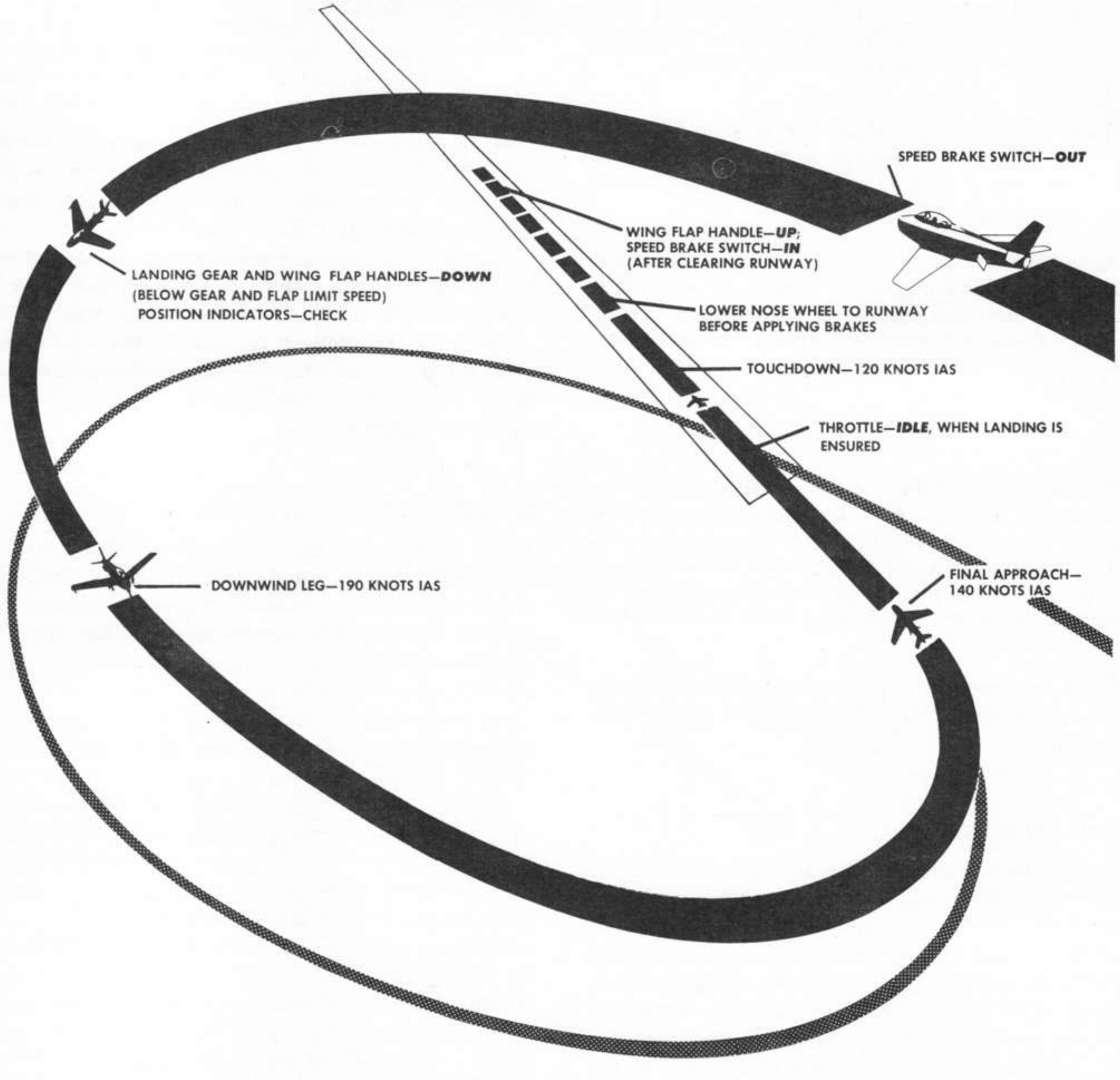
Warning Since a minimum-run landing is a maximum-performance maneuver and final approach speeds will be nearer to stall than in a normal landing, a straight-in final approach should be used; otherwise, stall will be more apt to occur when G-loads are imposed during shallow turns.

Final approach speed for a minimum-run landing should be about 20% above stall speed for the particular weight and wing leading edge configuration you are flying. After touchdown on a dry runway, set nose wheel down quickly and smoothly, and immediately raise flaps. Apply brakes smoothly and steadily to the point just short of locking the wheels; then release and apply brakes intermittently and forcefully at one-second intervals, holding them for about 2 to 3 seconds, but avoid sliding wheels. (Refer to "Wheel Brake Operation" in Section VII for additional information.)

SLIPPERY-RUNWAY LANDING.

When landing on a slippery runway (wet or icy), use the normal landing pattern and procedures. However, the condition of the runway (degree of slipperiness) must be determined by ground personnel and the pilot advised accordingly so that the proper technique can be used. On rough ice or a wet rough surface, upon touchdown, lower the nose immediately and apply heavy intermittent braking as necessary. On smooth ice or a wet smooth surface, maintain a nose-high attitude after touchdown with full flaps to provide aerodynamic braking. Care must be taken not to become airborne again at the higher speeds. As the speed is reduced and after the nose wheel touches, attempt to obtain braking with wheel brakes. As the braking coefficient is greatly reduced on slippery runways (especially on the first portion of the landing roll), the landing roll is increased. Careful braking action is necessary to prevent locking of the wheel brakes which cause skidding and loss of directional control. Braking should be intermittent to retain directional control as nose-wheel steering under these conditions is relatively ineffective. Rudder should be used also for directional control, and it will be effective down to about 60 knots IAS. Make every effort to remain on the runway in case a barrier engagement becomes necessary. When taxiing, care must be taken as directional control on a slippery runway is difficult. Refer to landing distance chart in Appendix I for approach and touchdown speeds and landing distances.

TYPICAL LANDING PATTERN



NOTE

Refer to landing distance charts in Appendix 1 for final approach and touchdown speeds at various gross weights.

F-86H-1-00-106B

Figure 2-5

GO-AROUND

NOTE

- Raise gear only after adequate flying speed is attained, because touchdown may be necessary during go-around.
- 150 pounds of fuel are required to accomplish a go-around, based on the procedure shown and assuming the following conditions:

  Airplane at, or below, normal landing gross weight.

  Go-around initiated just prior to touchdown.

  Climb from sea level to 1500 feet and traffic pattern of 10 ground miles flown.

The possibility of fuel gage error or the inability to use all fuel aboard should be considered in determining minimum fuel quantity gage reading for a go-around.

WARNING

Make decision to go around as early as possible, because of the slow acceleration of a jet airplane.

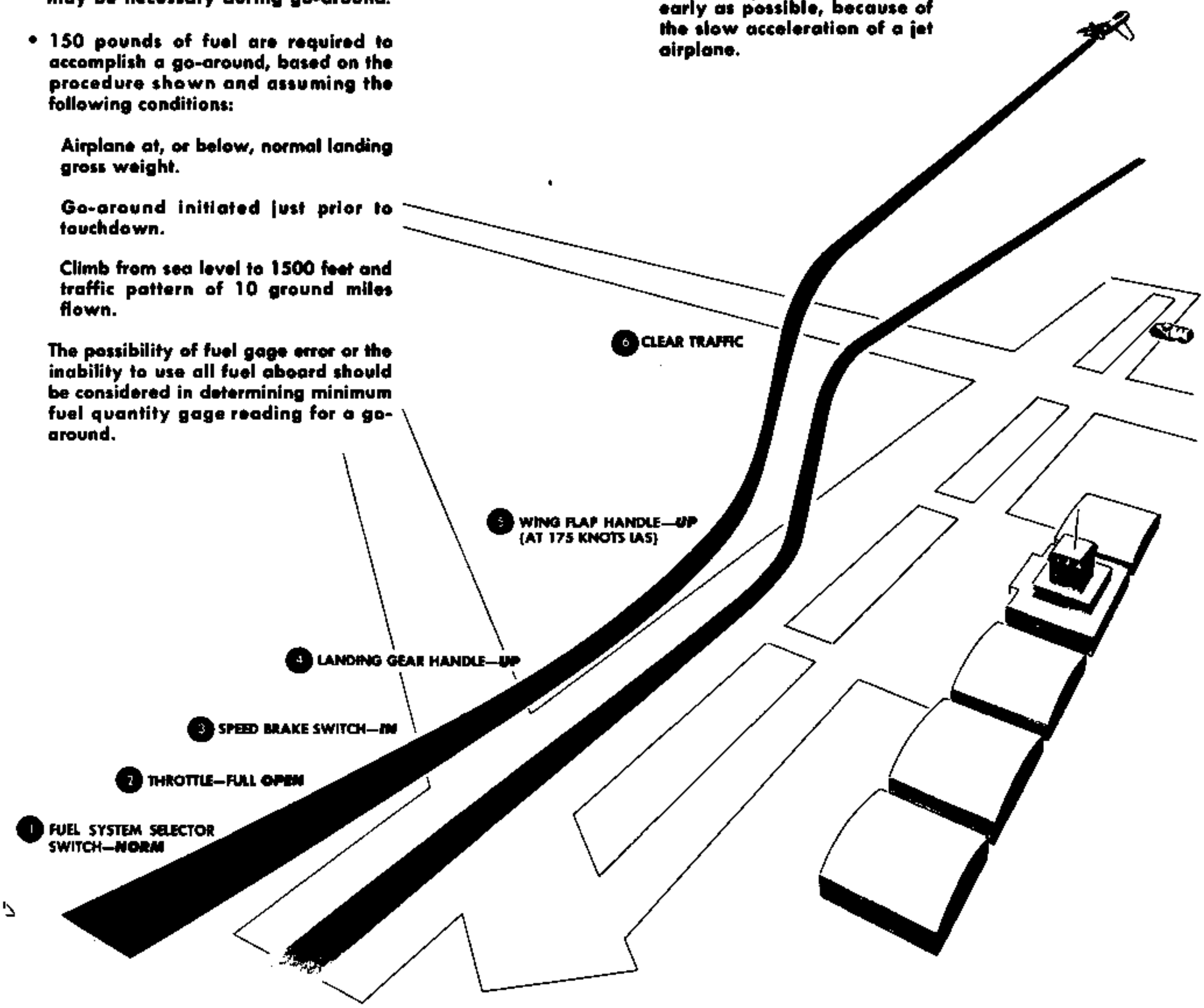


Figure 2-6

TOUCH-AND-GO LANDING.

When a touch-and-go landing is made, perform a normal approach and landing. Lower the nose wheel onto the runway as soon as possible after touchdown and simultaneously close the speed brakes and advance the throttle to Military Power.

Caution Advance throttle smoothly to Military Power to prevent compressor stall or engine overtemperature.

Complete the normal take-off, observing the recommended nose wheel lift-off and take-off speeds. Retract landing gear and wing flaps as in a normal take-off. Where a series of touch-and-go landings are to be made, the normal before-landing check must be accomplished for the initial landing. After the final touch-and-go landing, if flight is to be continued, the normal after take-off climb check must be made.

GO-AROUND.

See figure 2-6 for complete go-around procedure.

AFTER LANDING.

After turning off runway, do the following:

1. Speed brake switch—IN, then HOLD (neutral).

Caution If the speed brakes are actuated during taxiing, hydraulic boost pressure will not be available for use of nose wheel steering or application of the wheel brakes until speed brake operation is completed and system pressure is restored. Manual wheel brake pressure, however, will be available.

2. Wing flap handle—UP.
2A. Trim—Take-off position.
2B. Pitot heater switch—OFF.
2C. IFF master switch—OFF.
3. Nose screen—installed.

Warning If required by base procedure, nose screen must be installed, while engine is at idle rpm, before taxiing. Ground personnel installing screen must not wear articles of loose clothing nor carry equipment likely to be drawn into intake duct.

ENGINE SHUTDOWN.

This shutdown procedure permits engine stabilization at lowest temperature which minimizes the possibility of turbine bucket scrape. If required by emergency conditions, engine may be shut down from any rpm setting merely by moving throttle to OFF.

1. Toe brakes—Hold.
2. Engine—IDLE for 3 minutes.
3. Throttle—OFF.
4. Engine master switch—OFF.

Caution Do not turn engine master switch OFF until engine has coasted down to 5% rpm or less; otherwise, starter fuel will be depleted. This may require ground servicing before a later start. If a later start is attempted without ground servicing under this condition, starter drop-out speed will be low and a hot start may result.

5. Battery switch—OFF.

   Wait a few seconds before turning battery switch OFF, to allow fuel shutoff valve to close.

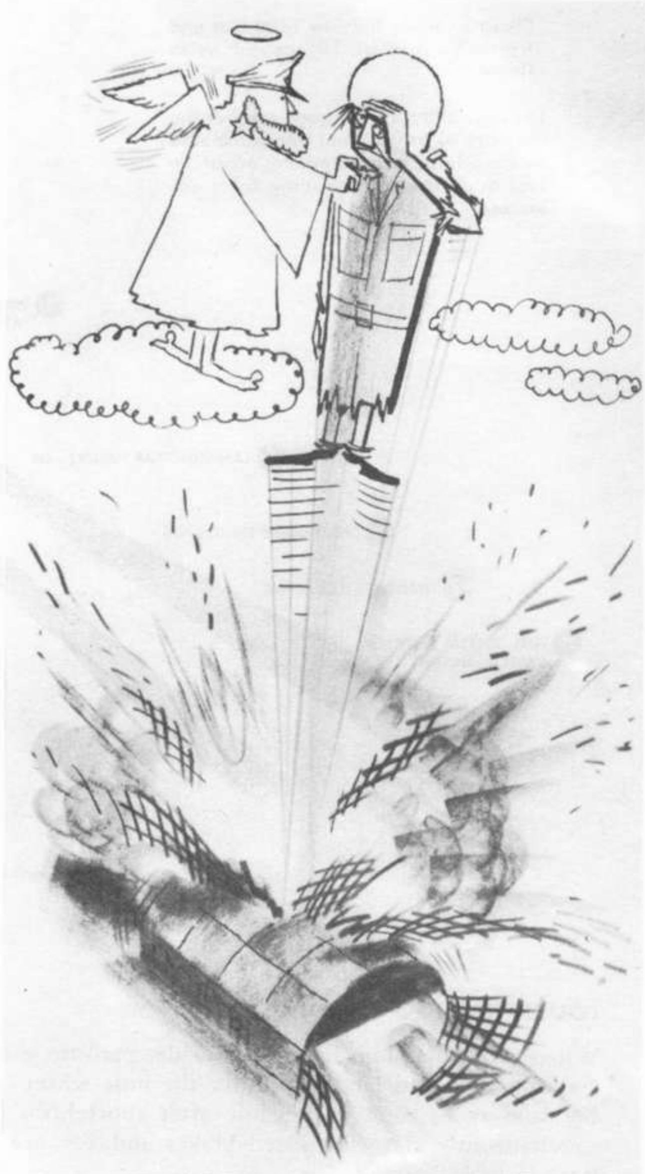
6. All switches except generator switch and instrument inverter circuit-breaker switches—OFF.
7. Control stick—Cycle.

   Cycle control stick full fore and aft until it "freezes," to dump flight control normal hydraulic system pressure. This will help prevent damage to "O" rings in normal system accumulator.

8. Flight control emergency change-over handle—Pull to full extension.
9. Control stick—Cycle.

   Move control stick as rapidly as possible full fore and aft through two complete cycles, to dump flight control alternate hydraulic system pressure. This will help prevent damage to "O" rings in alternate system accumulator.

10. Flight control emergency change-over handle—IN. Push emergency change-over handle full in immediately after control stick cycling is completed. If handle is not pushed in immediately after stick cycling is completed, alternate system pressure will build up again.



F-86H-1-0-21B

Warning

Keep clear of tail pipe and do not move airplane into hangar for at least 15 minutes after shutdown, because of the possibility of accumulated fuel vapors exploding.

BEFORE LEAVING AIRPLANE.

NOTE Leave landing gear handle DOWN when airplane is on ground, to prevent possibility of landing gear retracting before airplane is completely air-borne.

Make the following checks before leaving airplane:

1. Safety pins—Installed.

   Check that safety pins are installed in ejection seat and canopy initiators.

2. Armrests and triggers—Check.

   Check that both seat armrests are full down and latched, by applying a moderate downward force on each armrest. Check that white stripes on front face of seat bucket and inner face of each trigger guard are in perfect alignment. Also check that tops of red and white stripes on inside face of each armrest bracket do not extend above top of seat bucket.

Warning Do not raise armrests to determine whether latches are engaged; if you do, canopy may jettison.

Caution If wearing an automatic-opening parachute that has a key or anchor attached to the aneroid arming lanyard, make sure key or anchor and lanyard are not fouled before leaving seat, to prevent chute from being opened accidentally.

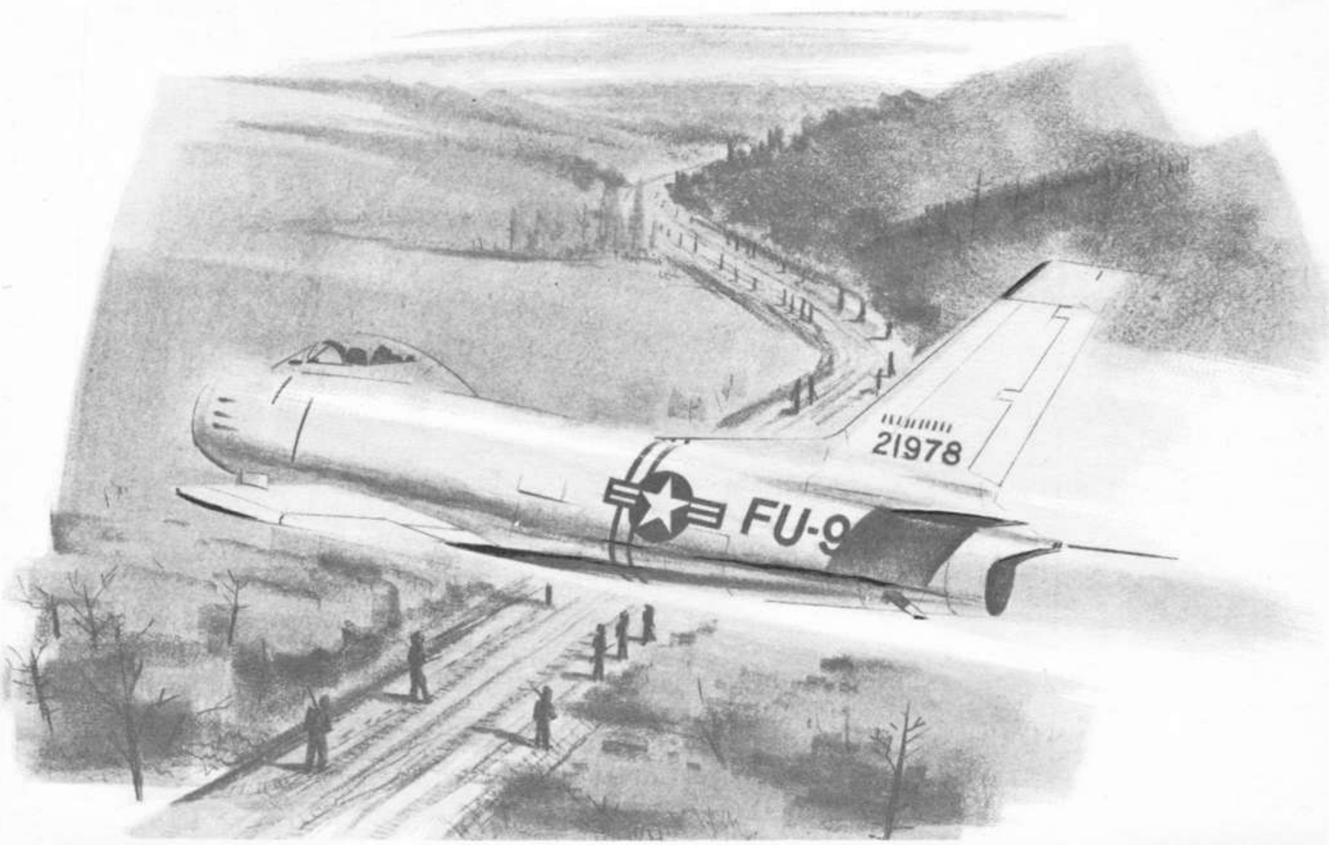
3. All electrical controls except generator switch—OFF.
4. Drop tank pressure switch—OFF.
5. Form 781—Complete.

Caution Make appropriate entries in 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 braking action during aborted take-offs, long and fast landings, and long taxi runs at high speeds, etc.

6. Canopy—Closed.
7. Main gear wheels—Chocked.
8. Nose gear ground safety lock—Installed.

CONDENSED CHECK LIST.

Refer to pages 2-23 through 2-38 for the Condensed Check List.




FU-976

CUT ON SOLID LINE

NORMAL PROCEDURES

F-86H CONDENSED CHECK LIST

NOTE

The following check list is a condensed version of the procedures presented in Section II. This condensed check list is arranged so that you may remove it from your Flight Manual and insert it into a flip pad for convenient use. It is arranged so that each action is in sequence with the expanded procedure given in Section II. Presentation of this condensed check list does not imply that you need not read and thoroughly understand the expanded version. To fly the airplane safely and efficiently, you *must* know the reason why each step is performed and why the steps occur in certain sequence.

T.O. 1F-86H-1
25 JUNE 1959
Changed 26 February 1960

CUT ON SOLID LINE

PREPARATION FOR FLIGHT.

BEFORE EXTERIOR INSPECTION.

1. Form 781—Check.

EXTERIOR INSPECTION.

While making exterior inspection, check all surfaces for cracks, distortion, loose rivets, and indications of damage; check for leaks of hydraulic fluid, fuel, and oil; check all access doors and panels and all filler caps secured; check tires for general condition, slippage, and proper inflation; check position of gear doors, gear strut extension, and condition of wheels.

1. Nose:

Nose wheel chock—Removed.
Nose gear ground safety lock—Removed.
Tow pin safety cap—Tight.
Nose gear emergency extension air bottle pressure—Within limits.
Nose gear emergency extension reset button—Flush position.
Landing and taxi lights—Retracted.
Intake duct clear (except nose screen installed).
Gun port plugs—Removed, if on firing mission.

2. Upper Right Wing:

Canopy deck circuit breakers—In.
Utility hydraulic system reservoir sight gage—Check for proper level.
Flight control normal hydraulic system reservoir fluid level indicator pin—Check within 1/4 inch of top of gage.
Access panel—Secure.

3. Forward Fuselage and Right Wing Leading Edge:

Starter air storage bottles—3000 psi for two starts; 1900 psi minimum for start.
Main gear wheel—Chocked.
Slats—Check for freedom of movement.
Navigation light and wing tip—Check general condition and security of mounting.
Pitot head—Uncovered.

T.O. 1F-86H-1
25 June 1959

2

CUT ON SOLID LINE

4. Right Wing Trailing Edge and Aft Fuselage:

Aileron and flap—Check general condition.
External load—Check for proper installation and security of mounting. If drop tanks are carried, visually check each tank for fuel level and amount. If quantity is questionable, measure with a dip stick. Check filler cap secure.
Speed brake—Check general condition.
Flight control normal and alternate system accumulator gage pressure—Within limits.

5. Empennage:

Tail-pipe cover—Removed.
Tail cone and navigation lights—Check general condition and security of mounting.

6. Aft Fuselage and Left Wing Trailing Edge:

Speed brake—Check general condition.
External load—Check for proper installation and security of mounting. If drop tanks are carried, visually check each tank for fuel level and amount. If quantity is questionable, measure with a dip stick. Check filler cap secure.
Aileron and flap—Check general condition.

7. Left Wing Leading Edge and Forward Fuselage:

Navigation light and wing tip—Check general condition and security of mounting.
Landing gear door ground control switch—CLOSE.
(Deleted)
Main gear wheel—Chocked.
Slats—Check for freedom of movement.

8. Upper Left Wing:

(Deleted)
Flight control alternate hydraulic system reservoir fluid level indicator pin—Check within ¼ inch of top of gage.
Access panel secure.

T.O. 1F-86H-1
Changed 26 February 1960 **3**

CUT ON SOLID LINE

CANOPY AND EJECTION SEAT CHECK.

1. Safety pins—Check.
2. Armrests and triggers—Check.
3. Lead seal—Check.
4. Seat quick-disconnects—Check.
5. Shoulder harness routing—Check.

INTERIOR CHECK.

1. Ground fire safety switch (20 mm guns)—SAFE.
2. Armament switches—OFF.
3. Stick grip—Check.
4. Safety belt (shoulder harness and lanyard to safety belt)—Secured (shoulder harness unlock handle unlocked).
5. Zero-second parachute hook—Attach to parachute "D" ring.
6. Seat—Adjust.
7. Rudder pedals—Unlock and adjust.
8. Engine master, air start, and battery switches—OFF.
9. External power—Connected.
10. Circuit breakers—IN; (instrument inverter circuit-breaker switches—ON).
11. Speed brake dump valve lever*—NORMAL (forward).
12. Anti-G suit pressure-regulating valve—Check.
13. Camera lens selector switch—As desired.
14. Bomb release selector switch—MANUAL RELEASE.
15. Command radio—Check for proper channelization and readability.
16. Radar range sweep switch—MIN.
17. Flight control switch—NORMAL.
18. Rudder trim switch—OFF.
19. Throttle—OFF (adjust friction).
20. Speed brake switch—HOLD (neutral).
21. Wing flap handle—UP.
22. Drop tank pressure switch—INBD if only inboard tanks installed—OUTBD if outboard tanks installed—OFF if tanks not installed.
23. Air compressor switch*—NORM.
24. Fuel filter deice switch*—OFF.
25. Cockpit pressure switch—As desired.
26. Cockpit temperature master switch—AUTO.
27. Cockpit temperature rheostat—As desired.
28. Cockpit console airflow lever—DECR.

T.O. 1F-86H-1
Changed 26 February 1960

4

CUT ON SOLID LINE

29. Pitot heater switch—ON, then OFF.
30. Windshield anti-icing (rain and ice removal) switch—OFF.
31. Canopy and windshield defrost handle (handles)—OFF.
32. Landing gear handle—DOWN.
33. Landing gear position indicators—Check.
34. Landing and taxi light switch—OFF.
35. Gun heater switch (.50-caliber guns)—OFF.
36. Canopy switch—OFF (center).
37. Special store jettison handle—IN.
38. Flight control emergency change-over handle—IN.
39. Emergency jettison handle—IN.
40. Fuel quantity—Check.
41. Clock, altimeter, and accelerometer—Set.
42. Directional indicator—Check against stand-by compass.
43. Vertical velocity indicator—Set.
44. Attitude indicator—Check.
45. Fuel system selector switch—NORM.
46. Sight mechanical caging lever—CAGE.
47. Hydraulic pressure gage selector switch—NORMAL.
48. Gun selector switch*—UPPER or ALL, as required.
49. Landing gear emergency release handle—IN.
50. Special store disarming lever*—DIS.
51. Warning lights and indicators and test warning system—Check.
52. Generator switch—ON.
53. Instrument ac power switch—ALTERNATE, then MAIN; ac power warning light—OUT.
54. Oxygen regulator—Check.
55. Radio compass—Check.
56. Lighting controls—As required.
57. Map case—Flight Manual, Radio Facility Charts, Pilot's Handbook—Jet, and other necessary publications and charts available.
58. Flashlight—Check.
59. Flight controls—Check.
60. Trim switch—Check.

T.O. 1F-86H-1
25 June 1959

5

CUT ON SOLID LINE

STARTING ENGINE.

AUTOMATIC START.

1. Battery switch—ON.
2. Engine master switch—ON.
3. Fuel system selector switch—NORMAL.
4. Throttle—IDLE.
5. Ground start button—Depress momentarily.
6. Oil pressure—Check.
7. Engine instruments—Check.
8. Generator-off warning light—Out.
9. External power—Disconnected.

MANUAL START.

1. Throttle—OFF.
2. Battery switch—ON.
3. Engine master switch—ON.
4. Fuel system selector switch—EMER.
5. Throttle—IDLE and outboard, to clear idle stop.
6. Starter button—Depress momentarily.
7. Fuel flow—Check for indication.
8. Throttle—Adjust to establish and maintain 1100 pounds per hour fuel flow until engine ignition occurs.
9. Throttle—Adjust for proper exhaust temperature.
10. Oil pressure—Check.
11. Throttle—Retard to IDLE.
12. Fuel system selector switch—NORM.
13. Engine instruments—Check.
14. External power—Disconnected.
15. Generator-off warning light—Out.

T.O. 1F-86H-1
25 June 1959

6

CUT ON SOLID LINE

GROUND OPERATION.

FLIGHT CONTROL HYDRAULIC SYSTEM CHECK.

1. Throttle—IDLE.
2. Hydraulic pressure gage selector switch—NORMAL.
3. Flight control switch—RESET (check alternate-on warning light out).
4. Flight control normal hydraulic system—Check.
   a. Flight control switch—NORMAL.
   b. Control stick—Move and visually check for proper control surface movement.
   c. Pressure—After 5 seconds, 2850 to 3200 psi (control stick not in motion).
5. Flight control alternate hydraulic system—Check.
   a. Flight control switch—ALTERNATE.
   b. Alternate-on warning light—On.
   c. Hydraulic pressure gage selector switch—ALTERN.
   d. Control stick—Move and visually check for proper control surface movement.
   e. Pressure—2550 to 3200 psi (control stick not in motion).
   f. Flight control switch—RESET.
6. Flight control manual emergency change-over system—Check.
   a. Hydraulic pressure gage selector switch—ALTERN.
   b. Flight control switch—Hold at RESET.
   c. Flight control emergency change-over handle—Pull to full extension.
   d. Control stick—Move and visually check for proper control surface movement. Check pressure drop on hydraulic pressure gage.
   e. Flight control switch—NORMAL.
   f. Alternate-on warning light—On (indicating electrical circuit complete).
   g. Pressure—3050 to 4000 psi.
7. Flight control emergency change-over handle—IN.
8. Pressure—2550 to 3200 psi.

T.O. 1F-86H-1
Changed 26 February 1960 **7**

CUT ON SOLID LINE

9. Automatic return to flight control normal system—Check.
   a. Control stick—Move rapidly.
   b. Alternate-on warning light—Out.
   c. Hydraulic pressure gage selector switch—NORMAL.
   d. Pressure—2850 to 3200 psi.

UTILITY HYDRAULIC SYSTEM CHECK.

1. Throttle—60% rpm.
2. Hydraulic pressure gage selector switch—UTILITY.
3. Speed brake switch—OUT, IN, then HOLD (neutral).
4. Pressure—2850 to 3000 psi for static (no-flow) condition.
5. Hydraulic pressure gage selector switch—NORMAL.

BEFORE TAXIING.

1. Safety pins—Remove.
2. Main gear wheel chocks—Removed.
3. Altimeter—Set to field pressure.

TAXIING.

1. Throttle—Advance; then return to IDLE.
2. Pitot heater switch—As required.
3. Nose wheel steering button—Depress (for directional control).
4. Turn-and-slip indicator—Check deflection of turn needle during turns.
5. Radio compass—Check relative bearing to selected station.
6. Directional indicator—Check actual changes of heading against the instrument indications.

T.O. 1F-86H-1
25 June 1959 8

CUT ON SOLID LINE

BEFORE TAKE-OFF.

PREFLIGHT AIRPLANE CHECK.

1. Nose screen—Removed.
2. Safety belt—Tighten; shoulder harness—Adjust.
3. Shoulder harness lock handle—UNLOCKED (aft).
4. Armament switches—OFF.
5. Trim for take-off—Check.
6. Wing flap handle—DOWN.
7. Canopy switch—CLOSE; check canopy unsafe warning light out.
8. Oxygen regulator diluter lever—NORMAL OXYGEN (100% OXYGEN if carbon monoxide suspected).
9. Take-off position—Align nose wheel.
10. Toe brakes—Hold.

PREFLIGHT ENGINE CHECK.

1. Fuel system selector switch—Recheck at NORM.
2. Throttle—Full OPEN, to maintain 100% rpm.
3. Fuel system selector switch—TAKE OFF.
4. Take-off switch-on indicator light—On.
5. Throttle—Retard to below 95% rpm.
6. Emergency fuel-on indicator light—On.
7. Throttle—Full OPEN.
8. Engine rpm—Check.
9. Fuel system selector switch—NORM, until engine stabilizes at 100% rpm.
10. Fuel system selector switch—TAKE OFF.
11. Emergency fuel-on indicator light—Out.
12. Take-off switch-on indicator light—On.

T.O. 1F-86H-1
25 June 1959 9

CUT ON SOLID LINE

ENGINE INSTRUMENT CHECK.

1. Throttle—Full OPEN.
2. Engine instruments—Check.

TAKE-OFF.

NORMAL TAKE-OFF.

1. Throttle—Full OPEN.
2. Toe brakes—Release.
3. Maintain directional control.
4. Maintain near-level attitude until take-off speed is attained.
5. Assume nose-high attitude when take-off speed is attained.

AFTER TAKE-OFF—CLIMB.

1. Landing gear handle—UP.
2. Wing flap handle—UP.
3. Zero-second parachute hook—Detach from parachute "D" ring and attach to stowage ring.
4. Trim—As required.
5. Level off and accelerate to best climb speed.
6. Fuel system selector switch—NORM, with engine at 100% rpm.
7. Oxygen regulator diluter lever—NORMAL OXYGEN (100% OXYGEN if carbon monoxide suspected).
8. Reset altimeter climbing through 23,500 feet—29.92 in. Hg, or as required.

DESCENT.

1. Reset altimeter descending through flight level 240—Altimeter setting at point of descent.

T.O. 1F-86H-1
Changed 26 February 1960 10

CUT ON SOLID LINE

TAKE-OFF DATA

CONDITIONS

Runway air temp .... °F

Runway length .... ft

Field press. alt .... ft

Gross weight .... lb

Surface wind .... knots

TAKE-OFF

Acceleration check .... knots IAS at .... ft

Refusal speed .... knots IAS at .... ft

Nose wheel lift-off .... knots IAS

Take-off speed .... knots IAS at .... ft

Distance to clear 50 ft obstacle .... ft

Initial climb speed .... knots IAS

LANDING IMMEDIATELY AFTER TAKE-OFF

Final approach speed .... knots IAS

Initial Stall Warning speed .... knots IAS

Touchdown speed .... knots IAS

Ground roll distance .... ft

Barrier configuration (no external load)

T.O. 1F-86H-1
25 June 1959

F-86H-1-93-268B

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CUT ON SOLID LINE

LANDING DATA

CONDITIONS

Outside air temp..................°F

Runway length ....ft

Field press. alt..................ft

Gross weight ....lb

Surface wind ....knots

LANDING

Final approach speed..................knots IAS

Initial Stall Warning speed ....knots IAS

Touchdown speed ....knots IAS

Ground roll distance..................ft

Total distance to clear 50 ft obstacle..................ft

Barrier configuration (no external load)

T.O. 1F-86H-1
25 June 1959

F-86H-1-93-267B

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CUT ON SOLID LINE

BEFORE LANDING.

1. Safety belt and shoulder harness—Tighten.
2. Shoulder harness lock handle—UNLOCKED (aft).
3. Gun safety switch—OFF.

3A. Circuit breakers—Check.

4. Bomb release selector switch—MANUAL RELEASE.
5. Bomb arming, master armament selector, and rocket fuze (arming) switches—OFF.
6. Sight mechanical caging lever—CAGE.
7. Hydraulic pressure—Normal.
8. Fuel system selector switch—NORM.
9. Oxygen regulator diluter lever—NORMAL OXYGEN.
10. Windshield anti-icing (rain and ice removal) switch—ON, if vision is impaired by rain.
11. Speed brake switch—OUT.
12. Landing gear and wing flap handles—DOWN; position indicators—Check.
13. Zero-second parachute hook—Attach to parachute "D" ring.
14. Downwind leg—Hold recommended speed.
15. Final approach—Hold recommended speed.
16. Throttle—IDLE when landing ensured.
17. Touchdown—At recommended speed.

GO-AROUND.

1. Fuel system selector switch—NORM.
2. Throttle—Full OPEN.
3. Speed brake switch—IN.
4. Landing gear handle—UP.
5. Wing flap handle—UP.
6. Clear traffic.

T.O. 1F-86H-1
Changed 26 February 1960 11

CUT ON SOLID LINE

AFTER LANDING.

1. Speed brake switch—IN, then HOLD (neutral).
2. Wing flap handle—UP.
2A. Trim—Take-off position.
2B. Pitot heater switch—OFF.
2C. IFF master switch—OFF.
3. Nose screen—Installed.

ENGINE SHUTDOWN.

1. Toe brakes—Hold.
2. Engine—IDLE for 3 minutes.
3. Throttle—OFF.
4. Engine master switch—OFF.
5. Battery switch—OFF.
6. All switches except generator switch and instrument inverter circuit-breaker switches—OFF.
7. Control stick—Cycle.
8. Flight control emergency change-over handle—Pull to full extension.
9. Control stick—Cycle.
10. Flight control emergency change-over handle—IN.

BEFORE LEAVING AIRPLANE.

1. Safety pins—Installed.
2. Armrests and triggers—Check.
3. All electrical controls except generator switch—OFF.
4. Drop tank pressure switch—OFF.
5. Form 781—Complete.
6. Canopy—Closed.
7. Main gear wheels—Chocked.
8. Nose gear ground safety lock—Installed.

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*Some airplanes

T.O. 1F-86H-1
Changed 26 February 1960 12

EMERGENCY PROCEDURES

TABLE OF CONTENTS **PAGE**

ENGINE FAILURE.

The majority of jet-engine flame-outs are the result of improper fuel flow caused by fuel control system malfunction or incorrect operating techniques during certain critical flight conditions. Specific information on this type of engine failure is given in "Engine Fuel Control System Failure." The engine instruments often provide indications of fuel control system failure before the engine actually stops. If engine failure is due to malfunctions of the fuel control system or improper operating technique, an air start can usually be made when time and altitude permit. In case of obvious mechanical failure within the engine, air starts should not be attempted. The airplane has normal flight characteristics with a dead engine, and no sudden trim changes are necessary.

ENGINE FAILURE DURING TAKE-OFF RUN (NO RUNWAY OVERRUN BARRIER).

NOTE For procedure when using a runway equipped with overrun barrier, refer to "Engaging Runway Overrun Barrier" in this section.

- If it is desirable to stop in the shortest possible distance because of obstacles beyond the runway overrun area and heavy braking will not be sufficient, then retract the landing gear. However, it may be desirable to leave gear extended in order to absorb impact loads, especially if the terrain is rough beyond the end of the runway.

If engine fails, or take-off is aborted before airplane leaves the ground, and insufficient runway remains for a normal stop, accomplish as much of the following as time permits:

1. External stores jettison button—Depress.

Warning Rockets cannot be jettisoned when airplane weight is on the landing gear.

2. Throttle—OFF.
3. Brakes—Apply as necessary.

   If landing gear must be retracted because of insufficient runway remaining, proceed with step 4.

4. Landing gear handle—UP (if conditions warrant); then, landing gear emergency-up button—Depress and hold.

   Hold landing gear emergency-up button depressed until gear completely retracts.

NOTE To accelerate gear retraction, yaw the airplane to relieve load on main gear downlock pins by alternately applying right and left wheel brakes or by applying rudder alternately with nose wheel steering engaged.

5. Either handgrip—Raise to jettison canopy.

   Jettison canopy by raising either handgrip before airplane comes to a complete stop.

Warning If canopy is not jettisoned before the airplane stops and if spilled fuel is in the vicinity of the airplane, use the mechanical means to open the canopy. If these systems fail, use the canopy jettison mechanism.

6. Engine master, generator, and battery switches—OFF.

Caution Do not turn battery switch OFF until engine master switch has been turned OFF, so that power will still be available to close fuel shutoff valve.

ENGINE FAILURE DURING TAKE-OFF (AIR-BORNE).

If the engine fails on take-off after the airplane is air-borne, prepare for an emergency landing, accomplishing as much of the following as time permits:

1. External stores jettison button—Depress.
2. Throttle—OFF.
3. Landing gear handle—DOWN.
4. Wing flap handle—DOWN.
5. Either handgrip—Raise to jettison canopy.
6. Engine master, generator, and battery switches—OFF.

Caution Do not turn battery switch OFF until engine master switch has been turned OFF, so that power will still be available to close fuel shutoff valve.

7. Land straight ahead, changing course only enough to miss obstacles.

ENGINE FAILURE DURING FLIGHT.

If engine fails during flight, follow this procedure:

1. Throttle—OFF.
2. Glide—200 knots IAS.

   Establish glide at 200 knots IAS, with gear and flaps up and speed brakes closed for maximum glide distance. Refer to "Maximum Glide" in this section.

3. Nonessential electrical equipment—OFF.

Warning At normal gliding speeds, engine windmilling does not provide enough generator output, and the battery is then the only source of electric power. With the engine master switch, radio, pitot heater, and lights turned off, the battery can supply power for only 7 to 28 minutes (approximately). If engine damage prevents windmilling (causing flight control normal hydraulic system pressure failure), the automatic operation of the electrically powered flight control alternate hydraulic pump imposes the maximum drain on battery power and results in minimum battery output time (about 6 to 7 minutes).

4. Attempt air start.

   Refer to "Engine Air Start" in this section.

ENGINE FAILURE DURING FLIGHT AT LOW ALTITUDE.

If engine failure occurs during flight at low altitude and with sufficient airspeed available, the airplane should be pulled up (zoom-up) to exchange airspeed for an increase in altitude. This will allow more time for accomplishing subsequent emergency procedures (air start, establishing forced landing pattern, ejection, etc).

NOTE The point at which climb should be terminated will depend on whether the pilot intends to eject or whether he intends to continue attempting air starts, establish forced landing pattern, etc. In any event, it is recommended that air start be attempted immediately upon detection of engine failure and repeated as many times as possible during the zoom-up. If the decision is to eject, the airplane should be allowed to climb as far as possible. *For this condition, the optimum zoom-up technique is to pull the airplane up with wings level until light buffet is encountered. Hold this light buffet until the speed drops to 120 knots IAS or the rate of climb approaches zero, then eject.* If the decision is to continue attempting air starts, the climb should be terminated before dropping below best glide speed, in order to obtain maximum glide distance and maintain adequate engine windmilling rpm for air start.

Maximum altitude can be achieved by jettisoning external loads before zoom-up. The further up the climbing flight path that external loads are jettisoned, the less additional altitude will be gained. However, when external loads are jettisoned, consideration must be given to such factors as terrain where external loads will fall (populated areas, friendly or enemy territory, etc); type of stores to be jettisoned (special store, conventional bombs, full or empty drop tanks, etc); controllability of the airplane if one or more stores fail to release resulting in a dangerous asymmetrical condition at low altitude. Also of prime importance are the external load release limits outlined in Section V. These limits should be observed to prevent damage to the airplane. It is impossible to predict the extent of damage which may occur if the external loads are released outside the established limits because of the number of factors involved. Depending on the emergency, it may be advisable to jettison the external loads outside the release limits and risk some damage to the airplane in order to increase the probability of being able to accomplish subsequent emergency procedures. In any event, the decision to jettison or retain external loads must be made by the pilot on the basis of his evaluation of the above factors and conditions existing at the time of the emergency.

ENGINE AIR START.

The engine can be restarted at altitudes up to 45,000 feet, but air starts are characteristically easy at any altitude below 40,000 feet. Air starts must be made on the emergency fuel system, so careful attention should be given to recommended fuel flow and throttling precautions. For air starting, follow these procedures:

1. Air start switch—ON.

   Air start switch ON to disconnect generator from battery, indicated by lighting of generator-off warning light.

2. Fuel system selector switch—EMER.
3. Engine master, battery, and generator switches—ON.

NOTE If possible, descend below 40,000 feet to ensure easy air start.

- If a long glide is considered, turn off all nonessential electrical equipment to conserve battery power.

4. Hold airplane level for 15 seconds.

   If altitude is available, hold airplane as level as possible for at least 15 seconds to drain any fuel that may have collected in the combustion chambers or turbine section.

5. Maintain 200 knots IAS.

   200 knots IAS will result in engine windmilling speeds of about 13% rpm at low altitude to 30% rpm at high altitude.

6. Throttle—Advance to obtain fuel flow of 500 to 800 pounds per hour.

   Advance throttle to obtain fuel flow of 500 (higher altitudes) to 800 (lower altitudes) pounds per hour.

Caution If there is no indication of ignition after 45 seconds, pull throttle to OFF. Level airplane to permit fuel drainage and repeat starting procedure.

7. RPM and exhaust temperature—Allow to stabilize; then advance throttle cautiously to desired power setting.

Caution As restart is made on emergency system, throttle should be advanced cautiously, making sure the engine accelerates and that exhaust temperature remains within limits.

NOTE Failure of the engine to accelerate and low exhaust temperature indicate a partial light-off. If this occurs, retard throttle to initial starting fuel flow to allow complete flame propagation; then readvance throttle cautiously.

8. Air start switch—OFF.

   Air start switch OFF to de-energize ignition system and return generator to the electrical system.

NOTE The air start switch must be moved to OFF after ignition is obtained, as ignition units may be damaged if energized any longer than 3 minutes of continuous operation.

Continue flight on emergency system, or investigate possibility of operation on main fuel system

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if there is no indication that flame-out was caused by main fuel system failure.

9. If engine fails to start:
   a. Throttle—OFF.
   b. Air start, engine master, and generator switches—OFF.
   c. External stores jettison button—Depress.
   d. Prepare for forced landing, or eject.
   Refer to "Forced Landing—Windmilling or Frozen Engine" in this section.

MAXIMUM GLIDE.

For maximum glide distance, the best gliding speed is 200 knots IAS with gear and flaps up, speed brakes closed, and no external load. (See figure 3-1.) Glide ratios and rates of descent for various airplane conditions at 200 knots IAS are as follows:

CONDITION	SPEED (KNOTS IAS)	GLIDE RATIO	RATE OF DESCENT
Gear and flaps up, speed brakes in	200	13.8 to 1	2970 fpm at 40,000 ft 1710 fpm at 10,000 ft
Gear and flaps down, speed brakes in	200	5.3 to 1	4330 fpm at 10,000 ft
Gear down, flaps up, speed brakes out	200	5.3 to 1	4310 fpm at 10,000 ft
Gear down, flaps down, speed brakes out	200	3.7 to 1	6010 fpm at 10,000 ft

EJECTION VS FORCED LANDING.

Normally, ejection is the best course of action with a windmilling or frozen engine. However, because of the many variables encountered, the final decision to attempt a forced landing, or to eject, must remain with the pilot. It is impossible to establish a predetermined set of rules and instructions which would provide a ready-made decision applicable to all emergencies of this nature. The basic conditions listed, combined with the pilot's analysis of the condition of the airplane, type of emergency, and his proficiency, are of prime importance in determining whether to attempt a forced landing, or to eject. These variables make a quick and accurate decision difficult. If the decision is made to eject, before ejection, if possible, attempt to turn the airplane toward an area where injury or damage to persons or property on the ground or water is least likely to occur.

Before a decision is made to attempt a forced landing, the following basic conditions should exist.

a. Forced landings should only be attempted by pilots who have satisfactorily completed simulated forced landing approaches in this airplane.

b. Forced landings should only be attempted on a prepared or designated suitable surface of at least 8000 feet.

c. Approaches to the runway should be clear and should not present a problem during a forced landing approach.

NOTE No attempt should be made to land a flamed-out airplane at any field with approaches over heavily populated areas, if a suitable area is available to abandon the airplane. If possible, before ejection, attempt to turn the airplane toward an area where injury or damage to persons or property on the ground or water is least likely to occur.

d. Weather and terrain conditions must be favorable. Cloud cover, ceiling, visibility, turbulence, surface wind, etc, must not impede in any manner the establishment of a proper forced landing pattern.

NOTE Night forced landings, or forced landings under poor lighting conditions such as at dusk or dawn, should not be contemplated, regardless of weather or field lighting.

e. Forced landings should only be attempted when either a satisfactory "High Key" or "Low Key" position can be achieved.

f. If at any time during the forced landing approach, conditions do not appear ideal for successful completion of the landing, ejection should be accomplished. EJECT no later than the "Low Key" altitude.

FORCED LANDING—WINDMILLING OR FROZEN ENGINE.

If a forced landing is considered, maintaining the glide at 200 knots IAS (gear and flaps up, speed brakes closed) will provide the maximum gliding distance. Unless the engine is damaged, it will windmill at ample speed to produce power for the hydraulic system, although landing gear operation will be considerably slower than usual. The flight control hydraulic system will operate normally; however, excessive use of the controls should be avoided in order to conserve accumulator pressure. See figure 3-2 for procedure to follow in case of forced landing. (For additional information, refer to "Ejection vs Forced Landing" in this section.)

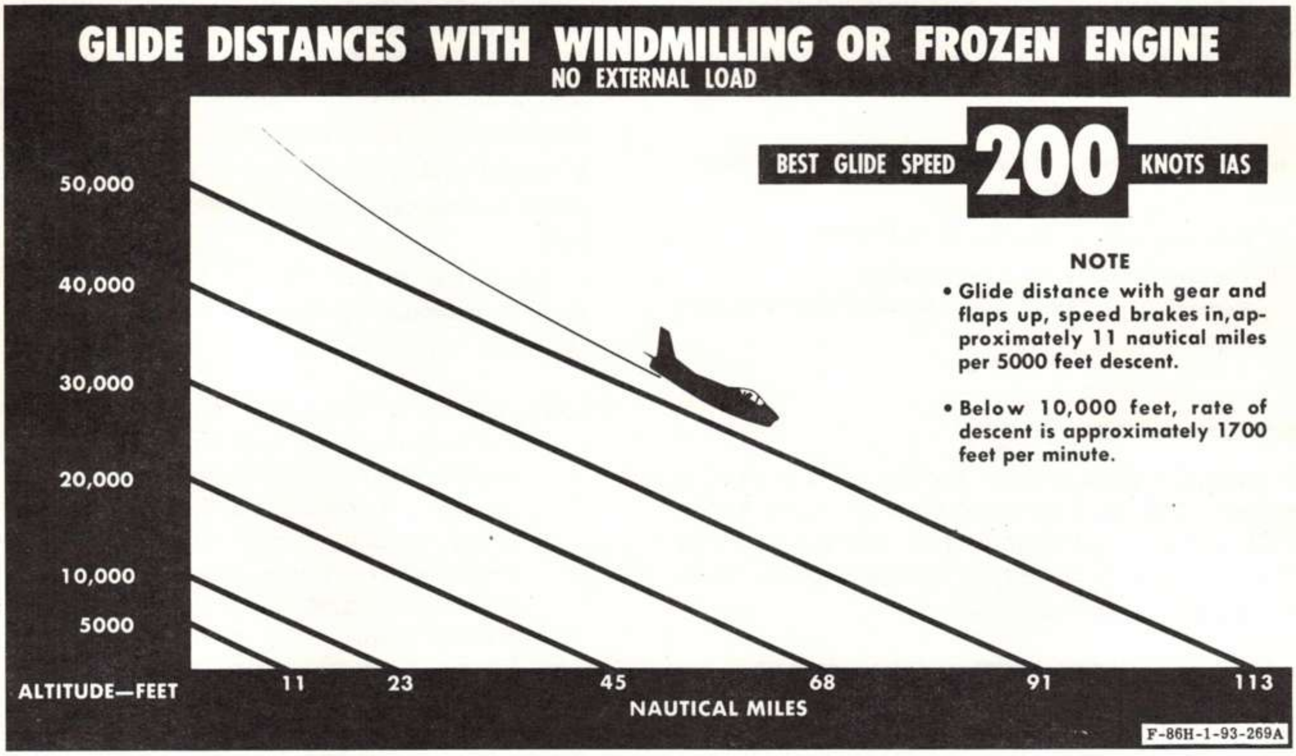


Figure 3-1

SIMULATED FORCED LANDING.

The normal procedure of retarding the throttle to IDLE to practice a forced landing does not apply to airplanes powered by turbojet engines. With the throttle at IDLE, this engine continues to provide thrust (about 650 pounds), whereas with complete power failure, the windmilling engine creates drag. Thus, if the throttle is retarded to IDLE to simulate engine failure, the thrust still produced will cause the rate of descent to be less and the glide distance to be greater than during an actual flame-out forced landing. The drag of a windmilling engine can be simulated for practice forced landings by opening the speed brakes. However, the drag created by the open speed brakes is actually greater than that of the windmilling engine; as a result, a certain amount of engine power is required to offset this excessive drag. Rate of descent, glide distance, and flight characteristics with the windmilling engine can be simulated above 12,000 feet by reducing the engine rpm to about 67%, opening speed brakes, and establishing a glide speed of 190 knots IAS. Landing gear should be lowered at high key point and a glide speed of 185 knots IAS initiated. To simulate the drag of a windmilling engine at 185 knots IAS, engine rpm should be reduced to about 63%, because of decrease in drag at the lower airspeed. Familiarization with forced landing techniques and procedures can be attained with practice. During an actual forced landing, the speed brakes may be used as desired to prevent possible overshoot. On practice forced landings, however, since the speed brakes have been opened previously, it is necessary to retard the throttle to IDLE when speed brake effect is desired. Final approach speed for any clean airplane gross weight is 170 knots IAS. Since the idling engine produces some thrust, landings made during practice will be slightly farther down the runway than a landing made with a dead engine. If approach during practice forced landing is not as desired, make a normal go-around and repeat the forced landing procedures until desired proficiency is attained.

FIRE.

Warning There is no fire-extinguishing system on this airplane.

ENGINE FIRE DURING STARTING.

If there is an indication of fire in the engine compartment, such as lighting of the forward fire-warning light or aft overheat light:

1. Throttle—OFF.
2. Engine master switch—OFF.

3. Generator switch—OFF, if generator-off warning light is out.
4. Battery switch—OFF.
5. Leave airplane as quickly as possible.

ENGINE FIRE DURING TAKE-OFF.

Illumination of the forward ("FIRE ENGINE COMPR. COMP.") fire-warning light during take-off indicates a fire in the engine compressor compartment, necessitating immediate action. The exact procedure to follow will vary with each set of circumstances and will depend on altitude, airspeed, length of runway, overrun clearing remaining, availability of runway overrun barrier, location of populated areas, etc. The decision you make will depend on these factors. To help you make a decision, the following procedures are presented for your consideration.

Forward Fire-warning Light (Ground Roll).

If the forward fire-warning light comes on during ground roll and sufficient runway or overrun area is available to allow for aborting the take-off, proceed as follows:

1. Throttle—OFF.
2. External stores jettison button—Depress.
3. Landing gear handle—UP; gear emergency-up button—Depress and hold, if necessary to retract gear.
4. Leave airplane immediately upon stopping, if fire is apparent.

Forward Fire-warning Light (Air-borne).

If the forward fire-warning light comes on after the airplane is air-borne, and there is not sufficient runway or overrun area available to abort the take-off, the following is recommended:

1. External stores jettison button—Depress.
2. Throttle—Maintain power.
   Maintain take-off power and begin immediate climb.
3. Maximum climb.
   Immediately climb to safe ejection altitude.
4. Fuel system selector switch—NORM.
5. Throttle—Adjust to minimum practical power.
   Adjust throttle to minimum practical power to maintain safe ejection altitude.
6. Check for fire.
   Determine whether a fire actually exists by a report from another airplane, abnormal instrument readings, airplane or engine response to controls, explosion, unusual noise or vibration, fumes, heat, cockpit smoke, or trailing smoke noted following a turn.
7. If fire is confirmed—Eject.

Warning Whenever existence of fire is confirmed, prompt ejection will ensure greatest chance for survival.

8. If fire cannot be confirmed—Land as soon as possible.
   If existence of fire cannot be confirmed, maintain a safe ejection altitude at minimum practical power. Establish controllability of airplane and try to obtain assistance from other airplanes in the area in determining existence of fire. If no assistance is available, reconfirm controllability before descent below safe ejection altitude, and land as soon as possible.

Aft Overheat Light (Ground Roll).

If the aft overheat light comes on during ground roll and sufficient runway or overrun area is available to abort the take-off, proceed as follows:

1. Throttle—OFF.
2. External stores jettison button—Depress.
3. Use maximum braking.
4. Overheat light—Check.
   a. If light remains on after stopping—Leave airplane immediately.
   b. If light goes out—Engine master switch OFF, then battery switch OFF.

Aft Overheat Light (Air-borne).

If the aft overheat light comes on after airplane becomes air-borne and take-off cannot be safely aborted, proceed as follows:

1. Fuel system selector switch—NORM.
2. Throttle—Retard and continue climb-out.
   Do not retard throttle below an rpm range where a safe climb cannot be maintained.
3. Overheat light—Check.
   a. If light goes out—Continue flight at reduced power and land as soon as possible.
   b. If light remains on—Maintain climb at reduced power and check for other indication of fire, such as trailing smoke, long exhaust flame, etc.
   c. If no fire is apparent—Continue flight at reduced power and land as soon as possible.
   d. If positive fire indication exists—Maintain power and immediately climb to minimum safe ejection altitude; then eject.

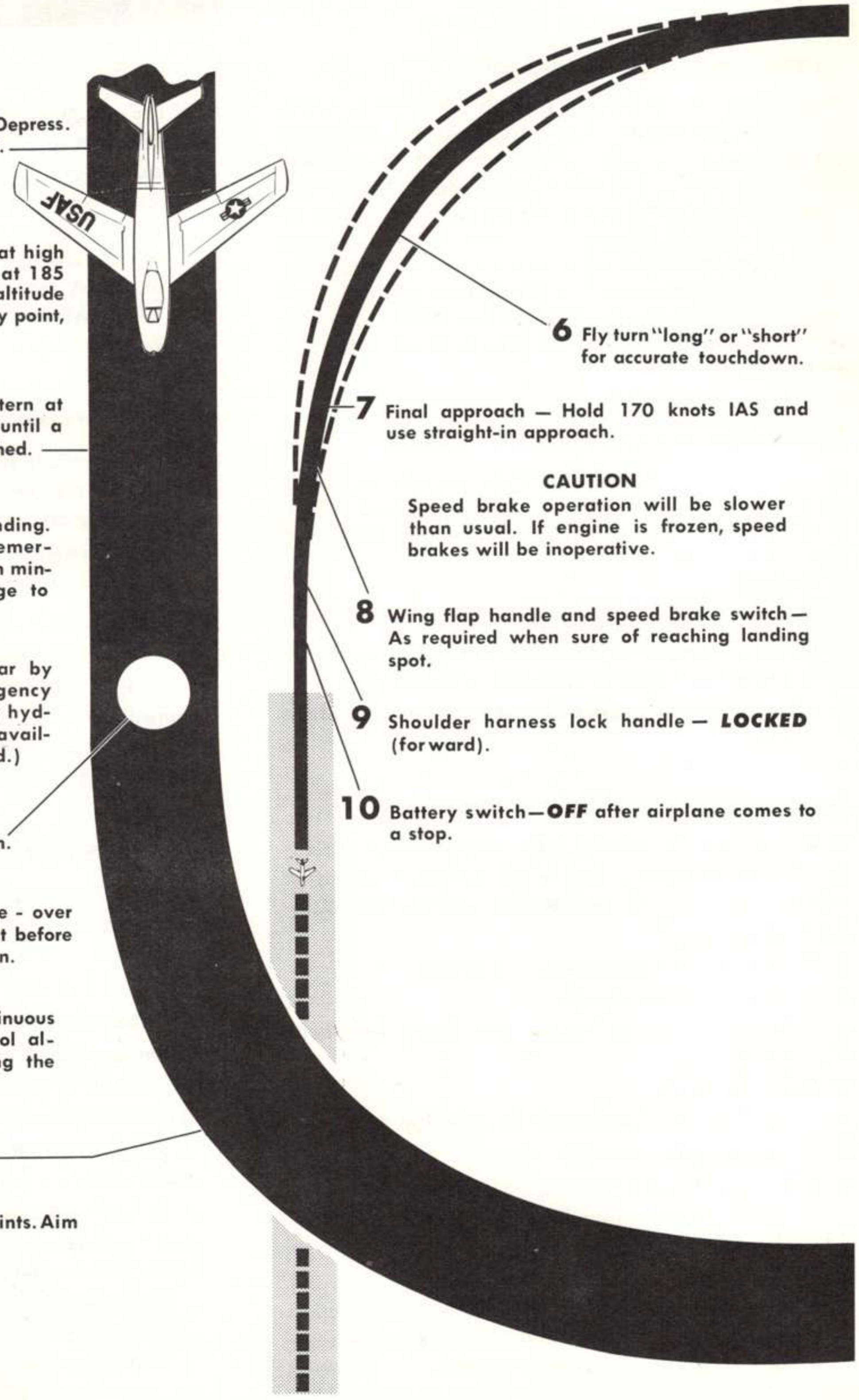
See figure 3-5 for minimum safe ejection altitudes.

FORCED LANDING

WINDMILLING OR "FROZEN" ENGINE

WARNING

IF TERRAIN IS UNKNOWN OR UNSUITABLE FOR FORCED LANDING, EJECT.



1 External stores jettison button—Depress. Maintain glide at 200 knots IAS.

2 Landing gear handle—***DOWN*** at high key point. Then establish glide at 185 knotsIAS. If necessary to lose altitude more rapidly to reach the high key point, gear may be lowered earlier.

If altitude is too low to enter pattern at high key point, leave gear up until a subsequent key point can be reached.

WARNING

Do not leave gear up for landing. Investigation has shown that emergency landings with gear down minimize pilot injury and damage to airplane.

NOTE

If engine is frozen, lower gear by means of landing gear emergency release handle, because utility hydraulic pressure will not be available. (Gear cannot be retracted.)

High key point, 7000 feet above terrain.

3 Flight control emergency change - over handle— Pull to full extension just before entering pattern if engine is frozen.

NOTE

This will ensure positive, continuous engagement of the flight control alternate hydraulic system during the landing phase.

4 Fly pattern at 185 knots IAS.

Vary flight path to make key points. Aim for one-third point of runway.

6 Fly turn "long" or "short" for accurate touchdown.

7 Final approach — Hold 170 knots IAS and use straight-in approach.

CAUTION

Speed brake operation will be slower than usual. If engine is frozen, speed brakes will be inoperative.

8 Wing flap handle and speed brake switch— As required when sure of reaching landing spot.

9 Shoulder harness lock handle — ***LOCKED*** (forward).

10 Battery switch—***OFF*** after airplane comes to a stop.

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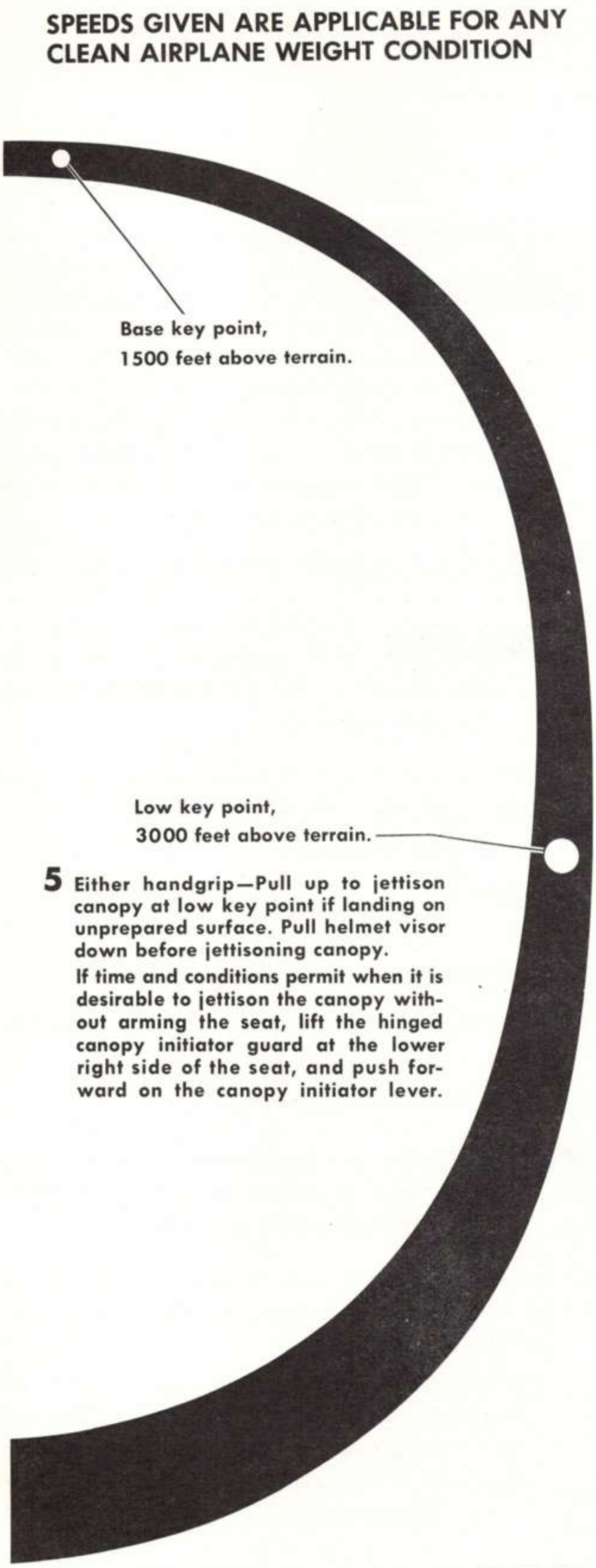
Figure 3-2



F-86H-1-00-108B

ENGINE FIRE DURING FLIGHT.

Forward Fire-warning Light.

If the forward fire-warning light comes on during flight, proceed as follows:

1. Throttle—Adjust to minimum practical power.
   Adjust throttle to minimum practical power to maintain safe ejection altitude.
2. Check for fire.
   Determine whether a fire actually exists by a report from another airplane, abnormal instrument readings, airplane or engine response to controls, explosion, unusual noise or vibration, fumes, heat, cockpit smoke, or trailing smoke noted following a turn.
3. If fire is confirmed—Eject.

Warning Whenever existence of fire is confirmed, prompt ejection will ensure greatest chance for survival.

4. If fire cannot be confirmed—Land as soon as possible.
   If existence of fire cannot be confirmed, maintain a safe ejection altitude at minimum practical power. Establish controllability of airplane en route to nearest available base and try to obtain assistance from other airplanes in the area in determining existence of fire. If no assistance is available, reconfirm controllability before descent below safe ejection altitude, and land as soon as possible.

Aft Overheat Light.

Illumination of the overheat light indicates an overheat condition or possible fire in the aft section, necessitating action as follows:

1. Overheat light—Check.
   a. Reduce power in attempt to extinguish light.
   b. If light goes out—Continue flight at reduced power, and land as soon as possible.
   c. If light remains on with throttle retarded to IDLE, indicating possible fire rather than overheat—Proceed to step 2.
2. Check for other indications of fire, such as trailing smoke, engine noise, verification from another airplane, etc.
   a. If no fire is apparent—Continue flight at minimum power and land as soon as possible.
   b. If positive indication of fire exists—Proceed to step 3.

3. Throttle—OFF.
4. Engine master switch—OFF.
5. If fire continues—Eject.
6. If fire ceases—Make forced landing, or eject.

ELECTRICAL FIRE.

Circuit breakers and fuses protect the circuits and will tend to isolate an electrical fire. However, if electrical fire occurs, proceed as follows:

1. Battery and generator switches—OFF.
2. Land as soon as possible.

Caution If engine has to be shut down or flight control normal hydraulic system fails, battery power for the flight control alternate hydraulic system will be available for only approximately 6 to 7 minutes with emergency override handle actuated.

- When the electrical power source is turned off, most of the electrical equipment (including fire-warning lights) and some instruments will be inoperative.

ELIMINATION OF SMOKE OR FUMES.

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

1. Cockpit pressure switch—RAM DUMP.
2. Oxygen regulator diluter lever—100% OXYGEN.
3. Oxygen regulator emergency toggle lever—Push to left or right.
4. When smoke or fumes persist, jettison canopy if necessary.

TAKE-OFF AND LANDING EMERGENCIES.

ENGAGING RUNWAY OVERRUN BARRIER.

In this airplane, successful engagements of the runway overrun barrier have been made up to 130 knots ground speed. The speed range where drop tanks are beneficial to engagement of the barrier is extremely small (40-60 knots). In an emergency, it is impractical to retain the drop tanks and attempt to control the airplane speed for barrier engagement within this speed range. Therefore, when engagement of the runway overrun barrier is imminent, jettison the drop tanks. The barrier should be engaged as close to the center as possible. Off-center engagements can be made successfully but will result in the airplane swerving as a result of the webbing pulling the nose wheel unevenly. This momentary swerve is not dangerous and therefore should be disregarded. If unable to bring the airplane to a stop or to a safe taxiing speed before reaching the end of the runway, and if the runway is equipped with an overrun barrier, observe the following:

1. Throttle—OFF.
2. Drop tanks—Jettison.

Warning Make decision to jettison drop tanks as early as possible to ensure greatest possible separation of tanks and airplane and to minimize possibility of tanks sliding ahead of the airplane and prematurely tripping the barrier. When drop tanks are jettisoned, all other external stores installed will also be jettisoned. If barrier engagement is anticipated while still air borne, jettison external load over an open area.

3. Engine master, generator, and battery switches—OFF.

Caution Do not turn battery switch OFF until engine master switch has been turned OFF, so that power will be available to close fuel shutoff valve.

4. Brakes—Avoid excessive use during engagement of barrier, to prevent tire blowouts.
5. Aim for center of barrier.
6. Engage barrier.

BELLY LANDING.

If a belly landing is unavoidable, these steps should be followed:

1. External stores jettison button—Depress.

NOTE If landing on a prepared surface, retain empty drop tanks to reduce possible pilot injury, impact damage, and fire hazard.

2. Either handgrip—pull up to jettison canopy before final approach. Pull helmet visor down before jettisoning canopy.

   If time and conditions permit when it is desirable to jettison the canopy without arming the seat, lift the hinged canopy initiator guard at the lower right side of the seat, and push forward on the canopy initiator lever.

NOTE It cannot be assured that the canopy will break away if opened electrically at speeds below 200 knots IAS.

3. Wing flap handle—DOWN, on final approach.
4. Speed brake switch—OUT.
5. Throttle—OFF, when landing ensured.
6. Engine master, generator, and battery switches—OFF, just before touchdown.

   Just before touchdown, turn engine master, generator, and battery-starter switches OFF. Battery switch should be turned OFF last, so that power will be available to close fuel shutoff valve when engine master switch is turned OFF.
7. Shoulder harness lock handle—LOCKED (forward).
8. Touch down in normal landing attitude.
9. Leave airplane immediately after it stops.

LANDING GEAR UNSAFE INDICATIONS.

If an unsafe gear-down indication exists after the emergency lowering procedure (figure 3-6) has been accomplished, attempt to obtain from the tower or chase plane, a positive confirmation of the gear condition. Either of two courses of action should be taken, depending upon the gear condition. If an unsafe main gear condition is *positively* confirmed, follow the procedures in "Main Gear-Up Landing (Prepared Surface Only)." If no positive confirmation can be obtained, then follow the procedure given in "Any One Gear Up or Unlocked."

Main Gear Up Landing (Prepared Surface Only).

When one or both main gear cannot be lowered (and utility hydraulic pressure is available), the main gear should be retracted and a landing made on the nose gear and aft fuselage (or empty drop tanks) rather than landing on only one main and nose gear. This should not be done unless the tower or chase plane can *positively* confirm that one or both main gears is not fully extended. If the main gear cannot be retracted, a landing with asymmetrical gear configuration may be made.

NOTE Whenever the gear cannot be lowered by the normal system, the emergency procedure should be used. However, once the emergency lowering procedure is used, the nose gear is extended and locked down and cannot be retracted.

If an unsafe condition is confirmed for the main gear after using the emergency lowering procedure, the following procedure should be used:

1. Landing gear handle—UP.
2. Landing gear emergency-up button—Depress until gear completely retracts.

   Retract main gear so that landing can be made on nose gear and aft fuselage (or empty drop tanks).
3. Either handgrip—Pull up to jettison canopy before final approach. Pull helmet visor down before jettisoning canopy.

   If time and conditions permit when it is desirable to jettison the canopy without arming the seat, lift the hinged canopy initiator guard at the lower right side of the seat and push forward on the canopy initiator lever.

Warning The canopy should be jettisoned before landing to prevent the possibility of being trapped in the cockpit if the fuselage warps and the canopy jams in the closed position.

4. External load—Jettison, if possible.

NOTE Retain empty tanks to reduce possible pilot injury, impact damage, and fire hazard.

5. Plan approach to touch down as near end of runway as possible.
6. Wing flap handle—DOWN on final approach.
7. Speed brake switch—OUT.
8. Throttle—OFF just before touchdown.
9. Engine master switch—OFF.
10. Battery switch—OFF.

    Wait one second to allow fuel shutoff valve to close, then move battery switch to OFF.
11. Generator switches—OFF.
12. Shoulder harness lock handle—LOCKED.
13. Touchdown—Attempt to touch down on nose gear and aft fuselage simultaneously.
14. Leave airplane immediately after stopping.

ANY ONE GEAR UP OR UNLOCKED.

If positive confirmation of gear condition cannot be obtained, leave remaining gear down and proceed as follows:

1. External stores jettison button—Depress.
2. Fire ammunition and expend excess fuel, if time and conditions permit.

   Fire all ammunition and expend excess fuel to establish an aft CG condition and to minimize possible fire hazard.

NOTE Retain empty drop tanks to reduce possible pilot injury, impact damage, and fire hazard.

3. Either handgrip—Pull up to jettison canopy before final approach. Pull helmet visor down before jettisoning canopy.

   If time and conditions permit when it is desirable to jettison the canopy without arming the seat, lift the hinged canopy initiator guard at the lower right side of the seat, and push forward on the canopy initiator lever.

NOTE It cannot be assured that the canopy will break away if opened electrically at speeds below 200 knots IAS.

4. Plan approach to touchdown as near end of runway as possible.
5. Wing flap handle—DOWN, on final approach.
6. Speed brake switch—OUT.

NOTE If nose gear is down but not locked, you can attempt to snap it down and locked by making a touch-and-go landing. Attempt this procedure only after all other emergency measures are exhausted.

7. Throttle—OFF, just before touchdown.
8. Engine master switch—OFF.
9. Battery switch—OFF.

   Wait one second to allow fuel shutoff valve to close; then move battery switch to OFF.
10. Generator switch—OFF, if time permits.
11. Shoulder harness lock handle—LOCKED (forward).
12. After touchdown—Hold unsafe gear off runway as long as possible.

    After touchdown, hold unsafe gear off runway as long as possible, easing unsafe gear down before flight controls become ineffective.
13. Brakes—Do not use, if stop can be made without them.
14. Leave airplane immediately after stopping.

LANDING ON UNPREPARED SURFACE.

A landing on an unprepared surface is not recommended. However, if an emergency landing on an unprepared surface is unavoidable, it should be made with as many landing gear down as possible. Investigation has shown that landings made on unprepared surfaces with the landing gear down have resulted in less pilot injury and less damage to the airplane than those made with gear up. Empty drop tanks should be retained to cushion impact loads and minimize airplane damage.

LANDING WITH FLAT TIRE.

Nose Gear Tire Flat.

When a landing is to be made with the nose gear tire flat, lower the landing gear in the normal manner and proceed as follows:

1. Touchdown—Hold nose gear off runway as long as possible.
2. Directional control—After nose wheel touchdown, use combination of braking and nose wheel steering.

Main Gear Tire Flat.

When a landing is to be made with a main gear tire flat, lower the landing gear in the normal manner and proceed as follows:

1. Release external ordnance in a safe condition and expend excess fuel to minimize fire and explosion hazard.

NOTE Retain empty drop tanks to reduce possible pilot injury, impact damage, and fire hazard.

2. Touchdown—Land on side of runway away from flat tire.

NOTE This is necessary to minimize the amount of differential braking required if the airplane pulls toward the flat tire.

3. Directional control—After nose wheel touchdown, use combination of differential braking and nose wheel steering.

NO-FLAP LANDING.

No special technique is required for landing without wing flaps. Speed during final approach and touchdown should be increased 10 percent over recommended speeds for load and configuration.

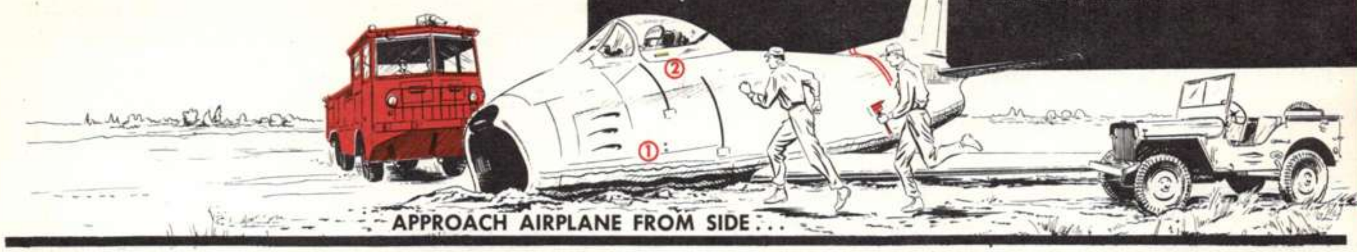
EMERGENCY ENTRANCE.

See figure 3-3 for emergency access to cockpit on the ground.

DITCHING.

NOTE Inspect emergency equipment, life vest, and raft pack before each overwater flight.

EMERGENCY ENTRANCE



1 Hold external control button marked "OPEN" depressed until canopy is fully open. (Continue with step 5.)

2 If canopy fails to open electrically, pull canopy external emergency release handle from stowed position, and slide canopy aft approximately one inch to release canopy locks. REMAIN CLEAR OF CANOPY EJECTION PATH (UP AND AFT).

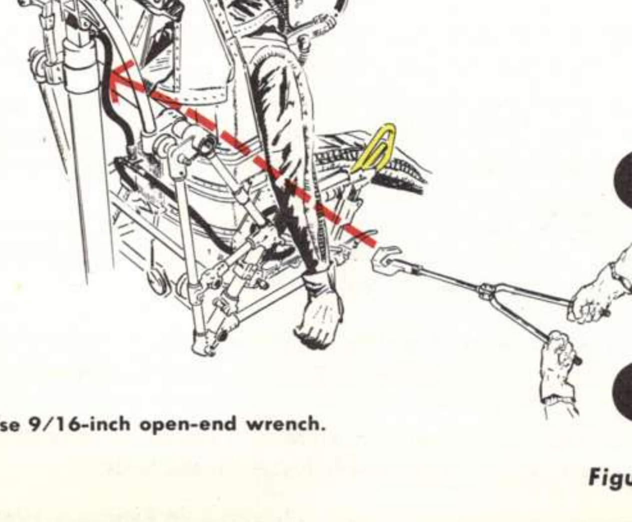
3 Lift canopy at forward end and push canopy up and aft until it has completely separated from the airplane. (Canopy weighs approximately 125 pounds.)

4 If canopy cannot be opened, break canopy AFT of seat with ax or heavy implement.

5 When access to cockpit is gained, check position of ejection seat handgrips.

WARNING

If pilot has jettisoned canopy in preparation for crash landing, seat handgrips will be up. (Raising either handgrip jettisons canopy.) When handgrips are up, seat ejection trigger in each handgrip is exposed. Subsequent movement of either trigger will fire catapult and eject seat from airplane.



6 If handgrips are up, disconnect hose* leading from "T" fitting to catapult at the catapult, or cut the hose (with cutters as shown) as close to the catapult as possible, and then complete rescue operation. Make sure loose ends are not aligned; otherwise, if seat initiators fire accidentally, expanding gases may still fire seat catapult .

7 If handgrips are down in normal position, be careful not to foul or raise handgrips. (Handgrips are interconnected and move simultaneously.)

*Use 9/16-inch open-end wrench.

F-86H-1-31-1F

Figure 3-3

Ditching the airplane is not recommended, since all emergency survival equipment is carried by the pilot; consequently, there is no advantage in riding the airplane down. However, if altitude is not sufficient for bail-out, and ditching is unavoidable, proceed as follows:

1. Follow radio distress procedure.
2. External stores jettison button—Depress.

Warning Drop tanks tend to be sucked under the surface and also cause very high deceleration forces upon contact with the water. Therefore, drop tanks should be jettisoned along with all other external loads, whether they contain fuel or not.

3. Personal equipment—Check that it will not foul when leaving cockpit.
4. Anti-G suit—Disconnect.
5. Oxygen regulator diluter lever—100% OXYGEN.

NOTE In the event of ditching and sinking in water where you find yourself unable to immediately escape because of any number of factors, temporary survival is possible with your oxygen equipment. The A-14 or A-13A pressure-demand type oxygen mask and the pressure-breathing diluter-demand oxygen regulator are suitable underwater breathing devices when the regulator is set at 100% OXYGEN. It is essential that the mask be in place and tightly strapped, and that the regulator be set at 100% OXYGEN. The bail-out bottle cannot be used under water.

6. Landing gear handle—UP.
7. Speed brake switch—IN.
8. Either handgrip—Pull up to jettison canopy. Pull helmet visor down before jettisoning canopy.

NOTE It cannot be assured that the canopy will break away if opened electrically at speeds below 200 knots IAS.

9. Throttle—OFF.
10. Wing flap handle—DOWN.
    Flaps collapse on impact and do not cause airplane to dive.
11. Engine master, generator, and battery switches—OFF. Turn battery switch OFF last, so that power will be available to close fuel shutoff valve when engine master switch is turned OFF.
12. Safety belt and shoulder harness—Tighten.
13. Shoulder harness lock handle—LOCKED (forward).
14. Surface conditions—Check.
    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 or just after crest passes. If wind is as high as 25 knots or surface is irregular, the best procedure is to approach into the wind and touch down on the falling side of a wave.
15. Approach and flare—Normal.
16. Touchdown—Keep nose high, and attempt to touch down at minimum flying speed.

Warning If airplane is ditched in a near-level attitude it will dive violently soon after contact.

17. Oxygen mask—Remove.
18. Leave airplane.

EJECTION.

Warning If overwater ejection is made, remove oxygen mask before hitting water, to prevent sucking water into mask.

- If ejection is mandatory, the throttle should be stopcocked before ejection if time and altitude permit.
- Escape from the airplane in flight should be made with the ejection seat.

NORMAL EJECTION.

The basic seat ejection procedure is shown in figure 3-4.

Warning Ejection should not be delayed when the airplane is in a descending attitude and cannot be leveled. The chance of successful ejection at low altitude under these conditions is greatly reduced.

Study and analysis of ejection techniques by means of the ejection seat have revealed that:

a. Ejection at airspeeds ranging from stall speed to 525 knots IAS results in relatively minor forces being exerted on the body, thus reducing the injury hazard.

NOTE The most ideal ejection speed range, considering tumbling and parachute opening time, is between 250 and 300 knots IAS.

b. The body will undergo appreciable forces when ejection is performed at airspeeds of 525 to 600 knots IAS, and escape is more hazardous than at lower speeds.

c. Above 600 knots IAS, ejection is extremely hazardous because of the excessive forces on the body.

EJECTION PROCEDURES

1 Either handgrip—Pull up to jettison canopy. (Shoulder harness locks automatically when handgrip is raised.)

2 Either trigger—Squeeze to eject seat.

BEFORE EJECTION, IF TIME AND CONDITIONS PERMIT . . .

- Hook heels in footrests and brace arms in armrests. Sit erect, head hard back against headrest, chin tucked in.
- Actuate bail-out oxygen bottle.
- Stow all loose equipment.

IF CANOPY FAILS TO JETTISON, ATTEMPT TO RELEASE CANOPY AS FOLLOWS . . .

If airspeed is above 200 knots IAS, hold canopy switch at OPEN until canopy is sufficiently open to permit airstream to break canopy away from airplane.

If airspeed is below 200 knots IAS, hold canopy switch at OPEN until canopy begins to rise, then pull canopy manual release handle.

WARNING

Grasp canopy manual release handle with palm of hand upward and with thumb under handle, to prevent serious injury when canopy releases (canopy breakaway is extremely rapid).

AFTER SEAT EJECTS . . .

- *If safety belt fails to open automatically after 2 seconds (one second for airplanes equipped with an M-12 automatic-opening safety belt initiator),* manually unfasten belt and kick free of seat. Then pull parachute arming lanyard.
- *If wearing automatic parachute **WITH** lanyard attached to safety belt buckle,* parachute opens at a preset altitude after pilot kicks free of seat. (Parachute opens after a preset time interval if below preset altitude.)
- *If wearing automatic parachute **WITHOUT** lanyard attached to safety belt buckle* kick free of seat and pull parachute arming lanyard.
- *If wearing manually operated parachute,* kick free of seat; pull "D" ring at altitude where normal breathing is possible.

WARNING

After leaving seat, manually pull "D" ring for all ejections below 14,000 feet to open parachute immediately.

F-86H-1-73-17

Figure 3-4

SAFE EJECTION SPEEDS AND ALTITUDES.

Figure 3-5 shows maximum safe ejection speeds, based on parachute restrictions, for the combinations of a one-second safety belt and zero-second parachute or a one-second safety belt and one-second parachute. Also shown in figure 3-5 are emergency minimum ejection altitudes for various combinations of escape equipment. These charts should be used only as guides. Once a minimum ejection altitude has been determined for a particular configuration of equipment, the decision as to when to eject or not to eject in an emergency should not be rigidly determined by the fact that the airplane is above or below the minimum altitude as determined by these figures. Each emergency will have its particular set of circumstances involving such factors as airplane speed, attitude, and control, as well as altitude. Based on the information in figure 3-5 and the escape equipment available, a decision should be made before take-off concerning actions to be taken in case of a low-altitude emergency. The emergency minimum ejection altitudes shown in figure 3-5 were determined from an extensive flight-test program and are based on altitude above the terrain on initiation of seat ejection. (Initiation of seat ejection is defined as the time the seat is fired.) However, human error and equipment malfunctions were not considered in determining these altitudes. Therefore, whenever possible, ejection should be started at altitudes higher than the minimums shown in figure 3-5.

LOW-ALTITUDE EJECTION.

For low-altitude ejections (below 200 feet), it is desirable to obtain the highest possible altitude for parachute deployment. The seat trajectory is the resultant of the ejection velocity and the airplane velocity. Pulling the nose of the airplane above the horizon before ejection makes the resultant trajectory more nearly vertical and usually provides an increase in altitude. As a result, additional ground clearance will be available after seat separation and parachute deployment. Aside from gaining maximum altitude, a nose-up maneuver slows the airplane before ejection, which reduces parachute opening forces on the body and minimizes the possibility of parachute panel blowout. (Refer to "Engine Failure During Flight at Low Altitude" for information on the zoom-up maneuver.)

NOTE Regardless of how low the altitude and speed, chances of survival will improve if a zoom-up maneuver is immediately initiated.

SEAT SEPARATION.

The automatic-opening safety belt should never be opened manually before ejection, for the following reasons:

a. It prolongs the escape operation.

b. It creates an injury hazard during uncontrollable flight, because the pilot cannot stay in the seat before ejection if negative G is encountered.

c. It creates a hazard to survival if the pilot decides to crash-land the airplane. He probably will not be able to refasten the belt and shoulder harness, as both hands may be needed to control the airplane.

d. It eliminates the automatic-opening feature of the automatic-opening parachute (if worn). The pilot would have to arm the parachute manually by pulling the parachute arming lanyard.

e. The pilot will probably separate from the seat immediately, thereby reducing tail clearance.

f. At high speeds, the peak deceleration due to air loads on the pilot and seat together approaches the limits of human tolerance. Since deceleration of the pilot alone is considerably greater than that of pilot and seat together, immediate separation at high speeds could result in severe injury.

g. Immediate separation of pilot and seat at high speeds could result in the parachute pack being accidentally blown open at the time of ejection. In this event, fatal injuries would probably be incurred because of the extremely high opening shock or because of serious damage to the parachute when it opens.

NOTE The automatic safety belt opens about 2 seconds (one second, for airplanes equipped with an M-12 automatic safety belt initiator) after ejection. This is sufficient time for safe deceleration of the pilot.

(Deleted)

FAILURE OF SEAT TO EJECT.

If the seat does not eject when either trigger is squeezed, proceed as follows:

1. Speed brake switch—IN.
   Close speed brakes to prevent hitting them in the event bail-out over the side is necessary.
2. Safety belt—Unfasten.
3. Bail-out bottle—Actuate, if necessary.
4. Personal leads (oxygen, radio, and anti-G suit)—Disconnect.
5. Invert airplane and then push free of seat, or bail out over side.
   If you have control of the airplane, trim nose down and pull stick back to slow airplane as much as possible; then invert airplane. Maintain positive G-load until inverted; then sharply release stick and push free of seat. If you do not have control of the airplane, slow airplane as much as possible; then bail out over the side.

6. Parachute-arming lanyard (automatic parachute) or "D" ring (manual parachute)—Pull.

Warning If bail-out occurs below 14,000 feet, pull "D" ring immediately whether parachute is automatic or manual type.

NOTE If you lose your oxygen mask and you do not have an automatic parachute, you should free-fall to 14,000 feet if possible, and then pull "D" ring. The length of time you can free-fall before anoxia prevents you from pulling the "D" ring depends upon your physical condition and the bail-out altitude.

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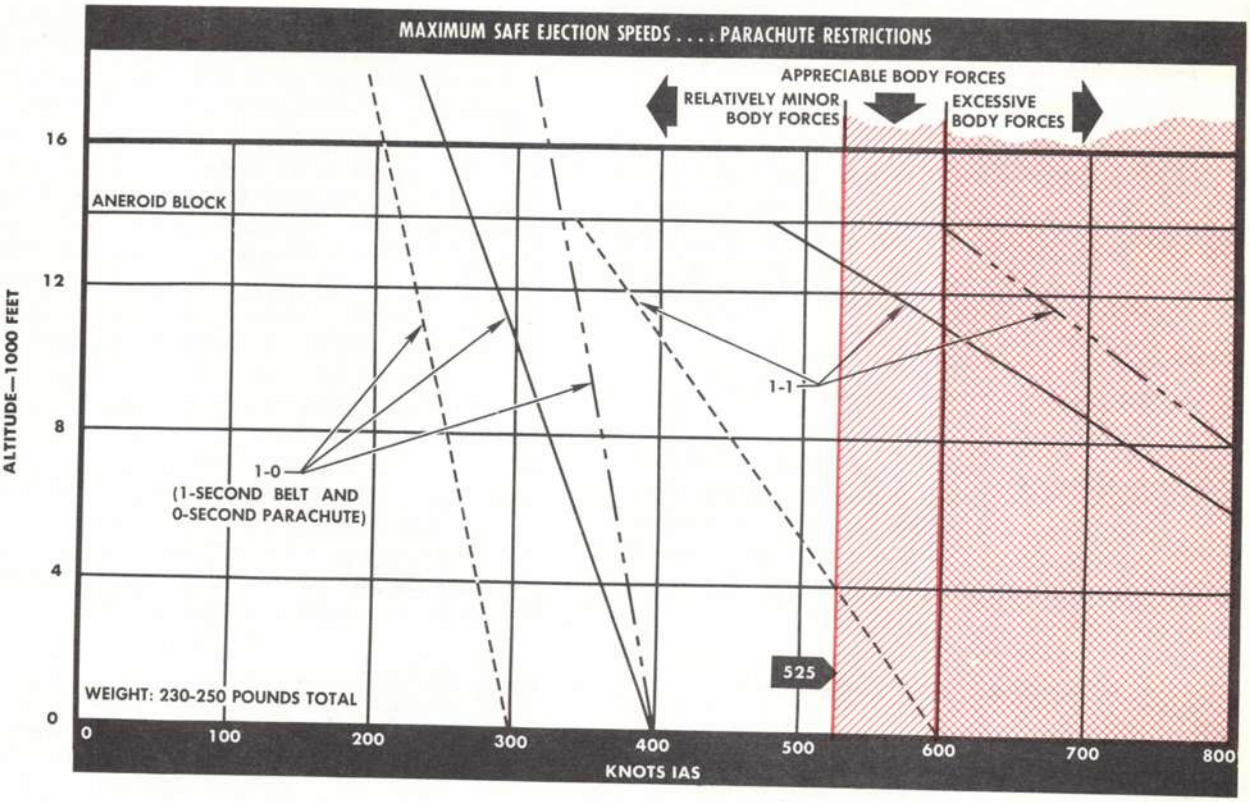
SAFE EJECTION SPEEDS AND ALTITUDES . . . (LEVEL FLIGHT)



- - - - - - TYPE C-9, 28 FT FLAT CANOPY, TYPE B-4 PACK

———— TYPE C-9, 28 FT FLAT CANOPY, TYPE B-5 PACK WITH 1/4 BAG

— - - - — TYPE C-11, 30 FT GUIDE CANOPY, TYPE B-5 PACK

NOTE

The graph shows safe ejection speeds for ideal level flight and average parachute performance only; other ejection altitudes, tumbling, separation delays, variations in parachute opening time, etc, are not included.

MINIMUM SAFE EJECTION ALTITUDES . . . . FEET — BASED ON THE SPEED RANGE OF 140-300 KNOTS IAS.

	2-SECOND PARACHUTE		2-SECOND PARACHUTE		1-SECOND PARACHUTE		1-SECOND PARACHUTE		0-SECOND PARACHUTE		0-SECOND PARACHUTE	
	F-1A TIMER		F-1A TIMER		F-1B TIMER		F-1B TIMER		LANYARD TO "D" RING		LANYARD TO "D" RING	
	B-4 OR B-5 PACK	C-9 CANOPY	B-5 PACK	C-11 CANOPY	B-4 OR B-5 PACK	C-9 CANOPY	B-5 PACK	C-11 CANOPY	B-4 OR B-5 PACK	C-9 CANOPY	B-5 PACK	C-11 CANOPY
2-SECOND AUTOMATIC LAP BELT (M-4 INITIATOR)	550		600		350		400		200		250	
1-SECOND AUTOMATIC LAP BELT (M-12 INITIATOR)	350		400		200		250		100		150	

WARNING: The minimum safe ejection altitude for a parachute which can only be opened manually is 1000 feet.

F-86H-1-73-15A

Figure 3-5

FUEL SYSTEM FAILURE.

ENGINE FUEL CONTROL SYSTEM FAILURE.

Failure of the hydromechanical engine fuel controller is indicated by sudden loss of fuel flow and decrease in engine rpm requiring selection of the emergency fuel system for proper engine operation as follows:

1. Throttle—IDLE.
2. Fuel system selector switch—EMER.

Warning If rpm is below 95%, do not turn fuel system selector switch to EMER without first retarding throttle to IDLE. To do so may cause dangerous engine overheating or compressor stall.

3. Throttle—Slowly advance to desired setting.

Caution During operation on the emergency fuel system, move throttle cautiously at all times; otherwise, overtemperature operation, compressor stall, or engine overspeed is likely to occur, especially at high altitudes.

FUEL TANK BOOST PUMP FAILURE.

Fuel tank boost pump failure is indicated by erratic fluctuations of fuel flow and engine rpm accompanied by a decrease or variation of exhaust temperature. In the event of a boost pump failure, proceed as follows:

1. Throttle—Retard as necessary in an attempt to eliminate fluctuation and surging.
2. Land as soon as possible.

ENGINE FLAME-OUT.

Flame-outs above 35,000 feet may be caused by faulty fuel flow regulation or by negative-G maneuvers. Flame-out resulting from faulty fuel flow regulation will usually occur during rapid throttle movements. Flame-out is indicated by loss of thrust, drop-off of exhaust temperature, and failure of the engine to accelerate when the throttle is advanced.

NOTE Under certain operating conditions, such as in descents from altitude with the throttle at IDLE, exhaust temperature will drop below the recommended operating minimum. The recommended operating minimum does not necessarily indicate the temperature level below which flame-out occurs, but signifies the minimum safe temperature to maintain sustained engine operation. The engine should not be operated at exhaust temperatures below the recommended minimum unless absolutely necessary.

Air starts must be made on the emergency fuel system. (Refer to "Engine Air Start.")

INLET GUIDE VANE FAILURE.

Failure of the inlet guide vanes in the closed position will result in a substantial loss in thrust in the high engine speed range (above 7000 rpm) due to restriction of engine airflow. The closed position failure of the inlet guide vanes will most likely be detected by abnormally low exhaust temperatures in the high power setting ranges. Engine fuel flow will also be affected in a like manner; however, this change is not always as obvious because of effects of outside air temperature and pressures. Failure of the inlet guide vanes in the open position can result in compressor stall during rapid throttle advancement. (Refer to "Compressor Stall" in Section VII.) Failure of the guide vanes in an intermediate position may cause either effect of the two extreme position failures in lesser degrees. If any of the preceding conditions are encountered during ground operation, the engine should be thoroughly inspected before any flight is attempted. If any of these conditions are encountered in flight, extreme caution should be used in engine operation during the remaining flight period. The flight should be terminated as soon as possible.

Warning Use a flame-out pattern and exert extreme caution during the landing phase under these conditions, since any attempt to rapidly increase power, if needed, can result in compressor stall, reduced thrust, or flame-out.

Inlet guide vane failure, compressor stall, and engine fuel controller malfunction may have similar symptoms. The following will help to determine which of the three conditions exist:

a. Inlet guide vane failure (closed position): Experience has shown that the likelihood of an inlet guide vane failure is greatest during throttle manipulation in the rpm range from 70% to 90%. While operating the engine on the main fuel control system with the guide vanes failed closed, the rpm will reach 100%, the exhaust temperature and fuel flow will be reduced, and the thrust at 100% rpm will be approximately 65% of Military Power.

NOTE In case of inlet guide vane failure, some instability similar to "choo-choo" may be encountered at 100% rpm, but can be eliminated by reducing the power setting slightly.

b. Compressor stall: A compressor stall occurs in the rpm range of approximately 60% to 70% and also causes a loss of thrust, but engine vibration will be experienced; the exhaust temperature will rise, and the rpm will not reach 100% unless the engine accelerates out of the stall condition.

c. Fuel controller malfunction: An engine fuel controller malfunction will cause the rpm, exhaust temperature, and fuel flow to be unstable and erratic. The emergency fuel system should be used in case of a main fuel controller malfunction.

Caution If an inlet guide vane failure is suspected, *do not switch to the emergency fuel system* unless a fuel controller malfunction is also suspected. If the emergency system is used, the throttle should be retarded to 40% rpm, the switch to the emergency fuel system should be made, and the throttle should be advanced very carefully to avoid overspeed, overtemperature, and rich blowout.

ENGINE OIL SYSTEM MALFUNCTION.

A decrease in oil pressure may be caused by an insufficient oil supply, a broken line, or a broken oil jet. An increase in oil pressure may be caused by an impedance in the line, or a clogged oil jet. In the event of an oil system malfunction, possible oil starvation accompanied by failure of one or more of the main bearings may occur. If engine rpm is reduced after oil starvation of one or more main bearings, the resistance to rotation offered by a failed bearing may be great enough to cause further deceleration of the engine. Engine seizure would probably occur regardless of the fact that the throttle may be advanced after the engine has begun to decelerate. The engine may operate for a longer period with one or more failed main bearings if the rpm is increased immediately after oil malfunction is detected. Extremely high oil pressure could cause the oil lines to rupture and cause damage to the main fuel controller. This would not prevent operation of the engine on the emergency fuel system. However, engine operation on the emergency fuel system should be avoided unless absolutely necessary, since switching from the main fuel system to the emergency fuel system results in momentary engine deceleration. Such a deceleration could cause complete engine failure. In case of high or low engine oil pressure indication, follow this procedure:

1. If power setting is above 80% rpm—Do not move throttle until landing is ensured.
2. If power setting is below 80% rpm—Advance throttle to 80% rpm or more and do not move throttle until landing is ensured.

Warning Retarding the throttle during an oil system malfunction may result in engine seizure and subsequent forced landing.

- In case of oil system malfunction, switching to the emergency fuel system is not recommended unless malfunction of the main fuel controller is detected. Switching fuel systems will generally cause momentary engine deceleration and possible engine seizure.

3. Land as soon as possible, using forced landing pattern to ensure landing in the event of complete power failure.

NOTE During extreme cold-weather operation, the oil pressure may exceed maximum limits until the oil temperature reaches normal.

ELECTRICAL POWER SYSTEM FAILURE.

COMPLETE ELECTRICAL FAILURE.

If a complete electrical failure occurs or if for any reason it becomes necessary to turn off both the battery and the generator, much of the equipment and many controls will be inoperable. Flight under this condition will be limited, and the following precautionary measures should be observed:

1. Airspeed—Reduce, and readjust trim.

   If possible, reduce airspeed and readjust trim before turning off electrical power, as trim is not available without electrical power.

2. Altitude and rpm—Reduce as necessary.

   The fuel booster pumps will be inoperative when power is shut off; consequently, it may be necessary to reduce altitude and rpm in order to maintain satisfactory engine operation. (This condition will be aggravated by high outside air temperature and high airspeed.)

3. Airplane attitude—Lower nose as necessary to drain trapped fuel.

   If reduction in rpm is necessary, airplane may have to be held in a slightly nose-high attitude to maintain altitude. If prolonged flight in this attitude is necessary, a small amount of fuel will be trapped in the aft fuselage tank. If sufficient altitude is available, nose airplane down slightly for a short period to drain some of the trapped fuel into the forward fuselage tank lower cell.

4. Land as soon as possible.

NOTE Use gear emergency lowering system to ensure that gear lowers and locks. (See figure 3-5.) When electrical power is not available to the primary bus, landing gear position indicators will be inoperative and will continuously show an unsafe condition.

GENERATOR IRREGULARITY.

Any generator irregularity (generator failure or a voltage rise or drop) will be indicated by illumination of the generator-off warning light.

Generator Failure or Undervoltage.

All equipment powered by the secondary bus will be inoperative and equipment on the primary bus will be operated by battery power when a generator failure or lowering of output occurs. Circuits for units powered by the single-phase inverter are controlled by the secondary bus and are also rendered inoperative when generator output fails or is reduced. (Refer to "Inverter Failure.") When generator output drops or fails, proceed as follows:

1. Nonessential electrical equipment—OFF.

   All nonessential electrical equipment should be turned off to reduce load on battery. The length of time that usable battery power is available for continued operation is approximately 7 to 28 minutes. Battery output duration may be decreased, however, by a number of variable factors including low state of battery charge, excessive electrical loads, and low battery temperature.

2. Engine master and generator switches—OFF, if generator output is lost because of engine failure.

   If generator output is lost because of engine failure, the engine master switch should be moved to OFF to lessen battery loads.

Warning In case the flight control normal hydraulic system fails while the generator is out, battery power for alternate hydraulic pump operation will last only 6 to 7 minutes with emergency change-over handle actuated.

3. Landing gear handle—DOWN.
4. Landing gear emergency release handle—Pull full out and hold extended momentarily for all landings where generator failure has occurred.

   For all landings where generator failure has occurred, lower the landing gear by the emergency system, to ensure that gear will extend and lock. (See figure 3-6.) Battery power may not be sufficient to position landing gear and door control valves when the normal gear lowering system is used.

NOTE If generator has failed and battery power is not available to primary bus or battery switch is turned OFF, landing gear position indicators will be inoperative and will continuously show an unsafe condition.

Generator Overvoltage.

If generator overvoltage condition is indicated by the voltmeter and illumination of the generator-off warning light, attempt to bring the generator back into the circuit as follows:

1. Generator switch—Hold at RESET momentarily, then OFF.
2. If voltmeter shows normal system voltage:
   a. Generator switch—ON.

      If the voltmeter shows normal system voltage, it indicates that overvoltage was temporary. Turn generator switch ON. (Generator-off warning light will go out.)
3. If generator overvoltage is still indicated by voltmeter:
   a. Generator switch—OFF.
   b. Land as soon as possible.

INVERTER FAILURE.

Radar (Single-phase) Inverter Failure.

Failure of the radar (single-phase) inverter is indicated by illumination of the amber radar ac power-off warning light. The radar inverter is controlled by the secondary bus; consequently, it will be energized only when the generator is operating or external power is connected. There is no alternate source of single-phase ac power.

Caution When single-phase power is lost, failure of the sight, cockpit temperature control system, IFF, SIF, sight radar, and strike camera occurs.

Instrument (Three-phase) Inverter Failure.

Illumination of the instrument ac power-off warning light indicates that the instrument (three-phase) inverter selected for use is inoperative.

1. Instrument ac power switch—ALTERNATE.

   If the alternate inverter is operating satisfactorily, the light will go out.

Caution Loss of three-phase ac power results in failure of the fuel flow, oil, and hydraulic pressure gages, directional indicator, attitude indicator, fuel quantity and flow indicators, engine control amplifier (airplanes with the -3D or -3E engine), and gunfire power (airplanes with 20 mm guns). The fuel quantity gage while inoperative will provide an erroneous indication, as it will continue to register the condition prevailing at time of power failure.

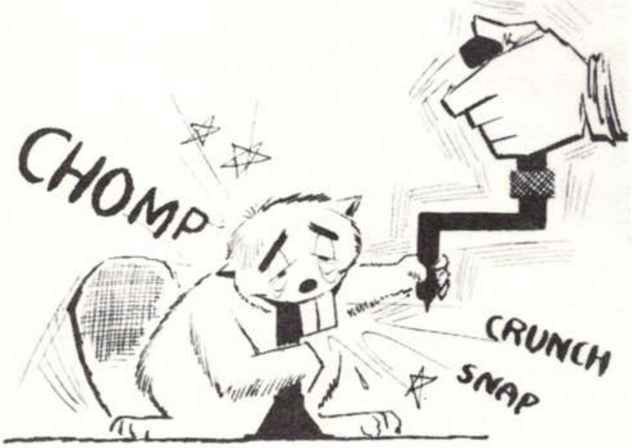
NOTE If for any reason the instrument ac power switch is moved from one position to the other, the directional indicator may be thrown off as much as 100 degrees; therefore, if instrument inverter selection is changed, check directional indicator reading against the stand-by compass and, if necessary, use fast slave button for fast gyro recovery to true heading.

UTILITY HYDRAULIC SYSTEM FAILURE.

There is no emergency provision in the utility hydraulic system. (Nose gear lowering can be accomplished pneumatically in case normal hydraulic operation fails.)

FLIGHT CONTROL HYDRAULIC SYSTEM FAILURE.

In the event of failure of the flight control normal hydraulic system, the alternate hydraulic system will automatically take over (provided adequate alternate system pressure is available), as indicated by illumination of the alternate-on warning light. If the normal system fails in flight, satisfactory control of the airplane can be maintained with the flight control alternate hydraulic system. The limitations of the alternate system are only that prolonged excessive control movement is limited because the capacity of the alternate system pump is less than that of the normal system pump.



F-86H-1-0-29A

Note

The change-over from the normal to the alternate flight control hydraulic system is momentary and usually not noticeable, although a slight surge or "nibble" may be felt on the stick during the change-over.

FAILURE OF NORMAL SYSTEM.

If the flight control normal hydraulic system fails in flight, proceed as follows:

1. Alternate-on warning light—Check on.

1A. Hydraulic pressure gage selector switch—ALTERN.

Warning Do not attempt to reset to the normal system even if pressure builds back up to operating range.

NOTE If the alternate system does not take over automatically, unlock and pull the emergency change-over handle out to its fully extended position.

Warning When the emergency change-over handle is pulled out, the alternate system pump is engaged and operates continuously, regardless of system pressure. If generator output is not available, the pump will deplete battery power in approximately 6 to 7 minutes.

1B. Do not fly close formation, perform aerobatics, or engage in unnecessary low-altitude flying.

2. Land as soon as possible.

3. Emergency change-over handle—Pull, just before entering traffic pattern.

   If complete failure of the flight control normal hydraulic system has been determined (i.e., system will not deliver 1000 psi), unlock and pull the emergency change-over handle out to its fully extended position just before entering the traffic pattern.

NOTE This action will ensure positive continuous engagement of the flight control alternate hydraulic system and thus prevent cycling from the alternate to the failed normal system and possibly momentarily freezing the controls during the landing phase.

FAILURE OF BOTH SYSTEMS.

If both hydraulic systems fail:

Warning If both flight control hydraulic systems fail, movement of the control stick will not cause corresponding surface movement except to allow the surfaces to streamline under air loads. Under such conditions, control of the airplane in cruising flight becomes very difficult, and control at high speeds or during extreme maneuvers is impossible. Extended flight and a landing with these high stick forces should not be attempted under any circumstances.

1. Airspeed—Attempt to reduce to about 220 knots.

2. Maintain control if possible.

   Maintain all possible control by using rudder and varying power as necessary. Attempt to neutralize ailerons and horizontal stabilizer by steady push or pull forces on the stick, allowing air loads to streamline the surfaces.
3. If control cannot be maintained—Eject.
4. If some control is available, and altitude permits—Attempt recovery and return to suitable area; then eject.

FLIGHT CONTROL ARTIFICIAL-FEEL SYSTEM FAILURE.

Artificial-feel system failure can be indicated by any combination of the following: lightening of stick forces (resulting in overcontrol), lack of trim response, and poor stick centering characteristics. Failure of the artificial-feel system leaves the pilot with no possible means of airplane recovery. Reduction of engine power may relieve the severity of oscillations of the airplane; however, when such failure occurs, ejection is recommended.

TRIM FAILURE.

There is no alternate trim system on this airplane. A maximum pilot control stick force of 22 pounds would be required to neutralize the stabilizer and 6 pounds to neutralize the ailerons if either trim system should fail in an extreme travel position. Movement of the control stick to the opposite extreme of travel after this type of failure requires a maximum force of 50 pounds on the stabilizer and 22 pounds on the aileron.

Caution The trim switch on the B-8 stick grip may be subject to occasional sticking in an actuated position, resulting in application of extreme trim. When this occurs in flight, the switch should be returned manually to the center OFF position after the proper amount of trim is obtained.

LOSS OF CANOPY OR CANOPY-UNLOCKED INDICATION.

LOSS OF CANOPY.

If the canopy comes off during flight, reduce airspeed immediately and slow-fly the airplane to check for availability of rudder control. If possible, have another airplane check for damage to the vertical stabilizer. If the airplane can be controlled, land as soon as possible.

NOTE Flight characteristics are essentially unchanged with the canopy off. The noise level is high, and wind blast effect is discomforting at high airspeeds. However, traffic pattern and touchdown speeds are unchanged.

CANOPY-UNLOCKED INDICATION.

If the canopy-unlocked warning light comes on during flight, proceed as follows:

1. Canopy switch—CLOSE.

   If the light goes out, proceed with flight.
2. Cabin pressure altimeter—Check.

   If the light remains on, check cockpit pressurization (if above 12,500 feet). If pressurization has been lost, reduce airspeed to 200 knots IAS and, fuel permitting, descend to a lower altitude.

NOTE If pressurization has not been lost, maintaining altitude and airspeed is permissible if required to obtain desired range.

3. Land as soon as possible.

   Proceed toward home base over the least inhabited area, or to the nearest usable base if fuel reserve is not adequate.

LANDING GEAR EMERGENCY OPERATION.

LANDING GEAR GROUND EMERGENCY RETRACTION.

If it is necessary to retract the landing gear when the airplane is on the ground, proceed as follows:

1. Landing gear handle—UP.
2. Landing gear emergency-up button—Depress until gear completely retracts.

Gear retraction time can be reduced when emergency-up button is used, by yawing the airplane through alternate application of right and left wheel brakes, or by applying rudder alternately with nose wheel steering engaged.

Caution The landing gear will retract only if utility hydraulic pressure and battery power are available.

- The landing gear cannot be retracted after being lowered by means of the landing gear emergency release handle.

LANDING GEAR IN-FLIGHT EMERGENCY OPERATION.

Emergency Retraction.

During flight, the following condition may be encountered: The landing gear unsafe warning light may remain on after the landing gear handle is placed at UP. This does not necessarily constitute an emergency condition, but under certain conditions air loads on the landing gear doors can prevent gear retraction. This would be indicated by a safe gear-down condition for all three gear indicators with the landing gear handle at UP and the unsafe warning light on. If such condition occurs, proceed as follows:

1. Landing gear handle—Leave UP, if all gear indicators show safe "down" with landing gear handle UP and unsafe warning light on.
2. Maintain straight flight.

   Maintain a straight flight path to minimize G-loads on the gear doors and to eliminate yaw.
3. Airspeed—Reduce to below gear-down limit speed.
4. If safe indication is obtained:
   a. Continue flight.
5. If unsafe condition still exists:
   a. Landing gear handle—DOWN.
   b. Land as soon as possible after safe gear-down indication is obtained.

      If mission is important, maintain straight flight path to minimize G-loads on the gear doors and to eliminate yaw. Hold airspeed below gear-down limit speed and cycle gear down and up. If unsafe warning light goes out, continue mission. If unsafe warning light remains on, lower gear and land as soon as possible.

Caution Do not move landing gear handle when red gear-unsafe warning light is on and speed is above 220 knots IAS, as gear doors may be torn off when hydraulic pressure is released from door actuating cylinders.

Emergency Lowering.

The landing gear emergency lowering procedure is shown in figure 3-6.

Figure 3-6

Caution The landing gear cannot be retracted after being lowered by means of the landing gear emergency release handle.

SPEED BRAKE SYSTEM FAILURE.

On some airplanes,* the speed brakes can be closed in flight in the event of electrical or hydraulic failure, by moving the speed brake dump valve lever aft. This mechanically positions a dump valve that opens the speed brake hydraulic lines to return, allowing air loads to close the speed brakes. There is no emergency system to open the speed brakes.

WING FLAP SYSTEM FAILURE.

No emergency system for flap operation is provided. If the flaps retract or extend unequally during normal flap operation, hold airplane level and return wing flap handle to original position to try to equalize the flaps. (Enough aileron control is available to hold wings level in this condition or to roll against the down flap if necessary.) Land as soon as possible without any further attempt to operate the flaps.

***F-86H-1 Airplanes AF52-1975 through -1980**

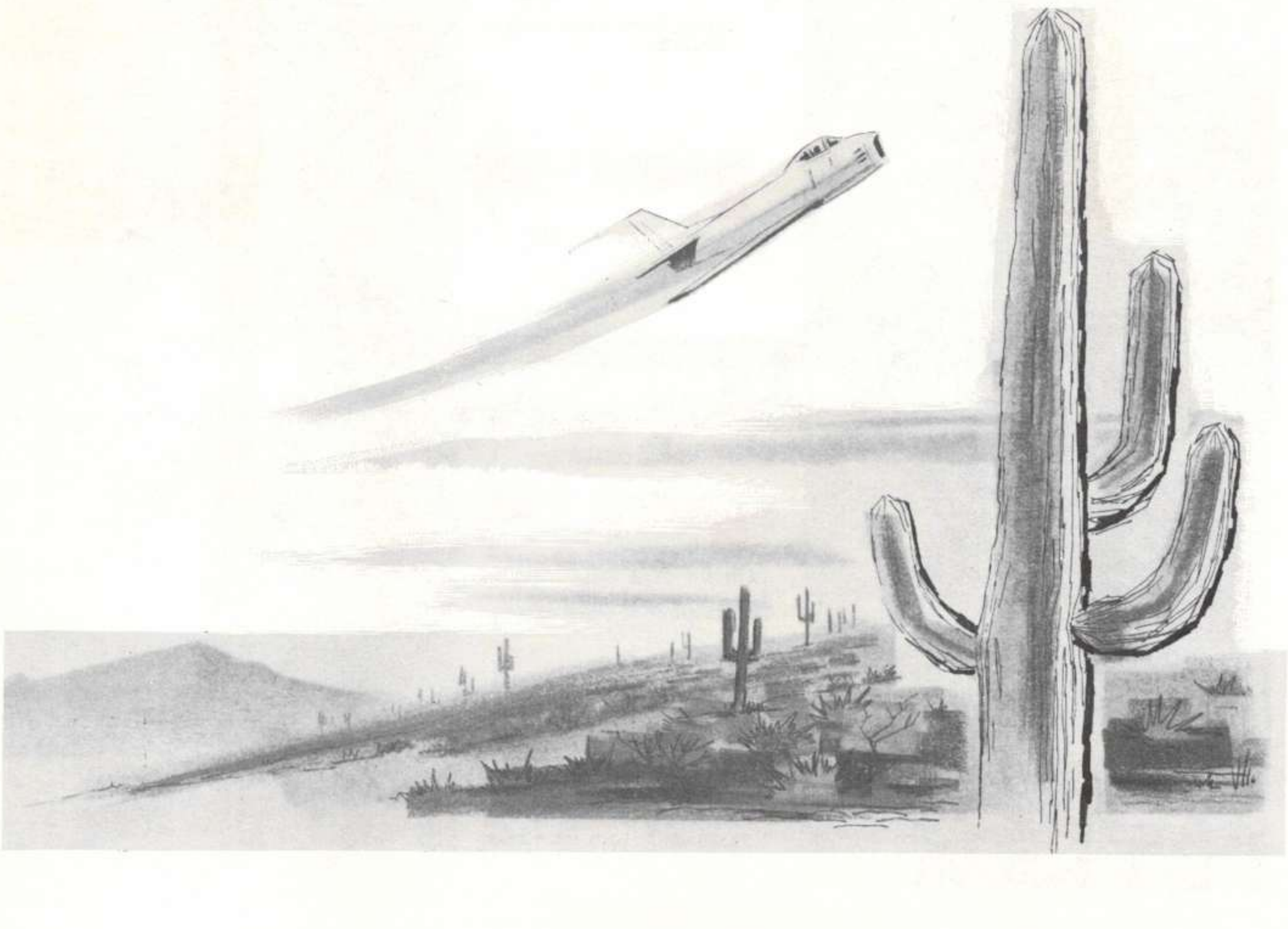
EXTERNAL LOAD EMERGENCY RELEASE.

To drop any external load during an in-flight emergency, follow this procedure:

1. External stores jettison button—Depress.
2. Load released—Check.
3. Emergency jettison handle—Pull, if no electrical power is available or load fails to release.

CONDENSED CHECK LIST.

Refer to pages 3-23 through 3-36 for Condensed Check List.



CUT ON SOLID LINE

EMERGENCY PROCEDURES
F-86H CONDENSED CHECK LIST

NOTE

The following check list is a condensed version of the emergency procedures presented in Section III. This condensed check list is arranged so that you may remove it from your Flight Manual and insert into a flip pad for convenient use. It is arranged so that each action is in sequence with the expanded procedure given in Section III. Presentation of this condensed check list does not imply that you need not read and thoroughly understand the expanded version. To fly the airplane safely and efficiently under emergency conditions, you *must* know the reason why each step is performed and why the steps occur in certain sequence.

T.O. 1F-86H-1
25 JUNE 1959
Changed 26 February 1960

CUT ON SOLID LINE

ENGINE FAILURE.

ENGINE FAILURE DURING TAKE-OFF RUN (NO RUNWAY OVERRUN BARRIER).

1. External stores jettison button—Depress.
2. Throttle—OFF.
3. Brakes—Apply as necessary.
4. Landing gear handle—UP (if conditions warrant); then, landing gear emergency-up button—Depress and hold.
5. Either handgrip—Raise to jettison canopy.
6. Engine master, generator, and battery switches—OFF.

ENGINE FAILURE DURING TAKE-OFF (AIR-BORNE).

1. External stores jettison button—Depress.
2. Throttle—OFF.
3. Landing gear handle—DOWN.
4. Wing flap handle—DOWN.
5. Either handgrip—Raise to jettison canopy.
6. Engine master, generator, and battery switches—OFF.
7. Land straight ahead, changing course only enough to miss obstacles.

ENGINE FAILURE DURING FLIGHT.

1. Throttle—OFF.
2. Glide—200 knots IAS.
3. Nonessential electrical equipment—OFF.
4. Attempt air start.

ENGINE AIR START.

1. Air start switch—ON.
2. Fuel system selector switch—EMER.
3. Engine master, battery, and generator switches—ON.
4. Hold airplane level for 15 seconds.

T.O. 1F-86H-1
25 June 1959

2

CUT ON SOLID LINE

5. Maintain 200 knots IAS.
6. Throttle—Advance to obtain fuel flow of 500 to 800 pounds per hour.
7. RPM and exhaust temperature—Allow to stabilize; then advance throttle cautiously to desired power setting.
8. Air start switch—OFF.
9. If engine fails to start:
   a. Throttle—OFF.
   b. Air start, engine master, and generator switches—OFF.
   c. External stores jettison button—Depress.
   d. Prepare for forced landing, or eject.

FORCED LANDING—WINDMILLING OR FROZEN ENGINE.

1. External stores jettison button—Depress. Maintain glide at 200 knots IAS.
2. Landing gear handle—DOWN at high key point; then establish glide of 185 knots IAS. If necessary to lose altitude more rapidly to reach the high key point, gear may be lowered earlier.
3. Flight control emergency change-over handle—Pull to full extension just before entering pattern if engine is frozen.
4. Fly pattern at 185 knots IAS.
5. Either handgrip—Pull up at low key point to jettison canopy if landing on unprepared surface. Pull helmet visor down before jettisoning canopy.
6. Fly turn "long" or "short" for accurate touchdown.
7. Final approach—Hold 170 knots IAS and use straight-in approach.
8. Wing flap handle and speed brake switch—As required when sure of reaching landing spot.
9. Shoulder harness lock handle—LOCKED (forward).
10. Battery switch—OFF, after airplane comes to a stop.

CUT ON SOLID LINE

FIRE.

ENGINE FIRE DURING STARTING.

1. Throttle—OFF.
2. Engine master switch—OFF.
3. Generator switch—OFF, if generator-off warning light is out.
4. Battery switch—OFF.
5. Leave airplane as quickly as possible.

ENGINE FIRE DURING TAKE-OFF.

Forward Fire-warning Light (Ground Roll).

1. Throttle—OFF.
2. External stores jettison button—Depress.
3. Landing gear handle—UP; gear emergency-up button—Depress and hold, if necessary to retract gear.
4. Leave airplane immediately upon stopping, if fire is apparent.

Forward Fire-warning Light (Air-borne).

1. External stores jettison button—Depress.
2. Throttle—Maintain power.
3. Maximum climb.

3A. Fuel system selector switch—NORM.

4. Throttle—Adjust to minimum practical power.
5. Check for fire.
6. If fire is confirmed—Eject.
7. If fire cannot be cofirmed—Land as soon as possible.

Aft Overheat Light (Ground Roll).

1. Throttle—OFF.
2. External stores jettison, button—Depress.
3. Use maximum braking.
4. Overheat light—Check.
   a. If light remains on after stopping—Leave airplane immediately.
   b. If light goes out—Engine master switch OFF, then battery switch OFF.

T.O. 1F-86H-1
25 June 1959

4

CUT ON SOLID LINE

Aft Overheat Light (Air-borne).

1. Fuel system selector switch—NORM.
2. Throttle—Retard and continue climb-out.
3. Overheat light—Check.
   a. If light goes out—Continue flight at reduced power and land as soon as possible.
   b. If light remains on—Maintain climb at reduced power and check for other indications of fire, such as trailing smoke, long exhaust flame, etc.
   c. If no fire is apparent—Continue flight at reduced power and land as soon as possible.
   d. If positive fire indication exists—Maintain power and immediately climb to minimum safe ejection altitude; then eject.

ENGINE FIRE DURING FLIGHT.

Forward Fire-warning Light.

1. Throttle—Adjust to minimum practical power.
2. Check for fire.
3. If fire is confirmed—Eject.
4. If fire cannot be confirmed—Land as soon as possible.

Aft Overheat Light.

1. Overheat light—Check.
   a. Reduce power in attempt to extinguish light.
   b. If light goes out—Continue flight at reduced power, and land as soon as possible.
   c. If light remains on with throttle retarded to IDLE, indicating possible fire rather than overheat—Proceed to step 2.
2. Check for other indications of fire, such as trailing smoke, engine noise, verification from another airplane, etc.
   a. If no fire is apparent—Continue flight at minimum power and land as soon as possible.
   b. If positive indication of fire exists—Proceed to step 3.

CUT ON SOLID LINE

3. Throttle—OFF.
4. Engine master switch—OFF.
5. If fire continues—Eject.
6. If fire ceases—Make forced landing, or eject.

ELECTRICAL FIRE.

1. Battery and generator switches—OFF.
2. Land as soon as possible.

ELIMINATION OF SMOKE OR FUMES.

1. Cockpit pressure switch—RAM DUMP.
2. Oxygen regulator diluter lever—100% OXYGEN.
3. Oxygen regulator emergency toggle lever—Push to left or right.
4. When smoke or fumes persist, jettison canopy if necessary.

TAKE-OFF AND LANDING EMERGENCIES.

ENGAGING RUNWAY OVERRUN BARRIER.

1. Throttle—OFF.
2. Drop tanks—Jettison.
3. Engine master, generator, and battery switches—OFF.
4. Brakes—Avoid excessive use during engagement of barrier, to prevent tire blowouts.
5. Aim for center of barrier.
6. Engage barrier.

BELLY LANDING.

1. External stores jettison button—Depress.
2. Either handgrip—Pull up to jettison canopy before final approach. Pull helmet visor down before jettisoning canopy.
3. Wing flap handle—DOWN, on final approach.
4. Speed brake switch—OUT.
5. Throttle—OFF, when landing ensured.
6. Engine master, generator, and battery switches—OFF, just before touch-down.

CUT ON SOLID LINE

7. Shoulder harness lock handle—LOCKED (forward).
8. Touch down in normal landing attitude.
9. Leave airplane immediately after it stops.

LANDING GEAR UNSAFE INDICATIONS.

Main Gear Up Landing (Prepared Surface Only).

1. Landing gear handle—UP.
2. Landing gear emergency-up button—Depress until gear completely retracts.
3. Either handgrip—Pull up to jettison canopy before final approach. Pull helmet visor down before jettisoning canopy.
4. External load—Jettison, if possible.
5. Plan approach to touch down as near end of runway as possible.
6. Wing flap handle—DOWN on final approach.
7. Speed brake switch—OUT.
8. Throttle—OFF just before touchdown.
9. Engine master switch—OFF.
10. Battery switch—OFF.
11. Generator switches—OFF.
12. Shoulder harness lock handle—LOCKED.
13. Touchdown—Attempt to touch down on nose gear and aft fuselage simultaneously.
14. Leave airplane immediately after stopping.

CUT ON SOLID LINE

ANY ONE GEAR UP OR UNLOCKED.

1. External stores jettison button—Depress.
2. Fire ammunition and expend excess fuel, if time and conditions permit.
3. Either handgrip—Pull up to jettison canopy before final approach. Pull helmet visor down before jettisoning canopy.
4. Plan approach to touchdown as near end of runway as possible.
5. Wing flap handle—DOWN, on final approach.
6. Speed brake switch—OUT.
7. Throttle—OFF, just before touchdown.
8. Engine master switch—OFF.
9. Battery switch—OFF.
10. Generator switch—OFF, if time permits.
11. Shoulder harness lock handle—LOCKED (forward).
12. After touchdown—Hold unsafe gear off runway as long as possible.
13. Brakes—Do not use, if stop can be made without them.
14. Leave airplane immediately after stopping.

LANDING WITH FLAT TIRE.

Nose Gear Tire Flat.

1. Touchdown—Hold nose gear off runway as long as possible.
2. Directional control—After nose wheel touchdown, use combination of braking and nose wheel steering.

Main Gear Tire Flat.

1. Release external ordnance in a safe condition and expend excess fuel to minimize fire and explosion hazard.
2. Touchdown—Land on side of runway away from flat tire.
3. Directional control—After nose wheel touchdown, use combination of differential braking and nose wheel steering.

CUT ON SOLID LINE

DITCHING.

1. Follow radio distress procedure.
2. External stores jettison button—Depress.
3. Personal equipment—Check that it will not foul when leaving cockpit.
4. Anti-G suit—Disconnect.
5. Oxygen regulator diluter lever—100% OXYGEN.
6. Landing gear handle—UP.
7. Speed brake switch—IN.
8. Either handgrip—Pull up to jettison canopy. Pull helmet visor down before jettisoning canopy.
9. Throttle—OFF.
10. Wing flap handle—DOWN.
11. Engine master, generator, and battery switches—OFF.
12. Safety belt and shoulder harness—Tighten.
13. Shoulder harness lock handle—LOCKED (forward).
14. Surface conditions—Check.
15. Approach and flare—Normal.
16. Touchdown—Keep nose high, and attempt to touch down at minimum flying speed.
17. Oxygen mask—Remove.
18. Leave airplane.

EJECTION.

1. Either handgrip—Pull up to jettison canopy.
2. Either trigger—Squeeze to eject seat.

CUT ON SOLID LINE

FAILURE OF SEAT TO EJECT.

1. Speed brake switch—IN.
2. Safety belt—Unfasten.
3. Bail-out bottle—Actuate, if necessary.
4. Personal leads (oxygen, radio, and anti-G suit)—Disconnect.
5. Invert airplane and then push free of seat, or bail out over side.
6. Parachute-arming lanyard (automatic parachute) or "D" ring (manual parachute)—Pull.

FUEL SYSTEM FAILURE.

ENGINE FUEL CONTROL SYSTEM FAILURE.

1. Throttle—IDLE.
2. Fuel system selector switch—EMER.
3. Throttle—Slowly advance to desired setting.

FUEL TANK BOOST PUMP FAILURE.

1. Throttle—Retard as necessary in an attempt to eliminate fluctuation and surging.
2. Land as soon as possible.

ENGINE OIL SYSTEM MALFUNCTION.

1. If power setting is above 80% rpm—Do not move throttle until landing is ensured.
2. If power setting is below 80% rpm—Advance throttle to 80% rpm or more and do not move throttle until landing is ensured.
3. Land as soon as possible, using forced landing pattern to ensure landing in the event of complete power failure.

T.O. 1F-86H-1
25 June 1959
10

CUT ON SOLID LINE

ELECTRICAL POWER SYSTEM FAILURE.

COMPLETE ELECTRICAL FAILURE.

1. Airspeed—Reduce, and readjust trim.
2. Altitude and rpm—Reduce as necessary.
3. Airplane attitude—Lower nose as necessary to drain trapped fuel.
4. Land as soon as possible.

GENERATOR IRREGULARITY.

Generator Failure or Undervoltage.

1. Nonessential electrical equipment—OFF.
2. Engine master and generator switches—OFF, if generator output is lost because of engine failure.
3. Landing gear handle—DOWN.
4. Landing gear emergency release handle—Pull full out and hold extended momentarily for all landings where generator failure has occurred.

Generator Overvoltage.

1. Generator switch—Hold at RESET momentarily, then OFF.
2. If voltmeter shows normal system voltage:
   a. Generator switch—ON.
3. If generator overvoltage is still indicated by voltmeter:
   a. Generator switch—OFF.
   b. Land as soon as possible.

INVERTER FAILURE.

Instrument (Three-phase) Inverter Failure.

1. Instrument ac power switch—ALTERNATE.

T.O. 1F-86H-1
25 June 1959 11

CUT ON SOLID LINE

FLIGHT CONTROL HYDRAULIC SYSTEM FAILURE.

FAILURE OF NORMAL SYSTEM.

1. Alternate-on warning light—Check on.
1A. Hydraulic pressure gage selector switch—ALTERN.
1B. Do not fly close formation, perform aerobatics, or engage in unnecessary low-altitude flying.
2. Land as soon as possible.
3. Emergency change-over handle—Pull, just before entering traffic pattern.

FAILURE OF BOTH SYSTEMS.

1. Airspeed—Attempt to reduce to about 220 knots.
2. Maintain control if possible.
3. If control cannot be maintained—Eject.
4. If some control is available, and altitude permits—Attempt recovery and return to suitable area; then eject.

LOSS OF CANOPY OR CANOPY-UNLOCKED INDICATION.

CANOPY-UNLOCKED INDICATION.

1. Canopy switch—CLOSE.
2. Cabin pressure altimeter—Check.
3. Land as soon as possible.

T.O. 1F-86H-1
Changed 26 February 1960
12

CUT ON SOLID LINE

LANDING GEAR EMERGENCY OPERATION.

LANDING GEAR GROUND EMERGENCY RETRACTION.

1. Landing gear handle—UP.
2. Landing gear emergency-up button—Depress until gear completely retracts.

LANDING GEAR IN-FLIGHT EMERGENCY OPERATION.

Emergency Retraction.

1. Landing gear handle—Leave UP, if all gear indicators show safe "down" with landing gear handle UP and unsafe warning light on.
2. Maintain straight flight.
3. Airspeed—Reduce to below gear-down limit speed.
4. If safe indication is obtained:
   a. Continue flight.
5. If unsafe condition still exists:
   a. Landing gear handle—DOWN.
   b. Land as soon as possible after safe gear-down indication is obtained.

Emergency Lowering.

1. Airspeed—Reduce to below 220 knots IAS.
2. Landing gear handle —DOWN.
3. Landing gear emergency release handle—Pull and hold extended to lower gear.
4. Landing gear position indicators—Check for safe gear indication. If necessary, yaw airplane to lock main gear. Release emergency release handle.

EXTERNAL LOAD EMERGENCY RELEASE.

1. External stores jettison button—Depress.
2. Load released—Check.
3. Emergency jettison handle—Pull, if no electrical power is available or load fails to release.

T.O. 1F-86H-1
25 June 1959 **13**

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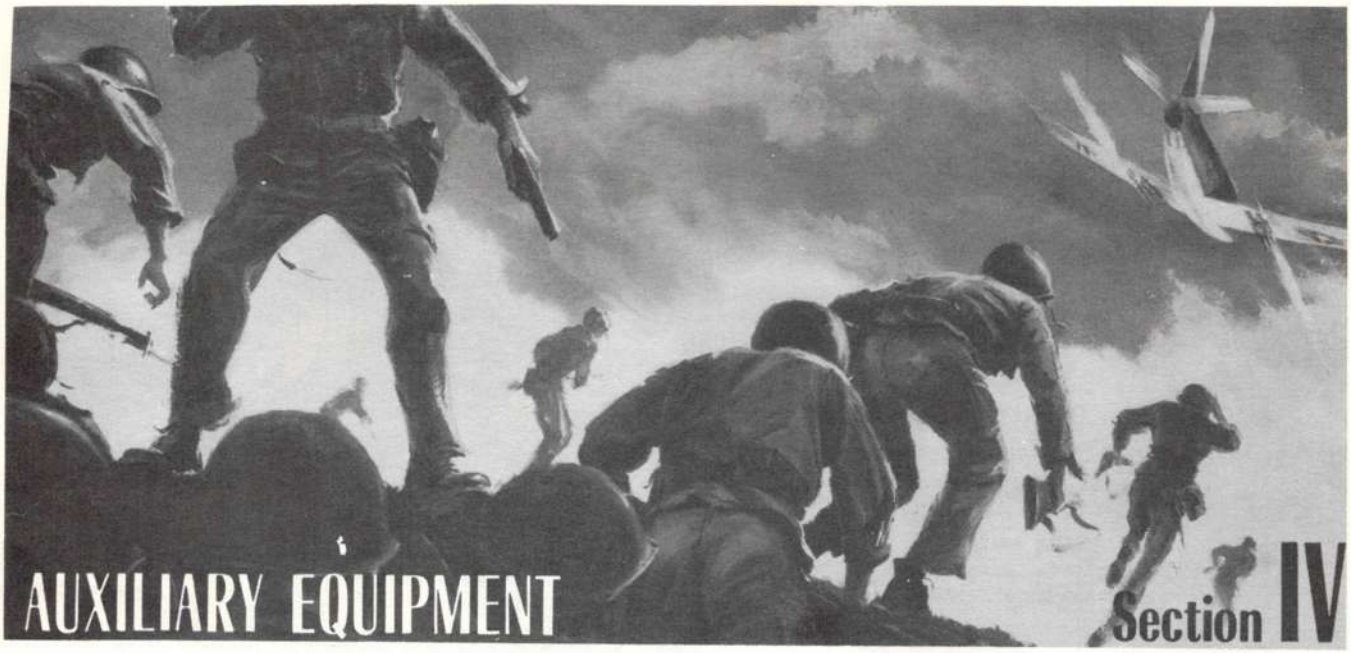


F-86H-1-00-83A

TABLE OF CONTENTS

COCKPIT AIR CONDITIONING AND PRESSURIZATION SYSTEM.

COCKPIT AIR CONDITIONING.

The air conditioning system supplies air for cockpit pressurization and cockpit temperature control. In addition, the system provides air for defrosting the windshield, the canopy, and the camera window, and for windshield anti-icing* or windshield rain and ice removal.† On early airplanes,* the windshield anti-icing system has limited rain removal capabilities. (Refer to "Defrosting and Rain and Ice Removal Systems.") Engine compressor discharge air is routed through a primary heat exchanger for initial cooling, and then directed either through or around a refrigeration unit to maintain a preselected cockpit temperature. Cockpit air temperature is regulated by an automatic temperature control system. This system proportions the mixing of hot air from the engine compressor and cool air from the refrigeration unit by positioning the hot-air bypass valve and the heat exchanger modulating valve. (On early airplanes,* if air from the compressor does not supply enough heat, an electric cockpit heater can be energized; it will then cycle on and off to maintain the desired cockpit temperature.) When maximum cockpit cooling is required, the bypass valve directs all the air through the refrigeration unit, which consists of an air-to-air heat exchanger combined with an expansion turbine; at the same time, the modulating valve is positioned for maximum cooling. The cockpit air conditioning and pressurization system is shown schematically in figure 4-1. Cockpit air outlets are along the consoles on either side of the pilot and between the rudder pedals. On early airplanes,* air for windshield anti-icing is routed directly from the primary heat exchanger to the windshield anti-icing outlet, with air temperature controlled by the cockpit temperature control regulator. On most airplanes,† air for windshield rain and ice removal also is routed from the primary heat exchanger to the windshield air outlet, but an auxiliary temperature regulator assumes automatic control of the temperature of the air to the windshield outlet. In both

***F-86H-1 Airplanes AF52-1975 through -1990**
†F-86H-1 Airplane AF52-1991 and all later airplanes

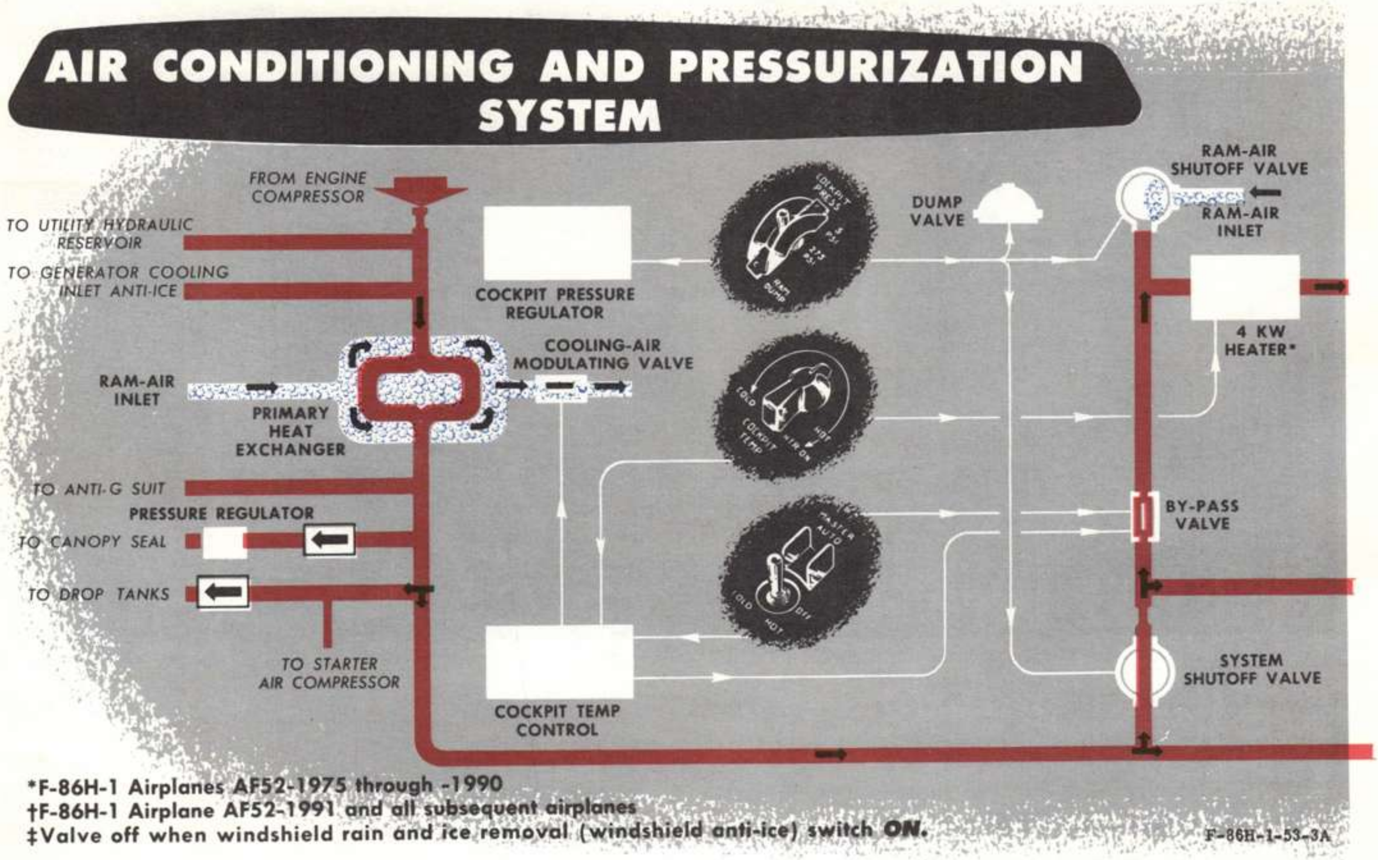


Figure 4-1

systems, the temperature is controlled by the position of the heat exchanger cooling-air modulating valve. The air to the windshield anti-icing system* can exceed design limit, whereas it will automatically be maintained within the design limit in the rain and ice removal system.† Compressed air is also used for the anti-G suit, starter compressor, pressurization of drop tanks and hydraulic reservoirs, canopy seal, and anti-icing of the generator cooling-air inlet scoop. Ram-air flow may be selected if the air conditioning system does not function correctly, and on some airplanes* it may be heated by the electric heater.

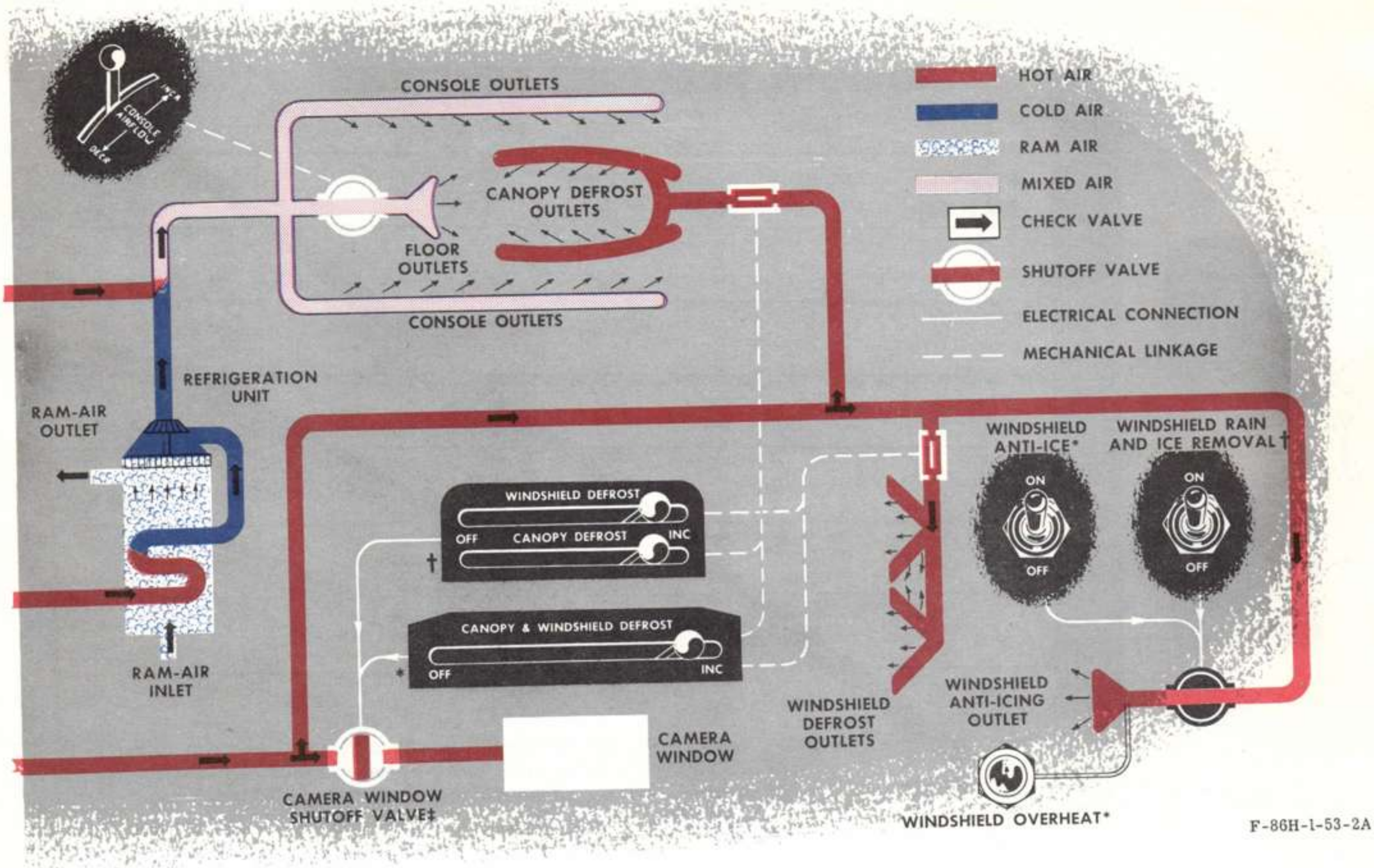
PRESSURIZATION.

Cockpit pressure is maintained at a predetermined schedule for various flight altitudes by a pressure regulator which controls the outflow of cabin air. (The cockpit pressure schedule is shown in figure 4-2.) The cockpit is nonpressurized from sea level to 12,500 feet. Above this altitude, either of two pressure schedules (2.75 psi or 5 psi) is maintained by the automatic pressure regulator. If 2.75 psi is selected, a cockpit pressure of 12,500 feet is maintained to an altitude of 21,200 feet and a constant pressure of 2.75 psi cockpit differential at all altitudes above. If 5 psi is selected, a cockpit pressure of 12,500 feet is maintained to about 31,000 feet and a constant 5 psi cockpit differential at all altitudes above.

NOTE Below a flight altitude of about 12,500 feet, the differential between cockpit altitude and flight altitude increases with airspeed and is usually 1000 feet or less when only the cockpit air conditioning system is on. If the windshield and canopy defrost systems are on, the difference in altitude should not exceed 5000 feet.

The minimum engine rpm necessary for adequate cockpit pressurization, air conditioning, and defrosting for any particular altitude is as follows:

***F-86H-1 Airplanes AF52-1975 through -1990**
†F-86H-1 Airplane AF52-1991 and all later airplanes



ALTITUDE	RPM
10,000 feet	70%
15,000 feet	73%
20,000 feet	75%
30,000 feet	80%
40,000 feet	92%
45,000 feet	100%

A dump valve releases all cabin pressure when the valve is selected by the pilot and automatically relieves any excess pressure above 5.3 psi if the pressure regulator fails. An external pressurized air source may be used for ground pressurization and cooling of the cockpit.

COCKPIT AIR CONDITIONING AND PRESSURIZATION SYSTEM CONTROLS AND INDICATOR.

A cockpit air conditioning and pressurization control panel is on the left console, forward of the throttle quadrant. The panel contains the controls for cockpit temperature, cockpit pressure, cockpit console airflow, windshield anti-icing, rain removal, and pitot heater, and, on some airplanes,* the windshield overheat indicator light.

Cockpit Pressure Switch.

A three-position switch, located on the air conditioning control panel (8, figure 1-5; figure 4-3), provides primary bus power for selection of cockpit pressure. When the switch is at RAM DUMP, the dump valve opens to depressurize the cockpit, the ram-air shutoff valve opens to admit ram air into the cockpit, the system shutoff valve closes, and the cockpit temperature control becomes inoperative. On some airplanes,* the ram air is heated by the electric heater when the cockpit temperature rheostat is moved to HTR ON. When the pressure switch is moved to either 2.75 PSI or 5 PSI, the ram-air valve is closed and the system shutoff valve is opened. The regulator will then maintain the selected pressure differential between cockpit and atmospheric pressure above 12,500 feet.

Cockpit Temperature Master Switch.

A four-position switch on the air conditioning control panel (8, figure 1-5; figure 4-3) controls cockpit air inlet temperature by means of secondary bus power. The switch, with AUTO, HOT, COLD, and OFF positions, is operable only when the cockpit pressure switch is at 5

***F-86H-1 Airplanes AF52-1975 through -1990**

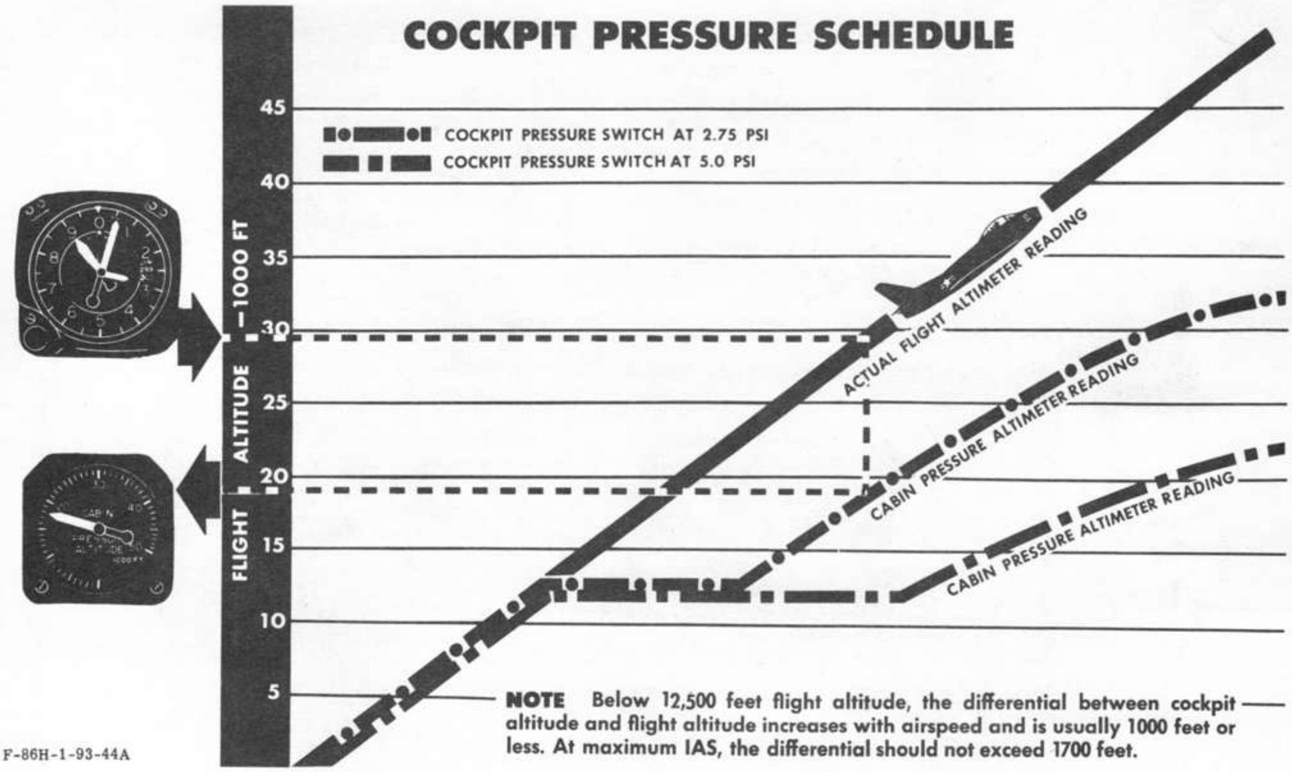


Figure 4-2

PSI or 2.75 PSI. For automatic temperature control, the switch should be positioned at AUTO and the cockpit temperature rheostat adjusted to obtain the desired temperature.

NOTE The cockpit temperature control unit operates on single-phase ac power. Therefore, if single-phase ac power is not available, automatic temperature control of the cockpit cannot be maintained.

Should the automatic control system function improperly or single-phase ac power failure occur, the cockpit temperature may be manually controlled by means of the master switch. Moving the switch to HOT opens the hot-air bypass valve; moving it to COLD closes the hot-air bypass valve and directs air through the refrigeration unit. The switch should be returned to OFF when desired temperature is attained. To control cockpit temperature when ram air is selected, the cockpit temperature rheostat on some airplanes* must be moved to HTR ON to actuate an electric heater. When the temperature master switch is OFF, the automatic control system is inoperative and the bypass valve remains in the position prevailing when the switch was set at OFF.

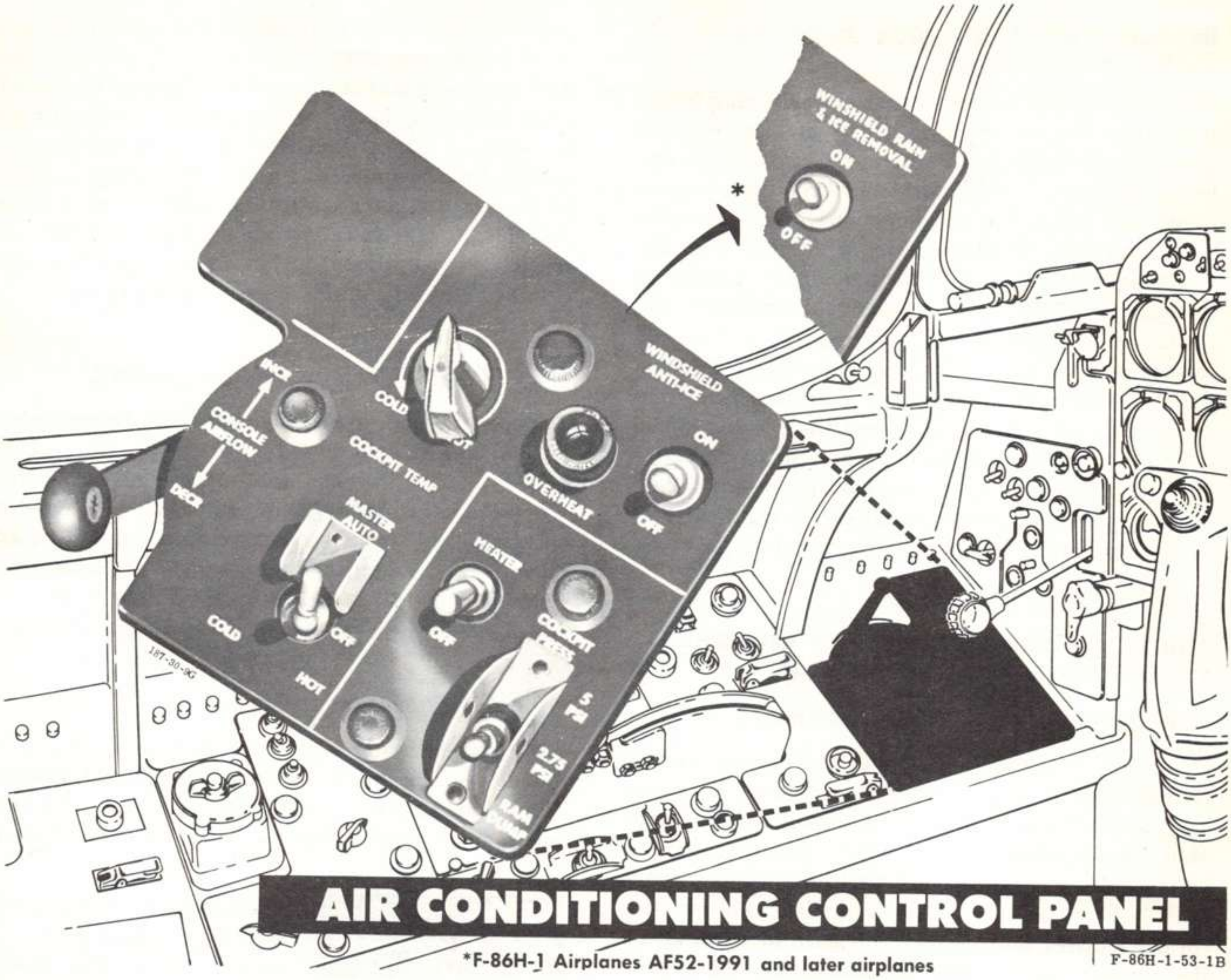
***F-86H-1 Airplanes AF52-1975 through -1990**

Cockpit Temperature Rheostat.

When the cockpit temperature master switch is at AUTO, the temperature rheostat (figure 4-3) may be set at any point between COLD and HOT to maintain desired cockpit inlet air temperature to the cockpit. On some airplanes,* when the rheostat is turned clockwise to HTR ON, the electric heater (secondary bus power) is turned on to supply added heat to the hot compressed air from the primary heat exchanger. The rheostat control is inoperative for selective temperatures if the temperature master switch is not in the AUTO position; however, the HTR ON position* is operative regardless of the position of the master switch.

Cockpit Console Airflow Lever.

Cockpit airflow is determined by a lever (figure 4-3) on the air conditioning control panel. The lever is used to direct the airflow of air to the outlets along the console and to the outlet between the rudder pedals. Positioning the lever toward INCR mechanically positions a diverter valve so that a greater share of the cockpit air is directed through the console air outlets. Moving the lever toward DECR directs a larger portion of the air to the pilot's feet, reducing cockpit air circulation, but still retaining the same airflow for pressurization.



*F-86H-1 Airplanes AF52-1991 and later airplanes

F-86H-1-53-1B

Figure 4-3

Cabin Pressure Altimeter.

The pressure altitude of the cockpit is indicated by the **cabin pressure altimeter (3, figure 1-6), located outboard** and forward on the right console. The cabin pressure altimeter is vented only to pressure within the cockpit.

NORMAL OPERATION OF COCKPIT AIR CONDITIONING AND PRESSURIZATION SYSTEM.

Normal operation of the air conditioning and pressurization system is done as follows:

1. Cockpit pressure switch at either 2.75 PSI or 5 PSI.
2. Cockpit temperature master switch at AUTO.
3. Cockpit temperature rheostat set as desired.
4. Cockpit console airflow lever set for desired airflow distribution.
5. Move canopy and windshield defrost handle to INC if further cockpit heating is desired.

EMERGENCY OPERATION OF COCKPIT AIR CONDITIONING AND PRESSURIZATION SYSTEM.

If sudden depressurization of cockpit is necessary:

1. Turn oxygen regulator diluter lever to 100% OXYGEN, and push emergency toggle lever from center position for positive pressure to mask.
2. Move cockpit pressure switch to RAM DUMP.
3. If circumstances permit, descend to 25,000 feet or below.

If cooling unit functions improperly, and temperature of cockpit remains high:

1. Turn cockpit temperature rheostat to COLD.
2. If temperature remains high, move cockpit temperature master switch to COLD position.
3. If temperature is still uncomfortably high, check oxygen mask and regulator and move cockpit pressure switch to RAM DUMP.
4. If circumstances permit, descend to 25,000 feet or below.

DEFROSTING AND RAIN AND ICE REMOVAL SYSTEMS.

Heated air for canopy and windshield defrosting is supplied from the air conditioning system; air from the primary heat exchanger is directed over the inner surface of the canopy and windshield. The canopy must be closed and locked for defrosting operation. For strike camera window defrosting, air is directed over the inside and outside of the camera window* or inside of the camera window.† For windshield anti-icing, and limited rain removal on early airplanes,* and for rain and ice removal on most airplanes,‡ a layer of heated air is directed over the outside of the windshield from an external outlet. The pitot head has a conventional resistance-type electrical heater to prevent formation of ice within the unit. Some airplanes have an alcohol deicing system to allow removal of ice from the fuel filter. (Refer to "Fuel Filter Deicing System.")

DEFROSTING AND RAIN AND ICE REMOVAL SYSTEM CONTROLS AND INDICATOR.

Canopy and Windshield Defrost Handle.

Defrosting of canopy, windshield, and camera window is controlled by means of a defrost handle (6, figure 1-5), above the cockpit air conditioning control panel. When the handle is moved to the INC position, butterfly valves in the system are opened mechanically to distribute heated air to the canopy and windshield, and an electrically actuated shutoff valve is opened to direct air to the camera window. However, when windshield rain and ice removal (anti-icing) is being used, the camera shutoff valve closes and camera defrosting facilities are inoperative. When the handle is in the OFF position, the canopy and windshield defrost butterfly valves are closed and the camera valve is closed. On most airplanes,‡ a separate handle is provided for controlling the canopy defrost system; another is provided for the windshield defrost system.

Windshield Anti-icing Switch and Overheat Indicator.*

Control of windshield anti-icing airflow is provided by a switch (figure 4-3) on the air conditioning control panel. Moving the switch to ON opens the anti-ice shutoff valve to supply hot air to the outer surface of the windshield and closes the camera defrost valve. An indicator light (figure 4-3) goes on (secondary bus power) whenever the temperature of air for windshield anti-icing exceeds the design limit of 300°F. However, this does not mean that the windshield itself is overheated or in immediate danger of damage. An attempt should be made to reduce windshield air outlet temperature, though, by reducing engine rpm or by placing the cockpit pressure switch at RAM DUMP. If either action is not desirable, or fails to correct the overheat condition, the anti-icing system should be left on to improve forward visibility, especially during the landing approach.

Windshield Rain and Ice Removal Switch.‡

The flow of hot air to the outer surface of the windshield for rain and ice removal is controlled by a two-position switch (figure 4-3) on the air conditioning control panel. When the switch is moved to ON, hot air is directed to the windshield, and the camera defrost valve is closed. There is no overheat indicator on these airplanes, since windshield outlet air temperature will not exceed the design limit when the system is functioning normally.

Pitot Heater Switch.

The electrical heater in the pitot head is controlled by the pitot heater switch (figure 4-3), on the left console. The switch has two positions, PITOT HEATER and OFF, and controls primary bus power for heater operation.

Warning The pitot heater should not be used for extended periods of time on the ground, because lack of sufficient airflow will cause overheating of the unit, which could result in serious injury to personnel.

NORMAL OPERATION OF WINDSHIELD AND CANOPY DEFROSTING AND WINDSHIELD ANTI-ICING SYSTEMS.*

NOTE The windshield and canopy defrosing system heats the transparent surfaces enough to effectively eliminate frost or fog during descent.

If inner surface of windshield or canopy becomes fogged, follow this procedure:

1. Move canopy and windshield defrost handle toward INC, as desired.

***F-86H-1 Airplanes AF52-1975 through -1990**
†F-86H-5 and later airplanes
‡F-86H-1 Airplane AF52-1991 and all later airplanes

2. If atmospheric or flight conditions cause fog to be emitted from the windshield defrost or airflow outlets, turn cockpit temperature rheostat to the full HOT position.

If windshield becomes iced, fogged or frosted, or rain obscures forward visibility, move windshield anti-icing switch to ON to engage windshield anti-icing system.

NOTE If windshield icing is frequently encountered during letdowns, the windshield anti-icing system should be turned on 10 minutes before letdown. However, the system should not be turned on and off unnecessarily, because thermal shock can break the windshield.

- The windshield anti-icing airflow will improve forward visibility under moderate rain conditions at engine speeds above 75% rpm. If it is necessary to reduce power, such as during landing approach, vision through the windshield side panels may become necessary.

Caution If the windshield overheat light goes on, try to reduce windshield air temperature by reducing engine rpm or by placing cockpit pressure switch at RAM DUMP. If either action is not desirable or fails to correct the overheat condition, the anti-icing system should be left on to improve forward visibility, especially during the landing approach.

NORMAL OPERATION OF WINDSHIELD AND CANOPY DEFROSTING AND WINDSHIELD RAIN AND ICE REMOVAL SYSTEMS.*

NOTE The windshield and canopy defrosting system heats the transparent surfaces enough to effectively eliminate frost or fog during descent.

1. If inner surface of canopy becomes fogged, move canopy and windshield defrost handle toward INC, as necessary.

2. If inner surface of windshield becomes fogged, move canopy and windshield defrost handle toward INC.

3. If atmospheric or flight conditions cause fog to be emitted from defrost outlets, turn cockpit temperature rheostat to full HOT position.

4. If windshield becomes iced, fogged, or frosted, or if forward visibility is obscured by rain, set windshield rain and ice removal switch to ON.

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*F-86H-1 Airplane AF52-1991 and all later airplanes
†F-86H-1 Airplanes AF52-1975 through -1983

FUEL FILTER DEICING SYSTEM.†

Alcohol is injected into the fuel filter inlet line to deice the fuel filter. Alcohol flow from the tank to the filter is pilot-controlled. The 3-gallon alcohol supply will last for about 3 minutes of continuous deicing operation. A warning light goes on whenever fuel flow through the filter is restricted by ice formation. For alcohol specification, see figure 1-30.

Fuel Filter Deicing System Control and Indicator.

Fuel Filter Deice Switch. The fuel filter deice switch (figure 1-9), on the left console, controls the alcohol system for deicing the fuel filter. When the switch is moved to DE-ICE, primary bus power opens a shutoff valve and starts the alcohol pump to inject alcohol into the fuel filter inlet line. When the ice warning light goes out, indicating that the filter is free of ice, the switch should be returned to OFF.

Fuel Filter Ice Warning Light. Ice formation within the fuel filter creates a pressure differential across the filter, which in turn lights the fuel filter ice warning light (figure 1-9) on the left console. The light goes out when ice has been removed from the filter by the alcohol. The light operates on primary bus power.

NOTE The fuel filter ice warning light may flicker under certain engine operating conditions, such as rapid acceleration. Therefore, since alcohol supply will last for only 3 minutes of deicing operation, make sure light burns steadily before actuating deice switch.

- An accumulation of dirt or other foreign matter in the fuel filter sufficient to restrict the fuel flow can also cause lighting of the fuel filter ice warning light. The deicing system will not remove such restrictions, and ground servicing of the filter is required for cleaning.

COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT.

UHF COMMAND SET—AN/ARC-27.

The AN/ARC-27 radio equipment, powered by the primary bus, provides two-way voice communication in the frequency range of 225 to 399.9 megacycles between aircraft and ground stations or between aircraft. Selection of 18 preset frequencies may be made plus a guard frequency that can be operated alone or with the selected frequency. The radio set control, which is a remote-control panel, contains three control devices: a power switch, a preset channel selector, and an audio volume control. (See figure 4-4.)

NOTE Desired frequencies can be preset before flight on the control box in the left radio bay.

On airplanes* changed by T.O. 1F-86H-635, the set control panel (figure 4-4) permits selection of 20 preset frequencies and provides manual selection of operating frequencies without disturbing any of the preset frequencies. This panel contains four controls: a preset channel selector; manual frequency selector; power switch; and audio volume control. The preset channel selector permits selection of any of 20 preset channels plus a guard frequency (G) and a manual position (M). The manual position is used when it is desired to place the manual frequency selector in control. The position selected on the preset channel selector appears in a windowed plate just below the selector knob. The manual frequency selector consists of three concentric knobs (a 10-megacycle inner knob, a one-megacycle center knob, and a .1-megacycle outer knob) that provide facilities for manually adjusting to any one of 1750 channels in the frequency range of 225 to 339.9 megacycles. The center knob has a tab for ease of rotation. The channel selected appears in a windowed plate that covers a portion of the knobs.

NOTE The preset channel selector must be at M when using the manual frequency selector.

The volume control and power switch function in the same manner as on the unmodified airplanes.

Operation of AN/ARC-27 Command Radio.

To operate the command radio, proceed as follows:

1. Move power switch from OFF to T/R. Allow at least one minute for warm-up.

2. Move power switch to T/R + G REC (T/R + G). This allows monitoring of an added independent receiver preset to a frequency that is guarded continuously throughout scheduled periods.

3. Move preset channel selector to desired preset frequency. Reception and transmission will be on the selected frequency. (On the modified airplanes, if manual frequency selection is desired, place preset channel selector at M; then rotate manual frequency selector knobs as required.)

4. Adjust volume control for desired audio level.

NOTE The volume control should not be forced beyond its rotational travel, as intermittent or complete loss of command signal will result.

5. To transmit, press microphone button on throttle.

NOTE Transmissions should not be made on emergency (distress) frequency channels except for emergency purposes. For test, demonstration, or drill purposes, the radio equipment must be operated in a shielded room to prevent transmission of messages that could be construed as actual emergency messages.

6. To operate with separate guard receiver off, move power switch to T/R. For operation of both receivers, rotate power switch to T/R + G REC (T/R + G). To transmit on guard frequency, move power switch to T/R and preset channel selector to G.

7. To turn command radio off, move power switch OFF.

NOTE The ADF position is inoperative on this airplane.

RADIO-COMPASS—AN/ARN-6.

The AN/ARN-6 radio compass set is a visual and navigational aid used together with the radio compass indicator (28, figure 1-4), on the instrument panel. Four separate frequency bands are provided: band one, 100 to 200 kilocycles; band two, 200 to 410 kilocycles; band three, 410 to 850 kilocycles; band four, 850 to 1750 kilocycles. Controls on the radio compass control panel (12, figure 1-6; figure 4-4) permit selection of automatic or manual direction finding. A tuning meter, on the control panel, indicates signal strength and accuracy of tuning. Illumination for the frequency bands and the tuning meter is controlled by a light switch on the control panel. The switch has three maintained positions, HI, LO, and OFF. The radio compass loop is within the aft portion of the canopy, and the sense antenna is in the upper arc of the canopy. (See figure 4-5.)

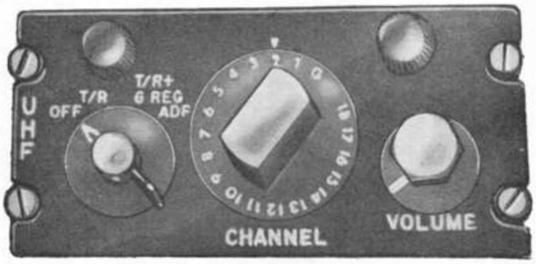
Operation of Radio Compass.

To operate the AN/ARN-6 radio compass, proceed as follows:

1. Turn function selector switch from OFF to ANT.
2. Rotate band switch to select desired frequency band.
3. Use tuning crank to tune station and obtain maximum swing of tuning meter needle.
4. Turn volume control to adjust headset volume.
5. With function switch on COMP and station tuned in, place "CW-VOICE" switch to CW and check that 900-cycle continuous tone is heard; then return switch to VOICE.
6. Set "VAR" knob on compass indicator to adjust index.

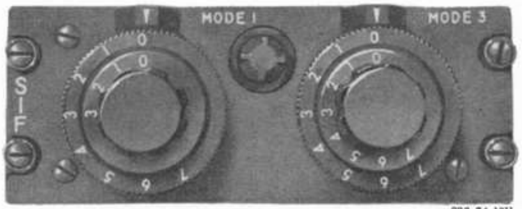
***F-86H-1 Airplane AF52-1979 and all later airplanes**

COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT



UHF COMMAND SET AN/ARC-27*

IDENTIFICATION RADAR AN/APX-6*



AN/APX-25*

223-74-13H

IDENTIFICATION RADAR AN/APX-6* OR AN/APX-6A*

FS-432

UHF COMMAND SET AN/ARC-27*

FS-431

TYPE			
UHF RECEIVER-TRANSMITTER AN/ARC-27	RADIO COMPASS AN/ARN-6	IFF AN/APX-6 AN/APX-6A	SIF AN/APX-25
FUNCTION			
TWO-WAY VOICE COMMUNICATION	RECEPTION OF VOICE AND CODE COMMUNICATION; POSITION FINDING; HOMING	AUTOMATIC IDENTIFICATION	SELECTIVE IDENTIFICATION
RANGE			
LINE OF SIGHT	20 TO 200 MILES, DEPENDING ON FREQUENCY USED AND TIME OF DAY	LINE OF SIGHT	LINE OF SIGHT
LOCATION			
LEFT CONSOLE	RIGHT CONSOLE	RIGHT CONSOLE	RIGHT CONSOLE

* Some airplanes (refer to applicable text).

RADIO COMPASS AN/ARN-6

F-86H-1-71-1B

Figure 4-4

ANTENNAS

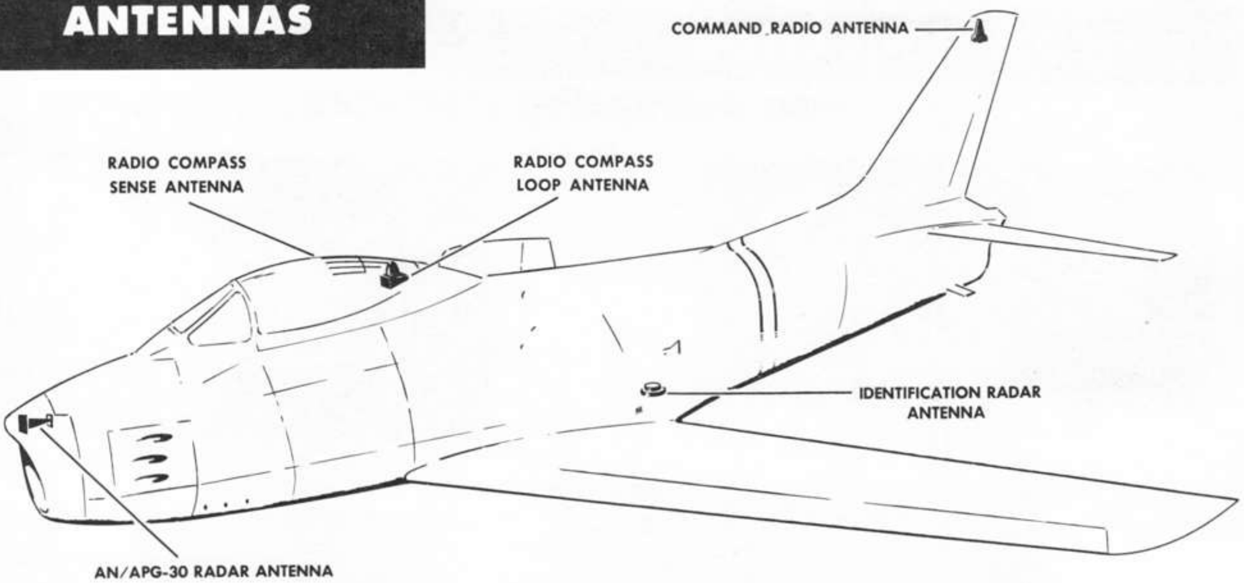


Figure 4-5

7. When function switch is at LOOP, use "LOOP L-R" switch to rotate loop as required to obtain aural-null orientation.

8. Return function selector switch to OFF.

IDENTIFICATION RADAR—AN/APX-6 (AIRPLANES NOT CHANGED BY T.O. 1F-86H-634).

The AN/APX-6 identification radar set (IFF) is used to automatically identify the airplane in which it is installed, whenever 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 and has means for transmitting a special distress code when challenged. Functionally, the AN/APX-6 receives challenges and transmits replies to the source of the challenges. These replies are displayed, together with the radar pip of the challenged airplane, on the radar indicators of the challenger. 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 IFF control panel (14, figure 1-6; figure 4-4), which is either a C-629/APX or a C-1158/APX IFF control panel. The C-1158/APX panel has an "I/P-MIC" switch in place of the destruct switch. Both of these switches are inoperative. The master switch, on either control panel, has five positions: EMERGENCY, NORM, LOW, STDBY, and OFF. There are two mode switches on each panel. On the C-629/APX panel, the upper mode switch has three positions: MODE 2, OUT, and I/P. The I/P position is inoperative. On the C-1158/APX panel, the upper mode switch has two positions: MODE 2 and OUT. The lower mode switch on either panel has two positions: MODE 3 and OUT. The set is powered by the single-phase ac bus.

Operation of Identification Radar—AN/APX-6.

The AN/APX-6 identification radar set is operated as follows:

Caution Before take-off, check with the crew chief that IFF frequency counters have been set to proper frequency channels.

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 (partial sensitivity) of the master switch should not be used, except upon proper authorization.

3. Set mode 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 off IFF set, rotate master switch to OFF.

IDENTIFICATION RADAR—AN/APX-6A (AIRPLANES CHANGED BY T.O. 1F-86H-634).

The AN/APX-6A identification radar set (IFF) is used to identify automatically the airplane in which it is installed whenever 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 (figure 4-4) on the right console. 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 lower mode switch has two positions, MODE 3 and OUT. The "I/P-MIC" switch has three positions, I/P, OUT, and MIC. An AN/APX-25 SIF (selective identification feature) is formed when a coder and an SIF control panel are connected to the AN/APX-6A system. Since the transponder is the main unit of both the IFF and SIF systems, the transponder must be adapted to the system in use. This is accomplished by a two-position switch in the transponder. The switch positions are NORM and MOD. The switch determines whether or not the coder and the SIF control panel are connected into the transponder. When the switch is at NORM, the system operates as an AN/APX-6A system. When the switch is at MOD, the system operates as an SIF system. Refer to "Identification Radar—AN/APX-25 (Airplanes Changed by T.O. 1F-86H-634)" in this section. The AN/APX-6A system is powered by the single-phase ac bus.

Operation of Identification Radar—AN/APX-6A.

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 OF OPERATION
All	OUT	1
Upper mode	MODE 2	1 and 2
Lower mode	OUT	
"I/P-MIC"	OUT	
Lower mode	MODE 3	1 and 3
Upper mode	OUT	
"I/P-MIC"	OUT	
Upper mode	MODE 2	1, 2, and 3
Lower mode	MODE 3	
"I/P-MIC"	OUT	

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 in two ways: 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 (command radio must be on). The I/P reply is the same as the mode 2 reply and is transmitted in response to each mode 2 interrogation. Perform the following steps for operation of the AN/APX-6A system.

Caution Before take-off, check with crew chief that the IFF frequency counters have been set to proper frequency channels and that the transponder switch is at NORM.

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 (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 set off, rotate master switch to OFF.

IDENTIFICATION RADAR—AN/APX-25 (AIRPLANES CHANGED BY T.O. 1F-86H-634).

The AN/APX-25 SIF (selective identification feature) is formed when a coder and a control panel, marked SIF, are added to the AN/APX-6A system. The SIF system has more comprehensive identification capability than does the IFF system. It is through an 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 (figure 4-4) is on the right console adjacent to the IFF control panel. The SIF control panel has two coder dials. These dials are used with the IFF control panel to provide control of the AN/APX-6A system. The dials, marked "MODE

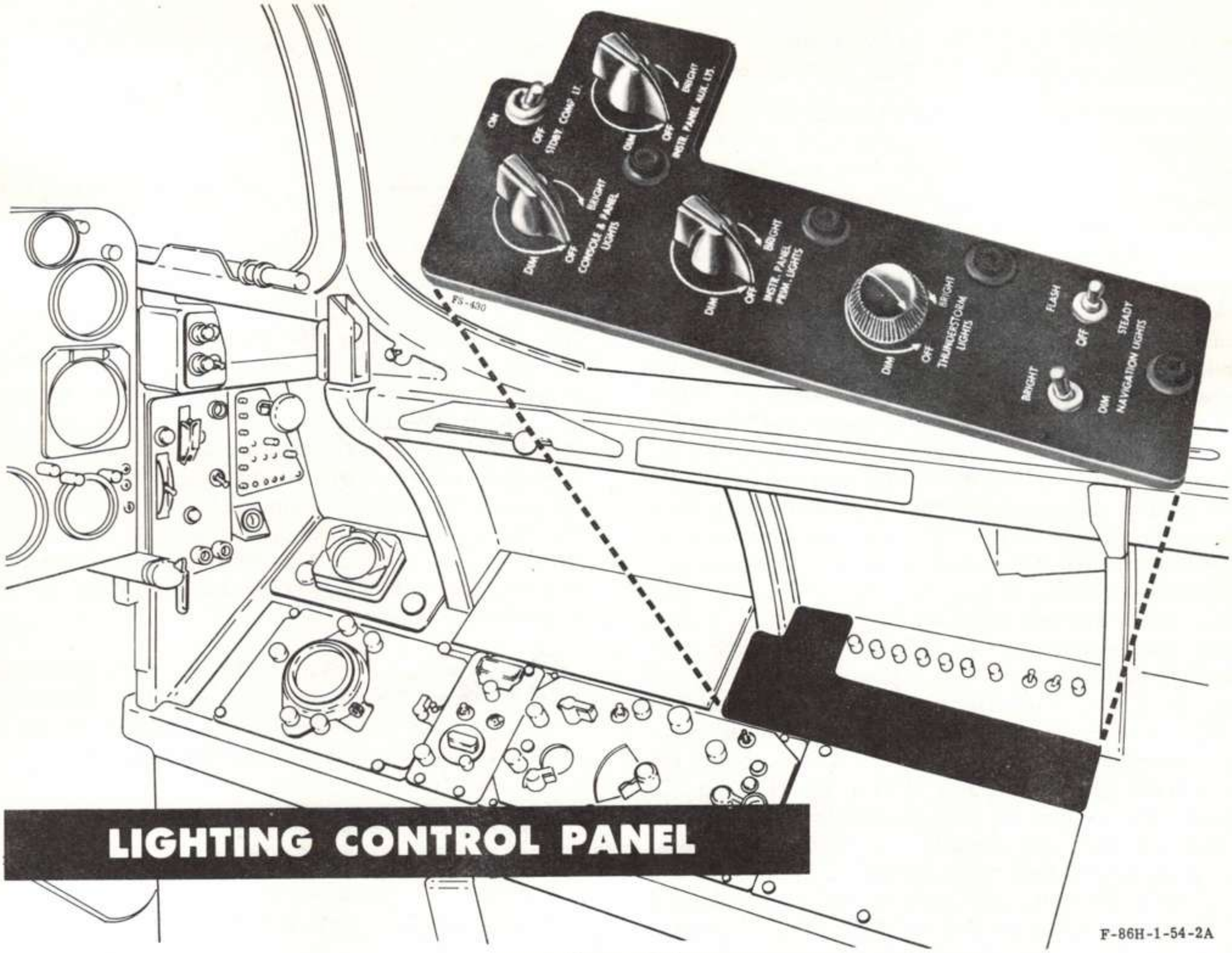


Figure 4-6

1" and "MODE 3," can be rotated to set in the reply code for the respective modes of operation that have been selected on the IFF control panel. The SIF system operates when the transponder switch is at MOD. The SIF system is powered by the single-phase ac bus.

Operation of Identification Radar—AN/APX-25. Perform the following steps for operation of the SIF system:

Caution Before take-off, check with crew chief that IFF frequency counters have been set to proper frequency channels and that the transponder switch has been placed 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. On IFF control panel, set upper mode switch at MODE 2 and lower mode switch and "I/P-MIC" switch at OUT, unless otherwise directed. (Refer to "Operation of Identification Radar—AN/APX-6A" in this section for switch settings in reply to the possible modes of interrogation.)
4. On SIF control panel, set coder dials as required.
5. To turn equipment off, rotate IFF master switch to OFF.

LIGHTING EQUIPMENT.

INTERIOR LIGHTING.

Interior lighting consists of red incandescent light units for the instruments and indicators, auxiliary red floodlighting for the consoles and instrument panel, and indirect console lighting (by means of plastic panel covers) for switch panels. The stand-by compass is lighted integrally. White thunderstorm lights provide a constant white light to protect vision against lightning flashes during any thunderstorm operation. A cockpit utility light (Type C-4A) is provided for map reading and general lighting. The control panel on the right console contains lighting controls for the console, instrument, thunderstorm, and navigation lights. All interior lighting rheostats can be adjusted to give desired light brilliancy. Spare lamps for console and instrument lights are stored on the right instrument subpanel.

Interior Lighting Controls.

Console and Panel Light Rheostat. Console and switch panel indirect lighting and the console floodlights are controlled by a rheostat, on the lighting control panel (5, figure 1-6; figure 4-6), and are powered from the primary bus. The rheostat has BRIGHT, DIM and OFF positions and may be adjusted for desired light brilliancy. The console light rheostat also controls power to the stand-by compass light.

Instrument Panel Primary Light Rheostat. The illumination and brilliancy of the instrument panel lights, and the lights at the landing gear position indicators and cabin pressure altimeter, which are powered from the primary bus, are controlled by a rheostat on the lighting control panel (6, figure 1-6; figure 4-6). The rheostat, when more than 30 degrees from OFF, also dims the landing gear unsafe warning light; however, varying degrees of illumination are not available for this light.

Instrument Panel Auxiliary Light Rheostat. The two instrument panel auxiliary floodlights, mounted on the canopy, are controlled by a rheostat on the lighting control panel (6, figure 1-6; figure 4-6), on the right console. The auxiliary lights operate from the primary bus.

Thunderstorm Light Rheostat. Two white lights (3, figure 1-5; 7, figure 1-6) are provided for use during thunderstorms and are controlled by a rheostat on the lighting control panel (6, figure 1-6; figure 4-6). The lights operate on secondary bus power.

NOTE To facilitate identification of the thunderstorm light control, the rheostat is equipped with a different style knob than the other lighting controls.

Stand-by Compass Light Switch. The compass light is controlled by an on-off switch on the lighting control panel (6, figure 1-6; figure 4-6). The console lights must be turned on for the compass light switch to be operative (primary bus).

Cockpit Utility Light Control. For general lighting, the cockpit utility light (11, figure 1-6) can be operated any time the primary bus is energized. The light control is an integral part of the unit.

EXTERIOR LIGHTING.

Exterior lighting consists of four navigation lights, two fuselage lights, and two landing and taxi lights. One navigation light is on each wing tip and two are on the empennage. Each fuselage light (one in the aft portion of the canopy, the other on the lower surface of the fuselage) contains one large lamp and a small lamp for dimming purposes. The landing and taxi lights are retractable and are mounted in the lower surface of the fuselage nose section. Both lights extend for use as landing lights until the weight of the airplane is on the nose gear; then the left landing light extends farther to provide taxi lighting, and the right landing light is turned out.

Exterior Lighting Controls.

Navigation Light Switches. The navigation and fuselage lights are controlled by two switches on the lighting control panel (6, figure 1-6; figure 4-6) on the right console. When the selector switch is at STEADY, the navigation and fuselage lights are lighted continuously by primary bus power. Moving the switch to FLASH causes the navigation lights to flash at 40 cycles per minute and the fuselage lights to remain steady. The dimmer switch, marked "DIM" and "BRIGHT," controls the intensity of the navigation and fuselage lights.

Landing and Taxi Light Switch. The retractable landing and taxi lights are controlled by a three-position switch (figure 1-19) on the left forward switch panel. When the switch is set at EXTEND & ON, both lights are extended to the landing position (about 58 degrees) and are lighted (primary bus). Upon touchdown, when the weight of the airplane is on the nose gear, the landing light goes out automatically; and the taxi light extends further to the taxi position (about 70 degrees) and remains on, thus providing a properly directed beam for taxiing. If a touch-and-go landing is made and the switch is left in the EXTEND & ON position, the landing light goes on again and the taxi light returns to the landing position as the weight of the airplane is removed from the nose gear. Both lights go out and retract when the switch is moved to RETRACT. Limit switches automatically cut off power to the light actuation motors when the lights reach the fully retracted or extended position. Returning the switch to the OFF position during extension or retraction stops the lights at any desired position.

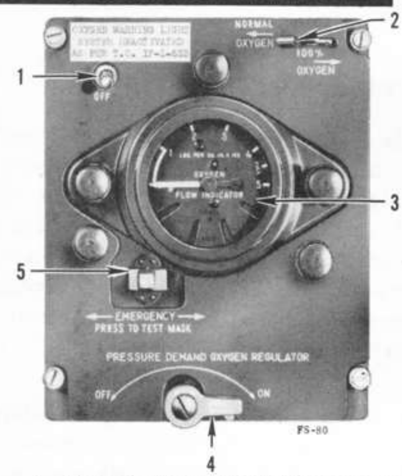
Caution To prevent damage to the lights, do not extend landing lights above landing light extension speed.

OXYGEN DURATION—HOURS

COCKPIT ALTITUDE —FEET—	GAGE PRESSURE—PSI 400	350	300	250	200	150	100	BELOW 100
50,000	7.1 / 7.1	6.1 / 6.1	5.1 / 5.1	4.0 / 4.0	3.0 / 3.0	2.0 / 2.0	1.0 / 1.0	EMERGENCY DESCEND TO ALTITUDE NOT REQUIRING OXYGEN
45,000	7.1 / 7.1	6.1 / 6.1	5.1 / 5.1	4.0 / 4.0	3.0 / 3.0	2.0 / 2.0	1.0 / 1.0	
40,000	7.1 / 7.1	6.1 / 6.1	5.1 / 5.1	4.0 / 4.0	3.0 / 3.0	2.0 / 2.0	1.0 / 1.0	
35,000	7.1 / 7.1	6.1 / 6.1	5.1 / 5.1	4.0 / 4.0	3.0 / 3.0	2.0 / 2.0	1.0 / 1.0	
30,000	5.3 / 5.1	4.5 / 4.4	3.8 / 3.6	3.0 / 2.9	2.3 / 2.2	1.5 / 1.5	0.75 / 0.75	
25,000	5.0 / 3.9	4.3 / 3.4	3.5 / 2.8	2.8 / 2.3	2.1 / 1.7	1.4 / 1.1	0.7 / 0.6	
20,000	5.6 / 3.0	4.8 / 2.6	4.0 / 2.2	3.2 / 1.7	2.4 / 1.3	1.6 / 0.9	0.8 / 0.4	
15,000	6.8 / 2.4	5.8 / 2.1	4.9 / 1.7	3.9 / 1.4	2.9 / 1.0	1.9 / 0.7	1.0 / 0.3	
10,000	9.0 / 1.9	7.7 / 1.7	6.5 / 1.4	5.2 / 1.1	3.9 / 0.8	2.6 / 0.5	1.3 / 0.25	

Black figures indicate diluter lever at NORMAL OXYGEN.
White figures indicate diluter lever at 100% OXYGEN.
Cylinders: Five Type D-2

D-2 OXYGEN REGULATOR PANEL



1. WARNING SYSTEM SWITCH (INOPERATIVE)
2. DILUTER LEVER
3. PRESSURE GAGE AND FLOW INDICATOR
4. SUPPLY LEVER
5. EMERGENCY TOGGLE LEVER

F-86H-1-73-5C

Figure 4-7

OXYGEN SYSTEM.

The gaseous oxygen system is supplied from five Type D-2 cylinders installed in the nose section, outboard of the intake duct. There are three on the right side and two on the left. Included in the system is a Type D-2 diluter-demand regulator, a pressure gage, and a flow indicator. For safety, check valves are incorporated in the oxygen supply system in case of system failure or cylinder rupture. If a cylinder is punctured, it is isolated by check valves, and the pressure gage indication remains the same, although the available oxygen supply is reduced. The oxygen system is serviced by means of a single-point refilling valve, within the access door on the left side of the nose section. Normal minimum system pressure for take-off is 400 psi. An oxygen duration table is shown in figure 4-7. See figure 1-30 for oxygen specification.

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, the oxygen gage pressure is reduced, sometimes rather rapidly. With a 100°F decrease in temperature in the cylinders, the gage pressure can be expected to drop 20 percent. This rapid fall in pressure sometimes causes 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, leakage or loss of oxygen must be suspected.

OXYGEN REGULATOR.

The Type D-2 continuous pressure-breathing, diluter-demand oxygen regulator (15, figure 1-6; figure 4-7) is on the right console. The regulator mixes air with oxygen in varying amounts, according to the altitude, and delivers a quantity of the mixture each time the user inhales. At high altitudes, the regulator supplies positive pressure-breathing. The delivery pressure automatically changes with altitude. A pressure relief valve is provided on the outside of the regulator to relieve excess mask pressure.

Warning Use only a pressure-demand oxygen mask with the D-2 oxygen regulator.

Oxygen Regulator Controls.

Supply Lever. The supply lever (4, figure 4-7), on the regulator, is safetied in the ON position at all times.

Diluter Lever. A diluter lever (2, figure 4-7) is provided in the top right corner of the regulator for selecting either NORMAL OXYGEN for normal use or 100% OXYGEN for emergency conditions.

Emergency Toggle Lever. The emergency toggle lever (5, figure 4-7), located directly below the flow indicator, should be in the center position at all times, unless an unscheduled pressure increase is required. Moving the toggle lever left or right from the center position provides continuous positive pressure to the oxygen mask for emergency use. When the toggle lever is depressed at the center position, it provides positive pressure to test the mask for leaks.

Caution When positive pressures are required, it is mandatory that the oxygen mask be well fitted to the face. Unless special precautions are taken to ensure no leakage, continued use of positive pressure under these conditions results in rapid depletion of the oxygen supply.

Warning System Switch. The warning system switch (1, figure 4-7), on the regulator, should be at OFF at all times. The warning light is removed and a placard is installed above the switch to indicate that the oxygen warning light system is inoperative.

Oxygen Regulator Indicators.

Pressure Gage and Flow Indicator. The pressure gage and flow indicator (3, figure 4-7), on the regulator, combines the oxygen pressure gage and the flow indicator in a single instrument. The pressure gage shows oxygen system pressure. The flow indicator consists of four small slots arranged symmetrically around the lower half of the gage dial face. These slots show black and white alternately with each breath.

OXYGEN SYSTEM PREFLIGHT CHECK.

1. Check mask unit properly connected (figure 4-8) and note oxygen pressure gage indication (400 psi minimum).

2. Check oxygen regulator with diluter valve first at NORMAL OXYGEN position and then at 100% OXYGEN position as follows: Remove mask and blow gently into

Figure 4-8

end of oxygen regulator hose as during normal exhalation. There should be resistance to blowing. Little or no resistance to blowing indicates a leak or faulty operation.

3. With regulator supply valve ON, oxygen mask connected to regulator, and diluter lever in 100% OXYGEN position, breathe normally into mask.

4. Observe blinker for proper operation.

5. Depress emergency toggle lever. A positive pressure should be supplied to mask. Hold breath to determine if there is leakage around mask.

6. Return emergency toggle lever to center position. Positive pressure should cease.

7. Return diluter lever to NORMAL OXYGEN.

NORMAL OPERATION OF OXYGEN REGULATOR.

1. Before each flight, be sure oxygen pressure gage reads at least 400 psi. If pressure is below this minimum, have oxygen system charged to capacity before take-off.

2. Oxygen supply lever safetied ON.

3. Diluter lever at NORMAL OXYGEN.

NOTE Above 30,000 feet, there may sometimes be a vibration or wheezing sound in the mask. This noise is a normal characteristic of regulator operation and can be overlooked.

EMERGENCY OPERATION OF OXYGEN REGULATOR.

If symptoms of anoxia develop, or if smoke or fumes enter cockpit, proceed as follows:

1. Move diluter lever to 100% OXYGEN.

2. Move emergency toggle lever left or right.

3. If oxygen regulator becomes inoperative, pull ball handle on H-2 emergency oxygen bail-out bottle and descend to a cockpit altitude below 10,000 feet as soon as possible.

NAVIGATION EQUIPMENT.

STAND-BY COMPASS.

Refer to "Instruments" in Section I.

RADIO COMPASS.

Refer to "Communication and Associated Electronic Equipment" in this section.

DIRECTIONAL INDICATOR (SLAVED).

The directional indicator (slaved), on the instrument panel (9, figure 1-4), indicates magnetic headings without oscillation, swinging, or northerly turning error. The directional indicator automatically indicates the magnetic heading of the airplane by means of a transmitter in the left wing, just inboard of the tip. This transmitter "senses" the south-north flow of the earth's magnetic flux. Electrical power for the directional indicator is provided when dc power from the primary bus and 400-cycle, three-phase ac power is available. The gyro is energized when the battery-starter switch is moved to BATTERY and is on a fast-slaving cycle for the first 3 to 4 minutes of operation, during which it should align with the magnetic heading. The gyro then begins a slow-slaving cycle. A switch allows pilot selection of the fast-slaving cycle, to permit faster magnetic heading recovery.

NOTE After the gyro reaches operating speed, the indicator should be checked against the stand-by compass indication to make sure that the indicator does not show a 180-degree ambiguity. The directional indicator is not operating properly if such ambiguity exists.

A knob at the lower left of the indicator permits the indicator course index to be rotated to a preselected heading. Indicator readings will be incorrect if the airplane exceeds 85 degrees of climb or dive, or banks left or right more than 85 degrees. The error in heading indication when the airplane is in an extreme bank or roll movement is an inherent characteristic of the gyro; however, it disappears when the airplane returns to straight-and-level flight. An additional error, however, will build up in the indication during turns. This is caused by centrifugal force which tends to swing the transmitter flux valve into the vertical component of the earth's magnetic field. The amount of error is proportional to time and duration of the turn. Therefore, errors will result in the indicator during turns, banks, or rolls. The fast-slaving switch may be actuated after the maneuvers are completed so as to correct the heading indication at the fastest possible rate.

Fast Slaving Button.

The fast-slaving cycle of the directional indicator can be selected by means of primary bus power through a push-button type switch (4, figure 1-4), on the instrument panel. Depressing the button momentarily de-energizes the slow-slaving cycle. Releasing the button engages the fast-slaving cycle to permit faster gyro recovery to the magnetic heading. The fast-slaving cycle is engaged for 2 or 3 minutes, after which it returns to slow slave.

Caution Excessive use of the fast-slaving button can damage the slaving torque motor. At least 10 minutes should elapse between each successive use of the fast-slaving button.

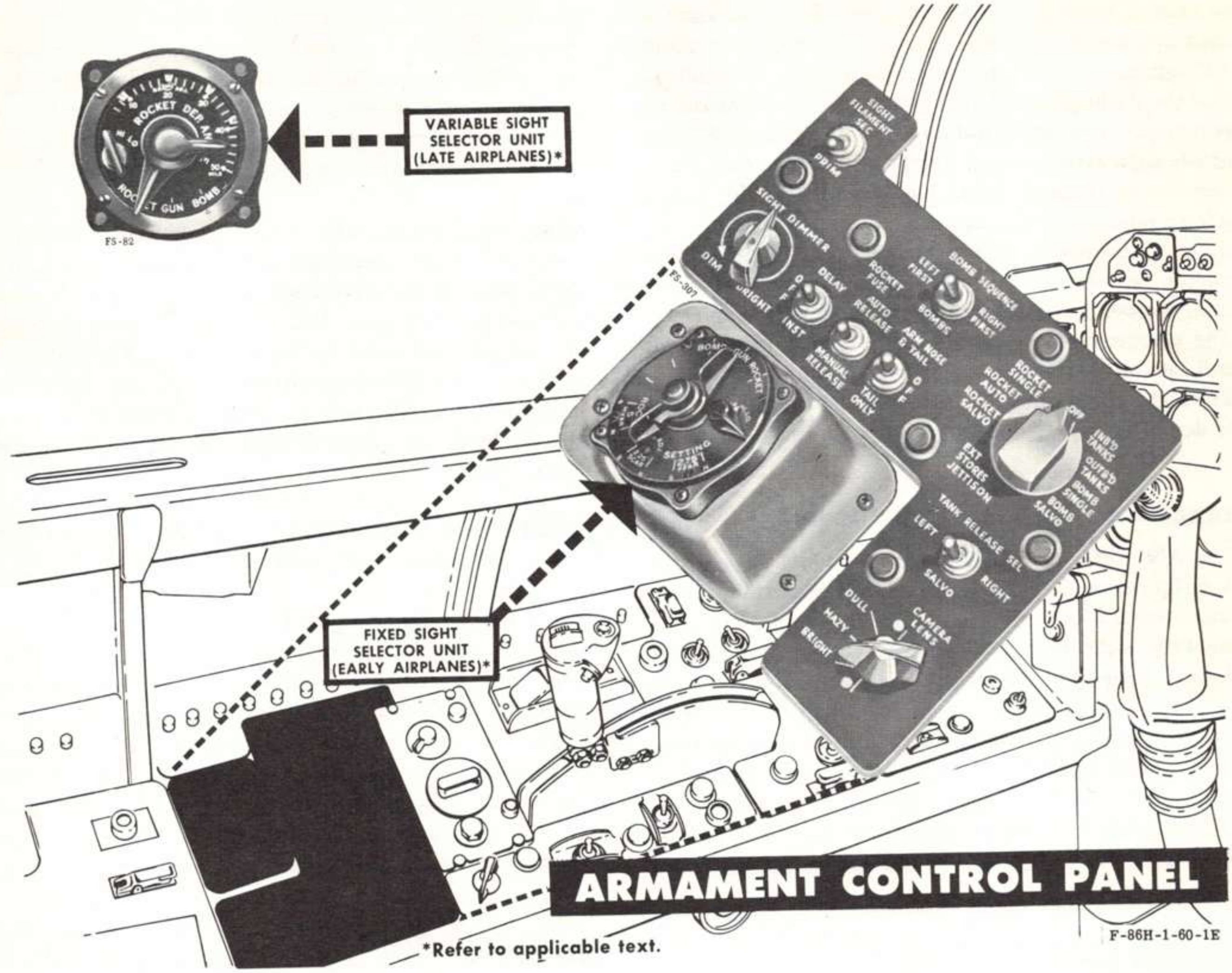


Figure 4-9

ARMAMENT EQUIPMENT.

The basic armament installation on early airplanes* consists of six Type M-3 .50-caliber machine guns, mounted in the forward fuselage. On most airplanes,† four Type M-39 20 mm guns are installed in place of the .50-caliber guns. The external armament may consist of demolition or napalm bombs and rockets. The armament equipment includes an A-4 gun-bomb-rocket sight to enable the pilot to accurately utilize the available firepower. A Type P-2 strike camera is installed to record the effect of rocket fire and bombing on ground targets, and a Type N9 or N6 camera is installed on the sight to record the sight reticle and target during gunfire, rocket fire, or bombing.

A-4 GUN-BOMB-ROCKET SIGHT.

The Type A-4 gyro computing sight automatically computes leads for gunnery, rocketry, or bombing. The sight computation is entirely automatic, requiring only that the pilot keep the reticle center dot on the target and track the target smoothly. The sight reticle image has a center dot and an outer circle composed of a number of diamond-shaped dots. The reticle image is projected on a reflector glass aft of the windshield and compensates for the required lead for gun and rocket firing. A dual-filament bulb provides lighting for the reticle image projection. Range data for gunnery is supplied either by the AN/APG-30 radar or by a manual range control. The sighting system is calibrated to automatically compute leads for ranges between 600 and 6000 feet. On overland targets (6000 feet or less above the terrain), radar ranging is usually erratic because of ground return effects. Under such conditions, radar ranging distances may be reduced by use of the radar range sweep rheostat,

***F-86H-1 Airplanes**
†F-86H-5 and later airplanes

or manual ranging may be employed. When the sight is used as a bombsight, the line of sight is depressed about 10 degrees. This requires the approach to be made so that the flight path becomes tangent to the proper bomb release point, which is indicated by automatic extinction of the sight reticle image. Bombs of less than 500-pound size can be released either automatically, at the proper release point by an accelerometer mechanism within the sight, or manually. Bombs larger than 500-pound size cannot be released by the use of the sight. In either case, the bomb-rocket release button must be depressed. The electrical power for the sight system (300-volt dc and 28-volt dc) is controlled by the gun safety switch. The sight can be operated as a fixed-reticle sight as long as dc power is available and the sight is manually caged.

RADAR—AN/APG-30.

The AN/APG-30 radar set provides range data to the A-4 sight computer. The radar system affords automatic search within its cone of coverage and range, and automatically locks onto, and computes range of, the target. An indicator light on the A-4 sight indicates when the radar has locked onto a target. A manual range control supplements the radar set and should be used for overland targets when operating at less than 6000 feet, as radar ranging below that altitude is usually erratic because of ground return effects. A horn-type antenna is installed in the upper leading edge of the engine air inlet scoop fairing.

A-4 Sight Controls.

Gun Safety Switch. Refer to "Gunnery Equipment Controls."

Sight Dimmer Rheostat. The sight dimmer rheostat, on the armament control panel (figure 4-9), adjusts the lighting intensity of the reticle image. When the sight is not in use, it is recommended that the rheostat be turned counterclockwise to DIM to increase the life of the reticle bulb. Turning the rheostat clockwise toward BRIGHT increases reticle brilliance.

Sight Filament Switch. Selection of either the primary or secondary filament in the dual-filament bulb is done by means of the sight filament switch, on the armament control panel (figure 4-9), on the left console. The switch is normally set at PRIM and may be moved to SEC if the primary filament in the bulb fails.

Sight Electrical Caging Button. An electrical caging button is provided on the throttle grip. Depressing the caging button stabilizes the gyro reticle image by caging the two gyros in the computer. When the button is released, the gyros are uncaged and operable. The sight should be caged before an attack, to stabilize the sight reticle image. The image must be stabilized to limit gyro movement to the sight as a result of maneuvering an initial approach to the target.

Wing Span Lever. The wing span lever and scale are mounted on the sight head. Graduated markings (from 30 to 120) on the scale represent the wing span, in feet, of the target airplane. The wing span lever is used for manual ranging and should be moved until it is aligned with the applicable span marking on the scale. Actuation of the lever inserts target size data into the sight, varying the reticle image circle diameter in proportion to the target size.

NOTE It is necessary to swing the camera away from the sight to adjust the wing span lever.

Sight Mechanical Caging Lever. Sight caging is done mechanically by a caging lever on the sight head. The lever is set at UNCAGE for normal automatic operation of the sight. If desired for use during ground attacks, or in case the sight fails, the lever should be moved to CAGE to provide a fixed-reticle image circle. The size of the fixed reticle depends on the setting of the wing span lever. (When the lever is set at 60 feet, a 100-mil fixed reticle is produced during mechanical caging.)

Caution The sight should be mechanically caged during taxiing, take-off, and landing, to prevent damage to the sight.

Sight Selector Unit. The airplane may be equipped with either a fixed sight selector unit (18, figure 1-5; figure 4-9) or a variable sight selector unit (figure 4-9), on the left console. The fixed sight selector unit (figure 4-9), on the center pedestal, incorporates three independent sight controls—the rocket setting lever, the sight function selector lever, and the target speed switch. The rocket setting lever is used to provide a depression angle correction for the type of rocket to be fired and the intended dive angle of the attack. On this airplane, only the 5″ HVAR setting is used. At each of the three positions, there are two detents, marked "S" and "N," for setting the intended dive angle into the sight system. For attack angles between 0 and 40 degrees, the control should be set on N (normal); for attack angles between 40 and 60 degrees, the control should be set at S (steep). The sight function selector lever, on the upper arc of the fixed unit, is set at either BOMB, GUN, or ROCKET to adjust the sight system for the desired operation. When the selector lever is moved to BOMB, the sight reticle image is depressed to approximate the bomb trajectory.

Warning To avoid damage to airplane, do not use automatic function of A-4 sight for bombing operations involving bombs of 500-pound size or heavier, as these bombs tend to strike portions of airplane under this or any negative-G release condition.

Moving the selector lever to ROCKET permits subsequent operation of the rocket setting lever to adjust the sight reticle image for the type of rocket to be fired. The selector lever automatically returns to the GUN position if it is set at either the BOMB or the ROCKET position when the radar target selector button on the stick grip is depressed. The target speed switch, on the right side of the selector unit, is used during gunnery missions to control lead angle data in accordance with speed ratio between the attacking airplane and its target. When the speed of the attacking airplane is greater than that of the target, the target speed switch is set at LO. The switch is moved to HI. when the speeds of the attacking airplane and the target are about the same. The TR. position is used when firing on a drogue or other training targets at low speeds. On the variable sight selector unit, the sight function selector lever (on the lower arc of the unit) and the target speed switch (on the left side of the unit) have the same function as on the fixed sight selector unit. The variable sight selector unit also incorporates a rocket depression angle selector, on the upper arc of the unit, with a scale calibrated in mils for sight reticle image depression. There are no specific rocket settings. Movement of the rocket depression angle selector lever depresses the sight reticle image in increasing amounts through the full range of the mil scale according to the position chosen. The nominal rocket depression angle selector lever setting for the 5-inch HVAR at a normal dive angle (0 to 40 degrees) is 17 mils. The pilot should determine, through test-firing runs, the settings for various dive angles most suitable to his own technique. The data thus obtained should be set on the mil scale with variable index markers so provided. The index markers, numbered from 1 through 4, are for reference only and have no function in the sight system. When pulled out, a pull tab near the 50-mil mark on the periphery of the selector unit face unlocks the index markers for adjustment.

Manual Ranging Control. A twist grip in the throttle allows manual ranging during gunnery operations when radar ranging becomes inoperative or is erratic because of ground effects (at altitudes below 6000 feet on overland targets). The manual range control covers a span of 1500 feet, from about 1200 feet to 2700 feet, as indicated on the sight range dial. The grip should be turned to keep the target spanned by the reticle circle. Clockwise movement of the twist grip reduces the range (increases reticle diameter); counterclockwise movement increases the range (decreases reticle diameter). The control is spring-loaded to the full counterclockwise position, where it must be for normal operation of radar ranging.

Radar Target Selector Button. After detecting a target, the radar locks on it and measures the range. To override the range lock-on and shift the radar to another target, it is necessary to actuate the radar target selector button (figure 1-17) on the control stick grip. To reject the target, the button should be depressed momentarily. The radar can then lock on targets at ranges greater than the one rejected until the maximum sweep range of the radar is reached. It then automatically recycles, commencing to sweep for minimum range. Depressing the selector button also automatically moves the sight function selector lever to GUN if the lever had been set at either the BOMB or the ROCKET position.

Radar Range Sweep Rheostat. The radar range sweep rheostat (15, figure 1-5), on the left console, controls reduction of radar ranging distances. The rheostat is used to keep the radar from locking on the ground or ground objects when the airplane is at low altitude. Turning the rheostat toward MIN decreases range, toward MAX increases range. During normal operation, the control should be at MAX.

Bomb-target Wind Control. The bomb-target wind control (24, figure 1-4), on the instrument panel, adjusts the sight system for dive-bombing operations and is operative when the sight function selector lever is at BOMB. Turning the control knob clockwise from the ROCKET GUN position depresses the sight reticle image to determine the proper approach on the target. If, during the attack, the path of the airplane is parallel to the wind or to the direction of a moving target, the bomb-target wind control is used to compensate the sight system accordingly. For attacking stationary targets, corrections for wind speed are made on either the UPWIND or DOWNWIND portion of the scale to correspond with known or estimated wind velocity. (The UPWIND scale is used for attacks made into a head wind, DOWNWIND, for attacks made with a tail wind.) If the wind direction is not parallel to the course of the attacking airplane, the amount of wind correction adjustment must be estimated. This correction approaches zero as the wind direction becomes 90 degrees to the airplane course. During attack on moving targets, added corrections must be made in consideration of target velocity. For approaching targets, the correction is DOWNWIND; for receding targets, the correction is UPWIND. No sight system correction is necessary when the target is moving at right angles to the path of attack; however, proper lead angle must be maintained. The ROCKET GUN position of the control is inoperative.

A-4 Sight Indicators.

Sight Range Dial. Target range in hundreds of feet is indicated by the range dial visible through a window on the sight head. The dial is graduated in 100-foot intervals covering a range from 600 to 6000 feet and presents range distances as determined by either the manual range control or the radar ranging system.

Radar Target Indicator Light. The radar target indicator light, on the sight head, comes on when the radar ranging equipment locks onto the target during tracking.

GUNNERY EQUIPMENT.

On early airplanes,* six Type M-3 .50-caliber machine guns are mounted in a vertical bank of three on each side of the fuselage, outboard of the cockpit. The removable ammunition containers are located below each gun compartment. The normal ammunition load of gun is 300 rounds. Electric gun heaters are installed on each gun and may be operated by the pilot. The gun blast panels are connected to blast tubes which seal around the gun barrels. Plugs are provided at the forward end of the blast tubes to prevent dust and moisture from entering the gun barrels. The plugs should be removed before ground firing and on the ground before air firing missions. The guns must be manually charged on the ground before take-off, as there are no provisions for gun charging during flight. On most airplanes,† four Type M-39 20 mm guns are installed in place of the .50-caliber guns. Each gun is supplied with 150 rounds of ammunition, which is electrically fired at the rate of about 1500 rounds per minute. The 20 mm guns are fired by ac, although the control circuits are primary bus dc. Therefore, if the red instrument ac power-off light illuminates, the guns will not fire. There are no gun heaters or gun-charging provisions for the 20 mm guns. The gun blast panels are connected to blast tubes, which seal around the gun barrels. Plugs are provided at the forward end of the blast tubes to keep dust and moisture from entering the gun barrels. The plugs must be removed before ground firing and on the ground before air firing missions. Expended ammunition links are retained in a compartment below the guns. Expended cases are ejected overboard with enough velocity to clear the airplane through tubes having outlets in the fuselage bottom. The guns, ammunition, and expended link compartments have a purging system for removing explosive gases created during gun firing. The purging system utilizes air extracted from the engine air intake duct. Doors that control the purging air open automatically during gun firing. On some airplanes with 20 mm guns, either the two upper guns only or all guns may be selected for firing. Certain airspeed limitations have been imposed for firing the guns, until flight test data has been evaluated. (Refer to "Airspeed Limitations" in Section V.)

Caution When the guns are fired on the ground, the gun compartment doors must be removed and the purge doors opened manually to allow gun-firing gases to escape.

Gunnery Equipment Controls.

Gun Safety Switch. Electric power for operation of the gun camera, sight, radar ranging, and guns is controlled by a guarded safety switch (34, figure 1-4), on the instrument panel. When the switch is at SIGHT CAMERA & RADAR, secondary bus power is supplied to the sight and radar equipment, and when the trigger is pressed, power is available to permit gun camera operation. Placing the switch at GUNS energizes the sight and radar and provides power to actuate the camera when the trigger is pressed. When the switch is at the guarded OFF position, power is disconnected.

Trigger. Primary bus power actuates the gun-firing and gun camera circuits when the trigger (figure 1-17), on the control stick, is depressed. The trigger has two depression positions. With the gun safety switch at GUNS, the first trigger position starts the gun camera and ammunition boost motors.* The second, or fully depressed position, fires the guns. The guns fire automatically as long as the trigger is depressed and no jam occurs. With the gun safety switch at SIGHT CAMERA & RADAR, only the gun camera is operative at either trigger position. When 20 mm guns are installed, the first depression of the trigger starts the sight camera and energizes the purge door selector valve so that utility hydraulic system pressure opens the purge door for gun, ammunition, and expended link compartment purging.

NOTE If the purge doors fail to open, thereby prohibiting the flow of air to the compartments requiring ventilation, a door position switch prevents the gun-firing circuit from being energized.

As the second trigger depression is released, the guns stop firing; however, a time-delay relay in the purging system circuit keeps the purging system operating for 5 seconds after the trigger is released.

Gun Selector Switch. Airplanes with 20 mm guns have a gun selector switch (35, figure 1-4), on the instrument

***F-86H-1 Airplanes**
†F-86H-5 and later airplanes

panel, which permits selective firing of either upper guns only or all guns. With the switch at UPPER, the gunfire control circuit for the left and right lower guns is opened, preventing operation of these guns. With the switch at ALL, the gunfire control circuits to the lower guns are completed, allowing these guns to be operative. The upper guns can be fired with the switch in either position.

Gun Heater Switch (.50-caliber Guns). Type J-4 electric gun heaters, one attached to each .50-caliber gun, are controlled by secondary bus power through the gun heater switch (figure 1-19), on the left forward switch panel. When the switch is moved from OFF to GUN HEATER, the heaters are operative.

Ground Fire Safety Switch (20 mm Guns). A safety relay connected to the extend side of the landing gear handle opens the 20 mm gun-firing circuit to prevent accidental firing of the guns on the ground. This safety relay can be overriden to fire the guns for bore-sighting purposes by the ground fire safety switch (figure 4-9; 19, figure 1-5), on the armament control panel or outboard of the rocket projector release. The switch is guarded in the SAFE position. The switch must be held in the momentary READY position to override the landing gear position control safety relay.

Warning The safety relay circuit is protected by the landing gear control circuit breaker. Therefore, do not pull the landing gear control circuit breaker out, especially when on the ground; otherwise, the safety relay circuit will not be energized and accidental firing of the guns will be possible.

Firing Guns.

Warning If the .50-caliber guns are fired in continuous bursts of about 7 seconds or more, "cook-off" may occur. Short successive firing bursts with short cooling periods between bursts also may cause "cook-off" when firing time of the short bursts totals about 7 seconds. When air firing, except in combat, a cooling period should follow each burst, to prevent "cook-off." A cooling period equal to 4 minutes per 3-second continuous burst will preclude the possibility of "cook-off." A "cook-off" in .50-caliber guns will not damage the guns or the airplane, since the "cook-off" round is chambered in the barrel.

NOTE "Cook-off" will not occur during air firing of 20 mm guns, because of the limited amount of ammunition carried in the airplane.

Radar Ranging. To fire guns using the A-4 sight and radar ranging, proceed as follows:

NOTE When firing at stationary ground targets, or in case of failure of the automatic function of the sight, move mechanical caging lever to CAGE and use sight as conventional 100-mil, fixed-reticle sight.

1. Check that radar inverter light is not on.
2. Place gun safety switch at SIGHT CAMERA & RADAR to allow a 5- to 15-minute warm-up period (depending on outside air temperature) for sight and radar. Check sight mechanical caging lever at CAGE.
3. Place gun selector switch (airplanes so equipped) at UPPER to fire only the upper guns or at ALL to fire all guns, as required.
4. Sight filament switch at PRIM. If primary filaments are inoperative, move switch to SEC.
5. Sight dimmer rheostat adjusted to desired image brilliance.
6. Move sight mechanical caging lever to UNCAGE.
7. Gun heater switch to GUN HEATER if outside air temperature is below 1.7°C (35°F) on .50-caliber guns only.
8. Make sure throttle twist grip is at full counterclockwise position (radar ranging engaged).
9. Sight selector unit: sight function selector lever at GUN; target speed switch at TR., HI., or LO., depending on rate of closure.
10. Gun safety switch to GUNS.
11. Set sight wing span lever to wing span of target airplane so that manual ranging can be set up in a minimum of time, should the radar ranging fail.
12. Radar range sweep rheostat to MAX.
13. Depress sight electrical caging button to stabilize reticle image, and begin tracking, estimating correct lead.
14. After radar target indicator light is on, release sight electrical caging button. (As caging button is released, the reticle will drift down and then back to the correct lead angle.)

NOTE If more than one target is within range along airplane flight path, make sure radar is tracking desired target. As range is decreased, reticle should grow larger to span target continuously. Check range dial against estimated range of target. If radar has locked on undesired target, reject it by depressing radar target selector button on stick grip.

15. Continue tracking target smoothly, without slipping or skidding, for about one second after releasing caging button; then fire.

Manual Ranging. To accomplish gunnery if radar ranging fails (as indicated by the radar target indicator light going out or by improper range indications), or if at any other time it is necessary or desirable to employ manual ranging, proceed as follows:

1. Check wing span lever for correct target span setting.
2. Move throttle grip clockwise to engage manual ranging. Continue to move grip until reticle image circle is reduced to minimum diameter.
3. Depress sight electrical caging button to stabilize reticle image and frame target within reticle circle.
4. Move throttle grip so that reticle circle continually frames target, and begin tracking.
5. On approaching target range, release sight electrical caging button.
6. After releasing caging button, continue tracking target smoothly for about one second; then fire.

CAMERAS.

Gun Sight Camera.

A Type N9 or AN-N6 gun sight aiming point camera (3, figure 1-4) is mounted on the A-4 sight to record the sight reticle and target during gun firing, rocket firing, or bombing. The camera type is designated on the name plate, on the face of the N9 and on the left side of the AN-N6. To operate the gun camera exclusive of the guns, the gun safety switch must be positioned to SIGHT CAMERA & RADAR and the trigger depressed. With the gun safety switch at GUNS, depressing the trigger to the first position starts the camera, which will continue to operate as long as the trigger is depressed, with an overrun which may be adjusted from 0 to 3 seconds on N9 cameras and 0 to 5 seconds on N6 cameras. For bombing or rocket fire, the gun camera is not started until the bomb-rocket release button is depressed to fire the rockets or release the bombs. For the camera to record during the entire rocket-firing or bombing run, the gun trigger must be held depressed, with the gun safety switch at SIGHT CAMERA & RADAR. (Refer to "Trigger.")

Strike Camera.

To record the impact of bombs and rockets against ground targets, a Type P-2 srike camera with a 15-foot (50-foot*) magazine is installed in the lower fuselage, directly aft (or forward*) of the ammunition compartments. When bombs are released or rockets are fired, the camera automatically takes a rapid sequence of exposures. Sliding doors protect the camera window. They open by mechanical linkage when the nose landing gear is retracted, or by an electrical actuator* not connected to the landing gear. Defrosting of the strike camera window is automatically controlled by the canopy defrost lever. However, if windshield deicing is being used, the camera defrost outlet is closed.

Strike Camera Timer. A camera timer (21, figure 1-5) starts and stops the P-2 strike camera. It is on the left console, just aft of the rocket projector release. The timer has two intervals, which are adjustable. The camera also can be mechanically adjusted on the ground for a fixed overrun of 0 to 3 seconds after the timer ceases operation. The first timer interval represents the time in seconds from release of the bombs or rockets to the start of camera operation. This is set before the start of the run with the large timer knob marked "PILOT ADJ." The second timer interval is the camera running time in seconds for a given pass not including the 3-second overrun, and must be set by the ground crew with the small timer knob marked "PRESET." The following tables give interval settings for the total number of passes to be made and various dive angles and release altitudes. (The conditions chosen are representative of typical combat conditions and requirements.)

Warning

Use these tables only for conditions known to be safe. For example, bomb release at 2000 feet above the target from a 30-degree dive at 650 knots IAS would require more than 2000 feet altitude for recovery using a 6 G pull-up.

***F-86H-5 and later airplanes.**

AIRPLANES WITH 50-FOOT MAGAZINE
Based on release speeds ranging from 350 to 650 knots TAS

NUMBER OF PASSES	"PRESET" RUNNING TIME PER PASS (SECONDS)	DIVE ANGLE (DEGREES)	RELEASE ALTITUDE ABOVE TARGET (FEET)	"PILOT ADJ." CAMERA DELAY AFTER RELEASE (SECONDS)	
				BOMBS	ROCKETS
1	30 (Max)	Any	Under 20,000	0	0
2	17	Any	Under 10,000	0	0
			10,000 to 20,000	—	10

AIRPLANES WITH 50-FOOT MAGAZINE (Cont)
Based on release speeds ranging from 350 to 650 knots TAS

NUMBER OF PASSES	"PRESET" RUNNING TIME PER PASS (SECONDS)	DIVE ANGLE (DEGREES)	RELEASE ALTITUDE ABOVE TARGET (FEET)	"PILOT ADJ." CAMERA DELAY AFTER RELEASE (SECONDS)	
				ROCKETS	BOMBS
3	10	30	Under 5000	0	0
			5000 to 10,000	4	7
			10,000 to 15,000	—	14
			15,000 to 20,000	—	20
		50	Under 5000	0	0
			5000 to 10,000	0	5
			10,000 to 15,000	—	10
			15,000 to 20,000	—	16
		70	Under 5000	0	0
			5000 to 10,000	0	4
			10,000 to 15,000	—	9
			15,000 to 20,000	—	14
4	7	30	Under 4000	0	0
			4000 to 7000	0	6
			7000 to 10,000	5	11
			10,000 to 13,000	—	15
			13,000 to 16,000	—	18
			16,000 to 20,000	—	22
		50	Under 4000	0	0
			4000 to 7000	0	4
			7000 to 10,000	4	8
			10,000 to 13,000	—	11
			13,000 to 16,000	—	14
			16,000 to 20,000	—	18
		70	Under 4000	0	0
			4000 to 7000	0	3
			7000 to 10,000	0	6
			10,000 to 13,000	—	9
			13,000 to 16,000	—	12
			16,000 to 20,000	—	15

AIRPLANES WITH 15-FOOT MAGAZINE
Based on release speeds ranging from 350 to 650 knots TAS

NUMBER OF PASSES	"PRESET" RUNNING TIME PER PASS (SECONDS)	DIVE ANGLE (DEGREES)	RELEASE ALTITUDE ABOVE TARGET (FEET)	ROCKETS	BOMBS
1	9	30	Under 4000	0	0
			4000 to 8000	0	6
			8000 to 12,000	6	12
			12,000 to 16,000	—	17
			16,000 to 20,000	—	22
		50	Under 4000	0	0
			4000 to 8000	0	4
			8000 to 12,000	4	9
			12,000 to 16,000	—	13
			16,000 to 20,000	—	17
		70	Under 4000	0	0
			4000 to 8000	0	3
			8000 to 12,000	0	7
			12,000 to 16,000	—	11
			16,000 to 20,000	—	15

AIRPLANES WITH 15-FOOT MAGAZINE (Cont)
Based on release speeds ranging from 350 to 500 knots TAS

NUMBER OF PASSES	"PRESET" RUNNING TIME PER PASS (SECONDS)	DIVE ANGLE (DEGREES)	RELEASE ALTITUDE ABOVE TARGET (FEET)	"PILOT ADJ." CAMERA DELAY AFTER RELEASE (SECONDS)	
				ROCKETS	BOMBS
2	3	30	Under 4000	0	4
			4000 to 6000	4	7
			6000 to 8000	5	10
			8000 to 10,000	7	13
			10,000 to 12,000	—	16
			12,000 to 14,000	—	19
			14,000 to 16,000	—	21
			16,000 to 18,000	—	23
			18,000 to 20,000	—	25
		50	Under 4000	0	2
			4000 to 6000	0	5
			6000 to 8000	4	8
			8000 to 10,000	5	10
			10,000 to 12,000	—	13
			12,000 to 14,000	—	15
			14,000 to 16,000	—	17
			16,000 to 18,000	—	19
			18,000 to 20,000	—	21
		70	Under 4000	0	2
			4000 to 6000	0	4
			6000 to 8000	0	6
			8000 to 10,000	4	9
			10,000 to 12,000	—	11
			12,000 to 14,000	—	13
			14,000 to 16,000	—	15
			16,000 to 18,000	—	17
			18,000 to 20,000	—	19

Based on release speeds ranging from 500 to 650 knots TAS

NUMBER OF PASSES	"PRESET" RUNNING TIME PER PASS (SECONDS)	DIVE ANGLE (DEGREES)	RELEASE ALTITUDE ABOVE TARGET (FEET)	ROCKETS	BOMBS
2	3	30	Under 6000	2	5
			6000 to 9000	5	9
			9000 to 12,000	8	14
			12,000 to 15,000	—	17
			15,000 to 18,000	—	20
			18,000 to 21,000	—	24
		50	Under 6000	0	4
			6000 to 9000	3	6
			9000 to 12,000	5	10
			12,000 to 15,000	—	13
			15,000 to 18,000	—	16
			18,000 to 21,000	—	19
		70	Under 6000	0	4
			6000 to 9000	0	5
			9000 to 12,000	4	8
			12,000 to 15,000	—	11
			15,000 to 18,000	—	14
			18,000 to 21,000	—	17

On F-86H-1 Airplanes, the strike camera is adjustable for viewing angles ranging from 35 to 70 degrees forward oblique and 105 to 145 degrees aft oblique. On F-86H-5 and later airplanes, the adjustment range is from 40 degrees forward oblique to 145 degrees aft oblique. For rocket runs on all airplanes, the camera viewing angle should be the most forward oblique setting (35 degrees on F-86H-1 Airplanes and 40 degrees on F-86H-5 and later airplanes). The following table gives the proper camera viewing angle for bombing runs. The viewing angle must be preset on the ground and varies with airspeeds and dive angle as follows:

AIRSPEED (KNOTS TAS)	DIVE ANGLE (DEGREES)	CAMERA VIEWING ANGLE (DEGREES)
450	30	108
	50	114
	70	123
550	30	114
	50	121
	70	131
650	30	122
	50	130
	70	136

NOTE Camera viewing angles are based on a 4 to 5 G pull-up at release to level flight.

Camera Lens Selector.

The aperture of the N9 gun camera and the lens diaphragm of the strike camera may be adjusted by a selector switch (figure 4-9) on the left console. This switch has BRIGHT, HAZY, and DULL positions and is powered by the secondary bus.

BOMBING EQUIPMENT.

Provision is made for the installation of Type S-2 and S-2A removable bomb racks on the lower surface of each wing outer panel. Although the airplane is equipped with four external store mounting stations, only the inboard stations may be used for bomb rack installation. (Outboard stations can be used for drop tank mountings only.) Each rack can carry single bombs of various types, ranging from 250- to 1000-pound sizes. Normally, depressing the bomb-rocket release button on the control stick energizes the selected circuits for bomb release; bombs may be dropped singly or simultaneously (salvoed). The automatic function of the A-4 sight is used for bomb sighting when releasing bombs of less than 500-pound size and may be employed to release these automatically. Separate controls are provided for normal or emergency bomb release. For emergency release, bombs may be jettisoned (unarmed) electrically either when the master armament selector is positioned at EXT. STORES JETTISON and the release button is actuated, or when the external stores jettison button is depressed regardless of armament selector position. In case of an electrical malfunction, the bombs can be jettisoned mechanically by means of the emergency jettison handle. A rack can be installed under the left wing to carry a single special external store. A separate control panel is provided for operation with the special store; an additional jettisoning control (mechanical) is also provided to jettison only the special store.

Bomb Loading.

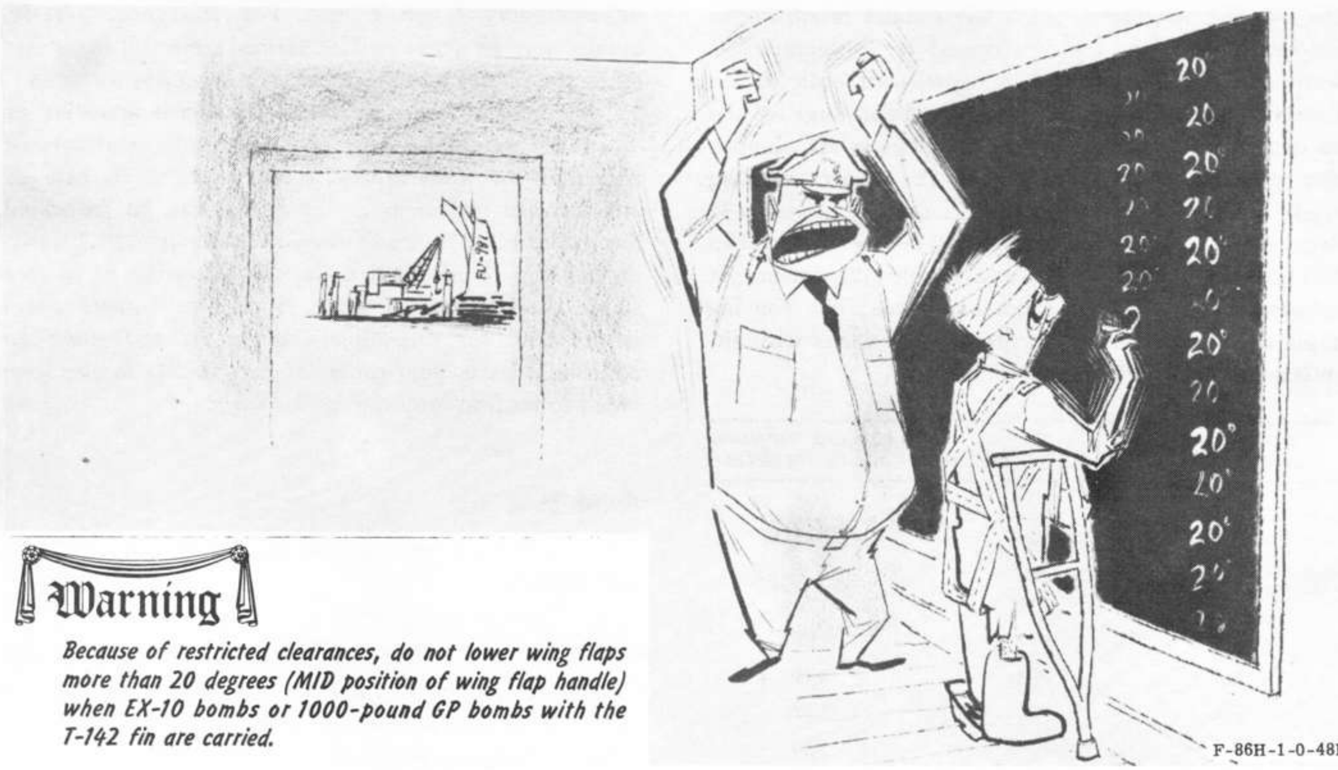
The bomb load may consist of one of the following installations:

- Two M57A1 bombs (250-pound general-purpose)
- Two MK-82 bombs (500-pound EX-12)
- Two M64A1 bombs (500-pound general-purpose)
- Two T-54 bombs (750-pound general-purpose)
- Two E74R2 bombs (750-pound napalm)
- Two MK-83 bombs (1000-pound EX-10)
- Two M65A1 bombs (1000-pound general-purpose)
- One special store

Caution When the special store is installed (alone or with any combination of drop tanks), taxiing must be done at low speeds, and short-radius turns must be avoided. The brakes must be applied slowly to eliminate sudden stops. Operation from relatively smooth and hard surfaces is mandatory (concrete or "black-top" surfaces preferred).

Bombing Equipment Controls and Indicator.

Master Armament Selector. The master armament selector, on the armament control panel (figure 4-9) on the left console, permits release selections of bombs, rockets, or drop tanks, and jettisoning of all external stores by primary bus power. Three positions of the armament selector are effective to select mode of bomb release. When the armament selector is properly positioned, bomb release circuits are energized when the bomb-rocket release button on the control stick is depressed. Bomb release may be selected for manual or automatic release, and bomb arming is selective (by means of bomb arming switch) when the armament selector is in either the BOMB SINGLE or BOMB SALVO position. For simultaneous release of the bomb load, the armament selector should be positioned at BOMB



Warning

Because of restricted clearances, do not lower wing flaps more than 20 degrees (MID position of wing flap handle) when EX-10 bombs or 1000-pound GP bombs with the T-142 fin are carried.

SALVO. When the selector is at EXT STORES JETTISON, the bomb load is jettisoned unarmed when the release button is depressed; drop tanks are also released if carried. For other positions of the master armament selector, refer to "Rocket System Controls."

Warning To prevent accidental release of external stores, do not press bomb release button on stick grip while armament master selector switch is being moved.

Bomb Arming Switch. Bombs are armed by means of the arming switch, on the armament control panel (figure 4-9). Power to the arming switch is supplied by the secondary bus. With the switch at TAIL ONLY, bombs are armed for delayed detonation. For bombs to explode instantly on impact, the switch must be positioned at ARM NOSE & TAIL. The bombs will be released unarmed if the switch is at OFF. Bomb arming is not effective except when the armament selector is at BOMB SINGLE or BOMB SALVO and the mechanical jettison handle is in the normal position.

Bomb Release Selector Switch. A two-position selector switch, on the armament control panel (figure 4-9), permits selection of either manual or automatic bomb release by means of secondary bus power. When the selector switch is at MANUAL RELEASE, bomb release occurs when the release button on the control stick is depressed. When the switch is at AUTO RELEASE and the release button is held closed, the mechanism within the A-4 sight automatically accomplishes bomb release when the path of the airplane during the bomb run becomes tangent to the bomb trajectory. During either manual or automatic release conditions, the correct bomb release point is indicated by automatic extinction of the sight reticle image.

Bomb Sequence Switch. The bomb sequence switch, on the armament control panel (figure 4-9), permits selective release of either the right or the left bomb rack first, as desired by the pilot. The bomb rack not selected will be released when the release button is pressed again.

Bomb-Rocket Release Button. Bomb and rocket release circuits are energized (after the master armament selective release of either the right or the left bomb rack when the bomb-rocket release button (figure 1-17) on the control stick grip is depressed. Used primarily for normal release of bombs and rockets, the release button can also effect release of drop tanks and all external stores, depending on master armament selector positioning. If necessary, all normal external loads can be released at the same time by depression of the release button when the master armament selector is positioned at EXT STORES JETTISON. The gun and impact cameras are started when the release button is depressed if the master armament selector is at BOMB SINGLE, BOMB SALVO, ROCKET SINGLE, or ROCKET SALVO. The release button must be held depressed when bombs are being released automatically by means of the A-4 sight.

Warning Before actuating bomb-rocket release button, make sure master armament selecetor is positioned correctly for desired release condition. Failure to check selector positioning may cause accidental bomb, drop tank, or rocket release, or failure of desired store to release.

External Stores Jettison Button. To jettison all external stores at the same time, a guarded red push button (figure 1-9) is provided on the left console. When the button is depressed, all external stores (bombs, rockets, drop tanks, and special store) are jettisoned at the same time from left and right wings. Regardless of the position of bomb or rocket arming switches, bombs and rockets are dropped unarmed when the external stores jettison button is actuated, because the arming circuit is interrupted when the button is depressed. The jettison control is operable whenever battery power is available, because the jettison circuit receives electrical power from the battery bus.

Caution Rockets cannot be jettisoned electrically when the airplane is on the ground, because the jettison circuit is interrupted when the weight of the airplane is on the landing gear.

Emergency Jettison Handle. The emergency jettison handle (23, figure 1-4) is to the left of the instrument subpanel. On airplanes changed by T.O., the handle is safety-wired to prevent inadvertent actuation. If the electrical jettison release fails, the emergency jettison handle can be used to release all of the external load except the special store. Bombs, rockets, or drop tanks are mechanically released independently of any of the electrical release systems when the emergency jettison handle is actuated. To jettison the outboard tanks only, the emergency jettison handle should be turned 45 degrees clockwise and *then* pulled out about 3½ inches. When the handle is pulled straight out to its full extension (about 6⅛ inches), all external stores are released at the same time. The bomb and rocket arming circuits are interrupted automatically when the emergency jettison handle is pulled, and bombs or rockets are dropped unarmed, regardless of the position of the bomb or rocket arming switches.

Special Store Jettison Handle. To jettison the special store in case of an electrical release failure, the mechanical release handle (30, figure 1-4), on the left instrument subpanel, above the landing gear handle, should be pulled to its full extension (about 2 inches).

A-4 Sight Bomb Release Indicator. When the sight controls are set for the bombing function, the sight will indicate bomb release. During the bombing run, the proper bomb release point (point at which the path of the airplane becomes tangent to a bomb trajectory) is indicated by automatic extinction of the reticle image circle and dot. This indication occurs whether the bomb release system is set for automatic or manual release.

Bomb Release.

To release bombs using the A-4 sight, proceed as follows:

Warning To avoid damage to the airplane, do not use automatic function of A-4 sight for bombing operations involving bombs of 500-pound size or heavier, as these bombs tend to strike portions of the airplane under this or any negative-G release condition.

1. Check that the radar inverter warning light is out.
2. Gun safety switch at SIGHT CAMERA & RADAR to allow a 5- to 15-minute warm-up period (depending on outside air temperature) for the sight. Check sight mechanical caging lever at CAGE.
3. Sight filament switch at PRIM. If primary filament is inoperative, set switch to SEC.
4. Sight dimmer rheostat adjusted for desired reticle image brilliancy.
5. Move sight mechanical caging lever to UNCAGE.
6. Master armament selector set at BOMB SINGLE for single release or BOMB SALVO for simultaneous release.
7. Set bomb sequence switch as desired.
8. Sight function selector lever to BOMB.
9. Bomb release selector switch at MANUAL RELEASE for selective release or AUTO RELEASE for release by means of the A-4 sight.
10. After sighting target and before starting approach, set bomb arming switch at ARM NOSE & TAIL or TAIL ONLY.

Warning Because of restricted clearances, do not lower wing flaps more than 20 degrees (MID position of wing flap handle) when EX-10 bombs or 1000-pound GP bombs with the T-142 fin are carried.

11. Set strike camera timer to desired delay.*

***F-86H-5 Airplane AF52-2092 and all later airplanes**

12. Bomb-target wind control turned from ROCKET GUN to known or estimated target and wind velocities.

13. Make approach to target that will give desired dive angle during bombing run.

14. Depress sight electrical caging button to stabilize reticle image before pushing over into dive.

15. Place reticle image dot on target.

16. After establishing dive, keep dot on target and release electrical caging button. If automatic release has been selected, depress bomb-rocket release button at this point.

17. Track smoothly, keeping dot on target.

18. On an automatic release, bomb release will occur automatically at correct release point, as indicated by the disappearance of the reticle circle and dot. If release is manual, depress bomb-rocket release button as circle and dot are extinguished.

Bomb Emergency Release.

To jettison normal bomb load (unarmed) and drop tanks, any of the following methods may be used:

1. Position master armament selector at EXT STORES JETTISON and depress bomb-rocket release button momentarily.

2. Depress external stores jettison button, on left console. (Position of master armament selector is ineffective.)

3. To jettison only the bomb load and retain drop tanks, position master armament selector at BOMB SALVO and arming switch at OFF, and depress bomb-rocket release button.

4. In case of an electrical malfunction, pull emergency jettison handle straight out to its fully extended position (about 6⅛ inches) to jettison bomb load and drop tanks mechanically.

MA-1 OR MA-1A LOW-ALTITUDE BOMBING SYSTEM (LABS).*

The MA-1 or MA-1A low-altitude bombing system is an electromechanical system used in conjunction with the A-4 sight for toss-bombing operations, to provide proper bomb aiming and bomb release control. The A-4 sight may be used to assist in bomb aiming; however, the sight is maintained in the electrically caged condition for this type of bomb release. The main components of the LABS equipment include a cageable, single-angle-sector, vertical gyro and a relay box, which are in the forward section of the fuselage. On late airplanes† and modified airplanes, a two-angle-sector gyro is installed. The gyro serves as the primary vertical reference for the system. Displacement of the airplane from the vertical, in both pitch and roll, is measured by potentiometers in both axes of the gyro. These potentiometers provide pitch and roll signals to the LABS dive-and-roll indicator mounted in the cockpit. An electrical system for caging the vertical gyro is controlled by a switch in the cockpit. A switch on late airplanes† is used to select either a normal or alternate release angle for use in the system. The LABS relay box contains numerous relays, to provide proper sequencing of the system, and an intervalometer. The intervalometer is ground-adjustable and is preset before flight to control the timing cycle of the bomb release circuit. The MA-1 or MA-1A LABS equipment receives dc power from the primary and secondary busses and ac power from the single-phase inverter, and is turned on by the gun safety switch.

MA-1 or MA-1A LABS Controls and Indicator.

LABS Change-over Switch. The two-position change-over switch (figure 4-10) is on a panel on the instrument panel. When the switch is set at A-4, the normal A-4 sight system is selected and operates for gunnery and bomb and rocket release operations. When the change-over switch is moved to LABS, the A-4 sight is caged electrically to permit it to function with the LABS equipment. The sight reticle circle goes out when the switch is moved to the LABS position. The switch should be returned to the A-4 position to shut off the LABS equipment.

LABS Start Switch. The LABS start switch (figure 4-10) is on a panel on the instrument panel. Moving this switch from OFF to ON supplies power to reilluminate the reticle circle of the A-4 sight and to energize the intervalometer motor. (Intervalometer timing action is not controlled by the computer switch.) The LABS start switch should be set at OFF to shut off the LABS equipment.

Gyro Caging Switch. Caging of the LABS vertical gyro is electrically controlled by a two-position switch (figure 4-10) on a panel on the instrument panel. The gyro cage switch should be in the CAGE position while starting the LABS equipment. The caging switch should be moved to UNCAGE when the LABS equipment is in use. When the switch is in this position, the gyro is uncaged and the LABS dive-and-roll indicator corresponds to airplane attitude. The switch should be at CAGE when the LABS equipment is not in use.

***F-86H-1 Airplane AF52-1979 and all later airplanes not changed by T.O. 1F-86H-611**
†F-86H-10 Airplane AF53-1379 and all later airplanes not changed by T.O. 1F-86H-611

NOTE The LABS equipment should have a 2-minute warm-up period before the caging switch is set at UNCAGE.

LABS Dive-and-Roll Indicator. The LABS dive-and-roll indicator (11, figure 1-4; figure 4-10) is a dual-movement, zero-centered unit mounted on the instrument panel. The position of the pointer on the arc at the top of the dial indicates airplane roll attitude; the position of the pointer on the arc at the right side of the dial indicates airplane pitch attitude. The dive-and-roll indicator is operable when the change-over switch is at LABS and the gyro caging switch is at UNCAGE. When the caging switch is set at CAGE, both indicator pointers should indicate zero.

Gyro Angle Selector Switch. On late airplanes* and modified airplanes, a two-position angle selector switch (36, figure 1-4) is on the instrument panel shroud. Placing the switch at NORMAL or ALTERNATE sets the desired release angle into the system.

Operation of Low-altitude Bombing System.

Refer to Secret T.O. 1F-86H-16A for information on operation of MA-1 and MA-1A low-altitude bombing system.

MA-2 LOW-ALTITUDE BOMBING SYSTEM (LABS).*

The MA-2 low-altitude bombing system is an electromechanical system used with the A-4 sight reticle to provide proper bomb aim and bomb release for toss bombing operations. It furnishes the pilot with the necessary flight maneuver information to effect an accurate bombing mission. The A-4 sight is maintained in an electrically caged condition for this type of bomb release. The main components of this LABS equipment include a cageable yaw-roll gyro, a vertical gyro, a relay box, and a calibrator. These units are in the forward section of the fuselage. There is an accelerometer in the forward compartment and a dive-and-roll indicator on the instrument panel. An electrical system for uncaging the yaw-roll gyro is controlled by a switch on the instrument. The vertical gyro provides roll and pitch information. The yaw-roll gyro provides yaw and roll information. The accelerometer provides acceleration information in G units. The LABS relay box contains an intervalometer and numerous relays to provide proper sequencing of the system. The MA-2 LABS equipment receives dc power from the primary and secondary buses and ac power from the single-phase inverter, and is turned on by the LABS start switch. The LABS accelerometer provides pitch acceleration data to the system. It is in the forward compartment. The accelerometer is energized by secondary bus power when the bomb-rocket release button is depressed if the LABS change-over switch is at ALTERN LABS, and the LABS start switch is at START. If the LABS change-over switch is at NORM LABS, it is energized only when the timing cycle is completed.

MA-2 LABS Control and Indicator.

LABS Start Switch. This switch (figure 4-10) is on a panel on the instrument panel. Moving this switch from OFF to START uncages and powers the vertical gyro, partially uncages the yaw-roll gyro, energizes the circuits to the dive-and-roll indicator, supplies secondary bus power so that the reticle circle comes on again in the A-4 sight, and energizes the intervalometer motor. (Intervalometer timing action is not controlled by the LABS start switch.) The LABS start switch should be at OFF when LABS equipment is not in use.

NOTE LABS equipment should have a 2-minute warm-up period after the change-over switch is moved to either NORM LABS or ALTERN LABS.

LABS Change-over Switch. This switch (figure 4-10) has three positions, A-4, NORM LABS, and ALTERN LABS, and is on a panel on the instrument panel. It is used to determine delivery angle during bomb release. When the switch is set at A-4, the normal A-4 sight system is selected and operates for gunnery and bomb and rocket release operations. With the switch at NORM LABS, the normal angle which is preset in the vertical gyro, is placed in the circuit. With the switch at ALTERN LABS, the alternate delivery angle which is preset in the vertical gyro is placed in the circuit. This switch is powered by the secondary bus.

LABS Dive-and-Roll Indicator. The LABS dive-and-roll indicator (11, figure 1-4; figure 4-10) is a dual-movement, zero-centered unit mounted on the instrument panel. The vertical pointer indicates airplane roll attitude when the vertical gyro is uncaged and the yaw-roll gyro is electrically caged. It indicates yaw-roll attitude when the yaw-roll gyro is completely uncaged. The horizontal pointer shows airplane pitch attitude when the vertical gyro is uncaged and the yaw-roll gyro is electrically caged. It indicates G when the yaw-roll gyro is completely uncaged. The dive-and-roll indicator is operable when the LABS change-over switch is at NORM LABS or ALTERN LABS and the LABS start switch is at START. When the LABS start switch is at OFF, both indicator pointers should rest at zero.

***Airplanes changed by T.O. 1F-86H-611**

LABS AND SPECIAL STORE CONTROLS AND INDICATORS

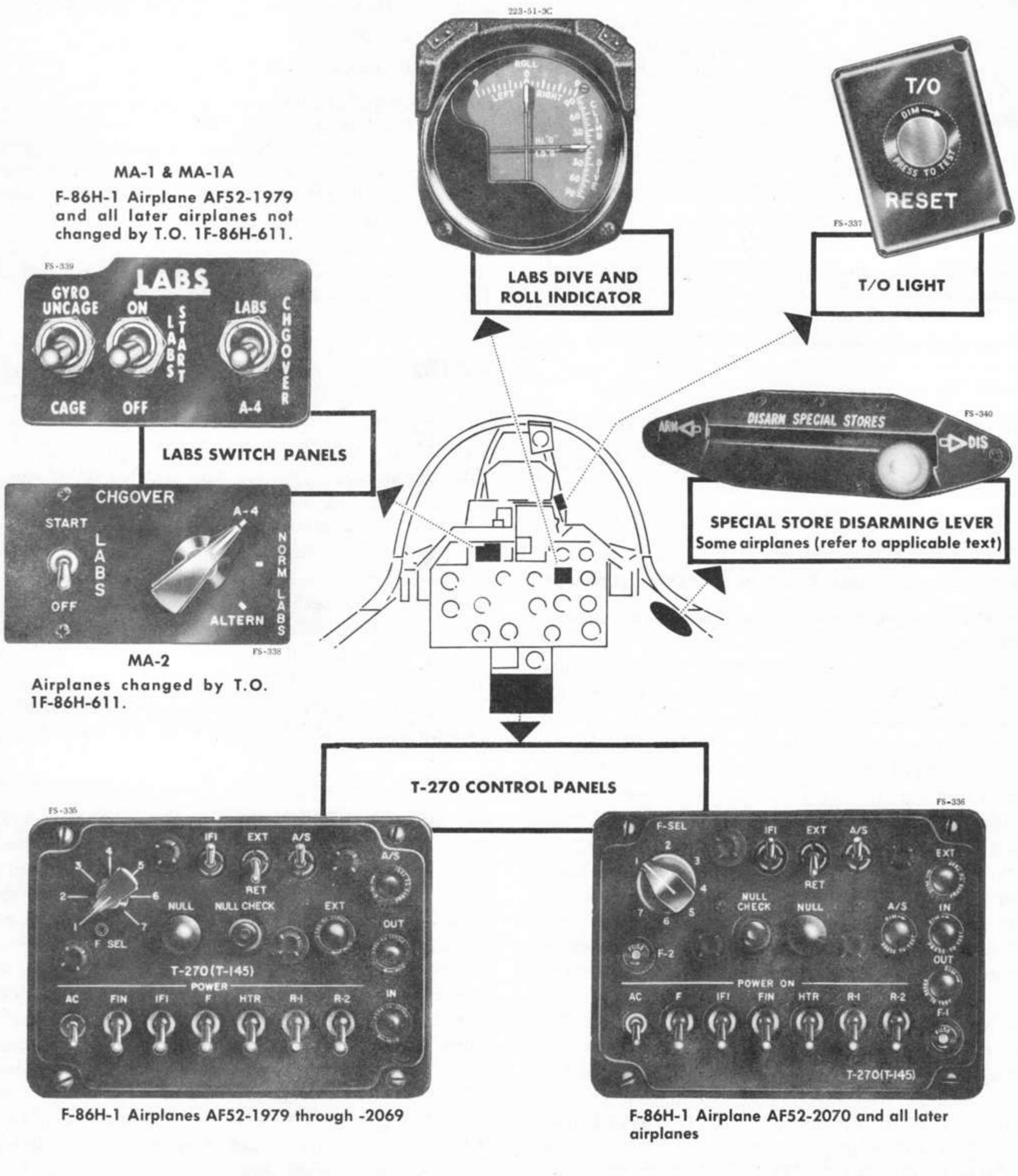


Figure 4-10

Operation of MA-2 Low-altitude Bombing System.

Refer to Secret T.O. 1F-86H-16A for information on operation of MA-2 low-altitude bombing system.

SPECIAL STORE.

A special store may be carried under the left wing at the inboard station. A T-270 control panel* (figure 4-10) for monitoring the store is on the instrument subpanel† or on the right console.‡ The fins must be folded for take-off, to provide ground clearance and clearance for flap operation. On airplanes not changed by T.O., a mechanical lever for special store arming is above the right console on the canopy sill and is marked "DISARM SPECIAL STORES." For mechanically jettisoning the special store, a jettisoning handle is to the left of the instrument panel. The special store also can be jettisoned electrically by means of the external stores jettison button and, when the master armament selector is properly positioned, by the bomb-rocket release button.

Special Store Control Panel Controls and Indicators.

F-SEL Switch. This switch, on the T-270 control panel and labeled "F-SEL," is powered by the primary bus. It has numbered positions from 1 through 7.

A/S Switch. This switch, on the T-270 control panel and powered by the primary bus, controls the safing switch solenoid. The switch, labeled "A/S," is spring-loaded to up. When the switch is moved momentarily downward, the amber "A/S" light will illuminate if the safing switch is in the closed (armed) position. To change the safing switch from either closed (armed) or open (safe) position, move the A/S switch momentarily downward.

IFI Control and IFI Power Switches. The IFI control switch, on the T-270 control panel, is spring-loaded up. With the "IFI" circuit-breaker power switch, located at the lower left of the panel, up, the IFI control switch readies the special store for arming. If the store is not ready for arming, the green "OUT" light will go on. If the store is readied for arming, the amber "IN" light will go on. Moving the IFI control switch downward momentarily will change the store from either existing condition to the other.

Fin Control and FIN Power Switches. The fin control switch, on the T-270 control panel and powered by the primary bus, will control the position of the special store fins, if the "FIN" circuit-breaker power switch, at the bottom of the panel, is up. With the fin control switch at EXT, the store fins will extend, and when fully extended, the amber "EXT" light will come on. With the switch at RET, the fins will retract and the amber "EXT" light will go out.

Warning

Special store fins must be retracted for take-off, since the fins will interfere with the wing flaps when the latter are full down. If a landing is made with the special store still installed, make sure the special store fins are fully retracted, to prevent interference with the flaps when they are lowered. *It requires about 19 seconds for the special store fins to move from the fully extended to the fully retracted position.*

Heater Power Switch. This circuit-breaker switch, labeled "HTR" on the T-270 control panel, applies primary bus power to the special store when placed at the maintained up position.

F-Switch. This circuit-breaker switch, on the T-270 control panel, applies primary bus power to the special store components, both directly and through the F-SEL switch, when placed at the maintained up position.

AC Power Switch. With the ac power switch, labeled "AC," on the T-270 control panel, at the maintained up position, 115-volt, 400-cycle ac power is applied to the special store.

Null Light. This light, labeled "NULL," on the T-270 control panel, and powered through the ac power switch, is used for checking the special store.

Null Check Switch. The null check switch is inoperative.

Special Store Arming Lever.

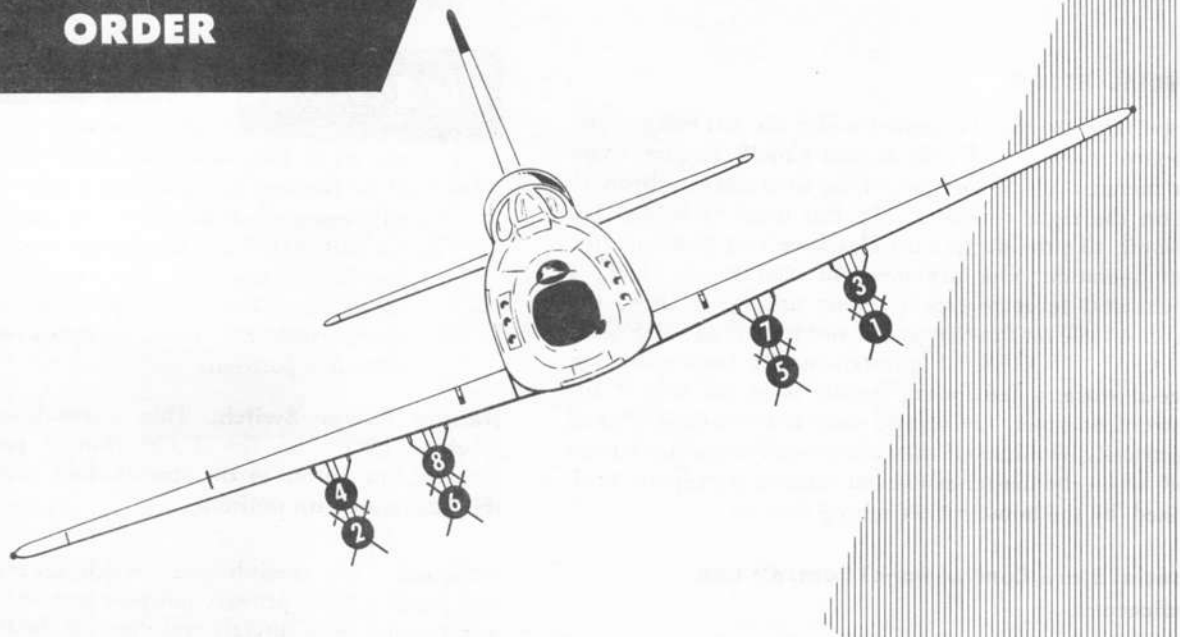
Airplanes not changed by T.O. have a mechanical lever (figure 4-10), above the right console on the canopy sill. The lever, labeled "DISARM SPECIAL STORES," mechanically arms or disarms the special store. With the lever at ARM, the store is armed, provided applicable switches are properly positioned. With the lever at DIS, the store is disarmed, regardless of the position of other switches.

Special Store Jettison Handle.

To jettison the special store in case of an electrical release failure, a mechanical release handle (30, figure

***F-86H-1 Airplane AF52-1976 and all later airplanes**
†F-86H-1 Airplane AF52-1979 and all later airplanes
‡F-86H-1 Airplanes AF52-1976 through -1978

ROCKET FIRING ORDER



F-86H-1-68-1B

Figure 4-11

1-4), on the left instrument subpanel, above the landing gear handle, should be pulled to its full extension (about 2 inches). The store will be dropped armed or disarmed, depending on the position of the special store disarming lever and applicable switches.

ROCKET SYSTEM.

Four removable, zero-rail rocket launcher assemblies may be installed to permit mounting eight 5-inch HVA rockets or four high-performance air-to-ground rockets. The launchers are fitted to the lower surface of the wing outer panels, two on each side. Two HVA rockets, one mounted directly below the other, or one high-performance rocket is hung from each launcher assembly. The Type A-4 gun-bomb-rocket sight is used for aiming the rockets and controls are provided for normal or emergency rocket release. Gun and strike cameras are operated automatically when rockets are fired. (Refer to "Cameras.") Normal rocket release, single or automatic, is done electrically by means of a rocket projector release, which controls the firing sequence. Rockets may be salvoed unfired, either armed or unarmed. Rockets may be jettisoned simultaneously and unarmed through either the master armament selector and the bomb-rocket release button, or the external stores jettison button. In an emergency, the rockets may be jettisoned mechanically by the emergency jettison handle.

Rocket System Controls.

Sight Selector Unit. Refer to "A-4 Sight Controls."

Bomb-Rocket Release Button. Refer to "Bombing Equipment."

Master Armament Selector. Four positions of the master armament selector, on the armament control panel (figure 4-9), are effective for selecting rocket release (primary bus): ROCKET SINGLE and ROCKET AUTO for normal rocket firing, and ROCKET SALVO and EXT STORES JETTISON for dropping rockets rather than firing them. Normal rocket fire is done when the master armament selector is positioned for the desired mode of release and the bomb-rocket release button is depressed. This also automatically starts the gun and strike cameras. With the selector at ROCKET SINGLE, one rocket is fired each time the release button is depressed; with the selector at ROCKET AUTO, all rockets are fired in train when the button is held depressed. Automatic firing ceases when the button is released. When the selector is positioned to ROCKET SALVO, the rockets can be dropped from the mounts simultaneously by means of the bomb-rocket release button. Rocket nose fuze arming is selective during this type of salvo release, even though the rockets are dropped rather than fired. Rockets and drop tanks may be jettisoned electrically by moving the master arma-

F-86H-1-0-49A

Note *Rockets cannot be jettisoned or salvoed electrically when the airplane is on the ground, as these circuits are inoperative with the weight of the airplane on the gear.*

ment selector to EXT STORES JETTISON and depressing the bomb-rocket release button. All rockets will be jettisoned simultaneously and unarmed.

Rocket Fuze (Arming) Switch. Arming of the rocket nose fuze is controlled by secondary bus power through the rocket fuze (arming) switch, on the armament control panel (figure 4-9). When the switch is at INST., the rocket nose fuze is armed upon release to provide instantaneous detonation on contact. The nose fuze is unarmed when the switch is at DELAY or OFF; however, when the rocket is fired, an internal fuze is primed and will cause delayed detonation after impact. During take-off, the arming switch should always be OFF. Nose fuze arming is selective during salvo release, but for rocket jettison release, the nose fuze is unarmed. The internal fuze is inoperative during jettisoning.

Rocket Projector Release (Intervalometer). Rocket-firing sequence during normal and automatic release is controlled by primary bus power by means of a rocket projector release (20, figure 1-5), on the aft left console. When the master armament selector is at ROCKET SINGLE, one rocket is fired each time the bomb-rocket release button is depressed and the projector release automatically maintains the correct firing sequence for each successive release. When the master armament selector is at ROCKET AUTO and the release button on the control stick grip is depressed, the projector release fires rockets in sequence at about 1/10-second intervals as long as the release button is held depressed. A numbered dial, visible through a window in the projector release housing, indicates the rocket to be fired. The dial is set at the time of rocket loading and should be at 1 when a normal complement of rockets is carried. The reset knob is used to select release of any particular rocket in case of misfire or other malfunction during a "single" release.

NOTE If the lower rocket fails to fire during a normal release, the upper rocket on the same mount cannot be fired. The unfired rockets should be jettisoned in a safe area. Jettisoning is not selective; all rocket stations jettison simultaneously.

External Stores Jettison Button. Refer to "Bombing Equipment Controls and Indicator."

Emergency Jettison Handle. Refer to "Bombing Equipment Controls and Indicator."

Rocket Jettison Test Switch. A means of checking the rocket jettison circuit on the ground is provided by a manually operated test switch on the canopy deck test switch panel.

Caution If the switch is closed while rockets are installed on the launcher, the rockets will be jettisoned.

Firing Rockets.

Sight and armament controls should be set as follows for rocket firing:

1. Check radar inverter operation (warning light out).
2. Gun safety switch at SIGHT CAMERA & RADAR to supply power to the sight; allow 5- to 15-minute warm-up (depending on outside air temperature) period for sight. Check sight mechanical caging lever at UNCAGE.
3. Sight function selector lever to ROCKET.
4. Master armament selector set at ROCKET SINGLE or ROCKET AUTO.
5. Rocket fuze (arming) switch at INST. or DELAY (in flight).
6. Rocket setting lever at 5" HVAR and at intended dive angle. (On airplanes equipped with the variable sight selector unit, set rocket depression angle selector at desired position.)
7. Before initial rocket firing, make sure rocket projector release dial is set at 1 to ensure proper release of all rockets carried.
8. Sight filament switch at PRIM. If primary filaments are inoperative, set switch at SEC.

9. Sight dimmer rheostat adjusted to obtain desired reticle image brilliancy.

10. Set camera delay timer to desired delay.*

11. Make approach to target that will give desired dive angle during firing.

12. Before pushing over into the dive, depress sight electrical caging button to stabilize reticle image.

13. Put reticle image dot on target.

14. After establishing dive, keep dot on target and release electrical caging button.

15. Track smoothly, without skidding or slipping, keeping dot on target for about 3 seconds; then depress bomb-rocket release button to fire rockets.

Rocket Emergency Release.

To salvo rockets unfired, proceed as follows:

1. Master armament selector at ROCKET SALVO.
2. Rocket fuze (arming) switch OFF. (Internal fuze is inoperative when rockets are salvoed.)
3. Press bomb-rocket release button to salvo all rockets simultaneously.

To jettison rockets unarmed, follow one of the following procedures:

1. Master armament selector EXT STORES JETTISON, and depress bomb-rocket release button momentarily to jettison all external stores.
2. Push external stores jettison button.
3. In case of an electrical malfunction, jettison all external stores by pulling out emergency jettison handle to its full extension (about 6⅛ inches).

MISCELLANEOUS EQUIPMENT.

ANTI-G SUIT PROVISIONS.

Air pressure for the anti-G suit bladders is taken from the final stage of the engine compressor and is then routed through a pressure-regulating valve to the suit attachment fitting. The line from the regulating valve to the attachment fitting passes through the quick-disconnect fitting on the front of the seat so that the line will sever automatically upon ejection. The pressure-regulating valve (1, figure 1-5) on the left aft console regulates air pressure to the suit and permits inflation of the suit only when positive G is encountered. The valve operates automatically and begins to function at about 1.75 G whether the cap has been moved to the HI (clockwise) or LO (counterclockwise) detent. When the valve is at LO, 1 psi of air pressure is exerted in the suit for each additional 1 G increase; when valve is at HI, 1.5 psi is delivered per G increase. Depressing the button on top of the valve permits valve operation to be checked manually and also allows the suit to be inflated momentarily when desired. Use of the suit in this manner will lessen fatigue during long flights.

DATA CASE.

The data case is in the right side of the aft fuselage. Access to the data case is provided by a hinged door marked "FIRE FIGHTING, FUEL PROBE, AND DATA ACCESS DOOR."

MAP CASE.

The map case and aircraft report holder (9, figure 1-6) are on the aft right console, below the canopy sill.

REAR-VISION MIRROR.

An adjustable rear-vision mirror is suspended from the inner upper surface of the canopy, just aft of the canopy bow.

PILOT'S PROTECTIVE HOOD.

Some airplanes may be equipped with a pilot's protective hood which is made of white canvas duck material and which moves on metal guides attached to the canopy.

MOORING EQUIPMENT.

Mooring rings are furnished in the mooring and jacking kit. On nontactical missions, mooring and jacking kits are stowed in the left rear ammunition container. Two fuselage fittings and two wing fittings are provided for attaching the mooring eyes. Both fuselage fittings are on the lower surface of the fuselage on the airplane centerline. The forward mooring ring is screwed into the jack pad fitting, just aft of the nose wheel door; the aft mooring ring is screwed into a fitting forward of the tail-pipe aperture. The wing mooring rings screw into threaded holes outboard of the 200-gallon wing tanks. All mooring-ring fittings are identified by suitable markings on the adjacent skin. When the airplane is tied down for extreme weather, it should be headed into the wind, with the rudder locked and wheel chocks installed. A ¼-inch cable or ¾-inch rope should be used for tie-down.

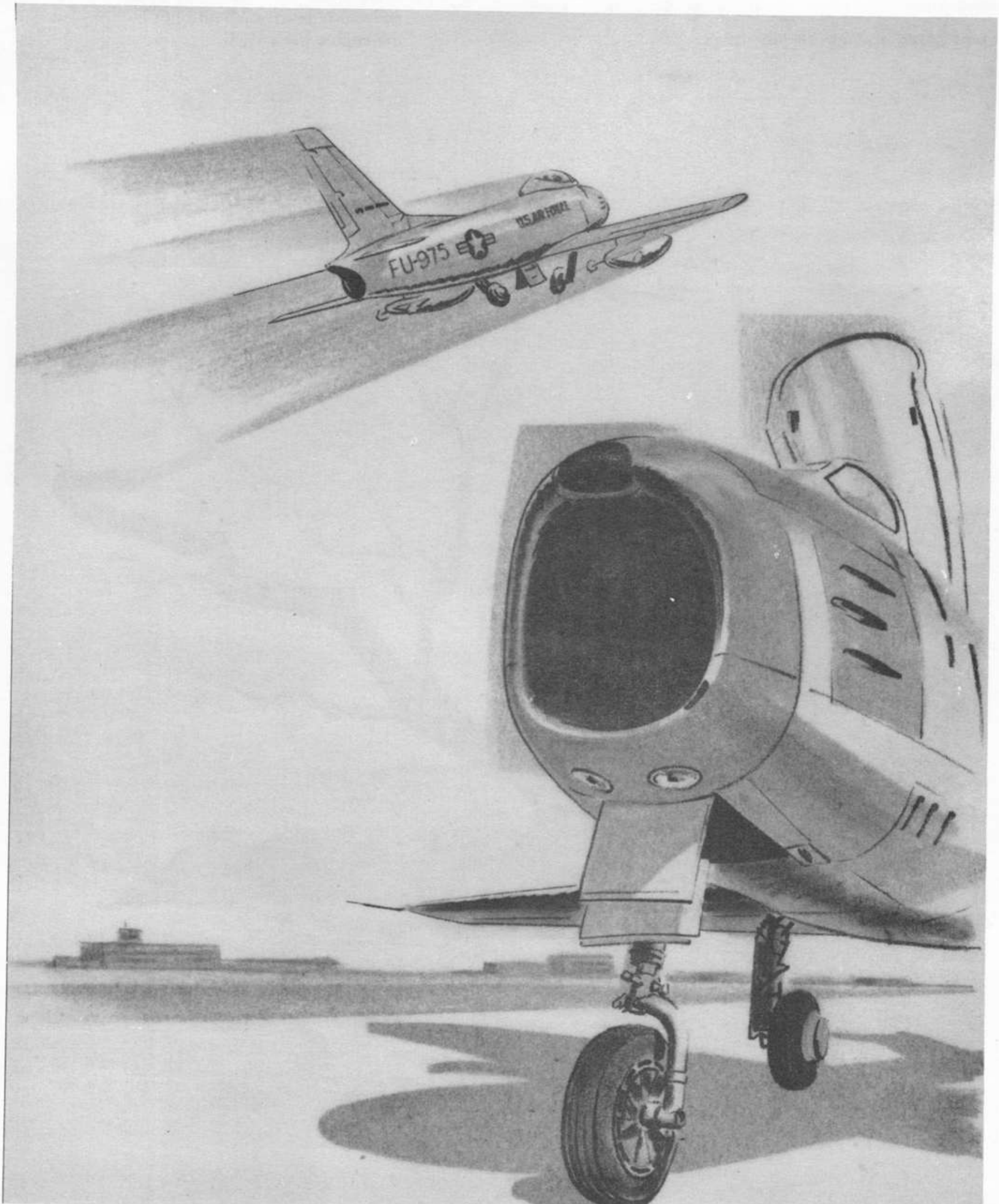
PROTECTIVE COVERS.

The removable covers, furnished for protecting the air-

***F-86H-5 Airplane AF52-2092 and all later airplanes**

plane while it is on the ground, include a cockpit canopy and intake duct cover, an air intake duct shield, a tail-pipe cover, and a pitot tube cover.

Caution To prevent formation of excessive moisture, the intake duct shield and tail-pipe cover should not be installed until the engine has cooled.


FU-975
U.S. AIR FORCE

F-86H-1-00-5A

OPERATING LIMITATIONS

Section V

TABLE OF CONTENTS

GENERAL.

Careful attention must be given to the instrument markings (figure 5-1), as the limitations shown on these instruments and noted in the captions are not necessarily repeated in the text of this or any other section.

ENGINE LIMITATIONS.

All normal engine limitations are shown in figure 5-1.

NOTE Military Power is defined as the power obtained at full open throttle (or 100% engine rpm, or 640°C, whichever is lower) and is limited to 30 minutes continuous operation.

- Maximum Continuous Power is defined as the power obtained at 96% engine rpm or 577°C, whichever is lower. There is no time limit for operation at this power setting.

ENGINE OVERSPEED.

The maximum permissible engine rpm is 104%. If this rpm is exceeded under any condition, a notation must be made on the Form 781, and the engine removed for overhaul.

ENGINE OVERTEMPERATURE.

The following conditions constitute overtemperature operation:

During starting (30% engine rpm or less)—

- Exhaust temperature exceeds 975°C, even if only momentarily.
- Exhaust temperature stabilizes at any temperature within the range of 875°C to 975°C. (Momentary peaking is permissible in this range as long as the exhaust temperature gage pointer is in constant motion.)

Transient operation (30% engine rpm or higher)—

- Exhaust temperature exceeds 875°C, even if only momentarily.

INSTRUMENT MARKINGS

AIRSPEED INDICATOR

* For airspeed limitations with external loads, refer to "Airspeed Limitations" in this section.

† On airplanes which do not incorporate the cable stop on the aft hinge of the nose wheel door, maximum gear-down airspeed is 200 knots IAS.

AIRPLANES WITHOUT SPLITTER RUDDER AND ELEVATOR

- (Red) No external load: 605 knots IAS, Mach 1.0, or airspeed where wing roll is excessive, whichever is lower.*
- (Red and yellow) No external load: The red and yellow pointer will show the limit airspeed of 605 knots IAS or the indicated airspeed that corresponds to the Mach 1.0 limit, whichever is lower.
- (Yellow) Maximum gear-and flaps-down airspeed: 220 knots IAS. †

AIRPLANES WITH SPLITTER RUDDER AND ELEVATOR

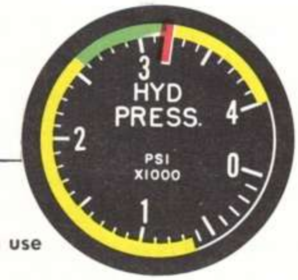
- (Red) No external load: 605 knots IAS, or airspeed where wing roll is excessive, whichever is lower.*
- (Red and yellow) The red and yellow pointer should not be used as a limit speed reference. Above the altitude where 605 knots IAS corresponds to Mach 1.0, this pointer will show an indicated airspeed corresponding to Mach 1.0.
- (Yellow) Maximum gear-and-flaps-down limit airspeed 220 knots IAS. †

ACCELEROMETER

- (Red) 7.33 G Maximum with no external load.*
- (Red) -3.0 G Maximum with no external load.*

*For acceleration limitations with external loads, refer to "Acceleration Limitations," in this section.

HYDRAULIC PRESSURE GAGE



		UTILITY HYDRAULIC SYSTEM FLIGHT CONTROL NORMAL HYDRAULIC SYSTEM	FLIGHT CONTROL ALTERNATE HYDRAULIC SYSTEM
Yellow	650-2550 psi	Malfunction within system—unit operation sluggish	Normal only if system is engaged and controls are operating
Green	2550-3200 psi	Normal —when systems are in operation*	Normal when controls are not in use
Red	3200 psi	Maximum	Maximum
Yellow	3200-4000 psi	Engine-driven pump compensator failure	Normal only if emergency override handle is pulled

*For static (no-flow) condition, gage pressure should indicate 2850-3200 psi.

F-86H-1-51-9A

Figure 5-1

BASED ON ALL FUEL GRADES

EXHAUST TEMPERATURE GAGE

Red	200°C	Minimum
Green	200°C to 577°C	Continuous
Red	640°C	Maximum (Take-off and Military Power—30 Min Max)
Red	875°C to 975°C	Starting Only (Momentary Peaking Permissible in This Range as Long as Gage Pointer is in Constant Motion).
Red	975°C†	Max During Start Only

†Refer to warning on hot starts and transient operation in starting procedure, Section II.

OIL PRESSURE GAGE

Red	20 psi	Minimum
Green	20-45 psi	Continuous
Red	45 psi	Maximum

FUEL FLOW METER

Red	350 lb/hr	Minimum
Green	480—12,000 lb/hr	Continuous

TACHOMETER

Green	88% – 96%	Continuous
Red	100%	Take-off and Military Power

F-86H-1-51-8A

AIRSPEED AND ACCELERATION LIMITATIONS

NOTE

Positive G-limits for rolling pull-outs are two thirds of limits shown. Negative G-limit for rolling push-downs is −1.0 G.

OUTBOARD STATION	INBOARD STATION	INBOARD STATION	OUTBOARD STATION	AIRSPEED LIMITATIONS*	G-LIMITS
NO EXTERNAL LOAD	NO EXTERNAL LOAD	NO EXTERNAL LOAD	NO EXTERNAL LOAD	605 knots IAS or airspeed where wing roll is excessive.	+7.33 −3.0
TWO 5 IN. HVAR	TWO 5 IN. HVAR	TWO 5 IN. HVAR	TWO 5 IN. HVAR	Above 25,000 feet: Maximum attainable. Below 25,000 feet: Mach .95. No continuous rolls.	+6.0 −3.0
	120 GAL DROP TANK	120 GAL DROP TANK		IF BOTH TANKS ARE TYPE I OR III Maximum attainable. †	+6.0 −3.0
				IF EITHER TANK IS TYPE II OR IV 500 knots IAS or Mach .90, whichever is lower. No abrupt maneuvers; no continuous rolls. Rate of roll limited to 90 degrees per second.	+4.0 −2.0
	M65 BOMB (1000 LB GP) WITH T-142 FIN	M65 BOMB (1000 LB GP) WITH T-142 FIN		Above 25,000 feet: Maximum attainable. Below 25,000 feet: Mach .80. No continuous rolls.	+6.0 −3.0
	MK-83 BOMB (1000 LB EX-10)	MK-83 BOMB (1000 LB EX-10		Maximum attainable.	+6.0 −3.0
	E-74 BOMB (750 LB NAPALM)	E-74 BOMB (750 LB NAPALM)		500 knots IAS or Mach .90, whichever is lower. No continuous rolls.	+6.0 −3.0
	T-54 BOMB (750 LB GP) M64 BOMB (500 LB GP) WITH T-127 FIN	T-54 BOMB (750 LB GP) M64 BOMB (500 LB GP) WITH T-127 FIN		Above 25,000 feet: Maximum attainable. Below 25,000 feet: Mach .85.	+6.0 −3.0
	MK-82 BOMB (500 LB EX-12) M57 BOMB (250 LB GP) WITH T-147 FIN	MK-82 BOMB (500 LB EX-12) M57 BOMB (250 LB GP) WITH T-147 FIN		Above 25,000 feet: Maximum attainable. Below 25,000 feet: Mach .90.	+6.0 −3.0

*The airspeed limitation is Mach 1.0 or the limit shown, whichever is lower, on airplanes without the splitter rudder and elevator.

† The 120-gallon drop tank must have the following stamped on the name plate: "T.O. 6J14-2-2-517." If this T.O. number is not stamped on the name plate, the airspeed limit is 500 knots IAS or Mach .90, whichever is lower.

F-86H-1-93-266A

Figure 5-2 (Sheet 1 of 4)

ONLY THE CONFIGURATIONS LISTED ARE APPROVED FOR FLIGHT.

OUTBOARD STATION	INBOARD STATION	INBOARD STATION	OUTBOARD STATION	AIRSPEED LIMITATIONS *	G-LIMITS
	M64 BOMB (500 LB GP) WITH BOXED FINS	M64 BOMB (500 LB GP) WITH BOXED FINS		Mach .70.	+6.0 −3.0
NAA TYPE I OR III 200 GAL DROP TANK			NAA TYPE I OR III 200 GAL DROP TANK	Maximum attainable, except avoid buffet regions.	+6.0 −3.0
NAA TYPE I OR III 200 GAL DROP TANK	FOUR 5 IN. HVAR	FOUR 5 IN. HVAR	NAA TYPE I OR III 200 GAL DROP TANK	Above 25,000 feet: Maximum attainable. Below 25,000 feet: Mach .95. No continuous rolls.	+6.0 −3.0
	M65 BOMB (1000 LB GP) WITH T-142 FIN	M65 BOMB (1000 LB GP) WITH T-142 FIN		Above 25,000 feet: Maximum attainable. Below 25,000 feet: Mach .80. No continuous rolls.	
	MK-83 BOMB (1000 LB EX-10)	MK-83 BOMB (1000 LB EX-10)		Above 25,000 feet: Maximum attainable. Below 25,000 feet: 500 knots IAS or Mach .90, whichever is lower.	
	E74 BOMB (750 LB NAPALM)	E74 BOMB (750 LB NAPALM)		500 knots IAS or Mach .90, whichever is lower. No continuous rolls.	
	T-54 BOMB (750 LB GP)	T-54 BOMB (750 LB GP)		Above 25,000 feet: Maximum attainable. Below 25,000 feet: Mach .85.	
	M64 BOMB (500 LB GP)	M64 BOMB (500 LB GP)			
	MK-82 BOMB (500 LB EX-12)	MK-82 BOMB (500 LB EX-12)		Above 25,000 feet: Maximum attainable. Below 25,000 feet: Mach .90.	
	M57 BOMB (250 LB GP)	M57 BOMB (250 LB GP)			
	M64 BOMB (500 LB GP) WITH BOXED FINS	M64 BOMB (500 LB GP) WITH BOXED FINS		Mach .70.	
	120 GAL DROP TANK	120 GAL DROP TANK		IF BOTH TANKS ARE TYPE I OR III Maximum attainable, except avoid buffet regions. †	

* The airspeed limitation is Mach 1.0 or the limit shown, whichever is lower, on airplanes without the splitter rudder and elevator.

† The 120-gallon drop tank must have the following stamped on the name plate: "T.O. 6J14-2-2-517." If this T.O. number is not stamped on the name plate, the airspeed limit is 500 knots IAS or Mach .90, whichever is lower.

F-86H-1-93-265B

Figure 5-2 (Sheet 2 of 4)

AIRSPEED AND ACCELERATION LIMITATIONS

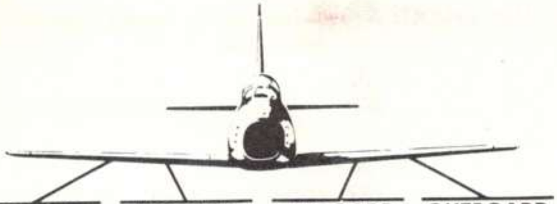
OUTBOARD STATION	INBOARD STATION	INBOARD STATION	OUTBOARD STATION	AIRSPEED LIMITATIONS *	G-LIMITS
NAA TYPE I OR III 200 GAL DROP TANK	120 GAL DROP TANK	120 GAL DROP TANK	NAA TYPE I OR III 200 GAL DROP TANK	IF EITHER 120-GAL TANK IS TYPE II OR IV 500 knots IAS or Mach .90, whichever is lower. No abrupt maneuvers; no continuous rolls. Rate of roll limited to 90 degrees per second.	+4.0 −2.0
TWO 5 IN. HVAR	M65 BOMB (1000 LB GP) WITH T-142 FINS	M65 BOMB (1000 LB GP) WITH T-142 FINS	TWO 5 IN. HVAR	Above 25,000 feet: Maximum attainable. Below 25,000 feet: Mach .85. No continuous rolls.	+6.0 −3.0
TWO 5 IN. HVAR	MK-83 BOMB (1000 LB EX-10)	MK-83 BOMB (1000 LB EX-10)	TWO 5 IN. HVAR	Above 25,000 feet: Maximum attainable. Below 25,000 feet: 550 knots IAS or Mach .95, whichever is lower. No continuous rolls.	+6.0 −3.0
NAA TYPE I OR III 200 GAL DROP TANK PLUS TWO 5 IN. HVAR	M65 BOMB (1000 LB GP) WITH T-142 FINS - - - - - - - MK-83 BOMB (1000 LB EX-10)	M65 BOMB (1000 LB GP) WITH T-142 FINS - - - - - - - MK-83 BOMB (1000 LB EX-10)	NAA TYPE I OR III 200 GAL DROP TANK PLUS TWO 5 IN. HVAR	Above 25,000 feet: Maximum attainable. Below 25,000 feet: Mach .85. No continuous rolls. - - - - - - - Above 25,000 feet: Maximum attainable. Below 25,000 feet: 550 knots IAS or Mach .95, whichever is lower. No continuous rolls.	+5.0 −2.0
		SPECIAL STORE PYLON		605 knots IAS or airspeed where wing roll is excessive.	+7.33 −3.0
		SPECIAL STORE		Above 25,000 feet: Maximum attainable or airspeed where wing roll is excessive. Below 25,000 feet: 550 knots IAS or Mach .90, whichever is lower.	+7.0 −3.0
	120 GAL DROP TANK	SPECIAL STORE		IF TANK IS TYPE I OR III Above 25,000 feet: Maximum attainable. † Below 25,000 feet: 550 knots IAS or Mach .90, whichever is lower. † - - - - - - - IF TANK IS TYPE II OR IV 500 knots IAS or Mach .90, whichever is lower. No abrupt maneuvers; no continuous rolls. Rate of roll limited to 90 degrees per second.	+6.0 −3.0 - - - - - +4.0 −2.0

* The airspeed limitation is Mach 1.0 or the limit shown, whichever is lower, on airplanes without the splitter rudder and elevator.

† The 120-gallon drop tank must have the following stamped on the name plate: "T.O. 6J14-2-2-517." If this T.O. number is not stamped on the name plate, the airspeed limit is 500 knots IAS or Mach .90, whichever is lower.

F-86H-1-93-264A

Figure 5-2 (Sheet 3 of 4)



OUTBOARD STATION	INBOARD STATION	INBOARD STATION	OUTBOARD STATION	AIRSPEED LIMITATIONS *	G-LIMITS
NAA TYPE I OR III 200 GAL DROP TANK		SPECIAL STORE	NAA TYPE I OR III 200 GAL DROP TANK	Above 25,000 feet: Maximum attainable. Below 25,000 feet: 550 knots IAS or Mach .95, whichever is lower.	+6.0 −3.0
NAA TYPE I OR III 200 GAL DROP TANK	120 GAL DROP TANK	SPECIAL STORE	NAA TYPE I OR III 200 GAL DROP TANK	IF ALL TANKS ARE TYPE I OR III Above 25,000 feet: Maximum attainable. † Below 25,000 feet: 550 knots IAS or Mach .90, whichever is lower. †	+6.0 −3.0
				IF 120-GAL TANK IS TYPE II OR IV 500 knots IAS or Mach .90, whichever is lower. No abrupt maneuvers; no continuous rolls. Rate of roll limited to 90 degrees per second.	+4.0 −2.0

* The airspeed limitation is Mach 1.0 or the limit shown, whichever is lower, on airplanes without the splitter rudder and elevator.

† The 120-gallon drop tank must have the following stamped on the name plate: "T.O. 6J14-2-2-517." If this T.O. number is not stamped on the name plate, the airspeed limit is 500 knots IAS or Mach .90, whichever is lower.

F-86H-1-93-263B

Figure 5-2 (Sheet 4 of 4)

Steady-state operation—

- Exhaust temperature exceeds 650°C, even if only momentarily.

NOTE Steady-state temperature operating limit is 640°C. If temperature inadvertently drifts into the range of 640°C to 650°C, retard throttle as required to maintain temperature below the 640°C operating limit.

The temperature and duration of all overtemperature operation must be entered on the Form 781.

AIRSPEED LIMITATIONS.

LANDING GEAR AND WING FLAP LOWERING SPEEDS.

The limit airspeed for lowering the flaps and for lowering the gear is 220 knots IAS. Flight with the gear or flaps lowered above the limit speed may cause damage to the fairings, doors, or operating mechanisms.

LANDING LIGHT EXTENSION SPEED.

The landing lights are designed for extension only on the final approach after the landing gear and wing flaps are lowered. Do not lower the landing lights at speeds above 220 knots IAS.

CANOPY OPENING SPEED.

The canopy is not to be opened in flight. During taxiing, the canopy may be operated at speeds not over 50 knots IAS. If the canopy is operated at speeds above this value, damage to the canopy operating mechanism will result.

MAXIMUM ALLOWABLE AIRSPEEDS.

The maximum allowable airspeeds for the airplane are shown in figures 5-1 and 5-2. The limits shown in figure

OPERATING FLIGHT LIMITS

NO EXTERNAL LOAD

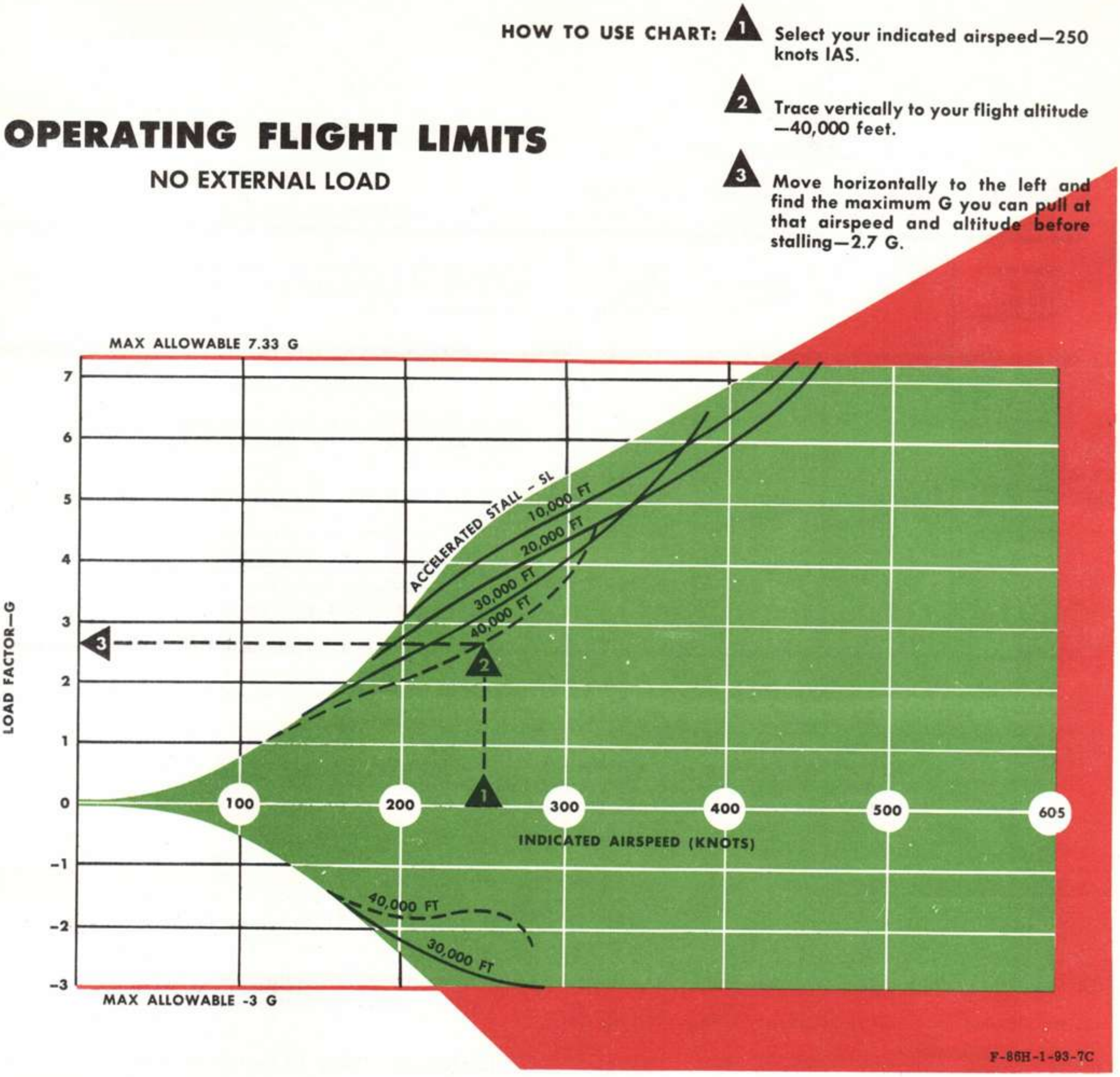


Figure 5-3

5-1 are for the airplane with no external load. The limits shown in figure 5-2 are for the airplane when carrying various external loads.

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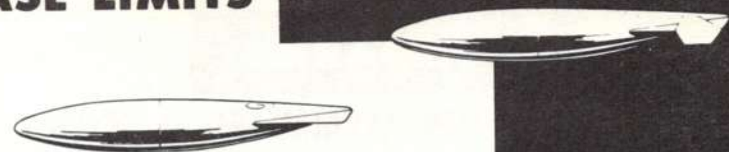
DROP TANK RELEASE LIMITS



NOTE: For asymmetrical release limits, refer to "Asymmetrical Stores Limitations" in this section.

DROP TANKS	STATION	STORES CARRIED (Single or dual)	ORIGINAL FIN	STUKA FIN (Fin with end plates)
TYPES I, II, III, OR IV 200-GALLON	OUTBOARD	SINGLE OR DUAL	Full tanks ······ Drop at any speed in symmetrical (no-roll) flight at 1.0 G. Empty or partially full tanks ······ Not recommended for drop; however, in emergency, drop as near cruising speed as practicable.	Full tanks ···· Drop at any speed in symmetrical (no-roll) flight at 1.0 G.
TYPES I, II, III, OR IV 120-GALLON	OUTBOARD	SINGLE	Full tanks ······ Drop at any speed in symmetrical (no-roll) flight at 1.0 G. Empty or partially full tanks ······ Drop at any speed above 220 knots IAS in symmetrical (no-roll) flight at 1.0 G.	Empty or partially full tanks ····· Drop at any speed above 220 knots IAS in symmetrical (no-roll) flight at 1.0 G.
	OUTBOARD	DUAL	Not recommended for drop; however, in emergency, drop as near cruising speed as practicable.	
	INBOARD	SINGLE		Not recommended for drop; however, in emergency, drop as near cruising speed as practicable.
		DUAL		

F-86H-1-93-262

Figure 5-4

ACCELERATION LIMITATIONS.

The maximum allowable positive- and negative-G limits for the airplane are shown in figures 5-1 and 5-2. These load factor limits are for straight (symmetrical) pull-outs. The G-limits shown in figure 5-1 are for the airplane with no external load. The limits shown in figure 5-2 are for the airplane when carrying various external loads. The Operating Flight Limits diagram (figure 5-3) graphically shows G-limits for the airplane with no external load and at an average combat weight.

DROP TANK RELEASE LIMITATIONS.

The limit airspeeds for symmetrical release of drop tanks are shown in figure 5-4. These airspeeds represent the limits imposed to assure that tanks will clear the airplane when released. For limit airspeeds when jettisoning drop tanks singly, based on lateral-directional control capabilities of the airplane, refer to "Asymmetrical Store Limitations" in this section.

ASYMMETRICAL STORE LIMITATIONS.

If conditions require take-off with an asymmetrical external store loading, if an asymmetrical loading condition is encountered during flight, or if it is desired to drop a single store from a symmetrical loading condition in flight, the penetration limitations given in figure 5-5 should be observed. It should be noted that there is a definite relationship between drop tank release limits given in figure 5-4 and asymmetrical store penetration limits given in figure 5-5. While you may safely fly down to a certain low speed with the airplane asymmetrically loaded and still maintain adequate lateral-directional control, you cannot jettison the 200-gallon drop tanks with stuka fins at the same speed, since the tank will not separate cleanly from the airplane.

PROHIBITED MANEUVERS.

The airplane is restricted from performing the following maneuvers:

1. Snap rolls or any snap maneuvers.

SPEED BOUNDARIES
FOR ASYMMETRICAL STORES

CONFIGURATION	ASYMMETRY AT	MINIMUM SPEED	MAXIMUM SPEED
One Store or Full Tank on One Wing Only	Outboard Station Only	150 Knots IAS	500 Knots IAS or Mach 1.0, Whichever is Lower
One Empty Tank on One Wing Only	Outboard Station Only	150 Knots IAS	525 Knots IAS or Mach 1.0, Whichever is Lower
One Full Tank or Store on One Wing and One Empty Tank on Other Wing	Outboard Station Only	150 Knots IAS	550 Knots IAS or Mach 1.0, Whichever is Lower
One Store or Full Tank on One Wing Only	Inboard Station Only	150 Knots IAS	550 Knots IAS or Mach 1.0, Whichever is Lower (Mach 0.9 with Special Store Below 25,000 Feet)
One Empty Tank on One Wing Only	Inboard Station Only	150 Knots IAS	560 Knots IAS or Mach 1.0, Whichever is Lower
One Full Tank or Store on One Wing and One Empty Tank on Other Wing	Inboard Station Only	150 Knots IAS	565 Knots IAS or Mach 1.0, Whichever is Lower (Mach 0.9 with Special Store below 25,000 Feet)
Two Stores or Two Full Tanks on One Wing Only	Inboard and Outboard Stations	170 Knots IAS	450 Knots IAS or Mach 0.9, Whichever is Lower
Two Empty Tanks on One Wing Only	Inboard and Outboard Stations	170 Knots IAS	525 Knots IAS or Mach 0.9, Whichever is Lower
Two Stores or Two Full Tanks on One Wing and Two Empty Tanks on Other Wing	Inboard and Outboard Stations	170 Knots IAS	470 Knots IAS

NOTE

- Any airspeed limitations for a symmetrical configuration which is more restrictive than those shown above should also prevail for asymmetrical configurations.
- As a precaution against failure of any combination of stores to release, observe the speed boundary for the most asymmetrical configuration which can result when either symmetrical or asymmetrical store drops are to be made. In addition, any more restrictive drop tank release limit given under "Drop Tank Release Limitations" in Section V shall prevail when dropping tanks.

F-86H-1-93-41E

Figure 5-5

2. Intentional spins with external loads installed.

3. Continuous rolls when certain external loads are installed. (See figure 5-2.)

NOTE Inverted flight, or any maneuver resulting in negative-G, must be limited to 10 seconds duration, as there is no means of ensuring a continuous flow of fuel while the airplane is in this attitude. At high altitudes (35,000 feet and above), maneuvers which produce negative-G forces may cause engine flame-out, because of fuel starvation resulting from engine fuel pump cavitation.

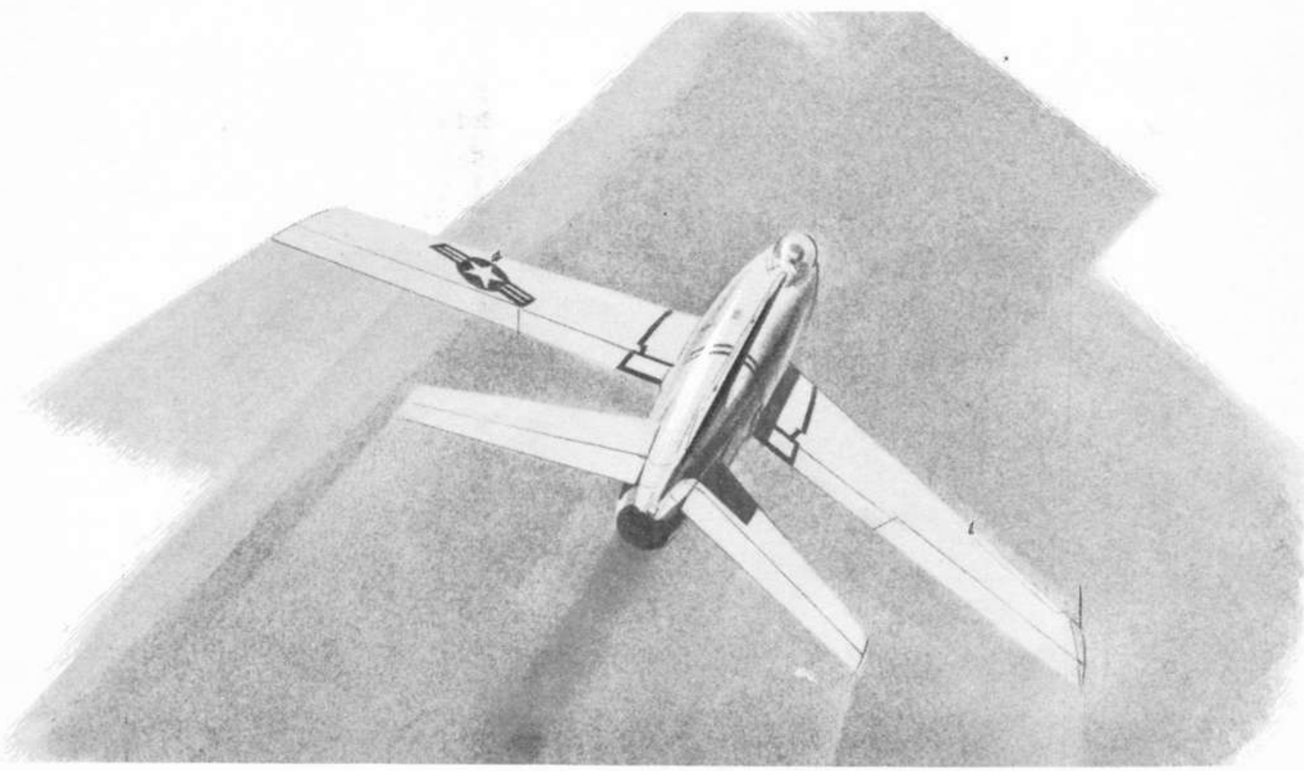
CENTER-OF-GRAVITY LIMITATIONS.

Since there is no in-flight control of CG position (other than the normal expenditure of ammunition and release of external loads), major factors affecting CG position must be checked before flight—for example, the installation of guns and ammunition. If any guns or ammunition are removed from the airplane, refer to Weight and Balance Data Techanical Manual, T.O. 1-1B-40, to check that proper ballasting has been done.

WEIGHT LIMITATIONS.

The design of the airplane precludes the possibility of overloading; consequently, there are no weight limitations to be observed so long as standard drop tanks and external armament, as described in Section IV, are carried.

Caution While there is no set maximum gross weight limit for landing, if a hard landing is made with the airplane near maximum take-off gross weight, the airplane should be inspected for signs of structural damage before the next flight.



F-86H-1-00-96

FLIGHT CHARACTERISTICS Section VI

TABLE OF CONTENTS

GENERAL.

This airplane is the latest of the Sabre series and is designed to serve a two-fold purpose as a fighter-bomber. Many of the flight qualities of the previous Sabres have been retained; however, by necessity this airplane is heavier because of a stronger airframe and the external loads it will carry. The added weight affects some flight handling characteristics, as well as increases indicated airspeeds during take-off and landing operations. The completely hydraulic flight control system enables you to handle this airplane with comfortable stick forces throughout its entire speed range. The horizontal stabilizer is somewhat larger than the previous Sabre's horizontal stabilizer, giving you very powerful pitch control. In some cases, you may find the flight controls too sensitive at first, but as you become familiar with this airplane, the light stick forces will present no problem. However, during your familiarization, be careful not to use abrupt fore and aft motions on the stick, as they may result in overcontrolling. Wing leading edge slats improve lateral-directional controllability at low speeds and reduce the stalling speed. In addition, slats increase available G-loads before stall at high altitudes and Mach numbers. The basic handling qualities have been thoroughly investigated and are included in this section. Successful handling of this airplane demands that you fully understand what it will do and the relationship of speed to weight and load factors. The airplane has no dangerous tendencies.

MACH NUMBER.

In this section, speeds are generally given in terms of Mach number rather than indicated airspeed. Speed references are presented in this form because to relate a flight characteristic to an indicated airspeed, it would be necessary to know the different airspeed for every altitude at which that particular characteristic occurred. When a flight characteristic is related to Mach number, however, the characteristic occurs at the same Mach number regardless of altitude and varies only in intensity, depending upon changes in altitude. When indicated airspeed is compared with Mach number, it will be found that the lower the altitude, the higher the indicated airspeed for a given Mach number. This higher indicated airspeed is a result of the greater pressure forces that air exerts at lower altitudes. Consequently, although a specific handling quality occurs at the same Mach number at all altitudes, the effect on the airplane

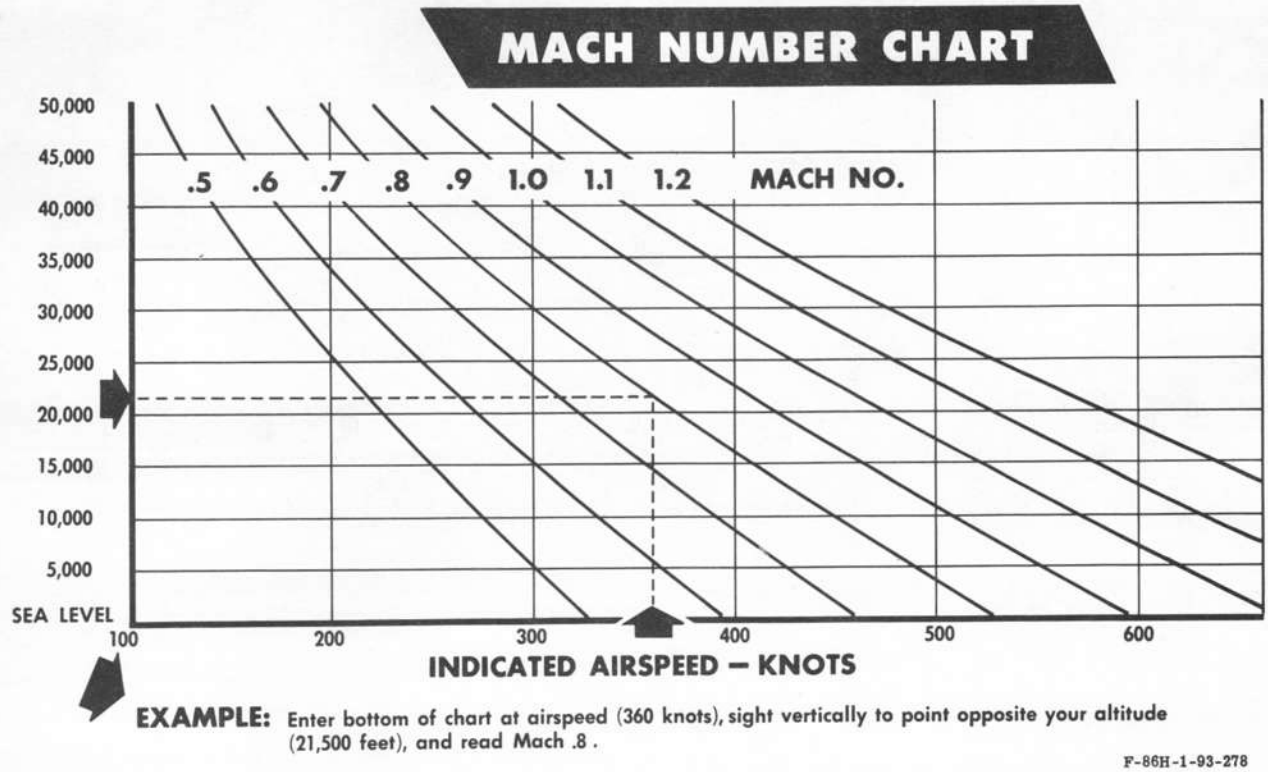


Figure 6-1

and on its control varies. At low altitudes, the effect could even be dangerous. Therefore, use of the Machmeter is very advantageous in high-speed and maneuvering flight. The Machmeter also provides an excellent means of obtaining maximum range. Maximum range is obtained by flying at high altitude and holding a constant Mach number and constant throttle setting. (The exact power setting and Mach number depend upon airplane gross weight at the start of cruising flight. Refer to nautical-miles-per-pound-of-fuel charts in Appendix I.) Constant Mach number cruising is economical, because, as fuel is consumed, reducing gross weight, the airplane climbs slightly as long as flight is maintained at the same Mach number and throttle setting. This means that at a constant Mach number, the airplane automatically seeks the optimum cruising altitude for the particular gross weight, thereby providing maximum range. If the airspeed indicator is used to obtain maximum range, you must know and select a different airspeed for each slight change in airplane gross weight. Since the airplane capabilities include high-speed, high-altitude operation, you should become very familiar with the Machmeter and know how to use it to obtain maximum performance from the airplane. A Mach number chart (figure 6-1) illustrates the variation of indicated airspeed with altitude for given Mach numbers.

STALLS.

The stall characteristics of this airplane are typical of a swept-back-wing type of fighter airplane. The swept-back wing has a characteristic of a higher angle of attack at the stalling point than you would experience in a straight-wing airplane. The stall warning in this airplane is satisfactory during approach to accelerated stalls. See figure 6-2 for stall speeds for various configurations.

UNACCELERATED STALLS.

Mild to moderate airplane buffet precedes the straight-through, unaccelerated 1 G stall. The power-on stall speeds shown in figure 6-2 (with gear and flaps either up or down) are slightly lower than power-off values for the same gross weight because of the added lift derived from engine thrust at high angles of attack. If the airplane is trimmed longitudinally into a stall, the push forces required for recovery will be high, but not uncomfortable. Unaccelerated stalls *with gear and flaps down* are preceded by a light, general airplane buffet about 10 knots above the stall and a rudder buffet of medium intensity just before the stall. Without power, the stall point will be noted by a slight pitching motion, and the nose will drop straight through without appreciable roll. Unaccelerated stalls *with gear and flaps up*

STALL SPEEDS

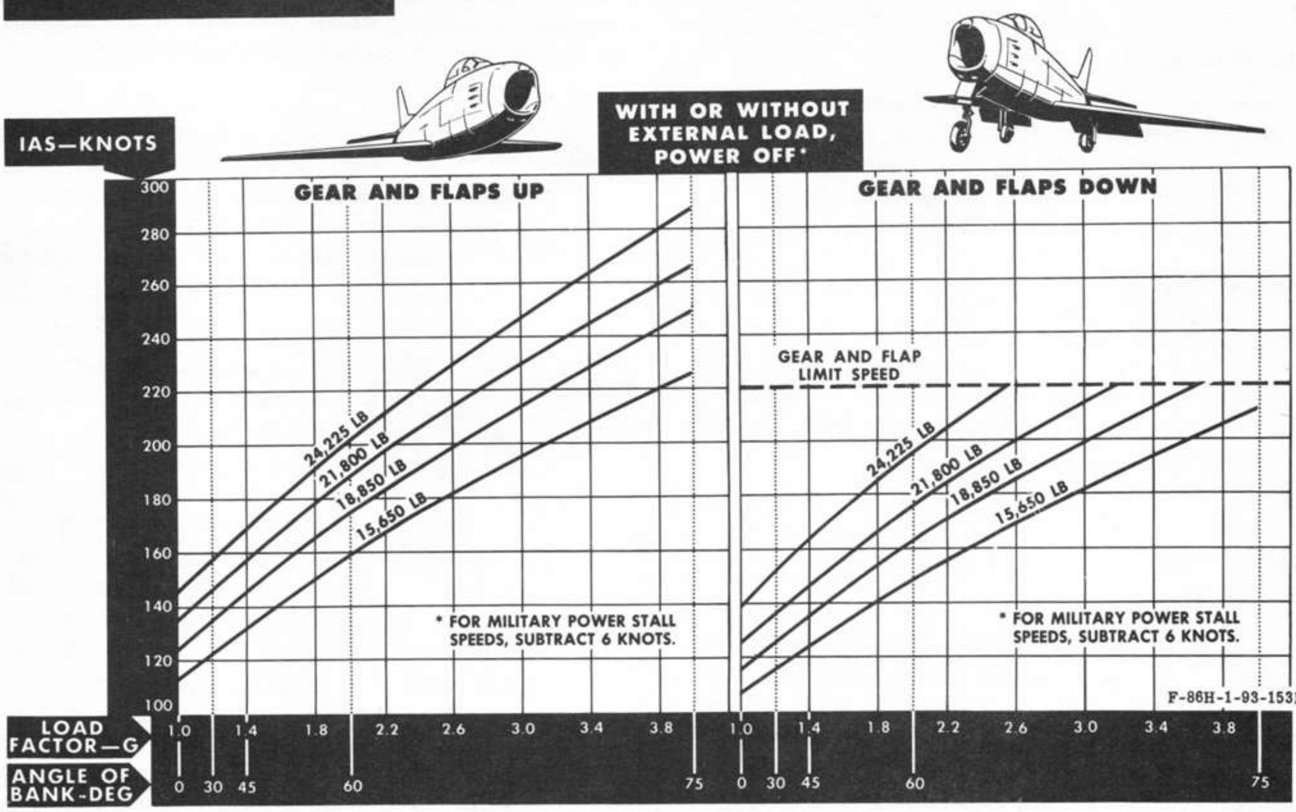


Figure 6-2

(with or without power) are preceded by a light rudder and airplane buffet about 10 to 20 knots above the stall, the buffeting becoming heavy just before the stall. The stall itself is characterized by a slight pitching, with the nose dropping as the airplane rolls about 10 degrees at the stall point.

ACCELERATED STALLS.

An accelerated stall (often termed a "high-speed stall") is primarily a stall that occurs while pulling more than 1 G. It results from pulling into a tight turn and rapidly increasing G through the buffet region to the stall point. Be alert for the buffet warning that precedes the stall.

Low-speed Accelerated Stalls.

Low-speed accelerated stalls are usually preceded by a mild airplane buffet. Keep constantly alert to detect the onset of a stall, because the mild buffet that constitutes a stall warning may escape your attention. Once a pending stall is recognized, reduce back pressure immediately and use power to avoid excessive loss of altitude near the ground.

High-speed Accelerated Stalls.

An impending high-speed accelerated stall is preceded by a distinct warning in the form of airplane buffet. As the stall is approached, you will notice a considerable increase in the buffet. The buffet will decrease noticeably when the slats open.

Warning

A high-speed accelerated stall below 25,000 feet can cause damage to the airplane, or it can cause blackout and possible loss of control.

Whenever you are pulling G, be alert for any signs of general airplane buffet; be prepared to relax back pressure and, if necesary, to apply forward stick pressure to avoid the stall. However, it is permissible to fly in the buffet region, provided you do not exceed the limit load factor of the airplane. Although the use of the horizontal stabilizer as the primary longitudinal control offers more positive control than can be obtained by means of the conventional elevator, caution still should be exercised. To prevent inadvertent high-speed accelerated stalls, do not pull back abruptly, *especially* while the speed brakes are opening. Also, do not trim out all feel during pull-outs.

STALL RECOVERY.

Stall recovery is made in the normal manner by applying forward stick and increasing power. If the gear or flaps are down, avoid exceeding the maximum permissible gear- and flaps-down airspeed during stall recovery.

PRACTICE STALLS.

During a stall and recovery, the *normal altitude loss will vary from 500 to 2000 feet.* Because you might accidentally kick the airplane into a spin during these maneuvers, stalls should not be practiced below 15,000 feet altitude.

SPINS.

NORMAL SPINS.

The airplane has been spin-tested with no external load, 200-gallon drop tanks installed, gear and flaps up, gear and flaps down, speed brakes open, speed brakes closed, and power on and power off. Spin characteristics for these configurations are similar. The nose of the airplane pitches up at the beginning of the first turn of a spin and then pitches down as the spin develops, with the airplane rolling into the turn. Further turns result in a combined pitching and rolling oscillation. On spins to the left, the airplane in all configurations tends to hesitate halfway through the first turn in a steep, nose-down attitude before the spin continues. There is no significant difference in time per turn between ailerons neutral and ailerons with the spin. The airplane will not enter a spin if ailerons are held against the direction of spin tendency at entry condition. However, if ailerons are applied against the spin after the spin has developed, the rotational rate will increase and recovery may be delayed, even using the recommended technique. Spins to the right are generally faster than spins to the left. If a spin is accidentally entered with gear and flaps down, airspeed may exceed placard limits during recovery. Therefore, retract gear and flaps immediately upon spin recovery, to avoid structural damage. Intentional spins with external loads installed are prohibited. If a spin is accidentally entered with external loads installed, use normal recovery technique; if the spin does not stop within 1½ turns after recovery control application, jettison external loads and repeat normal recovery technique.

NORMAL SPIN RECOVERY.

To recover from a normal spin, proceed as follows:

1. Retard throttle to IDLE upon spin entry, to prevent excessive altitude loss.
2. Apply full opposite rudder, followed immediately by well forward stick and neutral ailerons.
3. If normal recovery technique fails, trim airplane nose-down and release all controls. About two turns will be required, but the airplane will recover itself.

Caution Because confusion may exist as a result of the high rotational rates during a spin, make positive control movements by orienting control positions to the cockpit, to ensure ailerons neutral and stick forward recovery.

Warning Do not hold stick back during recovery, since this will prevent recovery.

- If horizontal stabilizer is trimmed airplane nose-up, airplane may not recover "hands off." Therefore, move stick forward to assist recovery.
- Do not apply ailerons against a spin either during spin or recovery, since this will adversely affect the spin (increase the rotational rate) or, during recovery attempt, may prevent recovery.
- After recovery controls are applied, spin rotation will speed up momentarily before rotation is stopped. Do not be misled into thinking that spin recovery is not effective, and do not change control positions until you are positive recovery is not being accomplished.

Flight test data indicates that about 7000 feet is the terrain clearance required to complete a recovery from a normal spin. To effect recovery from a one-turn spin (plus a one-turn recovery and pull-out), the altitude loss will be about 6500 feet. Therefore, if you get into a spin with less than 7000 feet terrain clearance, eject, since the margin of safety is too small to try a recovery. Practice spins generally should be entered at about 30,000 to 35,000 feet altitude.

INVERTED SPINS.

Inverted spin tests have not been conducted for this airplane; however, wind tunnel tests show the following procedure should be used to recover from an inverted spin:

1. Retard throttle to IDLE.
2. Apply full opposite rudder, neutral ailerons, and full back stick as required to effect recovery.
3. Hold recovery controls steadily for at least three turns or more, if terrain clearance permits.

Warning Hold ailerons neutral during all spin recoveries, since the recovery may be prolonged by improper use of ailerons.

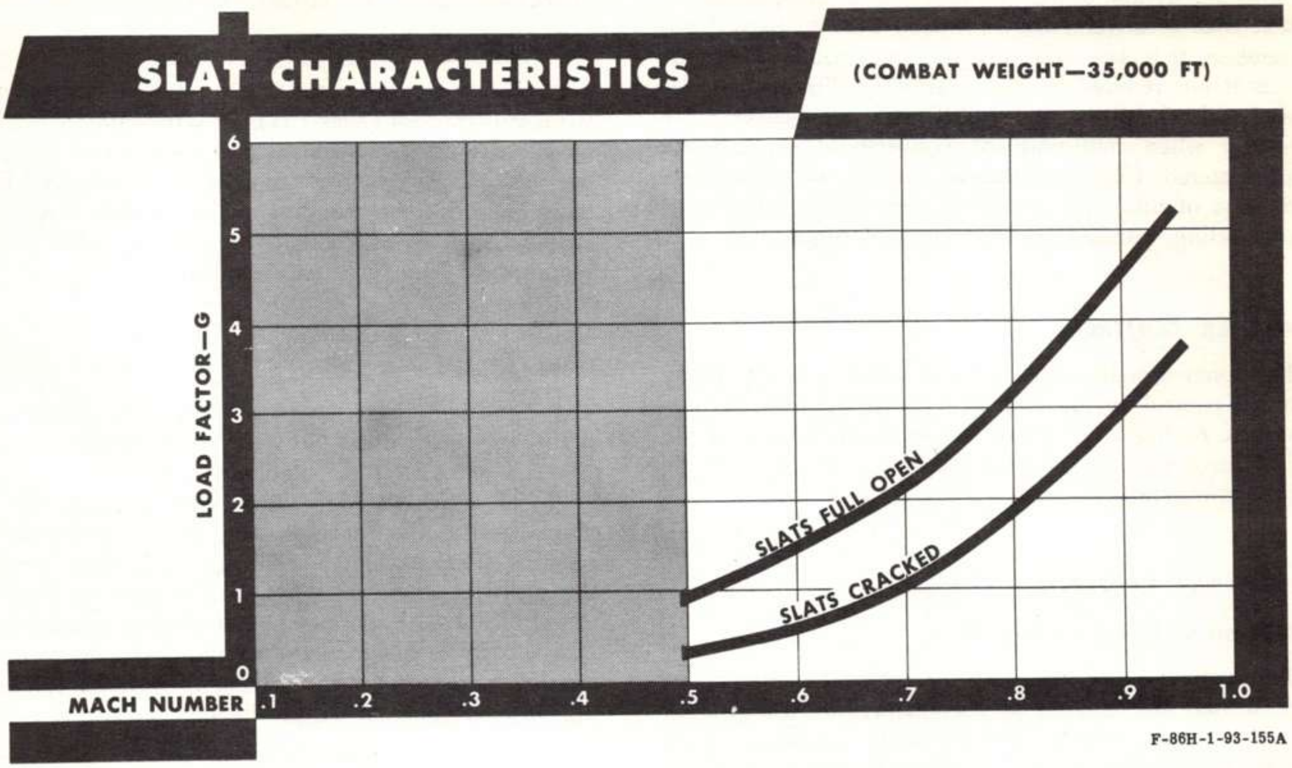


Figure 6-3

- Do not jettison external load.
- Flame-out could occur during an inverted spin, because of interrupted flow of fuel to the engine while the airplane is in the inverted position.

Caution Because confusion may exist as a result of the high rotational rates during a spin, make positive control movements by orienting control positions to the cockpit, to ensure ailerons neutral and stick back recovery.

- If landing gear is down when the spin is entered, retract gear immediately to prevent damaging gear if gear-down limit airspeed is exceeded during recovery.

FLIGHT CONTROL EFFECTIVENESS.

WING SLATS.

The slats are fully automatic in operation and, depending upon the angle of attack and airspeed, float to closed, partially open, or fully open positions. Reduction in airspeed extends the slats; conversely, increase in airspeed causes the slats to retract. Figure 6-3 graphically illustrates slat characteristics for the airplane for varying G-loads and Mach numbers when at combat weight at 35,000 feet. At recommended climb and cruising flight Mach numbers, the slats will not open. However, the slats will be open at low climb and cruise Mach numbers.

AILERON CONTROL.

In the low-speed range, the ailerons have control power similar to that of airplanes with conventional control systems. However, in the cruise Mach number region, the ailerons offer considerably greater roll ability. Until you are familiar with aileron effectiveness, be careful not to overcontrol in making abrupt or consecutive rolls. At low altitudes, however, during high-speed flight, i.e., below 5000 feet at speeds over 570 knots, the aileron control naturally becomes sluggish. The maximum rate of roll throughout the entire speed range is shown in figure 6-5. Because of the use of both a normal and an alternate flight control hydraulic system, each being irreversible, no "boost-out" provision is necessary. Therefore, in this airplane, particular care is not necessary in maintaining lateral trim. Should the flight control normal hydraulic system fail, automatic change-over to the alternate system occurs instantaneously, with no reduction in aileron control power or increase in pilot effort.

HORIZONTAL TAIL CONTROL.

In the low-speed range, controllability with the all-movable, hydraulically powered tail is comparable to that with a conventional control system. At high Mach numbers, it is definitely superior, since control effectiveness is not reduced by compressibility. This more positive and effective action enables you to recover more readily when conditions of G-overshoot or stall are encountered. Until you become familiar with the effectiveness of this type of control, use care to avoid overcontrolling, particularly in formation flight.

RUDDER CONTROL.

The conventional, cable-operated rudder provides directional control during take-off and landing at lower airspeeds. At higher airspeeds, the inherent stability of the airplane is such that coordinated maneuvers can be made with minimum use of the rudder.

TRIM TAB CONTROL.

Aileron and Horizontal Tail.

Trim tabs are not necessary on either the ailerons or horizontal tail because of the features of the type of control system utilized. The hydraulic actuators at these surfaces do not transmit air loads to the pilot; therefore, control stick feel is simulated by an artificial feel system. Actuating the related trim controls merely relocates the neutral (no-load) position of the stick so that stick forces are "zeroed" for a particular flight speed and attitude. To the pilot, this relocation of the neutral (no-load) position of the stick is identical to the result obtained from trim tab operation on a conventional control system.

Caution Do not trim into turns or aerobatic maneuvers to reduce stick forces.

Rudder.

The rudder trim tab is electrically controlled and actuated and is used to "zero" rudder pedal forces for a particular airspeed or flight attitude.

SPEED BRAKES.

Whenever deceleration is desired, and particularly in high-speed turns or during formation flight, the speed brakes may be opened without producing objectionable buffeting or changes in trim. An additional advantage in use of speed brakes is that they enable a steeper approach on a target at a given airspeed. In a pull-out, recovery may be effected with minimum altitude loss by first opening the speed brakes and then pulling the maximum permissible G.

LEVEL-FLIGHT CHARACTERISTICS.

LEVEL-FLIGHT STABILITY.

The stability characteristics of the airplane during speed changes from trim (near 1 G) are satisfactory. There are no stick reversal tendencies, and stick forces are light but positive. Any increase or decrease in airspeed from trim requires corresponding push or pull forces. As altitude is increased, the stick forces required to handle the airplane tend to increase slightly.

LOW SPEED.

The handling characteristics during low-speed, level flight are satisfactory, provided you carefully control airspeed when near the stall range. Except for a high angle of attack during take-off and landing, the airplane handles like a straight-wing fighter. The stabilizer remains effective when near the stall range. Do not allow the positive response of the stick movement fore and aft to give a false sense of lateral control. Special attention should be given to the recommended take-off and landing speeds shown in the take-off distance and landing distance charts in Appendix I.

CRUISE SPEED.

In the medium- to high-speed range, handling characteristics are considered good about all three axes (roll, pitch and yaw). Compared to a conventional elevator, the controllable horizontal tail is more effective and is considerably more sensitive because of the faster airplane response to small stick movements. Therefore, it is advisable not to try close-in formation flight until you are accustomed to the control response. The airplane is noticeably more sensitive to small fore-and-aft stick motions between Mach .8 and Mach .9 at low altitudes.

HIGH SPEED.

Stability and control in high-speed flight are unaffected by compressibility up to about Mach .95, with the exception of a slight flattening tendency in the stick force gradient for 1 G flight between Mach .85 and Mach .9. At speeds about Mach .95, the normal nose-up tendency becomes more pronounced and requires steadily increasing push forces and forward stick movement to increase the speed of the airplane. As in other speed ranges, the use of the controllable stabilizer results in positive and immediate airplane reaction. The control power of this tail configuration is particularly noticeable above 500 knots IAS, especially in turbulent air. *Caution should be used until you become familiar with the longitudinal control power available in this airplane.* Wing heaviness, which may begin at about Mach .96, is controllable at medium and high altitudes. At low altitudes, however, where high indicated airspeeds are encountered, this wing heaviness may become a limiting factor. To regain positive control, reduce power, open speed brakes, and pull up to dissipate excess speed.

WING ROLL.

All F-86H Airplanes are subject to a wing-roll condition. However, this characteristic is not of much concern except on certain airplanes which exhibit a strong tendency toward wing roll at high indicated airspeeds. This so-called wing roll or wing heaviness can be caused by two different flight influences. One is an influence induced by increasing the indicated airspeeds. The other results from a reduction in aileron control at high Mach numbers. The effect of increasing indicated airspeed works as follows: Slight variations in the angle of incidence between left and right wing panels may cause you to use a little aileron to hold a wings-level attitude at low speeds. This aileron displacement causes an aerodynamic twisting moment to be applied to the wing. As the airspeed increases, so does the twisting moment, and in such a direction that more than aileron angle must be used to regain wings-level trim. More aileron angle, in turn, means more wing twist, and so on. It can be seen that if incidence variations between left and right wing panels on certain airplanes are sufficiently large, it is possible to reach maximum aileron control before obtaining maximum level-flight speed near sea-level altitudes. It is possible to alleviate this tendency, on those airplanes which need an excessive amount of aileron for trim, by rigging the wing flaps to counteract the basic roll tendency. High Mach number wing heaviness is caused as follows: The aileron effectiveness is substantially reduced at a speed beginning around Mach .95. If, for example, the effectiveness fell to one fourth of its value at low Mach numbers, and the amount of aileron required to hold the wings level at low Mach numbers were about one degree, then the amount of aileron required at high Mach numbers would have to be increased to 4 degrees. In addition to this, standing shock waves will gradually form over each wing panel and may be at slightly different chordwise locations. Since the standing shock waves can disturb the airflow behind them, they may induce a difference in lift between wing panels. This condition may add to the effect caused by the reduction in aileron control. Flap rigging to alleviate wing roll due to high indicated airspeeds will not help wing roll caused by high Mach numbers. As the airplane altitude changes, the separate effects of indicated airspeed and Mach number on wing roll will combine in varying proportions. Generally, be aware of this wing-heaviness characteristic of the particular airplane you are flying, so as to anticipate wing roll during combat at altitude, and also to make the required allowance during high-indicated-airspeed, low-level passes.

MANEUVERING FLIGHT.

MANEUVERING-FLIGHT STABILITY.

The stick forces produced during maneuvering flight are relatively uniform throughout the full speed and altitude ranges of the airplane. At very high Mach numbers and also at speeds below 200 knots IAS, the stick forces required to obtain a given G increase slightly. Although this increase in stick forces may appear somewhat unusual during your first few hours of flight time in this airplane, *the absolute maximum stick force required at all airspeeds, always remains within your normal control capabilities, since it is supplied artificially.* In addition, the use of an artificial feel system allows the high Mach number range of the airplane to be exploited fully.

MANEUVERABILITY.

Maneuvers can be done with relative ease at all Mach numbers and airspeeds. All maneuvers can be performed with very little rudder action. The airplane is near its peak efficiency in maneuvering in the climb and cruise speed range, thus ensuring excellent handling qualities and combat performance. See figure 6-4 for comparison of maximum G and the buffet initiation G for varying Mach numbers. The maximum rate of roll (figure 6-5) at any one altitude occurs near the best climb speed for that altitude, and the peak airplane G response for the pull force you exert occurs in this speed range. Although speed is of primary importance, several other factors enter into any discussion of fighter maneuverability: climb potential, radius of turn, and time to turn. Climb potential is the difference between the graphical curves of the power available and the power required for straight-and-level flight. The difference between the two curves represents the excess thrust or power available for maneuvering flight, i.e., the extra power available to increase speed, increase rate of climb, or pull more G. The point of greatest difference between the two curves is the best climb speed. For the clean airplane, this best climb speed increases from about Mach .76 at sea level to about Mach .83 at 35,000 feet, then remains constant above that altitude. The best Mach number range at any given altitude is from the best climb speed to the maximum practical speed. Therefore, to maintain the maximum possible speed advantage, always fly at or above the best climb speed in combat. Below best climb speed, the rate of climb falls off rapidly and it also takes much longer to accelerate to high speed.

TURNING-RADIUS CONTROL.

Radius of turn or time to turn is important because it determines whether you can bring your guns to bear on a target or cease being a target yourself. At any constant

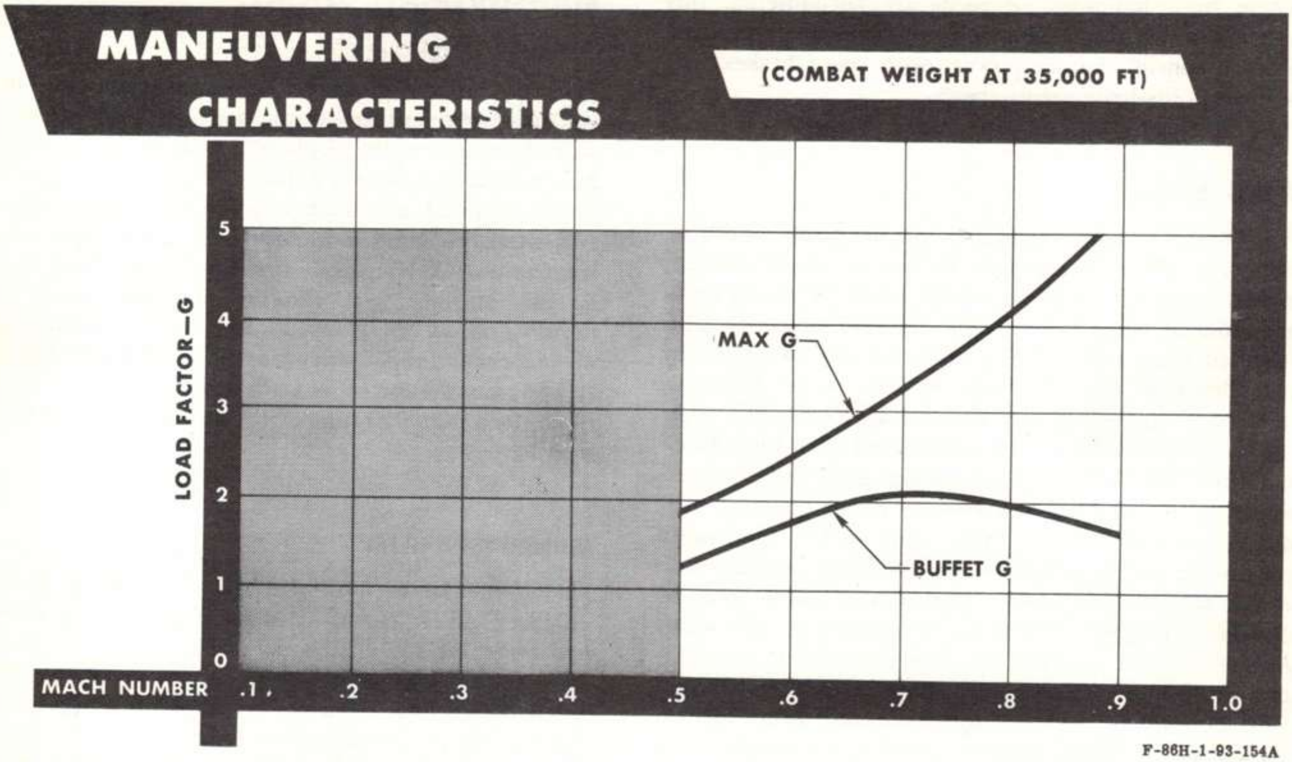


Figure 6-4

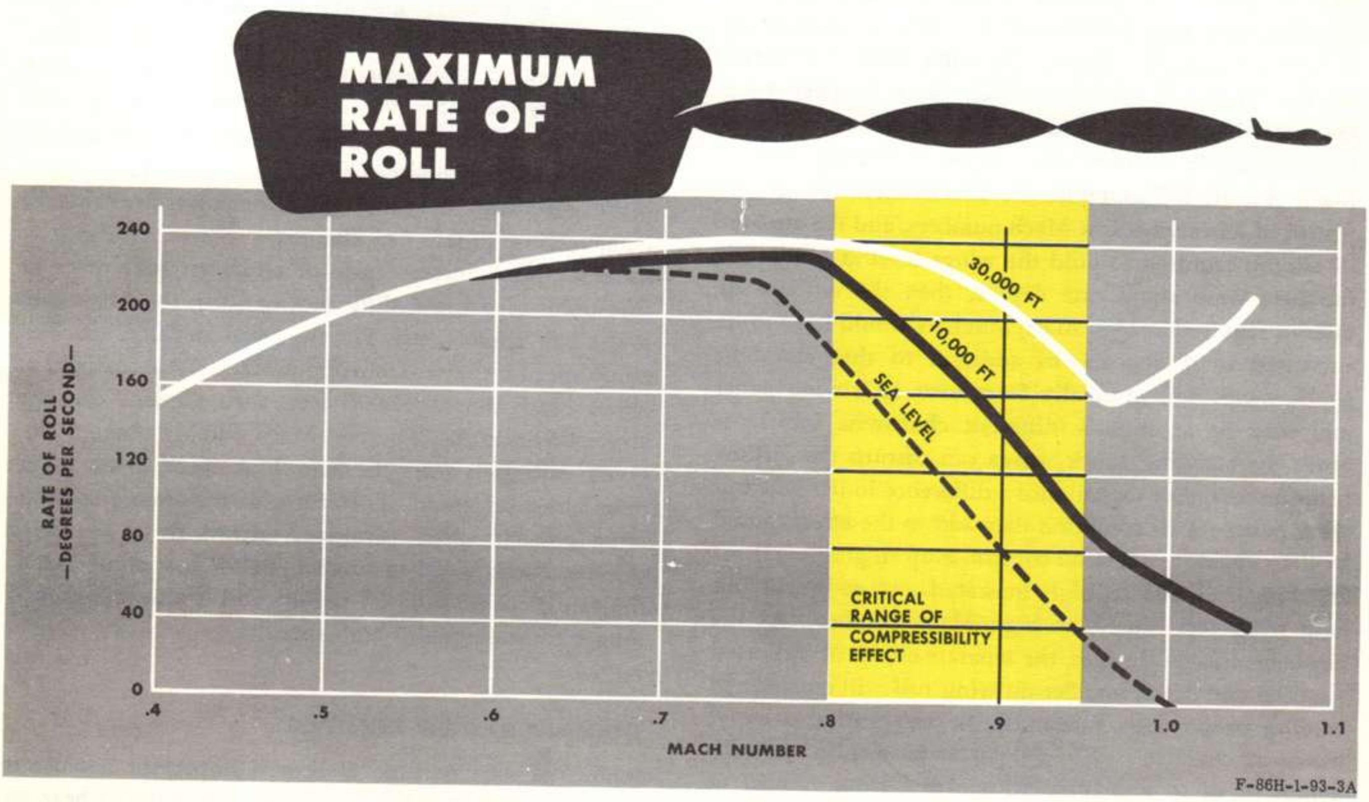


Figure 6-5

Mach number, radius of turn increases with an increase in altitude and also increases with an increase in airspeed. These two factors are of primary importance to the control of turn radius, and both may be utilized to advantage in combat. If a loss of altitude is a disadvantage in combat, a reduction in speed may be used in turning-radius control. One method of slowing down is to exchange excess speed for altitude, as in a sharp climbing turn or Immelmann. Another is to pull into a maximum usable-G level turn and, if necessary, open the speed brakes as required, remembering to ease off on the stick while the brakes are opening to maintain the same G. In either case, be careful to prevent the speed from falling below the best climb speed.

RECOMMENDED SPEED FOR MINIMUM-RADIUS TURNS.

The recommended speed for minimum-radius turns is the best climb speed at any altitude. Therefore, in combat, you should not turn with a slower airplane (which generally has a lower best climb speed) because it would outturn your airplane every time. You would gain a distinct advantage by inducing a faster airplane (which generally has a higher best climb speed) to turn with you. If operating above best climb speed, open the speed brakes or lose speed by gaining altitude to make the fastest practical turn, but do not allow the speed to drop below that for best climb. If operating at or very near best climb speed, use full throttle to make the fastest practical turn, pulling only enough G to allow the best climb speed to be maintained. These, of course, are only general rules of procedure; in actual practice, situations may arise in which further loss of speed or even loss of altitude to maintain speed is desirable.

DIVES.

DIVES AND ACCELERATED FLIGHT.

In high Mach number dives and maneuvers, airplane stability is good. Stick forces are relatively light, and the airplane is easily controllable up to the limit Mach numbers and load factors that may be applied.

G-OVERSHOOT.

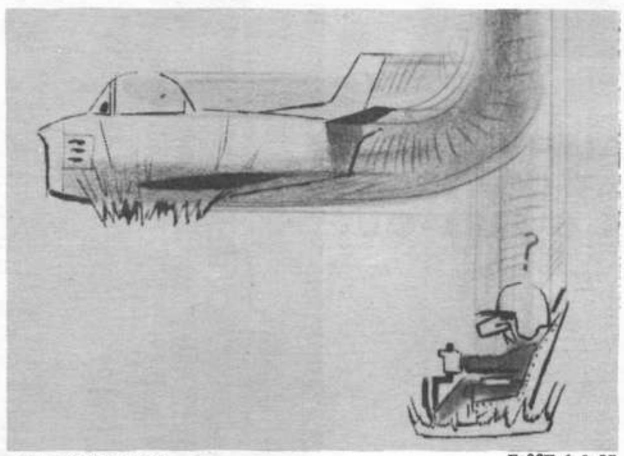
A distinctive characteristic of the airplane with which you must become completely familiar is its response to rapid pull-outs at higher Mach numbers. Because of the basic pitch characteristics at these Mach numbers, flight conditions can possibly be encountered in which the G-limit is exceeded inadvertently. The conditions at which this overshoot or "dig-in" may occur vary with Mach number, altitude, gross weight, and G. However, it is not necessary to remember the various combinations of these factors in order to avoid overshoot. The overshoot is likely to begin at the buffet boundary, that is, at the G at which you notice a distinct increase in the vibration or buffet of the airplane. This buffet increase or boundary is the warning of impending overshoot. *To avoid overshoot and resultant possible damage to the airplane, observe the G-limits of the airplane and be prepared to immediately decrease the rate of pull-out when encountering buffet.* This does not mean flight cannot be made in the buffet region, but it does mean that pulling up rapidly into the buffet region is dangerous. Familiarization with airplane response during rapid pull-outs is recommended, particularly in the medium altitude range (15,000 to 30,000 feet). Remember, although the controllable horizontal tail permits effective and positive corrective action, it does not prevent initiation of overshoot.

RUDDER BUZZ.

During high Mach number dives (about Mach 1 at high altitudes and Mach .94 at medium and low altitudes), you may encounter a high-frequency rudder vibration called "rudder buzz." This condition is not a normal characteristic and should not be considered as such. It should not occur on airplanes having the splitter rudder. If rudder buzz is encountered, reduce speed rapidly by a low-load pull-out. Any abnormal vibration during high-speed dives should be recorded in Form 781.

DIVE RECOVERY.

Because of the airplane trim changes which occur during pull-ups at high Mach numbers, the following procedure



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CAUTION

During dive recoveries at low altitude, use caution to avoid overstressing the airplane, because excellent elevator effectiveness and light stick forces make it easy to exceed the G-limitations of the airplane.

ALTITUDE LOSS IN DIVE RECOVERY

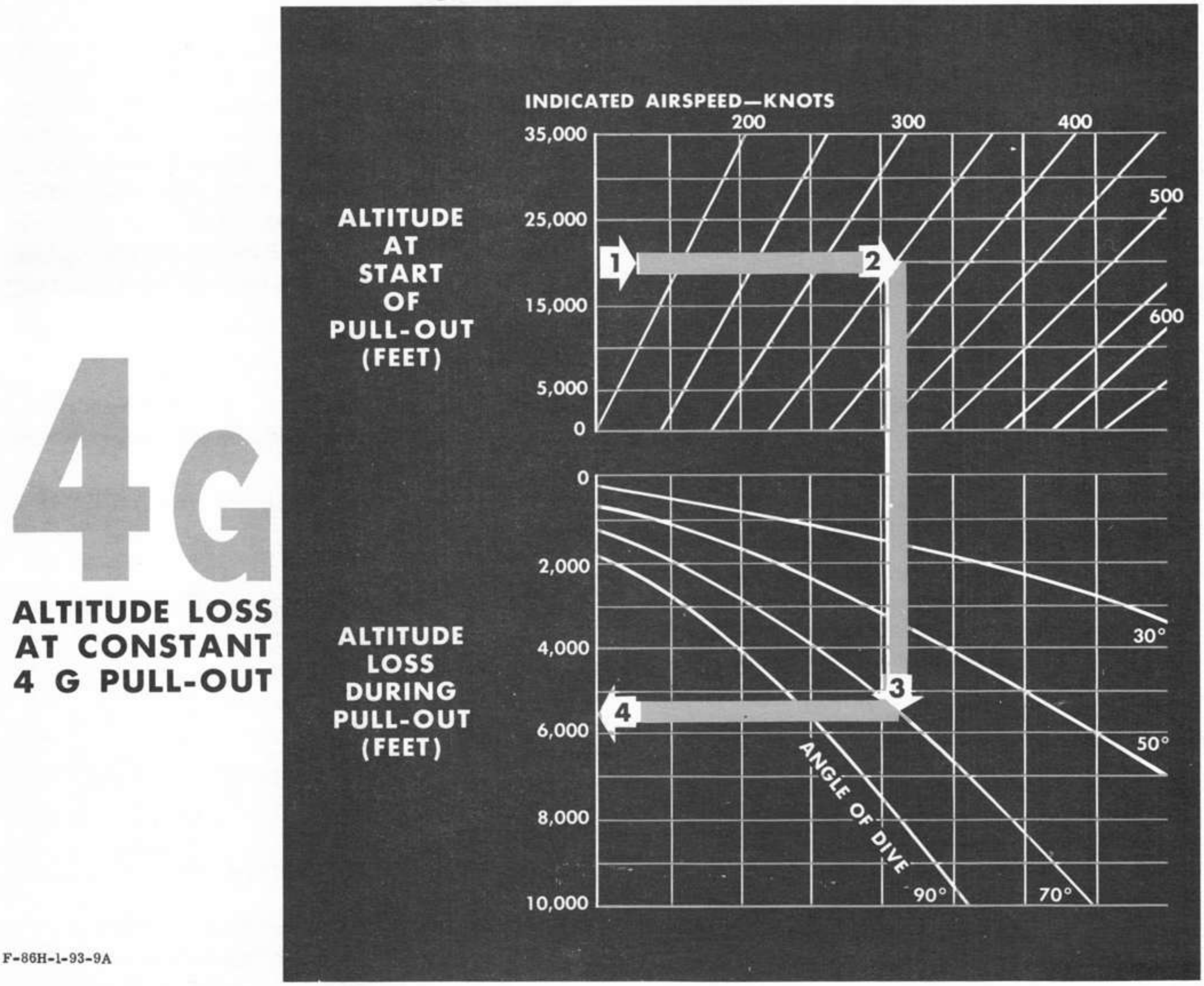

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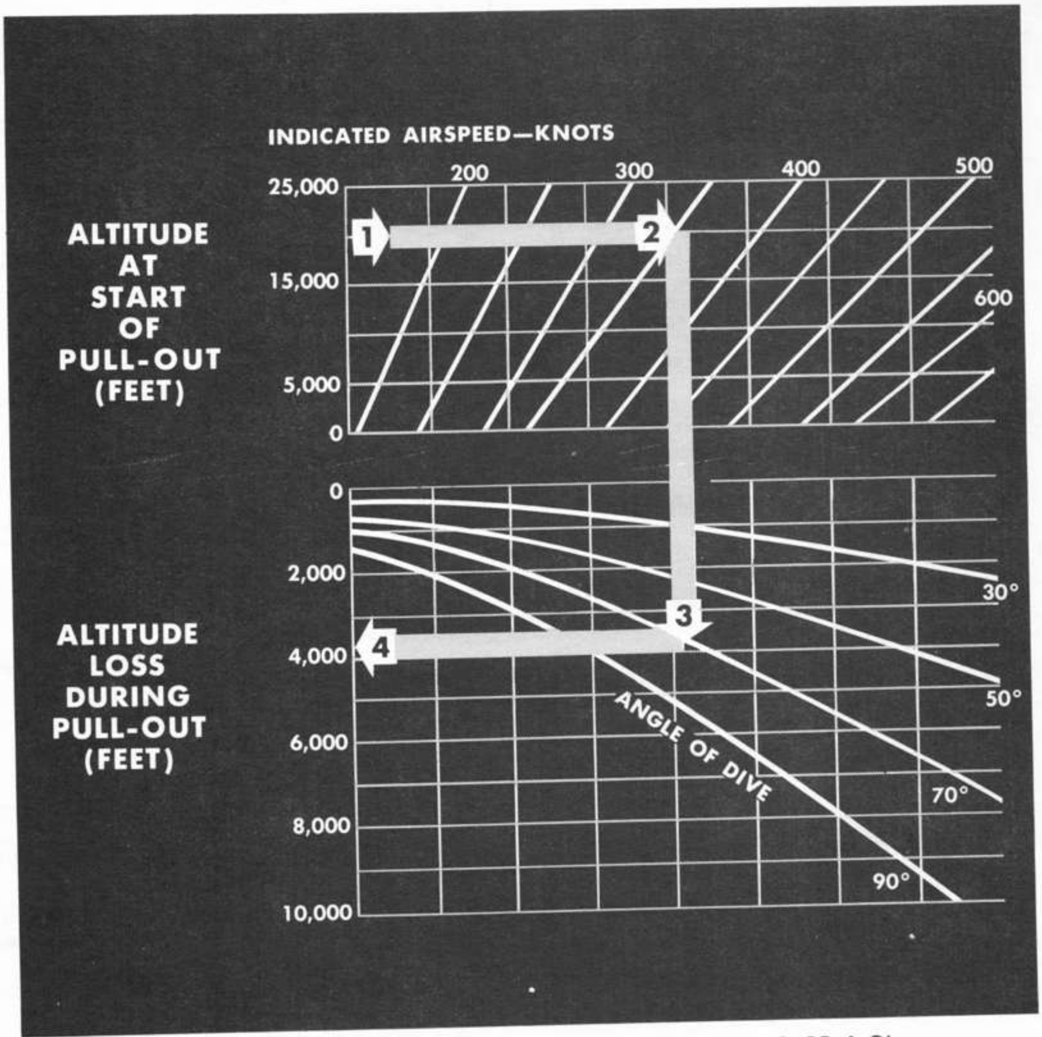
Figure 6-6

6G

ALTITUDE LOSS AT CONSTANT 6 G PULL-OUT



SELECT APPROPRIATE CHART DEPENDING UPON ACCELERATION (4 G OR 6 G) TO BE HELD IN PULL-OUT; THEN—

HOW TO USE CHARTS

1. Enter chart at altitude line nearest actual altitude at start of pull-out (for example, 20,000 feet).
2. On scale along altitude line, select point nearest the IAS at which pull-out is started (350 knots IAS).
3. Sight vertically down to point on curve of dive angle (70°) directly below airspeed.
4. Sight back horizontally to scale at left, to read altitude lost during pull-out (constant 4 G pull-out, 5700 feet; constant 6 G pull-out, 3800 feet).

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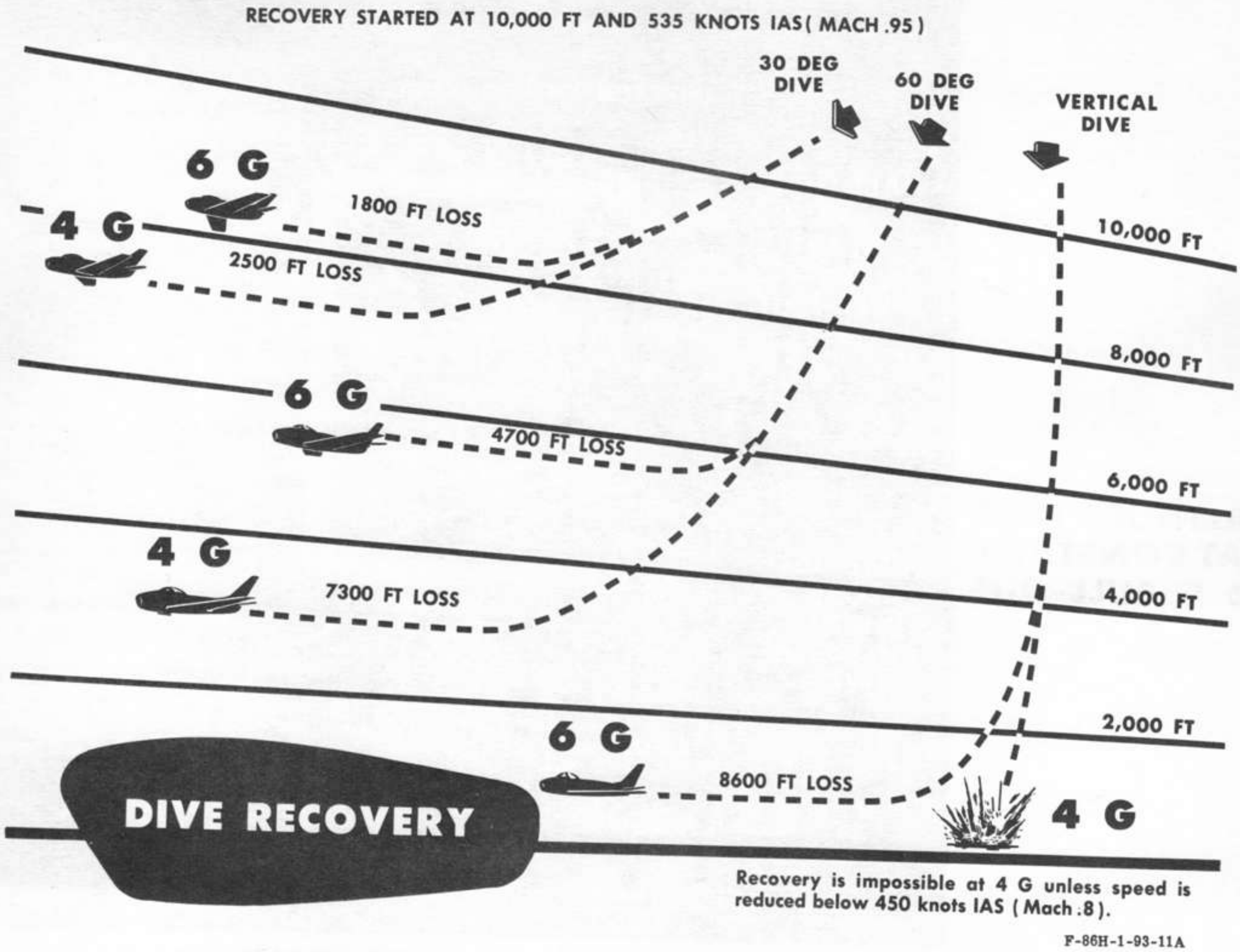

Figure 6-7

is recommended for recovering from high Mach number dives or maneuvers:

1. Open speed brakes.
2. Pull stick back as necessary to execute desired pull-out.

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 maintained during pull-out. Because these factors must be considered collectively in estimating the altitude required for recovery from any dive, their relationship is best presented in chart form, as shown in figure 6-6. Note that one of the charts is based on a 4 G pull-out, and the other on a 6 G pull-out. Compare the altitude lost during a recovery from a 4 G pull-out with that lost during recovery from a 6 G pull-out; also compare the effects of variations in the other three factors.

Remember that a value obtained from either chart is the *altitude lost during recovery—not the altitude at which recovery is completed.* Therefore, in planning maneuvers that 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. In using the charts, allow for the fact that without considerable experience in this airplane, you cannot determine exactly what your dive angle and speed are going to be at the start of the pull-out. If you come out of a split "S" or other high-speed maneuver in a near-vertical dive, speed builds up rapidly. Consequently, until you know the airplane well, go into the chart at the highest speed and dive angle you might expect to reach after completing your maneuvers. If, for instance, you are in a 90-degree dive at an airspeed above Mach .8 and you wait until 10,000 feet above the terrain to start your pull-out, you will have to make a 6 G pull-out; a 4 G pull-out will not permit

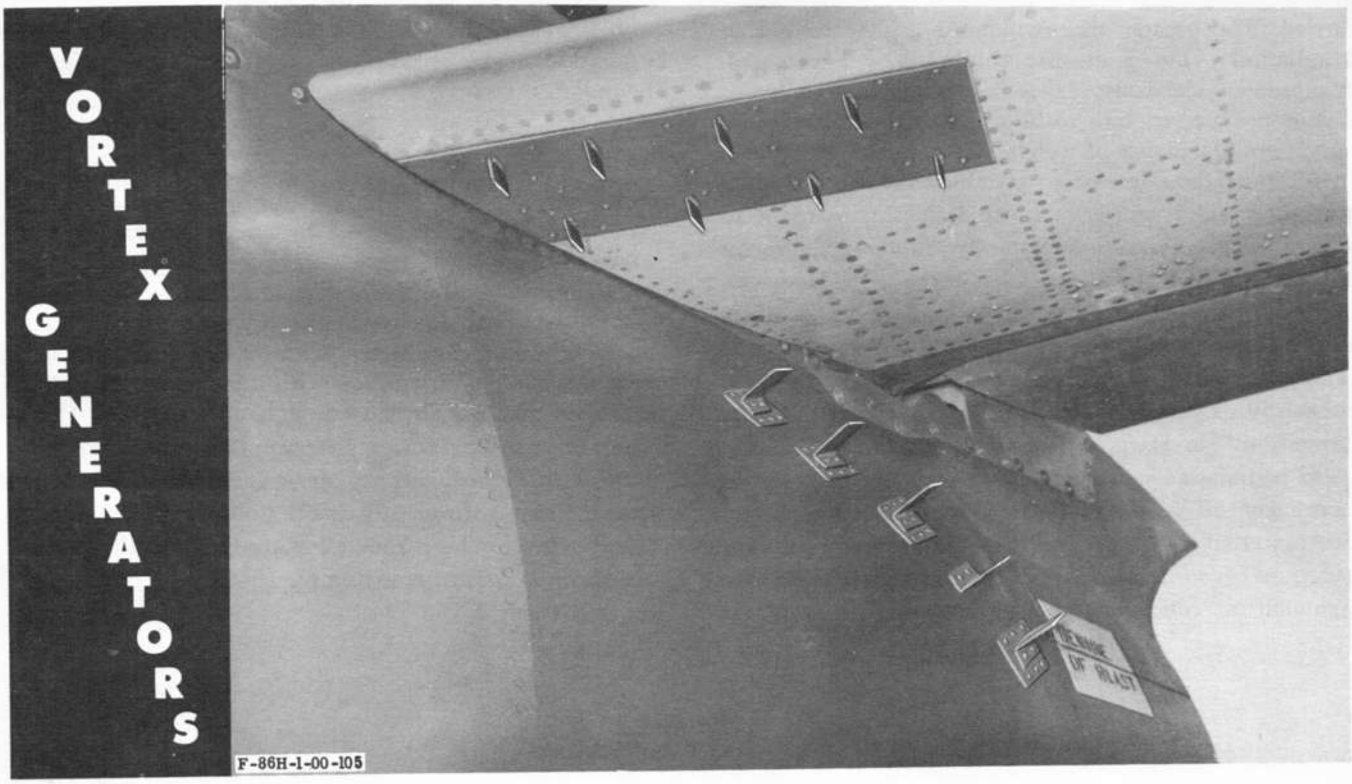

Figure 6-8

you to clear the terrain. (See figure 6-7.) Maneuvers should be planned so that if they end in a near-vertical dive, the airplane may be pulled on through to a shallower dive angle before the speed becomes excessive, or too low an altitude is reached.

NOTE It is a good idea to memorize a few specific conditions from the dive charts so that you have a basis for judgment on pull-outs.

LETDOWN.

Normally, the most economical letdown speed with a clean airplane is Mach .8 with the throttle at IDLE. For emergency letdown, descent can be made in minimum time by a vertical dive (power on, if available), and the rate of descent is limited only by the maximum allowable airspeed or Mach number.

FLIGHT WITH EXTERNAL LOADS.

Flying qualities of the airplane are essentially unaffected by drop tanks or externally mounted armament. However, because of the increased drag and weight when external stores are carried, naturally take-off distances will be greater and rate of climb and acceleration will be reduced. Also, maximum level flight and diving speeds will be somewhat lower than for the clean airplane, the reduction in speed depending on the type of stores carried. Airplane stability and control are unaffected by the presence of rockets, and dives up to the maximum speed obtainable can be performed without difficulty. Excessive buffeting of the wing flaps, aileron vibration, or lateral oscillation, depending on the type of external stores carried, will be present at speeds in excess of the established limits. (Refer to "Airspeed Limitations" in Section V.) Vibration or oscillation increases as Mach number increases and, at slightly higher Mach numbers, the buffeting becomes so pronounced that it can be felt in the control stick. Bomb dropping is evidenced by a momentary pitch-up of the airplane; however, the pitch-up is not objectionable, since the airplane immediately returns to trim.

ASYMMETRICAL STORE EFFECTS.

Adding a drop tank or armament store under the wing alters the flow or pressure distribution around the wing in that area so that there is a loss in lift. The actual number of pounds of lift lost because of the presence of the store grows rapidly as the indicated airspeed increases. The ailerons steadily lose their power as the indicated airspeed increases, because the wings twist when they are deflected. It may be anticipated, therefore, that at some high indicated airspeed, the ailerons no longer would be able to hold the wings level if asymmetrical stores were carried. The greater the asymmetry (either weight or installation), the more the condition is aggravated. A minimum speed also exists below which the ailerons cannot produce enough rolling moment to offset a certain lateral unbalance of weight. These effects are in roll. In addition, the effect of an asymmetrical external store configuration in yaw is to cause a sideslip in order to maintain constant heading. Naturally, rudder pedal forces become high and rudder trim has to be used. However, rudder trim loses effectiveness at high Mach numbers and, therefore, a high-speed limit is created. The effect of various combinations of asymmetrical external stores on either roll or yaw is summarized in "Asymmetrical Store Limitations" in Section V, as minimum and maximum speed boundaries between which you should stay. If you have taken off with, or somehow attained, an asymmetrical external loading configuration in flight, do not penetrate beyond the speed boundaries for the applicable asymmetrical condition; and, if you plan to make an unbalanced jettison from a symmetrical external configuration, make certain you are within the applicable boundaries.

VORTEX GENERATORS.

To minimize buffet caused by shock waves between Mach .89 and Mach .95, a series of small vanes (figure 6-8) are installed on the underside of the horizontal tail and on the fuselage below the horizontal tail. Installation of these vanes eliminates the turbulent airflow which produces the buffet; and, on with the elimination of the turbulent airflow, airplane drag is also reduced. These vanes are termed "vortex generators" because they generate small whirlpools of air, commonly called "vortexes." These vortexes stir up the slow-moving air found close to the fuselage, thus allowing the smooth flow of air to continue further aft on the fuselage before becoming turbulent.

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Section VII

SYSTEMS OPERATION

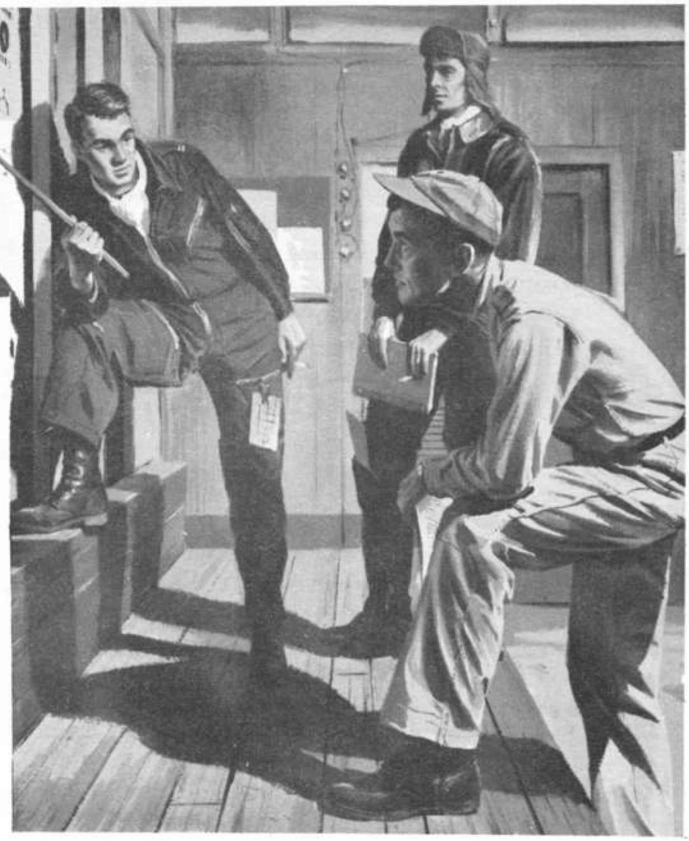


TABLE OF CONTENTS PAGE

COMPRESSOR STALL.

The possibility of compressor stall is unlikely during operation on the main fuel system. However, in the event of main fuel regulator malfunctions, improper fuel scheduling, or inlet guide vane failure in the open position, a compressor stall may occur during any rapid advancement of the throttle. Should the main fuel regulator function incorrectly, rapid throttle advancement may inject more fuel into the combustion chambers than the engine can safely use for acceleration at the existing rpm. The burning of this additional fuel increases the pressure ratio across the compressor, beyond the point where the compressor can operate in an unstalled condition. Stall occurs because of attempting to exceed the amount of "lift" of which the individual compressor stages or blades are capable. During stall, an alternate breakdown and build-up of airflow occurs, resulting in a pulsating condition characteristic of stalled operation. If the engine is allowed to continue operation in a stalled condition, combustion temperatures can increase until serious damage occurs to the turbine section of the engine. A roaring, pulsating noise and heavy vibration accompany compressor stall and may precede any engine instrument indication of changing engine conditions. In addition to the pulsating noise and vibration, the following indications of compressor stall may be present, depending upon the severity of the stall: rapidly rising exhaust temperature, failure of the engine to accelerate, a long flame from the tail pipe, and loss of thrust. If the stall is encountered during a rapid engine acceleration, action should be taken to eliminate it by immediately retarding the throttle. In flight, the throttle should be readvanced slowly while carefully monitoring exhaust temperature. However, if after the throttle is retarded, exhaust temperature continues to drop below 100°C, flame-out has occurred, and an air start should be attempted. In general, injection of excessive fuel into the engine at altitudes below 25,000 feet tends to cause compressor stall. Above this altitude, flame-out usually results. The inlet guide vanes are utilized to maintain compressor airflow and pressures for optimum acceleration through the critical range (below 7000 rpm). Failure of the inlet guide vanes in the open position creates compressor flow conditions which can result in stall during rapid throttle advancement when engine rpm is in the critical range. (Failure of the guide vanes in intermediate positions results in less violent stall conditions.) The stall characteristics and recovery procedures outlined in this paragraph are applicable to compressor stall resulting from inlet guide vane failure in the open position.

Warning If compressor stall occurs during rapid throttle advancement while operating on the main fuel system, main fuel regulator malfunction or inlet guide vane failure in the open position should be suspected. Consequently, use extreme caution during the landing phase, since any attempt to rapidly increase power, if needed, will probably result in compressor stall, reduced thrust, and possibly flame-out.

FLAME-OUT.

Flame-outs are just what the name implies and are caused by combustion chamber fuel-air mixtures that are either too rich or too lean to support combustion, or by complete fuel starvation. These conditions leading to a flame-out may be the result of a system component malfunction. However, flame-outs can also be caused by violent throttle manipulation at high altitude or by maneuvers in which negative G is maintained for excessive periods, causing fuel starvation. Flame-outs are indicated by loss in thrust, drop in exhaust temperature, and possibly by loud noise similar to engine backfire.

GROUND TEMPERATURE STABILIZATION CHARACTERISTICS.

It is characteristic of the J73 engine to require approximately 4 to 6 minutes for engine exhaust gas temperature to rise to a stabilized maximum during operation at full open throttle (100% engine rpm) on the ground. This characteristic may be noticed on take-off, since the normal procedure is to advance the throttle to full open just prior to initiating the take-off roll; this results in an exhaust temperature during take-off of approximately 600°C.

IN-FLIGHT EXHAUST TEMPERATURE CHARACTERISTIC.

With the J73 engine, it is characteristic for exhaust temperature to tend to rise as flight altitude increases. In order to prevent exhaust temperatures from exceeding Military Power limit, it will be necessary to reduce rpm, as required, by retarding the throttle.

ENGINE FUEL CONTROLLER SPEED REGULATION.

The speed governing characteristics of the engine fuel controller may allow engine speed to decrease slightly at full throttle as flight altitude is increased. Locked throttle speed losses up to 1% rpm may be encountered during climb and are considered acceptable. In cases where such loss occurs, the regulator speed drop-off condition can readily be detected and evaluated by noting engine speed and exhaust gas temperature drop-off during climb with full throttle. The condition should not be confused with manually throttling back during climb to maintain limit exhaust gas temperature.

AMBIENT TEMPERATURE EFFECTS ON EXHAUST TEMPERATURE.

Changes in ambient air temperatures will have a related effect on operating exhaust temperature for a given adjusted engine. The effect of normal day to day outside air temperatures is negligible, but seasonal changes are taken care of by adjusting the exhaust outlet area through the use of tail-pipe segments. It has been found that on some -3F engines the range of adjustment in the exhaust outlet may not be sufficient for proper engine adjustment under extreme hot-weather conditions (100°F day and above). Therefore, on hot days, it may be necessary on these engines to retard the throttle slightly when stabilizing exhaust temperature on the ground at 100% rpm in order to maintain exhaust temperature within the maximum limit. Generally, it will be unlikely that this condition will be encountered; the engine is not usually operated at full power on the ground long enough for exhaust temperature to rise to the stabilized maximum.

NOISE AND ROUGHNESS.

Any unusual noise or roughness noticed in flight that can definitely be attributed to the engine and cannot be eliminated when the engine speed or altitude is varied, indicates some mechanical failure and requires an immediate landing. The most probable source of noise in flight is the pressurization system; when cabin pressure is dumped for a few minutes, noise should stop. If noise continues, the engine should be checked during shutdown after landing. On some airplanes, roughness may develop in the engine during operation at high power above 15,000 feet. Engine roughness can usually be eliminated if the rpm is changed; however, if the roughness continues, a landing should be made as soon as possible.

TURBINE NOISE DURING SHUTDOWN.

The light scraping or rasping noise heard during engine shutdown results from interference between the turbine buckets and turbine shroud ring. Contact of the two parts is due to the tendency of the shroud to shift and distort under varying temperature conditions induced by engine shutdown. The scraping, while undesirable, does not damage either part. To minimize the scraping, it is necessary to run the engine at 50% rpm for approximately 3 minutes before shutdown after any high-power operation (either flight or ground). If, despite this precaution, heavy scraping does occur on shutdown, no attempt to restart engine should be made until turbine temperature has dropped sufficiently to provide adequate clearance between the buckets and shroud. If start must be made when interference is suspected, have the ground crew air-motor the starter prior to starting the engine.

SMOKE FROM TURBINE DURING SHUTDOWN.

During engine shutdown, fuel may accumulate in the turbine housing, where heat of the turbine section causes the fuel to boil. (Although a turbine housing drain is provided, it may not prevent accumulation of some fuel.) Presence of this residual fuel in the engine will be indicated by emission of fuel vapor or smoke from the tail pipe or intake duct.

WHITE SMOKE.

Boiling fuel, indicated by the appearance of white fuel vapor, is not injurious to the engine, but does create a hazard to personnel, since the vapor may ignite with explosive violence if allowed to accumulate in the engine and fuselage. Therefore, all personnel should keep clear of the tail pipe for at least 10 minutes after shutdown and at all times when fuel vapor or smoke issues from the tail pipe.

BLACK SMOKE.

The appearance of black smoke out of the tail pipe after shutdown indicates burning fuel, which will eventually damage the engine and should be cleared immediately as follows:

1. Throttle OFF.
2. Fuel system selector switch at EMER (airplanes with -3D or -3E engines).
3. Battery switch ON.
4. Engine master switch ON.
5. Hold ground starter button momentarily depressed.
6. When starter operation ceases (in approximately 4 seconds), turn engine master and battery switches OFF, in that order.

TAIL-PIPE SEGMENTS.

On turbojet engines equipped with fixed-area exhaust outlets, the exhaust temperature is a direct indication of thrust output, or power, at a given speed. As the exhaust temperature is increased, the velocity of the exhaust jet is increased and, consequently, engine thrust. It is apparent that although exhaust temperature should be kept below the maximum operating limit to prevent excessive engine wear, it must be held near the limit to obtain maximum thrust output. To obtain maximum operating exhaust temperature, tail-pipe segments (figure 7-1) are added to, or removed from, the aft end of the tail pipe. These segments correctly adjust the exhaust outlet area to produce, as nearly as possible, a stabilized exhaust temperature of 640°C at 100% rpm during ground run-up. Fixed-area outlets can be adjusted for only one set of operating conditions; thus, for a majority of operating conditions, the exhaust outlet will usually be too large or too small, resulting in low or high exhaust temperatures, respectively. When tail-pipe segments are added, increased thrust will be evidenced on an engine previously operating with low exhaust temperature. The initial segments are installed at the bottom of the tail

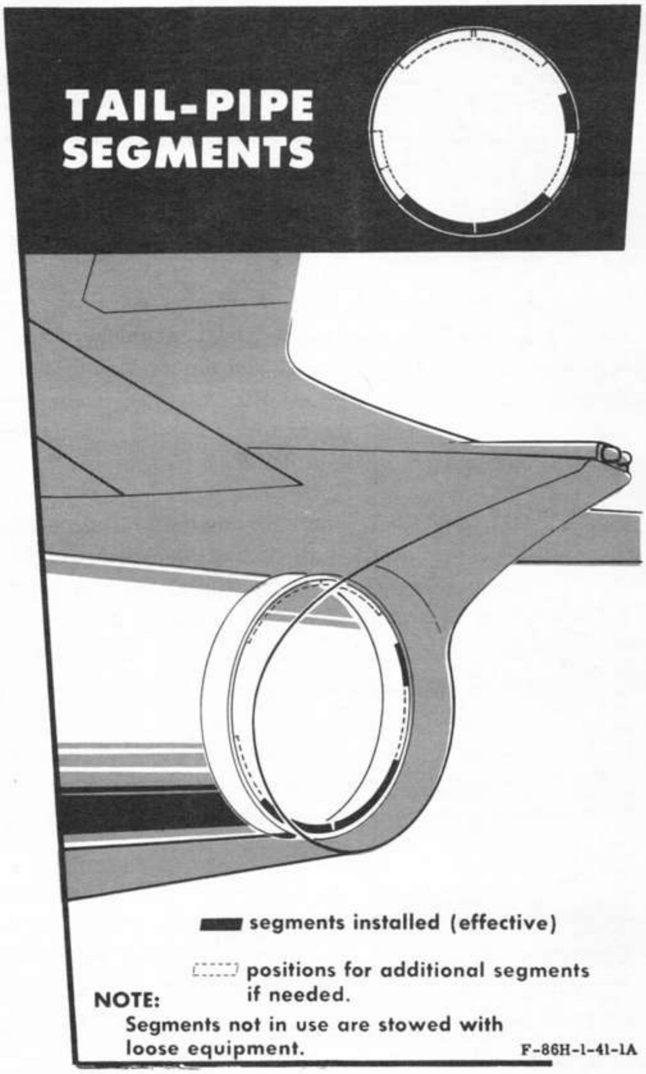


Figure 7-1

pipe. As additional segments are needed, they are installed as symmetrically as possible on each side of the tail pipe, starting from the bottom of the tail pipe. Initial segment installation beginning at the top of the tail pipe is not recommended, because it will reduce the down-tail load. Down-tail loading aids nose-wheel lift-off and is a reaction caused from the tendency of the jet exhaust stream to cling to the upper fairing shelf aft of the tail pipe. Whenever this tendency to cling is spoiled, the normal down-tail load is lost. Whenever this down-tail loading is reduced or lost, nose-wheel lift-off speed will increase substantially. Efficient minimum-run take-offs depend upon early nose-wheel lift-off; thus, if the tail-pipe segments are improperly located, a longer ground run will be required during take-off.

NOTE If more than four and one-half tail-pipe segments are installed, the exhaust temperature indicating system may not be functioning properly. If so, the engine can be operated at overtemperature condition without proper indication on the exhaust temperature gage. Therefore if more than four and one-half tail-pipe segments are installed, determine from responsible ground personnel whether the exhaust temperature indicating system has been checked.

FUEL SYSTEM.

Operation of the fuel system is essentially automatic, requiring no action from the pilot during flight. However, it is essential that the pilot keep the following precautions in mind:

1. Keep fuel selector switch at NORM for all normal operation, except during take-off and in case of actual main fuel regulator failure.

2. Use fuel from the outboard tanks first. When outboard tanks are empty, switch to inboard tanks (if carried) or turn drop tank pressure switch to OFF.

Caution If empty inboard drop tanks are retained, the drop tank pressure switch should be left at INBD to maintain pressurization to prevent possible tank collapse during descent.

After all fuel is transferred from the drop tanks, fuel from the internal tanks will be used automatically.

3. Before depressing fuel filter deicer button,* be sure fuel filter ice warning light burns steadily. As deicer alcohol supply is of 3-minute duration, deice no longer than necessary to extinguish warning light.

HYDRAULIC SYSTEMS.

Hydraulic system pressure should be checked periodically during flight. The utility hydraulic system pressure can be checked by placing the hydraulic pressure gage selector switch at UTILITY and reading the gage for proper system pressure. To check flight control hydraulic system pressure, fly straight and level for 30 seconds; then, with hydraulic pressure gage selector switch positioned at NORMAL, read flight control normal system pressure on pressure gage. Continue holding control stick steady, and position hydraulic pressure gage selector switch at ALTERN to read pressure in flight control alternate hydraulic system.

Caution The flight control alternate hydraulic system pump operates continuously as long as the manual emergency change-over handle is actuated. Decreased pump life may result from excessive periods of operation; also, drain on the battery in case of generator failure would appreciably shorten battery life. In addition, manual change-over to the alternate system may prevent return to the normal system if the change-over valve sticks. This would necessitate the duration of the flight to be performed on the alternate system. Therefore, do not actuate the manual emergency change-over handle in flight, except when the normal system fails and automatic (electrical) change-over does not occur, or just prior to entering the landing pattern when flying on the alternate system after normal system failure.

With conventional flight control systems, intermediate and maximum rate of control movements are both directly proportional to pilot effort. In constant-pressure, irreversible hydraulic systems, such as on this airplane, the rate of control movement will vary with pilot effort only until the actuator valve is completely open. Any additional effort by the pilot will not result in further increase in rate of movement. Thus, the maximum rate obtainable is not determined so much by pilot effort as by the hydraulics and kinematics of the system. With a conventional system, almost any malfunction which could occur that would limit maximum rate of control movement would also be readily apparent at some lesser rate. It would be difficult for it to continue undetected. The same is not true of irreversible systems. Should there be some restriction in rate of flow of hydraulic fluid in the irreversible system, it will not be apparent until an attempt is made to move the controls faster than the restriction will permit. Also, the rate of movement imposed by the restriction will be maximum, regardless of pilot effort. Failure to lift the nose wheel during take-off can result from the fact that the stabi-

***F-86H-1 Airplanes AF52-1975 through -1983**

lizer actuator control valves of the normal and alternate systems were not properly synchronized. If the valves are not synchronized, available control valve displacement is reduced, resulting in a corresponding reduction in maximum rate of control movement. This reduced rate would obviously restrict airplane response. The same effect would occur if restriction in hydraulic flow were caused, for example, by improper attachment of quick-disconnect fittings. Experience shows that this reduction in rate of control movement can mislead the pilot and at the same time escape detection by maintenance personnel. Whether the pilot encounters or notices the malfunction depends upon individual technique and whether the pilot desires to move the controls at a rate faster than the malfunction would permit. It is during take-off and landing that full stick deflection is most often necessary. Should the stick fail to move at the normal rate, the pilot may apply greater than normal pressure and gain the impression that he has full stick deflection. Because of the short time involved and the surprise element, the pilot may have an erroneous impression of how far the stick moved. Since a ground check will show that full stick deflection occurs (ignoring the fact that it can be moved only at a slower than normal rate), the nature of the malfunction remains undetected. Another pilot using a slower technique and not having occasion to move the stick at rapid rates will not encounter the malfunction. During nose wheel lift-off on take-off, during misjudged and consequently late flare-out on landing, and in the technique of "feeling for the runway," a pilot may assume he is getting the desired stick deflection, whereas restriction of hydraulic fluid flow for any of the reasons mentioned may actually be limiting the rate and consequently the amount of immediate stick deflection. These examples are based on use of the horizontal stabilizer, but other difficulties could also result from similar malfunctions affecting aileron control. It is important to check rate of control movement prior to flight. If the rate is slower than normal, based on experience in other F-86H Airplanes, malfunction of the flight control system, as previously described, should be suspected.

LANDING GEAR.

If the landing gear unsafe warning light should come on during flight, indicating an unsafe landing gear condition, airspeed should be reduced to below the gear-down limit airspeed before an attempt is made to correct the unsafe condition. This is necessary to prevent air loads from damaging the landing gear doors. When airspeed is below the gear-down limit airspeed, cycle landing gear down and up. If the warning light remains on after the gear is cycled several times, land as soon as possible.

WHEEL BRAKE OPERATION.

To reduce maintenance difficulties and accidents due to brake failure, it is important that wheel brakes be used properly. Frequently, operating personnel attempt to stop the airplane as quickly as possible, regardless of the length of runway. They also use the brakes consistently for speeding up turns, and they drag the brakes while taxiing. Brakes should not be used to their maximum potential to make all landing rolls as short as possible. The full landing roll should be utilized to take advantage of aerodynamic braking so that brakes can be used as little and as lightly as possible. To minimize brake wear, the following precautions should be observed insofar as practicable:

1. Immediately after touchdown or when there is considerable lift on the wings, use extreme care when applying brakes to prevent skidding tires and causing flat spots. A heavy brake pressure can result in locking the wheel more easily if the brakes are applied immediately after touchdown than if the same pressure is applied after the full weight of the airplane is on the wheels. A wheel once locked in this manner, immediately after touchdown, will not become unlocked until brake pressure has been greatly reduced. Proper braking action cannot be expected until the tires are carrying heavy loads.

NOTE Brakes can merely stop the wheel from turning, but stopping the airplane is dependent on the friction of the tires on the runway. There are two reasons for the loss of braking effectiveness with skidding. First, the immediate action is to scuff the rubber, tearing off little pieces which act almost like rollers under the tire. Second, the heat generated starts to melt the rubber and the molten rubber acts as a lubricant. If one wheel is locked during application of brakes, there is a tendency for the airplane to turn away from that wheel and further application of brake pressure will offer no corrective action. Since friction goes down when the wheel begins to skid, it is apparent that a wheel, once locked, will never free itself until brake pressure is less than the turning moment.

2. If maximum braking is required after touchdown, first decrease lift as much as possible by raising flaps and dropping nose before hard application of brakes.

3. For short landing rolls, use brakes intermittently and hard, but not hard enough to lock wheels. Apply brakes for about 2 to 3 seconds, allowing a one-second release between applications.

4. After heavy braking, such as in an aborted take-off or a heavily braked landing, do not take off again until ground crew has determined that wheel brakes have

cooled sufficiently. Otherwise, brake failure or blown tires may occur, especially when the landing gear is in the retracted position.

5. After the brakes have been used excessively for an emergency stop and are in a heated condition, do not taxi airplane into a crowded parking area. Peak temperatures occur in the wheel and brake assembly from 5 to 15 minutes after a maximum braking operation. If maximum braking has been used, notify ground personnel to cool wheel and tire assemblies immediately. Overheated wheel and brake assemblies should be cooled by means of an air blast from any source available such as a fan, blower, air compressor (except ground starting unit compressor), ground heater (utilizing the blower only, with the heating cycle turned off), etc. Cooling time may be accelerated by parking the airplane at right angles to any surface wind. If compressed air is not available to cool the wheel and tire assemblies, warn all personnel to remain clear of wheel area because of danger of possible explosion.

Warning

No attempt should be made to cool an overheated wheel and tire assembly with CO_2, water spray, foam, or any other fire-extinguishing agent, because such practice may cause the assembly to fail with explosive force.

6. If a wheel brake fire does occur, extinguish fire with a minimum amount of CB (chlorobromomethane) fire extinguishing agent. A guard should be maintained until the wheel has cooled sufficiently to preclude any danger of a reflash.

Warning

The use of CO_2, water spray, foam or any other similar extinguishing agent to extinguish a fire in wheel and tire assembly is not recommended, as thermal shock can cause the wheel to fail with explosive force. This failure can occur as long as 15 minutes after the use of the above extinguishing agents.

- When approaching the wheel with cooling apparatus, fire fighting equipment, or for inspection purposes immediately after a maximum braking operation, the approach direction should be in the plane of wheel rotation to minimize personnel danger from possible explosion.

Section VIII
CREW DUTIES

Not applicable

Section IX

ALL-WEATHER OPERATION

TABLE OF CONTENTS

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 satisfactory stability while being flown on instruments, and its flight handling characteristics during all-weather operation are satisfactory. Flight instruments provided for basic instrument flying and radio navigation enable the pilot to make low-frequency range, automatic direction finding (ADF), manual direction finding (MDF), and (PAR) type instrument approaches.

Warning Flight under IFR conditions is not recommended for airplanes not changed by T.O. 1F-86H-620 that have the MM-2 attitude indicator. On these airplanes, a slight reduction in three-phase ac or dc power, or failure of certain components in the K-4 system, will not cause the "OFF" flag to appear, even though the indicating system is not functioning properly. If IFR flight is required, periodically check the attitude indications given by the MM-2 against other flight instruments, such as the directional indicator and turn-and-slip and vertical velocity indicators. If malfunction is suspected when flying under IFR conditions, disregard indications of the attitude indicator and attempt to alter the flight path to an area of VFR conditions.

ON ENTERING AIRPLANE.

Using the command radio, check the tower, and check approach control, ground-controlled intercept (GCI), PAR, and CAA channels.

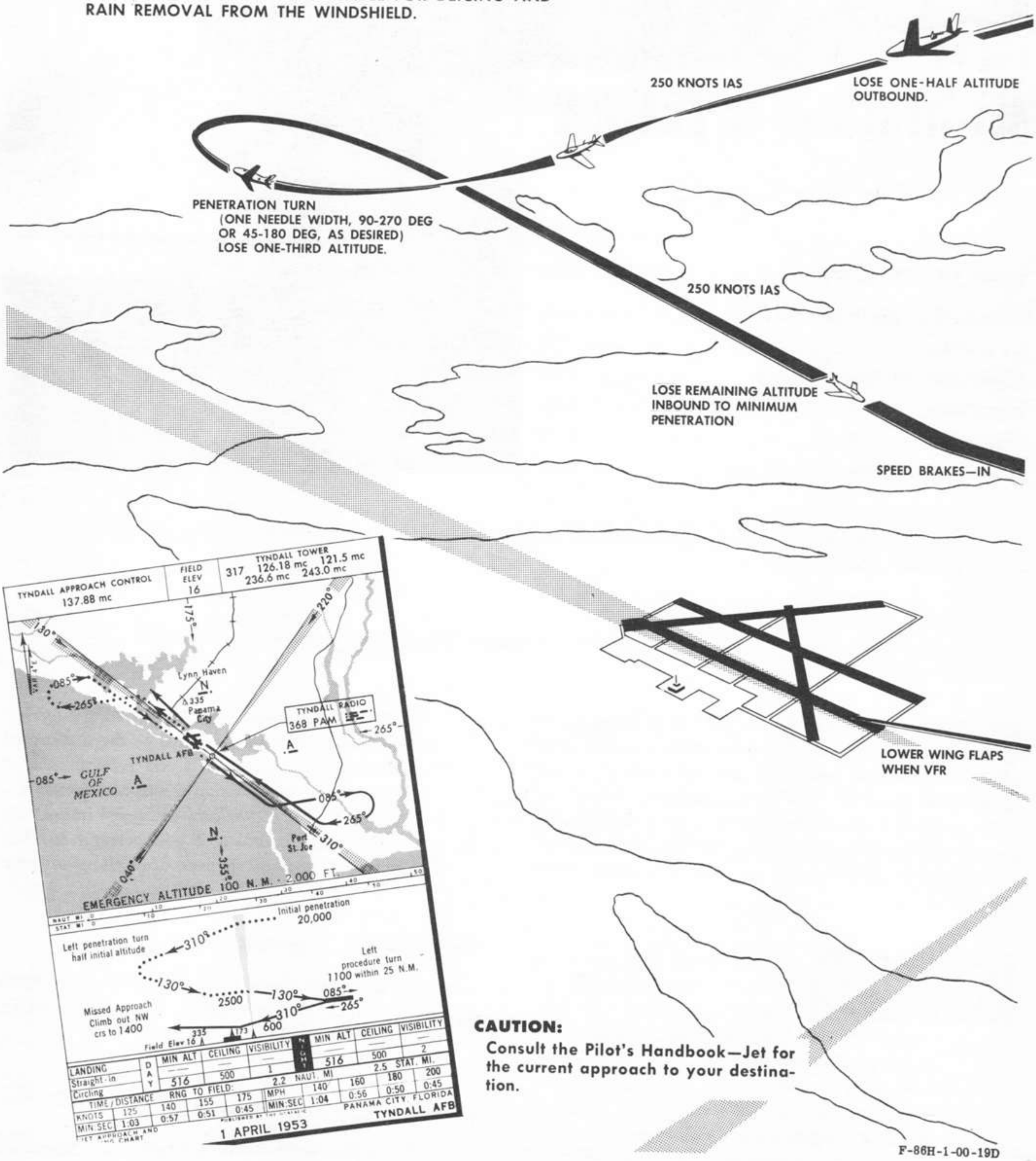
BEFORE INSTRUMENT TAKE-OFF.

1. IFF master switch—STDBY. Check operation after warm-up if radar coverage is available.

JET PENETRATION AND LOW APPROACH USING RADIO RANGE (TYPICAL)

NOTE:

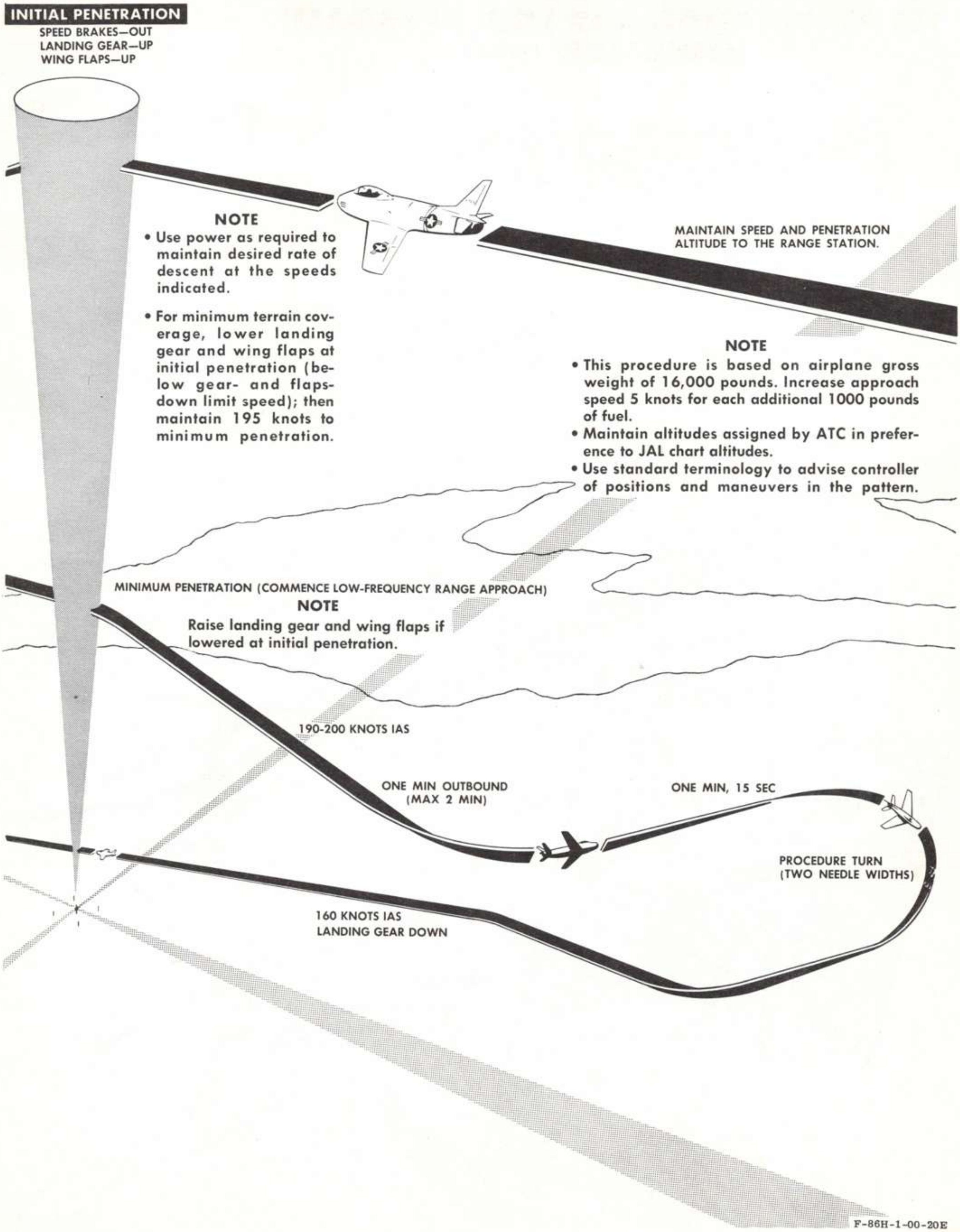
IF ICING IS ANTICIPATED OR IT IS RAINING, MAINTAIN A MINIMUM OF 75% ENGINE RPM TO ENSURE THAT SUFFICIENT AIRFLOW IS AVAILABLE FOR DEICING AND RAIN REMOVAL FROM THE WINDSHIELD.



CAUTION:

Consult the Pilot's Handbook—Jet for the current approach to your destination.

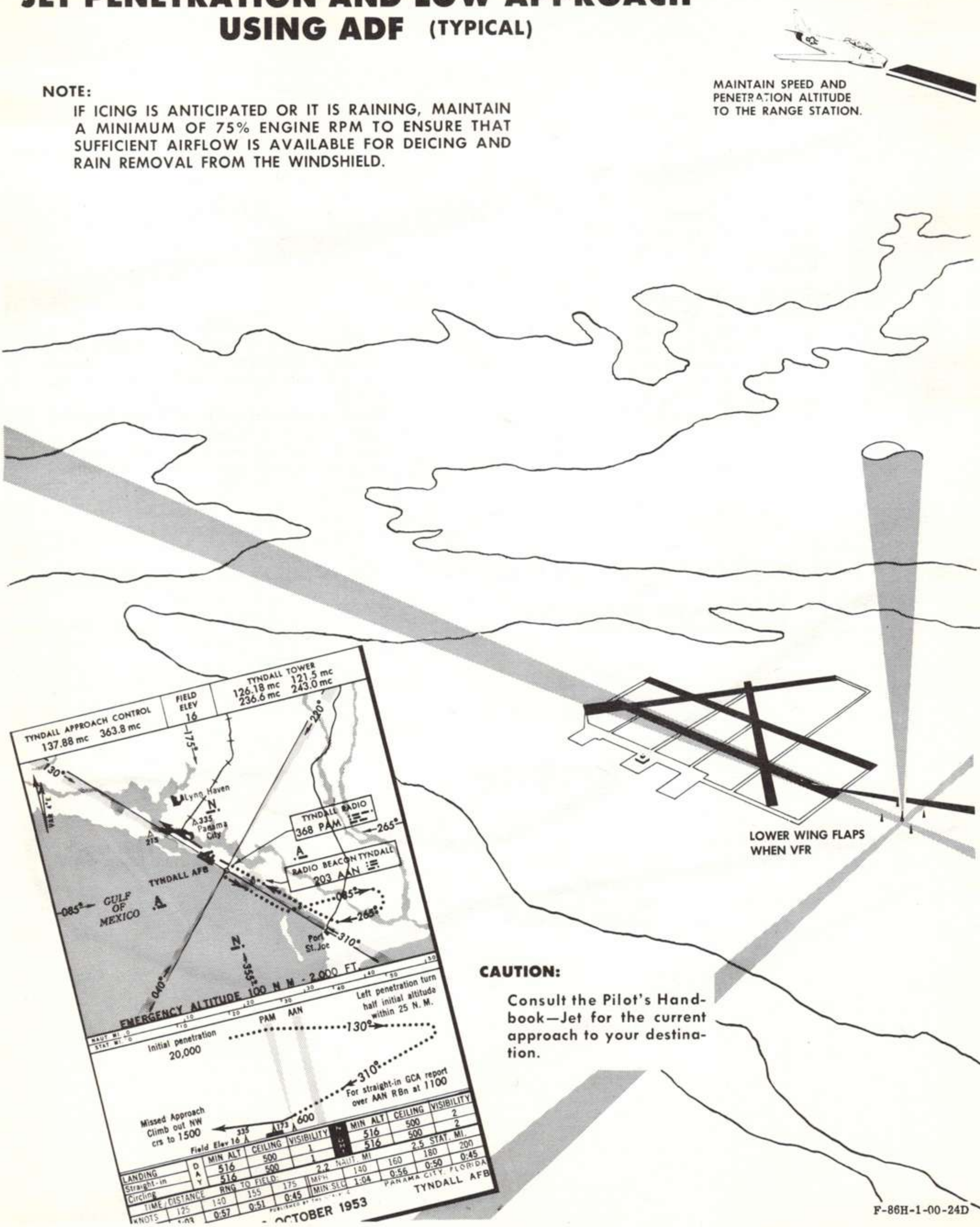
Figure 9-1


INITIAL PENETRATION
SPEED BRAKES—OUT
LANDING GEAR—UP
WING FLAPS—UP
NOTE
• Use power as required to maintain desired rate of descent at the speeds indicated.
• For minimum terrain coverage, lower landing gear and wing flaps at initial penetration (below gear- and flaps-down limit speed); then maintain 195 knots to minimum penetration.
MAINTAIN SPEED AND PENETRATION ALTITUDE TO THE RANGE STATION.
NOTE
• This procedure is based on airplane gross weight of 16,000 pounds. Increase approach speed 5 knots for each additional 1000 pounds of fuel.
• Maintain altitudes assigned by ATC in preference to JAL chart altitudes.
• Use standard terminology to advise controller of positions and maneuvers in the pattern.
MINIMUM PENETRATION (COMMENCE LOW-FREQUENCY RANGE APPROACH)
NOTE
Raise landing gear and wing flaps if lowered at initial penetration.
190-200 KNOTS IAS
ONE MIN OUTBOUND (MAX 2 MIN)
ONE MIN, 15 SEC
PROCEDURE TURN (TWO NEEDLE WIDTHS)
160 KNOTS IAS
LANDING GEAR DOWN

F-86H-1-00-20E

JET PENETRATION AND LOW APPROACH USING ADF (TYPICAL)

NOTE:
IF ICING IS ANTICIPATED OR IT IS RAINING, MAINTAIN A MINIMUM OF 75% ENGINE RPM TO ENSURE THAT SUFFICIENT AIRFLOW IS AVAILABLE FOR DEICING AND RAIN REMOVAL FROM THE WINDSHIELD.

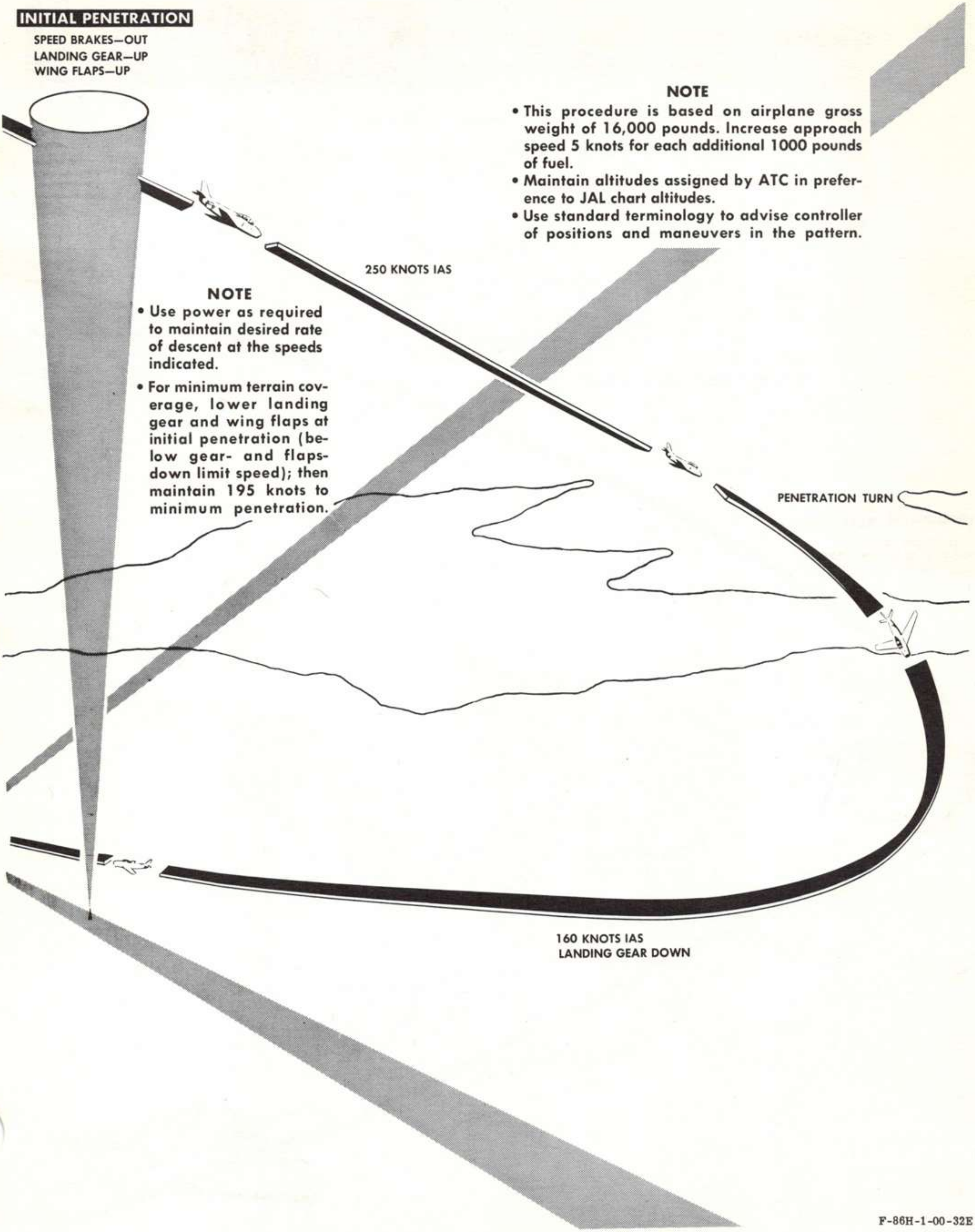


CAUTION:

Consult the Pilot's Handbook—Jet for the current approach to your destination.

F-86H-1-00-24D

Figure 9-2


INITIAL PENETRATION
SPEED BRAKES—OUT
LANDING GEAR—UP
WING FLAPS—UP
NOTE
• This procedure is based on airplane gross weight of 16,000 pounds. Increase approach speed 5 knots for each additional 1000 pounds of fuel.
• Maintain altitudes assigned by ATC in preference to JAL chart altitudes.
• Use standard terminology to advise controller of positions and maneuvers in the pattern.
250 KNOTS IAS
NOTE
• Use power as required to maintain desired rate of descent at the speeds indicated.
• For minimum terrain coverage, lower landing gear and wing flaps at initial penetration (below gear- and flaps-down limit speed); then maintain 195 knots to minimum penetration.
PENETRATION TURN
160 KNOTS IAS
LANDING GEAR DOWN

F-86H-1-00-32E

RADAR RECOVERY (TYPICAL)

ALTITUDE (FEET)	RANGE (MILES)	FUEL (POUNDS)	TIME (MINUTES)
40,000	33	*	8
35,000	29	*	7
30,000	25	*	6
25,000	21	*	5
20,000	17	*	4
15,000	12	*	3
10,000	8	*	3

RANGE (MILES) — DISTANCE FROM GATE

*THIS INFORMATION WILL BE SUPPLIED WHEN AVAILABLE.

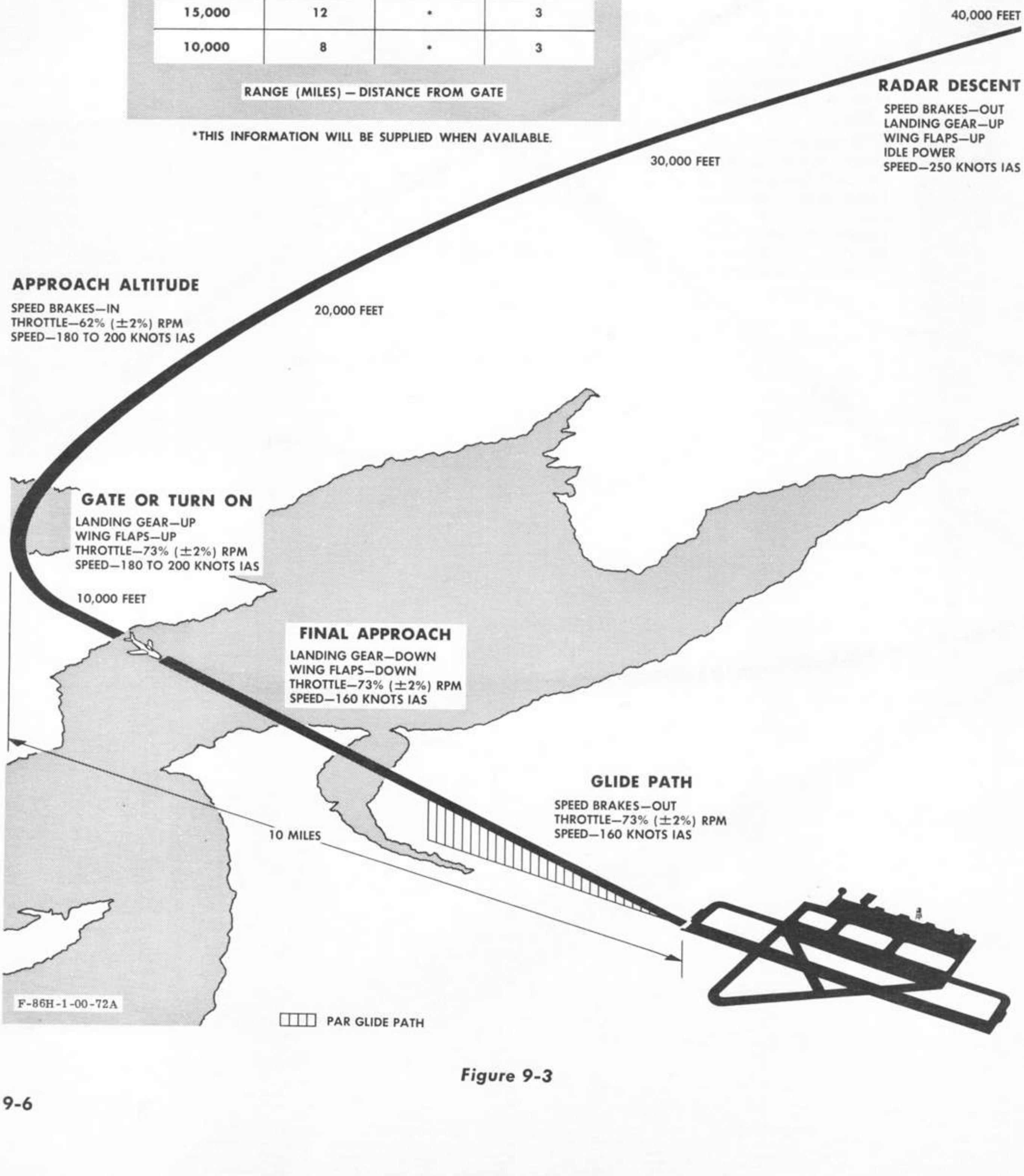
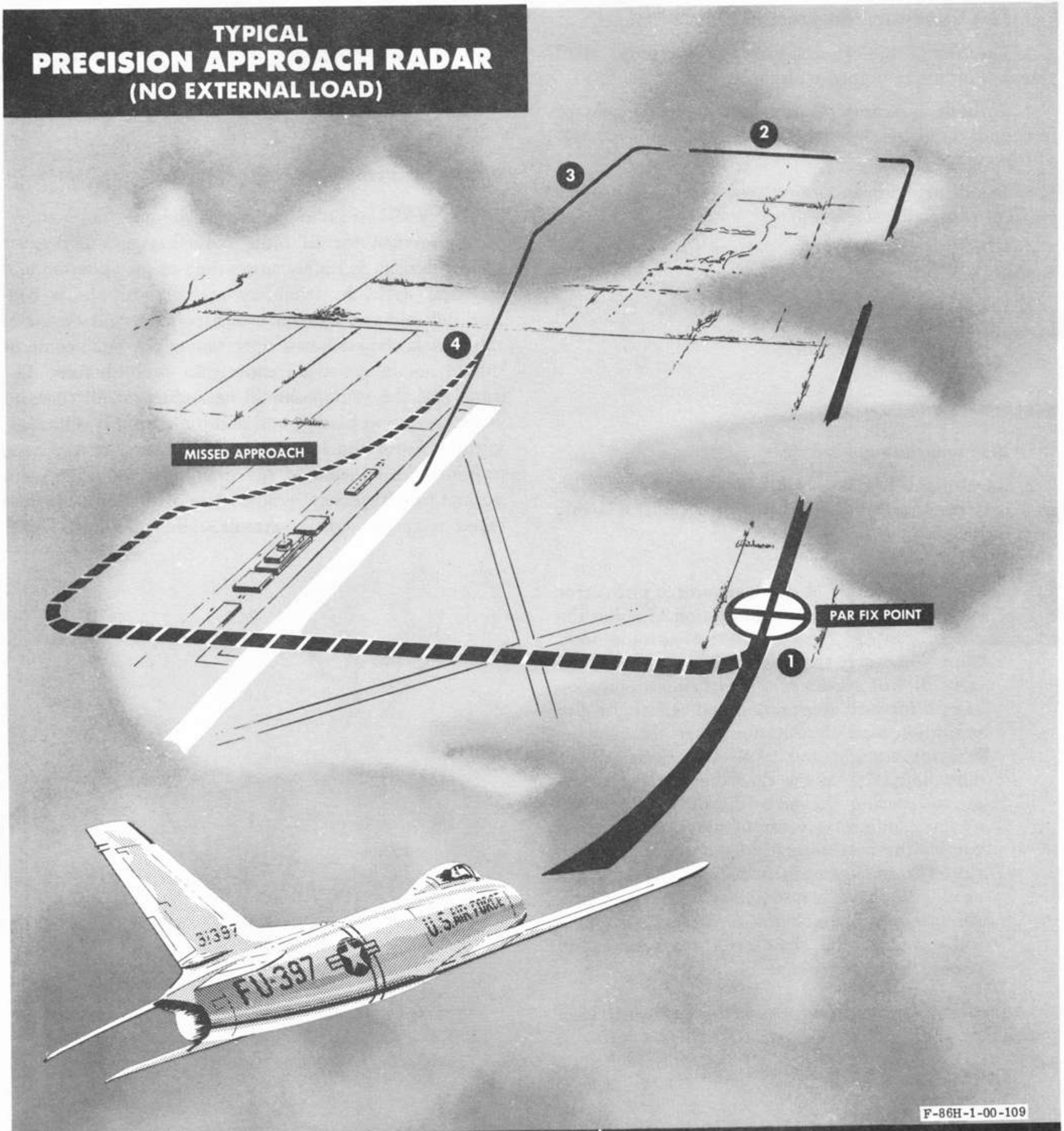


Figure 9-3



1. DOWNWIND LEG:
- THROTTLE—75% RPM
- LANDING GEAR—UP
- WING FLAPS—UP
- SPEED BRAKES—IN

2. BASE LEG:
- THROTTLE—80% RPM
- LANDING GEAR—DOWN
- SPEED—180 KNOTS IAS
- PERFORM LANDING COCKPIT CHECK

3. FINAL APPROACH:
- THROTTLE—83% RPM
- SPEED—160 KNOTS IAS
- WING FLAPS—DOWN

4. INTERSECTING GLIDE PATH:
- SPEED BRAKES—OUT
- THROTTLE—83% RPM
- SPEED—160 KNOTS IAS

TIME: 8 MINUTES

NOTE
- If fuel is critically low, request an emergency PAR pattern and delay lowering gear until on final approach.
- All turns are double-needle-width.

Figure 9-4

2. Line up visually with centerline of runway.

3. Directional indicator—Rotate course index until runway heading is aligned with top of dial.

4. Attitude indicator—Adjust reference airplane for level indication by aligning it with index on each side of instrument face.

5. Windshield rain and ice removal (anti-icing) switch —ON, if icing is expected.

6. Windshield and canopy defrost handle—INC. as needed.

7. Check engine instruments and recheck all flight instruments.

INSTRUMENT TAKE-OFF.

1. Maintain runway heading.

2. As airplane breaks ground, immediately establish an initial climb attitude on attitude indicator at a rate of 500 fpm.

Warning A slight amount of pitch error in the indication of either the J-8 or MM-2 attitude indicator will result from accelerations or decelerations. It will appear as a slight climb indication after a forward acceleration and as a slight dive indication after deceleration when the airplane is flying straight and level. This error will be most noticeable at the time the airplane breaks ground during the take-off run. At this time, a climb indication error of about 1½ horizon bar widths will normally be noticed; however, the exact amount of error will depend upon the acceleration and elapsed time of each individual take-off. The erection system will automatically remove the error after the acceleration ceases.

3. Landing gear handle—UP as soon as altimeter indicates a gain of altitude.

INSTRUMENT CLIMB.

1. Wing flap handle—UP at 160 knots IAS with a 1500 fpm climb established.

2. Holding a 1500 fpm rate of climb, accelerate to best VFR climbing speed.

3. Do not turn until 500-foot altitude above terrain is reached.

4. Limit angle of bank in turns to 30 degrees.

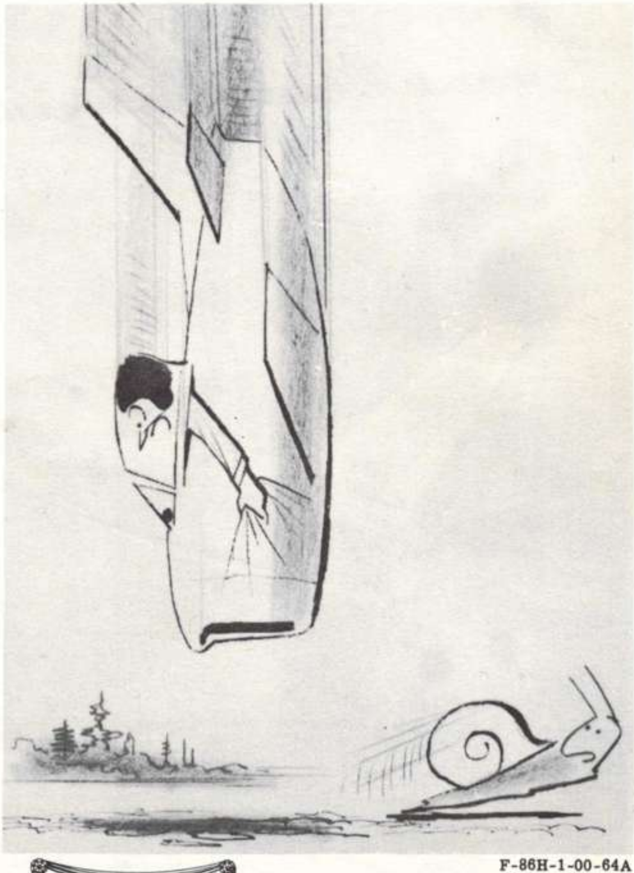
5. Maintain a careful watch for tail-pipe temperature rise for indications of intake duct icing while flying in visible moisture.

INSTRUMENT CRUISING FLIGHT.

Use normal technique and procedure for instrument cruising flight.

RADIO-NAVIGATION EQUIPMENT.

The AN/ARN-6 radio compass is the only radio equipment provided for en route radio navigation. Because this equipment is highly susceptible to precipitation and electrical static, its reliability at high altitudes is considerably reduced by thin overcasts, haze, and dust. For this reason, the automatic operation of the radio compass should not be relied on entirely to establish fixes. The signals of the station should be audited at all times to ascertain station passage and that the station is still transmitting. With the function switch turned to the ANT. position, the antenna of the radio compass serves as a normal low-frequency receiver. Use of the loop provides better reception during extreme static conditions.



F-86H-1-00-64A

Warning

It is imperative during descents that altimeter be accurately read, with particular attention given to the 1000-foot and 10,000-foot indexes.

DESCENT.

It is not recommended that descents at high Mach number be continued below 10,000 feet because of the very steep angle and high rate of descent. Instrument descent can be made with or without speed brakes extended. However, to limit the airspeed and distance covered at high rates of descent, use of speed brakes is recommended.

NOTE The windshield and canopy defrost system provides enough heating of the transparent surfaces to effectively stop formation of frost or fog during descents.

In medium to heavy rain, forward visibility will be almost completely obscured. By moving the windshield rain and ice removal (anti-icing) switch to ON, the airflow over the windshield is enough to improve vision if a minimum engine rpm of 75% is maintained. If rain is still encountered as power is reduced for landing, vision through the windshield side panels may be necessary during touchdown and roll-out.

NOTE Turn off windshield rain and ice removal (anti-icing) system after landing, to prevent windshield cracking.

Recommended Procedure.

For typical descents, proceed as follows:

1. Speed brake switch—OUT. [Return switch to HOLD (neutral) position after speed brakes are fully extended.]
2. Throttle—IDLE.

NOTE In steep dives during high rates of descent with idle power and speed brakes out, the horizon bar of the attitude indicator rises to a very high position, making accurate determination of pitch angle very difficult. The airspeed indicator becomes very important in limiting the pitch angle under these conditions.

3. Limit angle of bank to 30 degrees.

Caution A descending turn at a high rate of descent becomes progressively more difficult to control as bank angle is increased, and there is danger of falling into an uncontrolled spiral unless caution is used.

INSTRUMENT LETDOWNS.

On IFR cross-country flights, the letdown procedure at destination should be checked and fuel allowances made as part of preflight planning. For letdown procedures and approaches, see figures 9-1, 9-2, 9-3, and 9-4.

Jet Penetrations and Low Approaches.

Jet penetrations provide a high-speed and high-rate-of-descent letdown from cruising altitude to a point where a VFR approach or an instrument approach can be made.

MISSED APPROACH.

Refer to "Go-around" in Section II for missed-approach procedure.

ICE AND RAIN

Ice normally adheres to the windshield, the leading edges of the airfoils, and the forward portion of the drop tanks. Altitude should be changed immediately upon the first sign of ice accumulation. The resultant drag and weight increases associated with icing act to reduce the airspeed and to increase the power requirements with consequent reductions in range.

Warning Heavy ice accumulation will greatly increase the stalling speed; therefore, airspeed should be increased during low-altitude flight, approach, and landing under such conditions.

Icing of the engine air intake area is possible during operation in weather with temperatures near the freezing point. A reduction in fuel pressure and rpm with a loss of thrust (no mechanical difficulties present) can indicate engine icing. A major rise in exhaust temperature with a decrease in thrust is one of the normal indications of engine icing on this type of engine.

Warning Engine anti-icing is not effective below 95% engine rpm. Therefore, if in an area where icing is probable, maintain a minimum of 95% engine rpm, if possible, to prevent icing of the engine air intake area. If ice begins to form in the engine air intake area, indicated by a rise in exhaust temperature and loss of thrust, the throttle should be retarded immediately and an effort made to leave the icing area, because once ice begins to form, low airspeed and high engine rpm are most conducive to engine icing.

During take-offs into fog or low clouds, when temperatures are at or near freezing, the engine could be subject to icing. A climb should be made at higher than normal indicated airspeeds as an additional precaution. The high-speed performance capabilities of the airplane may be utilized in preventing icing formations on the flight surfaces. Flight speeds above Mach .85 ordinarily provide protection for the flight surfaces in all but extreme icing conditions. Avoid atmospheric icing conditions whenever feasible. It is recognized that the most proficient weather service cannot always predict accurately just when or where icing may be encountered. However, many areas of probable icing conditions can be avoided by careful flight planning that utilizes available weather information. If possible, avoid take-offs when the temperature is between −10°C (14°F) and 5°C (41°F) if fog is present or dew point is within 4°C (7°F) of outside air temperature. These are conditions under which engine icing can occur without wing icing. If outside air temperature is in the range of 0°C (32°F) to 5°C (41°F), the speed of the airplane should be maintained at 250 knots IAS or above to prevent intake duct icing. If icing conditions are encountered at freezing atmospheric temperatures, immediate action should be taken as follows:

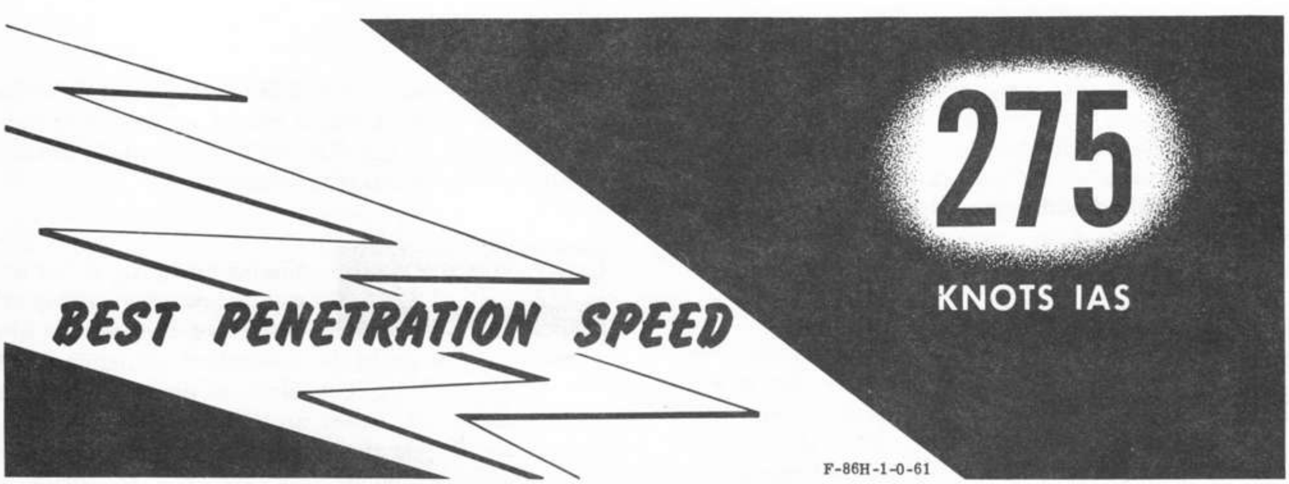
1. Change altitude rapidly by climb or descent in layer clouds, or vary course as appropriate to avoid cloud formations.
2. Reduce airspeed to 250 knots to minimize rate of ice build-up.
3. Maintain close watch of exhaust temperature, and reduce engine rpm as necessary to prevent excessive exhaust temperature.

LANDING IN RAIN.

On early airplanes,* the windshield anti-icing system airflow is capable of providing windshield and side panel clearance in a medium rain condition. A minimum power setting of 75% engine rpm is necessary for ample clearance. When the windshield overheat light illuminates, reduce engine power setting to reduce anti-icing airflow over the windshield, or place the cockpit pressure switch at RAM DUMP position. If these measures cannot be taken and windshield clearance is required, the anti-icing system should be left on. On most airplanes,† the windshield rain and ice removal system will provide ample windshield and side panel clearance in most rain conditions. The system is designed to maintain temperature of the jet airflow over the winshield and side panels within the design limits automatically. Therefore, the system may be left on as long as necessary to improve vision. The system does not include an overheat warning light. For detailed procedures on removal of ice and rain from the windshield, refer to "Defrosting and Rain and Ice Removal Systems" in Section IV.

TURBULENCE AND THUNDERSTORMS

Before entering an area of turbulence and thunderstorms, throttle and pitch attitude required for the desired penetration airspeed should be established, for they are the keys to proper flight technique in turbulent air. Throttle setting and pitch attitude, if maintained throughout the storm, must result in constant airspeed, regardless of any false readings of the airspeed indicator.



*F-86H-1 Airplanes AF52-1975 through -1990
†F-86H-1 Airplane AF52-1991 and all later airplanes

ENGINE SURGE AND FLAME-OUT CAUSED BY ADVERSE WEATHER CONDITIONS.

The following factors, singly or in combination, can cause engine flame-out:

a. Penetration of cumulus build-ups with associated high liquid content.

b. Engine icing of either nose accessory section cover or inlet guide vanes.

c. Turbulence associated with penetration can result in excessive nose-up angles of attack, causing marginal engine performance.

d. Above 40,000 feet, the surge margin of the engine is reduced, and there is poor air distribution across the face of the compressor.

Caution Flying in turbulence or hail may increase inlet duct distortion. At higher altitudes, this distortion can result in engine surge and possible flame-out. However, normal air starts may be accomplished, as outlined in Section III.

Areas of turbulent air, hailstorms, or thunderstorms should be avoided whenever possible, because of the increased danger of engine flame-out. If these areas cannot be avoided, the engine anti-icing system should be turned on before weather penetration. The exhaust temperature gage should be monitored continuously during weather penetration. The engine anti-icing system prevents the formation of ice and is not a deicer. Whenever possible, icing conditions should be anticipated in advance and the anti-icing system should be turned on to warm up the engine air inlet. If ice has already begun to build up before the anti-icing system is turned on, reduce throttle setting to minimize the danger of internal engine damage until all ice has broken off and been ingested by the engine. When the presence of ice is no longer evident, check the engine with the throttle at IDLE, and then advance the throttle to any desired setting.

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NIGHT FLYING

There are no specific techniques for flying this airplane at night which differ from those required for daylight operation.

COLD-WEATHER PROCEDURES

While still a factor for successful cold-weather operation, cold-weather postflight preparations are considerably reduced with jet engines because of the lack of oil dilution requirements and other difficulties associated with reciprocating engines. Icing conditions are not considered here. For information on icing problems, refer to "Ice and Rain" in this section. To hasten preflight inspection and ensure satisfactory operation for the next flight, normal operating procedures outlined in Section II should be followed, with the following additions and exceptions:

BEFORE ENTERING AIRPLANE.

1. Check that all surfaces, controls, ducts, shock struts, drains, etc, have been cleared of snow and ice.

Warning Check that all snow and ice is removed from the wings, fuselage, and tail before flight. Depending on the weight and distribution of the snow and ice, take-off distances and climb-out performance can be adversely affected. The roughness, pattern, and location of the snow and ice can affect stall speeds and handling characteristics to a dangerous degree. In-flight structural damage also may result, due to the vibrations induced by unbalanced loads of accumulated ice and snow.

2. Inspect lower portion of engine compressor section for evidence of ice formation on forward stator and rotor blades. If accumulation of ice can be seen or is suspected in the area of the compressor or turbine sections, check engine for freedom of rotation.

NOTE External heat must be applied to forward section of engine to remove ice. The engine should be started as soon as possible after heating, to prevent moisture from freezing.

ON ENTERING AIRPLANE.

On entering airplane, make sure that canopy can be fully closed.

STARTING ENGINE.

Caution When switching from the emergency to the main fuel system after a manual start, engine surge will occur, the magnitude depending upon how cold engine oil temperature is. In cases where the airplane has stood for long periods at extremely low outside air temperatures, overspeed can result when the switch-over is made. After a manual start, care should be taken to operate the engine on the emergency fuel system long enough to ensure safe operation on the main system before take-off. When switching over to the main fuel system, be prepared to immediately switch back to the emergency system if the engine surge is severe. Brakes will not hold the airplane on packed snow or ice, and if a violent surge occurs on switch-over, the airplane may move out of control.

WARM-UP AND GROUND CHECK.

Warning Because of low outside air temperatures, the thrust developed at all engine speeds is noticeably greater than normal. Make sure airplane is tied down securely and wheels are chocked before attempting a full-power run-up.

1. Turn on cockpit heat, and canopy and windshield defrosting system, as required, immediately after engine starts.

2. Check flight controls, speed brakes, rudder trim tab, and aileron and horizontal tail trim for proper operation.

NOTE Cycle flight controls four to six times on both the normal and alternate systems. Check hydraulic pressure and control reaction.

TAXIING.

1. Avoid taxiing in deep snow, as taxiing and steering are extremely difficult and the brakes may freeze.

F-86H-1-00-65A

CAUTION

Make sure all instruments have warmed up sufficiently to ensure normal operation. Check flight instruments for sluggishness during taxiing.

2. Increase interval between airplanes while taxiing at subfreezing temperatures, to ensure safe stopping distance and to prevent icing of airplane surfaces by melted snow and ice in the jet blast of a preceding airplane.

3. Minimize taxi time to conserve fuel and reduce amount of ice fog generated by engine.

BEFORE TAKE-OFF.

Make full power check if on a dry, clear runway; however, if take-off is started on ice or snow, make check during the initial part of the take-off roll. Do not attempt to hold the brakes while the engine is accelerating and the take-off roll is beginning, because loss of control is likely to result if one wheel begins to slide ahead of the other.

TAKE-OFF.

At low temperatures, excessive tail-pipe temperatures may result at high engine speeds and zero or low ram-air pressures. Therefore, exhaust temperatures may be a limiting factor for take-off rpm during the first part of the take-off roll. Any reduction in engine speed necessary to reduce exhaust temperature to permissible limit will be more than compensated for by the thrust augmentation resulting from increased air density; e.g., 100 percent rated thrust is reached at 94% rpm at −18°C (0°F) and at 88% rpm at −54°C (−65°F). Refer to take-off distance charts in Appendix I.

NOTE This airplane may be safely taken off with light frost on the lifting surfaces.

AFTER TAKE-OFF.

1. After take-off from a wet snow-covered or slush-covered field, operate landing gear and wing flaps through several complete cycles to prevent their freezing in the retracted position. (In cold weather, expect considerably slower landing gear operation due to stiffening of all lubricants.)

Caution Do not exceed gear- and flaps-down limit speed during the operation.

DURING FLIGHT.

1. Use cockpit heat, and canopy and windshield defrosting system as required.

2. Operate fuel filter deicing system* as required.

NOTE Since the deicing alcohol supply will last for only 3 minutes of deicing operation, make sure fuel filter ice warning light burns steadily before moving the deicing switch to DE-ICE.

DESCENT.

NOTE The windshield and canopy defrosting system heats the transparent surfaces enough to effectively eliminate frost or fog during descent.

Check engine operating temperatures during descents and in traffic pattern, as low temperatures are common at low altitudes because of frequent temperature inversions.

APPROACH.

Warning Heavy ice accumulation will greatly increase stalling speed; therefore, extreme caution must be exercised when landing under such conditions, and approach speed should be increased.

1. Make normal pattern and landing, but allow for flatter glide because of thrust augmentation caused by extremely low surrounding air temperatures.

2. Turn off all unnecessary electrical equipment at

***F-86H-1 Airplanes AF52-1975 through -1983**

least one minute before final approach, to reduce battery load when rpm is lowered and generator cuts out.

3. Pump brake pedals several times.

AFTER LANDING.

If snow and ice tires are installed, apply brakes smoothly and steadily to the point just short of locking wheels; then release and apply brakes intermittently and carefully to keep treads from filling and glazing over.

NOTE The best technique for obtaining minimum ground roll on slippery runways is to maintain a high angle of attack for as long as possible, keep the flaps fully down, and apply brakes only after the nose wheel touches the runway.

BEFORE LEAVING AIRPLANE.

1. If it is not snowing or raining, leave canopy partly open to allow circulation within cockpit, to prevent canopy cracking from differential contraction, and to decrease windshield and canopy frosting.

2. Whenever possible, leave airplane parked with full fuel tanks. Every effort should be made during servicing to prevent moisture from entering fuel system.

3. Check that battery is removed when airplane is parked outside for any extended period of time or at temperatures below −29°C (−20°F) for more than 4 hours.

4. Make sure that protective covers are installed on pitot head, canopy, and intake and exhaust ducts.

HOT-WEATHER AND DESERT PROCEDURES

Hot-weather and desert procedures differ from normal procedures mainly in that additional precautions must be taken to protect the airplane from damage due to high temperatures and sand 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 having 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 cross-wind, and shut down engine.

BEFORE TAKE-OFF.

The emergency fuel regulator normally is set to give 100% rpm on a 100°F day and does not compensate for temperature changes. If the emergency fuel system is turned on at maximum rpm when temperature is above 100°F, the engine may overspeed. The following procedure is recommended for testing the emergency fuel system before take-off at excessively high outside air temperatures.

1. Run up engine to 100% rpm with fuel system selector switch in NORM position.

2. Move fuel system selector switch to TAKE OFF position and retard throttle to below 95% rpm.

3. Check that emergency fuel-on indicator light comes on.

4. Advance throttle cautiously to stop, and check rpm against temperature as shown in figure 2-4. If rpm is within the prescribed limits, emergency system operation is satisfactory.

Caution Be prepared to retard throttle immediately if engine speed should exceed 100% rpm. If engine overspeeds (104% rpm or more), shut down engine and do not fly the airplane, since engine overhaul will be necessary.

5. Move fuel system selector switch to NORM position, to return to main fuel system operation. Check that emergency fuel-on indicator light goes out.

6. Move fuel system selector switch to TAKE OFF. Check that take-off switch-on indicator light is on.

NOTE If airplane is based at a field where normal temperature range is above 100°F, the emergency regulator should be reset to give 100% rpm at the maximum outside air temperature.

- At high outside air temperatures, it may be necessary to have tail-pipe segments reset to avoid excessive exhaust temperatures at maximum rpm.
- On some -3E engines, sufficient tail-pipe segment adjustment may not be available; therefore, it may be necessary to retard the throttle to maintain exhaust temperature within limits.

TAKE-OFF.

The increase in required take-off distances commonly associated with hot-weather operation of airplanes with reciprocating engines is even greater when the airplane is powered by a jet engine. Refer to take-off distance charts in Appendix I.

AFTER TAKE-OFF.

Follow normal flight procedures, being particularly careful to maintain a power setting that will keep exhaust temperature within its prescribed limits.

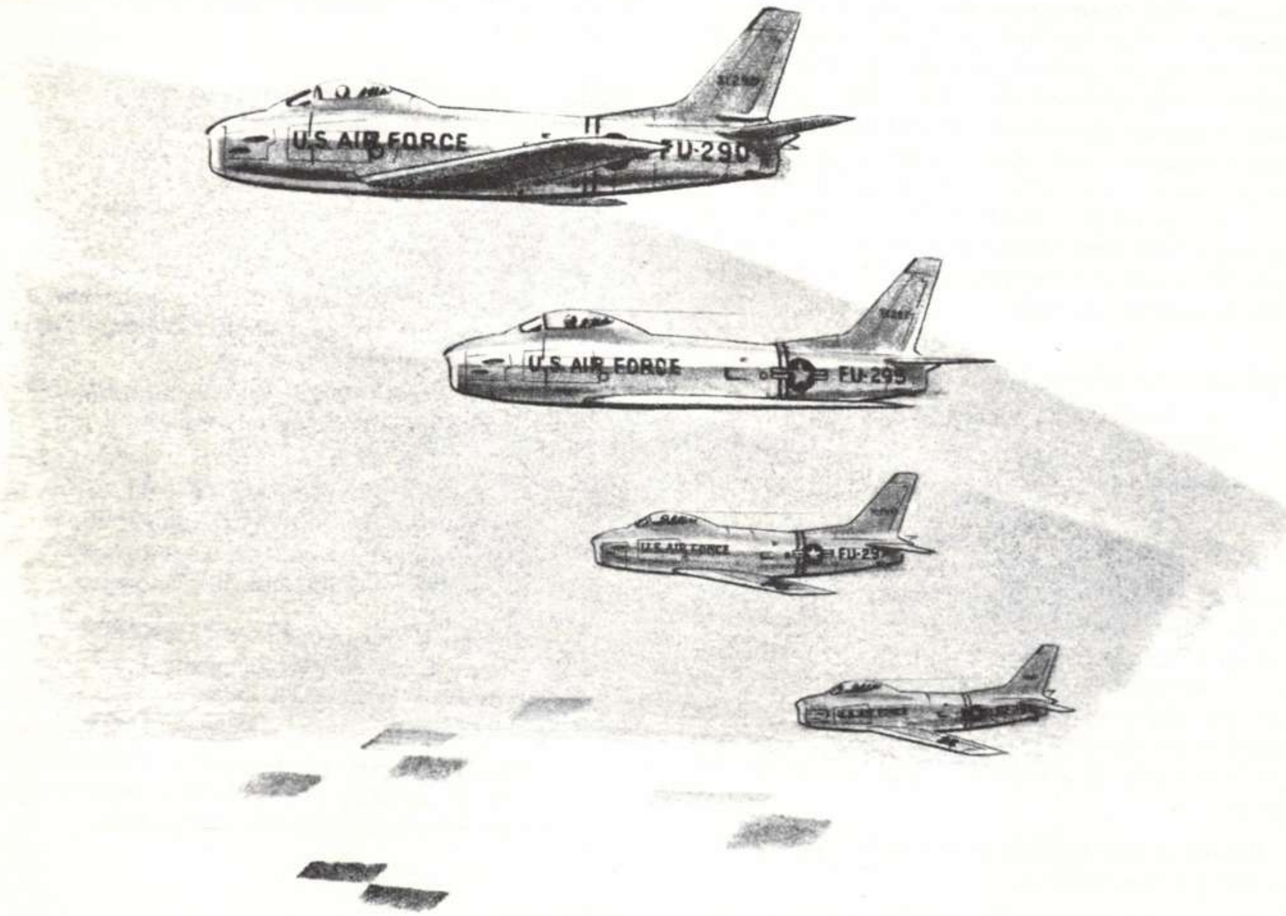
Caution To avoid electrical and electronic equipment failures due to overheating of this equipment, avoid as much as possible, flight at Maximum Power for periods in excess of 3 minutes, at altitudes below 8000 feet whenever the sea-level ambient temperature is 80°F or above.

APPROACH AND LANDING.

1. Maintain recommended indicated approach and touchdown speeds. Because of high outside air temperatures, speed relative to the ground will be higher than normal.
2. Expect a longer landing roll because of higher ground speed at touchdown.

BEFORE LEAVING AIRPLANE.

1. If sand or dust is not blowing, leave canopy slightly open to permit air circulation within cockpit.
2. Make sure that protective covers are installed on pitot head, canopy, and intake and exhaust ducts.



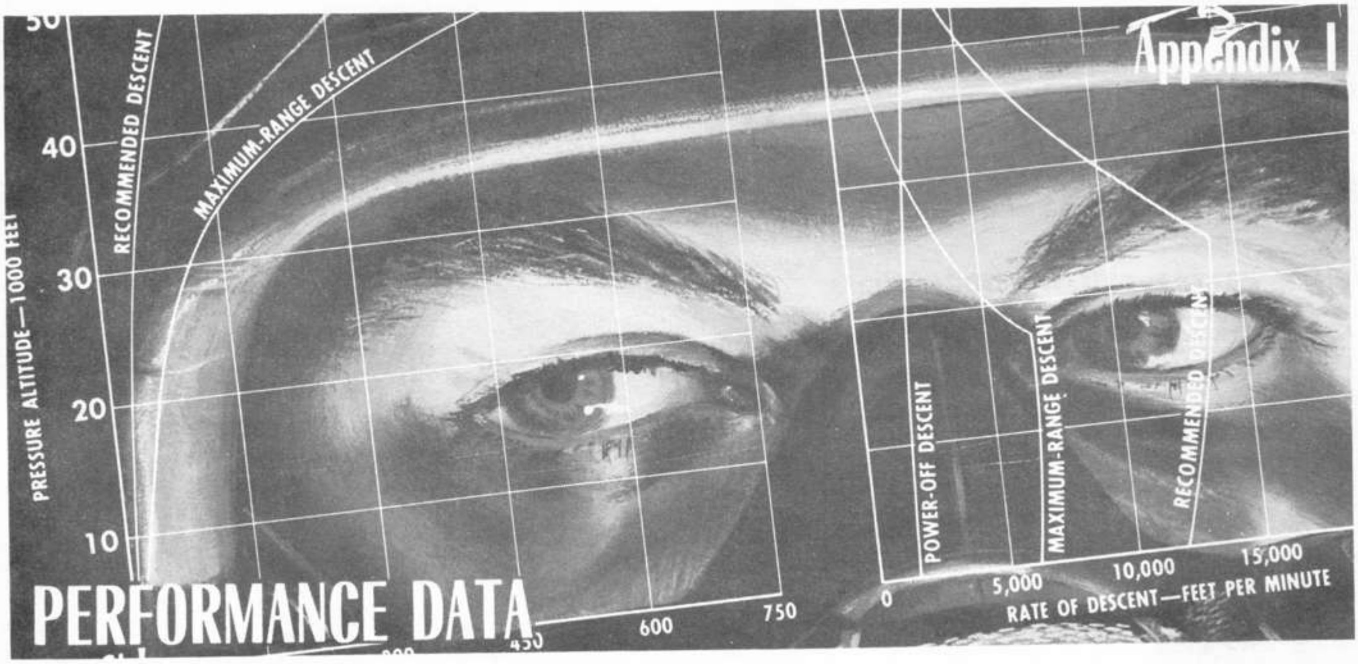


TABLE OF CONTENTS

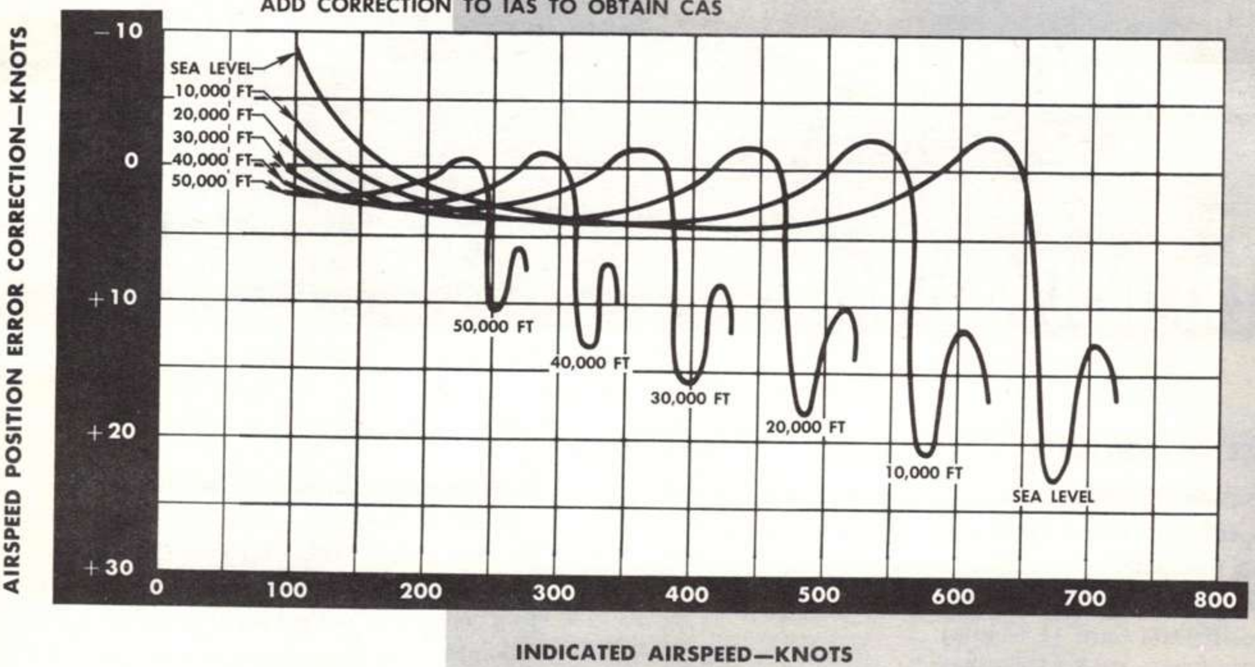
INTRODUCTION.

The flight performance charts in this section provide the pilot with data for flight planning purposes. Two types of charts are included: (1) profile-type charts for maximum range, endurance, and Maximum Continuous Thrust operation, and (2) graphical charts for take-off, climb, nautical miles per pound of fuel, descents, and landings. The data presented on all charts pertains to the -3A, -3D, and -3E engines (with modulated inlet guide vanes). The profile-type charts are a supplement to the graphical data and facilitate flight planning by reducing the computations that must be made. These charts are based on the recommended climb and cruise settings shown on the profile for the particular load configuration of the airplane. If the recommended settings are maintained, this type of presentation gives a direct indication of the fuel and time required to cover a given distance with the decrease in weight accounted for as fuel is consumed. For cruise at Mach numbers other than those given on the profile charts, the graphical charts should be used for flight planning. The graphical charts supply cruise performance data throughout the operating range of the airplane. For flight planning where accurate results are mandatory, the graphical data should be used. All charts are based on NACA Standard Day conditions. When applicable, temperature corrections for nonstandard atmosphere have been included on the charts.

AIRSPEED CONVERSION DATA

INSTALLATION CORRECTION

ADD CORRECTION TO IAS TO OBTAIN CAS



COMPRESSIBILITY CORRECTION

SUBTRACT CORRECTION FROM CALIBRATED AIRSPEED
TO OBTAIN EQUIVALENT AIRSPEED

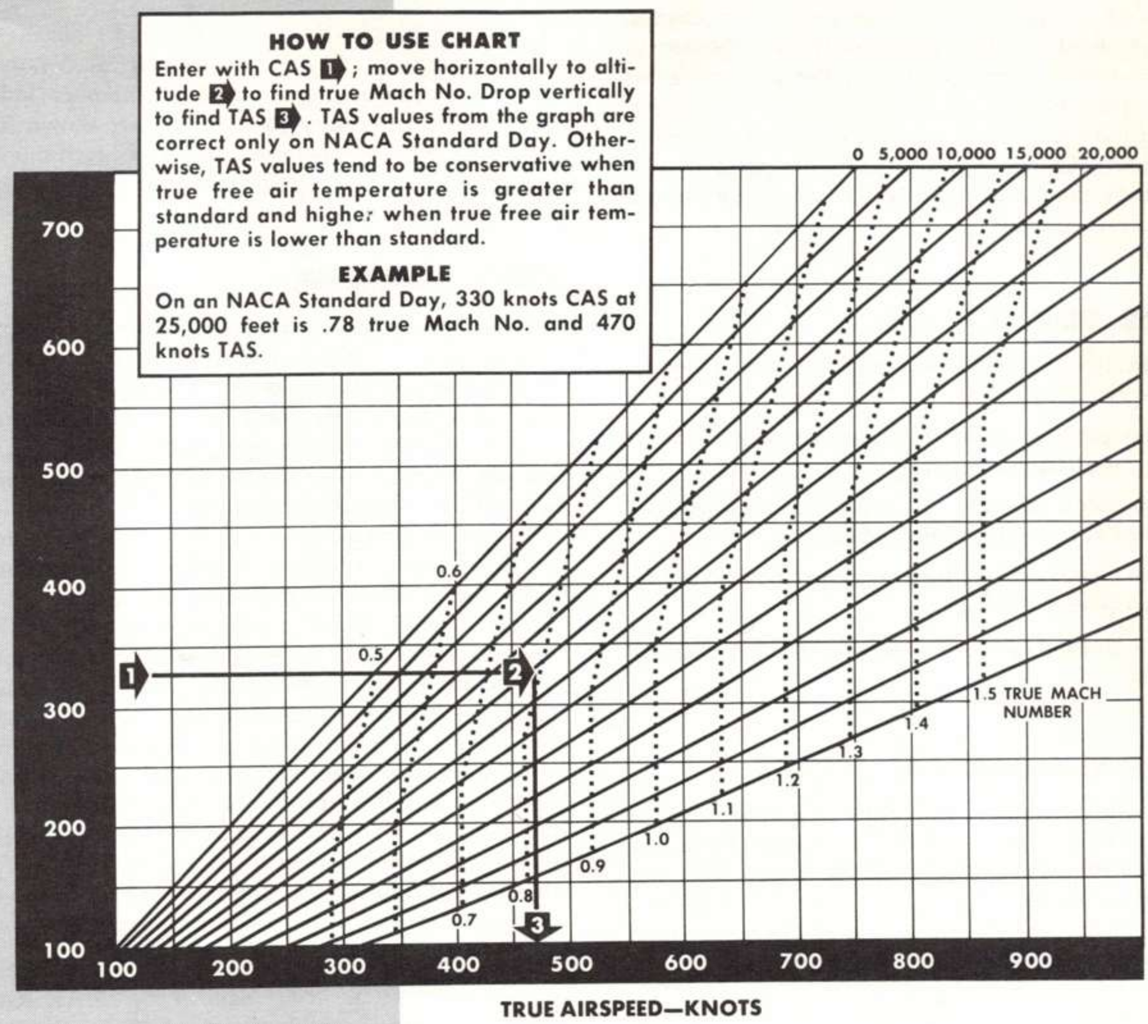
PRESSURE ALTITUDE—FEET	150	200	250	300	350	400	450	500	550	600
5,000	0	0	1	2	2	3	5	6	8	10
10,000	0	1	2	3	5	7	10	13	17	21
15,000	1	2	3	5	8	12	16	21	27	
20,000	1	3	5	8	12	17	23	31		
25,000	2	4	7	11	17	24	32			
30,000	2	5	9	15	23	32				
35,000	3	7	12	20	29					
40,000	4	9	16	25						
45,000	5	11	20							
50,000	7	14								

CAS—KNOTS

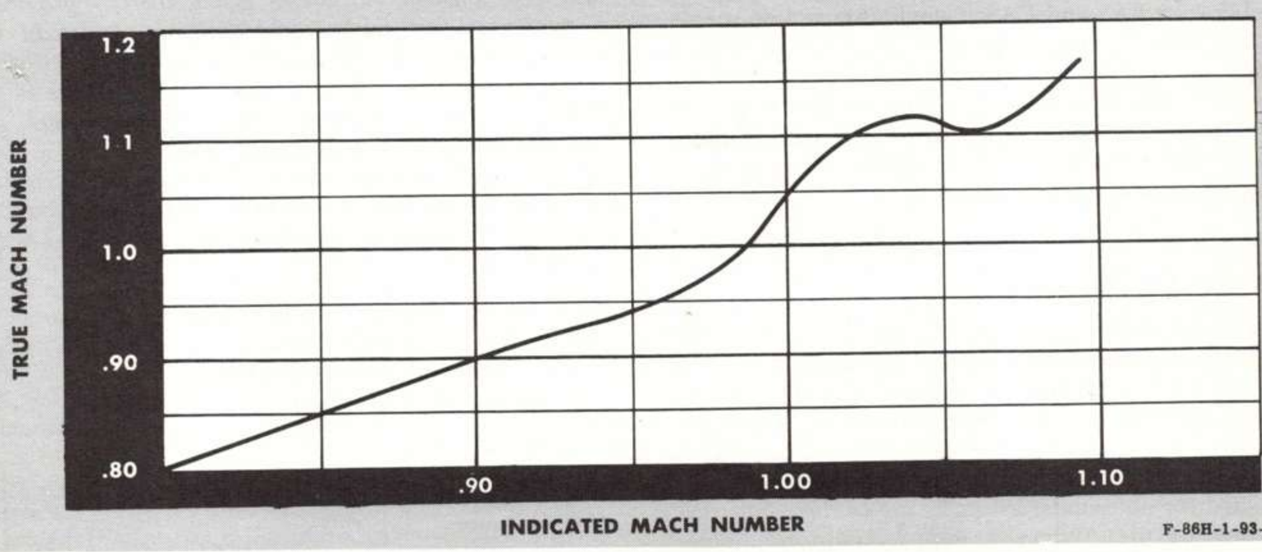
F-86H-1-93-270

Figure A-1

AIRSPEED CONVERSION



MACH NUMBER CORRECTION



F-86H-1-93-271

NOTE Because of gross weight variation between airplanes (which occurs from production changes and field modifications), weights presented on the profile charts in this handbook may not correspond exactly to your airplane. If these weight differences exceed about 2 percent, the graphical charts (climb and nautical-miles-per-pound-of-fuel) should be used for the most accurate performance data.

AIRSPEED CORRECTIONS.

IAS—Indicated airspeed is the reading taken from the airspeed indicator.

CAS—Calibrated airspeed is indicated airspeed corrected for installation effects.

EAS—Equivalent airspeed is calibrated airspeed corrected for compressibility effects.

TAS—True airspeed is equivalent airspeed corrected for atmospheric density.

TGS—True ground speed is true airspeed corrected for wind.

INSTALLATION CORRECTION.

Because of the position of the pitot-static boom and the installation error of the units in the airspeed indicating system, an airspeed correction must be made. This correction can be made by using the chart in figure A-1. Apply the correction shown to the indicated airspeed (IAS) to obtain calibrated airspeed (CAS).

COMPRESSIBILITY CORRECTION.

Equivalent airspeed (EAS) is calibrated airspeed (CAS) corrected for compressibility effects. Though the difference between EAS and CAS is negligible at low speeds and low altitudes, impact pressure upon the pitot tube at high speeds increases, causing the airspeed indicator to show values above normal. The correction factors shown in the compressibility correction table (figure A-1) should be subtracted from calibrated airspeed to determine equivalent airspeed.

AIRSPEED CONVERSION.

An airspeed conversion graph (figure A-1) is provided to change calibrated airspeed (CAS) directly to true airspeed (TAS). Indicated airspeed (IAS) must be changed to CAS before entering the chart. The chart shows true airspeed for NACA Standard Day only. TAS (which is EAS corrected for atmospheric density) can be computed for nonstandard days by use of the navigation computer or the AN5834-1 dead-reckoning computer (formerly the E6B) when Mach number and outside air temperature are known.

MACH NUMBER CORRECTION.

To convert *true* Mach number (as read from the Appendix performance charts) to *indicated* Mach number (as read from the airspeed and Mach number indicator), use the Mach number correction chart shown in figure A-1. The difference between *indicated* Mach number and *true* Mach number at speeds below .85 Mach is negligible.

MB-8 COMPUTER.

The MB-8 computer consists of three metal and two plastic disks of which the three metal disks supplied through regular Air Force channels (refer to foreword), are a standard item, good for any airplane; however, they are useless without the plastic "data" disks, since the plastic "data" disks contain the airplane performance. The MB-8 computer is designed to solve simple level-flight cruise control problems for jet aircraft. However, exclusive use for preflight planning is not recommended, since under normal conditions, the use of the Flight Manual results in far more comprehensive results. *The greatest advantage of the computer lies in its simplicity of operation and convenient size; therefore,* certain compromises which impose limitations are involved. The computer is designed for an *average* gross weight. This will result in a lower-than-indicated miles per pound of fuel with a subsequent higher rate of fuel flow at the beginning of flight and a higher-than-indicated miles per pound with a subsequent lower rate of fuel flow during the final portion of the flight, giving an average miles per pound as indicated on the computer.

The back or "tabulator side" (figure A-2) of the MB-8 computer shows the cruise data in the "MAX RANGE" window, listing combinations of fuel remaining at selected pressure altitude. This data can be used as a quick range check for various quantities of fuel remaining at altitude. Range data for both optimum cruise and cruise at constant altitude is given, thereby providing a quick and yet fairly comprehensive picture of the range potential. This data is very similar to the information given in the optimum return profile of the Flight Manual. A second window displays the time, fuel, and distance required for climb or descent, while a third window frames the recommended altitude-speed schedule for these maneuvers. Notice that a black background is used for one configuration, while the other has a white background.

Turn to the front or "working side" of the computer and begin at the center, working toward the outer edge. *Keep in mind the six factors of range:*

1. Speed (Mach number)
2. Altitude
3. Fuel
4. Distance
5. Time
6. Wind

Notice the opposing "pie-shaped" windows which allow the center plastic disks to show through. The black-bordered window is for the black background data, and vice versa. Notice that the window is divided into *altitudes,* with an index line through the center of the windows. The outer edge of this first (metal) disk is divided into a logarithmic scale labeled "FUEL QUANTITY—POUNDS" (referred to as the fuel disk). With this type of scale, the "1000" mark can mean 1, 10, 100, 1000, or 10,000 pounds, etc, depending on the magnitude of the other factors in the range problem. Using the tab provided, rotate the fuel disk *counterclockwise* so that the index line for any selected *altitude* passes across the *speed* lines which show through the respective window. The first speed line encountered is the *recommended* speed for maximum range. Further counterclockwise rotation results in passing over increasing speeds until the maximum speed line in the series is reached. In progressing from speed for maximum range to maximum speed, the index passes over a speed line coded as a solid dot with a vertical line passing through it. This is the computer setting for maximum endurance. The speed for maximum endurance is quoted at the extreme right of the *maximum range* speed line. This coded point is used together with the quoted speed to obtain maximum endurance information. Another coded speed line (diamond with a vertical line) is the maximum speed for Normal Power (Maximum Continuous Thrust). To help understand the position of these speed points on the computer, examine a typical nautical-miles-per-pound-of-fuel (specific range) curve which presents these same speed points graphically.

NOTE The speeds shown on the MB-8 computer are CAS or true Mach number; therefore, any indicated speeds should be corrected for installation error before speeds are entered on the computer. Because of numerous variables and possible modification of the airspeed indicating system, the indicated airspeed and Mach number are not incorporated in the MB-8 computer.

The second disk (plastic) is a performance data disk around which is placed a logarithmic scale labeled "AIR NAUTICAL MILES." Refer to this disk as the "distance disk." The placement of the speed lines previously described maintains the proper relationship between the *distance* and *fuel* disks. Note that any specific relationship between the fuel and distance disks for a selected ship between the fuel and distance disks for a selected air miles per pound of fuel; i.e., the air miles at the 1000-pound mark are actually nautical air miles per 1000 pounds of fuel. The tab on the distance disk is a special shape with the straight edge of the tab acting as a "wiper" or cursor on the third (metal) disk. Mention will be made of this cursor in the discussion of the "time" disk.

The third disk of the front face of the computer is referred to as the "time disk." On this disk is printed a series of concentric scales, of which the inner scale is labeled "HOURS—MINUTES." The succeeding scales are speed scales (Mach number or calibrated airspeed) for selected altitudes, i.e., altitudes corresponding to the altitudes listed on the fuel disk.

NOTE Make sure when the computer is assembled that this disk displays speed in the same terms as the speed appearing in the window of the fuel disk: either Mach number or CAS.

Notice the large black triangle on this disk, labeled "TAS—KNOTS," with the apex at the 60-minute mark of the time scale. For standard atmosphere conditions, the *true* airspeed in knots may be obtained from the distance disk opposite this TAS triangle. That is, when the distance disk cursor is aligned with a speed (Mach number) on the time disk, at some altitude, the corresponding *true* airspeed is indicated by the TAS triangle (using the distance scale as a speed scale). This conversion feature is useful in making corrections for wind.

WIND CORRECTIONS.

The front face of the computer can be adjusted for wind in the following manner:

a. Do not change the relationship of the fuel disk and the time disk. Pinch the fuel disk tab against the outer edge of the time disk. This will still permit rotation of the distance disk.

b. Rotate the distance disk until the ground speed (TAS + wind) on the "AIR NAUTICAL MILES" scale of the distance disk is aligned with the TAS triangle. The "AIR NAUTICAL MILES" scale then becomes ground nautical miles, and the fuel required to travel any ground distance is obtained from the fuel disk, while the time is read from the time disk.

Warning The Mach numbers now appearing in the window of the fuel disk and on the time disk under the index cursor no longer apply. The *original Mach number must be maintained in flight.*

c. To determine the winds while in flight, a system of check points can be utilized. Rotate the distance disk until the distance between check points is aligned with the elapsed time on the "MINUTES" scale of the time disk. The ground speed is then read on the distance disk opposite the TAS triangle. The fuel required to travel any selected ground distance is obtained from the time

MB8-COMPUTER

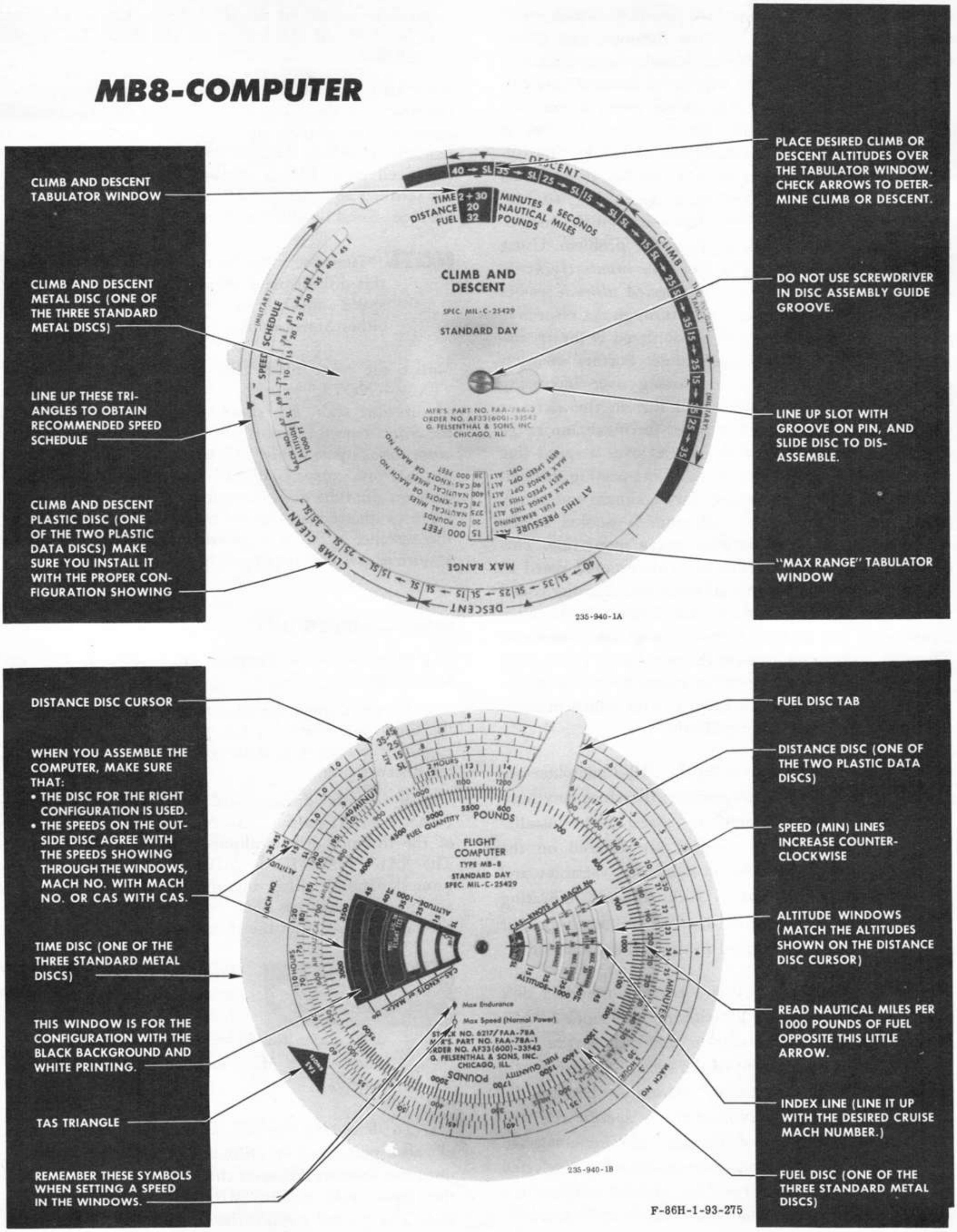


Figure A-2

disk. The Mach numbers appearing in the window of the fuel disk no longer apply and should be ignored. The *original Mach number must be maintained.*

FUEL FLOW CORRECTIONS.

Variations in the fuel consumption characteristics due to battle damage, small changes in configurations, differences in engines, formation flight, etc, may be accounted for in the following manner:

a. Determine the fuel flow from the flowmeter.

b. Do not change the relationship of the distance disk and the time disk (set from ground speed).

c. Rotate the fuel disk until the rate of fuel flow, read from the flowmeter, is aligned with the TAS triangle.

d. Determine distance and time for selected fuel quantities from the respective disks.

SUMMARY.

Variations in rate of fuel flow of an average magnitude of +5 percent of that indicated on the computer can be expected on the initial portion of the flight and −5 percent on the final portion when flying at the Mach number recommended for maximum range. These variations show up plainly when the maximum range shown on the tabulator side of the computer is compared with the range obtained on the fuel-distance side. The tabulator side will indicate a greater distance because this data considers the change in airplane gross weight as fuel is consumed, whereas the indicated specific range on the fuel-distance side of the computer is an average value and results in a slightly conservative distance. The true airspeeds presented on the computer are based on standard atmospheric conditions. An allowance for the difference in this true airspeed and the true airspeed for the actual atmospheric condition can be made by the wind correction method described previously. The rate of fuel flow is also based on standard atmospheric conditions. However, the difference in fuel flow need not be corrected, since the air range calculated on the flight computer is normally independent of air temperature when the Mach number is properly indexed.

CROSS-WIND CHART.

The cross-wind chart (figure A-3) is used to obtain the equivalent head wind for cross winds from 0 to 60 knots and up to 90 degrees from airplane heading. The equivalent head wind is used in the take-off and landing charts to determine distances with wind. Refer to Section II for recommendations and suggested techniques for take-off and landing with a cross wind.

TAKE-OFF.

Take-off performance is affected by a large number of variables, i. e., temperature, altitude, gross weight, and wind, as well as runway surface, use of brakes for directional control, and engine condition. Charts including these variables are provided for take-off distance, acceleration distance and speed, and stopping distance or refusal speed. Increases in any of these variables except wind tend to increase take-off ground roll to a point where a take-off in which normal techniques are used may not be successfully accomplished in the available runway length. The last point where a decision to stop or take off can be made is called the go, no-go distance point and can be determined by the combined use of the take-off and acceleration distance charts and the refusal speed chart. When used separately, the take-off charts show distances for ground roll as well as total distance required to clear a 50-foot obstacle, the take-off acceleration charts show the speed-distance relationship during the ground-roll portion of take-off, and the refusal speed charts show the combined distance traveled in acceleration to any given refusal speed, and the distance required for a full stop.

TAKE-OFF DISTANCES.

Two take-off distance charts are presented: The chart for flaps down 20 degrees (figure A-5) is used with the EX-10 bomb or the 1000-pound GP bomb with the T-142 fin configuration because of the limited flap travel, and the chart for flaps full down (figure A-4) is used for all other configurations. These charts include the recommended indicated airspeeds (IAS) versus gross weight for nose wheel lift-off, take-off, the 50-foot obstacle speeds, and the initial stall warning speeds. Take-off distances are shown, using normal take-off technique on a dry, hard-surface runway. Changes in configuration are compensated for if the gross weight at take-off is considered. Use of the charts is explained by a sample problem.

NOTE It is difficult to obtain accurate results with an accumulative error of less than 300 feet when computing take-off and landing distances. Therefore, follow the grid and guide lines carefully to keep the error to a minimum.

TAKE-OFF ACCELERATION.

The take-off acceleration charts (figures A-6 and A-7) give ground-roll distances required to accelerate to any desired indicated airspeed using Military Thrust. Checkpoint speeds may also be determined for specific ground-roll distances at prevailing take-off conditions. Use of the charts is explained by a sample problem.

REFUSAL SPEEDS.

The highest indicated airspeed to which the airplane can accelerate and then stop in the available runway length is called the refusal speed. This speed is obtained from the refusal speed charts (figures A-8 and A-9) for the prevailing take-off conditions and runway length. The refusal speed charts are based on a Military Thrust acceleration to the refusal speed, and then normal braking to a stop on a dry, hard-surface runway, without use of speed brakes. The speed brakes will reduce the distance required to stop and should be used if possible. The ground-roll distance required to accelerate to refusal speed can be found on the take-off acceleration charts (figures A-6 and A-7). Use of the charts is explained by a sample problem.

GO, NO-GO SPEED AND DISTANCE.

The go, no-go distance and the corresponding go, no-go speed form the maximum allowable ground-roll and minimum-speed combination that will permit either a take-off or a complete stop in the remaining runway length. For example, if the indicated airspeed (IAS) falls below the go, no-go speed at the go, no-go distance point, the take-off should be discontinued. If the IAS is above the go, no-go speed, the take-off may be continued.

Perform the following steps to obtain the go, no-go speed and distances.

a. With available runway length and effective wind, enter ground-roll distance scale on the take-off distance chart, and proceed to gross weight and then to field pressure altitude. Note the temperature on the temperature scale. This procedure assumes that the take-off would be made in exactly the available runway length. Obviously, obstacles at the end of the runway should be considered when establishing the available runway length. If step a. results in a temperature beyond the chart limits, it is an indication that the available runway length is in excess of the distance required to take off even under the most adverse conditions. To obtain the desired information, select the highest temperature shown for the field pressure altitude and proceed with steps b. and c.

b. Use maximum temperature obtained from step a. to enter refusal speed chart, and obtain a refusal speed corresponding to available runway length used in step a. This is the speed to which the airplane can accelerate and still stop in the available runway length. To determine the maximum distance down the runway that this speed can occur, proceed to step c.

c. With temperature obtained from step a. and speed from step b., obtain ground-roll required to accelerate to desired speed from the take-off acceleration chart. This, then, is the go, no-go distance point. Acceleration checkpoint distances can be determined by following the guide line to intersections with lower speeds and obtain the corresponding check-point distances.

NOTE This procedure shows how the charts are used to obtain the go, no-go distance and speed for a minimum acceleration condition. Normal conditions permit take-offs in shorter distances at improved acceleration rates which give higher go, no-go speeds. These values may be extracted from the refusal speed chart, while auxiliary check-point distances and speeds can be obtained from the take-off acceleration chart, using the exact runway temperature and altitude.

RUNWAY DISTANCE MARKING SYSTEM.

The numbering and placement of runway distance markers reflect the distance remaining to the end of the runway. The following procedure is recommended for use of runway distance markers in checking take-off performance.

a. Determine go, no-go speed and distance.

b. Obtain distance remaining between refusal point and end of the runway by subtracting go, no-go distance from runway available.

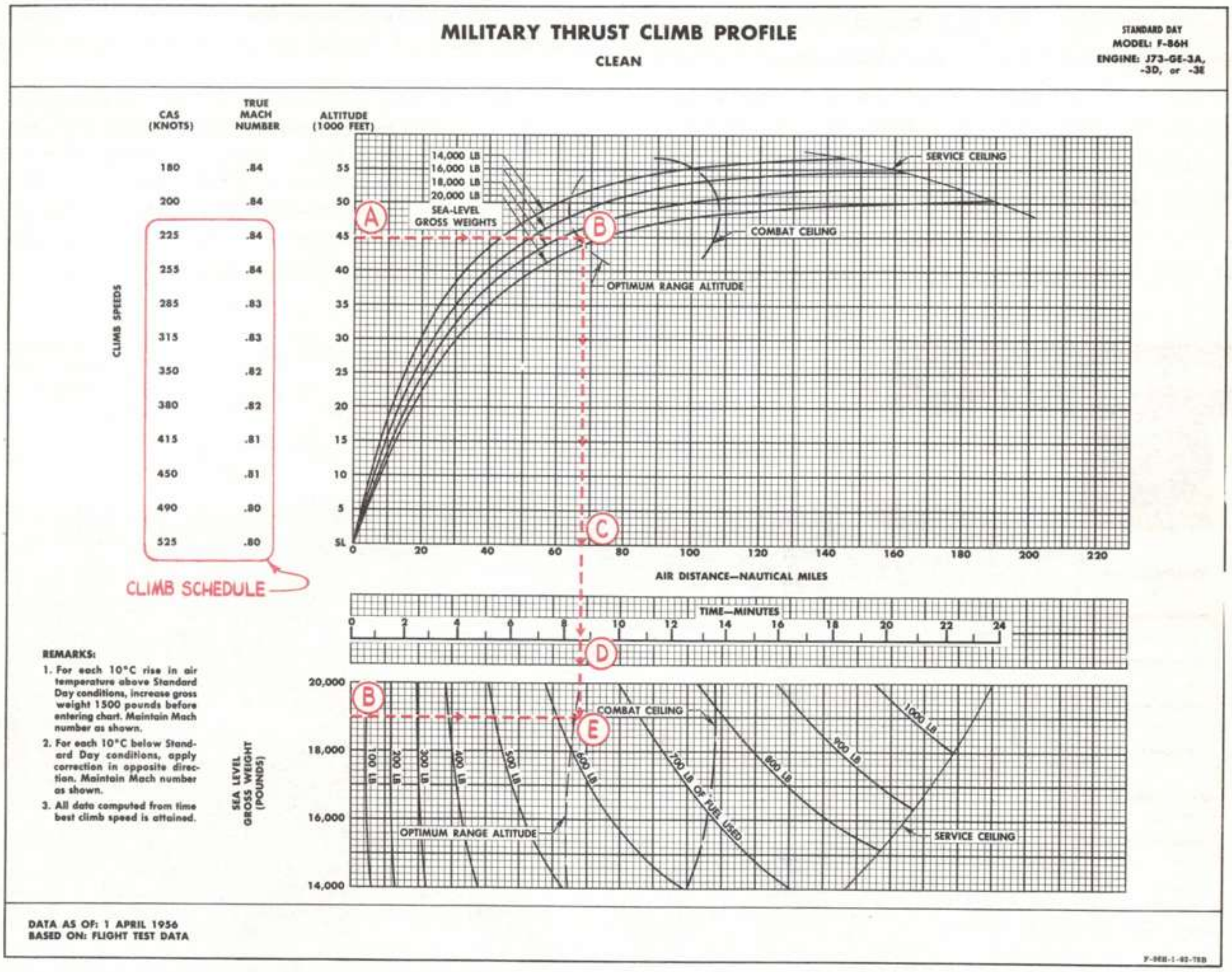
c. Establish go, no-go marker as the marker from which at least this distance remains to end of runway. (In accordance with the new marker system on an odd-length runway, one half of the odd figure over exact thousands of feet must be added to the distances shown on the markers to determine the actual distance remaining.)

d. Use take-off acceleration chart to determine acceleration check speed. Since the acceleration check marker is two markers short of the go, no-go marker, the acceleration check speed is determined at a distance 2000 feet less than the go, no-go distance.

CLIMB PROFILE

DESCRIPTION

The climb profile charts give time required, distance traveled, and fuel used (based on the recommended climb speed schedule) for a Military Thrust climb from sea level for several gross weights. The reduction in weight due to fuel used during climb is taken into account. Approximate climb data for climbs between two specific altitudes may be obtained from these profile charts, but it is recommended that the graphical climb charts be used for such in-flight climb data.



USE

Enter the chart at the altitude at end of climb and go to the gross weight at start of climb (sea level). Directly below this point, read the distance traveled and time required to climb. To obtain the fuel used during climb, project the point down to the sea-level gross weight in the lower portion of the chart and determine the fuel used. The gross weight at the end of climb is the sea-level gross weight minus fuel required to climb. For temperatures other than Standard Day, apply the corrections, shown on each graph, to gross weight.

The example shown is for a Military Thrust climb from sea level to 45,000 feet with a gross weight of 19,000 pounds in the clean configuration.

A is altitude at end of climb........................45,000 ft
B is sea-level gross weight..........................19,000 lb
C is distance traveled in climb..................68 naut mi
D is time required to climb..............................8.6 min
E is fuel used during climb..............................630 lb
B minus E is gross weight at end of climb........18,370 lb

MISSION PROFILE

DESCRIPTION

These charts give the time, fuel, distance, and altitude relationship to maximum range for no-wind conditions. This relationship is based on a mission sequence of take-off, Military Thrust climb, and maximum range cruise. The fuel curves include a 600-pound allowance for start, taxi, and take-off, and the fuel used in climb to each altitude, as well as the fuel required for maximum range cruise. The time lines include the time required to climb to cruise altitude but do not include the time to start, taxi, or take off.

The line labeled "Initial Climb Path" shows the distance traveled and time to climb during the Military Thrust climb from sea level to cruising altitude, using the climb speed schedule tabulated at the left of the chart. The continuation of the initial climb path is the cruise-climb path based on a constant Mach number.

For some configurations, two cruise-climb paths are shown: Maximum Continuous Thrust cruise-climb and best range cruise-climb. Other configurations show Maximum Continuous cruise-climb only, since this flight path gives maximum range. The approximate cruise-climb altitude can be obtained by climbing at the recommended Military Thrust climb schedule to the

MISSION PROFILE

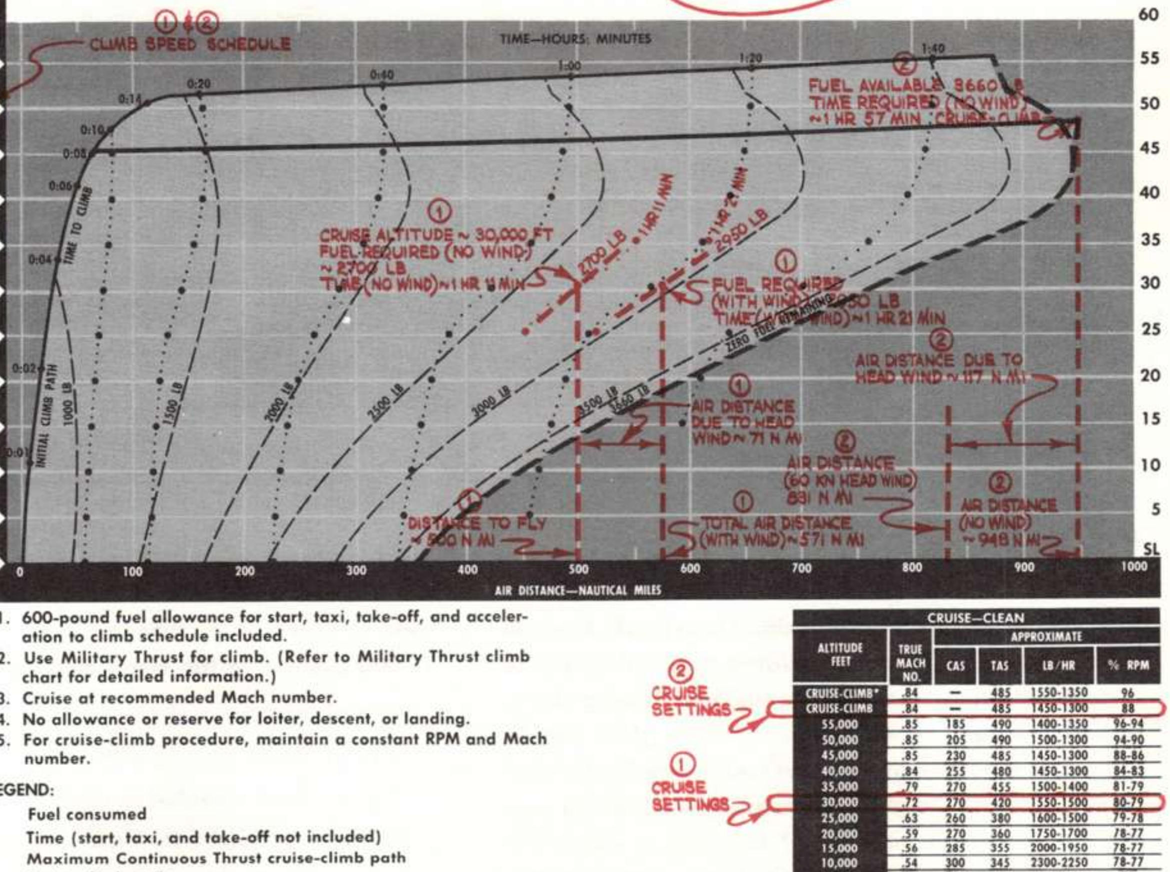
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Sample Chart
DO NOT USE FOR FLIGHT PLANNING

CLEAN
TAKE-OFF GROSS WEIGHT: 18,908 LB

MILITARY THRUST CLIMB

TRUE MACH NO.	CAS	ALT 1000 FT
.84	180	55
.84	200	50
.84	225	45
.84	255	40
.83	285	35
.83	315	30
.82	350	25
.82	380	20
.81	415	15
.81	450	10
.80	490	5
.80	525	SL



REMARKS
1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (Refer to Military Thrust climb chart for detailed information.)
3. Cruise at recommended Mach number.
4. No allowance or reserve for loiter, descent, or landing.
5. For cruise-climb procedure, maintain a constant RPM and Mach number.

LEGEND:
- — — — — Fuel consumed
- ●·····●·····● Time (start, taxi, and take-off not included)
- ——— Maximum Continuous Thrust cruise-climb path
- ——— Cruise-climb path

CRUISE—CLEAN

ALTITUDE FEET	TRUE MACH NO.	CAS	TAS	LB/HR	% RPM
		APPROXIMATE			
CRUISE-CLIMB*	.84	—	485	1550-1350	96
CRUISE-CLIMB	.84	—	485	1450-1300	88
55,000	.85	185	490	1400-1350	96-94
50,000	.85	205	490	1500-1300	94-90
45,000	.85	230	485	1450-1300	88-86
40,000	.84	255	480	1450-1300	84-83
35,000	.79	270	455	1500-1400	81-79
30,000	.72	270	420	1550-1500	80-79
25,000	.63	260	380	1600-1500	79-78
20,000	.59	270	360	1750-1700	78-77
15,000	.56	285	355	2000-1950	78-77
10,000	.54	300	345	2300-2250	78-77
5000	.52	315	340	2550-2500	78
SEA LEVEL	.50	335	335	2900-2800	79

② CRUISE SETTINGS (CRUISE-CLIMB, .84, 88)
① CRUISE SETTINGS (30,000)

F-86H-1-93-79E *MAXIMUM CONTINUOUS THRUST

Data as of: 1 April 1956. Based on flight test data.

altitude where cruise-climb path and initial climb path intersect. Level off and set up the recommended thrust setting and Mach number; the airplane then automatically seeks its cruise-climb altitude for its particular gross weight. Maintain this recommended Mach number and percent rpm throughout the remainder of cruise-climb. For cruise at a constant altitude, set up the recommended Mach number at the intersection of the climb path and the cruise altitude. As the flight progresses, the thrust setting must be decreased gradually as fuel is consumed in order to maintain the recommended Mach number.

A cruise table gives recommended Mach numbers and approximate operating conditions for both cruise-climb procedure and for cruise at constant altitude. (Cruise-at-constant-altitude data is given for each 5000 feet.)

USE

The chart may be entered with one or more of the four range factors: time, fuel, distance, and altitude. By entering the chart with the known factors, the others may readily be determined. This is for a no-wind condition.

To determine wind effect upon time, fuel, and distance, compute the average true airspeed (distance ÷ time, no wind) and apply wind to TAS to obtain ground speed (G.S.). Then compute the time with wind (distance ÷ G.S.). Re-enter the profile at the cruising altitude and the computed time with wind to determine the fuel required with wind.

SAMPLE PROBLEM 1

Using the example shown, find the fuel required, time, necessary speed, and power setting to cruise 500 nautical miles at 30,000 feet with a head wind of 60 knots in the clean configuration.

a. Enter at 500 nautical miles and 30,000 feet to obtain Time (no wind) .... 1 hr 11 min (1.18 hr)

b. Air distance due to wind (1.18 × 60) .... 71 naut mi

c. Total air distance with head wind (500 + 71) .... 571 naut mi

d. Re-enter the profile with the air distance with wind and move to the cruise altitude (30,000 feet) to obtain the fuel required with wind .... 2950 lb
and time required with wind .... 1 hr 21 min

e. Determine cruise speed from table .... .72 Mach No.

f. Determine cruise thrust setting from table .... 80% to 79% rpm

Note that if this flight had been made at 41,000 feet cruising altitude, the time and fuel required would have been less with the same head wind.

SAMPLE PROBLEM 2

Determine the maximum distance flyable, using clean airplane with 3660 pounds of fuel and a 60-knot head wind. (Hint: Use best range cruise-climb.)

a. Enter at 3660 pounds of fuel and obtain maximum air distance at cruise-climb (no wind) .... 948 naut mi

b. Time (no wind) .... 1 hr 57 min (1.77 hr)

c. Air distance due to head wind (1.95 × 60) .... 117 naut mi

d. Maximum range with head wind (948 — 117) .... 831 naut mi

e. Determine cruise-climb speed from table .... .84 Mach no.

f. Determine cruise thrust setting from table .... 88% rpm

Note: *No reserve for descent or landing has been included.*

F-86H-1-93-80E

HIGH-SPEED PROFILE

DESCRIPTION

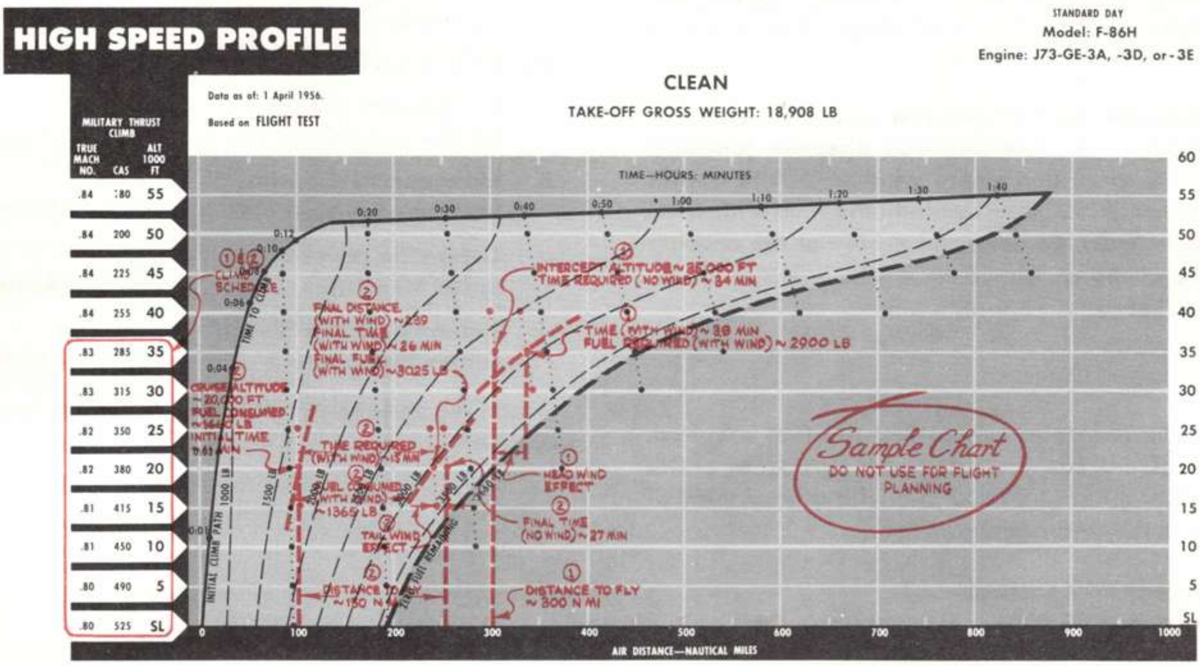
The high-speed profile (formerly intercept profile) shows the fuel necessary to fly a given distance at a desired altitude in a *minimum* amount of time, starting with a Military Thrust climb to altitude, and then using Normal Thrust (Maximum Continuous Thrust) for cruise. The high-speed profile is similar to the mission profile in use; however, its use should be restricted to flights where time is the important factor, while the mission profile is employed for maximum-range flights.

The fuel curves include a 600-pound allowance for start, taxi, take-off, and acceleration to climb schedule, plus the fuel used in climb to each altitude, as well as the fuel required for Maximum Continuous Thrust cruise. The time lines include the time required to climb to cruise altitude, but do not include the time to start, taxi, or take off.

No fuel reserve for descent or landing has been included.

The line labeled "INITIAL CLIMB PATH" shows the distance traveled and time consumed during the Military Thrust climb from sea level to cruising altitude, using the climb speed schedule tabulated at the left of the chart. The continuation of the initial climb path is the cruise-climb path based on Maximum Continuous Thrust operation.

A cruise table gives approximate operating conditions along with the true Mach numbers for both cruise-climb procedure and constant-altitude cruise at every 5000 feet for Standard Day conditions. Observe the recommended exhaust gas temperature limits shown in Section V. For cruise at constant altitude, set up the recommended thrust setting at the intersection of the climb path and cruise altitude. As the flight progresses, the Mach number increases.



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (See Military Thrust climb chart for detailed information.)
3. Cruise at Maximum Continuous Thrust (96% rpm).
4. No allowance or reserve for loiter, descent, or landing.

LEGEND:

— — — — Fuel consumed

• · · · • · · · • Time (start, taxi, and take-off not included)

———— Maximum Continuous Thrust cruise-climb path

① CRUISE SETTINGS

② CRUISE SETTINGS

CRUISE—CLEAN

ALTITUDE FEET	% RPM	APPROXIMATE TRUE MACH NO.	APPROXIMATE CAS	APPROXIMATE TAS	APPROXIMATE LB/HR
CRUISE-CLIMB*	96	.84	-	485	1550-1350
55,000		.84-.86	205-210	485-495	1350
50,000		.88-.89	210-220	505-510	1650
45,000		.90-.92	245-250	520-525	2050
40,000		.92	280-285	525-530	2700
35,000		.92	320	530	3350
30,000		.92	355	545	4000
25,000		.92	390	555	4700
20,000		.92	430	560	5550
15,000		.91	470	570	6450
10,000		.90	505	575	7300
5000		.89	545	580	8250
SEA LEVEL		.88	580	580	9200

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-276

USE

Like the mission profile, the high-speed profile may be entered with one or more of the four range factors: time, fuel, distance, and altitude. By entering the chart with the known factors, the others may readily be determined. This is for a no-wind condition.

To determine wind effect upon time, fuel, and distance, compute air distance due to wind (time X wind velocity) and apply it to the no-wind distance to obtain the total air distance with wind. Re-enter the profile with the air distance (with wind) and move to the cruise altitude to obtain the fuel and time required with wind.

SAMPLE PROBLEM 1

Find the time and fuel required to reach a point of interception 300 nautical miles away at an altitude of 35,000 feet with a head wind of 60 knots in the clean configuration.

a. Enter at 400 nautical miles and 35,000 feet to determine the time required (no wind) . . . . . . 34 min (0.56 hr)
b. Air distance due to wind (0.56 X 60) . . . . 34 naut mi
c. Total air distance with head wind (300 + 34) . . . . 334 naut mi
d. Re-enter the profile with air distance (with wind) and move to the cruise altitude (35,000 ft) to obtain the fuel required with wind . . . . 2900 lb
   and time required with wind . . . . 38 min
e. Determine cruise thrust setting (% rpm) from table . . . . 96% rpm
f. Determine cruise speed from table .92 Mach No.

SAMPLE PROBLEM 2

Determine the fuel and time required to fly a distance of 150 nautical miles at 20,000 feet, with 2000 pounds of fuel on board at start of cruise. Assume a 40-knot tail wind, clean configuration.

a. Determine fuel consumed before start of cruise (5660—2000) . . . . 1660 lb
b. Enter profile at 1660 pounds of fuel consumed at cruise altitude of 20,000 feet.
   Initial distance is . . . . 100 naut mi
   Initial time is . . . . 11 min
c. Distance at end of cruise (no wind) (100 + 150) . . . . 250 naut mi
d. Enter profile at 250 naut mi and cruise altitude of 20,000 feet to obtain final time . . . . 27 min
e. Time (no wind) to cruise (27—11) . . . . 16 min (0.27 hr)
f. Air distance due to wind (40 X 0.27) . . . . 11 naut mi
g. Final distance at end of cruise with tail wind (100 + 150 — 11) . . . 239 naut mi
h. Re-enter the profile at 239 naut mi and move to the cruise altitude (20,000 feet) to obtain the final fuel consumed with wind . . . . . 3025 lb
   and the final time with wind . . . . 26 min
j. Subtract the initial conditions from the final conditions to obtain net fuel consumed (3025—1660) . . . . 1365 lb
   and net time required (26—11) . . . . 15 min
k. Determine cruise conditions from table.
   Thrust setting (% rpm) . . . . 96% rpm
   Mach number 92

F-86H-1-93-277

OPTIMUM RETURN PROFILE

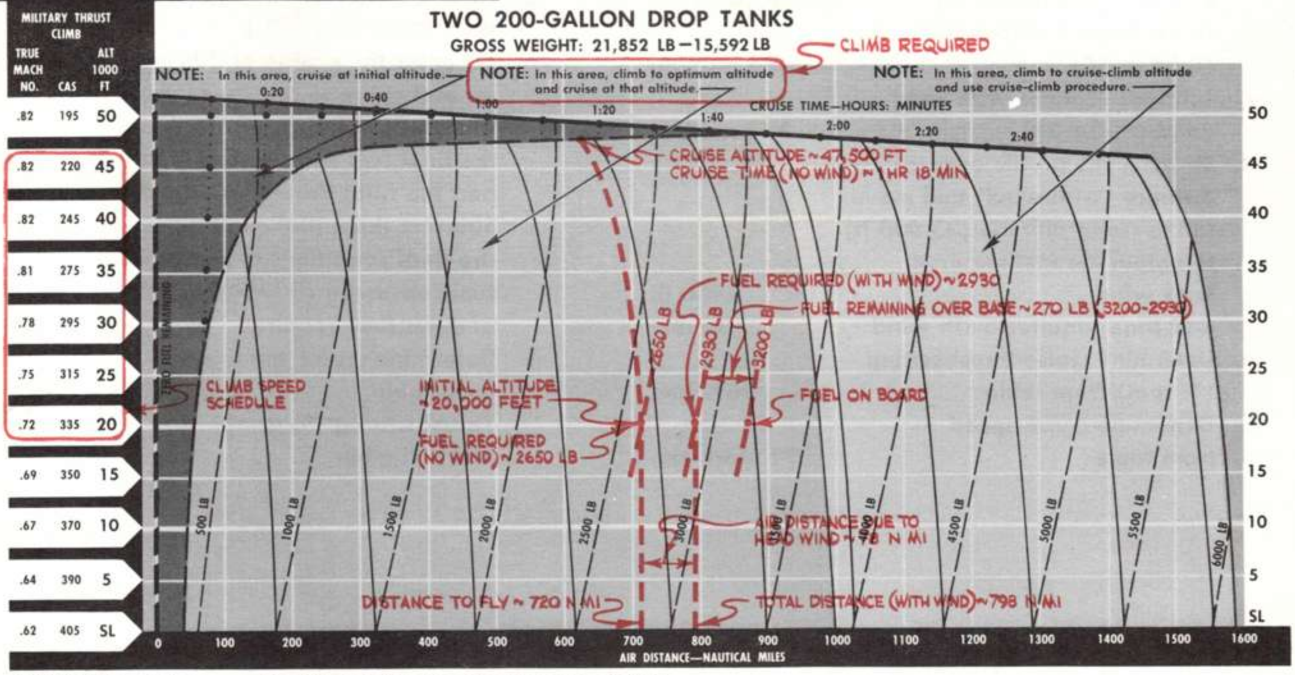
DESCRIPTION

These profiles show the minimum fuel required to obtain maximum distance (no wind) based on an optimum flight path from any starting point within the range of the airplane configuration. The flight path required is indicated by the different shaded areas and the notes relative to them.

The cruise altitude giving maximum distance appears on the profile as the "line of best range for constant-altitude flight." The maximum distance using cruise-climb procedure is shown as the "line of best range for cruise-climb flight." The intersection of the cruise-climb line and the constant-altitude line determines whether the return will be made at a constant altitude or at cruise-climb. Climb path guide lines and lines of constant fuel are added for interpolation. The fuel lines are based on a Military Thrust climb to, and recommended cruise at, the optimum altitude. The Military Thrust climb speed schedule and recommended cruise settings are tabulated on each chart. No fuel reserve for descent and landing has been included. The time shown at the optimum altitude is cruise time only; it does not include time required for climb to optimum altitude or any allowance for descent, loiter, or landing.

OPTIMUM RETURN PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E



REMARKS

1. Optimum cruise altitude is determined by intersection of climb path guide lines and lines of best range.
2. Fuel required at any point includes Military Thrust climb to cruise altitude (if below that).
3. Cruise at recommended Mach number.
4. For cruise-climb procedure, use Maximum Continuous Thrust and maintain a constant Mach number.
5. No allowance for loiter, descent, or landing.

LEGEND:

- Line of best range for cruise-climb flight
- Time at cruising altitude
- Line of best range for constant-altitude flight
- Climb path guide lines
- Fuel required

Data as of: 1 April 1956. Based on flight test data.

Sample Chart
DO NOT USE FOR FLIGHT PLANNING

CRUISE SETTINGS

CRUISE—TWO 200-GALLON DROP TANKS

ALTITUDE FEET	TRUE MACH NO.	APPROXIMATE CAS	TAS	LB/HR	% RPM
CRUISE-CLIMB*	.84	—	485	1850-1500	96
50,000	.84	205	485	1600-1500	94-90
45,000	.84	225	480	1800-1500	94-87
40,000	.80	245	460	1800-1550	91-83
35,000	.78	260	445	1850-1600	86-80
30,000	.70	265	410	1850-1650	84-78
25,000	.64	265	385	1900-1750	83-77
20,000	.59	270	365	2050-1900	82-77
15,000	.56	280	350	2250-2100	81-77
10,000	.53	290	335	2450-2350	81-77
5000	.51	305	325	2750-2600	80-78
SEA LEVEL	.49	320	320	3050-2950	80-79

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-81C

USE

The chart may be entered at the initial altitude with either the fuel on board (to determine the distance available) or with the distance to be flown (to determine the fuel required). The shaded area in which the initial point falls establishes the cruising procedure to be used, as stated in the note relative to the area.

The total time required to fly the distance is the time at cruise altitude (obtain from profile), plus the time required to climb (obtained from the graphical Military Thrust climb chart). To simplify the calculation of distance and/or fuel with wind, however, the time to climb may be omitted and the profile cruise time used to determine the average return speed. If greater accuracy is desired, the graphical data should be used.

The effect of wind must be applied to obtain the actual fuel and time to fly the distance. A close approximation can be obtained by considering the head or tail wind for the time required to complete the flight (neglecting the difference in wind at the lower altitudes since comparatively little time is spent in the climb phase).

SAMPLE PROBLEM

From the example shown, determine the fuel and time required to return to a base 720 nautical miles away. The airplane is at 20,000 feet with 3200 pounds of fuel on board in the two 200-gallon tank configuration (gross weight 18,792 pounds). A 60-knot head wind is assumed.

a. Enter profile at 720 nautical miles and 20,000 feet to establish starting point.
Fuel required (no wind) .... 2650 lb
(In this area, note that a climb is required and a constant-altitude cruise procedure is followed.)

b. By following the climb guide lines, the cruise altitude is .... 47,500 ft

c. Cruise time*
(no wind) .... 1 hr 18 min (1.30 hr)

*Greater accuracy can be obtained by considering the time to climb, which is obtained from the Military Thrust climb chart.

d. Air distance due to wind (1.30 × 60) .... 78 naut mi

e. Total air distance with wind (720 + 78) .... 798 naut mi

f. Re-enter the profile at the air distance (e) and move to the initial altitude (20,000 feet) to obtain the
fuel required with wind .... 2930 lb
and time with wind .... 1 hr 27 min (1.45 hr)
(Use the flight path originally determined for no wind.)

g. Fuel remaining over base at altitude (3200 − 2930) .... 270 lb

h. Determine cruise speed from table .... .84 Mach no.

i. Determine cruise power setting from table .... 94% to 90% rpm

Note: It is recommended that sufficient reserve be considered for a normal landing operation when determining maximum distance obtainable; unless, however, an emergency condition prevails.

MAXIMUM ENDURANCE PROFILE

DESCRIPTION

These profiles show the maximum time available for the fuel on board when loitering at a constant altitude.

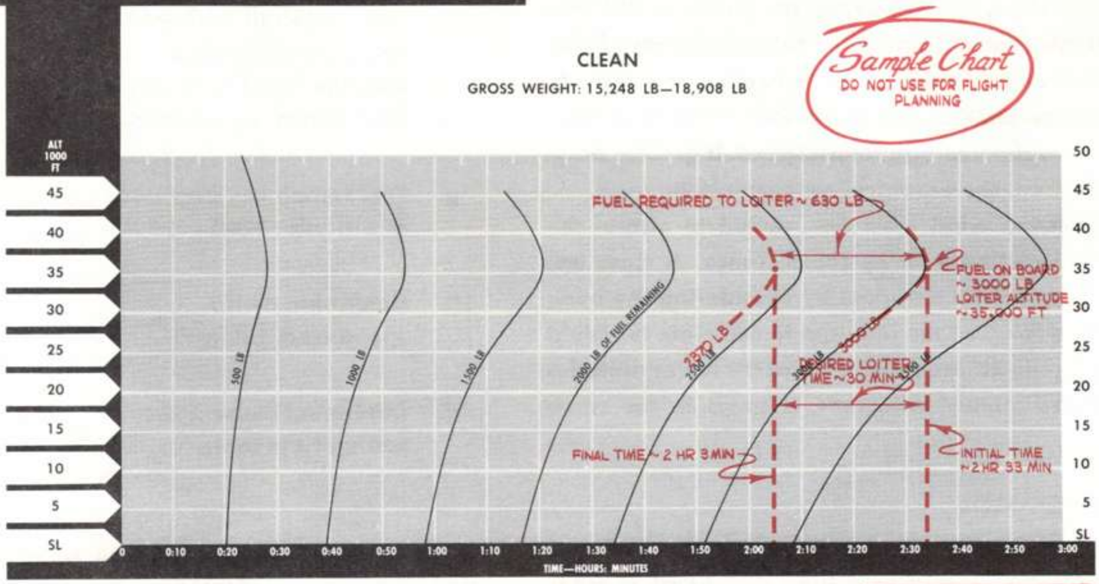
The recommended calibrated airspeed (CAS) and the approximate operating conditions are tabulated on each chart for several fuel quantities.

Limit maximum endurance flight to 1.2 G load factor to avoid low-speed stall.

MAXIMUM ENDURANCE PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

CLEAN
GROSS WEIGHT: 15,248 LB—18,908 LB



REMARKS
1. Loiter at recommended CAS.
2. Maintain constant altitude.

LOITER SETTINGS

LOITER	LESS THAN 2000 LB FUEL REMAINING					MORE THAN 2000 LB FUEL REMAINING				
		APPROXIMATE					APPROXIMATE			
ALTITUDE FEET	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM
50,000	195	.82	470	1450-1300	91	195	.82	470	1600-1450	94
45,000	200	.76	435	1350-1200	86	215	.80	460	1450-1350	88
40,000	195	.65	375	1250-1100	82	210	.70	400	1350-1250	84
35,000	190	.58	320	1200-1100	78	205	.61	350	1350-1200	80
30,000	185	.50	295	1250-1150	76	200	.54	315	1350-1250	78
25,000	185	.45	270	1350-1250	75	195	.47	285	1450-1350	77
20,000	180	.40	245	1450-1300	75	190	.42	260	1550-1450	76
15,000	180	.36	225	1500-1400	74	190	.38	240	1600-1500	75
10,000	170	.32	205	1550-1400	74	190	.34	215	1700-1550	75
5,000	170	.28	185	1600-1450	73	185	.30	195	1750-1600	74
SEA LEVEL	165	.25	165	1650-1450	73	175	.27	175	1800-1650	74

Data as of 1 April 1956. Based on flight test data.

F-86H-1-93-82B

USE

To determine the time available for a given amount of fuel, enter the chart at the amount of fuel on board at the start of loiter and the flight altitude; note the initial time. Re-enter the chart at the amount of fuel on board at the end of the endurance flight (initial fuel on board less fuel to be used) and read the final time. The difference between the initial and final time is the time available to loiter at constant altitude.

To obtain the fuel required to loiter a given time, enter the chart at the amount of fuel on board at the start of loiter and flight altitude; note the initial time. Re-enter the chart at the time at the end of loiter (initial time less time to loiter) and read final fuel on board. The difference between the initial and final fuel on board is the fuel required to loiter.

From the example shown, determine the fuel required to loiter at 35,000 feet with clean airplane for 30 minutes. The fuel on board at start of loiter is 3000 pounds.

a. Initial time at 3000 pounds and 35,000 feet .... 2 hr 33 min

b. Final time (2:33 — 0:30) .... 2 hr 3 min

c. Fuel on board at end of loiter (2:03 at 35,000 feet) .... 2370 lb

d. Fuel required to loiter (3000 — 2370) .... 630 lb

e. Recommended loiter (CAS) .... 205 kn

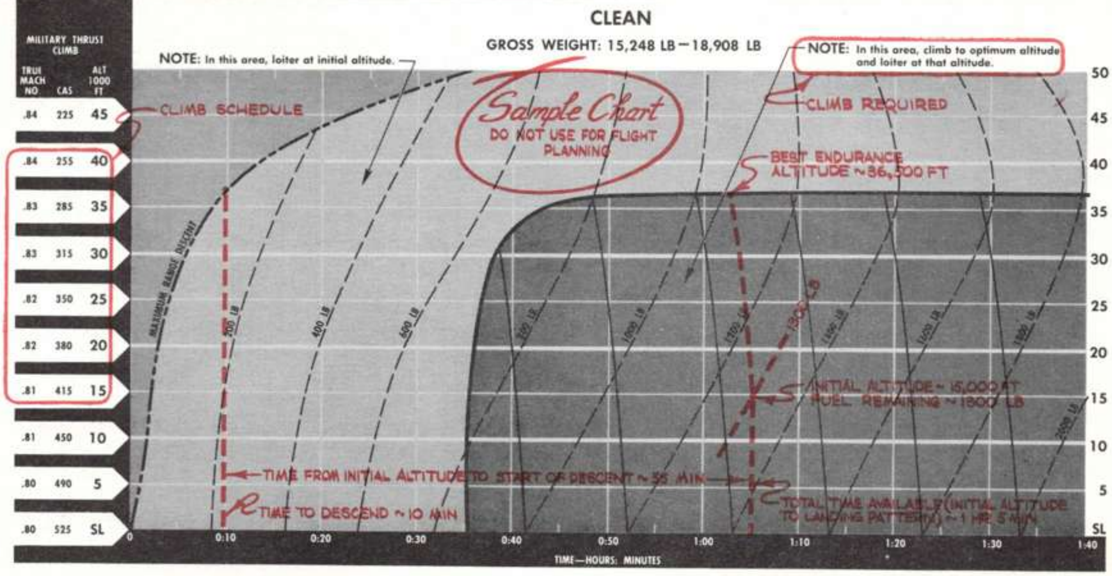
OPTIMUM MAXIMUM ENDURANCE PROFILE

DESCRIPTION

These profiles give the maximum time in the air for the fuel remaining, based on an optimum flight path, from any starting altitude. The flight path required is indicated by the different shaded areas and the notes relative to them. Time and fuel lines shown are based on a Military Thrust climb to best endurance altitude, loiter at the altitude, and a maximum range descent to sea level (no reserve for landing). The climb speed schedule is tabulated at the left of the chart; the loiter speed schedule is tabulated below the chart.

OPTIMUM MAXIMUM ENDURANCE PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E



REMARKS

DESCENT SCHEDULE

1. Maximum range descent. (Use idle thrust, speed brakes closed. Descend at .80 true Mach number or 400 knots CAS, whichever is less.)
2. Loiter at recommended CAS.
3. Use Military Thrust for climb. (See Military Thrust climb chart for detailed information.)
4. No allowance or reserve for landing.

LEGEND:
- ——— Line of optimum altitudes for loiter
- — — — Fuel remaining
- ——— Military Thrust climb path guide lines

Data as of: 1 April 1956. Based on flight test data.

LOITER SETTINGS

LOITER—CLEAN					
		APPROXIMATE			
ALTITUDE FEET	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM
50,000	195	.82	470	1450-1300	91
45,000	200	.76	435	1350-1200	86
40,000	195	.65	375	1250-1100	82
35,000	190	.58	330	1200-1100	78
30,000	185	.50	295	1250-1150	76
25,000	185	.45	270	1350-1250	75
20,000	180	.40	245	1450-1300	75
15,000	180	.36	225	1500-1400	74
10,000	170	.32	205	1550-1400	74
5000	170	.28	185	1600-1450	73
SEA LEVEL	165	.25	165	1650-1450	73

F-86H-1-93-101C

USE

The chart may be entered at the initial altitude with either the fuel remaining (to determine the time available) or the time desired (to determine the fuel requirement). The shaded area in which the initial point falls establishes the flight path to be used, as stated in the note relative to the area.

From the following example, determine the time available and necessary flight plan to remain aloft with 1300 pounds of fuel remaining at 15,000 feet in the clean configuration.

a. Enter profile at 15,000 feet and 1300 pounds of fuel remaining to establish starting point. Total time available .... 1 hr 5 min (In this area, note that a climb is required.)

b. By following the climb guide lines, the best endurance altitude is .... 36,500 ft

c. Descent time from 36,500 feet to sea level .... 10.0 min

d. Elapsed time from start of climb to start of descent (1:05 — 0:10) .... 55.0 min

Suppose a reserve of 600 pounds of fuel had been desired for landing; then enter the profile at 700 pounds of fuel (1300 — 600) and proceed as outlined in steps a. through d.

Time available .... 32 min

Endurance altitude .... 15,000 ft

Descent time .... 2.0 min

Elapsed time .... 30.0 min

CLIMB GRAPHICAL

DESCRIPTION

Climb charts for Military and Maximum Continuous Thrust operations, based on a recommended climb speed schedule, are shown for each configuration. Time and distance are plotted against gross weight, with guide lines to show the reduction in gross weight during climb due to the fuel used. Service ceiling (100 fpm) and optimum range altitude (constant Mach cruise-climb) are superimposed on the Military Thrust climb graphs while only service ceiling appears on the Maximum Continuous Thrust climb graph.

EXAMPLE:

(AW) is initial gross weight (17,800 LB).

(AH) is initial altitude (15,000 FT).

(AD) is initial distance (11.5 n mi).

(AT) is initial time (1.4 min).

(BH) is final altitude (50,000 FT).

(BD) is final distance (100.5 n mi).

(BT) is final time (12.4 min).

(BW) is final gross weight (17,250 LB).

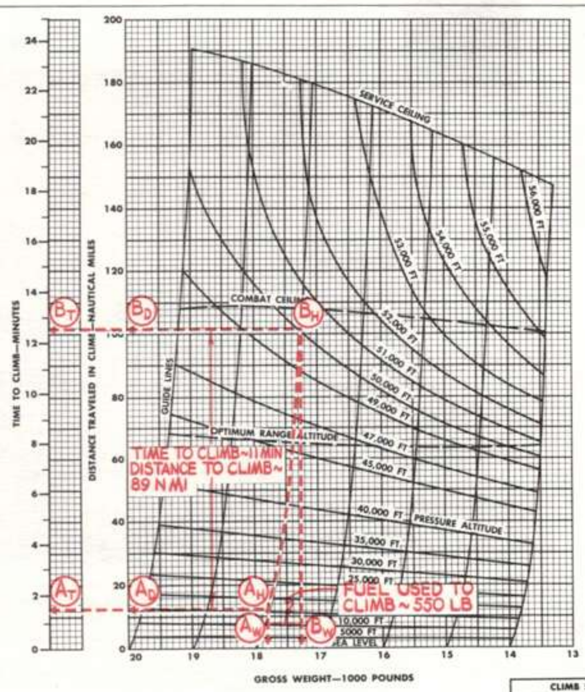
(AW) minus (BW) is fuel used (550 LB).

(BD) minus (AD) is distance traveled (89 n mi).

(BT) minus (AT) is time to climb (11 min).

MILITARY THRUST CLIMB
CLEAN

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

CLIMB SPEEDS		
ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
60,000	.84	160
55,000	.84	180
50,000	.84	200
45,000	.84	225
40,000	.84	255
35,000	.83	285
30,000	.83	315
25,000	.82	350
20,000	.82	380
15,000	.81	415
10,000	.81	450
5000	.80	490
SL	.80	525

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST DATA

USE

To obtain the climb data desired, enter the proper climb chart at the gross weight and altitude at start of climb. Note the time and distance at this point. From this initial altitude point, trace a curve parallel to the guide lines until it intersects the desired altitude at end of climb. Note the time, distance, and gross weight at this intersection. The difference between the initial and final time is the time required to climb. The difference between initial and final values for distance and for gross weight gives, respectively, the distance traveled and fuel used to climb. Since time and distance are zero at sea level, the time required and distance traveled may be read directly for climbs starting at sea level. Fuel used, however, must still be determined by the difference in gross weights.

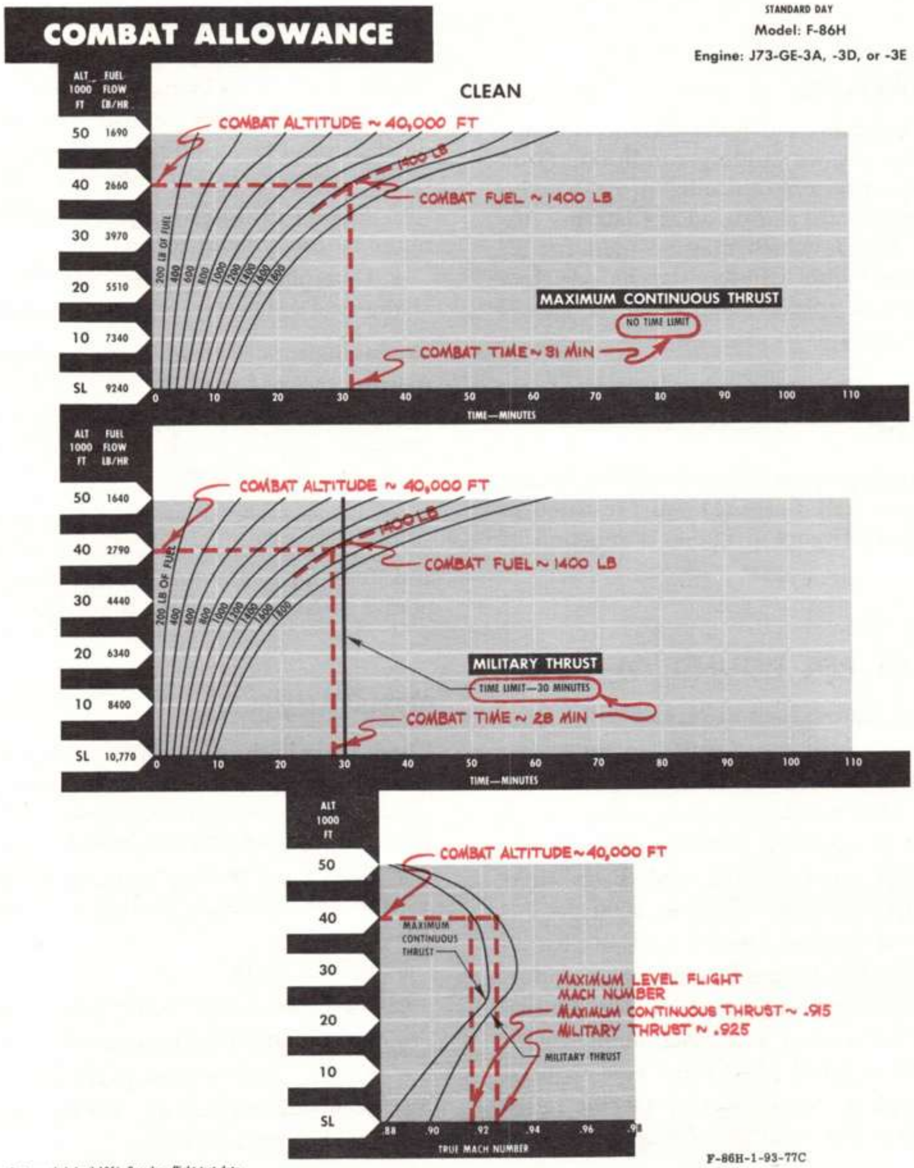
The effect of temperature on time, fuel, and distance to climb is accounted for by using a corrected gross weight at start of climb (increased at temperatures above standard; decreased at temperatures below standard). Instructions for temperature correction are given on each climb chart.

The example shows the fuel used, distance traveled, and time to climb from 15,000 feet to 50,000 feet, using Military Thrust, clean configuration, with an initial gross weight of 17,800 pounds at start of climb.

COMBAT ALLOWANCE

DESCRIPTION

The Combat Allowance chart shows the relationship of time and fuel with changes in altitude, at Military and Maximum Continuous Thrust settings. Maximum speeds for the respective thrust settings are also shown, based on an average combat gross weight. Combat time or fuel may be determined from these charts for a given thrust setting. The time limitations for Military Thrust operations are shown. Maximum Continuous Thrust does not have a time limitation.



Data as of: 1 April 1956. Based on flight test data.

F-86H-1-93-77C

USE

Enter the chart at the combat altitude and the fuel quantity to be used for combat to obtain the time available. Enter at the altitude and time available for combat to obtain the fuel required. Enter at the altitude and thrust setting to obtain the Mach number.

Using the example shown for the clean configuration, obtain the combat time available for a fuel allowance of 1400 pounds at 40,000 feet, using Military and Maximum Continuous Thrust. Also obtain the maximum level-flight Mach number for the altitude and thrust setting.

	TIME AVAILABLE	MACH NO.
Military Thrust	28.0 min	.925
Max Cont Thrust	31.0 min	.915

DESCENTS.

Recommended and maximum range descents are shown for configurations clean (figure A-54), two external loads (figure A-55), and four external loads (figure A-56). The recommended descent is made at Idle Thrust with speed brakes open. The maximum range descent is made at Idle Thrust with speed brakes closed. Fuel used in descent, rate of descent, time to descend, and distance traveled are shown.

LANDING DISTANCES.

Landing ground-roll distance and total distance to clear a 50-foot obstacle for various landing conditions (runway air temperature, pressure altitude, gross weight, and relative wind speed) are shown on the landing distance chart (figure A-10), which may be used for all configurations. Charted values assume a dry, hard-surface runway, flaps full down, speed brakes open. A sample problem on the chart explains its use.

LANDING SPEEDS.

The recommended landing indicated airspeeds (approach, touchdown, and initial stall warning) are presented in the landing speed chart (figure A-11) as a function of gross weight.

NAUTICAL MILES PER POUND OF FUEL.

Cruise data (no wind) throughout the speed range from maximum endurance to Military Thrust are shown on the nautical-miles-per-pound-of-fuel charts (figures A-73 through A-102). Several weights for each configuration are given at altitudes of sea level, 15,000, 25,000, 30,000, 35,000, 40,000, 45,000, and 50,000 feet. Each chart includes specific range (nautical miles per 1000 pounds of fuel), fuel flow, and % rpm. Also included are curves of recommended cruise Mach number, maximum endurance, Maximum Continuous Thrust, and Military Thrust. Specific range is plotted against *true* Mach number with subscales of calibrated airspeed (CAS) and true airspeed (TAS). Cruising range is the product of specific range multiplied by pounds of fuel available for cruise.

$$\text{Range} = \frac{\text{naut mi}}{\text{lb}} \times \text{lb of fuel}$$

For greatest accuracy in determining cruising range, consider small amounts of fuel at a time rather than total fuel available. By this method, the total cruising range is the sum of the individual ranges obtained for each amount of fuel. To obtain the cruising range for a given amount of fuel, use the following steps:

a. Select the proper chart for the airplane configuration and altitude.

b. Determine the average weight of the airplane for the amount of fuel being considered.

c. Enter the chart at this average weight and the desired true Mach number, or desired % rpm, to obtain specific range (nautical miles per 1000 pounds of fuel).

d. Obtain cruising range by multiplying the specific range by the amount of fuel.

e. Determine the approximate fuel flow and % rpm, at the true Mach number and average weight.

When there is a wind to be considered, multiply the specific range found in step c. by the range factor (ground speed divided by true airspeed) to obtain the specific range for wind. Proceed with steps d. and e. to complete the problem.

For temperatures other than Standard Day, apply the corrections shown on each chart to true airspeed, % rpm, and fuel flow. Do not change the nautical miles per pound of fuel or *true* Mach number.

SUMMARY.

Check your flight plan during the actual flight to determine whatever deviations exist. These deviations may be applied to the reserve expected at the destination. The most important factors to consider are:

a. Fuel used during start, taxi, and take-off. (The mission and intercept profiles allow 600 pounds for this phase.)

b. Wind effects.

c. Deviation from recommended climb schedule.

d. Deviation from recommended cruise settings.

e. Variations in engine performance.

f. Navigational errors, formation flight, and fuel actually aboard at take-off.

SAMPLE PROBLEM NO. 1.

The following sample problem combines the use of the charts and graphs in this section to plan a mission.

A high-altitude combat mission is to be flown using two 200-gallon tanks which are to be dropped before combat. Prepare a flight plan based on the following data:

a. Distance to combat area .... 450 naut mi

b. Assigned altitudes:
   Inbound to combat (best range altitude) .... 42,500 ft
   Outbound from combat (optimum return) .... 43,000 ft

c. Combat (Military Thrust) 35,000 feet .... 10 min

d. Weather (assume Standard Day Temperatures throughout) .... CAVU
   Winds aloft:
   Inbound .... 30 kn head wind
   Outbound .... 45 kn tail wind

e. Field elevation .... 2000 ft

f. Runway length .... 4000 ft

g. Airplane gross weight:
   Basic (includes trapped oil, internal fuel, armament, and miscellaneous equipment) .... 14,928 lb
   Pilot .... 220 lb
   Two 200-gallon tanks (empty weight) .... 344 lb
   Ammunition (150 rounds including links) .... 105 lb
   Maximum usable fuel—internal and drop tanks (962 gallons) .... 6253 lb
   Total gross weight .... 21,850 lb

TAKE-OFF.

Obtain the take-off distance from the Military Thrust take-off distance chart, flaps full down (figure A-4). (Standard Day temperature at 2000 feet is 52°F.) Use zero wind.

Ground-roll distance (21,850 pounds) .... 2600 ft
Total take-off distance over 50-foot obstacle .... 3900 ft
Take-off speed (IAS) .... 136 kn
Nose wheel lift-off (IAS) .... 119 kn
Initial stall warning speed (power off) .... 135 kn

GO, NO-GO SPEED AND DISTANCE.

Enter the Military Thrust normal take-off distance chart (figure A-4) with the available runway length (4000 feet and zero wind) and obtain the maximum allowable take-off temperature.

Temperature (2000 feet altitude and 21,850 pounds) .... 140°F

Obtain the go, no-go speed from figure A-8, using the temperature, gross weight, field elevation, wind, and runway length.

Go, no-go speed (IAS), 21,850 pounds, and 140°F .... 86 kn

Use the temperature and go, no-go speed to determine the acceleration ground roll distance from figure A-6.

Go, no-go speed distance (140°F and 2000 feet altitude) .... 1450 ft

LANDING IMMEDIATELY AFTER TAKE-OFF.

To complete the take-off data card, data for landing at take-off gross weight must be determined from figure A-10. Use take-off conditions.

Ground roll distance (21,850 pounds) .... 3800 ft
Final approach speed (IAS) .... 166 kn
Touchdown speed (IAS) .... 140 kn

INBOUND TO COMBAT.

The inbound leg may be determined directly from the mission profile chart for two 200-gallon drop tanks (figure A-19). The profile includes a 600-pound fuel allowance for start, taxi, and take-off, as well as the fuel required to climb and cruise at assigned altitude (42,500 feet).

a. Distance .... 450 naut mi

b. Time (no wind) from profile .... 58 min (0.97 hr)

c. Air distance due to wind (0.97×30) .... 29 naut mi

d. Total air distance with head wind (450+29) .... 479 naut mi

e. Fuel required (with wind) from profile .... 2950 lb

f. Time with wind from profile .... 1 hr

g. Cruise speed (42,500 ft) .... .82 Mach No.

h. Cruise thrust setting .... 92% to 85% rpm

i. Military Thrust climb speed schedule .... (See profile.)

j. Gross weight at end of cruise (drop tanks released at end of cruise) 21,850 pounds minus (e) minus 344 lb .... 18,556 lb

COMBAT ALLOWANCE.

The tanks are dropped at the end of the cruise, before entering combat. From the combat allowance chart, clean (figure A-51), obtain the fuel required and combat speed at 35,000 feet. (No allowance is made for descent from cruise altitude to combat altitude.)

a. Combat—Military Thrust (10 minutes) .... 600 lb

b. True Mach number .... .93

Determine the fuel remaining and weight at the end of combat.

c. Take-off, climb, and cruise fuel....................2950 lb

d. Combat fuel ....600 lb

Total fuel used ....3550 lb

e. Fuel remaining (6253 pounds − 3550 pounds) ....2703 lb

f. Gross weight at end of combat [18,556 pounds minus 600 pounds (combat fuel) minus 87 pounds (ammunition links retained)] ....17,869 lb

OUTBOUND FROM COMBAT (RETURN).

Assume return is started 500 nautical miles from base at an altitude of 25,000 feet. Enter the optimum return profile for the clean configuration (figure A-15) at the distance from base, and determine the fuel required and reserve with the existing tail wind.

a. Distance ....500 naut mi

b. Recommended cruise altitude (constant) ....43,000 ft

c. Cruise time (no wind)....................................58 min

d. Time to climb* (Military Thrust, clean) 25,000 feet to 43,000 feet, initial gross weight 17,869 pounds ....5 min

e. Total time, no wind (c + d)......1 hr 3 min (1.05 hr)

f. Air distance due to wind (1.05 × 45)......47 naut mi

g. Total air distance with tail wind (500 − 47) ....453 naut mi

h. Fuel required (with wind) from profile........1340 lb

i. Cruise time, with wind from profile................53 min

j. Total time with wind (d + i)........58 min (0.97 hr)

k. Cruise speed .... .85 Mach No.

l. Thrust setting ....87% to 85% rpm

m. Reserve over base at 43,000 feet (2703 pounds − k)..1363 lb

DESCENT.

Obtain the fuel required to descend to base from 43,000 feet. (See figure A-54.)

a. Recommended descent fuel required..................40 lb

b. Time to descend ....4 min

c. Speed schedule—Idle Thrust, speed brakes open .... .80 Mach No.

d. Fuel reserve for landing (1363 pounds minus 40 pounds)..1323 lb

e. Airplane weight for landing........................16,489 lb

LANDING.

Obtain the landing distance from figure A-10. Use 2000 feet, 52°F, and zero wind.

a. Ground-roll distance ....2925 ft

b. Total distance over 50-foot obstacle................4200 ft

Obtain the following speeds from figure A-11.

c. Approach speed (IAS) ....143 kn

d. Touchdown speed (IAS) ....123 kn

e. Initial stall warning speed (IAS)....................118 kn

The sum of all the time required gives the time from take-off to landing*................2 hr 12 min (2.20 hr)

SAMPLE PROBLEM NO. 2.

A ground support mission is to be flown consisting of climb and cruise inbound to combat, descent to sea level, a 45-nautical-mile high-speed (Maximum Continuous Thrust) penetration into the combat area, delivery of two 750-pound napalm bombs, and return to base. The configuration with two 200-gallon tanks plus two 750-pound napalm bombs is to be used, with the 200-gallon tanks dropped when empty. Prepare a flight plan based on the following data:

a. Cruise distance ....300 naut mi

b. Penetration distance ....45 naut mi

c. Total distance to combat area..................345 naut mi

d. Assigned altitudes:
   Inbound to combat (constant altitude) ....30,000 ft
   Penetration to combat area......................sea level
   Outbound from combat (optimum return)..................................42,500 ft

e. Combat-time (Military Thrust) sea level ....6 min

f. Weather (assume Standard Day temperatures throughout) ....CAVU
   Winds aloft
   Inbound (30,000 feet)................20 kn head wind
   Outbound (42,500 feet)................30 kn tail wind

g. Field elevation ....4000 ft

h. Runway length ....5000 ft

i. Surface wind ....10 kn

j. Airplane gross weight:
   Basic (includes trapped oil, internal fuel, armament, and miscellaneous equipment) ....14,928 lb
   Pilot ....220 lb
   Two 200-gallon tanks (empty weight) ....344 lb

***Calculation of time to climb is not necessary unless an accurate time history is required. (Refer to use of optimum return profile.)**

Ammunition (150 rounds including links) .... 105 lb
Two 750-pound napalm bombs and racks .... 1,638 lb
Maximum usable fuel—internal and drop tanks (962 gallons) .... 6,253 lb
Total gross weight .... 23,488 lb

TAKE-OFF.

Obtain the take-off distance from the Military Thrust take-off distance chart, flaps full down (figure A-4). (Standard Day temperature at 4000 feet is 44°F.) Use 10-knot head wind.

Ground roll distance (23,488 pounds) .... 3150 ft
Total take-off distance over 50-foot obstacle .... 4600 ft
Take-off speed (IAS) .... 141 kn
Nose wheel lift-off (IAS) .... 124 kn
Initial stall warning speed (power off) .... 140 kn

GO, NO-GO SPEED AND DISTANCE.

Enter the Military Thrust normal take-off distance chart (figure A-4) with the available runway length (5000 feet and 10-knot head wind) and obtain the maximum allowable take-off temperature.

Temperature (4000 feet and 23,488 pounds) .... 134°F

Obtain the go, no-go speed from figure A-8, using the temperature, gross weight, field elevation, wind, and runway length.

Go, no-go speed (IAS), 23,488 pounds, and 134°F .... 95 kn

Use the temperature and go, no-go speed to determine the acceleration ground-roll distance from figure A-6.

Refusal speed distance (134°F and 4000 feet altitude) .... 1900 ft

INBOUND TO COMBAT (30,000 FEET).

The inbound leg may be determined directly from the mission profile chart for two 200-gallon tanks and two 750-pound napalm bombs (figure A-31). The profile includes a 600-pound fuel allowance for start, taxi, and take-off, as well as the fuel required to climb and cruise at 30,000 feet.

a. Fuel available from drop tanks .... 2600 lb
b. Time to tank release point, from profile (2600 lb, 30,000 ft) .... 44 min (0.73 hr)
c. Distance (no wind) to tank release point .... 300 naut mi
d. Air distance due to wind (0.73 × 20) .... 15 naut mi
e. Maximum range with head wind (300 − 15) .... 285 naut mi
f. Cruise speed (30,000 feet) .... .68 Mach No.
g. Cruise Thrust setting .... 85% to 83% rpm
h. Military Thrust climb speed schedule .... (See profile.)
i. Gross weight at end of cruise at 30,000 feet (drop tanks released when empty) 23,488 pounds minus a. minus 344 pounds .... 20,544 lb
j. Distance remaining to combat area (345 − d.) .... 60 naut mi

NOTE At this point, the descent and penetration distances should be subtracted from j. to determine the remaining cruise distance (at 30,000 feet) to be traveled without tanks. The fuel required is the distance remaining divided by specific range, times range factor (wind effect). Refer to "Nautical Miles Per Pound of Fuel," clean configuration, in this section.

DESCENT TO COMBAT PENETRATION ALTITUDE.

Use the descent chart for two external loads (figure A-55) to determine the time, fuel, and distance traveled in descent.

a. Recommended descent distance (30,000 feet to sea level) .... 15 naut mi
b. Time required for descent .... 2 min
c. Fuel used to descend .... 20 lb
d. Speed schedule using Idle Thrust with speed brakes open .... .80 Mach No. or 350 kn CAS

Obtain cruise distance without tanks:

e. Distance from tank drop point to combat area (j.) .... 60 naut mi
(Refer to note in "Inbound to Combat 30,000 Feet.")
f. Penetration distance .... 45 naut mi
g. Descent distance .... 15 naut mi
h. Distance remaining to cruise (60 − 45 − 15) .... 0 naut mi

COMBAT PENETRATION (SEA LEVEL).

From the combat allowance chart for two external loads (figure A-52) at Maximum Continuous Thrust, obtain:

a. True Mach number at sea level .... .857 (566 kn TAS)

b. Time required for combat penetration 45 naut mi ÷ 566 kn TAS ....5 min (0.08 hr)

c. Fuel required for combat penetration (from combat allowance chart) ....700 lb

d. Gross weight at end of penetration 20,544 pounds minus 20 pounds (descent) minus 700 pounds (penetration) ....19,824 lb

COMBAT ALLOWANCE.

From the combat allowance chart for two external loads (figure A-52), obtain the fuel required for combat at sea level.

a. Combat—Military Thrust (6 minutes) ....1100 lb

b. Gross weight at end of combat 19,824 pounds minus 1100 pounds of fuel minus 1500 pounds of napalm bombs (racks retained) minus 150 pounds ammunition ....17,074 lb

Determine the fuel remaining at end of combat.

c. Take-off climb cruise (with tanks) ....2600 lb

d. Cruise (without tanks) ....0 lb

e. Descent from cruise to combat penetration ....20 lb

f. Combat penetration ....700 lb

g. Combat ....1100 lb

h. Total fuel used ....4420 lb

i. Fuel remaining (6253 pounds minus 4420 pounds) ....1833 lb

OUTBOUND FROM COMBAT (RETURN).

Because of combat tactics, assume return is started 400 nautical miles from base at sea level. Enter the optimum return profile for the clean configuration (figure A-11) at the distance given from base. Determine the fuel required and reserve remaining with a 30-knot tail wind.

a. Distance ....400 naut mi

b. Recommended cruise altitude (constant) ....42,500 ft

c. Cruise time, no wind ....44 min (0.73 hr)

d. Time to climb* (Military Thrust clean)—sea level to 42,500 feet. gross weight 17,074 pounds ....6 min

e. Total time, no wind (c. + d.) ....50 min (0.84 hr)

f. Air distance due to wind (0.84 × 30) ....25 naut mi

g. Total air distance with tail wind (400 − 25) ....375 naut mi

h. Fuel required (with wind) from profile ....1375 lb

i. Cruise time (with wind) from profile ....40 min

j. Total time with wind (d. + i.) ....46 min (0.77 hr)

k. Cruise speed (42,500 feet) ....84 Mach No.

l. Thrust setting ....86% to 84% rpm

m. Reserve over base at 42,500 feet (1833 pounds − h) ....458 lb

n. Gross weight at end of cruise (17,074 − h) ....15,699 lb

DESCENT.

Obtain the fuel required for recommended descent to base from 42,500 feet, clean. (See figure A-54.)

a. Fuel required (42,500 feet) ....40 lb

b. Time to descend ....4 min

c. Speed schedule, using Idle Thrust with speed brakes open ....80 Mach No. or 350 kn CAS

d. Fuel reserve for landing (458 pounds − 40 pounds) ....418 lb

e. Airplane gross weight for landing (15,699 − a) ....15,659 lb

LANDING.

Obtain the landing distance from figure A-10. Use 4000 feet, 44°F, and zero wind.

a. Ground-roll distance ....2925 ft

b. Total distance over 50-foot obstacle ....4200 ft

Obtain the following speeds from figure A-11.

c. Approach speed (IAS) ....140 kn

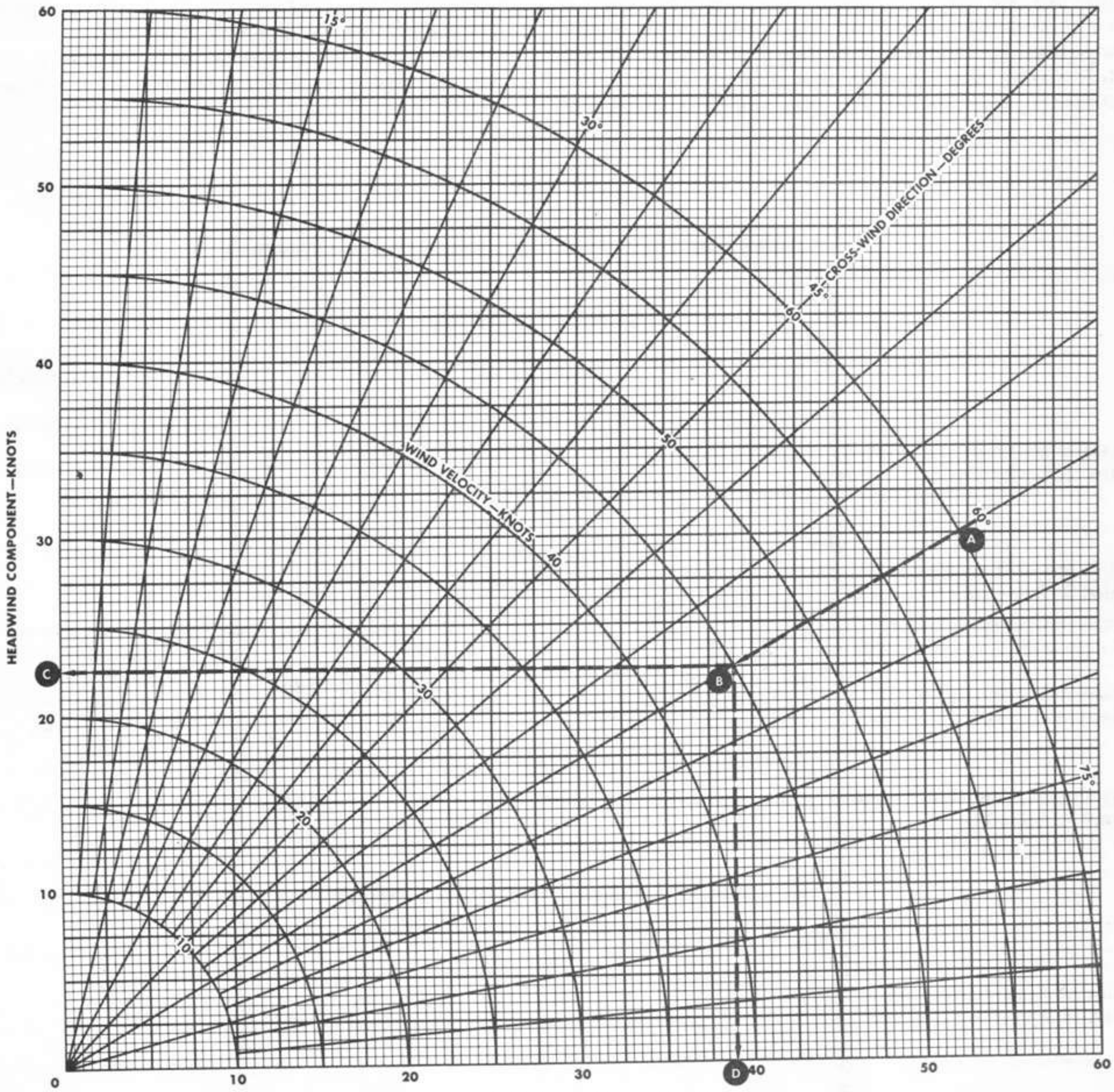
d. Touchdown speed (IAS) ....120 kn

e. Initial stall warning speed (IAS) ....115 kn

The sum of all the time required gives the time from take-off to landing* ....1 hr 47 min (1.78 hr)

***Calculation of time to climb is not necessary unless an accurate time history is required. (Refer to use of optimum return profile.)**

TAKE-OFF AND LANDING CROSS-WIND CHART



NOTE:
To obtain tail-wind components, enter chart with direction of wind taken from reciprocal heading of airplane.

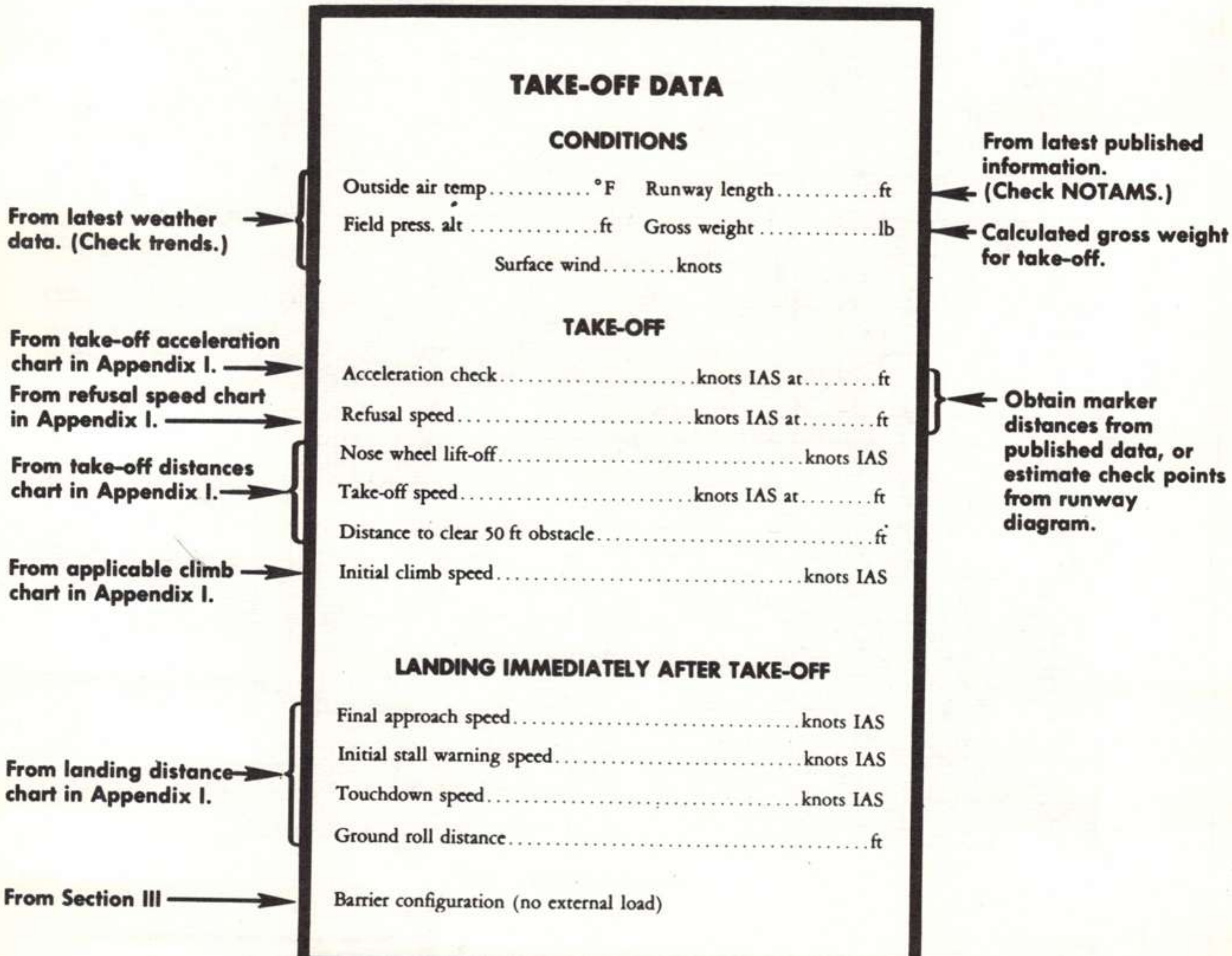
EXAMPLE:
A is cross-wind direction, from airplane heading (60 degrees).
B is wind velocity (45 knots).
C is effective head wind (22.5 knots).
D is effective 90-degree cross wind (39 knots).

F-86H-1-93-274

Figure A-3

TAKE-OFF AND LANDING DATA CARDS

Before take-off, the pilot should compute all data required to complete the take-off and landing data cards. Reproductions of these cards appear in the condensed check list at the end of Section II. Each card should be filled out completely so that the information which the cards provide will be available as needed. The required data is computed from the appropriate charts in this Appendix. Interpretation of the data entered on the cards 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 cards. However, the cards are very useful as a general guide to expected airplane performance, and will contribute substantially to flight safety when properly used. These two examples are provided as a guide for completion of the cards.



F-86H-1-93-272A

LANDING DATA

CONDITIONS

From latest weather data. (Check trends.)

Runway air temp...........°F Runway length..........ft

From latest published information. (Check NOTAMS.)

Field press. alt ....ft Gross weight ....lb

Calculated gross weight for take-off.

Surface wind...........knots

LANDING

From landing distance chart in Appendix I.

Final approach speed..............................knots IAS

Initial stall warning speed..........................knots IAS

Touchdown speed................................knots IAS

Ground roll distance....................................ft

Total distance to clear 50 ft obstacle.........................ft

From Section III

Barrier configuration (no external load)

F-86H-1-93-273A

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

TAKE-OFF DISTANCES

FLAPS FULL DOWN*

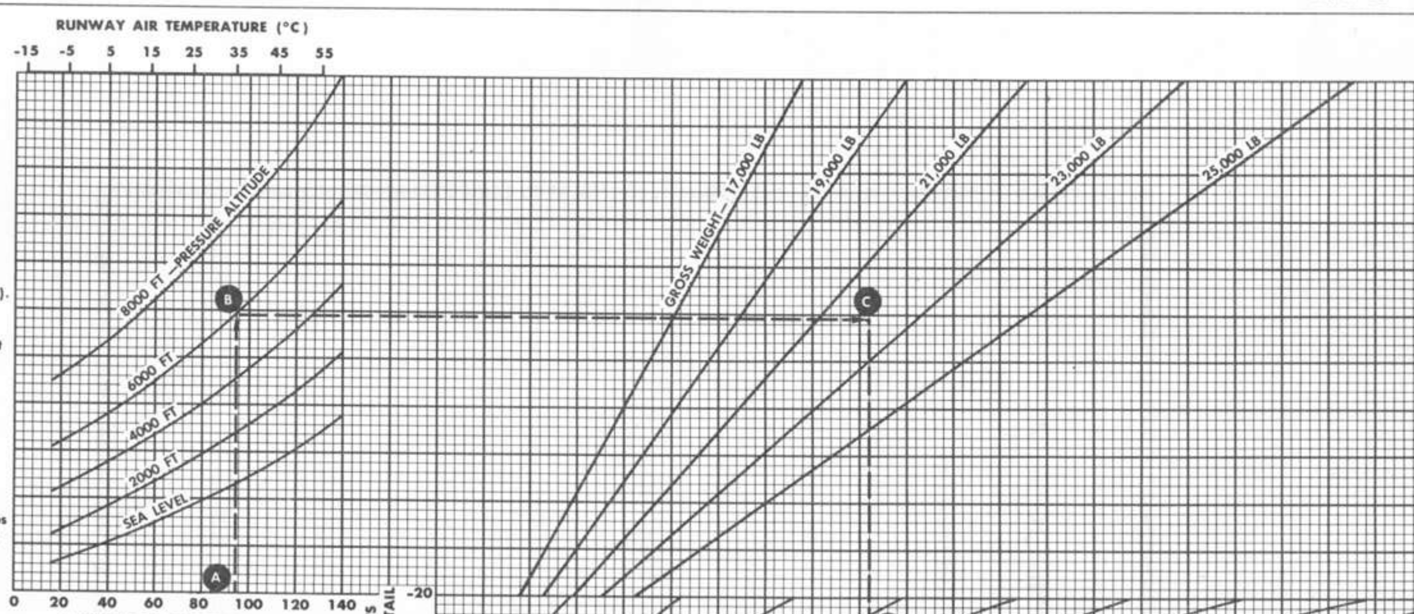
HARD-SURFACE RUNWAY
MODEL F-86H
ENGINE: J73-GE-3A, -3D, or -3E

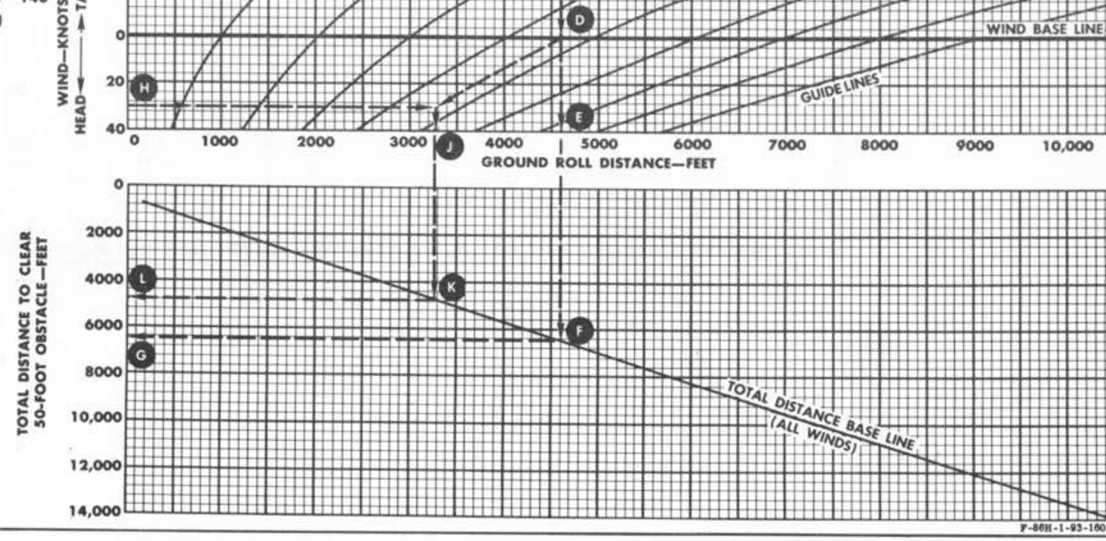
EXAMPLE:

- (A) is air temperature (95°F).
- (B) is pressure altitude (6,000 feet).
- (C) is gross weight (22,000 pounds).
- (D) is wind base line.
- (E) is ground roll distance with zero wind (4600 feet).
- (F) is base line for total distance.
- (G) is total distance to clear 50-foot obstacle with zero wind (6500 feet).
- (H) is head wind (30 knots).
- (J) is ground roll distance with 30-knot head wind (3250 feet).
- (K) is base line for total distance.
- (L) is total distance to clear 50-foot obstacle with 30-knot head wind (4800 feet).

NOTE

* Do not use full flaps with EX-10 bombs or 1000-pound GP bombs with T-142 fins installed.





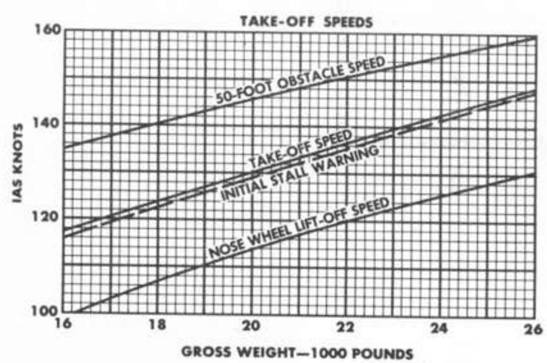


Figure A-4

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

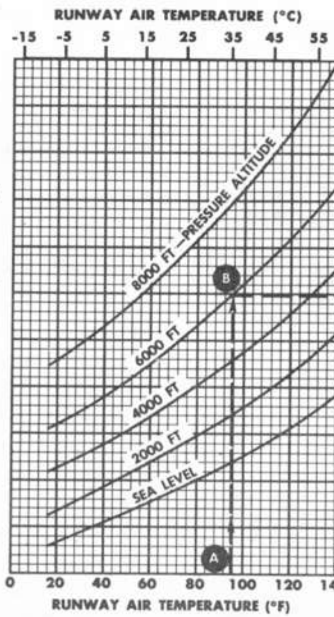
TAKE-OFF DISTANCES

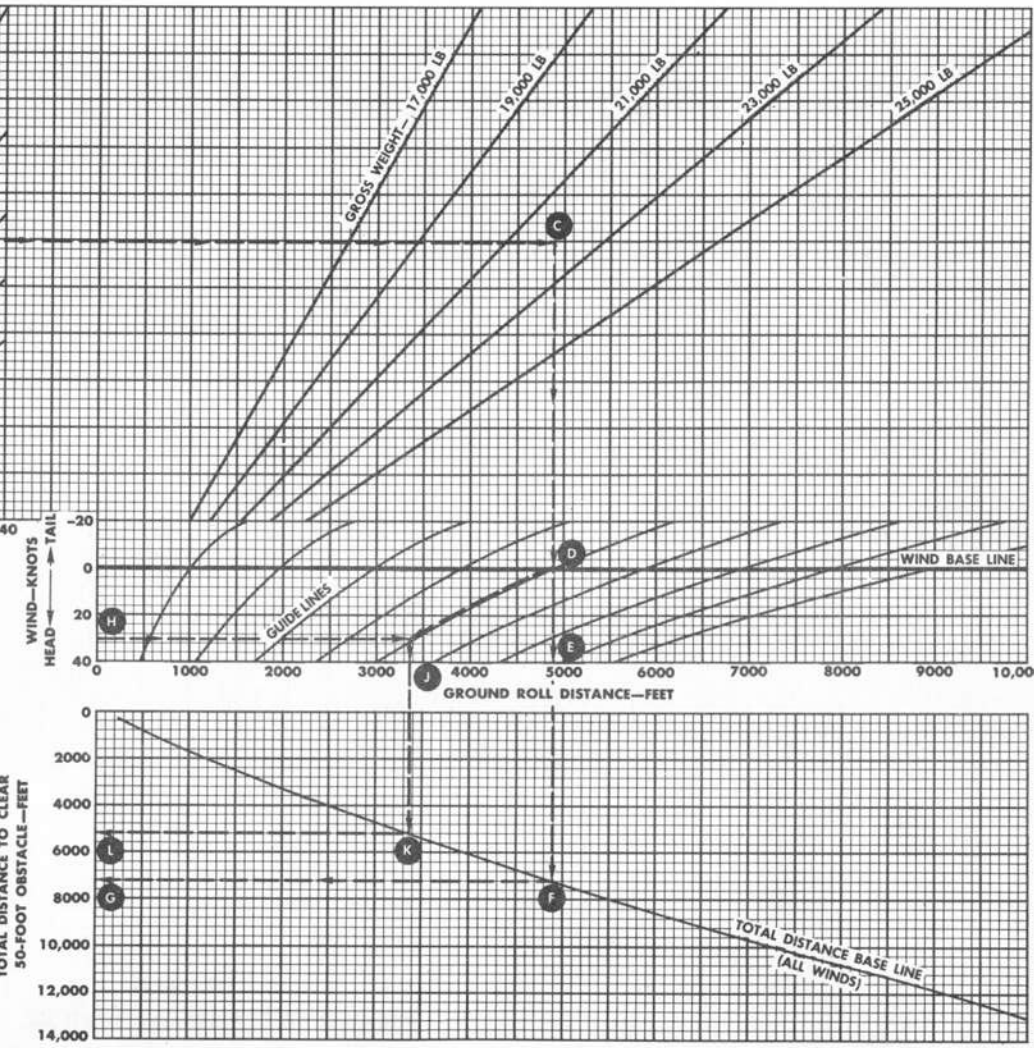
FLAPS DOWN 20 DEGREES

HARD-SURFACE RUNWAY
MODEL F-86H
ENGINE: J73-GE-3A, -3D, or -3E

EXAMPLE:

- (A) is air temperature (95°F).
- (B) is pressure altitude (6,000 feet).
- (C) is gross weight (22,000 pounds).
- (D) is wind base line.
- (E) is ground roll distance with zero wind (4900 feet).
- (F) is base line for total distance.
- (G) is total distance to clear 50-foot obstacle with zero wind (7200 feet).
- (H) is head wind (30 knots).
- (J) is ground roll distance with 30-knot head wind (3340 feet).
- (K) is base line for total distance.
- (L) is total distance to clear 50-foot obstacle with 30-knot head wind (5100 feet).





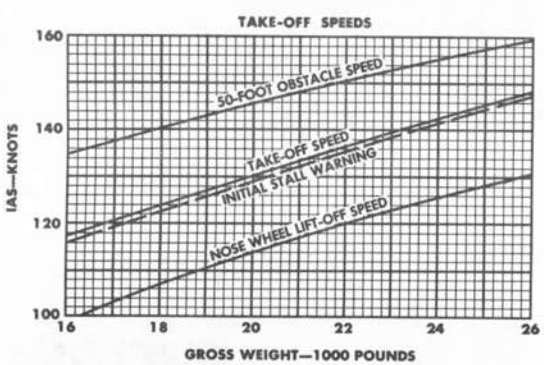


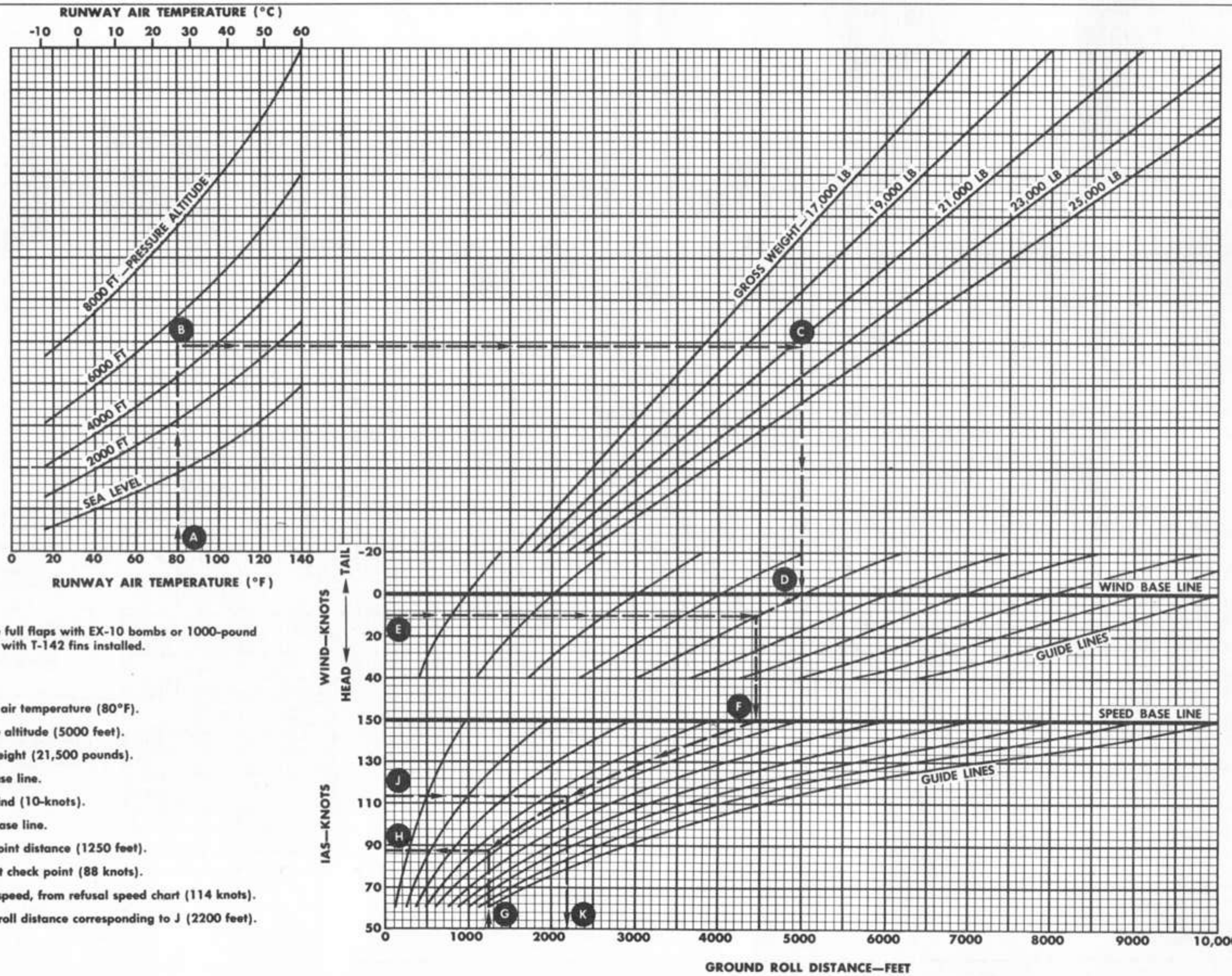
Figure A-5

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

TAKE-OFF ACCELERATION

FLAPS FULL DOWN*

HARD-SURFACE RUNWAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



NOTE:
* Do not use full flaps with EX-10 bombs or 1000-pound GP bombs with T-142 fins installed.

EXAMPLE:

- (A) is runway air temperature (80°F).
- (B) is pressure altitude (5000 feet).
- (C) is gross weight (21,500 pounds).
- (D) is wind base line.
- (E) is head wind (10-knots).
- (F) is speed base line.
- (G) is check-point distance (1250 feet).
- (H) is speed at check point (88 knots).
- (J) is refusal speed, from refusal speed chart (114 knots).
- (K) is ground roll distance corresponding to J (2200 feet).

F-86H-1-93-162B

Figure A-6

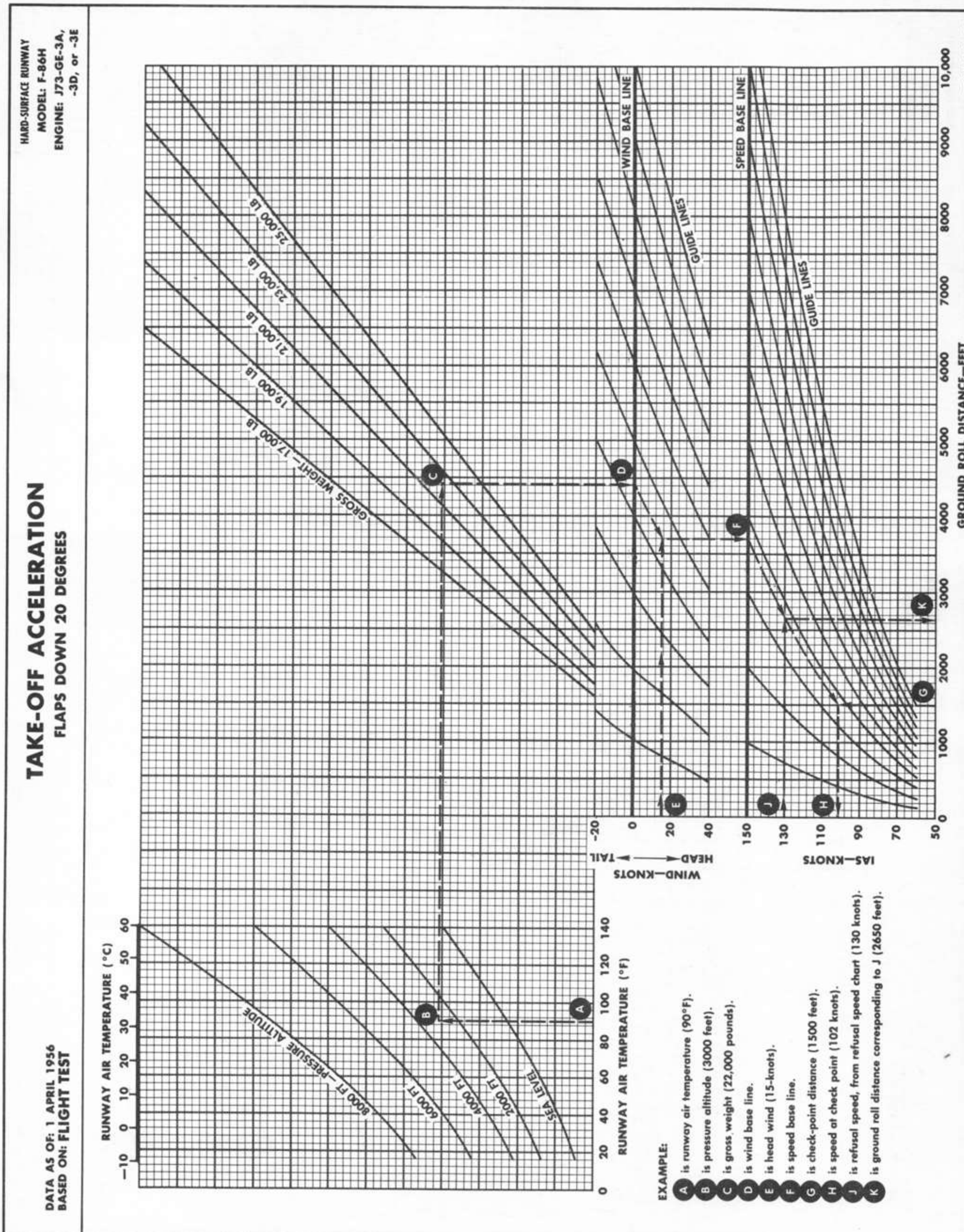

TAKE-OFF ACCELERATION
FLAPS DOWN 20 DEGREES
HARD-SURFACE RUNWAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E
DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST
RUNWAY AIR TEMPERATURE (°C)
-10 0 10 20 30 40 50 60
RUNWAY AIR TEMPERATURE (°F)
0 20 40 60 80 100 120 140
8000 FT—PRESSURE ALTITUDE
6000 FT
4000 FT
2000 FT
SEA LEVEL
GROSS WEIGHT—17,000 LB
19,000 LB
21,000 LB
23,000 LB
25,000 LB
WIND BASE LINE
GUIDE LINES
SPEED BASE LINE
GUIDE LINES
WIND—KNOTS
HEAD ⟵ ⟶ TAIL
-20 0 20 40
IAS—KNOTS
150 130 110 90 70 50
GROUND ROLL DISTANCE—FEET
0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10,000
EXAMPLE:
A is runway air temperature (90°F).
B is pressure altitude (3000 feet).
C is gross weight (22,000 pounds).
D is wind base line.
E is head wind (15-knots).
F is speed base line.
G is check-point distance (1500 feet).
H is speed at check point (102 knots).
J is refusal speed, from refusal speed chart (130 knots).
K is ground roll distance corresponding to J (2650 feet).
F-86H-1-93-163B

Figure A-7

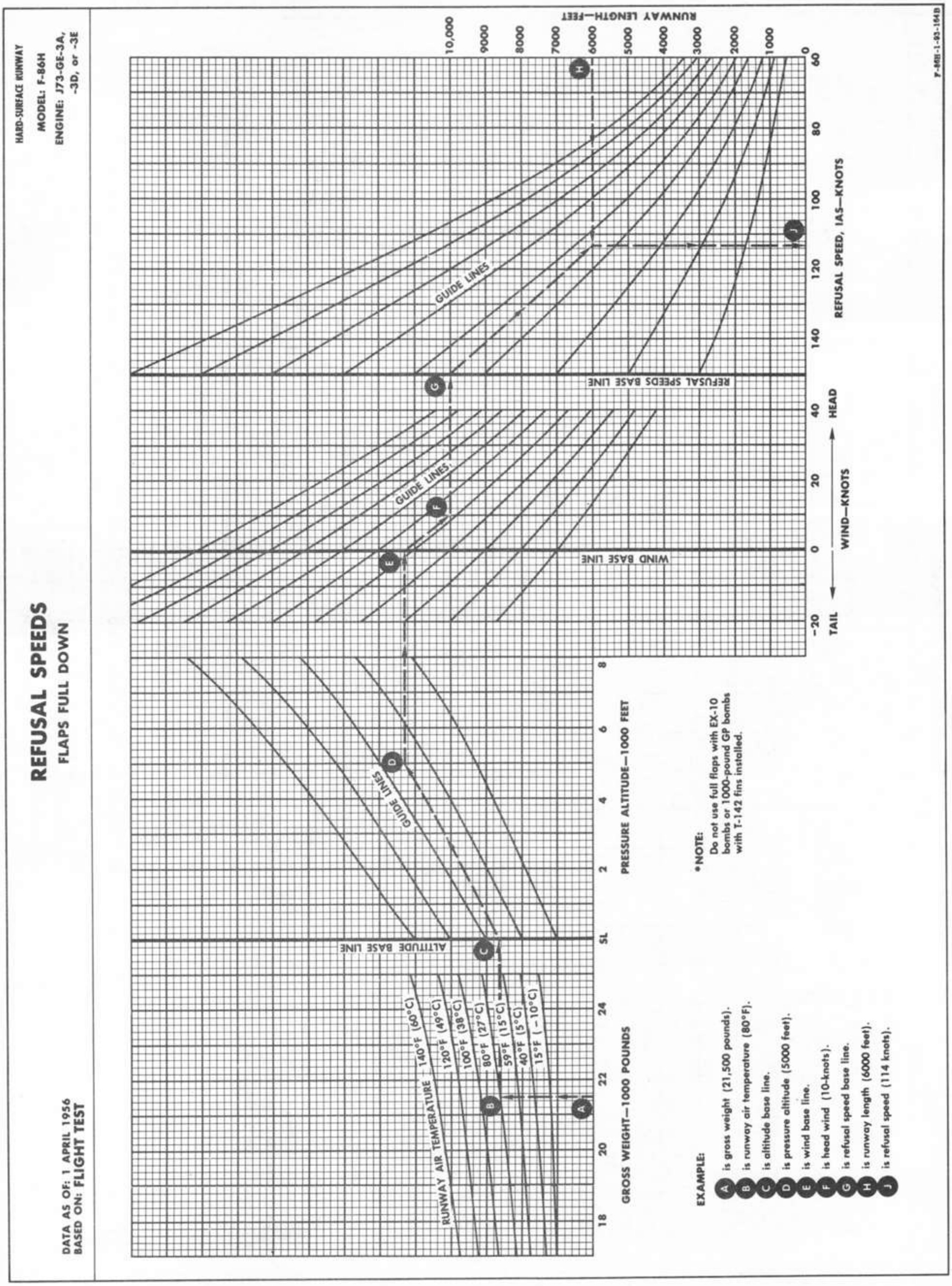

REFUSAL SPEEDS
FLAPS FULL DOWN
HARD-SURFACE RUNWAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E
DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST
RUNWAY AIR TEMPERATURE
140°F (60°C)
120°F (49°C)
100°F (38°C)
80°F (27°C)
59°F (15°C)
40°F (5°C)
15°F (−10°C)
GROSS WEIGHT—1000 POUNDS
18
20
22
24
ALTITUDE BASE LINE
SL
2
4
6
8
PRESSURE ALTITUDE—1000 FEET
GUIDE LINES
WIND BASE LINE
−20
0
20
40
TAIL
HEAD
WIND—KNOTS
REFUSAL SPEEDS BASE LINE
140
120
100
80
60
REFUSAL SPEED, IAS—KNOTS
RUNWAY LENGTH—FEET
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10,000
*NOTE:
Do not use full flaps with EX-10 bombs or 1000-pound GP bombs with T-142 fins installed.
EXAMPLE:
A is gross weight (21,500 pounds).
B is runway air temperature (80°F).
C is altitude base line.
D is pressure altitude (5000 feet).
E is wind base line.
F is head wind (10-knots).
G is refusal speed base line.
H is runway length (6000 feet).
J is refusal speed (114 knots).
F-86H-1-93-164B

Figure A-8

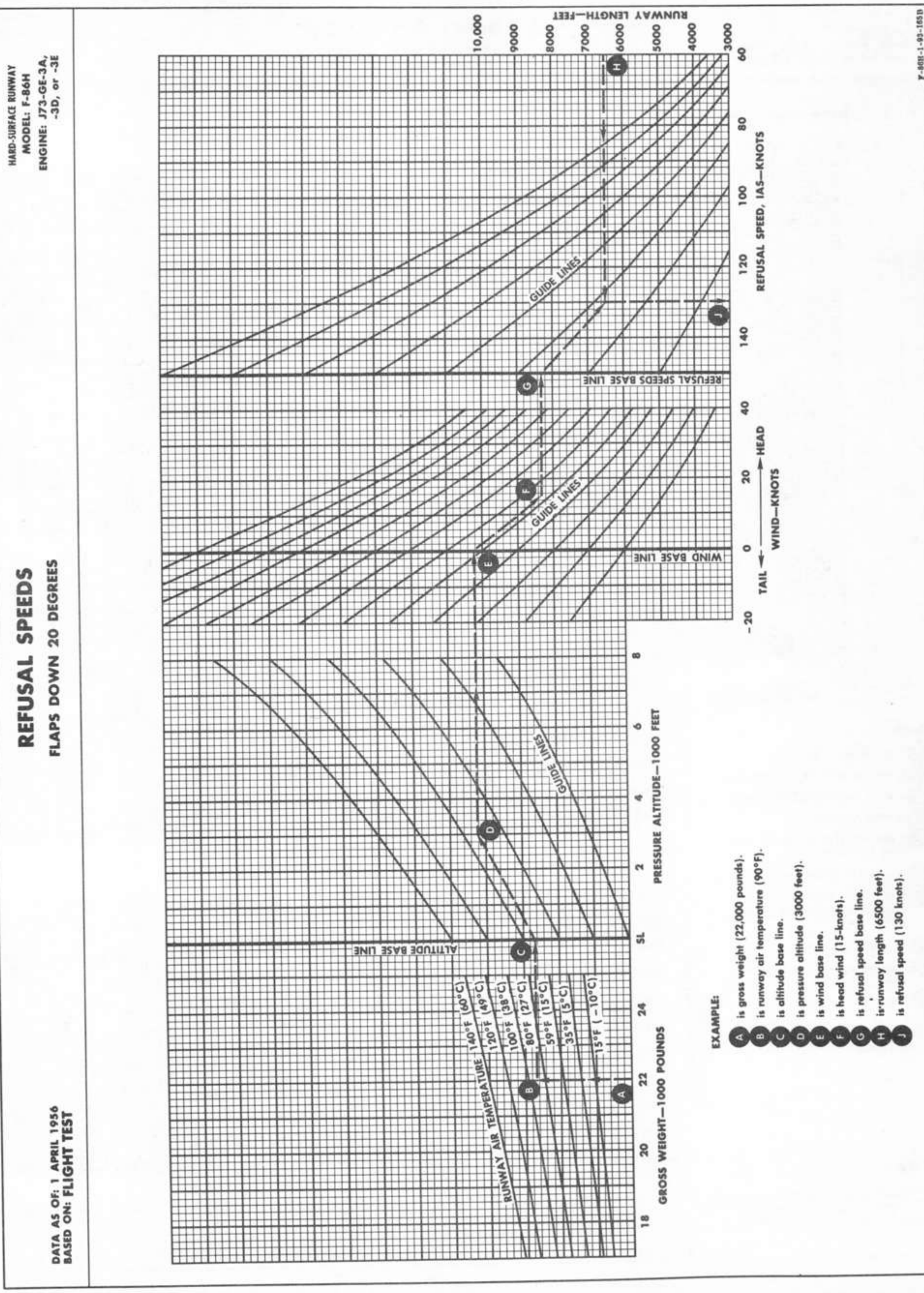

REFUSAL SPEEDS
FLAPS DOWN 20 DEGREES
HARD-SURFACE RUNWAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E
DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST
RUNWAY AIR TEMPERATURE
140°F (60°C)
120°F (49°C)
100°F (38°C)
80°F (27°C)
59°F (15°C)
35°F (5°C)
15°F (−10°C)
ALTITUDE BASE LINE
WIND BASE LINE
REFUSAL SPEEDS BASE LINE
GUIDE LINES
GROSS WEIGHT—1000 POUNDS
18
20
22
24
SL
2
4
6
8
PRESSURE ALTITUDE—1000 FEET
−20
0
20
40
TAIL
HEAD
WIND—KNOTS
60
80
100
120
140
REFUSAL SPEED, IAS—KNOTS
RUNWAY LENGTH—FEET
10,000
9000
8000
7000
6000
5000
4000
3000
EXAMPLE:
A is gross weight (22,000 pounds).
B is runway air temperature (90°F).
C is altitude base line.
D is pressure altitude (3000 feet).
E is wind base line.
F is head wind (15-knots).
G is refusal speed base line.
H is runway length (6500 feet).
J is refusal speed (130 knots).
F-86H-1-93-165B

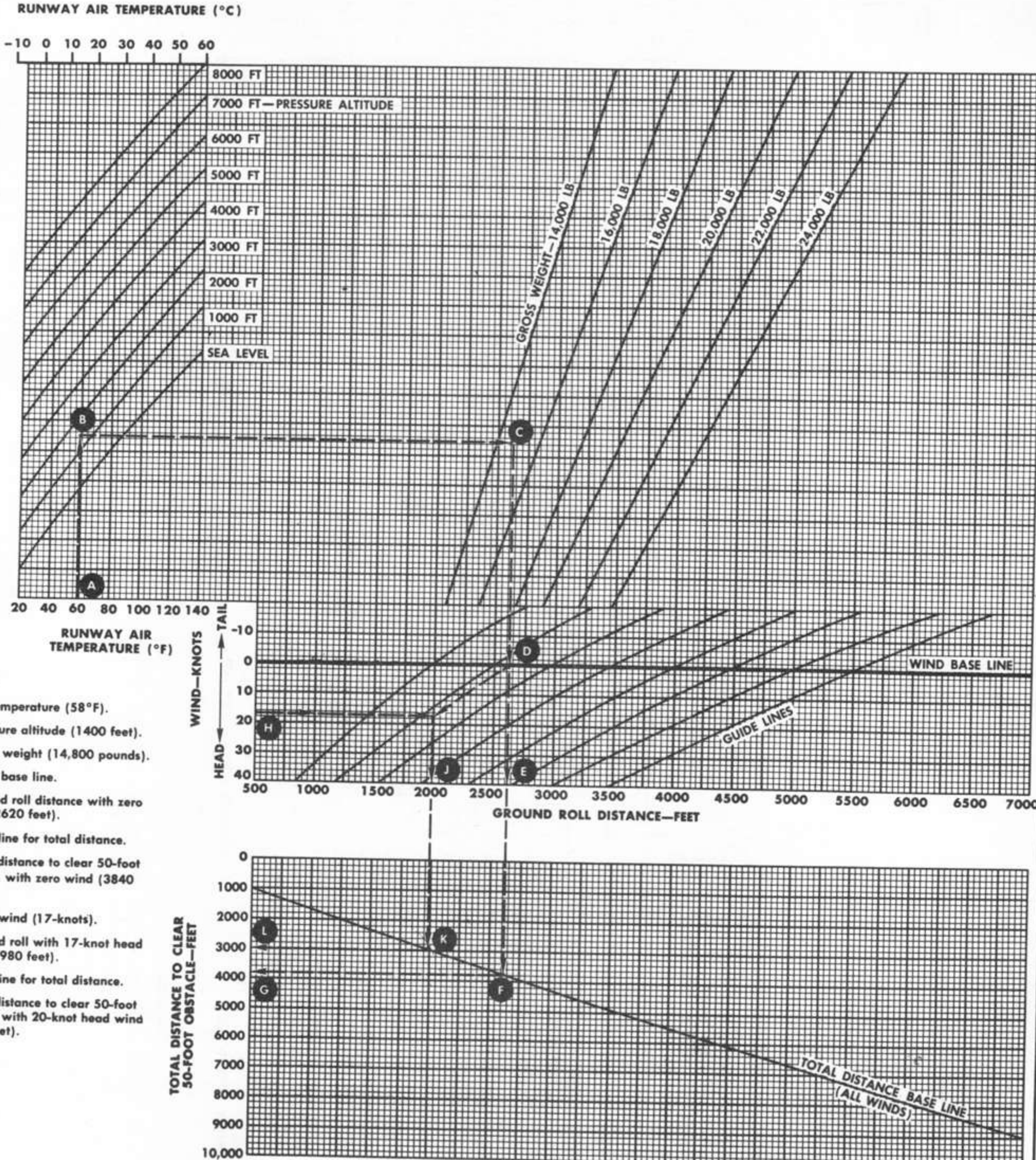
Figure A-9

LANDING DISTANCES

SPEED BRAKES OPEN
FLAPS FULL DOWN *

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

HARD-SURFACE RUNWAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



EXAMPLE:

- (A) is air temperature (58°F).
- (B) is pressure altitude (1400 feet).
- (C) is gross weight (14,800 pounds).
- (D) is wind base line.
- (E) is ground roll distance with zero wind (2620 feet).
- (F) is base line for total distance.
- (G) is total distance to clear 50-foot obstacle with zero wind (3840 feet).
- (H) is head wind (17-knots).
- (J) is ground roll with 17-knot head wind (1980 feet).
- (K) is base line for total distance.
- (L) is total distance to clear 50-foot obstacle with 20-knot head wind (3000 feet).

NOTES:

1. For landings with flaps down 20 degrees:
   (a) Increase charted distances 5%.
   (b) Increase landing speeds 4%.
2. For landings without flaps:
   (a) Increase landing speeds 10%.
   (b) Increase charted distances 10%.
3. For speed brakes closed, increase charted distances 5%.
4. Wet runways may increase ground roll distances as much as 100%.

* Do not use full flaps with EX-10 bombs or 1000-pound GP bombs with T-142 fins installed.

F-86H-1-93-212C

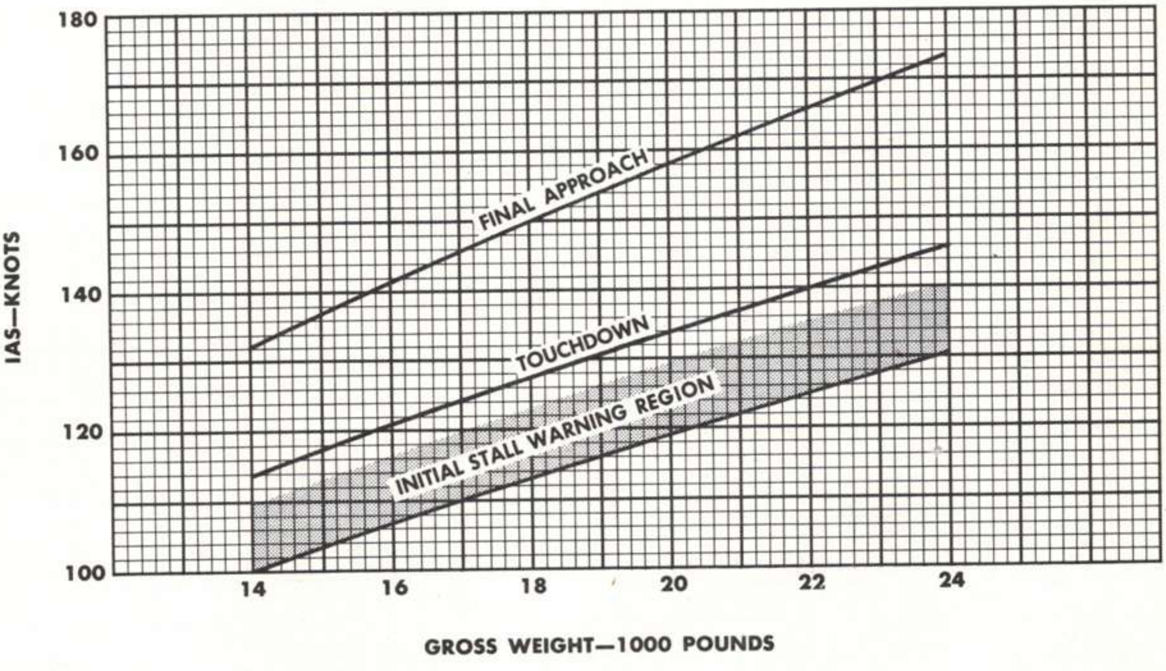
Figure A-10

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST

LANDING SPEEDS

SPEED BRAKES OPEN, FLAPS FULL DOWN*

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



*Do not use full flaps with EX-10 bombs or 1000-pound GP bombs with T-142 fins installed.

F-86H-1-93-211C

Figure A-11

MILITARY THRUST CLIMB PROFILE

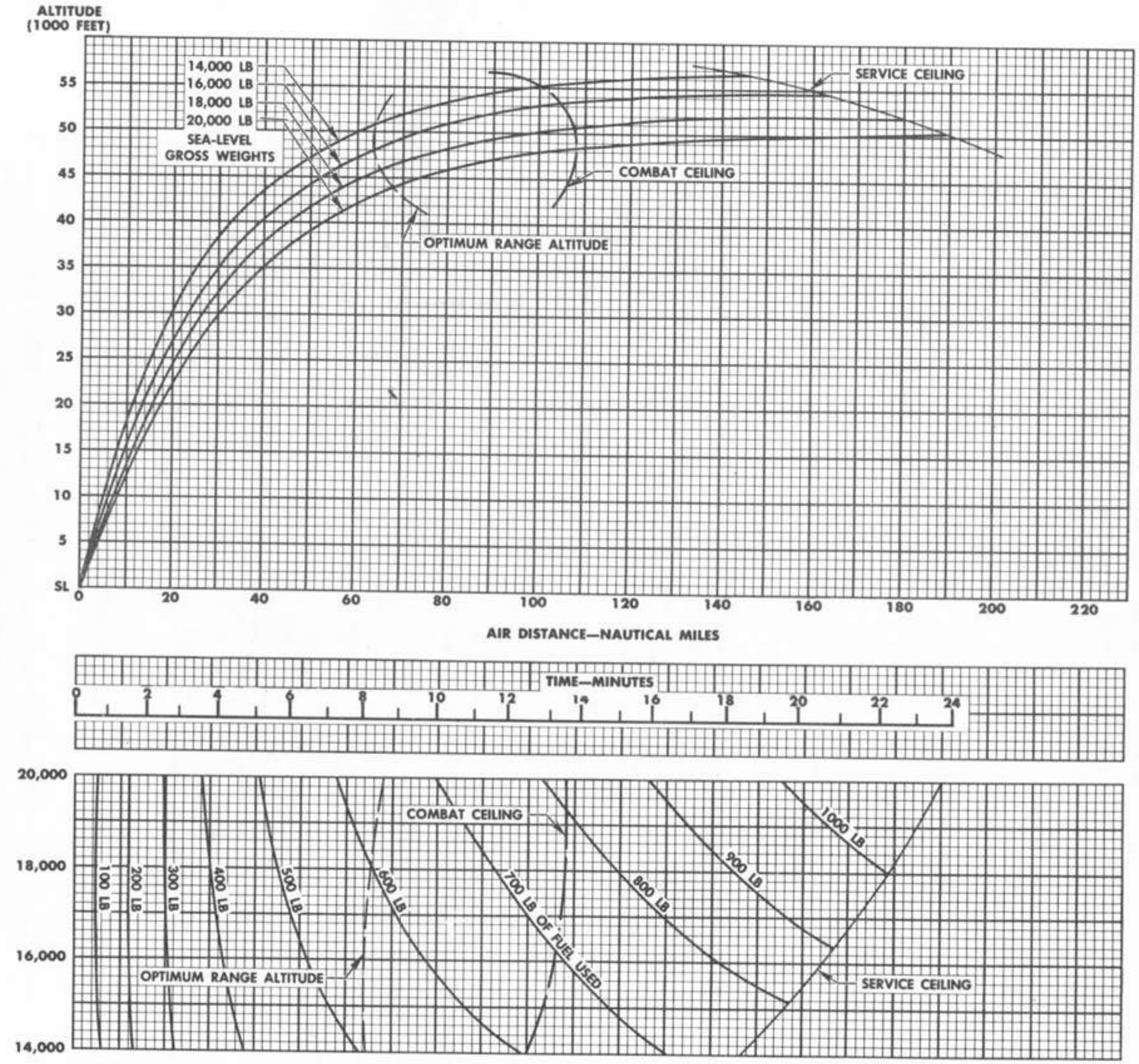
CLEAN

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E

CLIMB SPEEDS

CAS (KNOTS)	TRUE MACH NUMBER	ALTITUDE (1000 FEET)
180	.84	55
200	.84	50
225	.84	45
255	.84	40
285	.83	35
315	.83	30
350	.82	25
380	.82	20
415	.81	15
450	.81	10
490	.80	5
525	.80	SL



F-86H-1-93-166A

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

Figure A-12

MISSION PROFILE

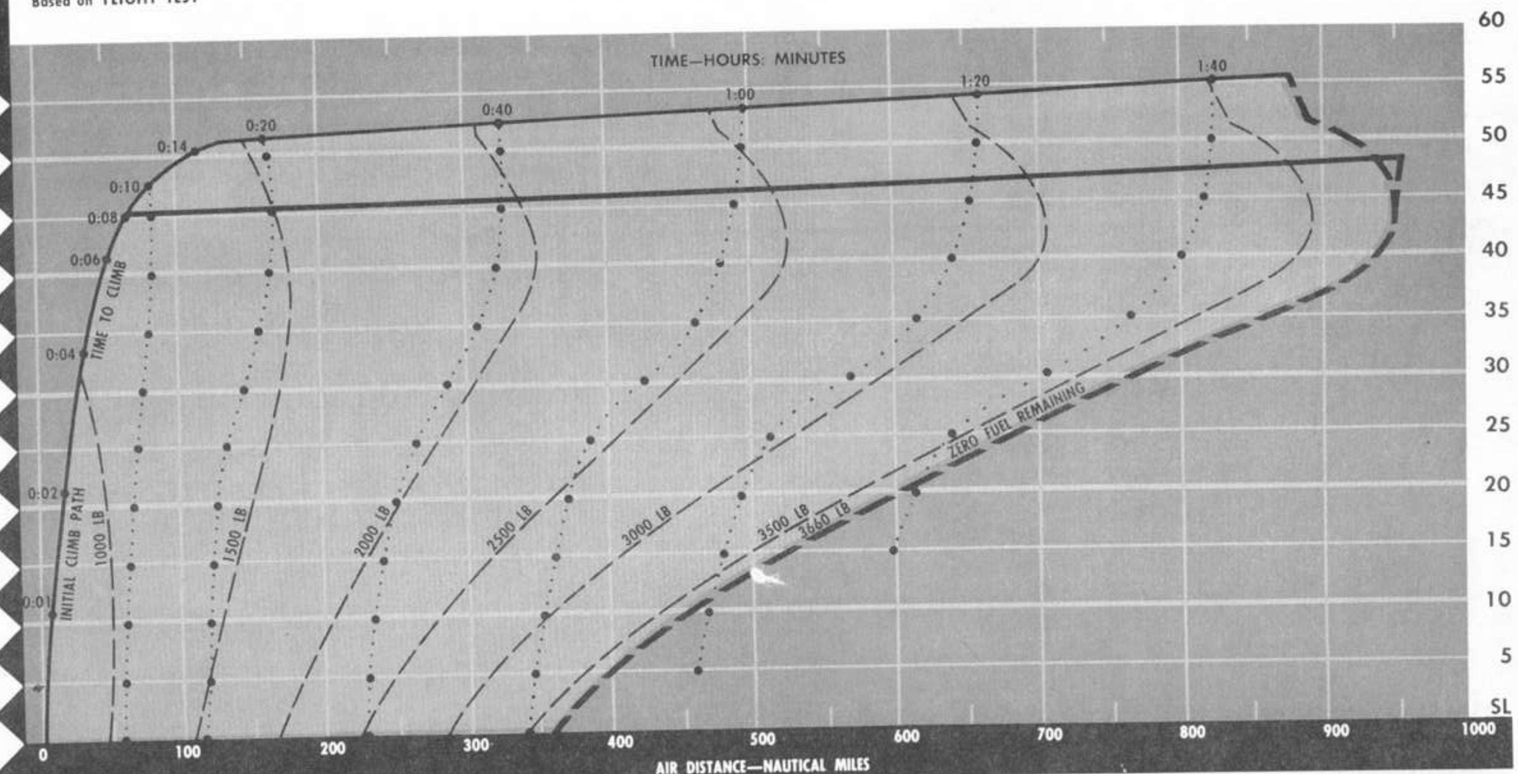
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

CLEAN

TAKE-OFF GROSS WEIGHT: 18,908 LB

MILITARY THRUST CLIMB TRUE MACH NO.	CAS	ALT 1000 FT
.84	180	55
.84	200	50
.84	225	45
.84	255	40
.83	285	35
.83	315	30
.82	350	25
.82	380	20
.81	415	15
.81	450	10
.80	490	5
.80	525	SL



REMARKS
1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (Refer to Military Thrust climb chart for detailed information.)
3. Cruise at recommended Mach number.
4. No allowance or reserve for loiter, descent, or landing.
5. For cruise-climb procedure, maintain a constant RPM and Mach number.

LEGEND:

- — — — — Fuel consumed
- •····•····• Time (start, taxi, and take-off not included)
- ——— Maximum Continuous Thrust cruise-climb path
- ——— Cruise-climb path

CRUISE—CLEAN

ALTITUDE FEET	TRUE MACH NO.	APPROXIMATE CAS	TAS	LB/HR	% RPM
CRUISE-CLIMB*	.84	—	485	1550-1350	96
CRUISE-CLIMB	.84	—	485	1450-1300	88
55,000	.85	185	490	1400-1350	96-94
50,000	.85	205	490	1500-1300	94-90
45,000	.85	230	485	1450-1300	88-86
40,000	.84	255	480	1450-1300	84-83
35,000	.79	270	455	1500-1400	81-79
30,000	.72	270	420	1550-1500	80-79
25,000	.63	260	380	1600-1500	79-78
20,000	.59	270	360	1750-1700	78-77
15,000	.56	285	355	2000-1950	78-77
10,000	.54	300	345	2300-2250	78-77
5000	.52	315	340	2550-2500	78
SEA LEVEL	.50	335	335	2900-2800	79

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-167C

Figure A-13

HIGH SPEED PROFILE

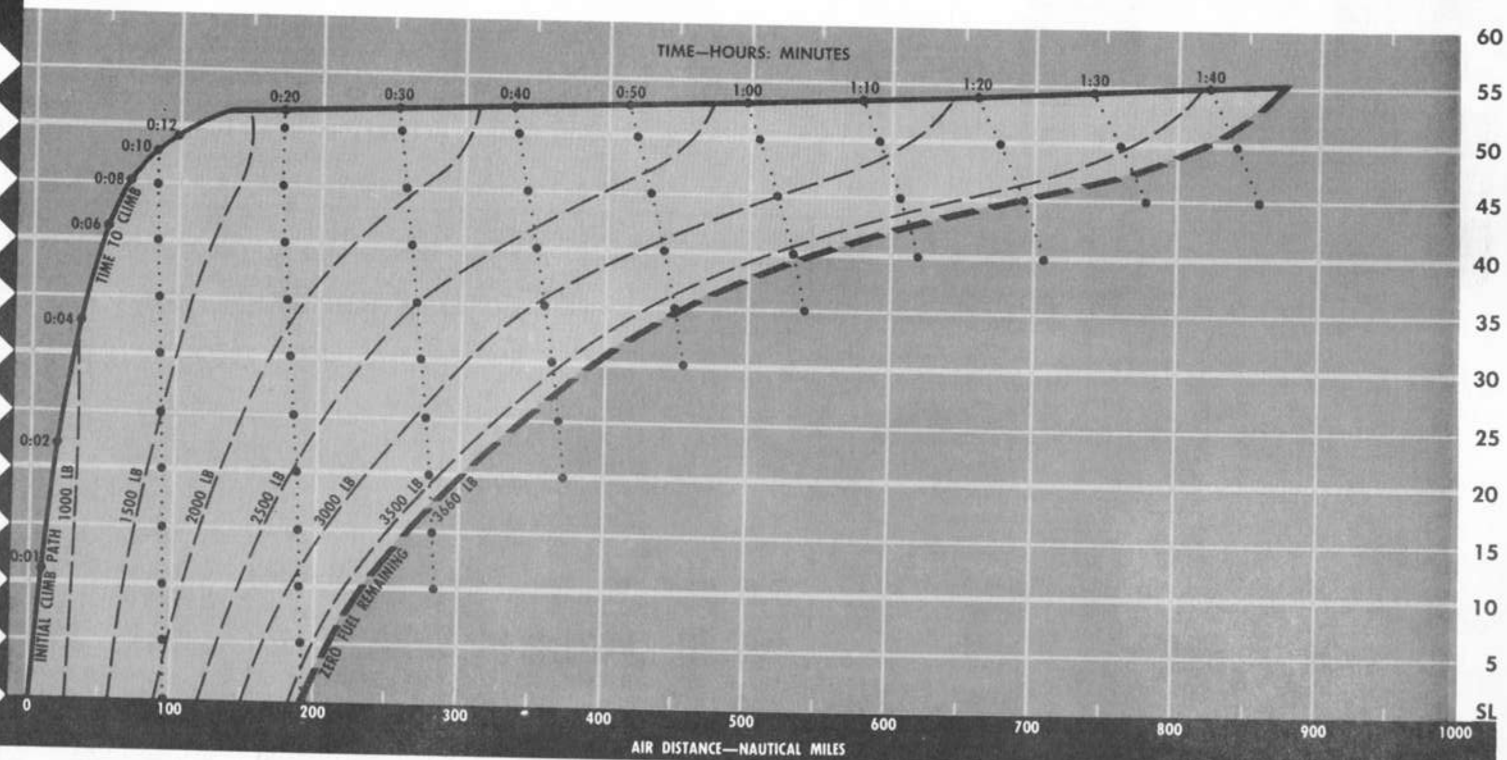
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

CLEAN

TAKE-OFF GROSS WEIGHT: 18,908 LB

MILITARY THRUST CLIMB TRUE MACH NO.	CAS	ALT 1000 FT
.84	180	55
.84	200	50
.84	225	45
.84	255	40
.83	285	35
.83	315	30
.82	350	25
.82	380	20
.81	415	15
.81	450	10
.80	490	5
.80	525	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (See Military Thrust climb chart for detailed information.)
3. Cruise at Maximum Continuous Thrust (96% rpm).
4. No allowance or reserve for loiter, descent, or landing.

LEGEND:

— — — — Fuel consumed
•·····•·····• Time (start, taxi, and take-off not included)
——— Maximum Continuous Thrust cruise-climb path

CRUISE—CLEAN

ALTITUDE FEET	% RPM	APPROXIMATE TRUE MACH NO.	CAS	TAS	LB/HR
CRUISE-CLIMB*	96	.84	-	485	1550-1350
55,000	↓	.84-.86	205-210	485-495	1350
50,000		.88-.89	210-220	505-510	1650
45,000		.90-.92	245-250	520-525	2050
40,000		.92	280-285	525-530	2700
35,000		.92	320	530	3350
30,000		.92	355	545	4000
25,000		.92	390	555	4700
20,000		.92	430	560	5550
15,000		.91	47[illegible]	570	6450
10,000		.90	505	575	7300
5000		.89	545	580	8250
SEA LEVEL		.88	580	580	9200

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-168C

Figure A-14

OPTIMUM RETURN PROFILE

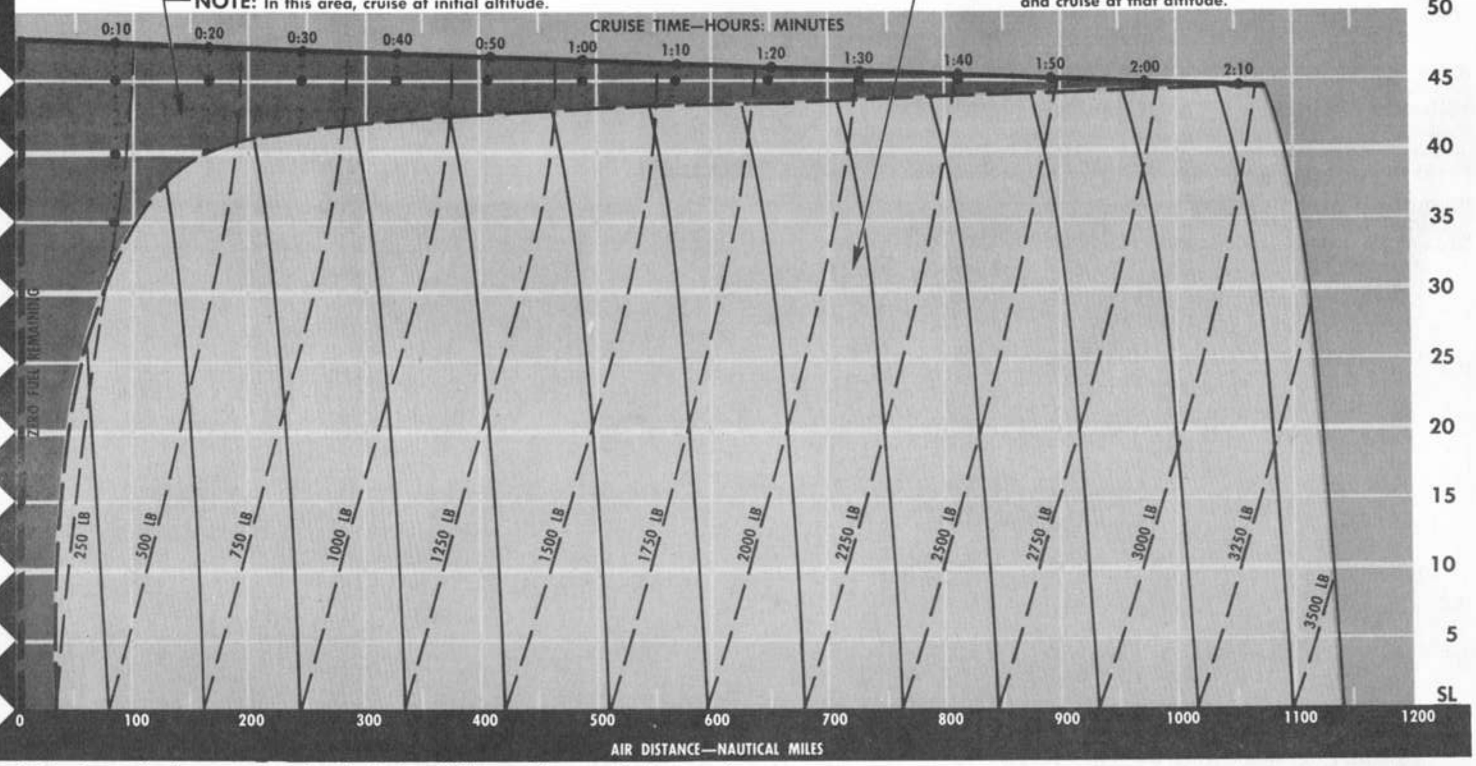
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

CLEAN

GROSS WEIGHT: 15,248-18,908 LB

Data as of: 1 April 1956.
Based on FLIGHT TEST

MILITARY THRUST CLIMB TRUE MACH NO.	CAS	ALT 1000 FT
.84	225	45
.84	255	40
.83	285	35
.83	315	30
.82	350	25
.82	380	20
.81	415	15
.81	450	10
.80	440	5
.80	525	SL



REMARKS

1. Fuel required at any point includes Military Thrust climb to cruise altitude (if below that).
2. No allowance for loiter, descent, or landing.
3. Best cruise condition determined by intersection of climb path guide lines and lines of best range.
4. Cruise at recommended Mach number.
5. For cruise-climb procedure, maintain constant rpm and Mach number.
6. Use Military Thrust for climb. (See Military Thrust climb chart for detailed information.)

LEGEND:

- — — — — Fuel required
- ——— Climb path guide lines
- —— — —— Line of best range for constant-altitude flight
- ━━━ Line of best range for cruise-climb flight
- •····•····• Time at cruising altitude

CRUISE—CLEAN

ALTITUDE FEET	TRUE MACH NO.	APPROXIMATE CAS	TAS	LB/HR	% RPM
CRUISE-CLIMB	.84	-	485	1450-1300	88
45,000	.85	230	485	1450-1300	88-86
40,000	.84	255	480	1450-1300	84-83
35,000	.79	270	455	1500-1400	81-79
30,000	.72	270	420	1550-1500	80-79
25,000	.63	260	380	1600-1500	79-78
20,000	.59	270	360	1750-1700	78-77
15,000	.56	285	355	2000-1850	78-77
10,000	.54	300	345	2300-2250	78-77
5000	.52	315	340	2550-2500	78
SEA LEVEL	.50	335	335	2900-2800	79

F-86H-1-93-169B

Figure A-15

MAXIMUM ENDURANCE PROFILE

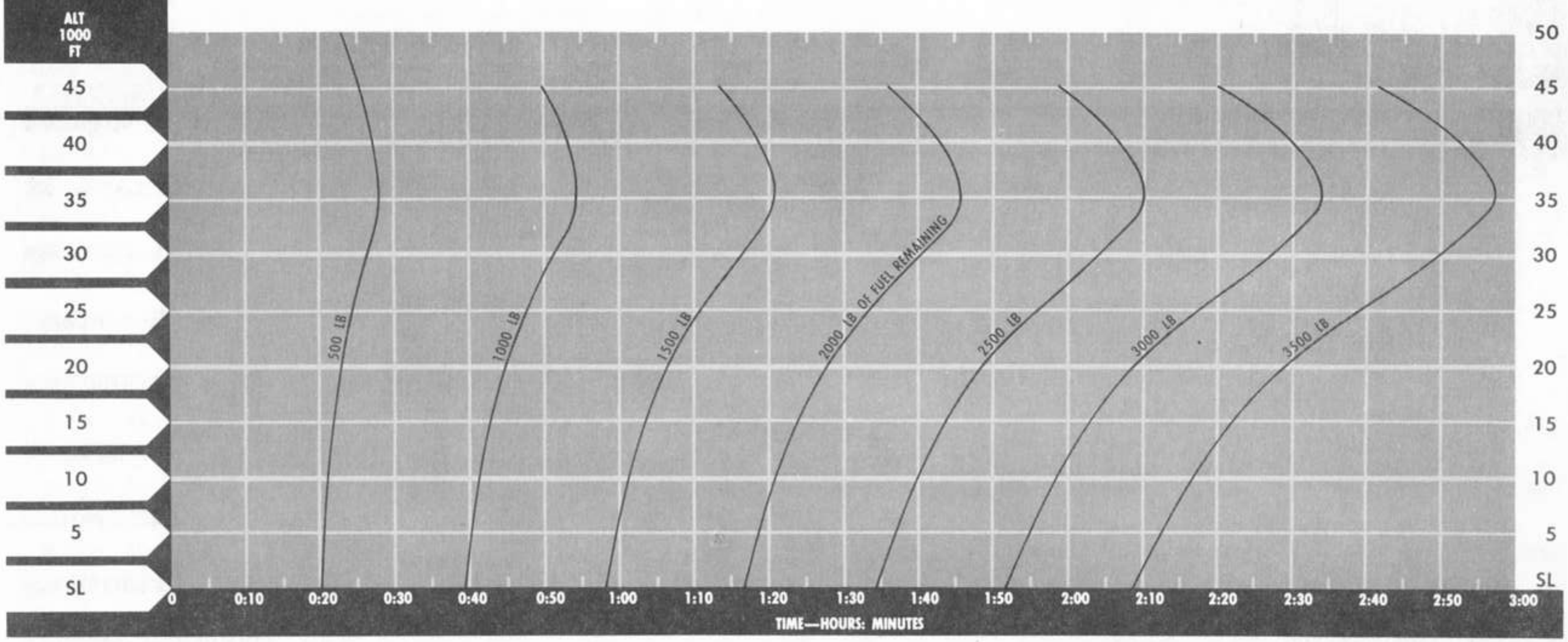
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of 1 April 1956.

Based on FLIGHT TEST

CLEAN

GROSS WEIGHT: 15,248 LB—18,908 LB



REMARKS

1. Loiter at recommended CAS.
2. Maintain constant altitude.

LOITER	LESS THAN 2000 LB FUEL REMAINING					MORE THAN 2000 LB FUEL REMAINING				
		APPROXIMATE					APPROXIMATE			
ALTITUDE FEET	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM
50,000	195	.82	470	1450-1300	91	195	.82	470	1600-1450	94
45,000	200	.76	435	1350-1200	86	215	.80	460	1450-1350	88
40,000	195	.65	375	1250-1100	82	210	.70	400	1350-1250	84
35,000	190	.58	330	1200-1100	78	205	.61	350	1350-1200	80
30,000	185	.50	295	1250-1150	76	200	.54	315	1350-1250	78
25,000	185	.45	270	1350-1250	75	195	.47	285	1450-1350	77
20,000	180	.40	245	1450-1300	75	190	.42	260	1550-1450	76
15,000	180	.36	225	1500-1400	74	190	.38	240	1600-1500	75
10,000	170	.32	205	1550-1400	74	190	.34	215	1700-1550	75
5,000	170	.28	185	1600-1450	73	185	.30	195	1750-1600	74
SEA LEVEL	165	.25	165	1650-1450	73	175	.27	175	1800-1650	74

F-86H-1-93-170B

Figure A-16

OPTIMUM MAXIMUM ENDURANCE PROFILE

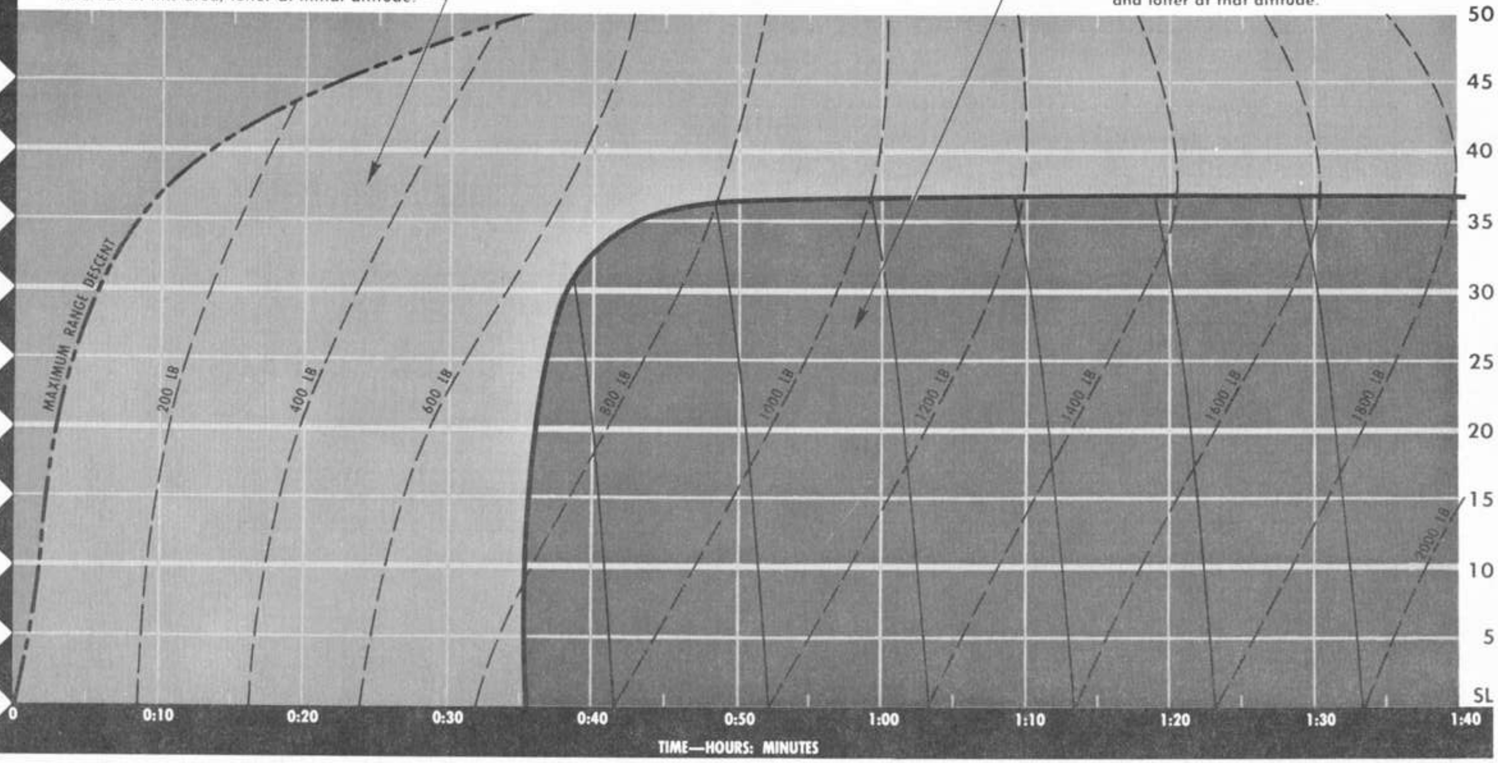
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

CLEAN

GROSS WEIGHT: 15,248 LB—18,908 LB

MILITARY THRUST CLIMB		
TRUE MACH NO.	CAS	ALT 1000 FT
.84	225	45
.84	255	40
.83	285	35
.83	315	30
.82	350	25
.82	380	20
.81	415	15
.81	450	10
.80	490	5
.80	525	SL



REMARKS

1. Maximum range descent. (Use idle thrust, speed brakes closed. Descend at .80 true Mach number or 400 knots CAS, whichever is less.)
2. Loiter at recommended CAS.
3. Use Military Thrust for climb. (See Military Thrust climb chart for detailed information.)
4. No allowance or reserve for landing.

LEGEND:

- ——— Line of optimum altitudes for loiter
- — — — Fuel remaining
- ——— Military Thrust climb path guide lines

LOITER—CLEAN

ALTITUDE FEET	CAS	APPROXIMATE TRUE MACH NO.	APPROXIMATE TAS	APPROXIMATE LB/HR	APPROXIMATE % RPM
50,000	195	.82	470	1450-1300	91
45,000	200	.76	435	1350-1200	86
40,000	195	.65	375	1250-1100	82
35,000	190	.58	330	1200-1100	78
30,000	185	.50	295	1250-1150	76
25,000	185	.45	270	1350-1250	75
20,000	180	.40	245	1450-1300	75
15,000	180	.36	225	1500-1400	74
10,000	170	.32	205	1550-1400	74
5000	170	.28	185	1600-1450	73
SEA LEVEL	165	.25	165	1650-1450	73

F-86H-1-93-171B

Figure A-17

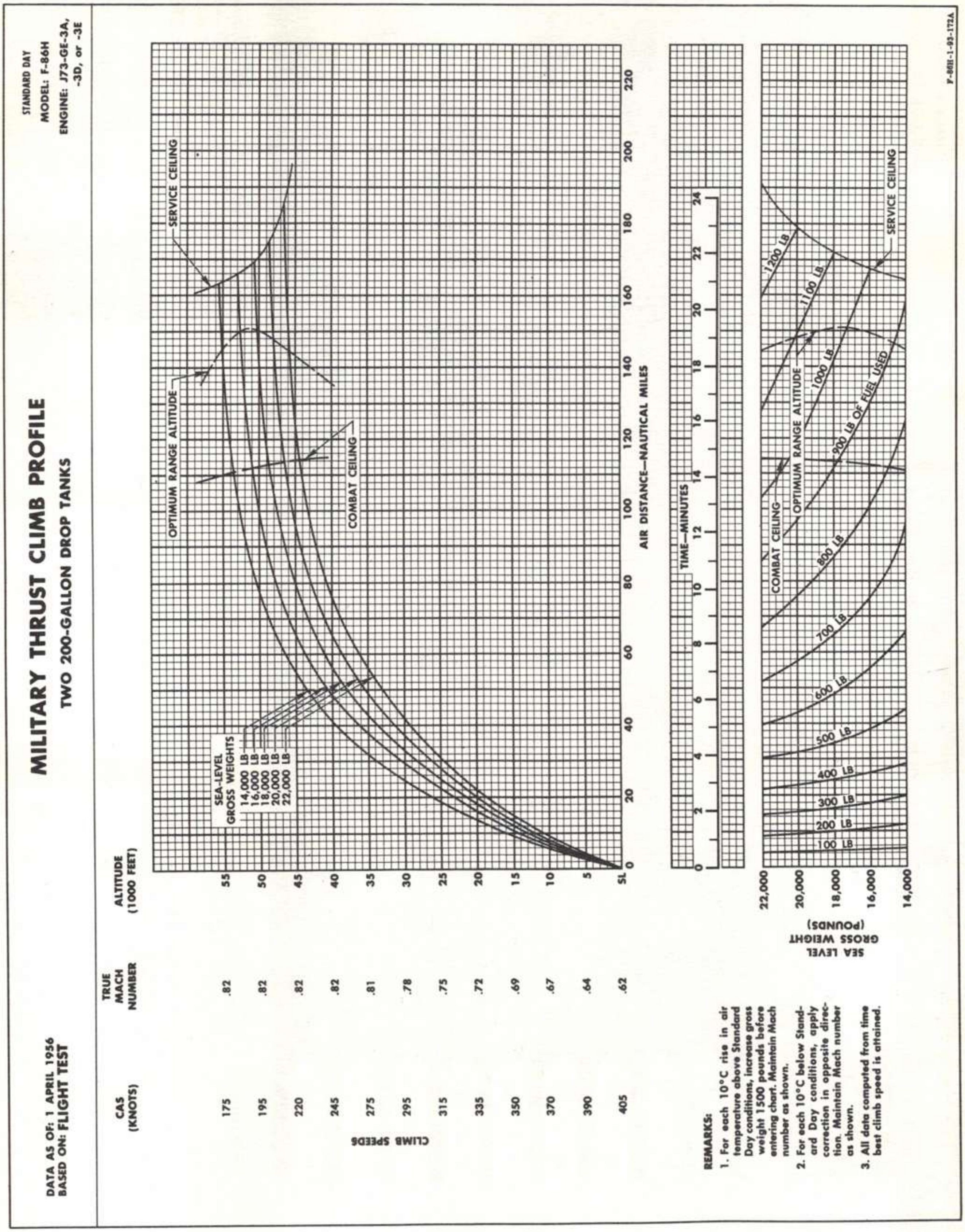

MILITARY THRUST CLIMB PROFILE
TWO 200-GALLON DROP TANKS
STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E
DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST
CLIMB SPEEDS
CAS (KNOTS)
TRUE MACH NUMBER
ALTITUDE (1000 FEET)
175 .82 55
195 .82 50
220 .82 45
245 .82 40
275 .81 35
295 .78 30
315 .75 25
335 .72 20
350 .69 15
370 .67 10
390 .64 5
405 .62 SL
SERVICE CEILING
OPTIMUM RANGE ALTITUDE
COMBAT CEILING
SEA-LEVEL GROSS WEIGHTS
14,000 LB
16,000 LB
18,000 LB
20,000 LB
22,000 LB
AIR DISTANCE—NAUTICAL MILES
0 20 40 60 80 100 120 140 160 180 200 220
TIME—MINUTES
0 2 4 6 8 10 12 14 16 18 20 22 24
SEA LEVEL GROSS WEIGHT (POUNDS)
22,000 20,000 18,000 16,000 14,000
100 LB
200 LB
300 LB
400 LB
500 LB
600 LB
700 LB
800 LB
900 LB OF FUEL USED
1000 LB
1100 LB
1200 LB
REMARKS:
1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.
F-86H-1-93-172A

Figure A-18

MISSION PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

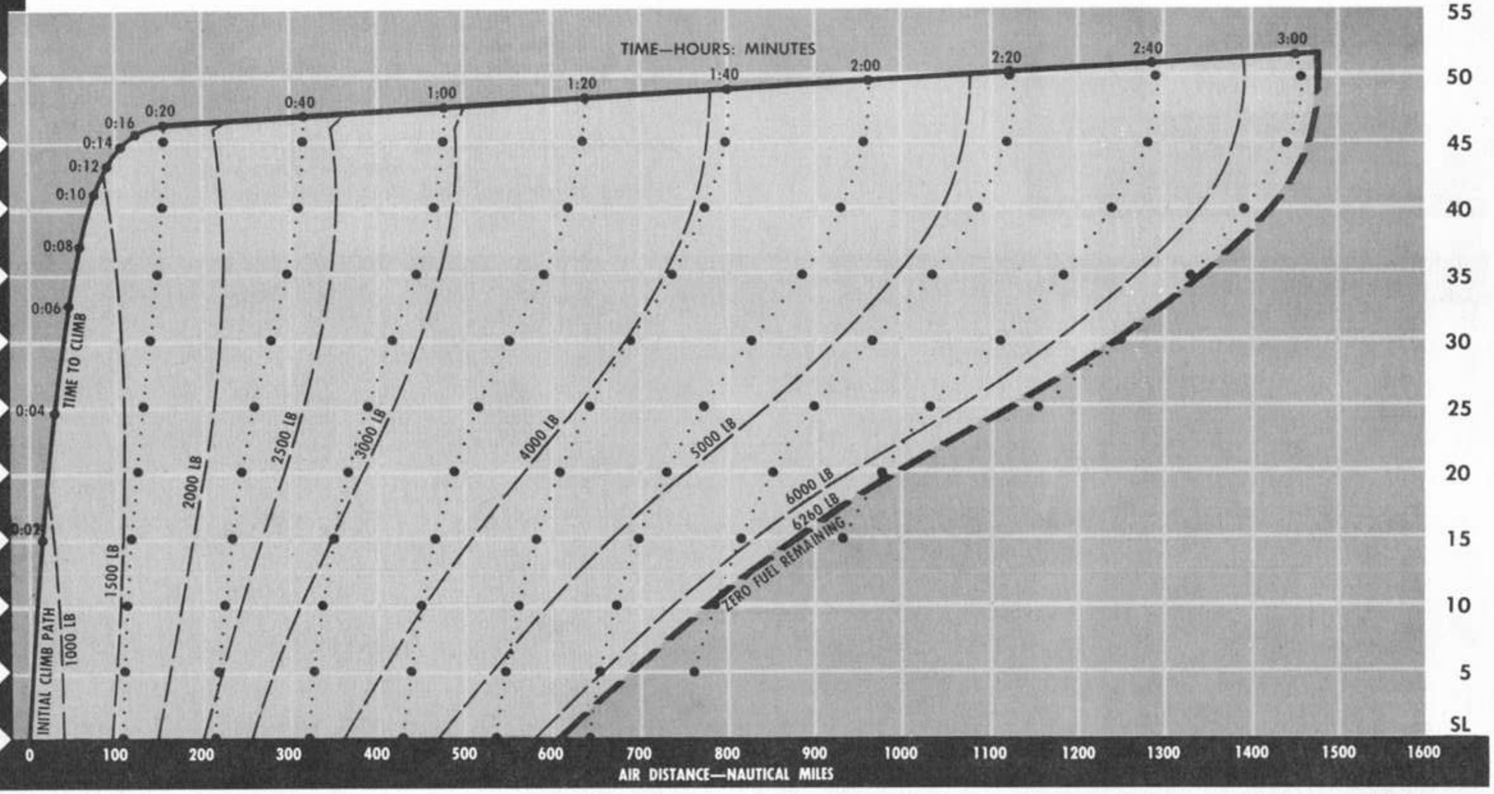
Data as of: 1 April 1956.
Based on FLIGHT TEST

TWO 200-GALLON DROP TANKS

TAKE-OFF GROSS WEIGHT: 21,852 LB

MILITARY THRUST CLIMB

TRUE MACH NO.	CAS	ALT 1000 FT
.82	195	50
.82	220	45
.82	245	40
.81	275	35
.78	295	30
.75	315	25
.72	335	20
.69	350	15
.67	370	10
.64	390	5
.62	405	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (Refer to Military Thrust climb chart for detailed information.)
3. Cruise at recommended Mach number.
4. No allowance or reserve for loiter, descent, or landing.
5. For cruise-climb procedure, use Maximum Continuous Thrust and maintain a constant Mach number.

LEGEND:

— — — — Fuel consumed
● · · · ● · · · ● Time (start, taxi, and take-off not included)
——— Cruise-climb path

CRUISE—TWO 200-GALLON DROP TANKS

ALTITUDE FEET	TRUE MACH NO.	APPROXIMATE CAS	TAS	LB/HR	% RPM
* CRUISE-CLIMB	.84	—	485	1850-1500	96
50,000	.84	205	485	1600-1500	94-90
45,000	.84	225	480	1800-1500	94-87
40,000	.80	245	460	1800-1550	91-83
35,000	.78	260	445	1850-1600	86-80
30,000	.70	265	410	1850-1650	84-78
25,000	.64	265	385	1900-1750	83-77
20,000	.59	270	365	2050-1900	82-77
15,000	.56	280	350	2250-2100	81-77
10,000	.53	290	335	2450-2350	81-77
5000	.51	305	325	2750-2600	80-78
SEA LEVEL	.49	320	320	3050-2950	80-79

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-173C

Figure A-19

HIGH SPEED PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

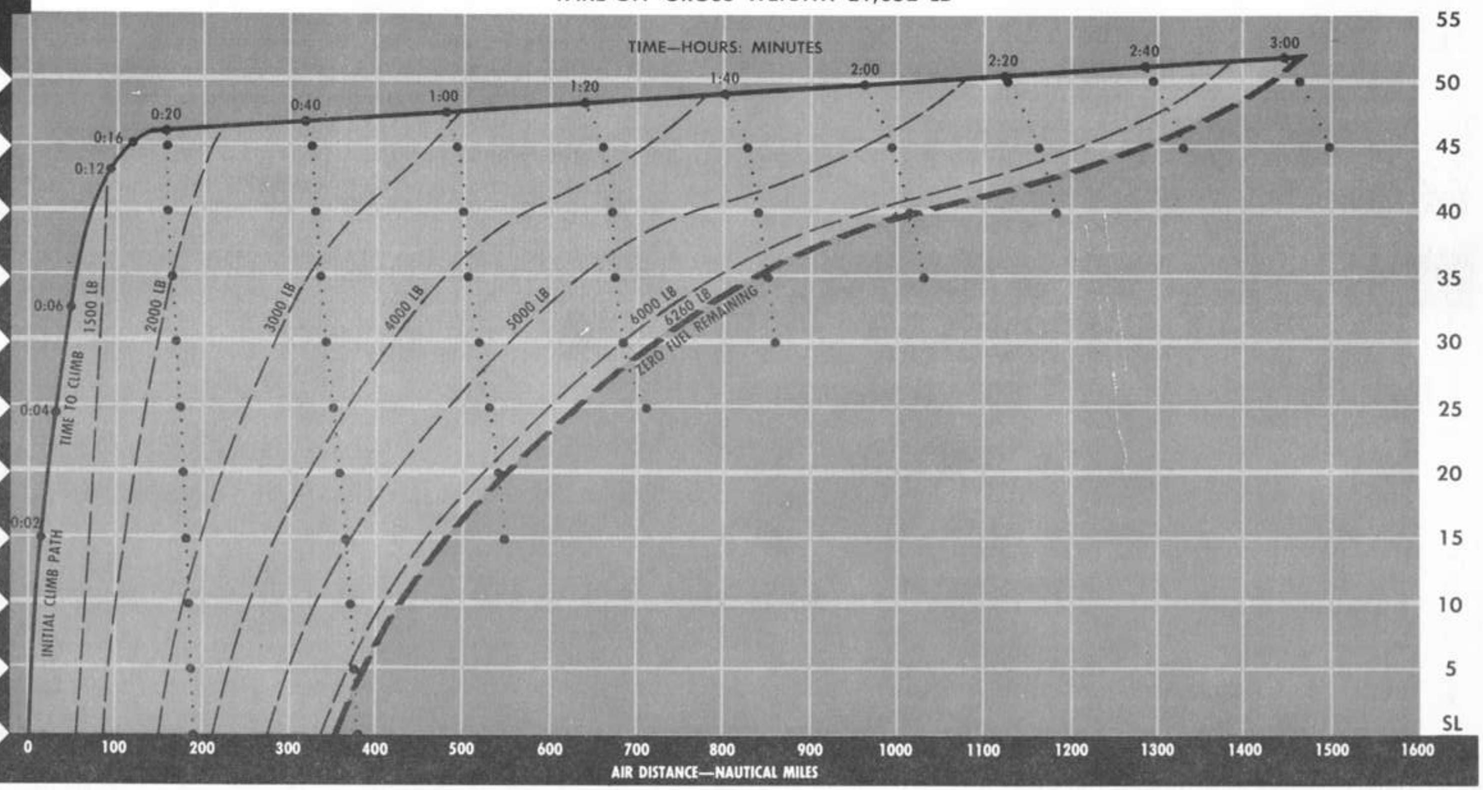
Data as of: 1 April 1956.
Based on FLIGHT TEST

TWO 200-GALLON DROP TANKS

TAKE-OFF GROSS WEIGHT: 21,852 LB

MILITARY THRUST CLIMB

TRUE MACH NO.	CAS	ALT 1000 FT
.82	195	50
.82	220	45
.82	245	40
.81	275	35
.78	295	30
.75	315	25
.72	335	20
.69	350	15
.67	370	10
.64	390	5
.62	405	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (See Military Thrust climb chart for detailed information.)
3. Cruise at Maximum Continuous Thrust (96% rpm).
4. No allowance or reserve for loiter, descent, or landing.

LEGEND:

- — — — — Fuel consumed
- •····•····• Time (start, taxi, and take-off not included)
- ——— Maximum Continuous Thrust cruise-climb path

CRUISE —TWO 200-GALLON DROP TANKS

ALTITUDE FEET	% RPM	APPROXIMATE TRUE MACH NO.	CAS	TAS	LB/HR
CRUISE-CLIMB*	96	.84	—	485	1850-1500
50,000	↓	.86-.88	210-215	495-505	2450-2400
45,000		.86-.88	235-240	495-505	2000-2050
40,000		.88-.89	270-275	510-515	2600-2650
35,000		.89-.90	305-310	510-515	3250-3300
30,000		.89	345	525	3900
25,000		.89	380	535	4600
20,000		.89	415	545	5450
15,000		.88	450	550	6350
10,000		.87	490	555	7200
5,000		.87	530	560	8150
SEA LEVEL		.86	565	565	9050

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-174C

Figure A-20

OPTIMUM RETURN PROFILE

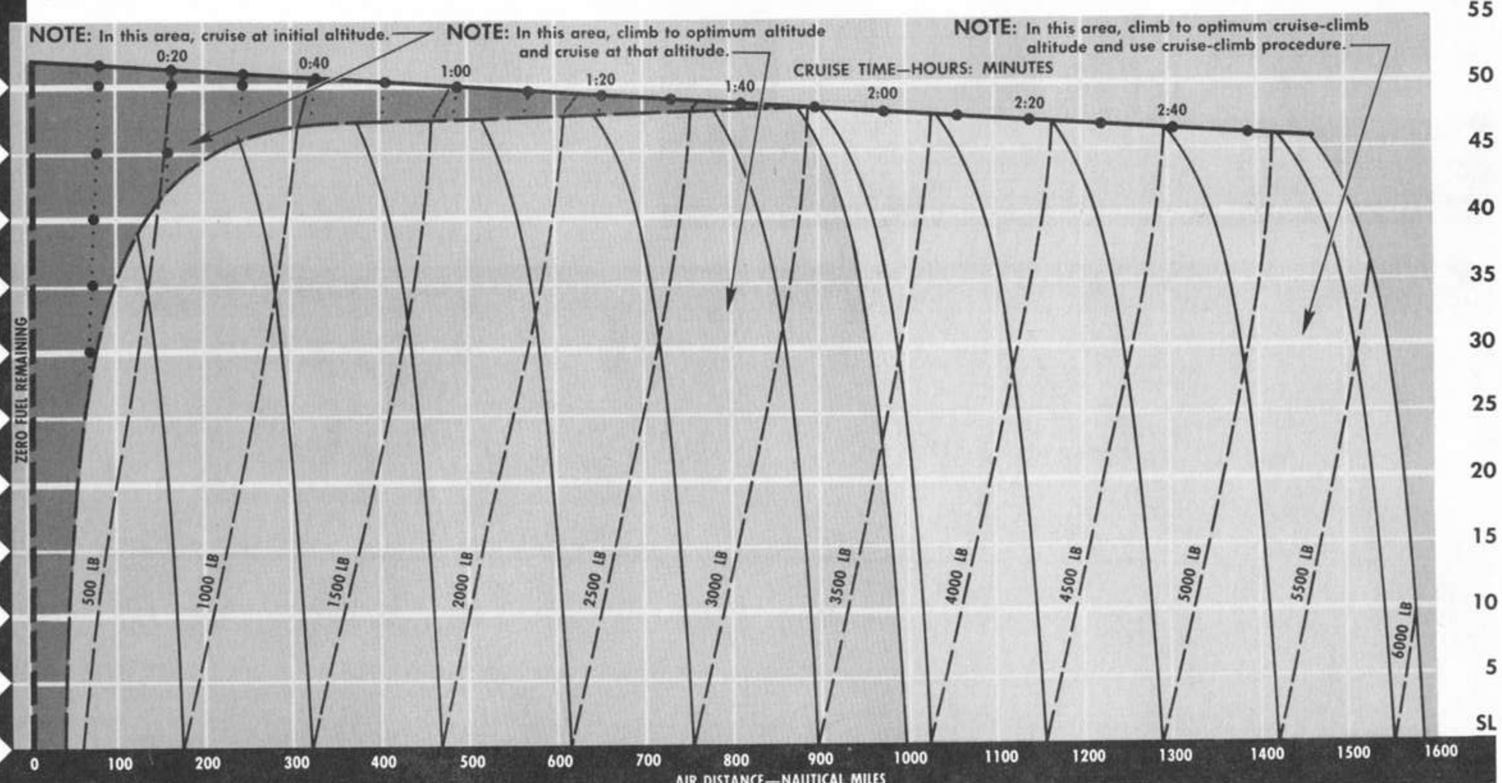
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

TWO 200-GALLON DROP TANKS

GROSS WEIGHT: 21,852 LB — 15,592 LB

Data as of: 1 April 1956.
Based on FLIGHT TEST

MILITARY THRUST CLIMB		
TRUE MACH NO.	CAS	ALT 1000 FT
.82	195	50
.82	220	45
.82	245	40
.81	275	35
.78	295	30
.75	315	25
.72	335	20
.69	350	15
.67	370	10
.64	390	5
.62	405	SL



REMARKS

1. Optimum cruise altitude is determined by intersection of climb path guide lines and lines of best range.
2. Fuel required at any point includes Military Thrust climb to cruise altitude (if below that).
3. Cruise at recommended Mach number.
4. For cruise-climb procedure, use Maximum Continuous Thrust and maintain a constant Mach number.
5. No allowance for loiter, descent, or landing.

LEGEND:

- (solid line) Line of best range for cruise-climb flight
- (dotted line with dots) Time at cruising altitude
- (long-dash line) Line of best range for constant-altitude flight
- (thin solid line) Climb path guide lines
- (short-dash line) Fuel required

CRUISE—TWO 200-GALLON DROP TANKS					
ALTITUDE FEET	TRUE MACH NO.	APPROXIMATE			
		CAS	TAS	LB/HR	% RPM
*CRUISE-CLIMB	.84	—	485	1850-1500	96
50,000	.84	205	485	1600-1500	94-90
45,000	.84	225	480	1800-1500	94-87
40,000	.80	245	460	1800-1550	91-83
35,000	.78	260	445	1850-1600	86-80
30,000	.70	265	410	1850-1650	84-78
25,000	.64	265	385	1900-1750	83-77
20,000	.59	270	365	2050-1900	82-77
15,000	.56	280	350	2250-2100	81-77
10,000	.53	290	335	2450-2350	81-77
5000	.51	305	325	2750-2600	80-78
SEA LEVEL	.49	320	320	3050-2950	80-79

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-175C

Figure A-21

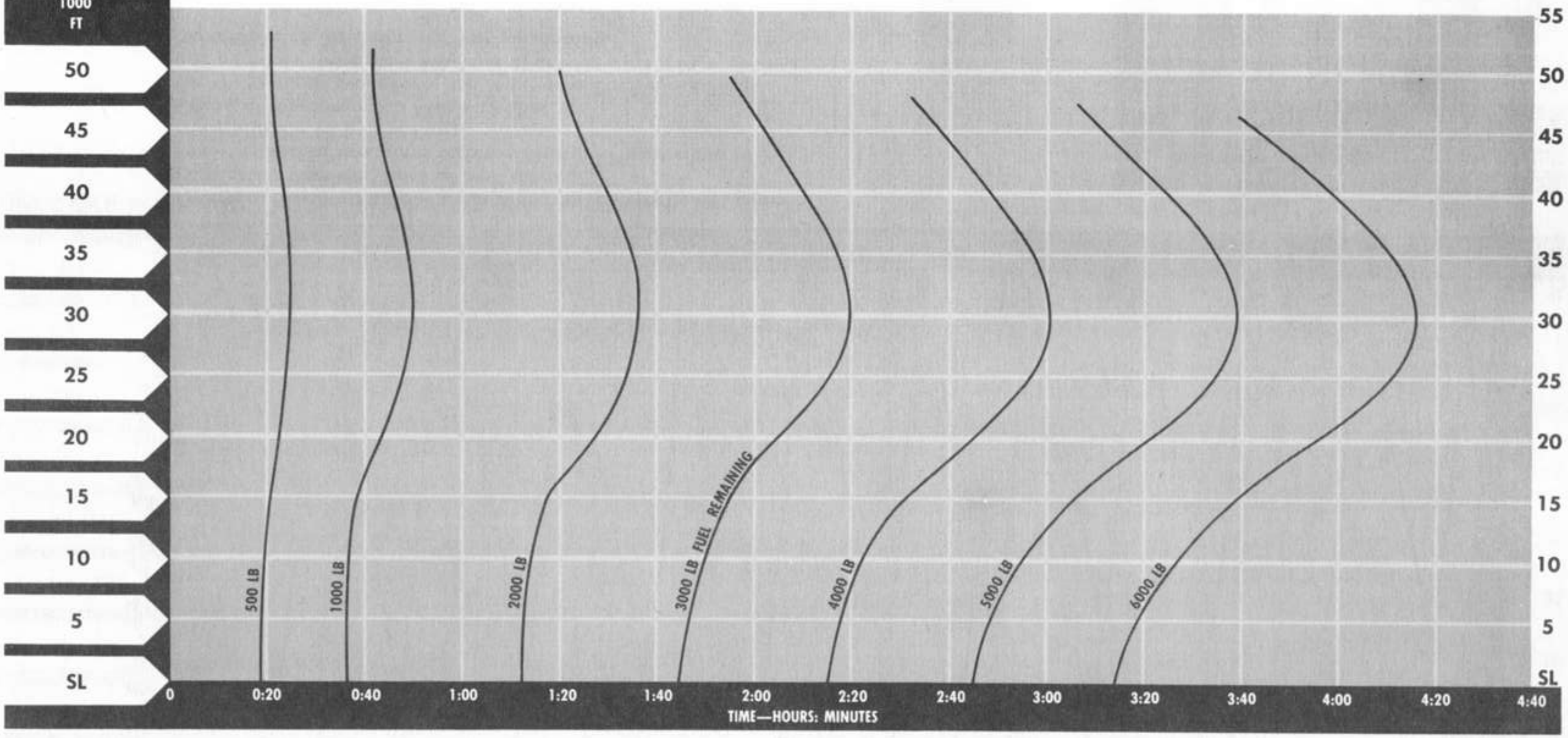
MAXIMUM ENDURANCE PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

TWO 200-GALLON DROP TANKS

GROSS WEIGHT: 21,852 LB—15,592 LB



LOITER	LESS THAN 3000 LB FUEL REMAINING					MORE THAN 3000 LB FUEL REMAINING				
		APPROXIMATE					APPROXIMATE			
ALTITUDE FEET	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM
50,000	195	.80	460	1750-1400	96-90	—	—	—	—	—
45,000	195	.74	425	1650-1350	90-86	215	.79	450	1950-1650	96-90
40,000	190	.65	370	1550-1250	85-81	210	.70	400	1850-1550	91-85
35,000	185	.56	325	1450-1200	81-77	205	.61	350	1750-1450	85-81
30,000	185	.50	290	1450-1150	79-75	205	.55	320	1700-1450	82-79
25,000	185	.44	265	1450-1200	77-74	200	.49	295	1700-1450	80-77
20,000	185	.40	245	1550-1350	76-74	200	.44	270	1800-1550	79-76
15,000	180	.36	225	1650-1450	75-73	200	.39	245	1850-1650	78-75
10,000	180	.33	205	1750-1500	75-73	195	.36	225	1950-1750	78-75
5000	175	.29	185	1800-1550	74-72	190	.32	205	2050-1800	77-74
SEA LEVEL	165	.25	165	1900-1600	74-72	190	.28	185	2150-1900	77-74

REMARKS

1. Loiter at recommended CAS.
2. Maintain a constant altitude.

F-86H-1-93-176B

Figure A-22

OPTIMUM MAXIMUM ENDURANCE PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

TWO 200-GALLON DROP TANKS

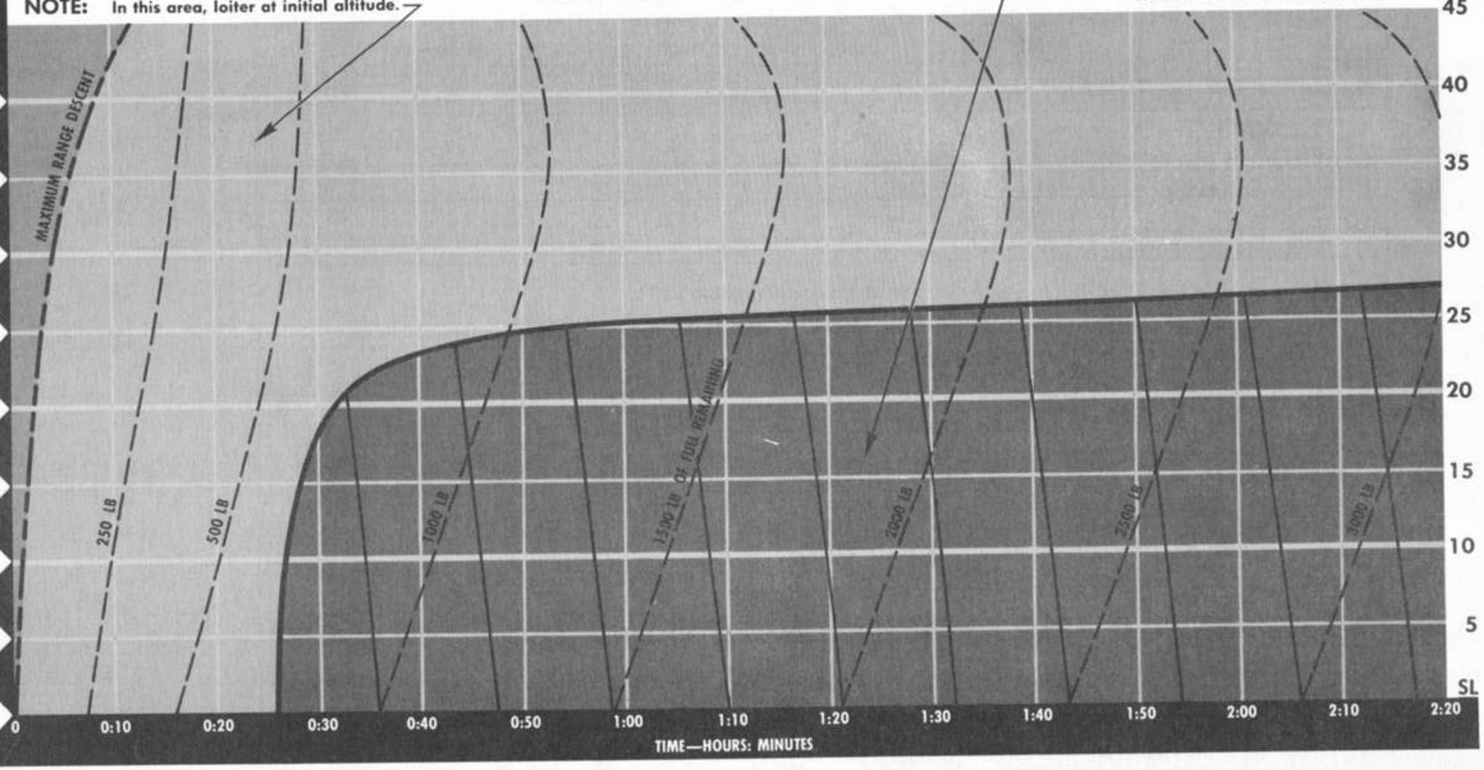
GROSS WEIGHT: 18,722 LB — 15,592 LB

NOTE: In this area, loiter at initial altitude.

NOTE: In this area, climb to optimum altitude and loiter at that altitude.

MAXIMUM CONTINUOUS THRUST CLIMB

TRUE MACH NO.	CAS	ALT 1000 FT
.82	245	40
.82	275	35
.78	295	30
.75	315	25
.72	335	20
.69	350	15
.67	370	10
.64	390	5
.62	405	SL



REMARKS

1. Use Maximum Continuous Thrust for climb. (See Maximum Continuous Thrust climb chart for detailed information.)
2. Loiter at recommended CAS.
3. Maximum range descent. (Use idle power, speed brakes closed. Descend at .80 Mach number or 400 knots CAS, whichever is less.)
4. No allowance or reserve for landing.

LEGEND

- (solid heavy line) Line of optimum altitude for loiter
- (dashed line) Fuel remaining
- (solid thin line) Maximum Continuous Thrust climb guide lines

LOITER—TWO 200-GALLON DROP TANKS

ALTITUDE FEET	CAS	APPROXIMATE TRUE MACH NO.	TAS	LB/HR	% RPM
45,000	195	.74	425	1650-1350	90-86
40,000	190	.65	370	1550-1250	85-81
35,000	185	.56	325	1450-1200	81-77
30,000	185	.50	290	1450-1150	79-75
25,000	185	.44	265	1450-1200	77-74
20,000	185	.40	245	1550-1350	76-74
15,000	180	.36	225	1650-1450	75-73
10,000	180	.33	205	1750-1500	75-73
5000	175	.29	185	1800-1550	74-72
SEA LEVEL	165	.25	165	1900-1600	74-72

F-86H-1-93-177B

Figure A-23

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

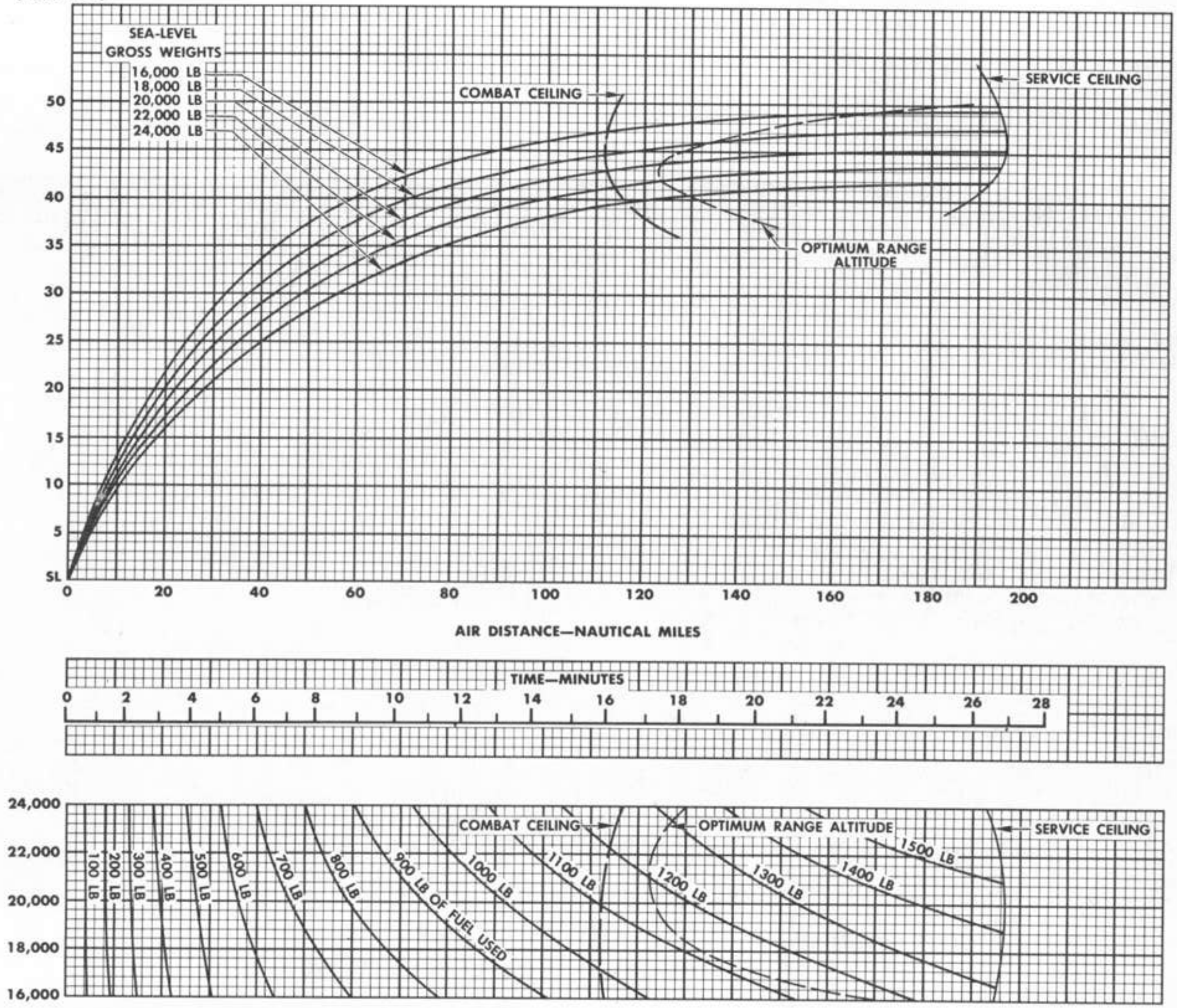
MILITARY THRUST CLIMB PROFILE

TWO 200-GALLON DROP TANKS plus TWO 120-GALLON DROP TANKS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E

CLIMB SPEEDS

CAS (KNOTS)	TRUE MACH NUMBER	ALTITUDE (1000 FEET)
195	.82	50
215	.80	45
235	.78	40
255	.76	35
270	.72	30
285	.69	25
300	.65	20
315	.62	15
330	.59	10
340	.56	5
355	.54	SL



REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

F-86H-1-93-178A

Figure A-24

MISSION PROFILE

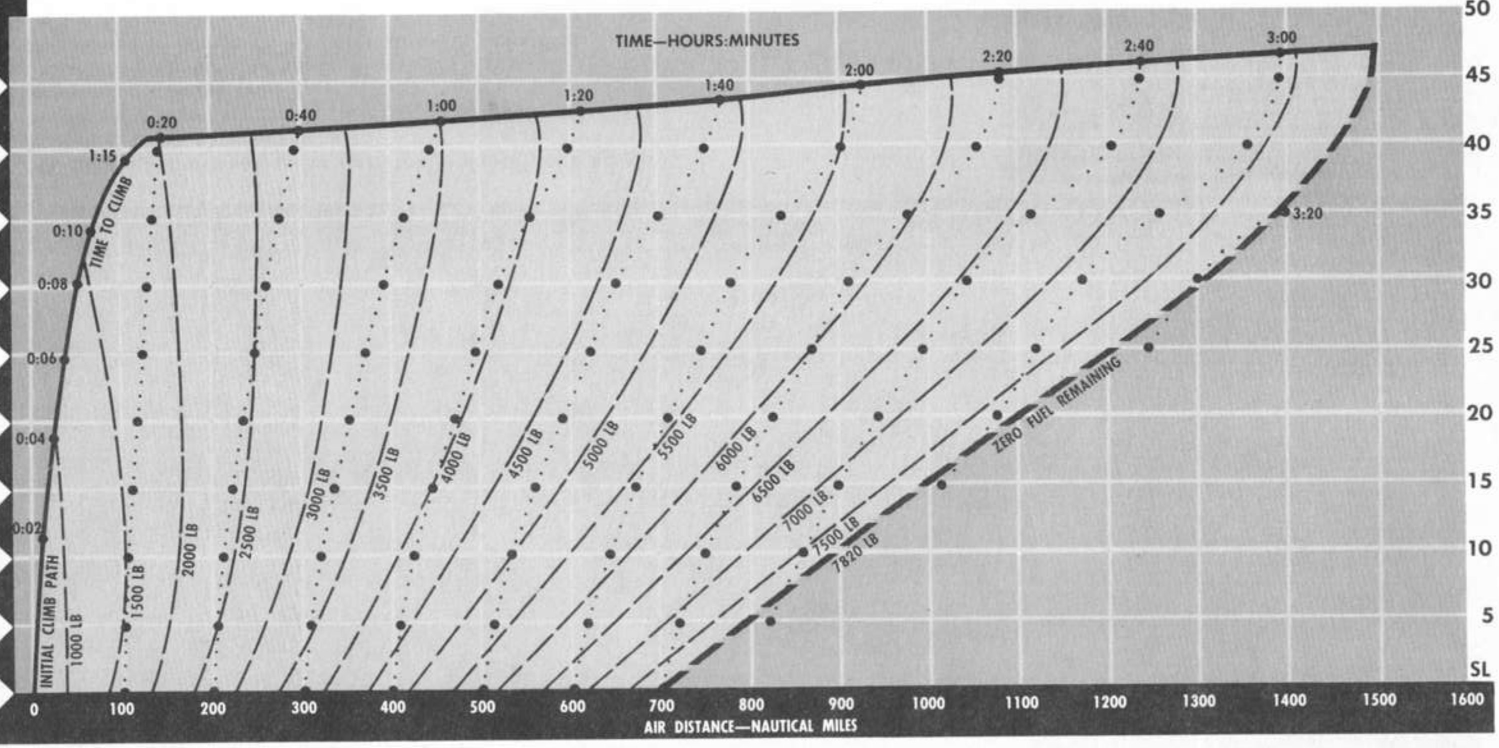
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

TWO 200-GALLON DROP TANKS plus TWO 120-GALLON DROP TANKS

TAKE-OFF GROSS WEIGHT: 23,716 LB

Data as of: 1 April 1956.
Based on FLIGHT TEST

MILITARY THRUST CLIMB		
TRUE MACH NO.	CAS	ALT 1000 FT
.80	215	45
.78	235	40
.76	255	35
.72	270	30
.69	285	25
.65	300	20
.62	315	15
.59	330	10
.56	340	5
.54	355	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (Refer to Military Thrust climb chart for detailed information.)
3. Cruise at recommended Mach number.
4. No allowance or reserve for loiter, descent, or landing.
5. For cruise-climb procedure, use Maximum Continuous Thrust and maintain a constant Mach number.

LEGEND:

- — — — — Fuel consumed
- •····•····• Time (start, taxi, and take-off not included)
- ——— Maximum Continuous Thrust cruise-climb path

CRUISE—TWO 200-GALLON DROP TANKS PLUS TWO 120-GALLON DROP TANKS

ALTITUDE FEET	TRUE MACH NO.	APPROXIMATE CAS	TAS	LB/HR	% RPM
CRUISE-CLIMB*	.81	—	465	2300-1700	96
45,000	.81	220	465	1900-1750	96-92
40,000	.80	240	460	2250-1900	96-89
35,000	.73	245	420	2200-1850	90-85
30,000	.66	245	385	2150-1800	87-83
25,000	.62	255	375	2250-1950	85-82
20,000	.57	265	350	2350-2100	83-81
15,000	.53	270	335	2500-2250	82-80
10,000	.50	275	320	2650-2450	82-80
5000	.47	285	305	2850-2650	81-80
SEA LEVEL	.45	300	300	3200-3000	81-80

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-179C

Figure A-25

HIGH SPEED PROFILE

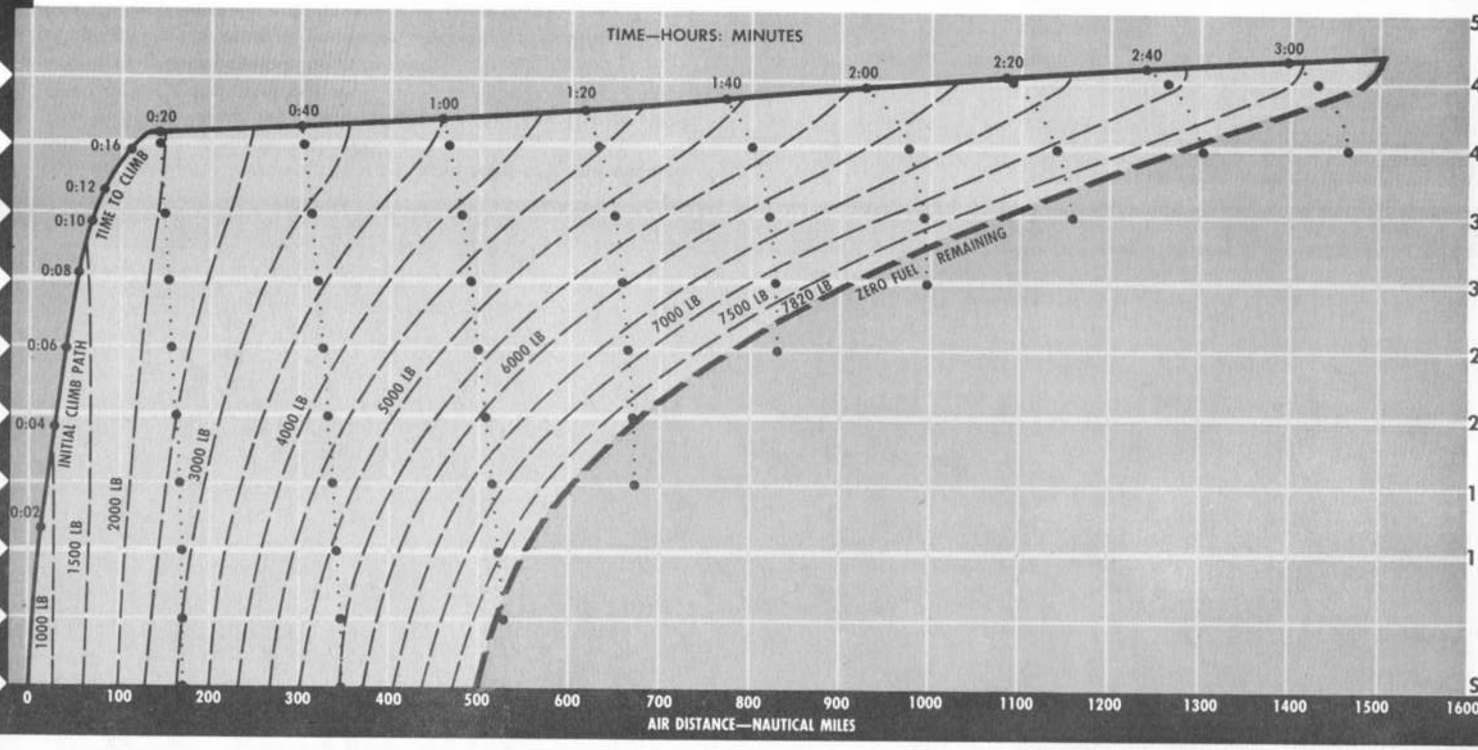
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

TWO 200-GALLON DROP TANKS plus TWO 120-GALLON DROP TANKS

TAKE-OFF GROSS WEIGHT: 23,716 LB

MILITARY THRUST CLIMB TRUE MACH NO.	CAS	ALT 1000 FT
.80	215	45
.78	235	40
.76	255	35
.72	270	30
.69	285	25
.65	300	20
.62	315	15
.59	330	10
.56	340	5
.54	355	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (See Military Thrust climb chart for detailed information.)
3. Cruise at Maximum Continuous Thrust (96% rpm).
4. No allowance or reserve for loiter, descent, or landing.

LEGEND:

- — — — — Fuel consumed
- •·····•·····• Time (start, taxi, and take-off not included)
- ——— Maximum Continuous Thrust cruise-climb path

CRUISE—TWO 200-GALLON DROP TANKS PLUS TWO 120-GALLON DROP TANKS

ALTITUDE FEET	% RPM	APPROXIMATE TRUE MACH NO.	APPROXIMATE CAS	APPROXIMATE TAS	APPROXIMATE LB/HR
CRUISE-CLIMB*	96	.81	—	465	2300-1700
40,000	↓	.84-.87	250-260	480-500	2500-2600
35,000		.85-.86	285-290	490-495	3150
30,000		.85-.86	320-325	500-510	3850
25,000		.85-.86	355-360	510-515	4600
20,000		.84-.85	390-395	515-520	5400
15,000		.83-.84	425-430	520-525	6250
10,000		.81-.82	455-460	520-525	7050
5,000		.80-.81	490-495	520-525	7900
SEA LEVEL		.78	515	515	8700

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-180C

Figure A-26

OPTIMUM RETURN PROFILE

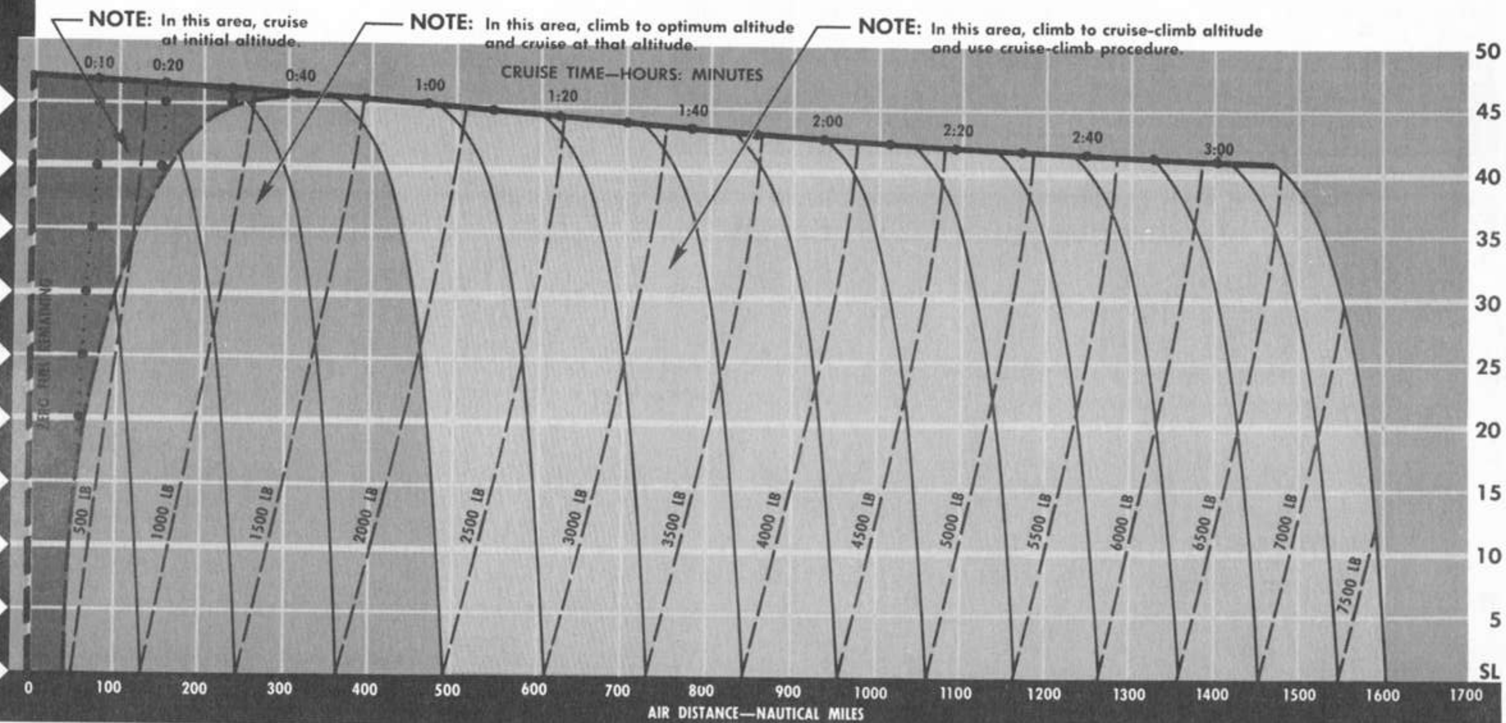
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

TWO 200-GALLON DROP TANKS plus TWO 120-GALLON DROP TANKS

GROSS WEIGHT: 23,716 LB — 15,896 LB

MILITARY THRUST CLIMB TRUE MACH NO.	CAS	ALT 1000 FT
.80	215	45
.78	235	40
.76	255	35
.72	270	30
.69	285	25
.65	300	20
.62	315	15
.59	330	10
.56	340	5
.54	355	SL



REMARKS

1. Optimum cruise altitude is determined by intersection of climb path guide lines and lines of best range.
2. Fuel required at any point includes Military Thrust climb to cruise altitude (if below that).
3. Cruise at recommended Mach number.
4. For cruise-climb procedure, use Maximum Continuous Thrust and maintain a constant Mach number.
5. No allowance made for loiter, descent, or landing.

LEGEND:

- Line of best range for cruise-climb flight
- Time at cruising altitude
- Line of best range for constant-altitude flight
- Climb path guide lines
- Fuel required

CRUISE—TWO 200-GALLON DROP TANKS PLUS TWO 120-GALLON DROP TANKS

ALTITUDE FEET	TRUE MACH NO.	APPROXIMATE CAS	APPROXIMATE TAS	APPROXIMATE LB/HR	APPROXIMATE % RPM
CRUISE-CLIMB*	.81	—	465	2300-1700	96
45,000	.81	220	465	1900-1750	96-92
40,000	.80	240	460	2250-1900	96-89
35,000	.73	245	420	2200-1850	90-85
30,000	.66	245	385	2150-1800	87-83
25,000	.62	255	375	2250-1950	85-82
20,000	.57	265	350	2350-2100	83-81
15,000	.53	270	335	2500-2250	82-80
10,000	.50	275	320	2650-2450	82-80
5000	.47	285	305	2850-2650	81-80
SEA LEVEL	.45	300	300	3200-3000	81-80

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-181B

Figure A-27

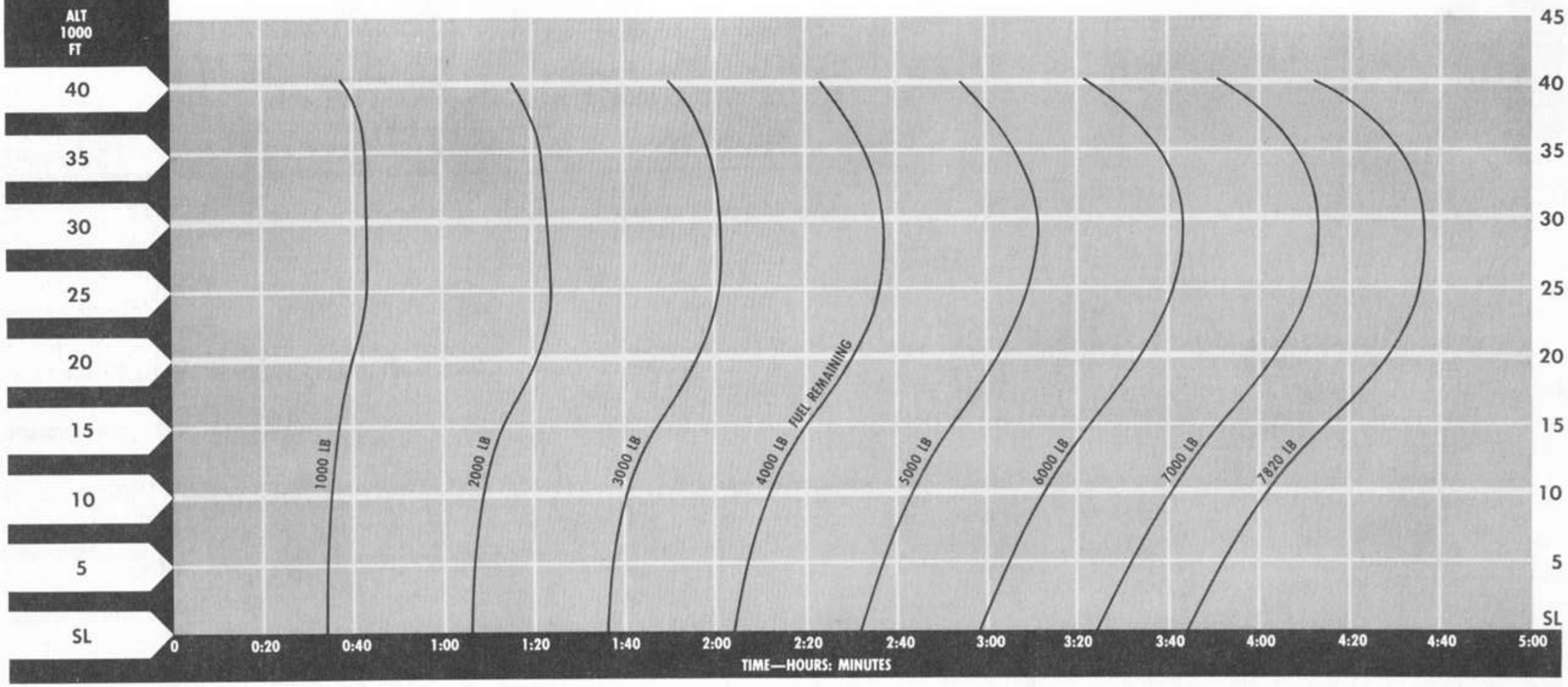
MAXIMUM ENDURANCE PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

TWO 200-GALLON DROP TANKS plus TWO 120-GALLON DROP TANKS

GROSS WEIGHT: 23,716 LB-15,896



REMARKS
1. Loiter at recommended CAS.
2. Maintain a constant altitude.

LOITER	LESS THAN 4000 LB FUEL REMAINING					MORE THAN 4000 LB FUEL REMAINING				
		APPROXIMATE					APPROXIMATE			
ALTITUDE FEET	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM
40,000	185	.63	360	1850-1450	91-86	210	.70	400	2300-1850	97-91
35,000	180	.55	320	1800-1350	85-81	205	.62	360	2200-1800	90-85
30,000	180	.49	290	1700-1300	83-78	205	.55	320	2150-1700	87-83
25,000	175	.43	255	1750-1350	80-77	200	.49	295	2100-1750	84-80
20,000	180	.39	240	1800-1450	79-75	195	.43	265	2100-1800	82-79
15,000	180	.36	225	1850-1550	78-74	195	.39	245	2150-1850	80-78
10,000	180	.32	205	1950-1650	77-74	190	.35	220	2250-1950	79-77
5000	175	.29	185	2050-1700	76-73	190	.31	200	2350-2050	78-76
SEA LEVEL	165	.25	165	2150-1700	76-73	180	.28	180	2500-2400	78-76

F-86H-1-93-182B

Figure A-28

OPTIMUM MAXIMUM ENDURANCE PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

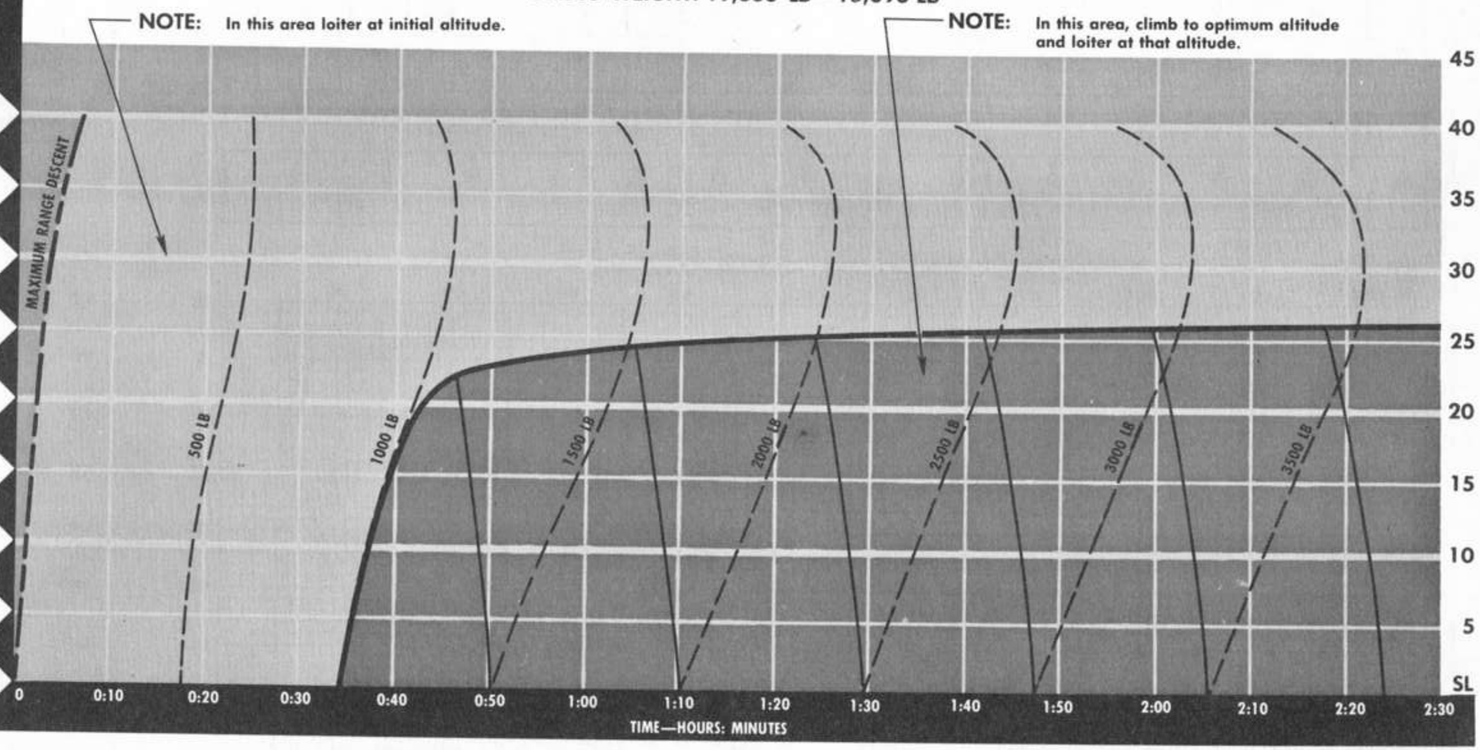
TWO 200-GALLON DROP TANKS plus TWO 120-GALLON DROP TANKS

GROSS WEIGHT: 19,806 LB — 15,896 LB

Data as of: 1 April 1956.
Based on FLIGHT TEST

MAXIMUM CONTINUOUS THRUST CLIMB

TRUE MACH NO.	CAS	ALT 1000 FT
.80	240	40
.80	270	35
.75	285	30
.70	295	25
.66	305	20
.62	310	15
.58	315	10
.54	325	5
.50	330	SL



REMARKS

1. Use Maximum Continuous Thrust for climb. (See Maximum Continuous Thrust climb chart for detailed information.)
2. Loiter at recommended CAS.
3. Maximum range descent. (Use idle power, speed brake closed. Descend at .80 Mach number or 400 knots CAS, whichever is less.)
4. No allowance or reserve for landing.

LEGEND

- (solid heavy line) Line of optimum altitude for loiter
- (dashed line) Fuel remaining
- (solid thin line) Maximum Continuous Thrust climb guide lines

LOITER—TWO 200-GALLON DROP TANKS PLUS TWO 120-GALLON DROP TANKS

ALTITUDE FEET	CAS	APPROXIMATE TRUE MACH NO.	APPROXIMATE TAS	APPROXIMATE LB/HR	APPROXIMATE % RPM
40,000	185	.63	360	1850-1450	91-86
35,000	180	.55	320	1800-1350	85-81
30,000	180	.49	290	1700-1300	83-78
25,000	175	.43	255	1750-1350	80-77
20,000	180	.39	240	1800-1450	79-75
15,000	180	.36	225	1850-1550	78-74
10,000	180	.32	205	1950-1650	77-74
5000	175	.29	185	2050-1700	76-73
SEA LEVEL	165	.25	165	2150-1700	76-73

F-86H-1-93-183B

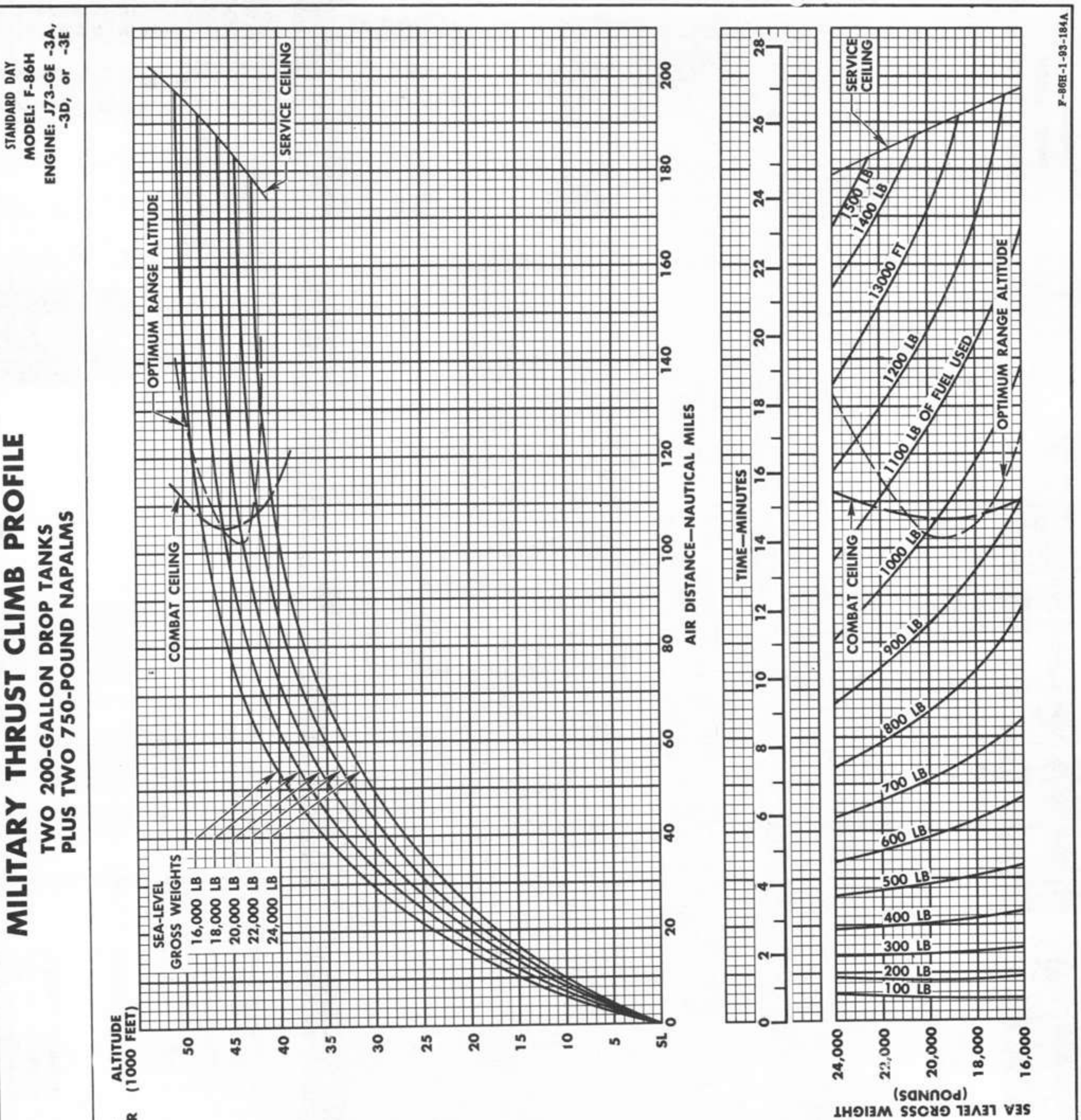
Figure A-29

MILITARY THRUST CLIMB PROFILE

TWO 200-GALLON DROP TANKS PLUS TWO 750-POUND NAPALMS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE -3A, -3D, or -3E

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST



CLIMB SPEEDS

CAS (KNOTS)	TRUE MACH NUMBER	ALTITUDE (1000 FEET)
195	.82	50
215	.80	45
235	.78	40
255	.76	35
270	.72	30
285	.69	25
300	.65	20
315	.62	15
330	.59	10
340	.56	5
355	.54	SL

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

Figure A-30

MISSION PROFILE

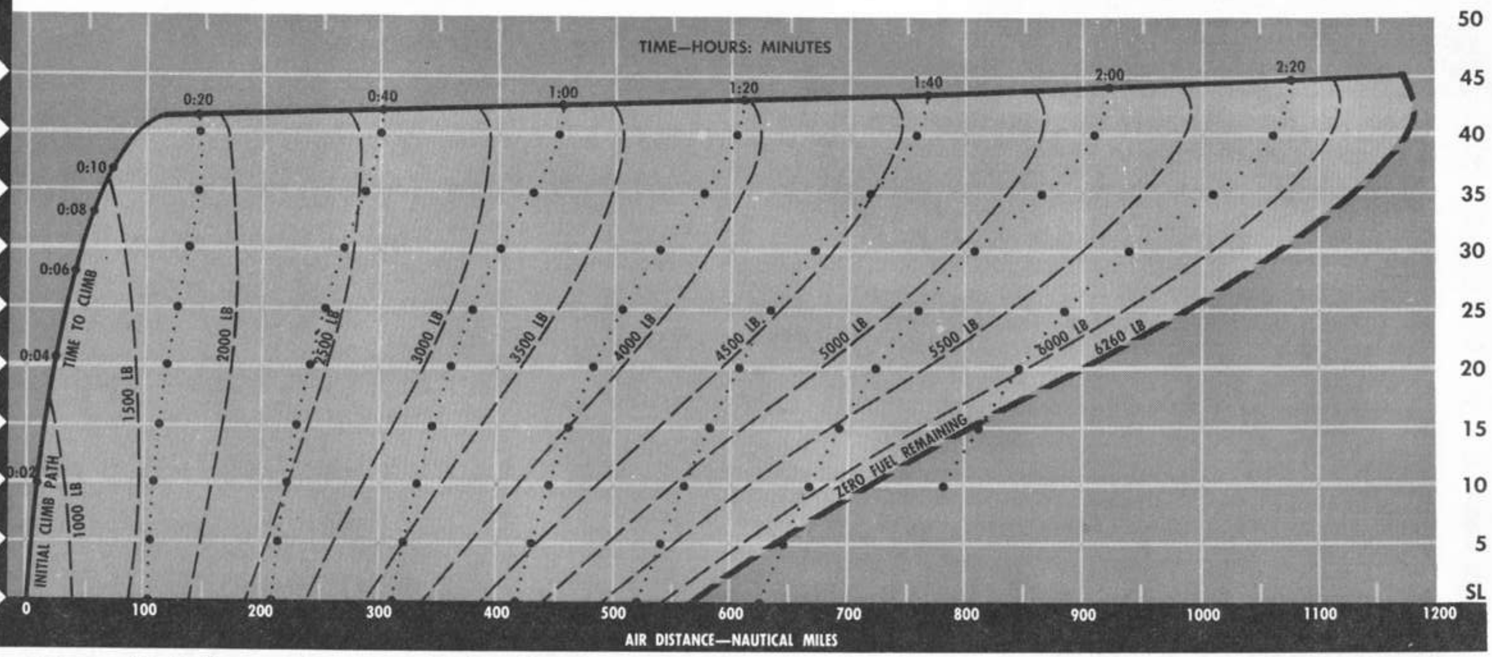
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

TWO 200-GALLON DROP TANKS plus TWO 750-POUND NAPALMS

TAKE-OFF GROSS WEIGHT: 23,504 LB

MILITARY THRUST CLIMB TRUE MACH NO.	CAS	ALT 1000 FT
.80	215	45
.78	235	40
.76	255	35
.72	270	30
.69	285	25
.65	300	20
.62	315	15
.59	330	10
.56	340	5
.54	355	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (Refer to Military Thrust climb chart for detailed information.)
3. Cruise at recommended Mach number.
4. No allowance or reserve for loiter, descent, or landing.
5. For cruise-climb procedure, use Maximum Continuous Thrust and maintain a constant Mach number.

LEGEND:

— — — — Fuel consumed

•····•····• Time (start, taxi, and take-off not included)

——— Maximum Continuous Thrust cruise-climb path

CRUISE—TWO 200-GALLON DROP TANKS PLUS TWO 750-POUND NAPALMS

ALTITUDE FEET	TRUE MACH NO.	APPROXIMATE CAS	TAS	LB/HR	% RPM
CRUISE-CLIMB*	.81	-	465	2150-1750	96
40,000	.79	240	455	2100-1800	92-88
35,000	.75	250	430	2100-1850	87-85
30,000	.68	255	405	2100-1850	85-83
25,000	.63	260	380	2150-1950	84-81
20,000	.58	265	360	2200-2050	82-80
15,000	.55	280	345	2400-2250	81-80
10,000	.52	290	335	2650-2500	81-80
5000	.50	300	325	2900-2750	81-80
SEA LEVEL	.47	315	315	3200-3050	81-80

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-185C

Figure A-31

HIGH SPEED PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or-3E

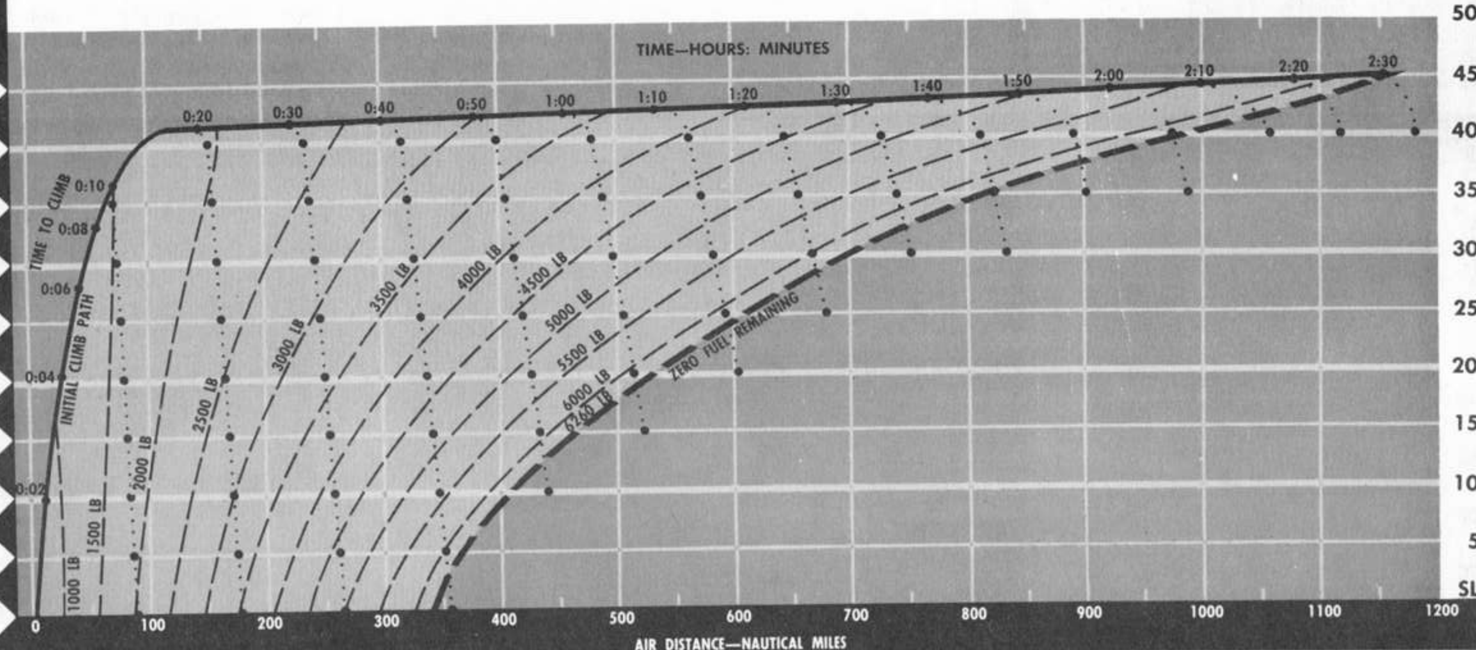
Data as of: 1 April 1956.
Based on FLIGHT TEST

TWO 200-GALLON DROP TANKS plus TWO 750-POUND NAPALMS

TAKE-OFF GROSS WEIGHT: 23,504 LB

MILITARY THRUST CLIMB

TRUE MACH NO.	CAS	ALT 1000 FT
.80	215	45
.78	235	40
.76	255	35
.72	270	30
.69	285	25
.65	300	20
.62	315	15
.59	330	10
.56	340	5
.54	355	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (See Military Thrust climb chart for detailed information.)
3. Cruise at Maximum Continuous Thrust (96% rpm).
4. No allowance or reserve for loiter, descent, or landing.

LEGEND:

- — — — Fuel consumed
- • · · · • · · · • Time (start, taxi, and take-off not included)
- ——— Maximum Continuous Thrust cruise-climb path

CRUISE—TWO 200-GALLON DROP TANKS PLUS TWO 750-POUND NAPALMS

ALTITUDE FEET	% RPM	APPROXIMATE TRUE MACH NO.	CAS	TAS	LB/HR
CRUISE-CLIMB*	96	.81	-	465	2150-1750
40,000		.85-.86	260-265	485-495	2550
35,000		.86-.87	295-300	495-500	3200
30,000		.86-.87	325-330	505-510	3850
25,000		.86	365	515	4500
20,000		.86	400	525	5300
15,000		.85	435	530	6250
10,000		.83	465	530	7100
5000		.82	500	530	7950
SEA LEVEL		.80	530	530	8850

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-186C

Figure A-32

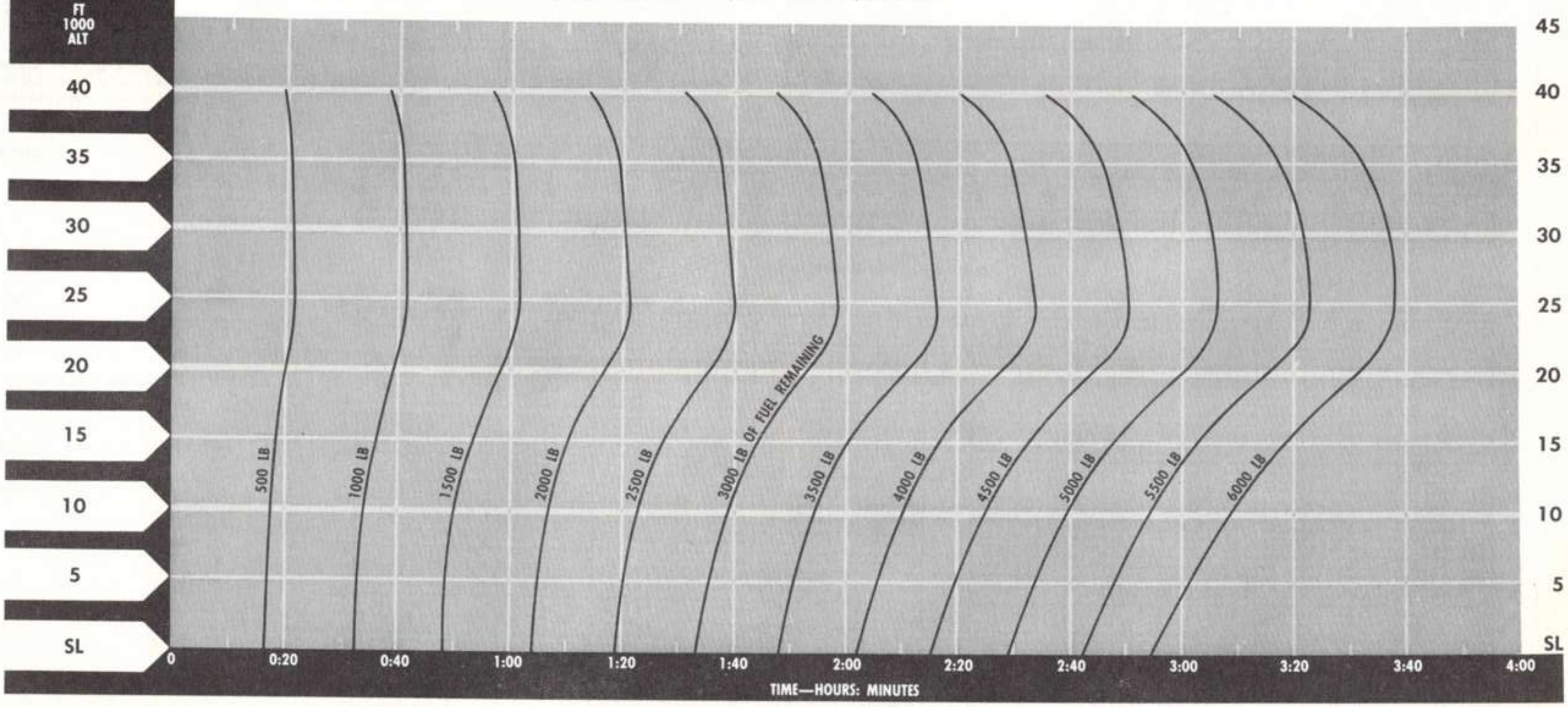
MAXIMUM ENDURANCE PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of 1 April 1956.
Based on FLIGHT TEST

TWO 200-GALLON DROP TANKS plus TWO 750-POUND NAPALMS

GROSS WEIGHT: 17,244 LB—23,504 LB



REMARKS

1. Loiter at recommended CAS.
2. Maintain constant altitude.

LOITER	LESS THAN 3000 LB FUEL REMAINING					MORE THAN 3000 LB FUEL REMAINING				
		APPROXIMATE					APPROXIMATE			
ALTITUDE FEET	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM
40,000	200	.67	385	1800-1500	90-85	210	.71	405	2150-1800	94-90
35,000	190	.58	335	1750-1400	86-82	210	.63	360	2050-1750	88-86
30,000	190	.52	305	1700-1400	82-79	210	.56	330	2000-1700	85-82
25,000	185	.45	270	1650-1400	80-77	205	.50	300	2000-1650	82-80
20,000	190	.41	255	1700-1500	78-76	205	.46	280	2000-1700	80-78
15,000	190	.38	235	1850-1650	77-76	205	.41	255	2050-1850	79-77
10,000	185	.34	215	1950-1700	76-75	205	.37	235	2150-1950	78-76
5,000	175	.29	190	2000-1750	75-74	200	.33	215	2250-2000	77-75
SEA LEVEL	170	.25	170	2100-1800	75-74	190	.29	190	2400-2100	77-75

F-86H-1-93-187B

Figure A-33

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

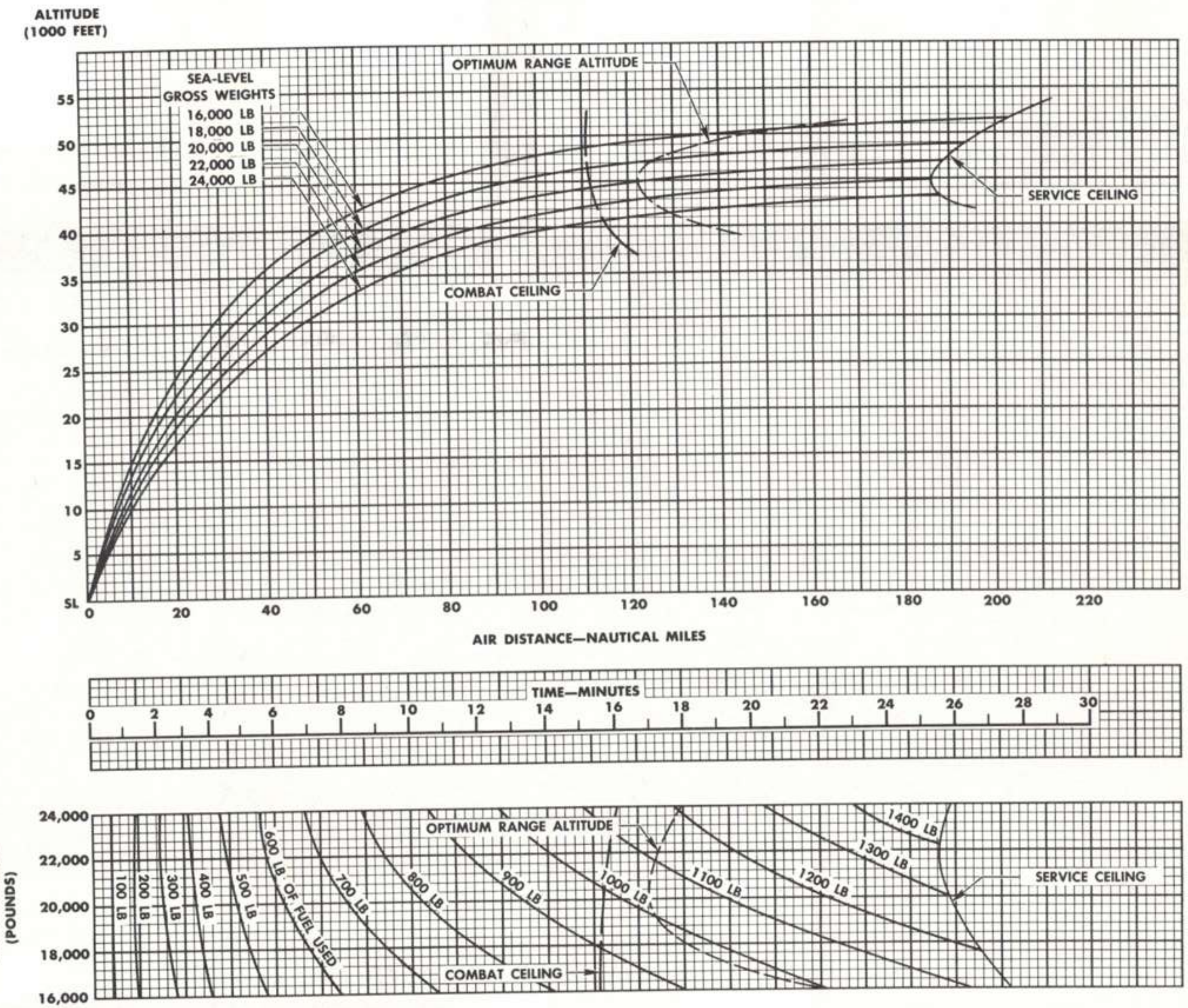
MILITARY THRUST CLIMB PROFILE

TWO 200-GALLON DROP TANKS plus TWO EX-10 BOMBS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E

CLIMB SPEEDS

CAS (KNOTS)	TRUE MACH NUMBER
180	.84
195	.82
215	.80
235	.78
255	.76
270	.72
285	.69
300	.65
315	.62
330	.59
340	.56
355	.54



REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

Figure A-34

MISSION PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

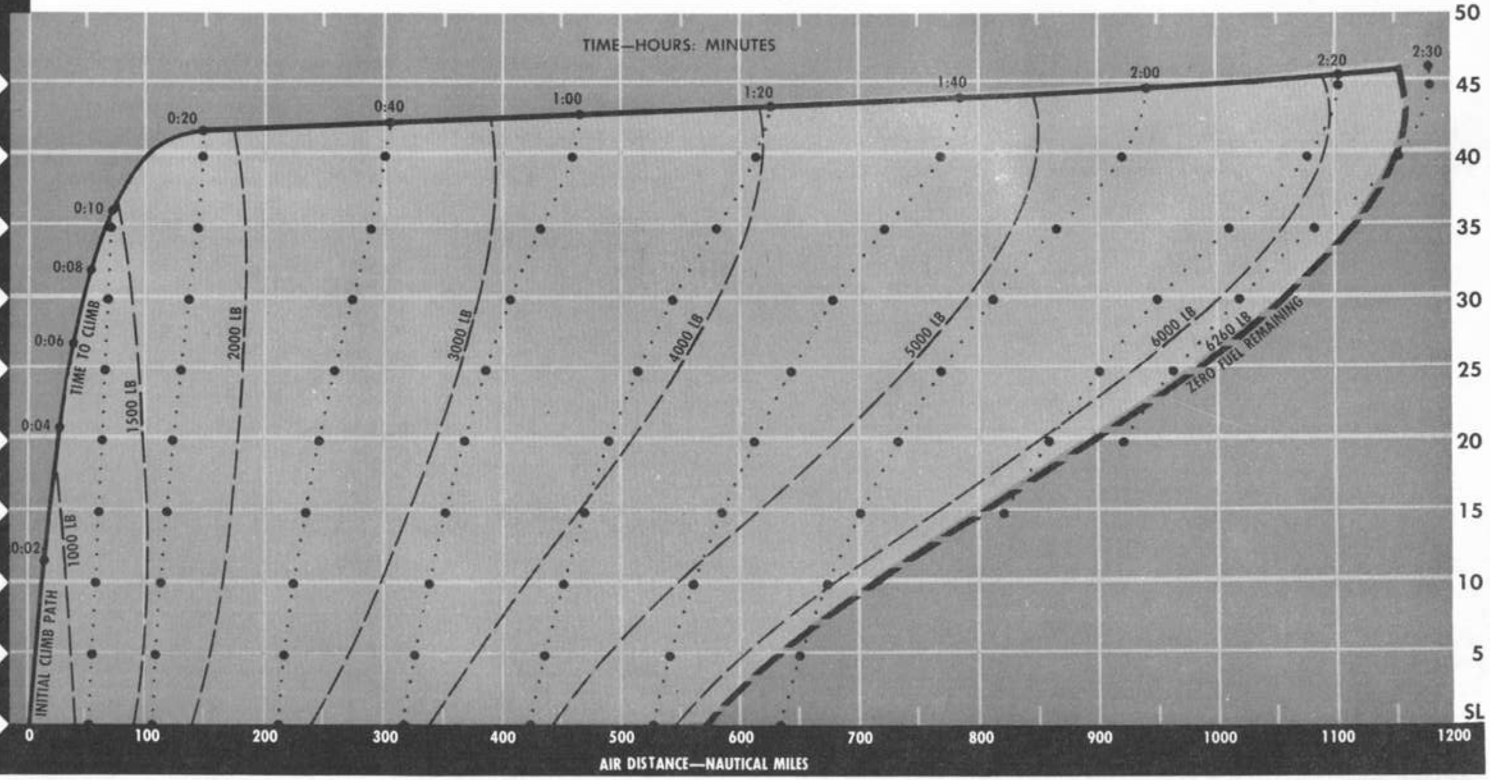
Data as of: 1 April 1956.
Based on **FLIGHT TEST**

TWO 200-GALLON DROP TANKS plus TWO EX-10 BOMBS

TAKE-OFF GROSS WEIGHT: 24,042 LB

MILITARY THRUST CLIMB

TRUE MACH NO.	CAS	ALT 1000 FT
.80	215	45
.78	235	40
.76	255	35
.72	270	30
.69	285	25
.65	300	20
.62	315	15
.59	330	10
.56	340	5
.54	355	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (Refer to Military Thrust climb chart for detailed information.)
3. Cruise at recommended Mach number.
4. No allowance or reserve for loiter, descent, or landing.
5. For cruise-climb procedure, use Maximum Continuous Thrust and maintain a constant Mach number.

LEGEND:

- — — — — Fuel consumed
- •····•····• Time (start, taxi, and take-off not included)
- ——— Maximum Continuous Thrust cruise-climb path

CRUISE—TWO 200-GALLON DROP TANKS PLUS TWO EX-10 BOMBS

ALTITUDE FEET	TRUE MACH NO.	APPROXIMATE CAS	APPROXIMATE TAS	APPROXIMATE LB/HR	APPROXIMATE % RPM
* CRUISE-CLIMB	.83	—	475	2250-1900	96
40,000	.82	245	470	2200-1940	93-89
35,000	.76	255	435	2150-1885	87-85
30,000	.68	255	400	2120-1870	85-83
25,000	.64	265	385	2190-1990	84-82
20,000	.60	275	370	2300-2120	83-81
15,000	.56	280	350	2460-2310	81-80
10,000	.54	300	330	2670-2530	81-80
5000	.50	300	320	2900-2780	81-80
SEA LEVEL	.47	310	310	3160-3040	81-80

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-189C

Figure A-35

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

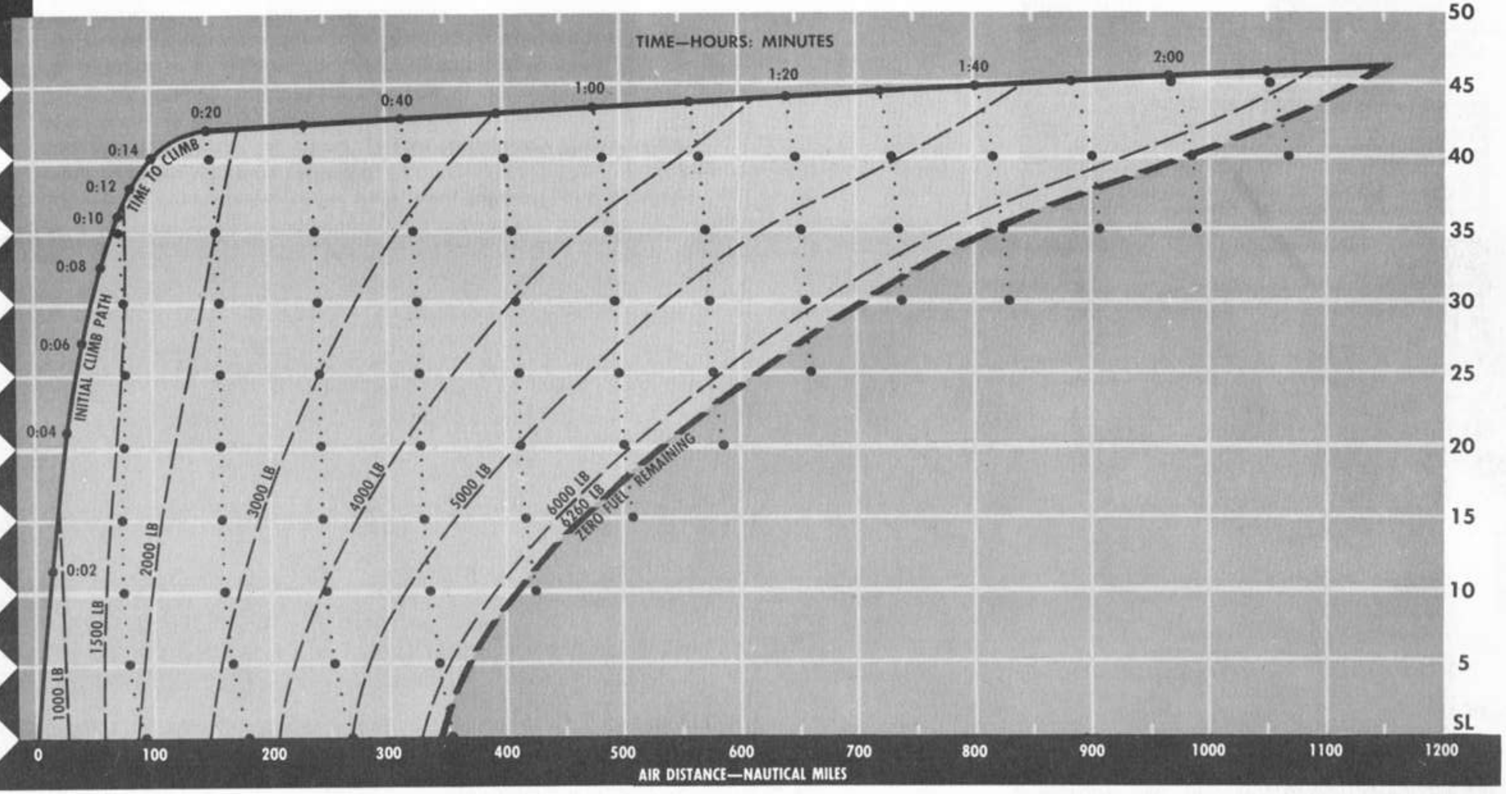
HIGH SPEED PROFILE

TWO 200-GALLON DROP TANKS plus TWO EX-10 BOMBS

TAKE-OFF GROSS WEIGHT: 24,042 LB

Data as of: 1 April 1956.
Based on FLIGHT TEST

MILITARY THRUST CLIMB TRUE MACH NO.	CAS	ALT 1000 FT
.80	215	45
.78	235	40
.76	255	35
.72	270	30
.69	285	25
.65	300	20
.62	315	15
.59	330	10
.56	340	5
.54	355	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, Take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (See Military Thrust climb chart for detailed information.)
3. Cruise at Maximum Continuous Thrust (96% rpm).
4. No allowance or reserve for loiter, descent, or landing.

LEGEND:

- — — — — Fuel consumed
- •·····•·····• Time (start, taxi, and take-off not included)
- ——— Maximum Continuous Thrust cruise-climb path

CRUISE—TWO 200-GALLON DROP TANKS PLUS TWO EX-10 BOMBS

ALTITUDE FEET	% RPM	APPROXIMATE TRUE MACH NO.	CAS	TAS	LB/HR
CRUISE-CLIMB*	96	.83	—	475	2250-1900
40,000		.85-.87	260-265	490-500	2550-2600
35,000		.87-.88	295-300	500-505	3200-3250
30,000		.86-.87	330-335	510-515	3850-3850
25,000		.86-.87	365-370	520-525	4550-4550
20,000		.86-.87	400-405	525-530	5400-5500
15,000		.85-.86	435-440	530-535	6300-6350
10,000		.84-.85	470-475	535-540	
5,000		.82-.83	500-505	530-535	7950-8000
SEA LEVEL		.81-.82	530-535	530-535	8800-8850

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-190C

Figure A-36

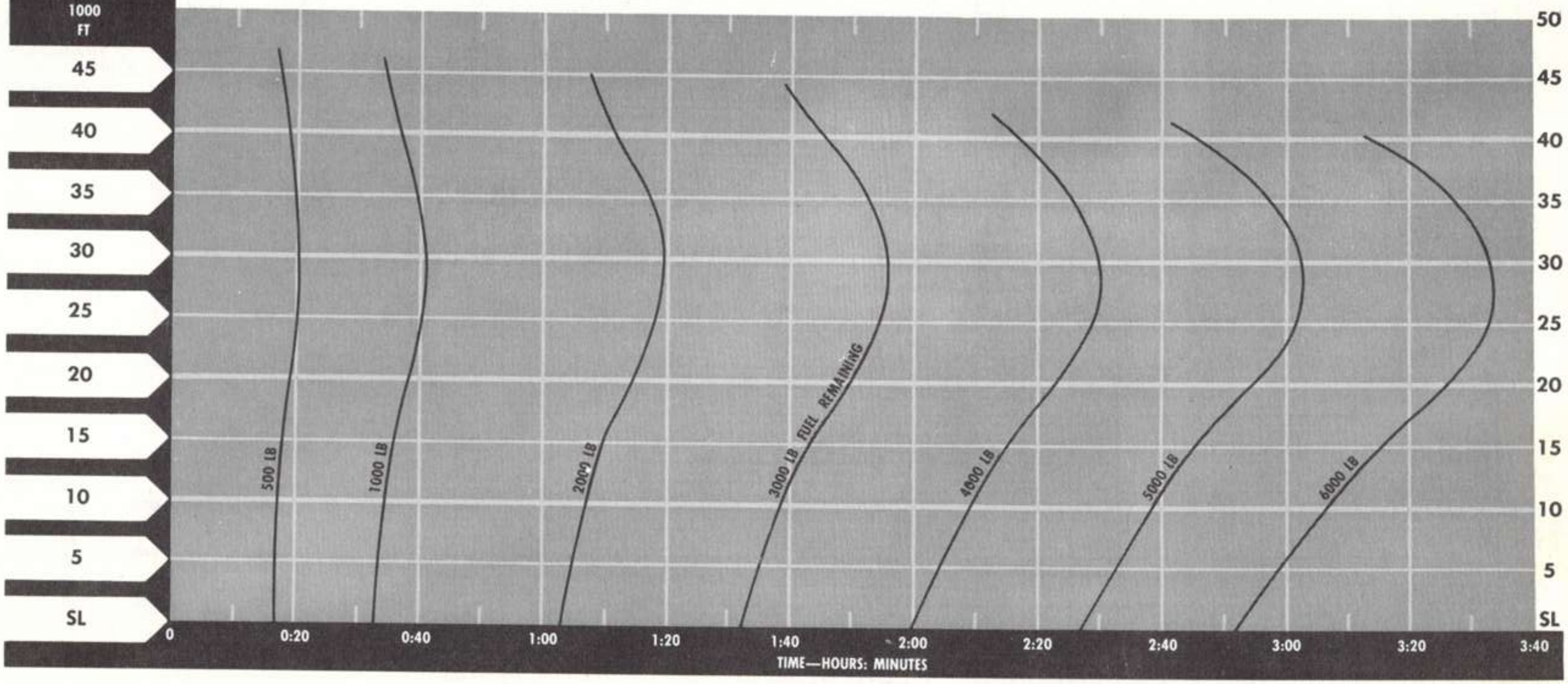
MAXIMUM ENDURANCE PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

TWO 200-GALLON DROP TANKS
plus TWO EX-10 BOMBS

GROSS WEIGHT: 24,042 LB—17,782 LB



LOITER	LESS THAN 3000 LB OF FUEL REMAINING					MORE THAN 3000 LB FUEL REMAINING				
		APPROXIMATE					APPROXIMATE			
ALTITUDE FEET	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM
45,000	200	.74	425	2000-1650	96-90	—	—	—	—	—
40,000	200	.67	385	1900-1550	89-84	215	.71	410	2200-1900	94-89
35,000	195	.60	340	1750-1450	84-80	215	.64	370	2100-1750	88-84
30,000	195	.53	310	1700-1450	82-78	210	.57	335	2050-1700	86-82
25,000	195	.47	282	1700-1450	79-76	210	.51	305	2000-1700	83-79
20,000	190	.42	250	1800-1550	77-75	210	.46	280	2050-1800	80-77
15,000	185	.37	235	1850-1650	76-74	206	.41	255	2100-1850	78-76
10,000	185	.33	215	1950-1700	75-74	205	.37	235	2200-1950	78-75
5000	180	.30	195	2050-1750	75-73	200	.33	215	2300-2050	78-75
SEA LEVEL	180	.27	180	2150-1800	75-73	195	.30	195	2400-2150	78-75

REMARKS
1. Loiter at recommended CAS.
2. Maintain a constant altitude

F-86H-1-93-191B

Figure A-37

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

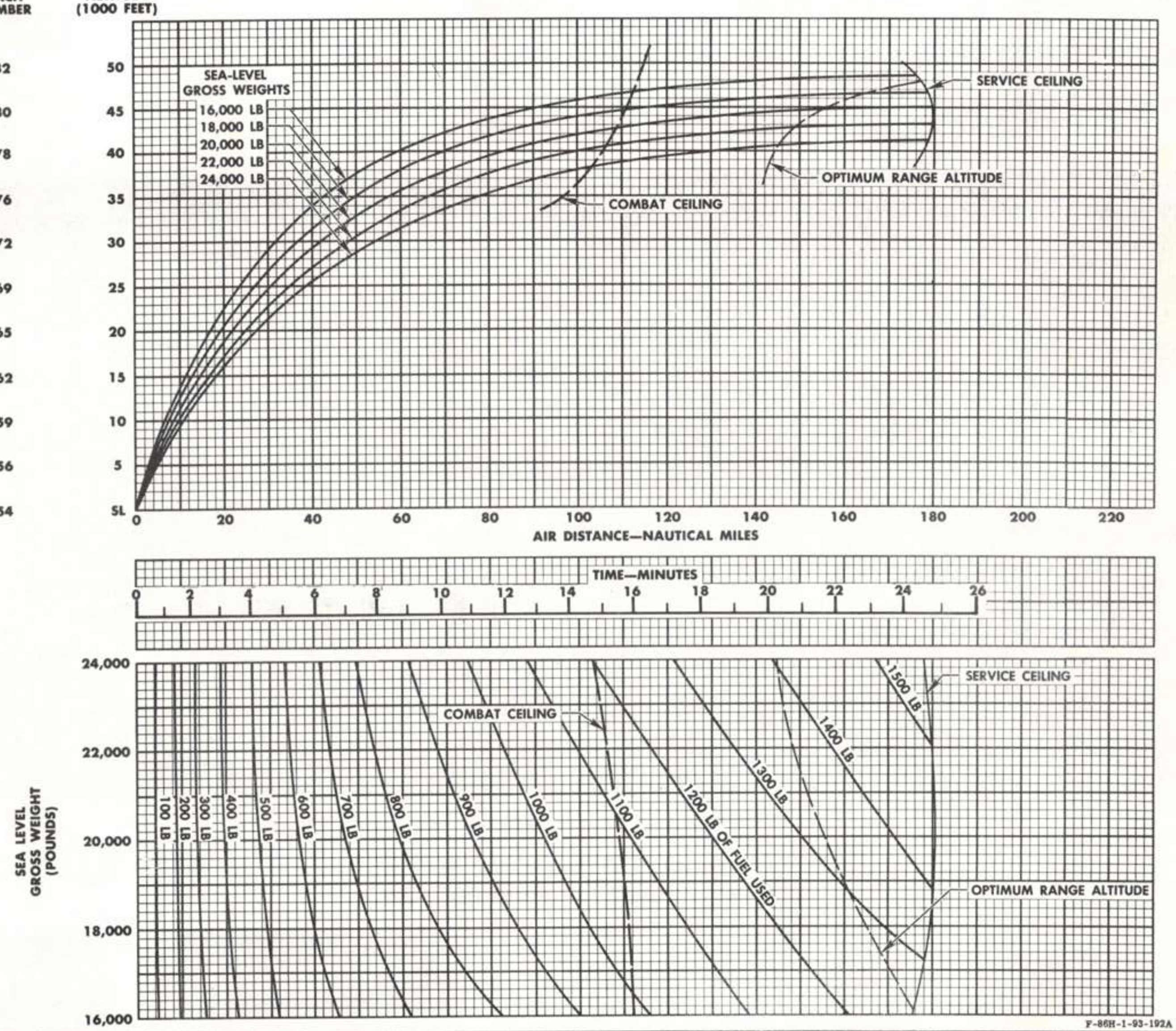
MILITARY THRUST CLIMB PROFILE

TWO 200-GALLON DROP TANKS PLUS EIGHT 5-INCH ROCKETS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE -3A, -3D, or -3E

CLIMB SPEEDS

CAS (KNOTS)	TRUE MACH NUMBER	ALTITUDE (1000 FEET)
195	.82	50
215	.80	45
235	.78	40
255	.76	35
270	.72	30
285	.69	25
300	.65	20
315	.62	15
330	.59	10
340	.56	5
355	.54	SL



REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

Figure A-38

MISSION PROFILE

TWO 200-GALLON DROP TANKS plus EIGHT 5-INCH ROCKETS

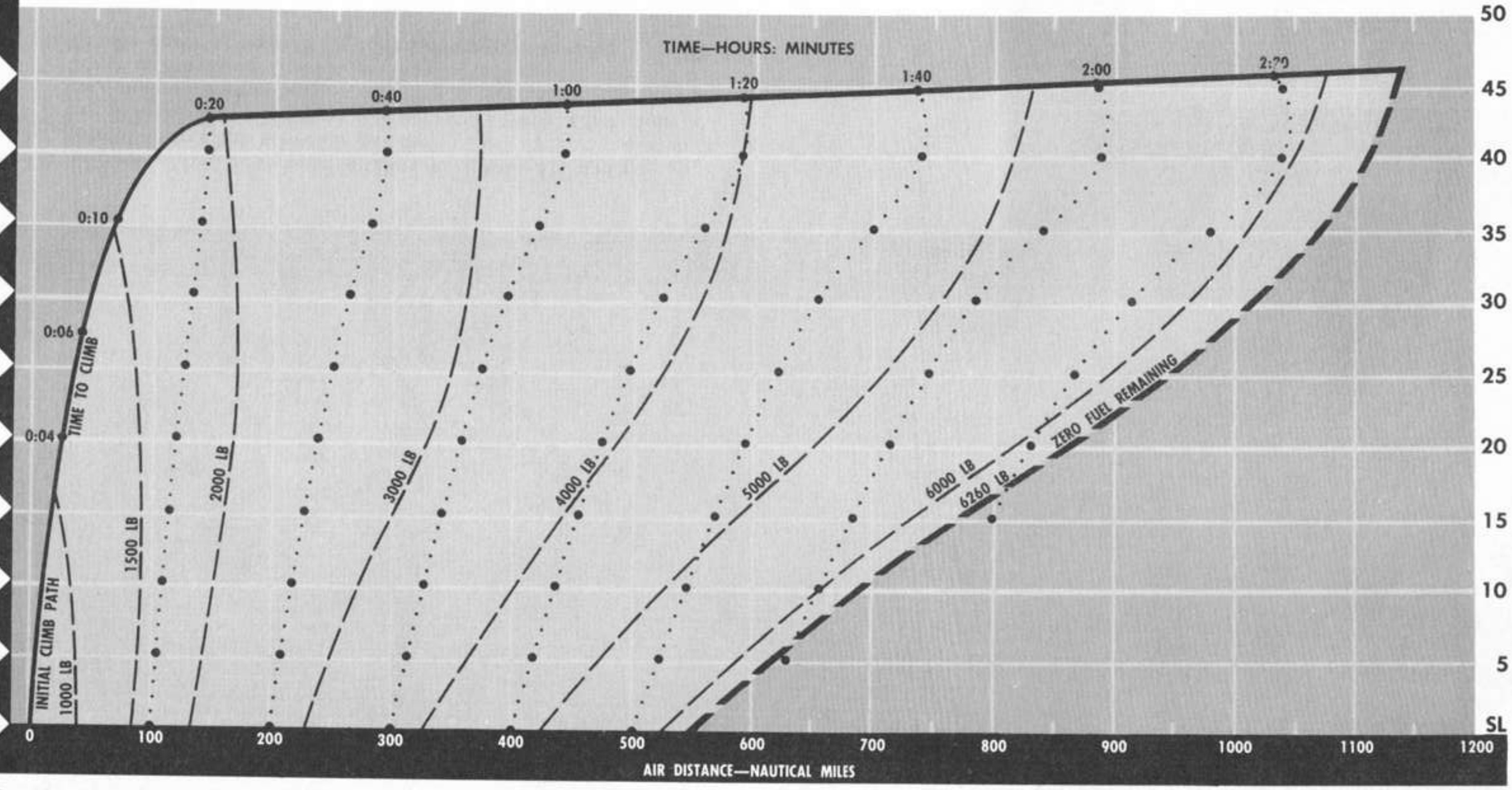
TAKE-OFF GROSS WEIGHT: 22,962 LB

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

MILITARY THRUST CLIMB

TRUE MACH NO.	CAS	ALT 1000 FT
.80	215	45
.78	235	40
.76	255	35
.72	270	30
.69	285	25
.65	300	20
.62	315	15
.59	330	10
.56	340	5
.54	355	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (Refer to Military Thrust climb chart for detailed information.)
3. Cruise at recommended Mach number.
4. No allowance or reserve for loiter, descent, or landing.
5. For cruise-climb procedure, use Maximum Continuous Thrust and maintain a constant Mach number.

LEGEND:

— — — — Fuel consumed
●····●····● Time (start, taxi, and take-off not included)
——— Maximum Continuous Thrust cruise-climb path

CRUISE—TWO 200-GALLON DROP TANKS PLUS EIGHT 5-INCH ROCKETS

ALTITUDE FEET	TRUE MACH NO.	APPROXIMATE CAS	APPROXIMATE TAS	APPROXIMATE LB/HR	APPROXIMATE % RPM
CRUISE-CLIMB*	.78	-	445	2100-1750	96
45,000	.78	210	450	1850-1750	96-93
40,000	.78	235	445	2150-1850	93-90
35,000	.73	245	420	2150-1850	88-85
30,000	.66	245	390	2100-1850	86-84
25,000	.62	265	370	2200-1950	84-82
20,000	.58	265	355	2300-2100	83-81
15,000	.55	275	340	2500-2300	82-80
10,000	.52	285	330	2700-2550	81-80
5000	.49	295	315	2900-2800	81-80
SEA LEVEL	.46	300	300	3150-3050	81-80

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-193C

Figure A-39

HIGH SPEED PROFILE

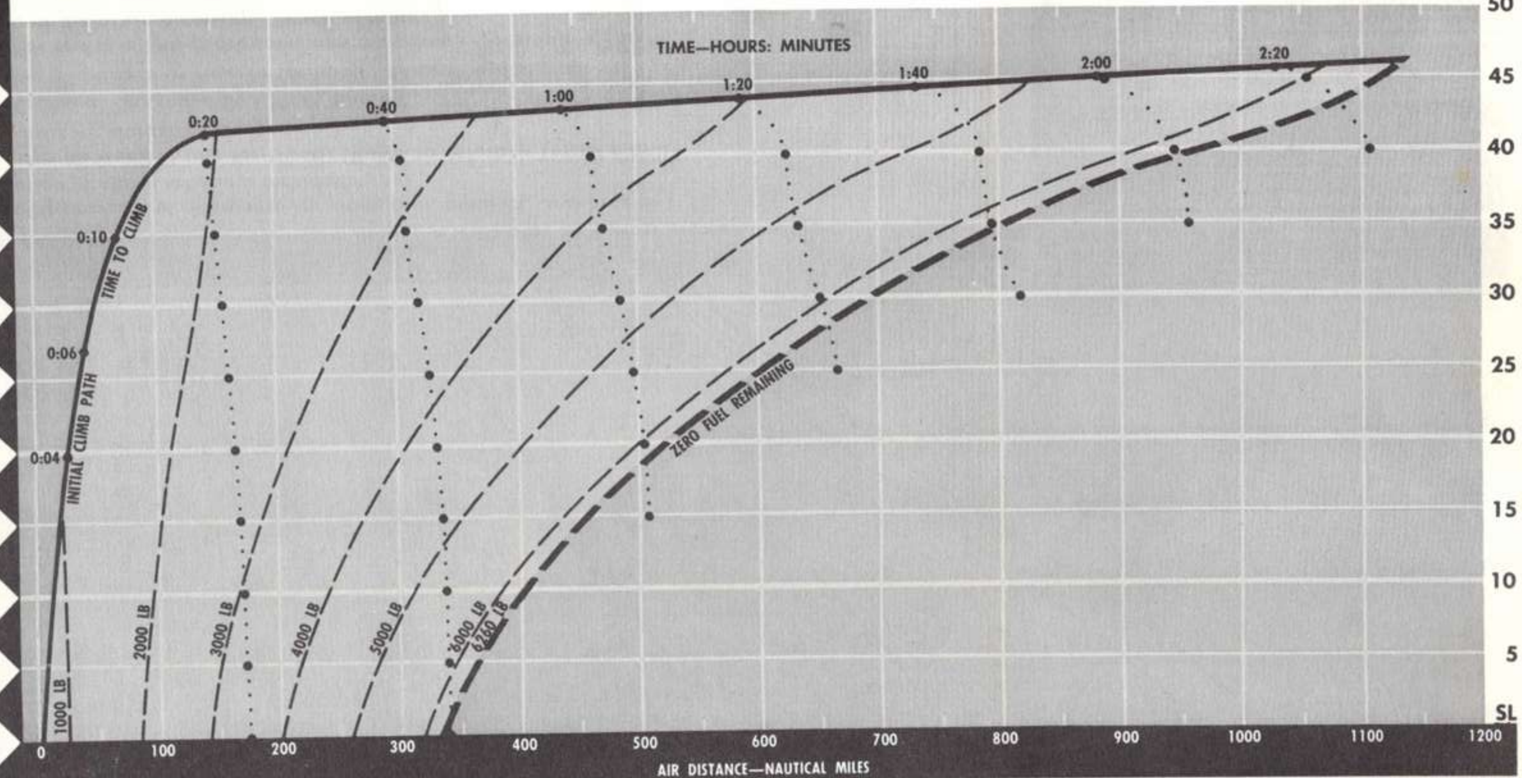
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or-3E

TWO 200-GALLON DROP TANKS plus EIGHT 5-INCH ROCKETS

TAKE-OFF GROSS WEIGHT: 22,962 LB

Data as of: 1 April 1956.
Based on FLIGHT TEST

MILITARY THRUST CLIMB TRUE MACH NO.	CAS	ALT 1000 FT
.80	215	45
.78	235	40
.76	255	35
.72	270	30
.69	285	25
.65	300	20
.62	315	15
.59	330	10
.56	340	5
.54	355	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (See Military Thrust climb chart for detailed information.)
3. Cruise at Maximum Continuous Thrust (96% rpm).
4. No allowance or reserve for loiter, descent, or landing.

LEGEND:

- ——— Fuel consumed
- •····•····• Time (start, taxi, and take-off not included)
- ━━━ Maximum Continuous Thrust cruise-climb path

CRUISE—TWO 200-GALLON DROP TANKS PLUS EIGHT 5-INCH ROCKETS

ALTITUDE FEET	% RPM	APPROXIMATE TRUE MACH NO.	CAS	TAS	LB/HR
CRUISE-CLIMB*	96	.78	-	445	2100-1750
45,000		.76-.79	205-215	440-460	1800-1850
40,000		.82-.84	250-255	470-485	2500-2550
35,000		.84-.85	285-290	480-490	3100-3150
30,000		.84-.85	320-325	495-500	3750-3800
25,000		.84	355	505	4500
20,000		.83	390	510	5350
15,000		.82	420	515	6200
10,000		.81	455	515	7050
5000		.79	480	510	7850
SEA LEVEL		.78	510	510	8650

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-194C

Figure A-40

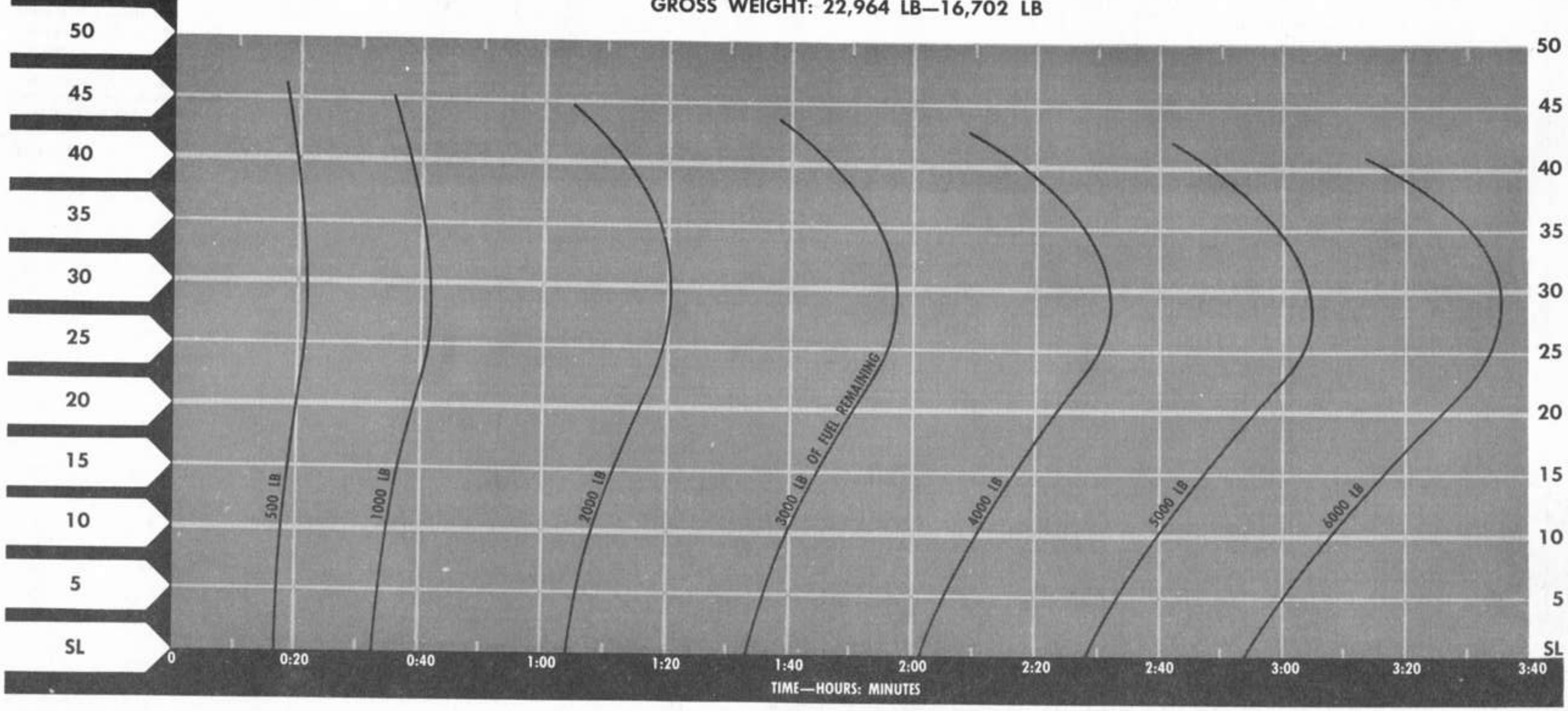
MAXIMUM ENDURANCE PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of 1 April 1956.
Based on FLIGHT TEST

TWO 200-GALLON DROP TANKS plus EIGHT 5-INCH ROCKETS

GROSS WEIGHT: 22,964 LB—16,702 LB



REMARKS
1. Loiter at recommended CAS.
2. Maintain constant altitude.

LOITER	LESS THAN 3000 LB FUEL REMAINING					MORE THAN 3000 LB FUEL REMAINING				
		APPROXIMATE					APPROXIMATE			
ALTITUDE FEET	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM
45,000	185	.70	400	1800-1630	96-93	-	-	-	-	-
40,000	185	.64	365	1850-1550	91-87	210	.68	390	2200-1850	96-91
35,000	185	.57	325	1750-1450	86-82	205	.61	355	2100-1750	89-86
30,000	185	.50	295	1700-1400	83-80	200	.55	320	2050-1700	86-83
25,000	185	.45	270	1700-1400	80-78	200	.49	295	2000-1700	83-80
20,000	185	.40	250	1800-1500	79-76	200	.44	270	2000-1800	81-79
15,000	180	.36	225	1850-1650	78-75	200	.39	245	2100-1850	80-78
10,000	175	.32	205	1950-1700	77-74	195	.35	225	2200-1950	79-77
5,000	170	.29	185	2050-1750	77-74	190	.31	205	2300-2050	78-77
SEA LEVEL	170	.25	170	2100-1800	76-74	185	.28	185	2400-2100	77-76

F-86H-1-93-195B

Figure A-41

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

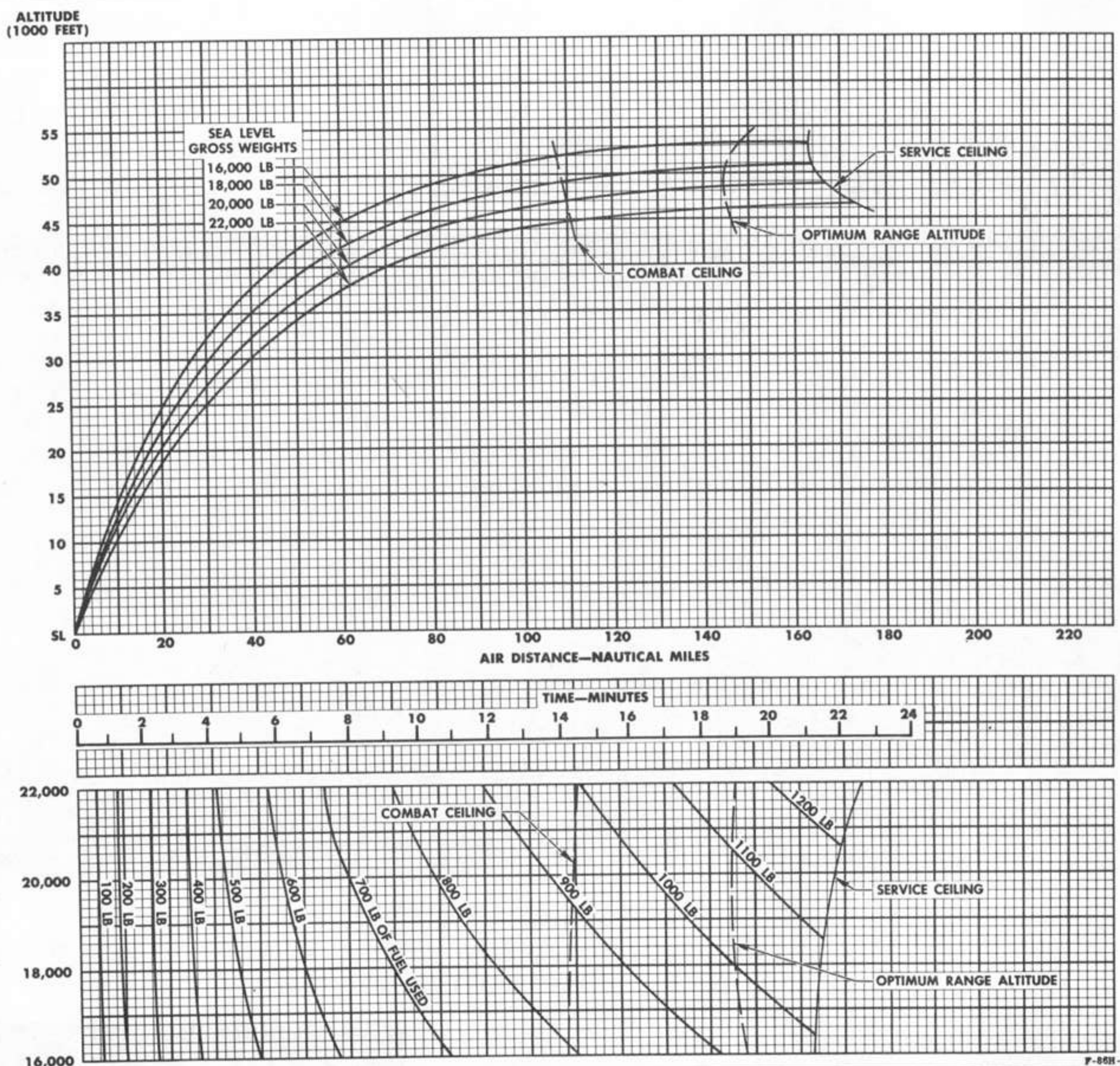
MILITARY THRUST CLIMB PROFILE

ONE SPECIAL STORE

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE -3A, -3D, or -3E

CLIMB SPEEDS

CAS (KNOTS)	TRUE MACH NUMBER
175	.82
195	.82
220	.82
245	.82
275	.82
295	.81
315	.78
335	.75
350	.72
370	.67
390	.64
405	.62



REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

Figure A-42

MISSION PROFILE

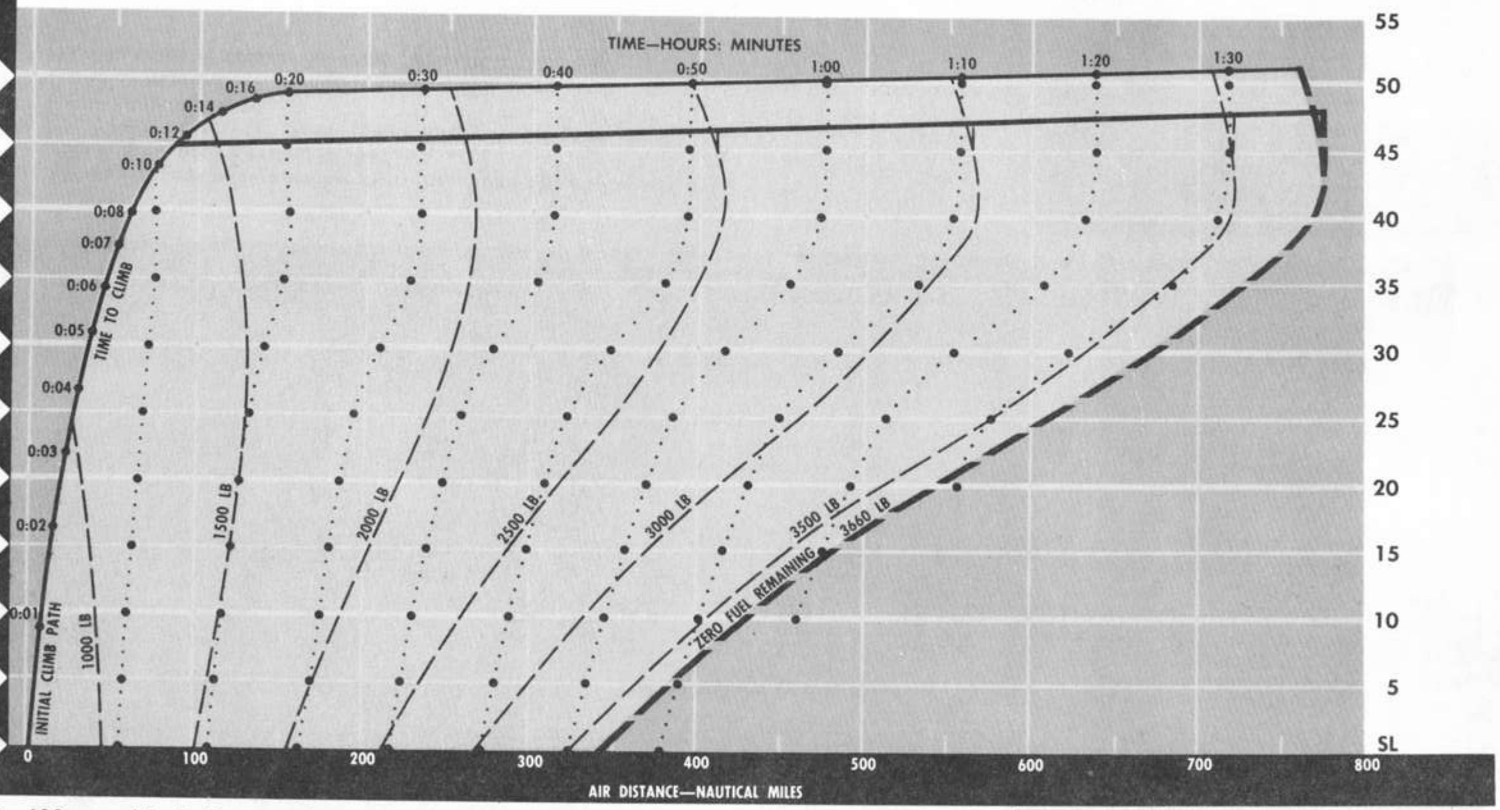
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

ONE SPECIAL STORE

TAKE-OFF GROSS WEIGHT: 20,254 LB

Data as of: 1 April 1956.
Based on FLIGHT TEST

MILITARY THRUST CLIMB TRUE MACH NO.	CAS	ALT 1000 FT
.82	195	50
.82	220	45
.82	245	40
.82	275	35
.81	295	30
.78	315	25
.75	335	20
.72	350	15
.67	370	10
.64	390	5
.62	405	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (Refer to Military Thrust climb chart for detailed information.)
3. Cruise at recommended Mach number.
4. No allowance or reserve for loiter, descent, or landing.
5. For cruise-climb procedure, maintain a constant rpm and Mach number.

LEGEND:

- — — — — Fuel consumed
- ●· · · ·●· · · ·● Time (start, taxi, and take-off not included)
- ——— Maximum Continuous Thrust cruise-climb path
- ▬▬▬ Cruise-climb path

CRUISE—ONE SPECIAL STORE

ALTITUDE FEET	TRUE MACH NO.	APPROXIMATE CAS	TAS	LB/HR	% RPM
CRUISE-CLIMB*	.84	-	485	1700-1550	96
CRUISE-CLIMB	.84	-	485	1650-1500	91
45,000	.84	230	485	1650-1550	95-88
40,000	.83	250	475	1650-1550	89-85
35,000	.80	270	455	1700-1600	85-81
30,000	.70	265	415	1700-1600	83-80
25,000	.64	265	380	1750-1650	82-79
20,000	.60	275	365	1950-1850	81-78
15,000	.56	285	355	2150-2100	80-78
10,000	.54	300	345	2400-2300	80-78
5000	.52	310	335	2650-2600	80-78
SEA LEVEL	.49	325	325	2950-2900	80-79

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-197C

Figure A-43

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

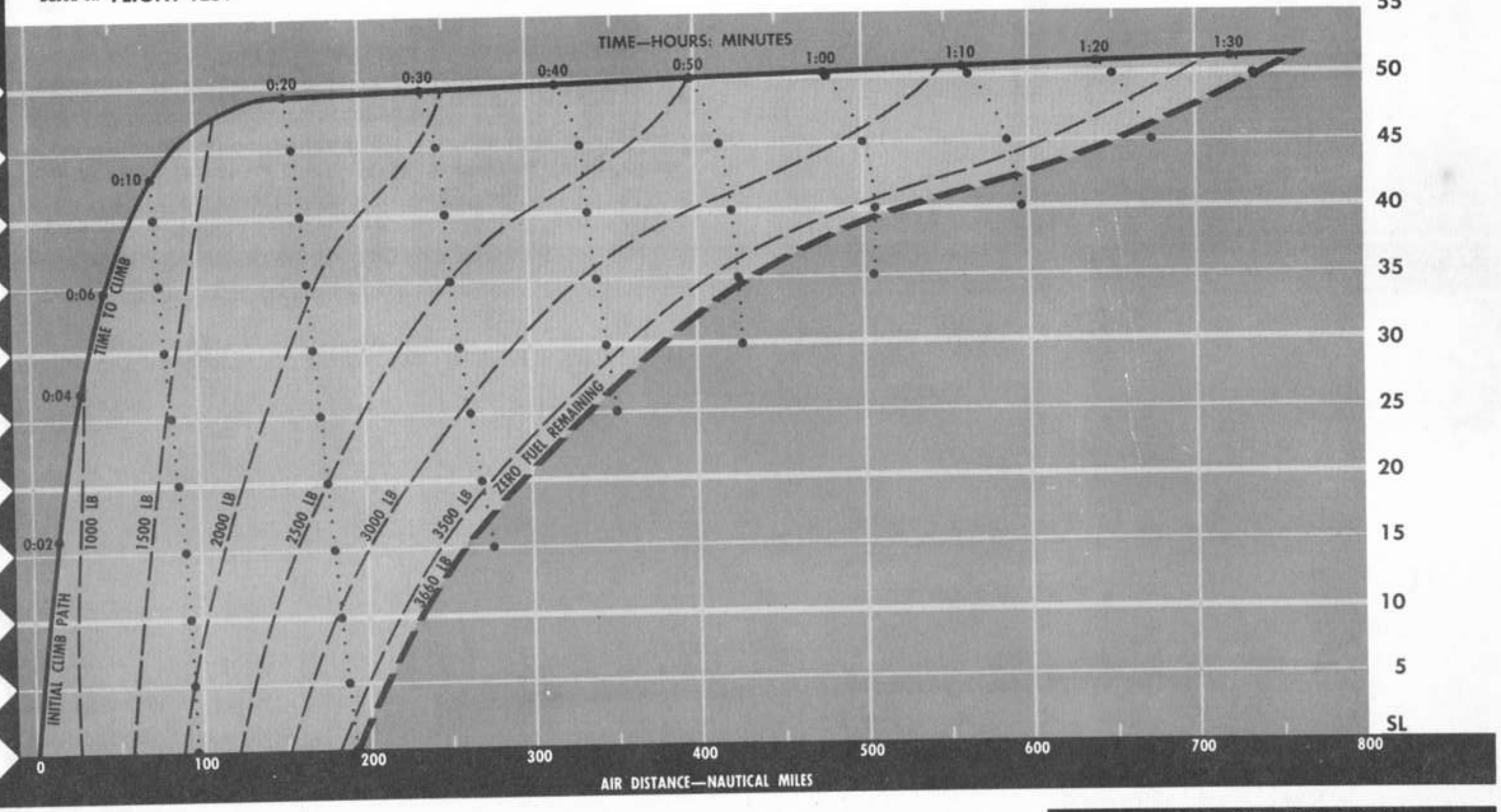
HIGH SPEED PROFILE

ONE SPECIAL STORE

TAKE-OFF GROSS WEIGHT: 20,254 LB

Data as of: 1 April 1956.
Based on FLIGHT TEST

MILITARY THRUST CLIMB TRUE MACH NO.	CAS	ALT 1000 FT
.82	195	50
.82	220	45
.82	245	40
.82	275	35
.81	295	30
.78	315	25
.75	335	20
.72	350	15
.67	370	10
.64	390	5
.62	405	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, Take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (See Military Thrust climb chart for detailed information.)
3. Cruise at Maximum Continuous Thrust (96% rpm).
4. No allowance or reserve for loiter, descent, or landing.

LEGEND:

- — — — — Fuel consumed
- •····•····• Time (start, taxi, and take-off not included)
- ——— Maximum Continuous Thrust cruise-climb path

CRUISE—ONE SPECIAL STORE

ALTITUDE FEET	% RPM	APPROXIMATE TRUE MACH NO.	APPROXIMATE CAS	APPROXIMATE TAS	APPROXIMATE LB/HR
CRUISE-CLIMB*	96	.84	-	485	1650-1500
45,000	↓	.89	245	510	2000
40,000	↓	.89	275	515	2600
35,000	↓	.90	310	520	3300
30,000	↓	.90	345	530	4000
25,000	↓	.90	385	540	4550
20,000	↓	.89	420	550	5550
15,000	↓	.89	460	560	6500
10,000	↓	.89	500	565	7400
5000	↓	.88	540	570	8250
SEA LEVEL	↓	.87	575	575	9000

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-198C

Figure A-44

OPTIMUM RETURN PROFILE

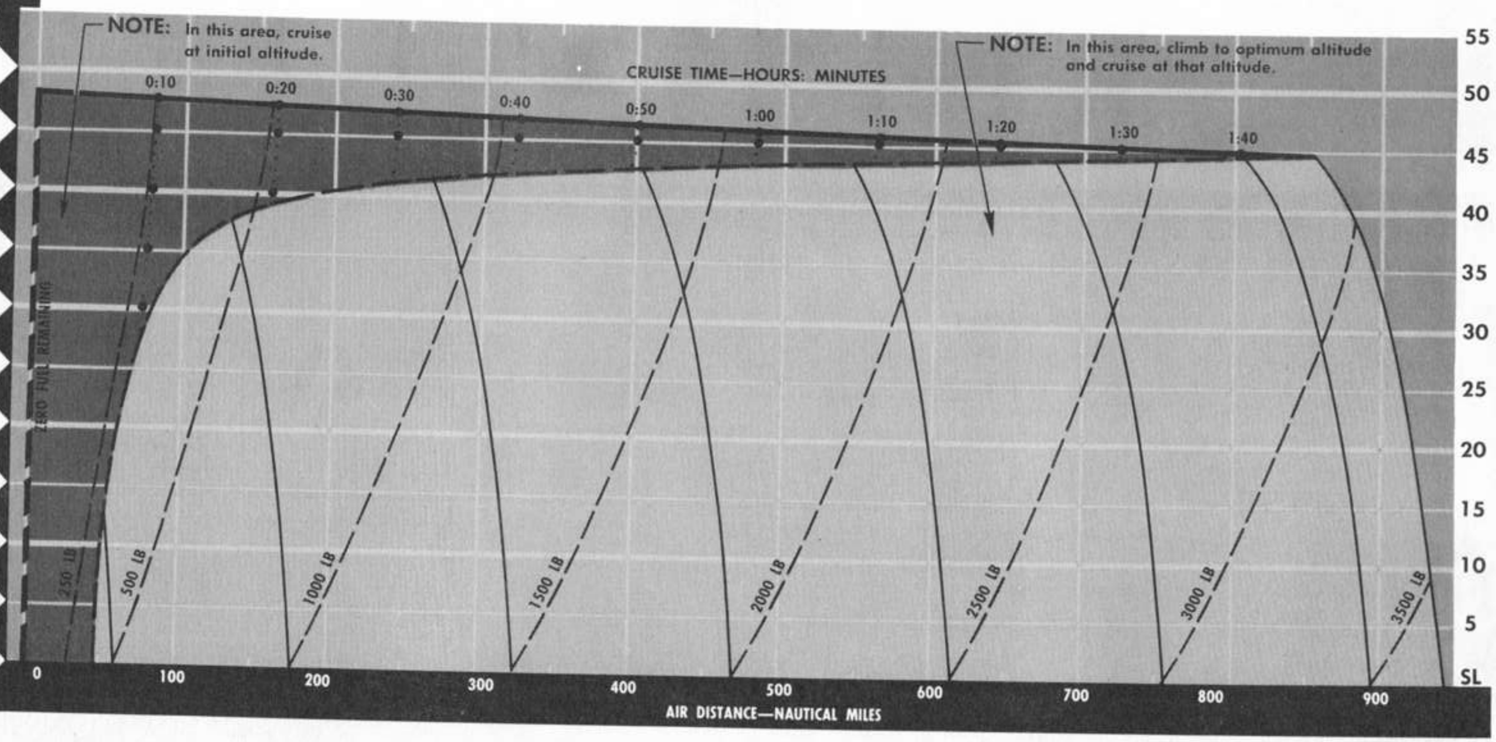
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

ONE SPECIAL STORE

GROSS WEIGHT: 20,254 LB — 16,594 LB

MILITARY THRUST CLIMB TRUE MACH NO.	CAS	ALT 1000 FT
.82	195	50
.82	220	45
.82	245	40
.81	275	35
.78	295	30
.75	315	25
.72	335	20
.69	350	15
.67	370	10
.64	390	5
.62	405	SL



REMARKS

1. Fuel required at any point includes Military Thrust climb to cruise altitude (if below that).
2. No allowance made for loiter, descent, or landing.
3. Best cruise condition determined by intersection of climb path guide lines and lines of best range.
4. Cruise at recommended Mach number.
5. For cruise-climb procedure, maintain constant rpm and Mach number.

LEGEND:

Line of best range for cruise-climb flight
Time at cruising altitude
Line of best range for constant-altitude flight
Climb path guide lines
Fuel required

CRUISE—ONE SPECIAL STORE

ALTITUDE FEET	TRUE MACH NO.	APPROXIMATE CAS	TAS	LB/HR	% RPM
CRUISE-CLIMB	.84	—	485	1650-1500	91
45,000	.84	230	485	1650-1550	95-88
40,000	.83	250	475	1650-1550	89-85
35,000	.80	270	455	1700-1600	85-81
30,000	.70	265	415	1700-1600	83-80
25,000	.64	265	380	1750-1650	82-79
20,000	.60	275	365	1950-1850	81-78
15,000	.56	285	355	2150-2100	80-78
10,000	.54	300	345	2400-2300	80-78
5000	.52	310	335	2650-2600	80-78
SEA LEVEL	.49	325	325	2950-2900	80-79

F-86H-1-93-199A

Figure A-45

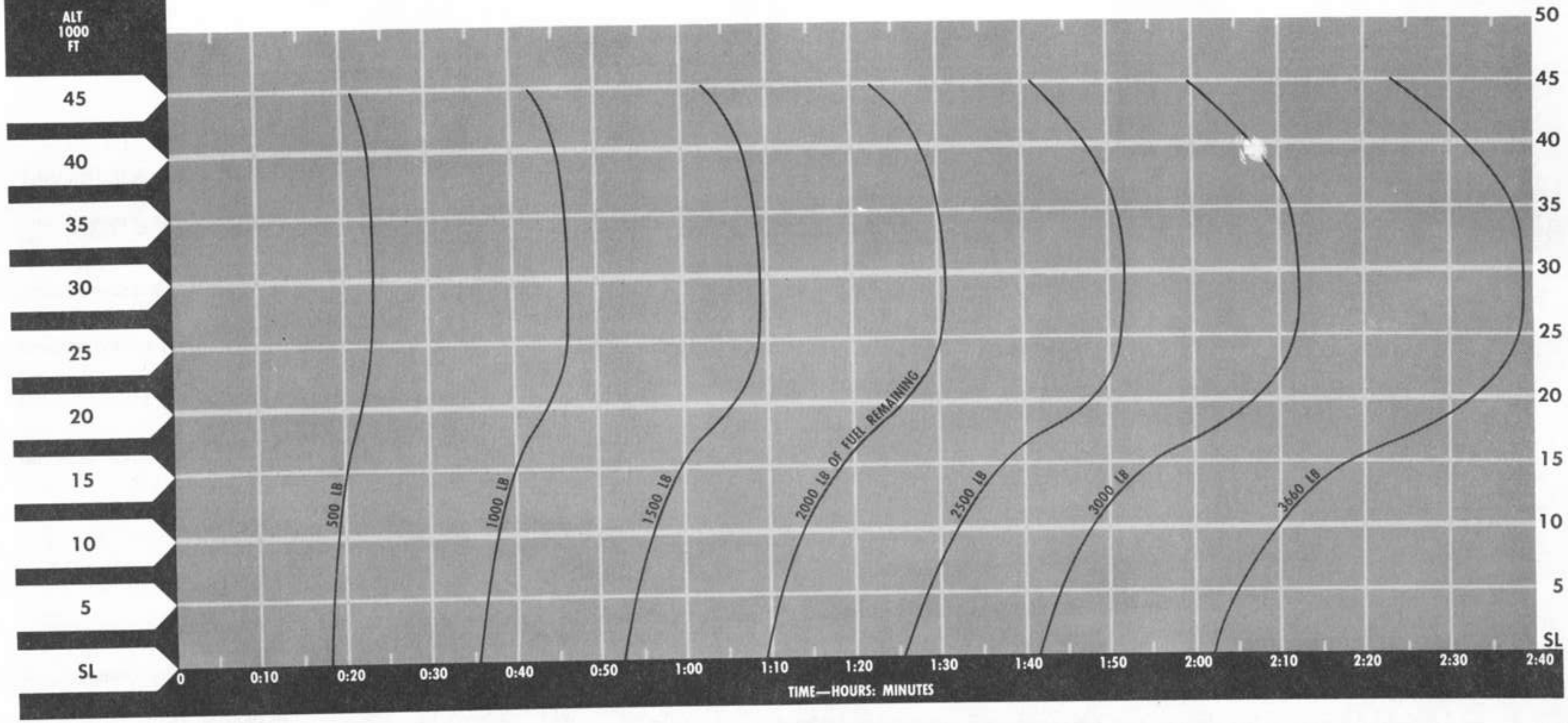
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

MAXIMUM ENDURANCE PROFILE

Data as of 1 April 1956.
Based on FLIGHT TEST

ONE SPECIAL STORE

GROSS WEIGHT: 16,594 LB—20,254 LB



REMARKS
1. Loiter at recommended CAS.
2. Maintain constant altitude.

LOITER	LESS THAN 2000 LB FUEL REMAINING					MORE THAN 2000 LB FUEL REMAINING				
		APPROXIMATE					APPROXIMATE			
ALTITUDE FEET	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM
45,000	200	.75	430	1550-1400	90-88	210	.78	450	1700-1550	92-90
40,000	195	.66	380	1450-1250	85-83	210	.70	400	1600-1450	87-85
35,000	185	.56	325	1400-1250	81-80	200	.61	350	1550-1400	83-81
30,000	185	.50	295	1400-1250	79-78	200	.54	320	1550-1400	81-79
25,000	185	.46	275	1400-1250	77-76	195	.47	290	1550-1400	78-77
20,000	185	.41	255	1450-1300	76-75	195	.43	265	1600-1450	77-76
15,000	185	.37	230	1600-1450	75-74	195	.39	245	1700-1600	76-75
10,000	180	.33	210	1700-1550	75-74	185	.33	220	1800-1700	76-75
5,000	170	.29	185	1750-1600	74-73	185	.31	200	1900-1750	75-74
SEA LEVEL	165	.25	165	1800-1650	74-73	175	.27	175	1950-1800	75-74

F-86H-1-93-200B

Figure A-46

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DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

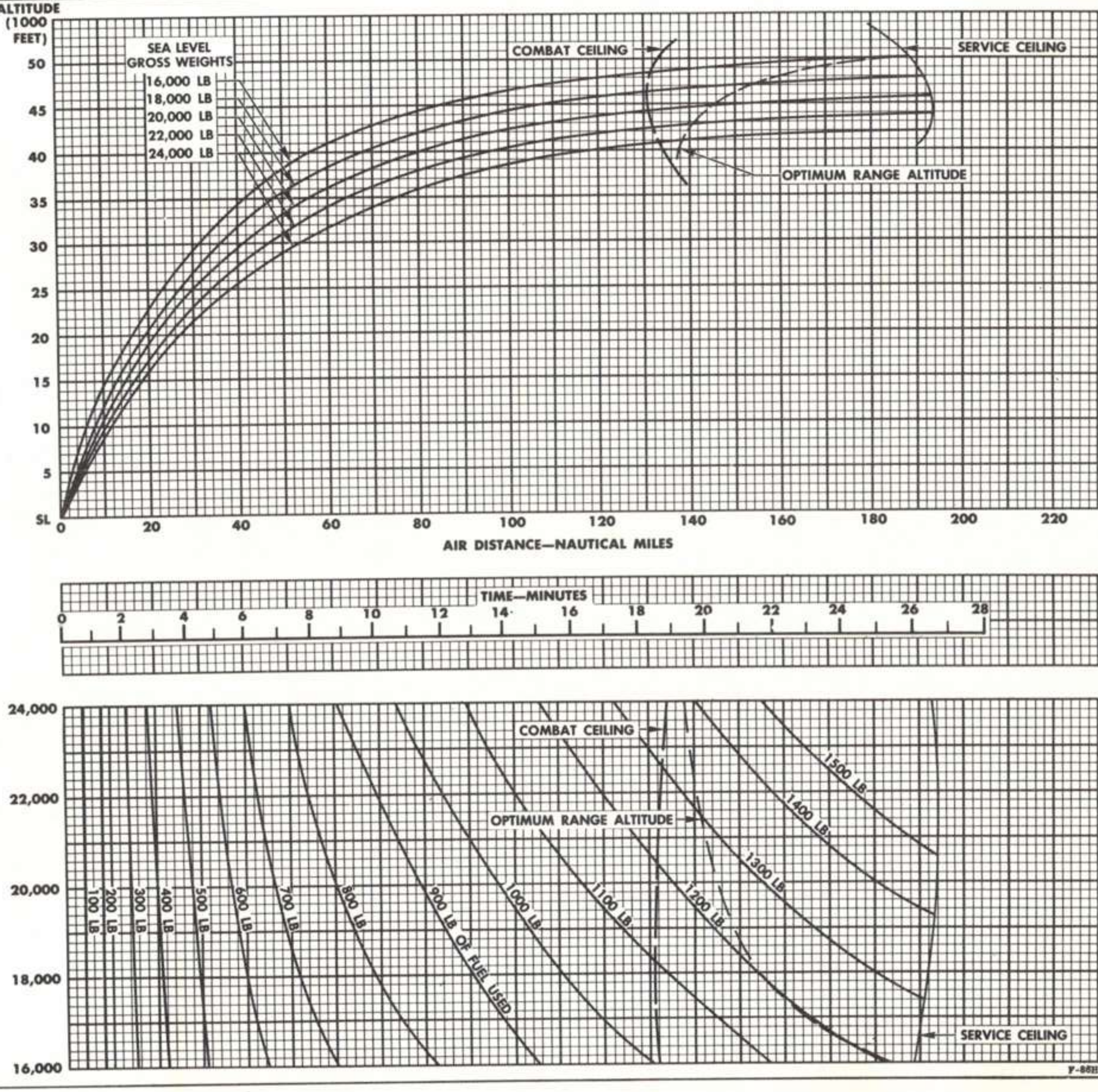
MILITARY THRUST CLIMB PROFILE

ONE SPECIAL STORE PLUS TWO 200-GALLON DROP TANKS PLUS ONE 120-GALLON DROP TANK

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E

CLIMB SPEEDS

CAS (KNOTS)	TRUE MACH NUMBER	ALTITUDE (1000 FEET)
195	.82	50
215	.80	45
235	.78	40
255	.76	35
270	.72	30
285	.69	25
300	.65	20
315	.62	15
330	.59	10
340	.56	5
355	.54	SL



SEA LEVEL GROSS WEIGHT (POUNDS)

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

Figure A-47

MISSION PROFILE

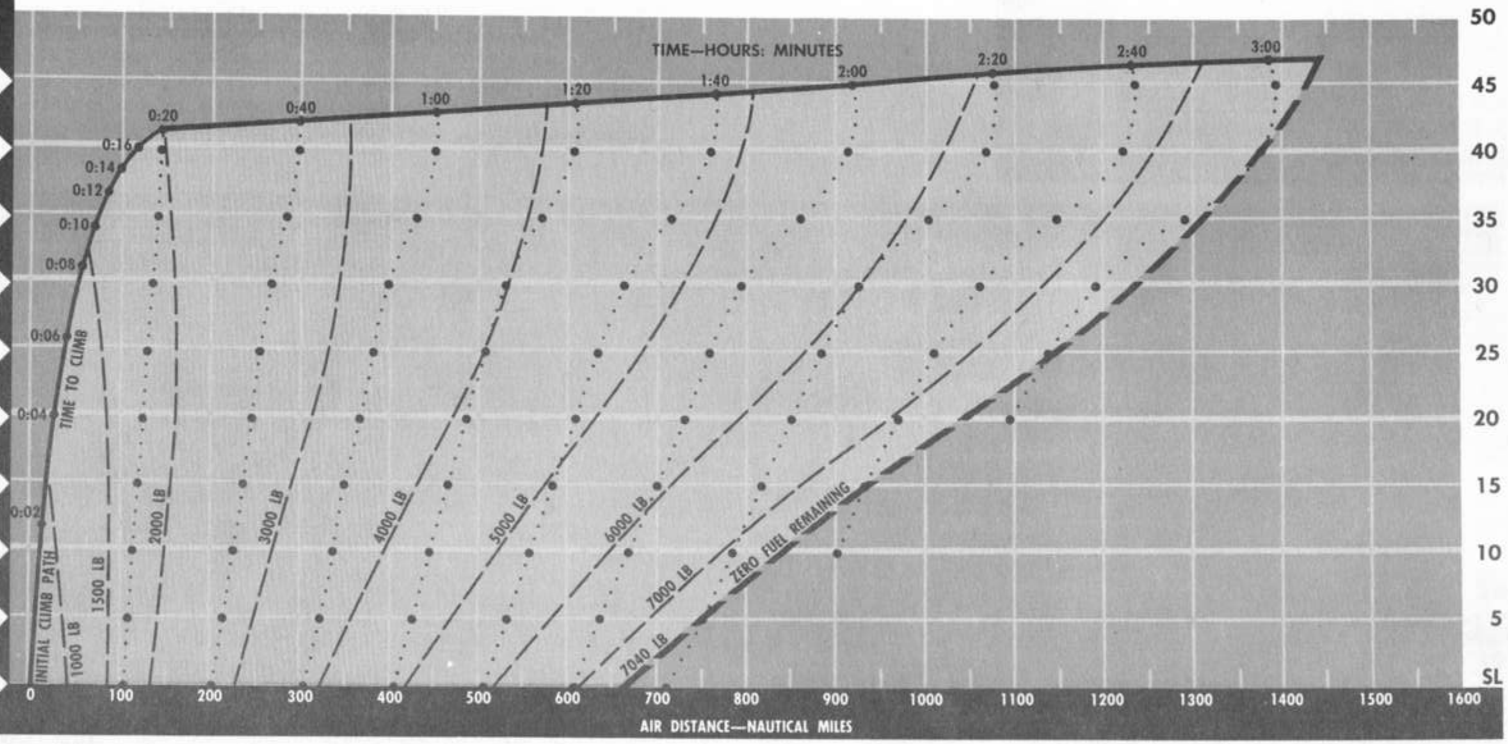
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

ONE SPECIAL STORE plus TWO 200-GALLON DROP TANKS plus ONE 120-GALLON DROP TANK

TAKE-OFF GROSS WEIGHT: 24,130 LB

MILITARY THRUST CLIMB TRUE MACH NO.	CAS	ALT 1000 FT
.80	215	45
.78	235	40
.76	255	35
.72	270	30
.69	285	25
.65	300	20
.62	315	15
.59	330	10
.56	340	5
.54	355	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (Refer to Military Thrust climb chart for detailed information.)
3. Cruise at recommended Mach number.
4. No allowance or reserve for loiter, descent, or landing.
5. For cruise-climb procedure, use Maximum Continuous Thrust and maintain a constant Mach number.

LEGEND:

— — — — Fuel consumed

●····●····● Time (start, taxi, and take-off not included)

——— Maximum Continuous Thrust cruise-climb path

CRUISE—ONE SPECIAL STORE PLUS TWO 200-GALLON DROP TANKS PLUS ONE 120-GALLON DROP TANK

ALTITUDE FEET	TRUE MACH NO.	APPROXIMATE CAS	TAS	LB/HR	% RPM
CRUISE-CLIMB*	.81	-	465	2250-1800	96
40,000	.81	245	465	2250-1900	94-90
35,000	.75	255	430	2250-1950	90-86
30,000	.68	255	400	2200-1950	87-84
25,000	.63	260	380	2300-2000	86-82
20,000	.59	270	360	2400-2200	85-81
15,000	.56	280	345	2600-2400	84-80
10,000	.52	290	330	2800-2600	83-80
5000	.49	295	320	3000-2850	83-80
SEA LEVEL	.46	305	305	3200-3050	82-80

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-202C

Figure A-48

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

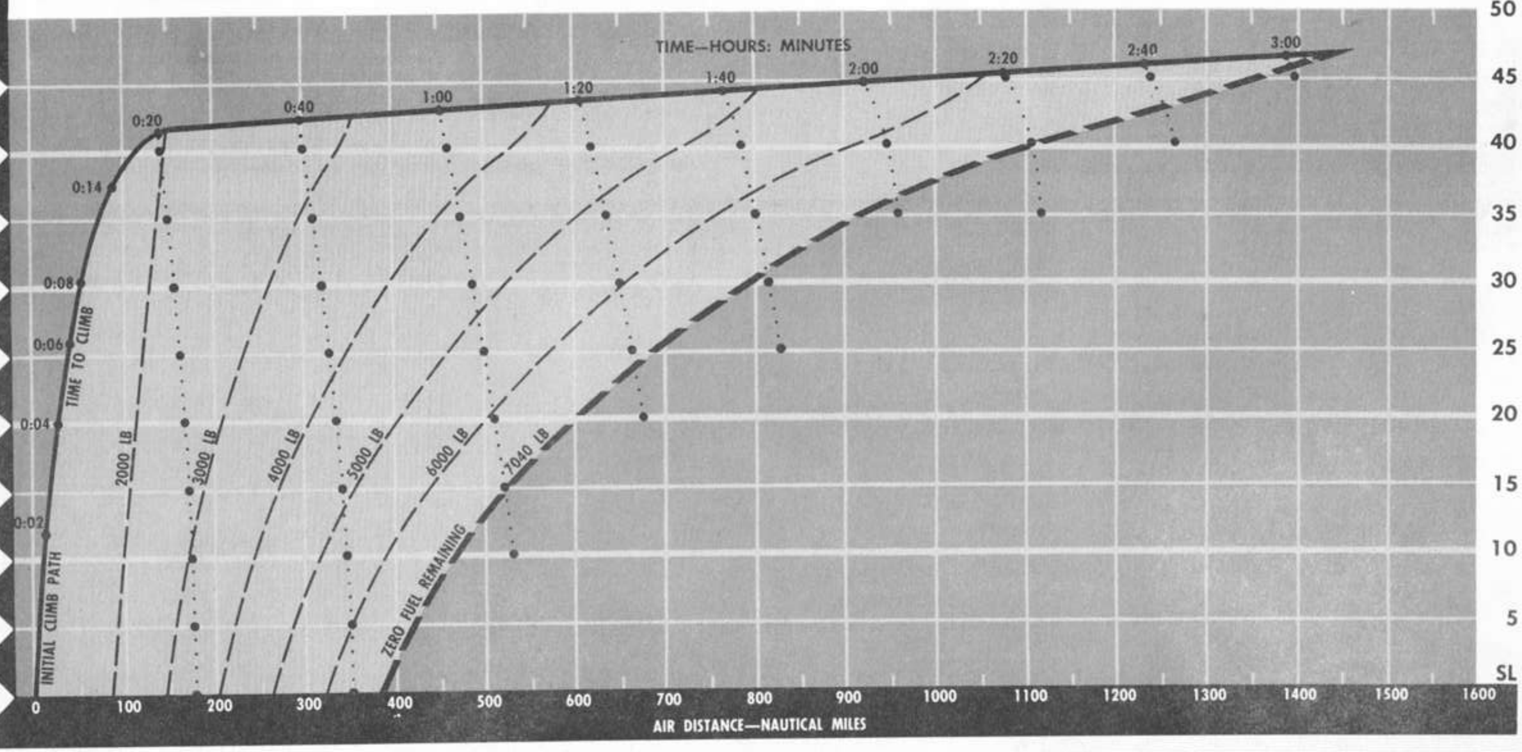
HIGH SPEED PROFILE

ONE SPECIAL STORE plus TWO 200-GALLON DROP TANKS plus ONE 120-GALLON DROP TANK

TAKE-OFF GROSS WEIGHT: 24,130 LB

Data as of: 1 April 1956.
Based on FLIGHT TEST

MILITARY THRUST CLIMB TRUE MACH NO.	CAS	ALT 1000 FT
.80	215	45
.78	235	40
.76	255	35
.72	270	30
.69	285	25
.65	300	20
.62	315	15
.59	330	10
.56	340	5
.54	355	SL



REMARKS

1. 600-pound fuel allowance for start, taxi, take-off, and acceleration to climb schedule included.
2. Use Military Thrust for climb. (See Military Thrust climb chart for detailed information.)
3. Cruise at Maximum Continuous Thrust (96% rpm).
4. No allowance or reserve for loiter, descent, or landing.

LEGEND:

- — — — — Fuel consumed
- • · · · • · · · • Time (start, taxi, and take-off not included)
- ——— Maximum Continuous Thrust cruise-climb path

CRUISE—ONE SPECIAL STORE PLUS TWO 200-GALLON DROP TANKS PLUS ONE 120-GALLON DROP TANK

ALTITUDE FEET	% RPM	APPROXIMATE TRUE MACH NO.	CAS	TAS	LB/HR
CRUISE-CLIMB*	96	.81	-	465	2250-1800
40,000	↓	83-84	255	475-485	2500
35,000		.84-.85	285-290	485-490	3200
30,000		.84-.85	320-325	495-500	3800
25,000		.84	355	505	4500
20,000		.84	395	515	5250
15,000		.83	425	520	6000
10,000		.82	460	520	6800
5000		.80	490	520	7650
SEA LEVEL		.79	520	520	8500

*MAXIMUM CONTINUOUS THRUST

F-86H-1-93-203C

Figure A-49

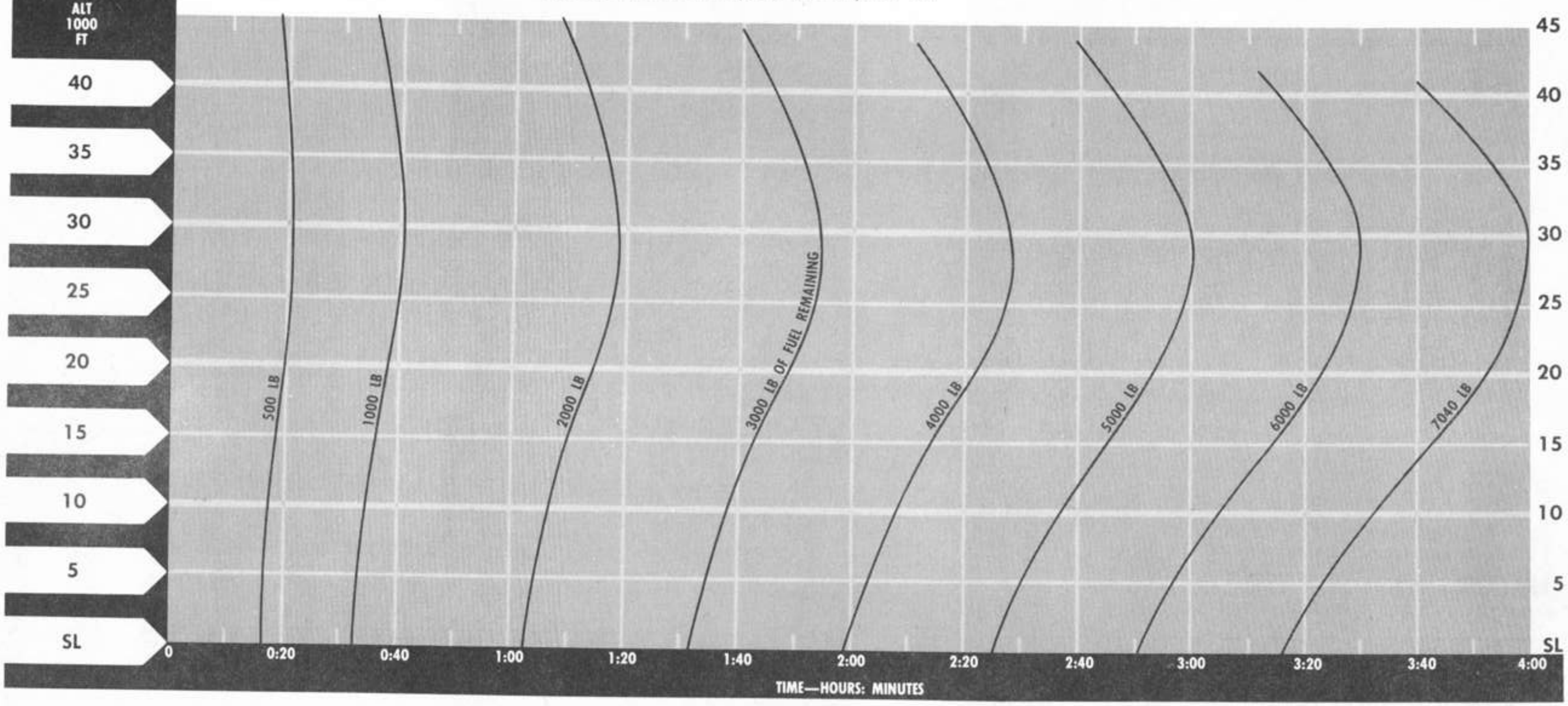
MAXIMUM ENDURANCE PROFILE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of 1 April 1956.
Based on FLIGHT TEST

ONE SPECIAL STORE plus TWO 200-GALLON DROP TANKS plus ONE 120-GALLON DROP TANK

GROSS WEIGHT: 17,090 LB—24,130 LB



REMARKS
1. Loiter at recommended CAS.
2. Maintain constant altitude.

LOITER	LESS THAN 3500 LB FUEL REMAINING					MORE THAN 3500 LB FUEL REMAINING				
		APPROXIMATE					APPROXIMATE			
ALTITUDE FEET	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM	CAS	TRUE MACH NO.	TAS	LB/HR	% RPM
45,000	195	.73	420	1800-1700	96-94	-	-	-	-	-
40,000	205	.69	395	1950-1600	92-88	205	.69	400	2250-1950	96-92
35,000	190	.58	335	1850-1500	86-83	210	.64	365	2200-1850	88-86
30,000	190	.52	305	1800-1450	82-80	210	.57	335	2150-1800	87-82
25,000	190	.46	275	1800-1450	81-78	210	.51	305	2150-1800	84-78
20,000	190	.42	255	1850-1500	79-77	205	.45	275	2150-1850	82-79
15,000	185	.37	230	1900-1550	78-76	195	.39	245	2200-1900	81-78
10,000	180	.33	205	1950-1600	78-76	195	.35	225	2250-1950	79-78
5,000	170	.28	185	2050-1700	77-75	190	.32	205	2350-2050	79-77
SEA LEVEL	160	.24	160	2200-1800	76-75	190	.29	190	2500-2200	78-76

F-86H-1-93-204B

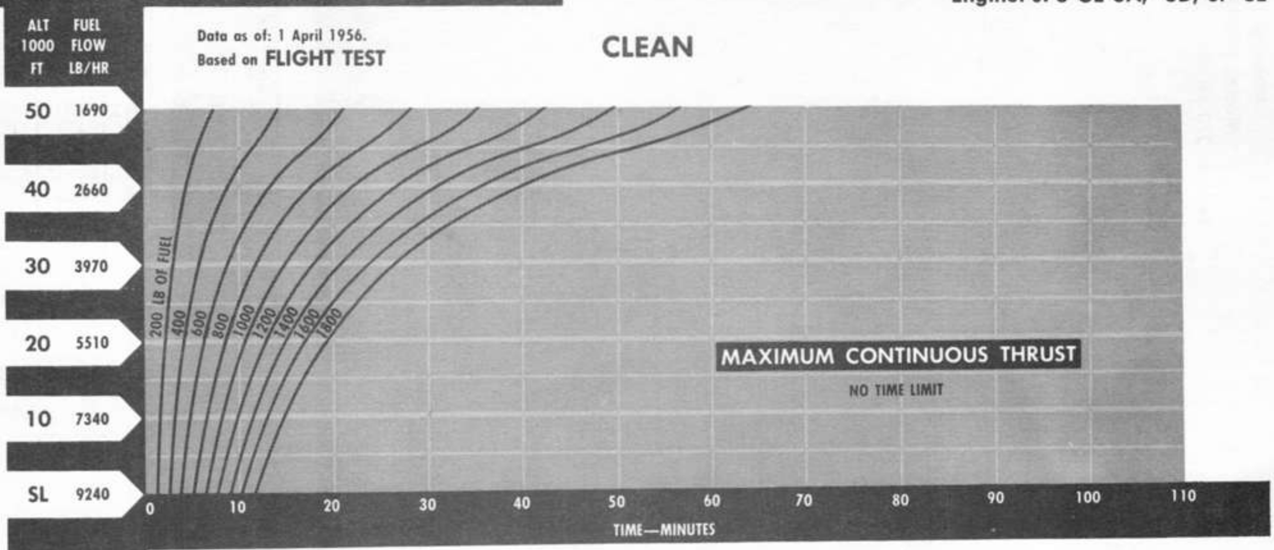
Figure A-50

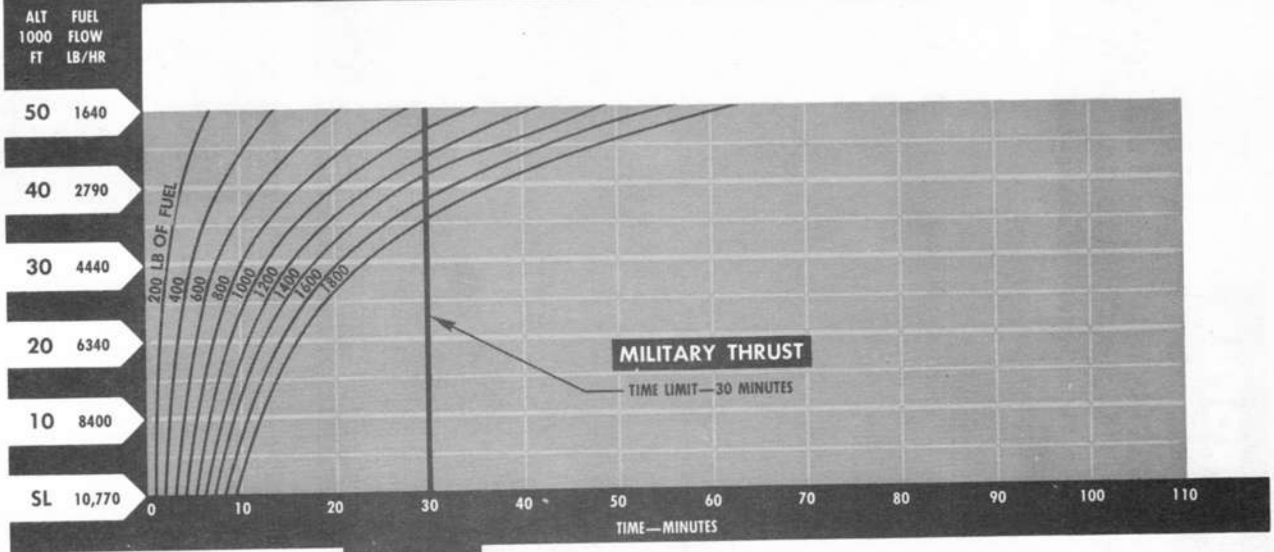
COMBAT ALLOWANCE

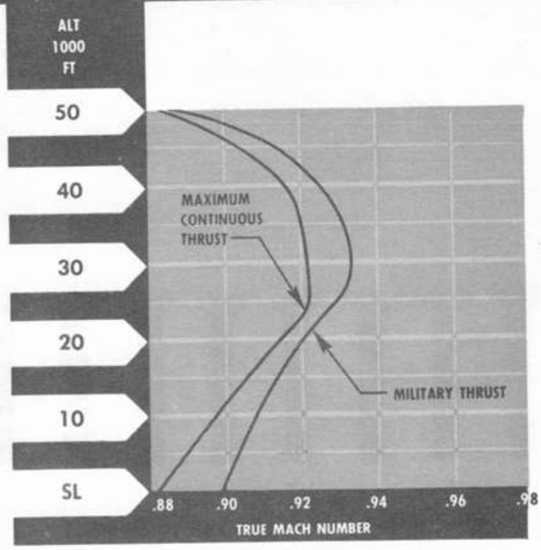
STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

CLEAN







F-86H-1-93-205B

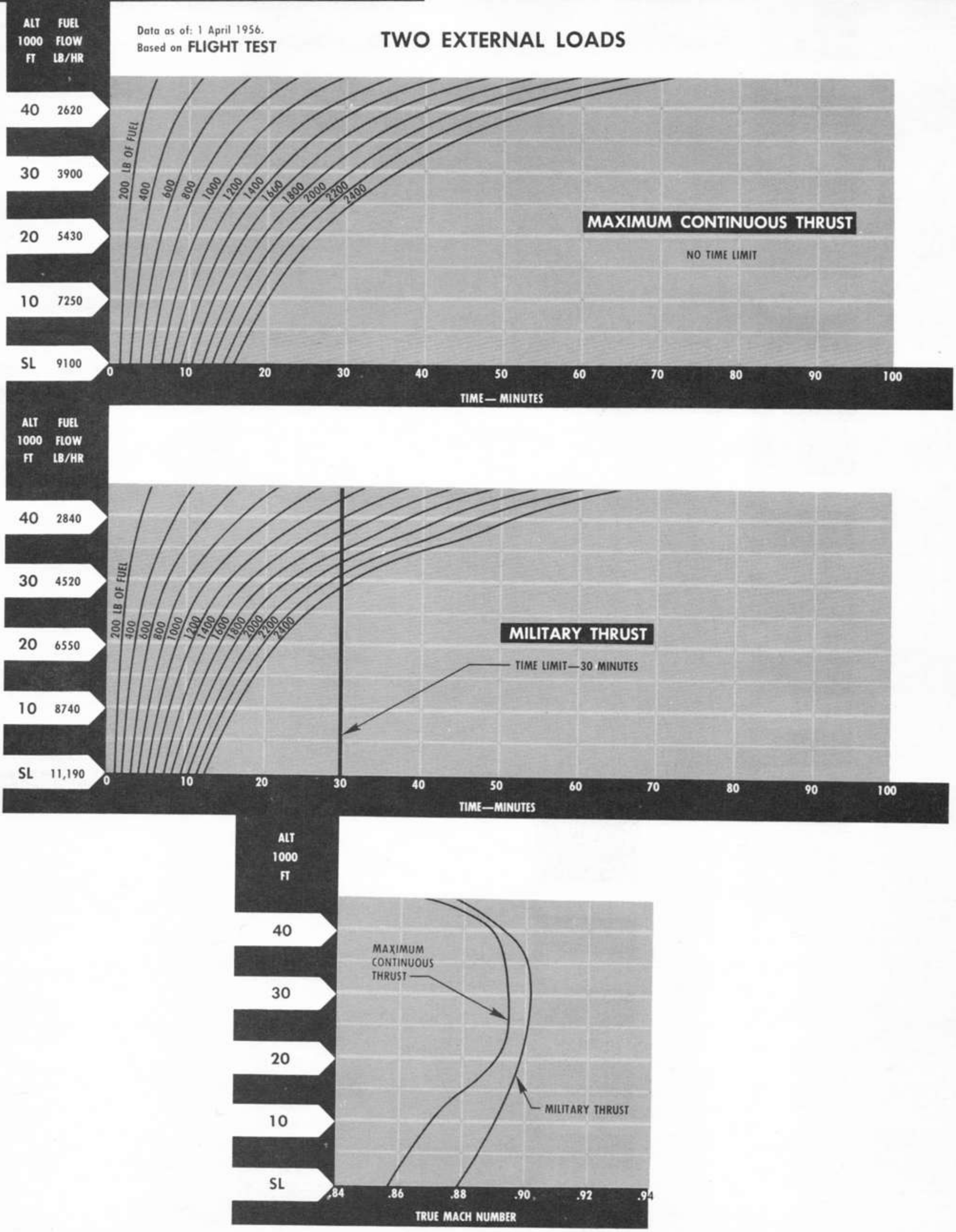
Figure A-51

COMBAT ALLOWANCE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

TWO EXTERNAL LOADS



F-86H-1-93-206B

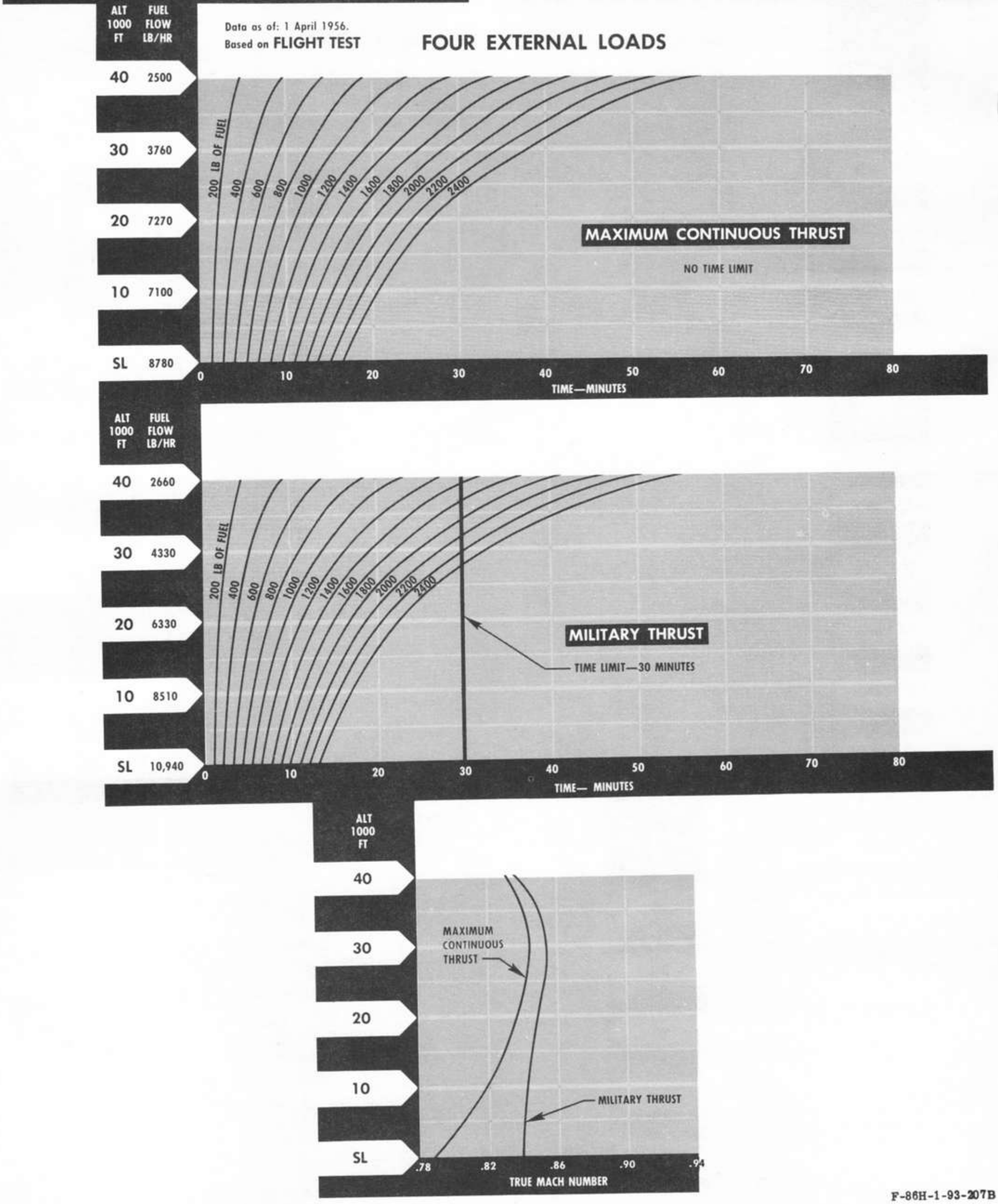
Figure A-52

COMBAT ALLOWANCE

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

FOUR EXTERNAL LOADS



F-86H-1-93-207B

Figure A-53

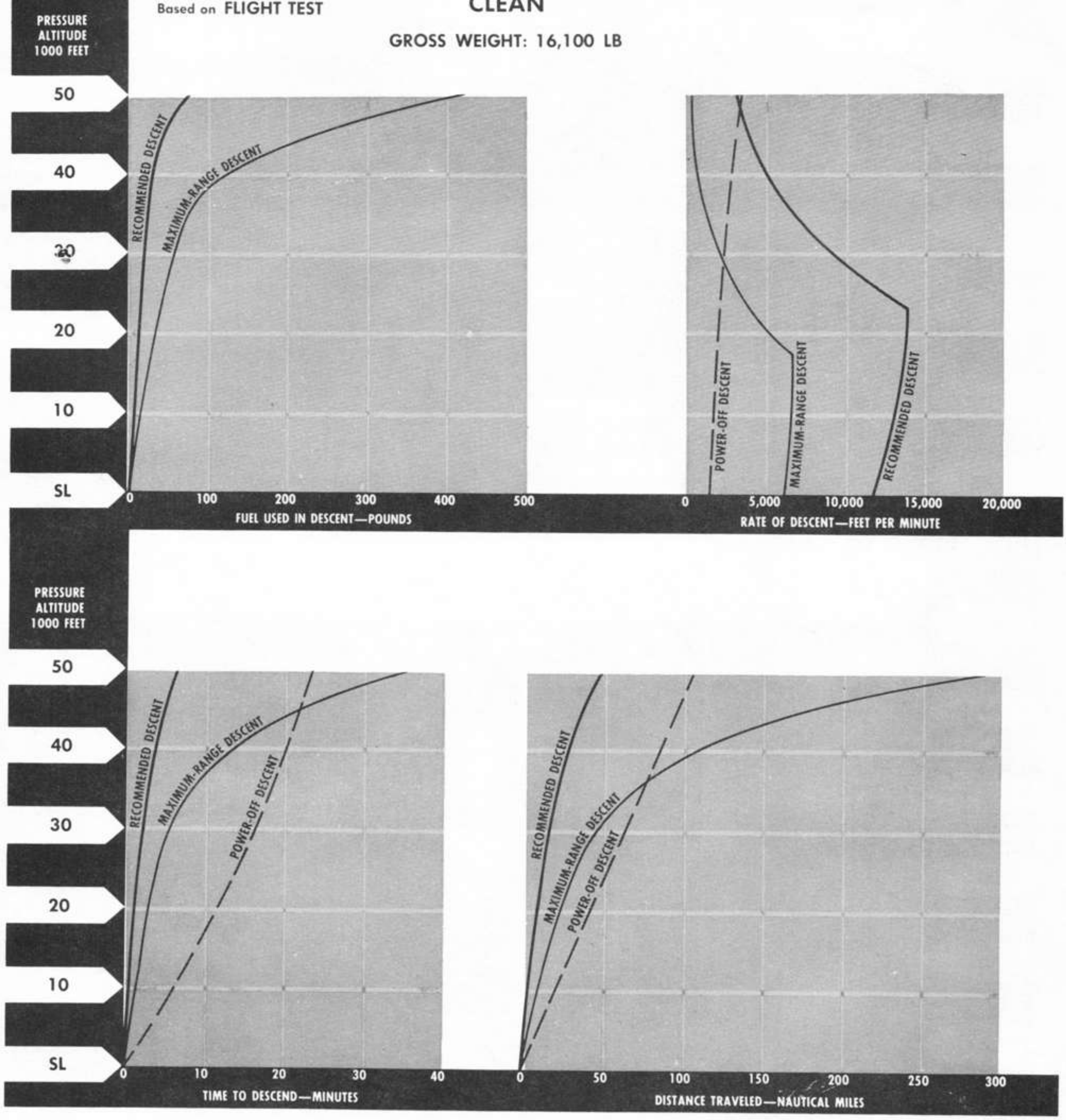
DESCENTS

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

CLEAN

GROSS WEIGHT: 16,100 LB



REMARKS

1. Recommended descent—Use idle power, speed brakes open.
   Descend at .80 true Mach number or 350 knots CAS, whichever is less.
2. Maximum-range descent—Use idle power, speed brakes closed.
   Descend at .80 true Mach number or 400 knots CAS, whichever is less.
3. Power-off descent—Speed brakes closed.
   Descend at 200 knots CAS.

F-86H-1-93-208A

Figure A-54

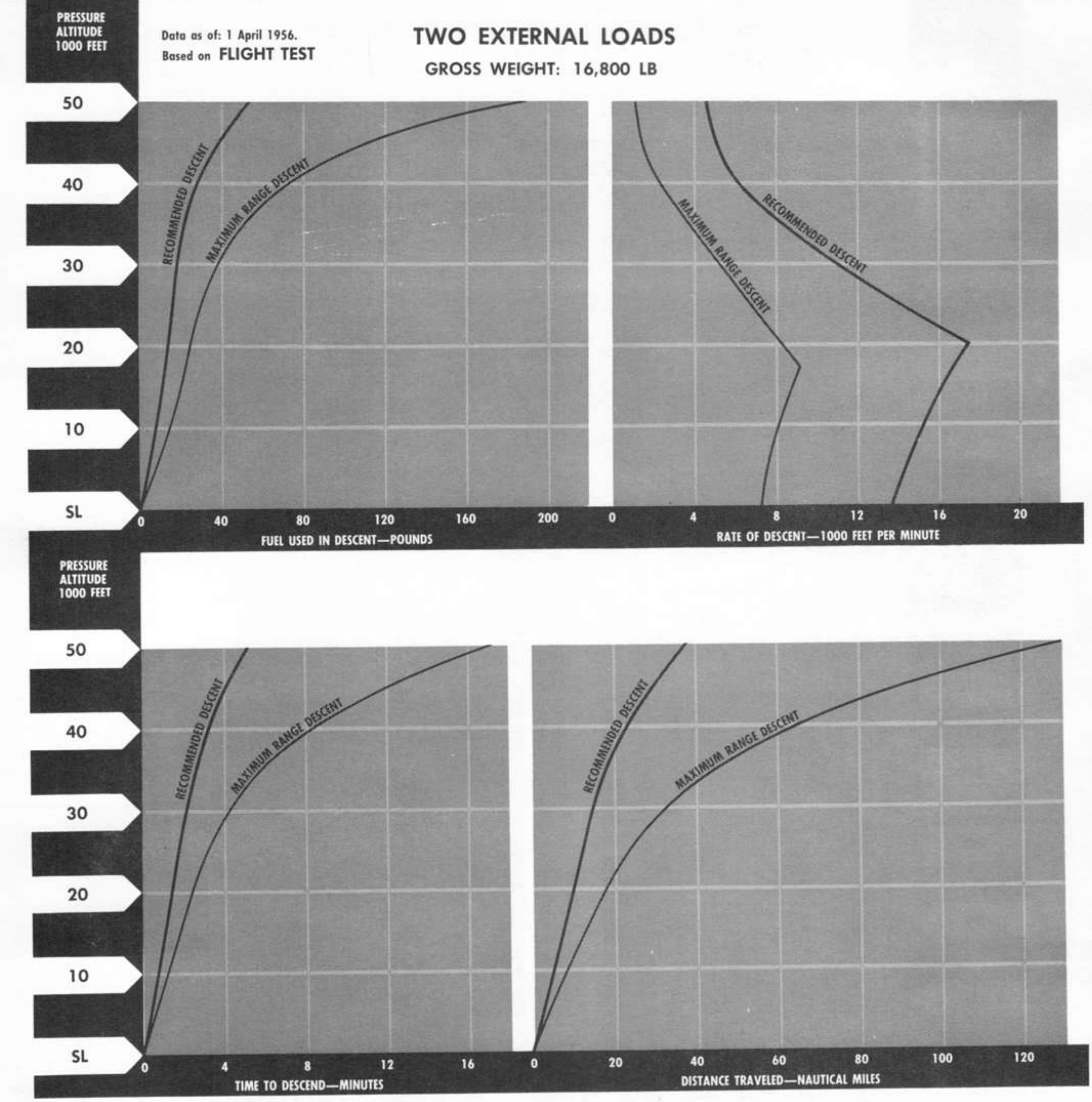
DESCENTS

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

Data as of: 1 April 1956.
Based on FLIGHT TEST

TWO EXTERNAL LOADS

GROSS WEIGHT: 16,800 LB



REMARKS

1. Recommended descent— Use idle thrust, speed brake open. Descend at .80 true Mach number or 350 knots CAS, whichever is less.
2. Maximum range descent—Use idle thrust, speed brakes closed. Descend at .80 true Mach number or 400 knots CAS, whichever is less.

F-86H-1-93-209A

Figure A-55

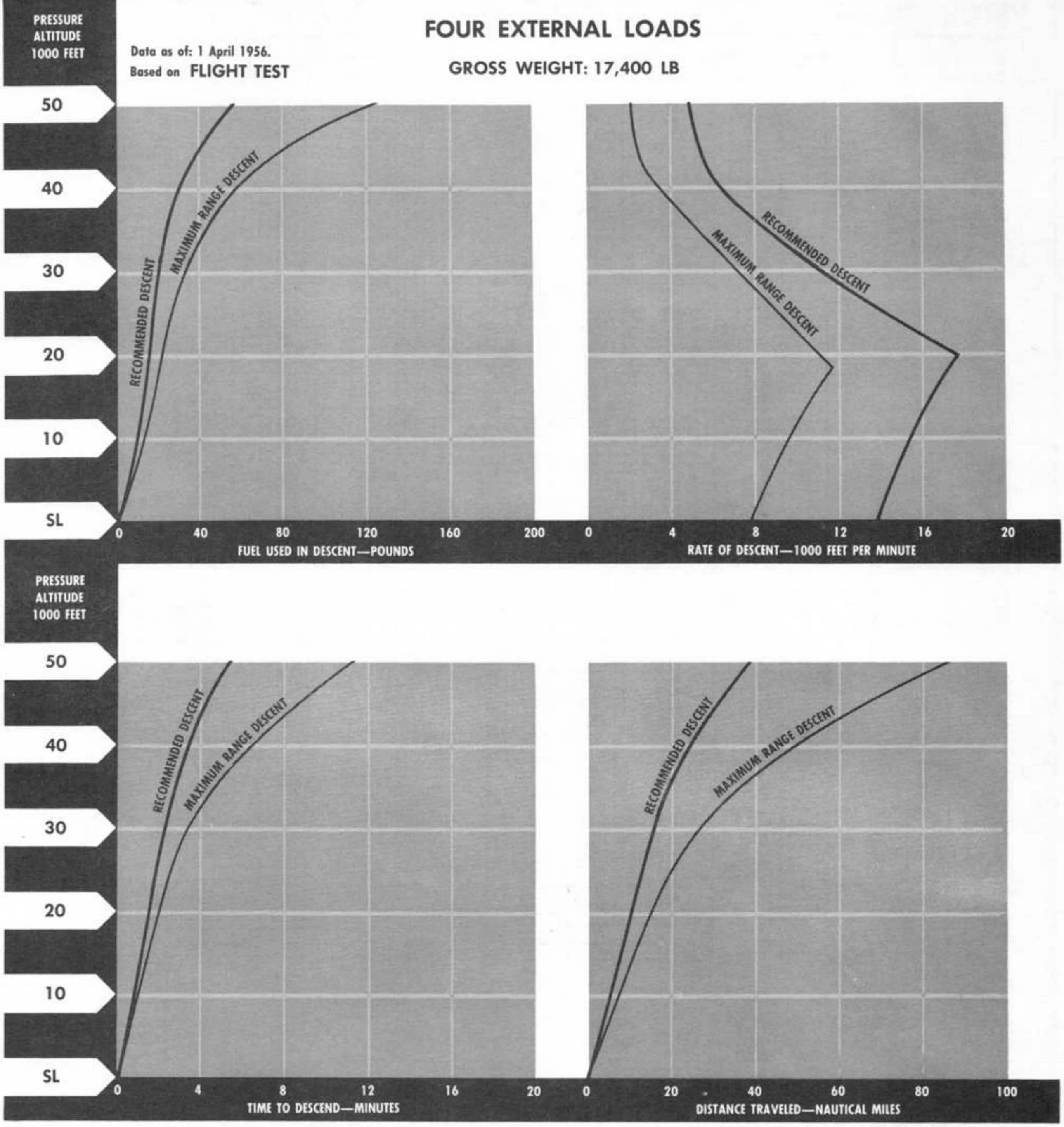
DESCENTS

STANDARD DAY
Model: F-86H
Engine: J73-GE-3A, -3D, or -3E

FOUR EXTERNAL LOADS

GROSS WEIGHT: 17,400 LB

Data as of: 1 April 1956.
Based on FLIGHT TEST



REMARKS

1. Recommended descent— Use idle thrust, speed brake open. Descend at .80 true Mach number or 350 knots CAS, whichever is less.
2. Maximum range descent—Use idle thrust, speed brakes closed. Descend at .80 true Mach number or 400 knots CAS, whichever is less.

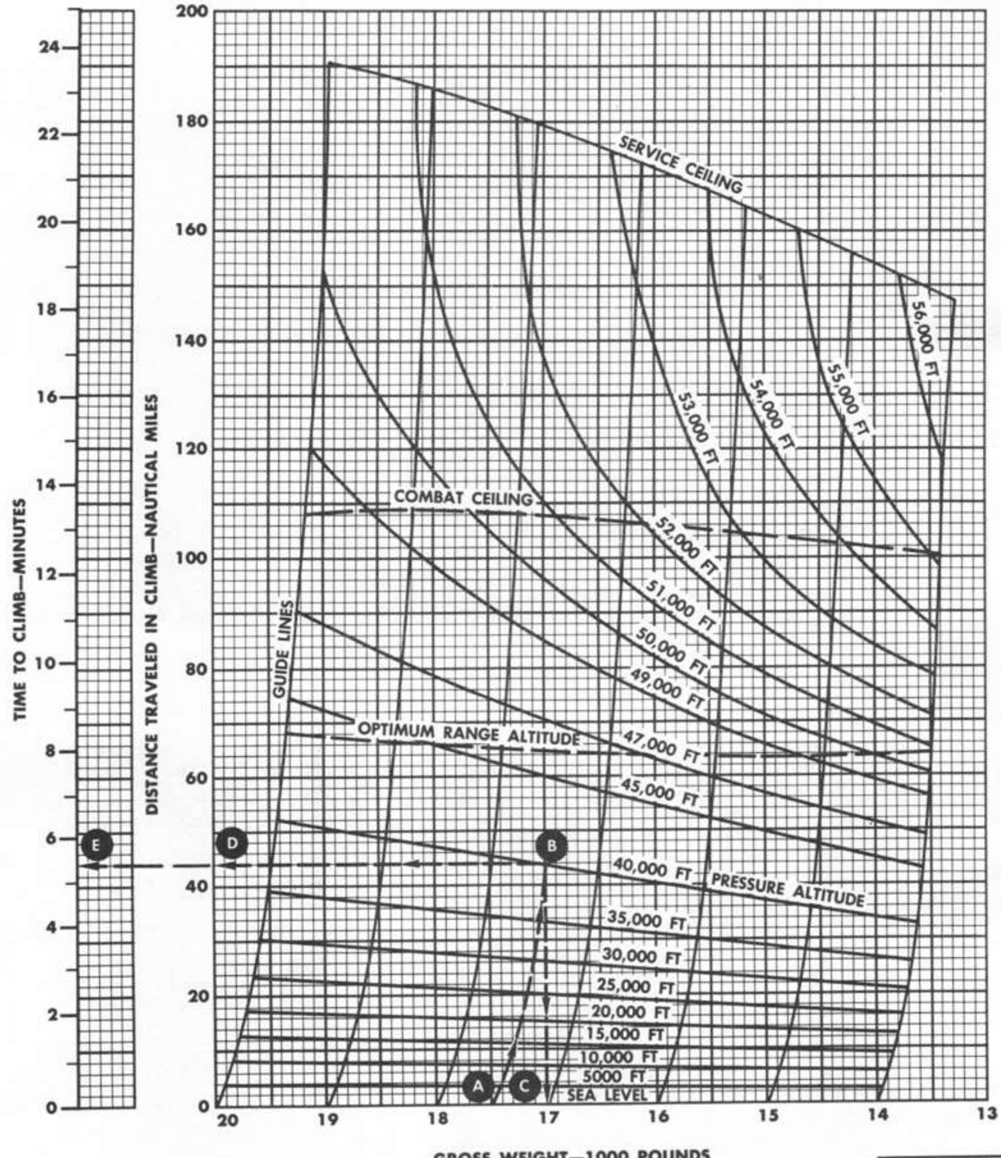
F-86H-1-93-210A

Figure A-56

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

MILITARY THRUST CLIMB
CLEAN

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



EXAMPLE

- **A** is initial gross weight (17,500 pounds).
- **B** is final altitude (40,000 feet).
- **C** is final gross weight (17,000 pounds).
- **A** minus **C** is fuel used in climb (500 pounds).
- **D** is distance traveled in climb (44 nautical miles).
- **E** is time to climb (5.4 minutes).

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

CLIMB SPEEDS

ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
60,000	.84	160
55,000	.84	180
50,000	.84	200
45,000	.84	225
40,000	.84	255
35,000	.83	285
30,000	.83	315
25,000	.82	350
20,000	.82	380
15,000	.81	415
10,000	.81	450
5000	.80	490
SL	.80	525

F-86H-1-93-213A

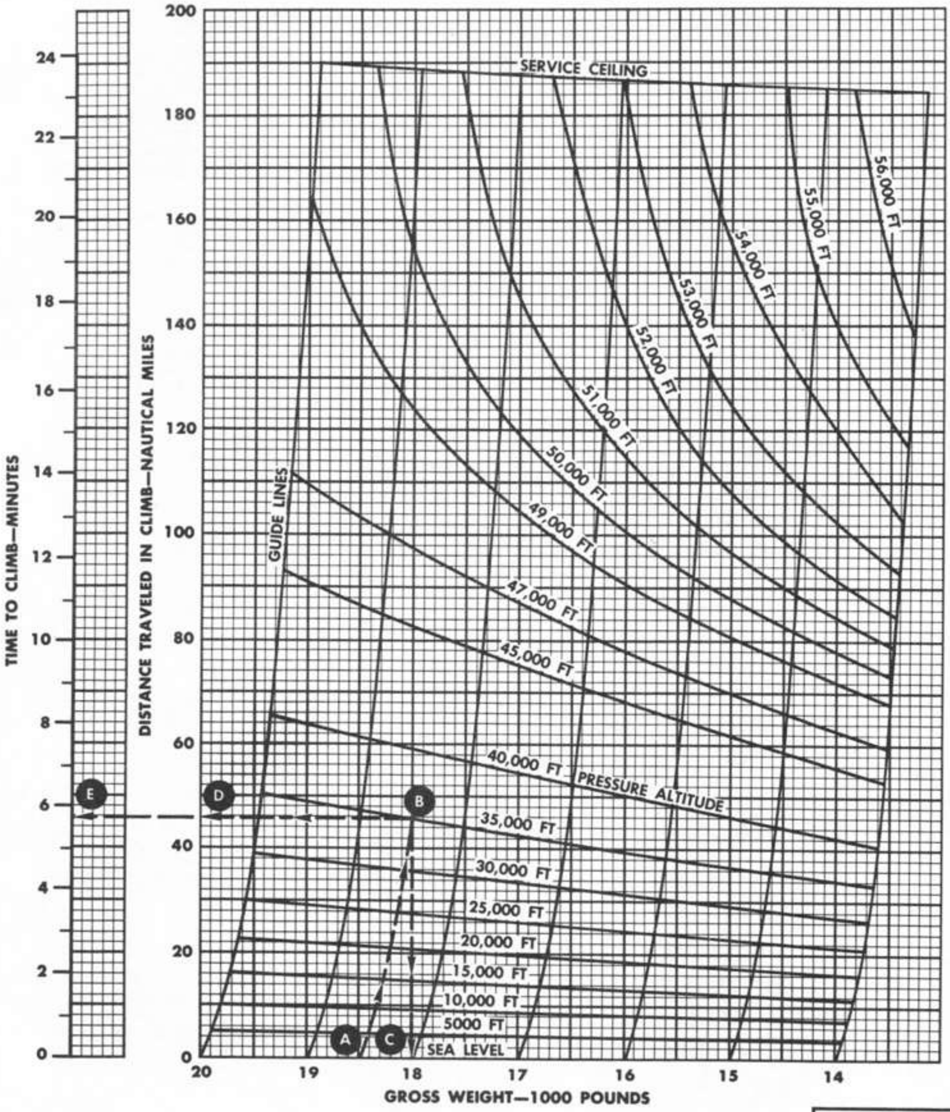
Figure A-57

MAXIMUM CONTINUOUS THRUST CLIMB

CLEAN

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



EXAMPLE

- A is initial gross weight (18,500 pounds).
- B is final altitude (35,000 feet).
- C is final gross weight (18,000 pounds).
- A minus C is fuel used in climb (500 pounds).
- D is distance traveled in climb (46 nautical miles).
- E is time to climb (5.8 minutes).

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

CLIMB SPEEDS

ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
60,000	.84	160
55,000	.84	180
50,000	.84	200
45,000	.84	225
40,000	.84	255
35,000	.83	285
30,000	.82	310
25,000	.80	340
20,000	.78	365
15,000	.77	390
10,000	.75	420
5000	.74	450
SL	.73	480

F-86H-1-93-214A

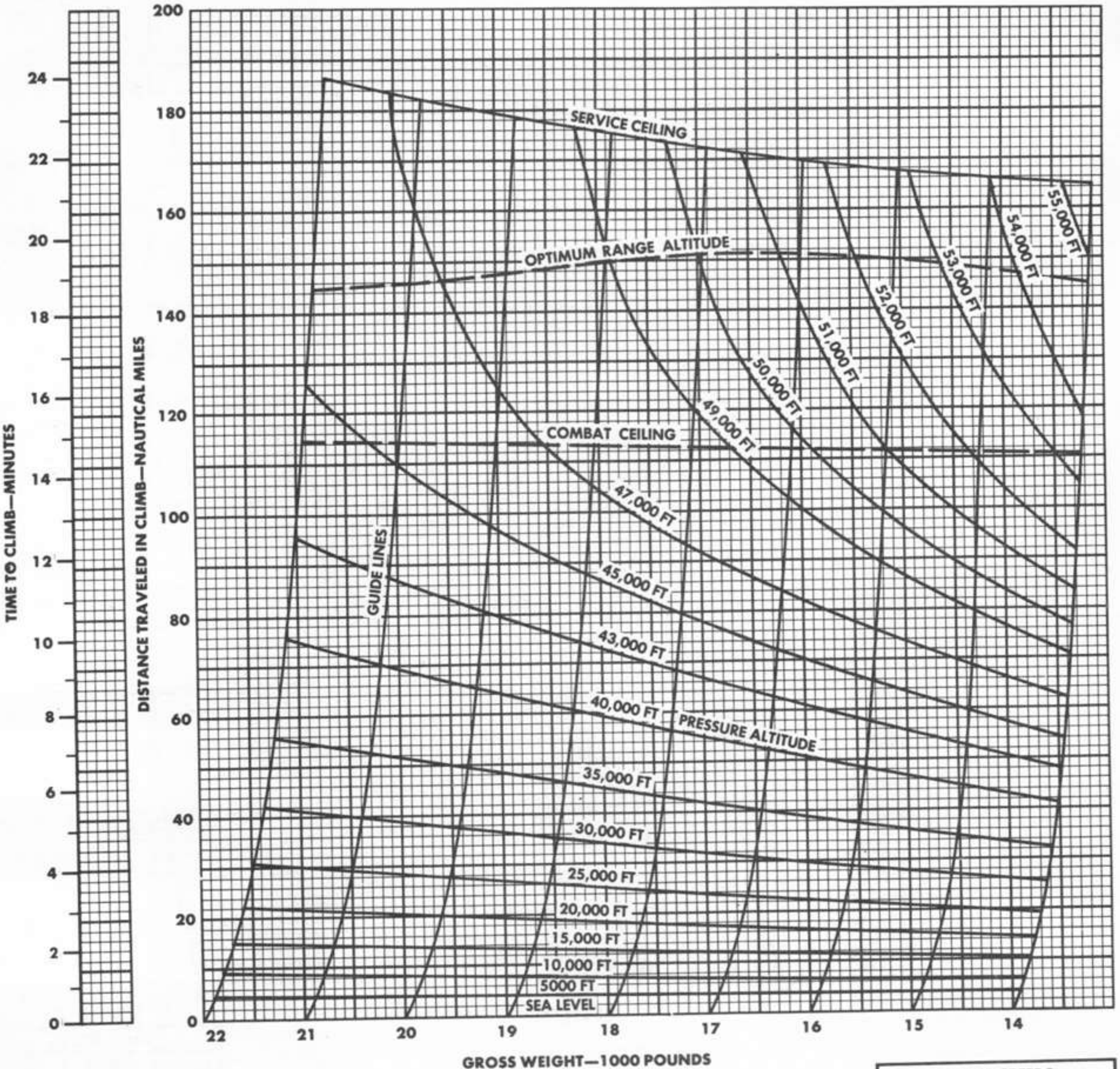
Figure A-58

MILITARY THRUST CLIMB

TWO 200-GALLON DROP TANKS

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from the time best climb speed is attained.

CLIMB SPEEDS

ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
55,000	.82	175
50,000	.82	195
45,000	.82	220
40,000	.82	245
35,000	.81	275
30,000	.78	295
25,000	.75	315
20,000	.72	335
15,000	.69	350
10,000	.67	370
5000	.64	390
SL	.62	405

F-86H-1-93-215A

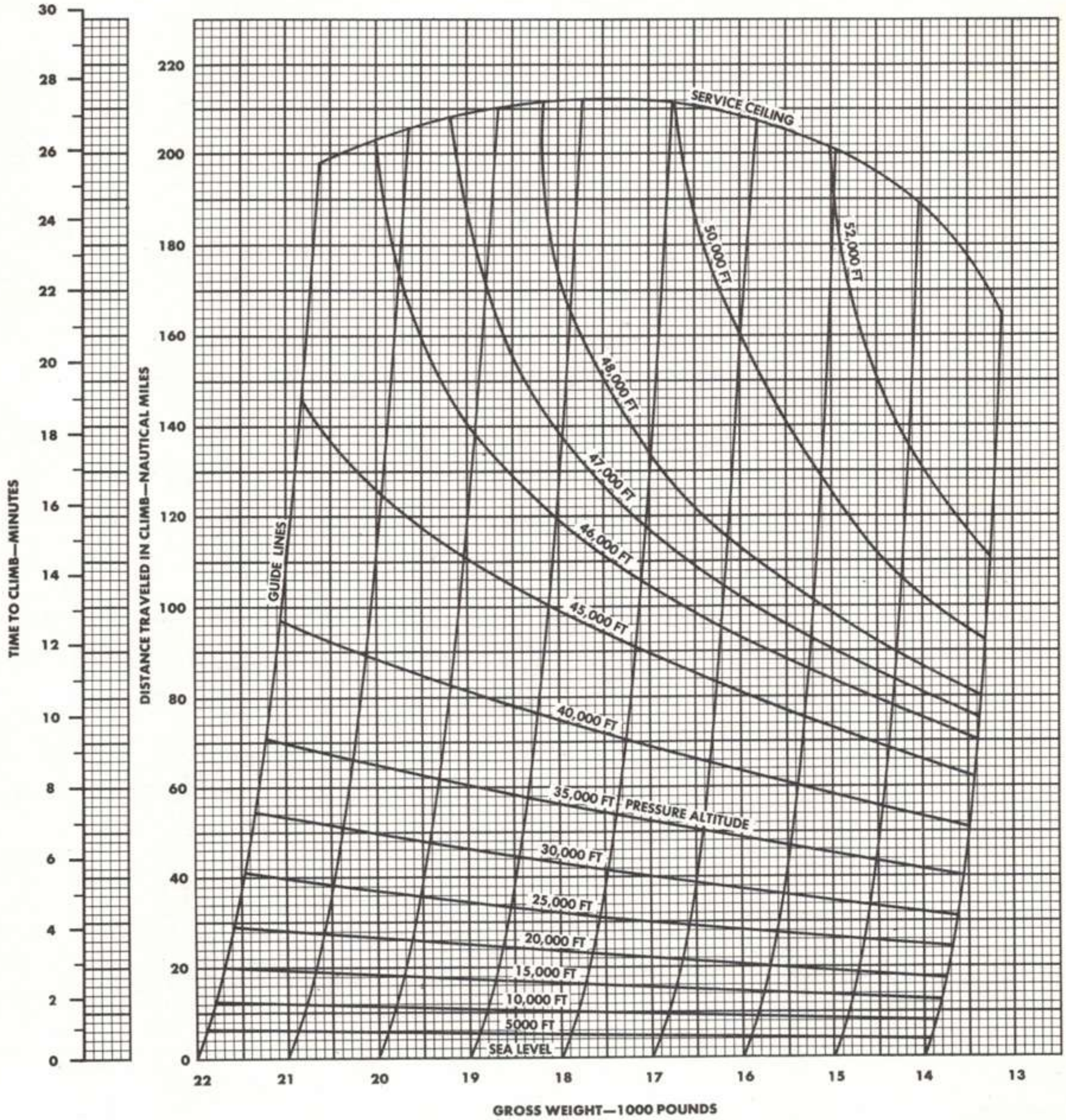
Figure A-59

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST

MAXIMUM CONTINUOUS THRUST CLIMB

TWO 200-GALLON DROP TANKS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from the time best climb speed is attained.

CLIMB SPEEDS		
ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
50,000	.82	200
45,000	.82	220
40,000	.82	245
35,000	.82	275
30,000	.78	295
25,000	.75	315
20,000	.72	335
15,000	.70	350
10,000	.67	370
5000	.64	390
SL	.62	405

F-86H-1-93-216A

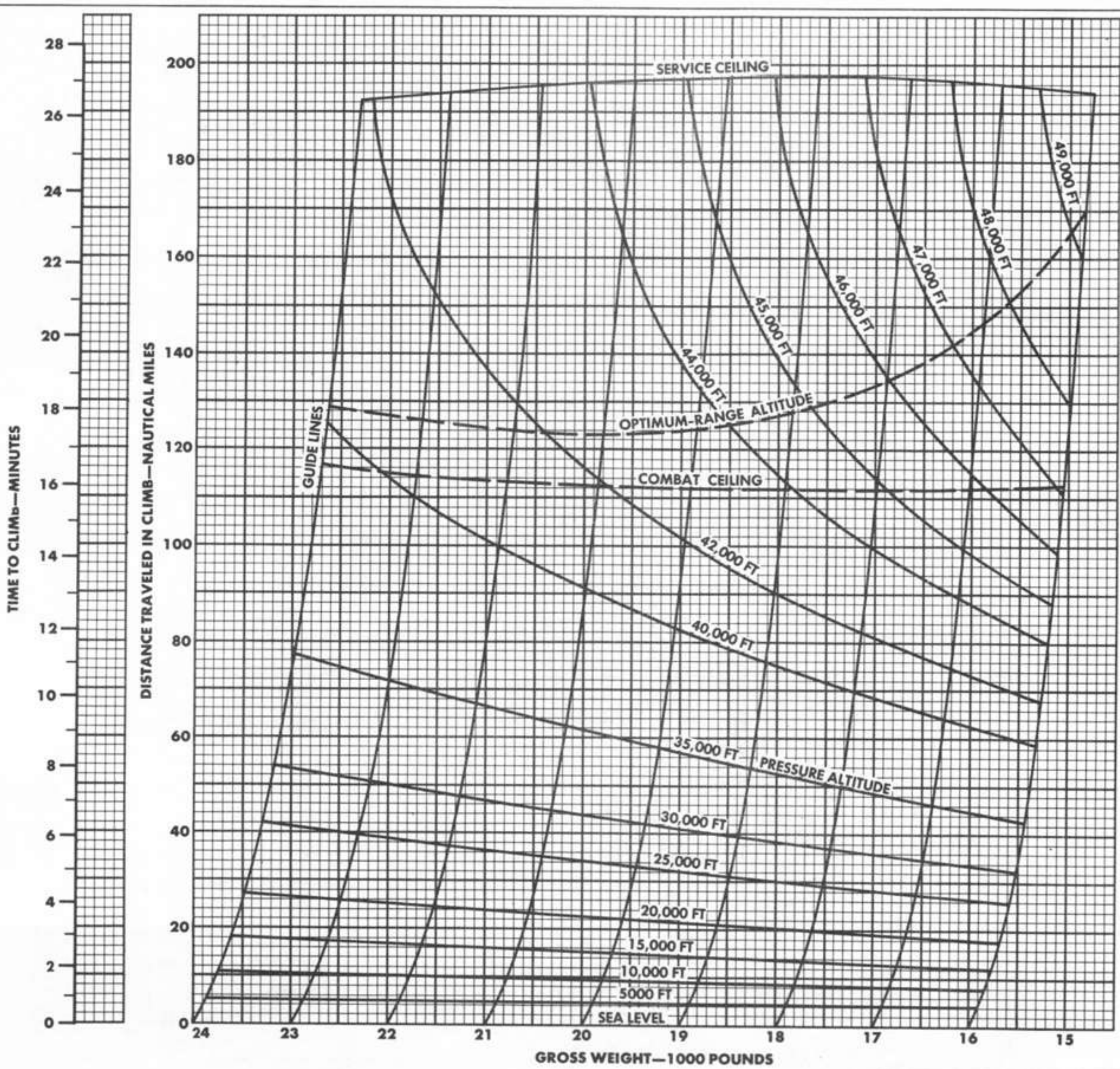
Figure A-60

MILITARY THRUST CLIMB

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

TWO 200-GALLON DROP TANKS plus
TWO 120-GALLON DROP TANKS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from the time best climb speed is attained.

CLIMB SPEEDS		
ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
50,000	.82	195
45,000	.80	215
40,000	.78	235
35,000	.76	255
30,000	.72	270
25,000	.69	285
20,000	.65	300
15,000	.62	315
10,000	.59	330
5000	.56	340
SL	.54	355

F-86H-1-93-217B

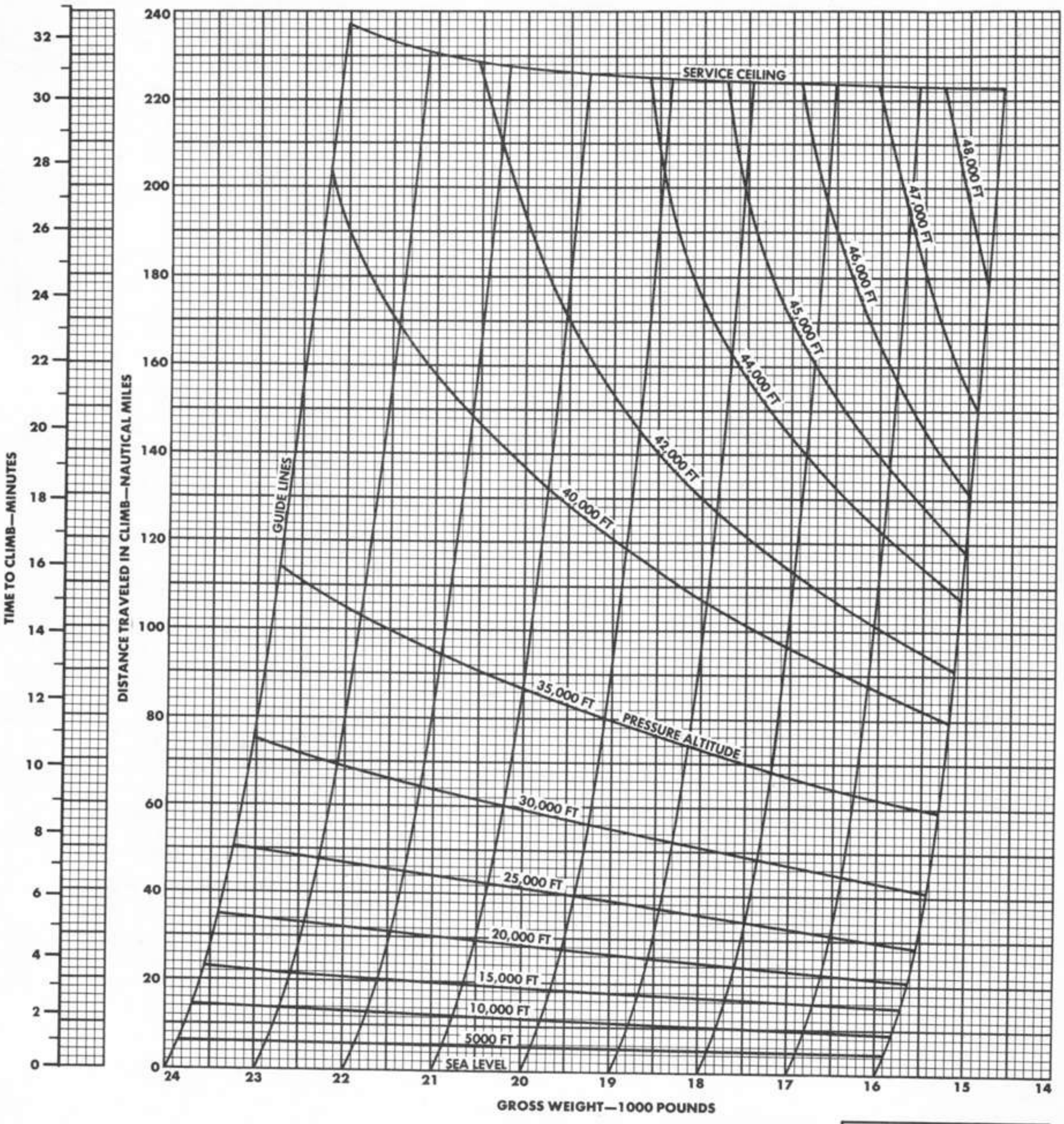
Figure A-61

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST

MAXIMUM CONTINUOUS THRUST CLIMB

TWO 200-GALLON DROP TANKS plus TWO 120-GALLON DROP TANKS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from the time best climb speed is attained.

CLIMB SPEEDS		
ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
50,000	.80	190
45,000	.80	215
40,000	.80	240
35,000	.80	270
30,000	.75	285
25,000	.70	295
20,000	.66	305
15,000	.62	310
10,000	.58	315
5000	.54	325
SL	.50	330

F-86H-1-93-218A

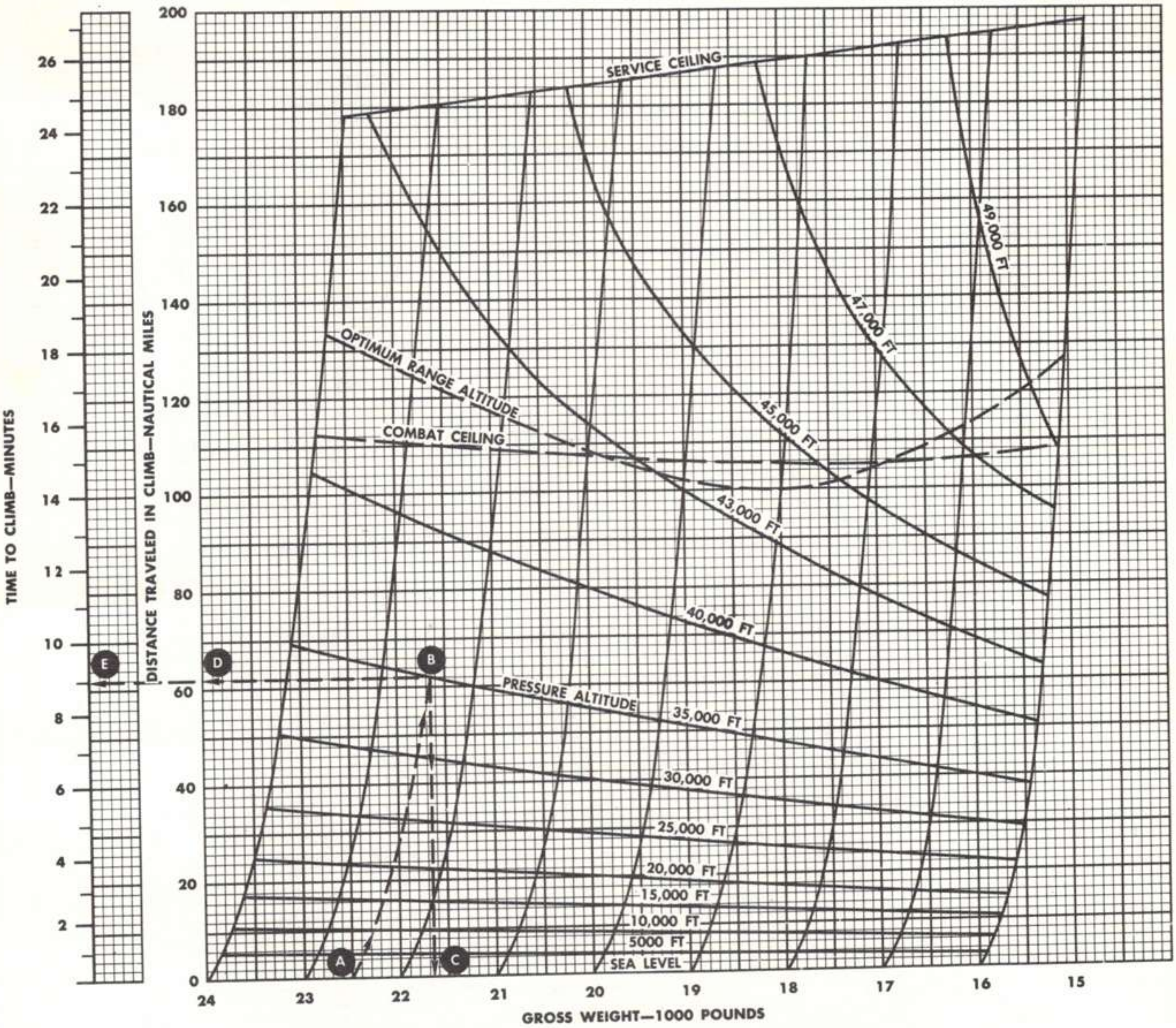
Figure A-62

MILITARY THRUST CLIMB

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

TWO 200-GALLON DROP TANKS
PLUS TWO 750-POUND NAPALMS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



EXAMPLE:

- (A) is initial gross weight (22,500 pounds).
- (B) is final altitude (35,000 feet).
- (C) is final gross weight (21,650 pounds).
- (A) minus (C) is fuel used in climb (850 pounds).
- (D) is distance traveled in climb (62 nautical miles).
- (E) is time to climb (8.9 minutes).

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

CLIMB SPEEDS		
ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
50,000	.82	195
45,000	.80	215
40,000	.78	235
35,000	.76	255
30,000	.72	270
25,000	.69	285
20,000	.65	300
15,000	.62	315
10,000	.59	330
5000	.56	340
SL	.54	355

F-86H-1-93-219A

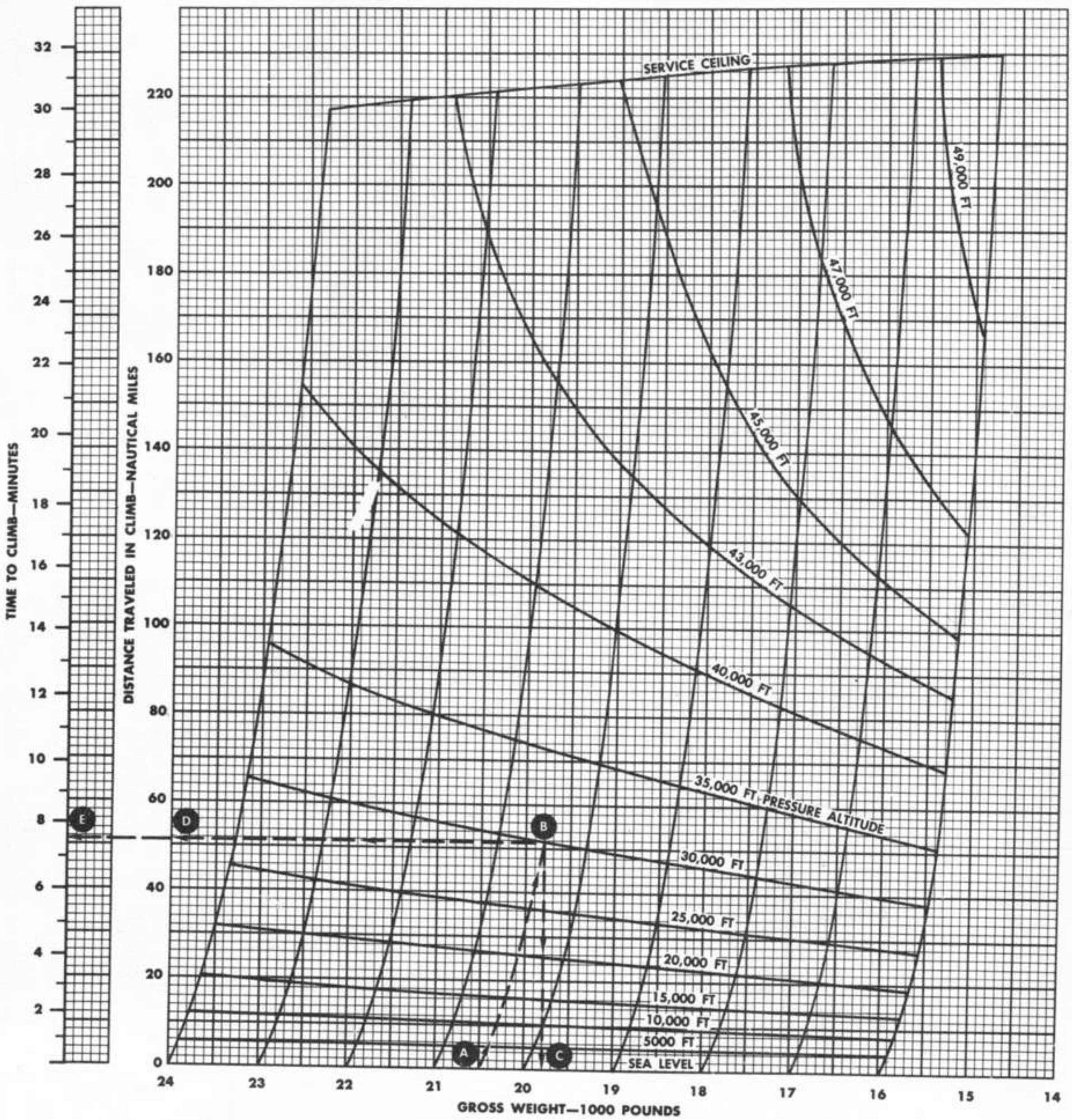
Figure A-63

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

MAXIMUM CONTINUOUS THRUST CLIMB

TWO 200-GALLON DROP TANKS PLUS TWO 750-POUND NAPALMS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



EXAMPLE:

- (A) is initial gross weight (20,500 pounds).
- (B) is final altitude (30,000 feet).
- (C) is final gross weight (19,800 pounds).
- (A) minus (C) is fuel used in climb (700 pounds).
- (D) is distance traveled in climb (52 nautical miles).
- (E) is time to climb (7.6 minutes).

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

CLIMB SPEEDS		
ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
50,000	.80	190
45,000	.80	215
40,000	.80	240
35,000	.80	270
30,000	.75	285
25,000	.70	295
20,000	.66	305
15,000	.62	310
10,000	.58	315
5000	.54	325
SL	.50	330

F-86H-1-93-220A

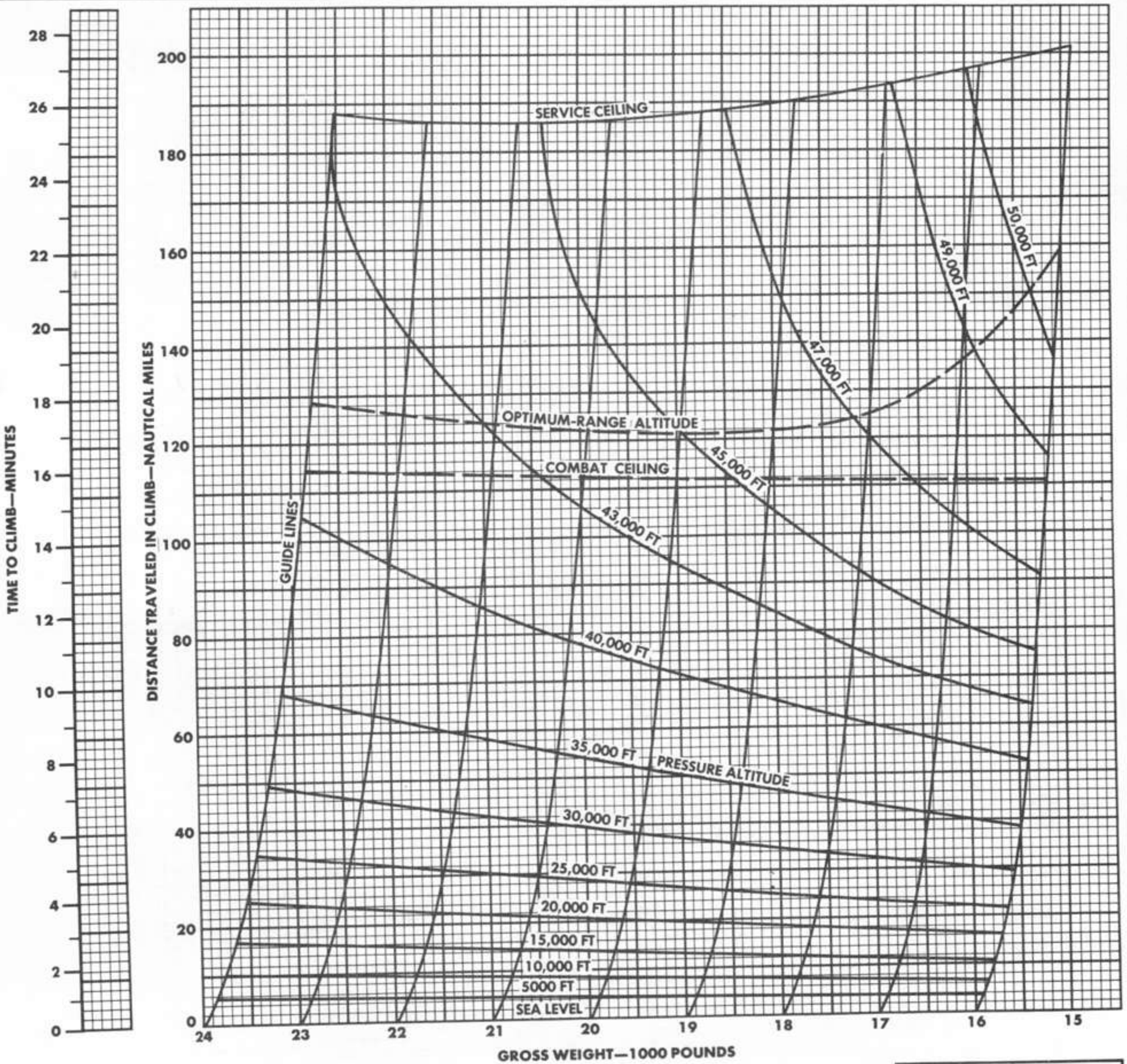
Figure A-64

MILITARY THRUST CLIMB

TWO 200-GALLON DROP TANKS
plus TWO EX-10 BOMBS

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



CLIMB SPEEDS		
ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
50,000	.82	195
45,000	.80	215
40,000	.78	235
35,000	.76	255
30,000	.72	270
25,000	.69	285
20,000	.65	300
15,000	.62	315
10,000	.59	330
5000	.56	340
SL	.54	355

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from the time best climb speed is attained.

F-86H-1-93-221A

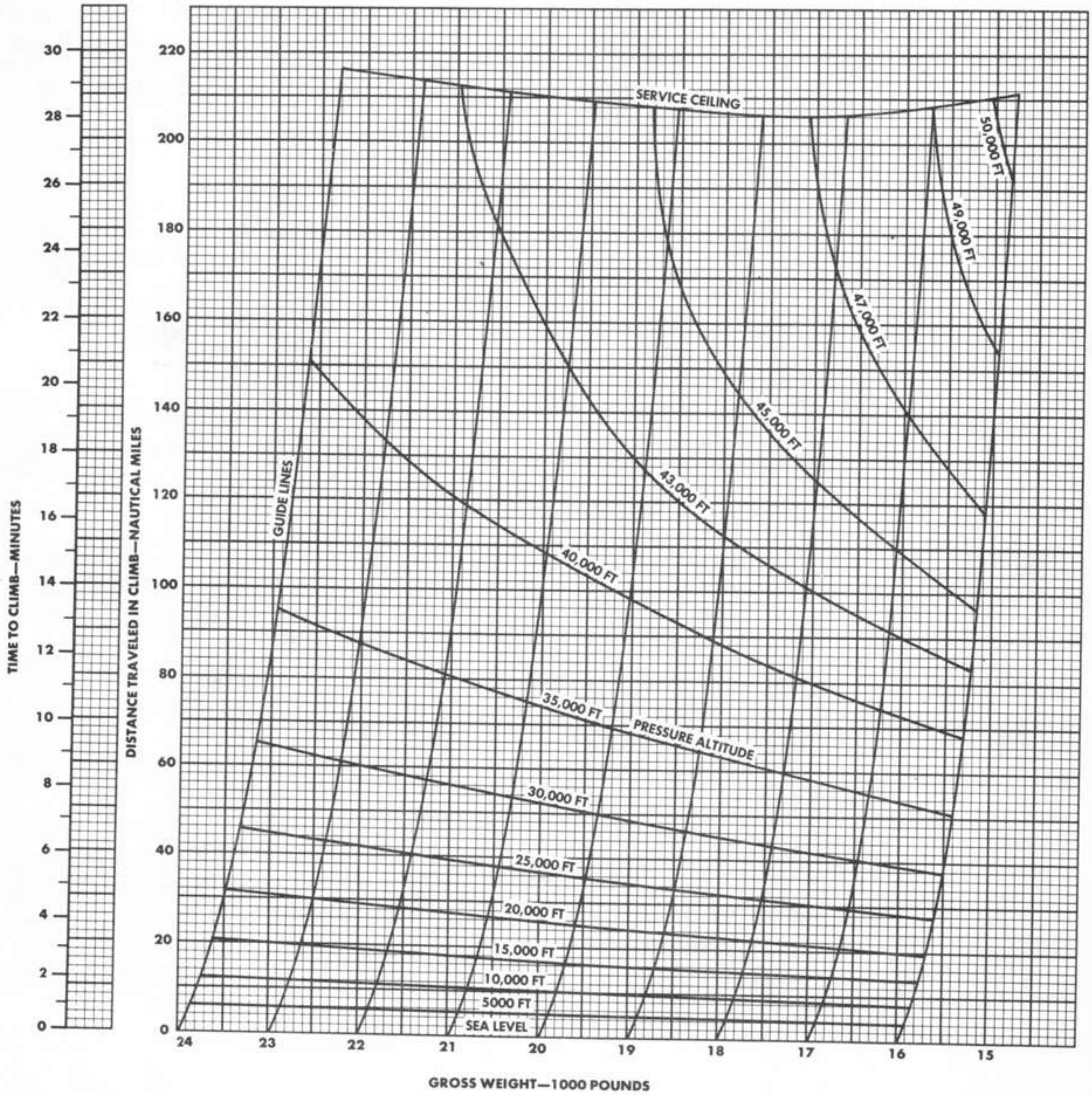
Figure A-65

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

MAXIMUM CONTINUOUS THRUST CLIMB

TWO 200-GALLON DROP TANKS plus TWO EX-10 BOMBS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from the time best climb speed is attained.

CLIMB SPEEDS		
ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
50,000	.80	190
45,000	.80	215
40,000	.80	240
35,000	.80	270
30,000	.75	285
25,000	.70	295
20,000	.66	305
15,000	.62	310
10,000	.58	315
5000	.54	325
SL	.50	330

F-86H-1-93-222A

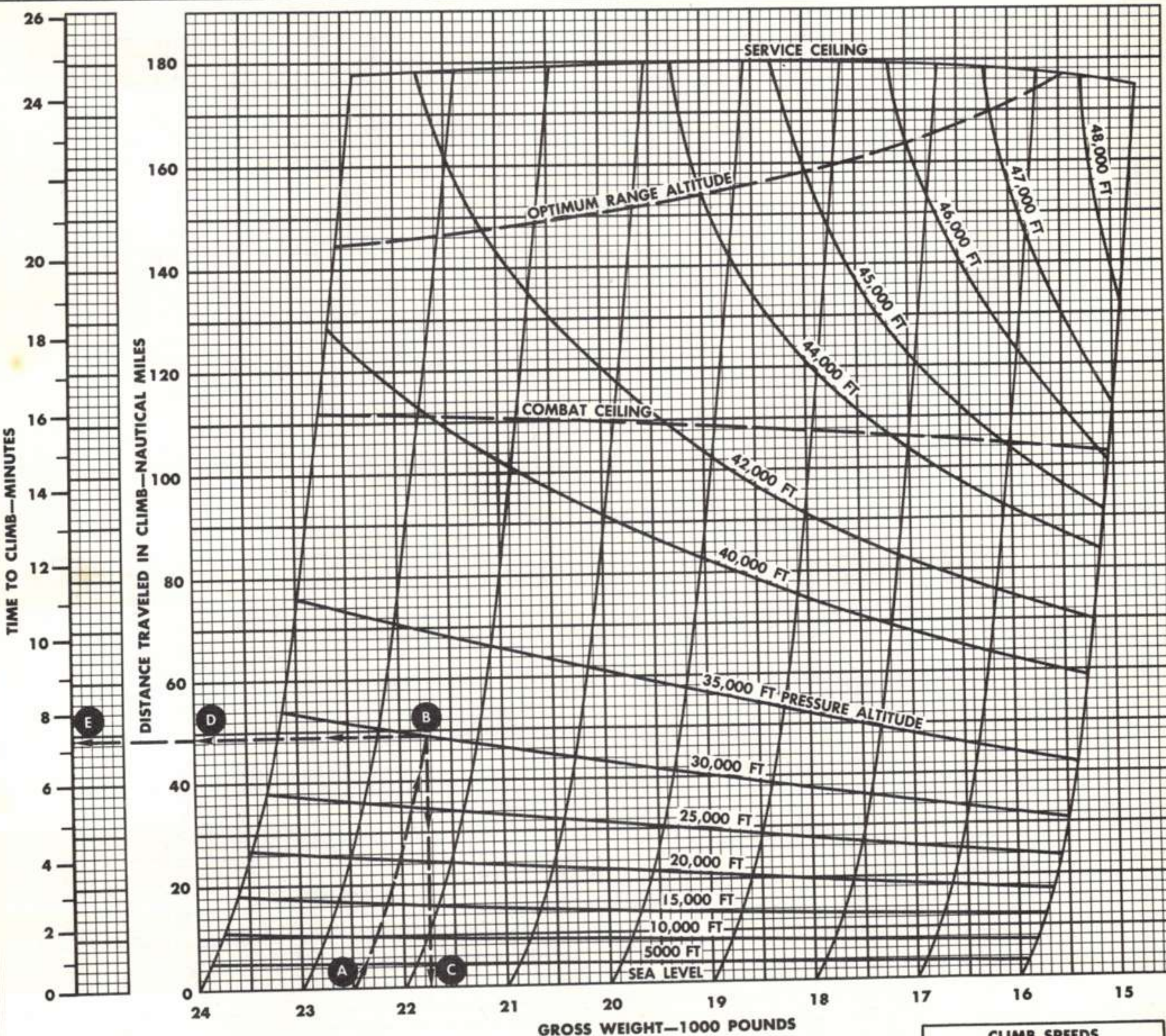
Figure A-66

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

MILITARY THRUST CLIMB

TWO 200-GALLON DROP TANKS plus EIGHT 5-INCH ROCKETS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



EXAMPLE:

(A) is initial gross weight (22,500 pounds).
(B) is final altitude (30,000 feet).
(C) is final gross weight (21,750 pounds).
(A) minus (C) is fuel used in climb (750 pounds).
(D) is distance traveled in climb (49 nautical miles).
(E) is time to climb (7.3 minutes).

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

CLIMB SPEEDS

ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
50,000	.82	195
45,000	.80	215
40,000	.78	235
35,000	.76	255
30,000	.72	270
25,000	.69	285
20,000	.65	300
15,000	.62	315
10,000	.59	330
5000	.56	340
SL	.54	355

F-86H-1-93-223B

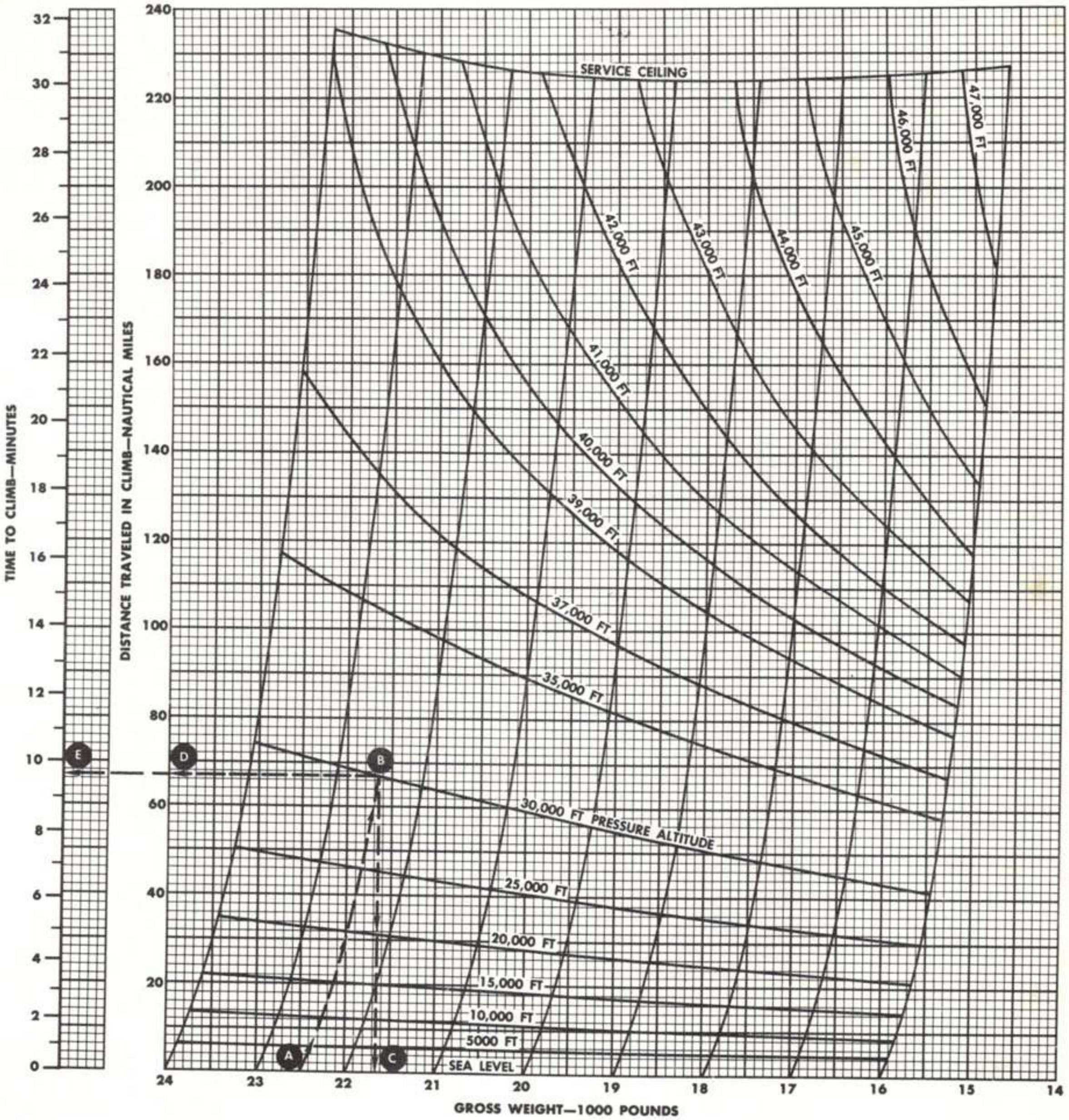
Figure A-67

MAXIMUM CONTINUOUS THRUST CLIMB

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST

TWO 200-GALLON DROP TANKS
PLUS EIGHT 5-INCH ROCKETS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



EXAMPLE:

- (A) is initial gross weight (22,500 pounds).
- (B) is final altitude (30,000 feet).
- (C) is final gross weight (21,650 pounds).
- (A) minus (C) is fuel used in climb (850 pounds).
- (D) is distance traveled in climb (67 nautical miles).
- (E) is time to climb (9.6 minutes).

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

CLIMB SPEEDS

ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOT)
50,000	.80	190
45,000	.80	215
40,000	.80	240
35,000	.80	270
30,000	.75	285
25,000	.70	295
20,000	.66	305
15,000	.62	310
10,000	.58	315
5000	.54	325
SL	.50	330

F-86H-1-93-224A

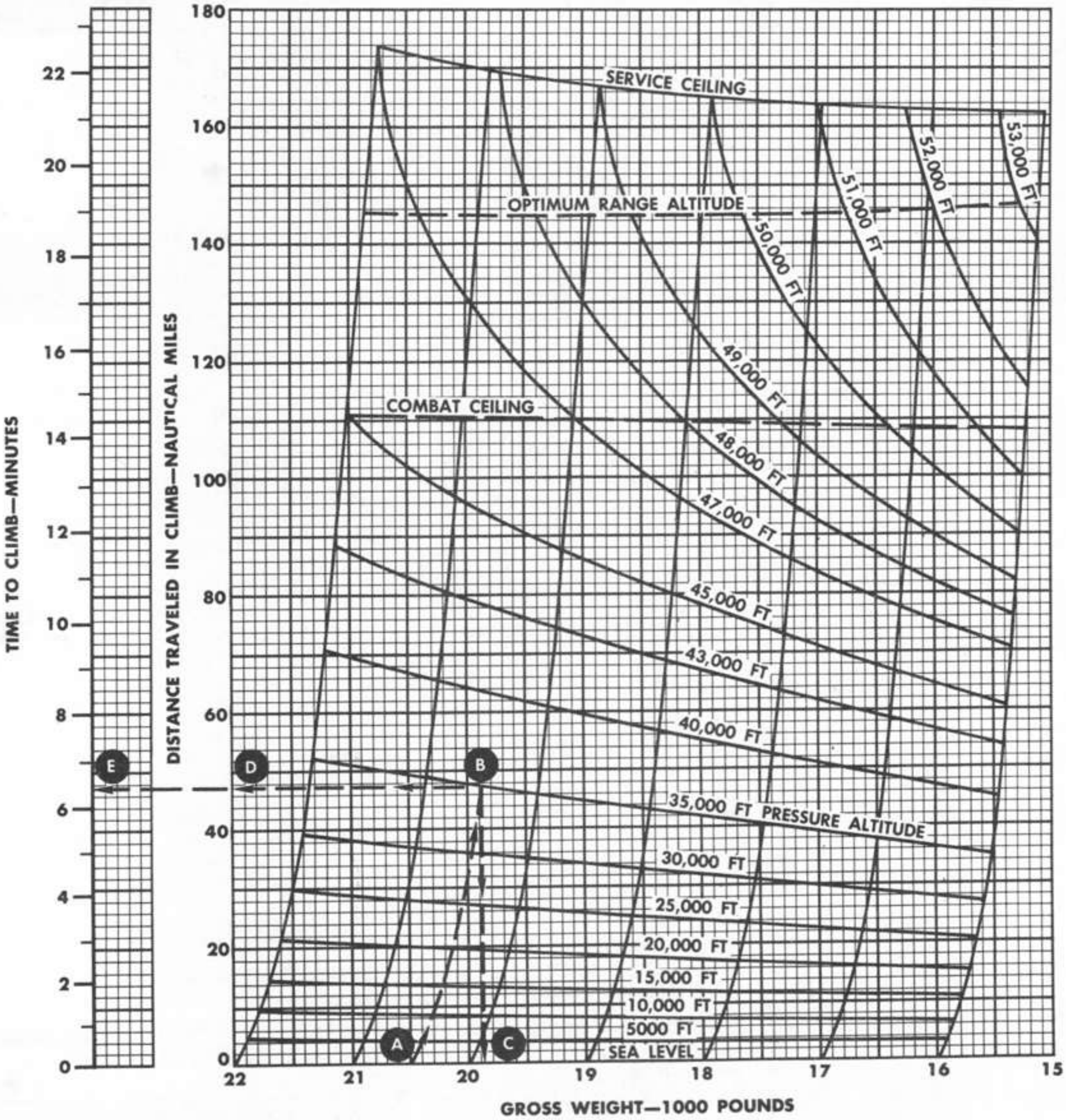
Figure A-68

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

MILITARY THRUST CLIMB

ONE SPECIAL STORE

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



EXAMPLE:

- **A** is initial gross weight (20,500 pounds).
- **B** is final altitude (35,000 feet).
- **C** is final gross weight (19,900 pounds).
- **A** minus **C** is fuel used in climb (600 pounds).
- **D** is distance traveled in climb (47 nautical miles).
- **E** is time to climb (6.4 minutes).

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

CLIMB SPEEDS

ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
55,000	.82	175
50,000	.82	195
45,000	.82	220
40,000	.82	245
35,000	.82	275
30,000	.81	295
25,000	.78	315
20,000	.75	335
15,000	.72	350
10,000	.67	370
5000	.64	390
SL	.62	405

F-86H-1-93-225A

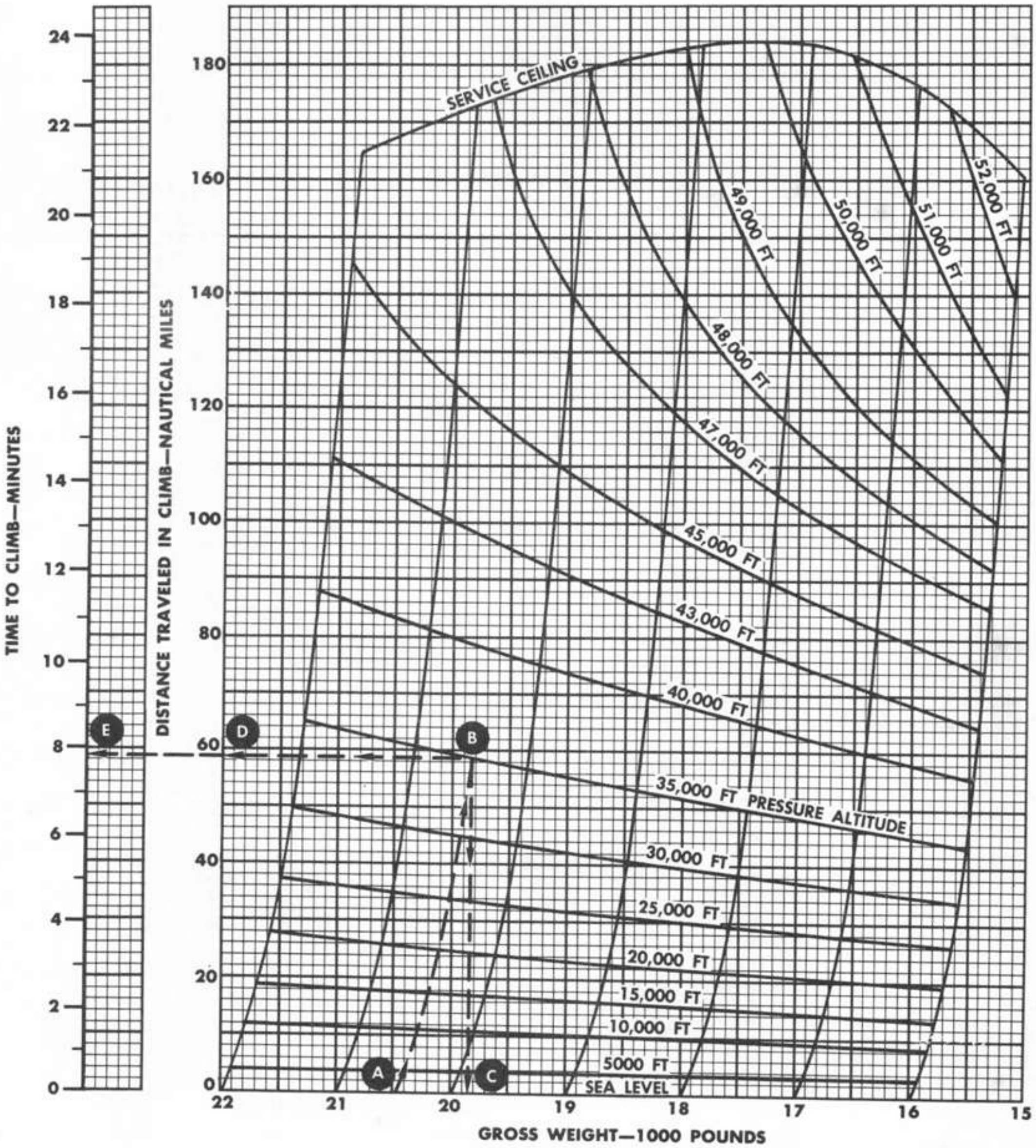
Figure A-69

MAXIMUM CONTINUOUS THRUST CLIMB

ONE SPECIAL STORE

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



EXAMPLE:

- (A) is initial gross weight (20,500 pounds).
- (B) is final altitude (35,000 feet).
- (C) is final gross weight (19,850 pounds).
- (A) minus (C) is fuel used in climb (650 pounds).
- (D) is distance traveled in climb (59 nautical miles).
- (E) is time to climb (7.8 minutes).

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

CLIMB SPEEDS		
ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
50,000	.82	195
45,000	.82	220
40,000	.82	250
35,000	.82	280
30,000	.80	305
25,000	.77	320
20,000	.73	340
15,000	.70	355
10,000	.67	375
5000	.64	390
SL	.61	405

F-86H-1-93-226A

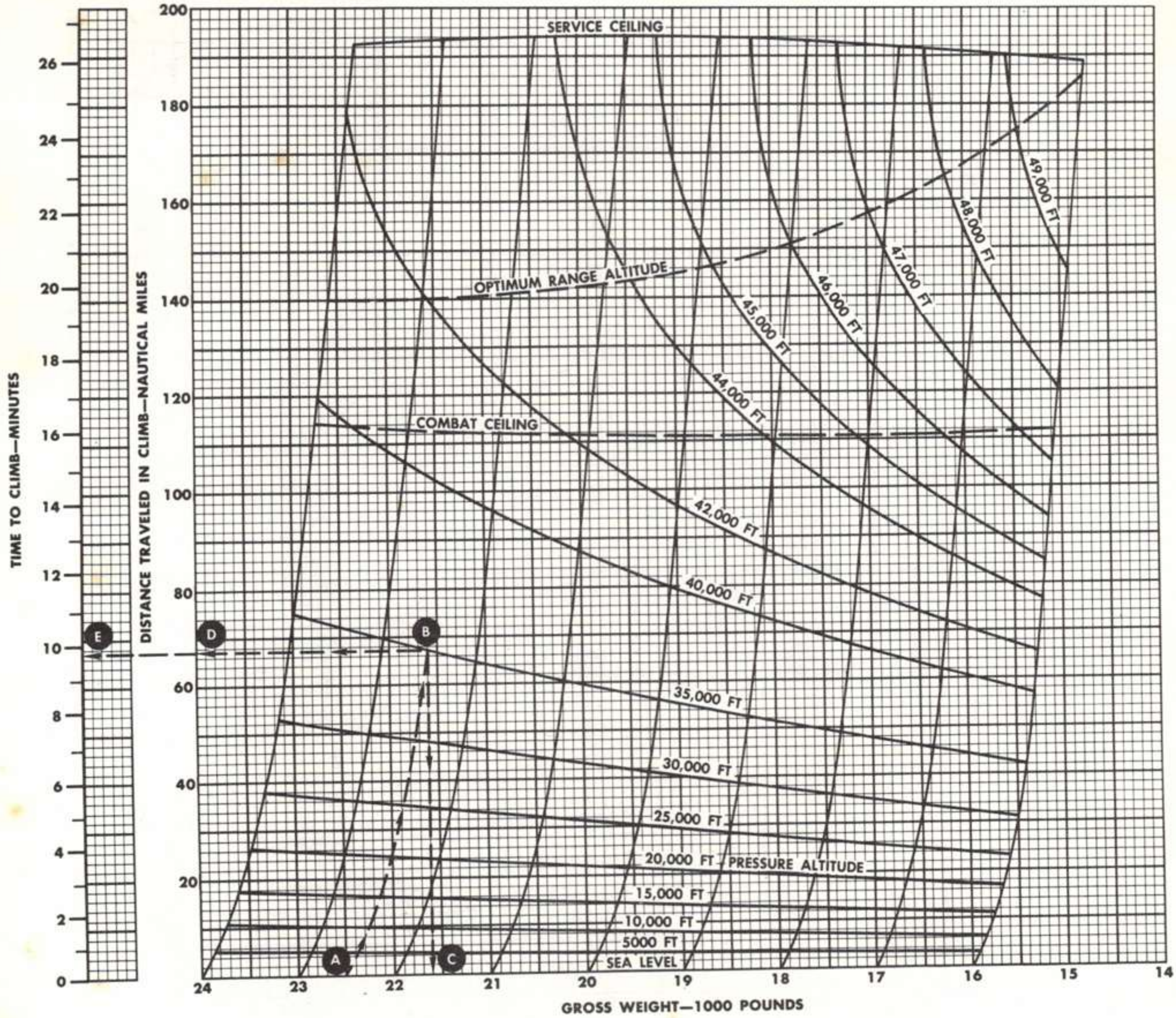
Figure A-70

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

MILITARY THRUST CLIMB

ONE SPECIAL STORE plus TWO 200-GALLON DROP TANKS plus ONE 120-GALLON DROP TANK

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



EXAMPLE:

- (A) is initial gross weight (22,500 pounds).
- (B) is final altitude (35,000 feet).
- (C) is final gross weight (21,600 pounds).
- (A) minus (C) is fuel used in climb (900 pounds).
- (D) is distance traveled in climb (68 nautical miles).
- (E) is time to climb (9.8 minutes).

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

CLIMB SPEEDS

ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
50,000	.82	195
45,000	.80	215
40,000	.78	235
35,000	.76	255
30,000	.72	270
25,000	.69	285
20,000	.65	300
15,000	.62	315
10,000	.59	330
5000	.56	340
SL	.54	355

F-86H-1-93-227A

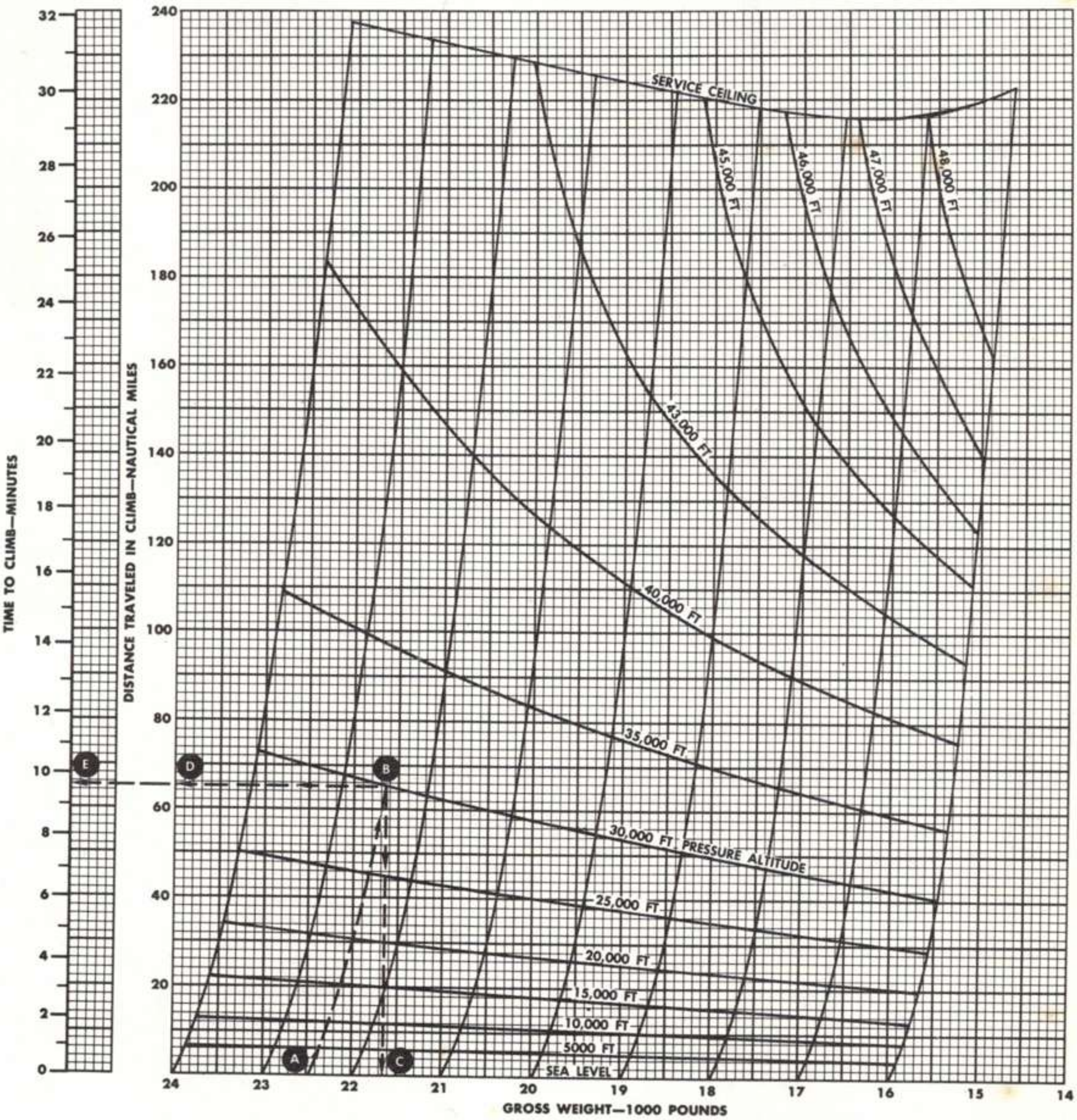
Figure A-71

MAXIMUM CONTINUOUS THRUST CLIMB

ONE SPECIAL STORE plus TWO 200-GALLON DROP TANKS plus ONE 120-GALLON DROP TANK

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E



EXAMPLE:

- (A) is initial gross weight (22,500 pounds).
- (B) is final altitude (30,000 feet).
- (C) is final gross weight (21,650 pounds).
- (A) minus (C) is fuel used in climb (850 pounds).
- (D) is distance traveled in climb (66 nautical miles).
- (E) is time to climb (9.6 minutes).

REMARKS:

1. For each 10°C rise in air temperature above Standard Day conditions, increase gross weight 1500 pounds before entering chart. Maintain Mach number as shown.
2. For each 10°C below Standard Day conditions, apply correction in the opposite direction. Maintain Mach number as shown.
3. All data computed from time best climb speed is attained.

CLIMB SPEEDS		
ALTITUDE (FEET)	TRUE MACH NUMBER	CAS (KNOTS)
50,000	.80	190
45,000	.80	215
40,000	.80	240
35,000	.80	270
30,000	.75	285
25,000	.70	295
20,000	.66	305
15,000	.62	310
10,000	.58	315
5000	.54	325
SL	.50	330

F-86H-1-93-228A

Figure A-72

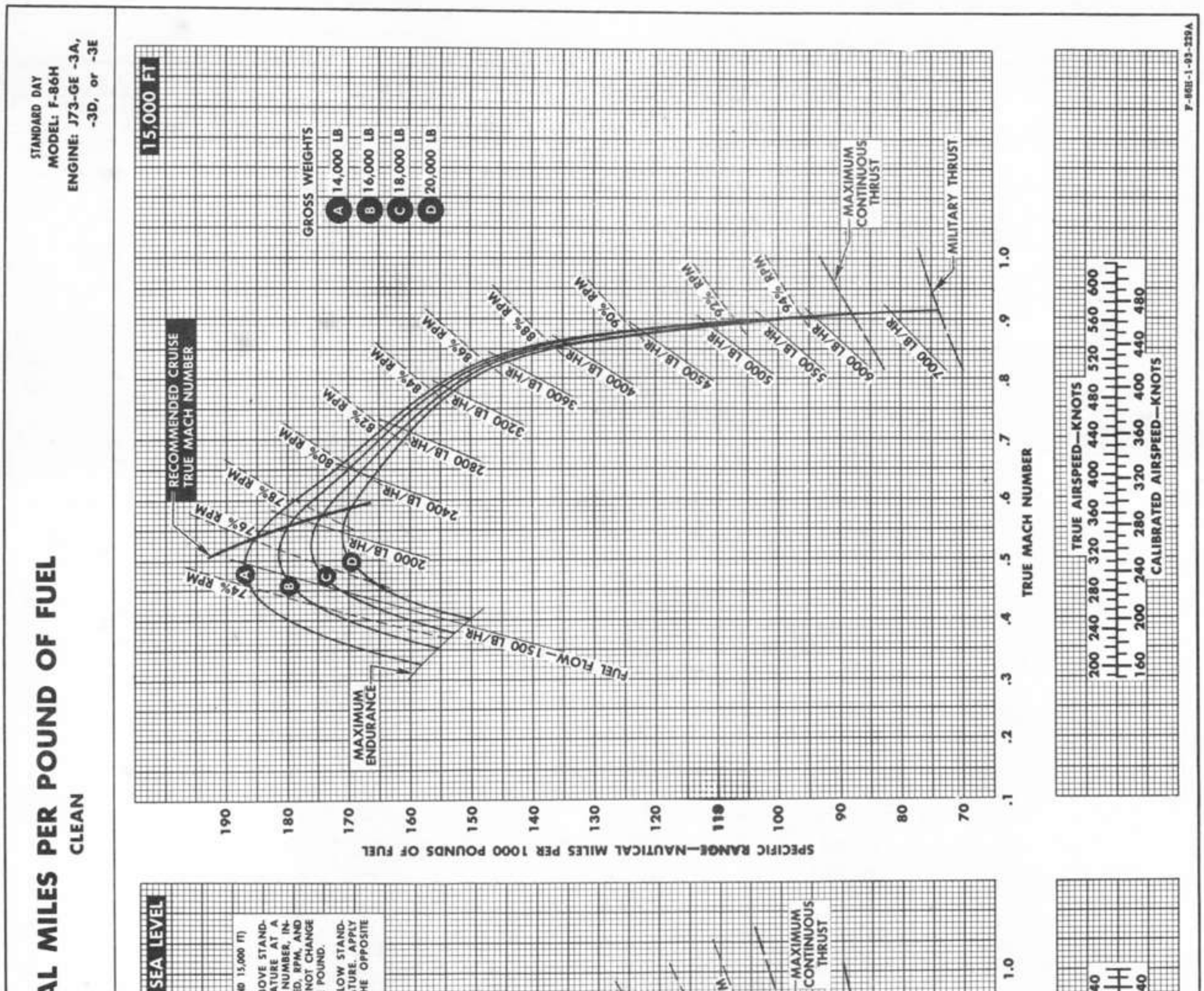

NAUTICAL MILES PER POUND OF FUEL
CLEAN
STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE -3A, -3D, or -3E
DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST
SEA LEVEL
REMARKS: (SEA LEVEL AND 15,000 FT)
1. FOR EACH 10°C ABOVE STANDARD DAY TEMPERATURE AT A GIVEN TRUE MACH NUMBER, INCREASE TRUE AIRSPEED, RPM, AND FUEL FLOW 2%. DO NOT CHANGE NAUTICAL MILES PER POUND.
2. FOR EACH 10°C BELOW STANDARD DAY TEMPERATURE, APPLY CORRECTION IN THE OPPOSITE DIRECTION.
15,000 FT
GROSS WEIGHTS
A 14,000 LB
B 16,000 LB
C 18,000 LB
D 20,000 LB
RECOMMENDED CRUISE TRUE MACH NUMBER
MAXIMUM ENDURANCE
MAXIMUM CONTINUOUS THRUST
MILITARY THRUST
FUEL FLOW—1600 LB/HR
FUEL FLOW—1500 LB/HR
SPECIFIC RANGE—NAUTICAL MILES PER 1000 POUNDS OF FUEL
TRUE MACH NUMBER
TRUE AIRSPEED—KNOTS
CALIBRATED AIRSPEED—KNOTS
F-86H-1-93-229A

Figure A-73

NAUTICAL MILES PER POUND OF FUEL

CLEAN

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE -3A, -3D, or -3E

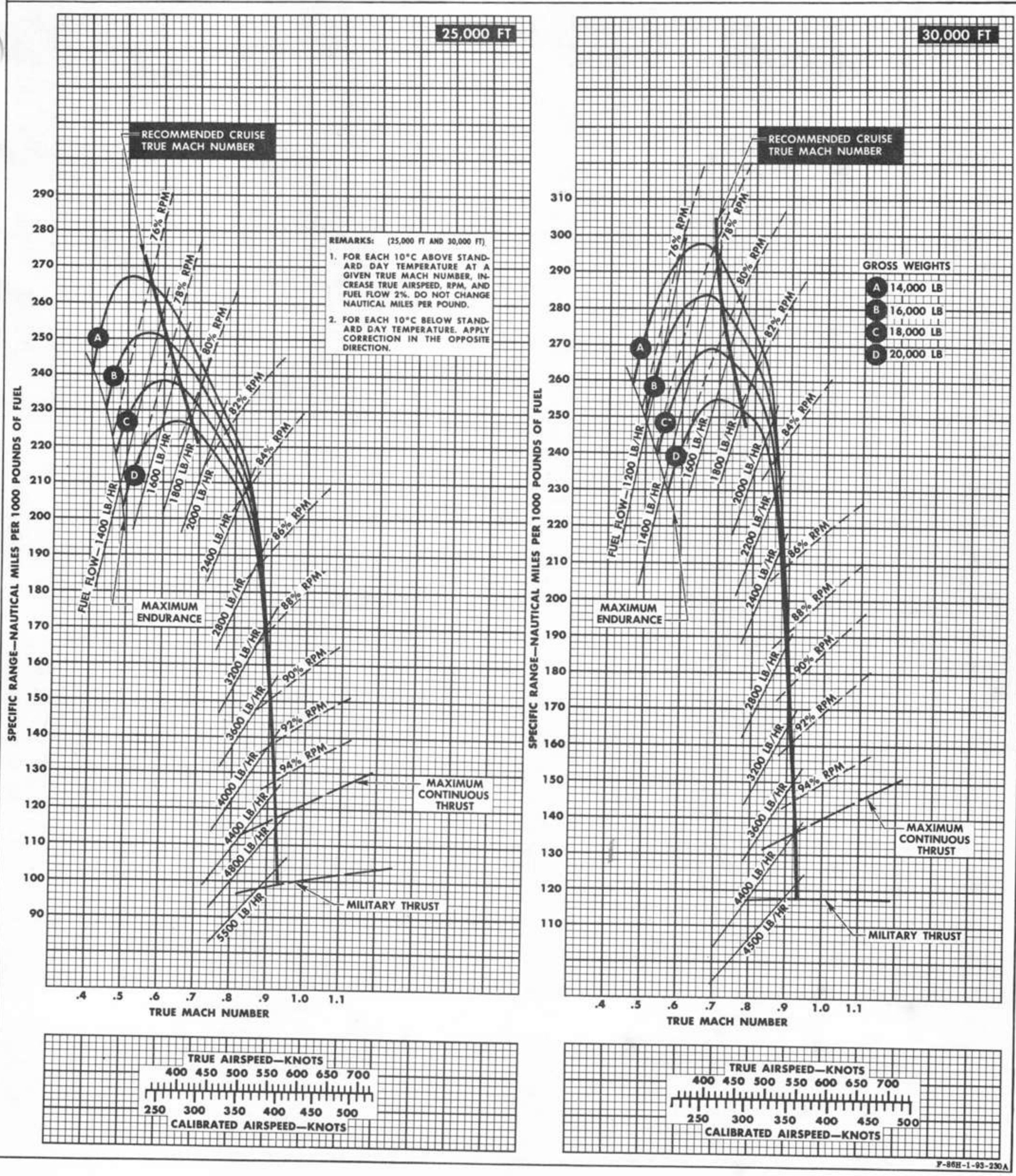


Figure A-74

NAUTICAL MILES PER POUND OF FUEL

CLEAN

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE -3A, -3D, or -3E

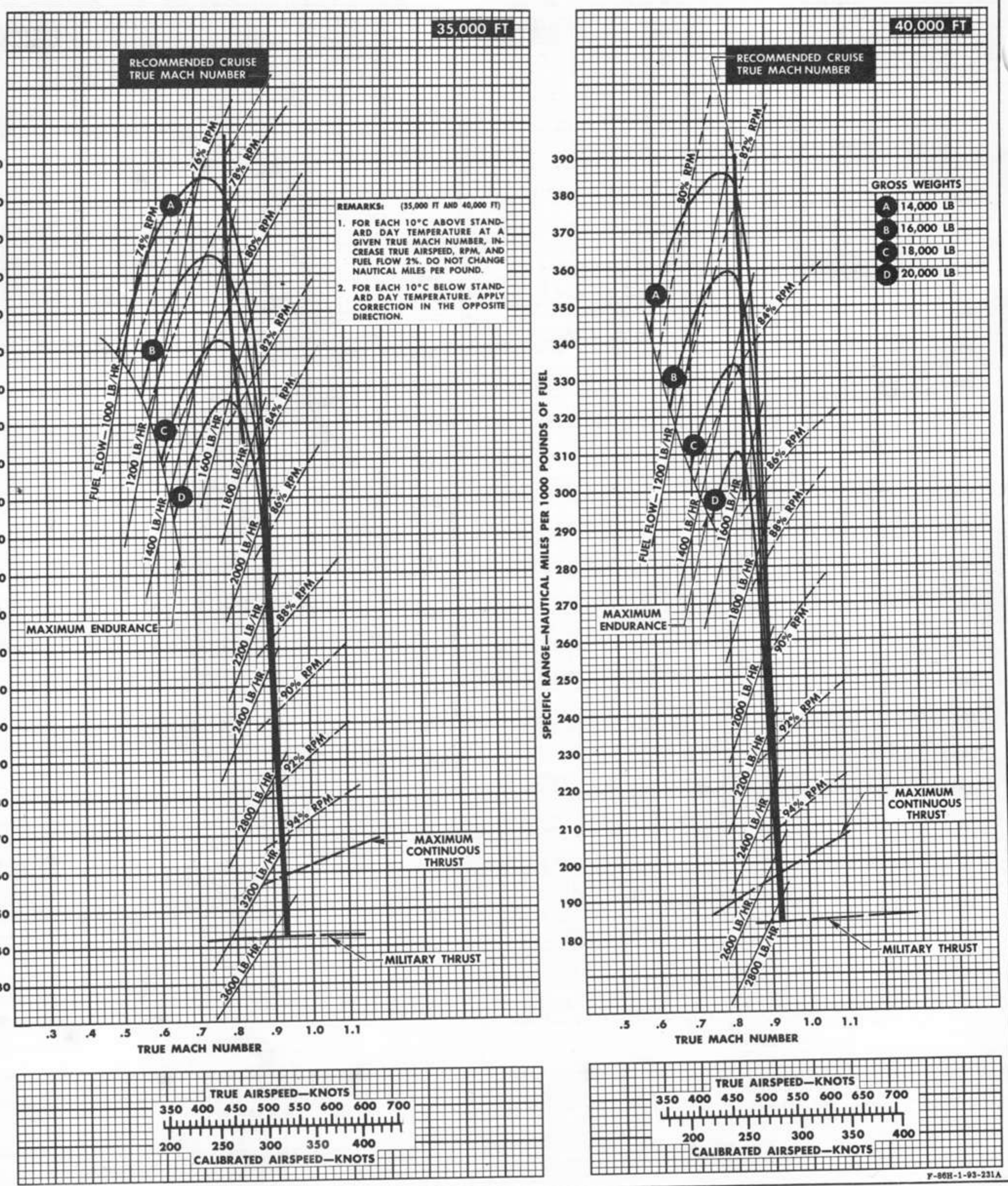


Figure A-75

NAUTICAL MILES PER POUND OF FUEL

CLEAN

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE -3A, -3D, or -3E

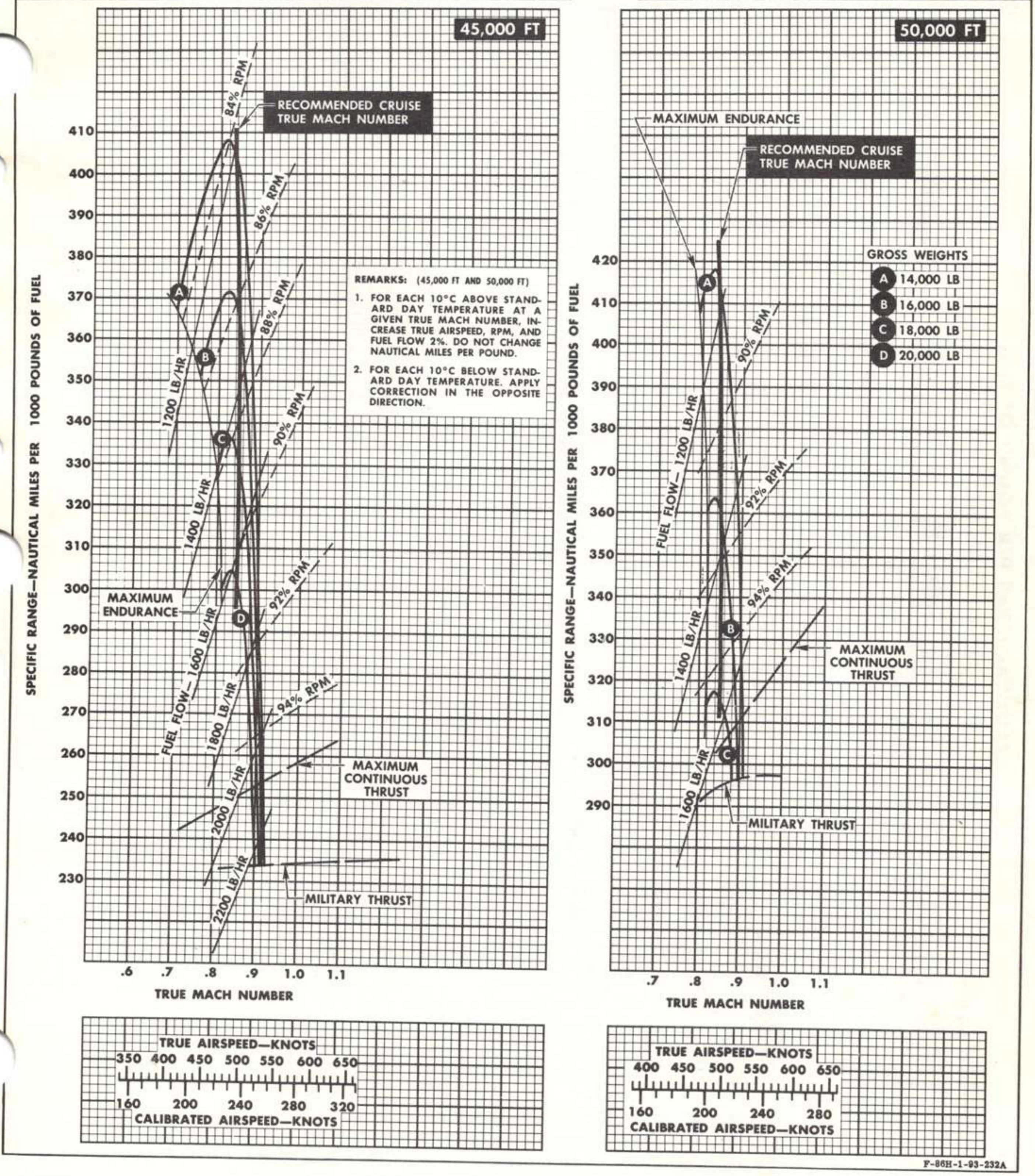


Figure A-76

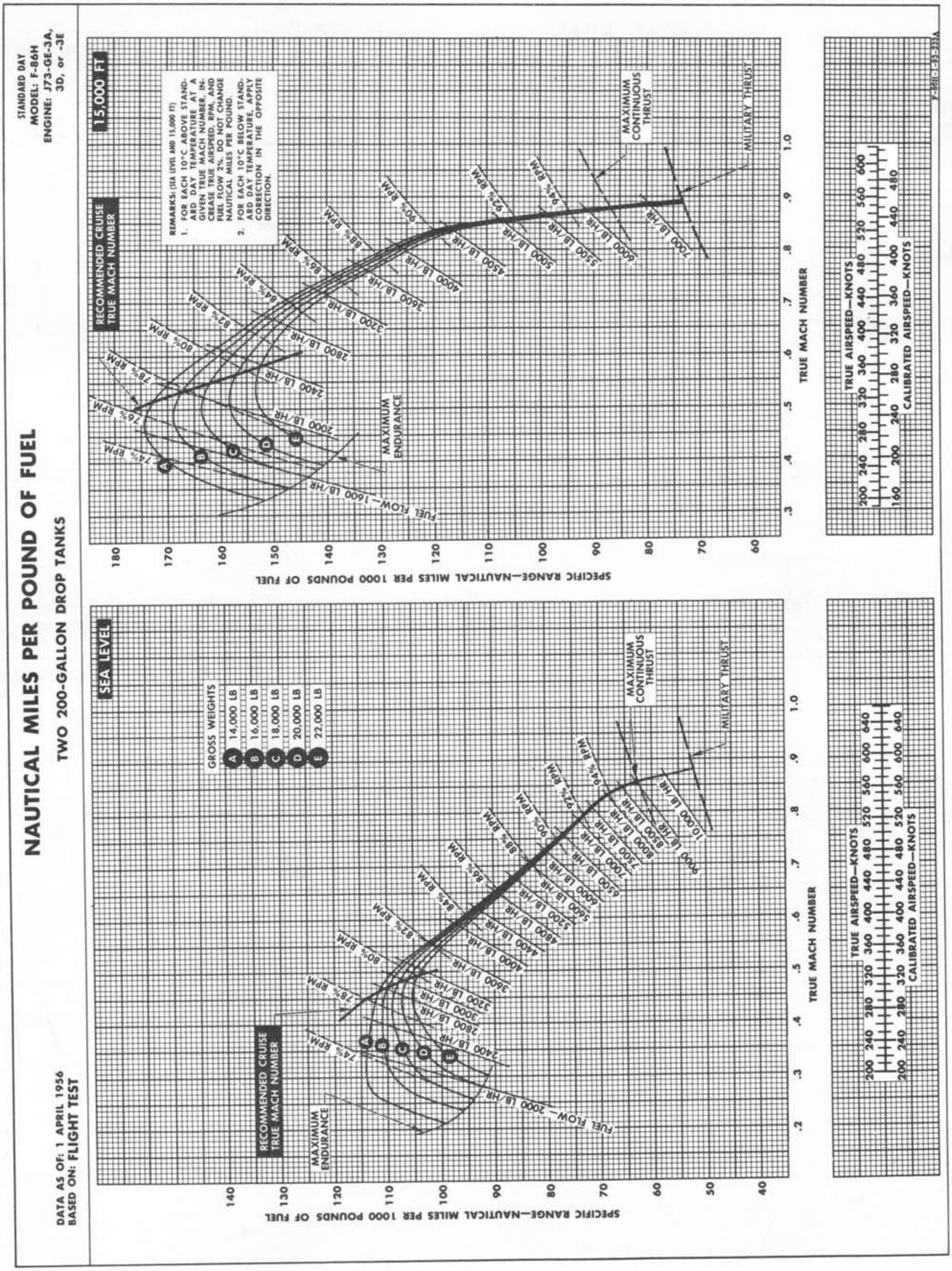

NAUTICAL MILES PER POUND OF FUEL
TWO 200-GALLON DROP TANKS
DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST
STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, 3D, or -3E
SEA LEVEL
GROSS WEIGHTS
A 14,000 LB
B 16,000 LB
C 18,000 LB
D 20,000 LB
E 22,000 LB
RECOMMENDED CRUISE TRUE MACH NUMBER
MAXIMUM ENDURANCE
MAXIMUM CONTINUOUS THRUST
MILITARY THRUST
FUEL FLOW—2000 LB/HR
74% RPM
78% RPM
80% RPM
82% RPM
84% RPM
86% RPM
88% RPM
90% RPM
92% RPM
94% RPM
2400 LB/HR
2800 LB/HR
3000 LB/HR
3200 LB/HR
3600 LB/HR
4000 LB/HR
4400 LB/HR
4800 LB/HR
5200 LB/HR
5600 LB/HR
6000 LB/HR
6500 LB/HR
7000 LB/HR
7500 LB/HR
8000 LB/HR
8500 LB/HR
9000 LB/HR
10,000 LB/HR
SPECIFIC RANGE—NAUTICAL MILES PER 1000 POUNDS OF FUEL
TRUE MACH NUMBER
TRUE AIRSPEED—KNOTS
CALIBRATED AIRSPEED—KNOTS
15,000 FT
REMARKS: (SEA LEVEL AND 15,000 FT)
1. FOR EACH 10°C ABOVE STANDARD DAY TEMPERATURE AT A GIVEN TRUE MACH NUMBER, INCREASE TRUE AIRSPEED, RPM, AND FUEL FLOW 2%. DO NOT CHANGE NAUTICAL MILES PER POUND.
2. FOR EACH 10°C BELOW STANDARD DAY TEMPERATURE, APPLY CORRECTION IN THE OPPOSITE DIRECTION.
FUEL FLOW—1600 LB/HR
76% RPM
2000 LB/HR
2400 LB/HR
2800 LB/HR
3200 LB/HR
3600 LB/HR
4000 LB/HR
4500 LB/HR
5000 LB/HR
5500 LB/HR
6000 LB/HR
7000 LB/HR
F-86H-1-93-233A

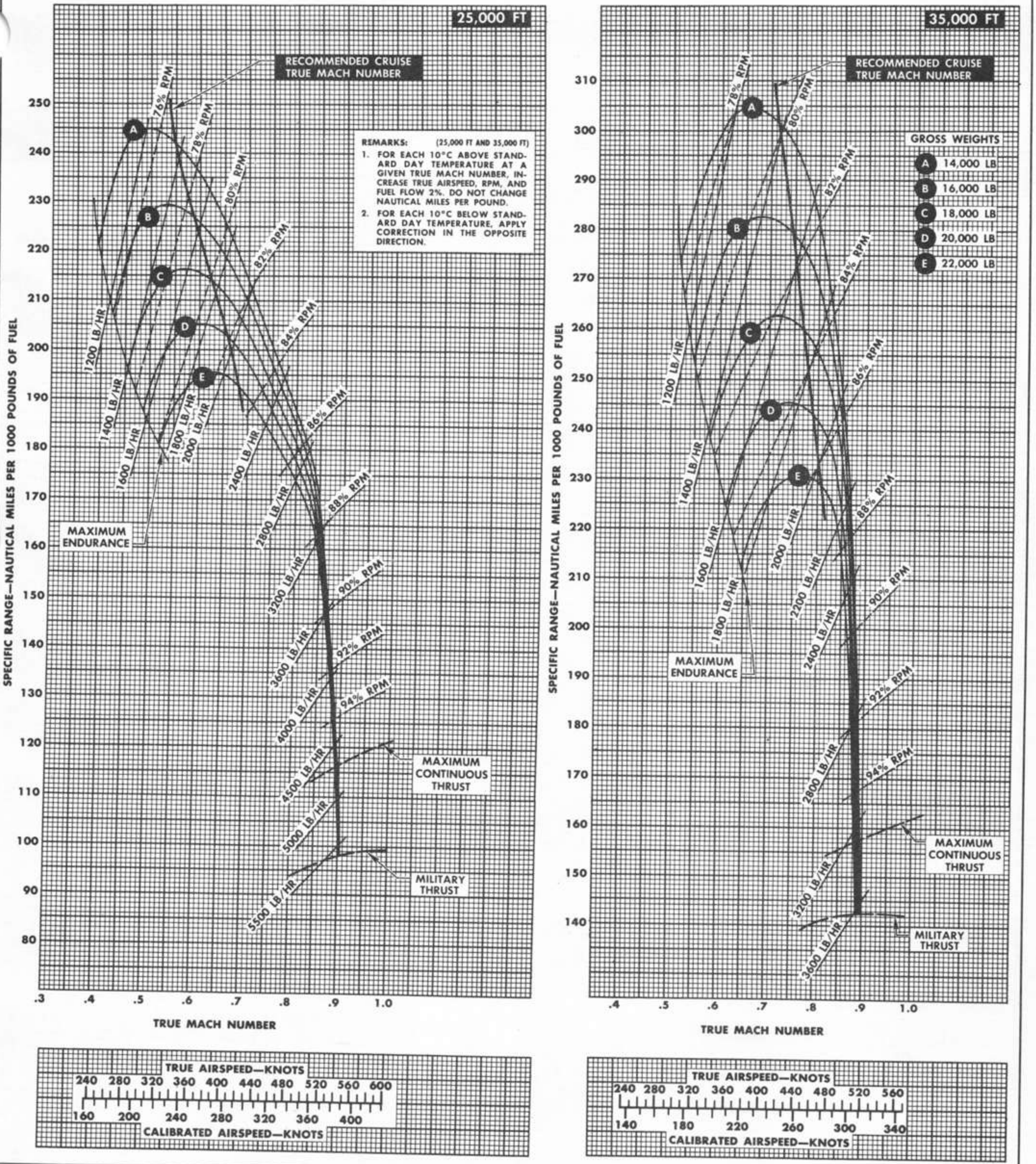
Figure A-77

NAUTICAL MILES PER POUND OF FUEL

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

TWO 200-GALLON DROP TANKS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, 3D, or -3E



F-86H-1-93-234A

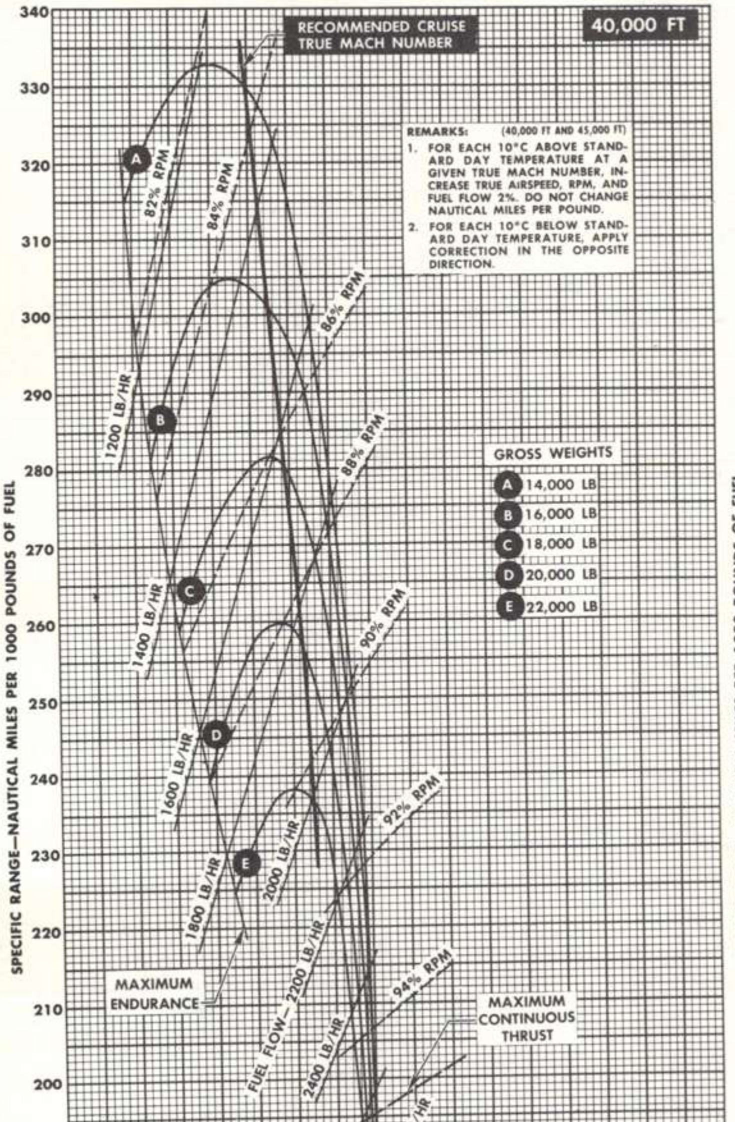
Figure A-78

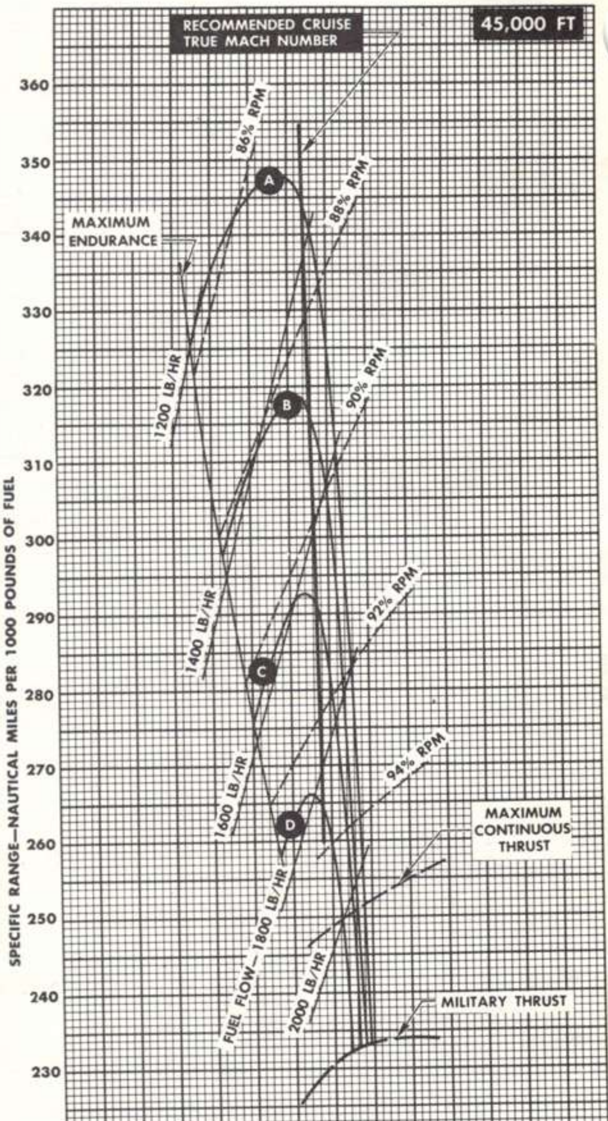
NAUTICAL MILES PER POUND OF FUEL

TWO 200-GALLON DROP TANKS

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E





F-86H-1-93-235A

Figure A-79

NAUTICAL MILES PER POUND OF FUEL

TWO 200-GALLON DROP TANKS

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, 3D, or -3E

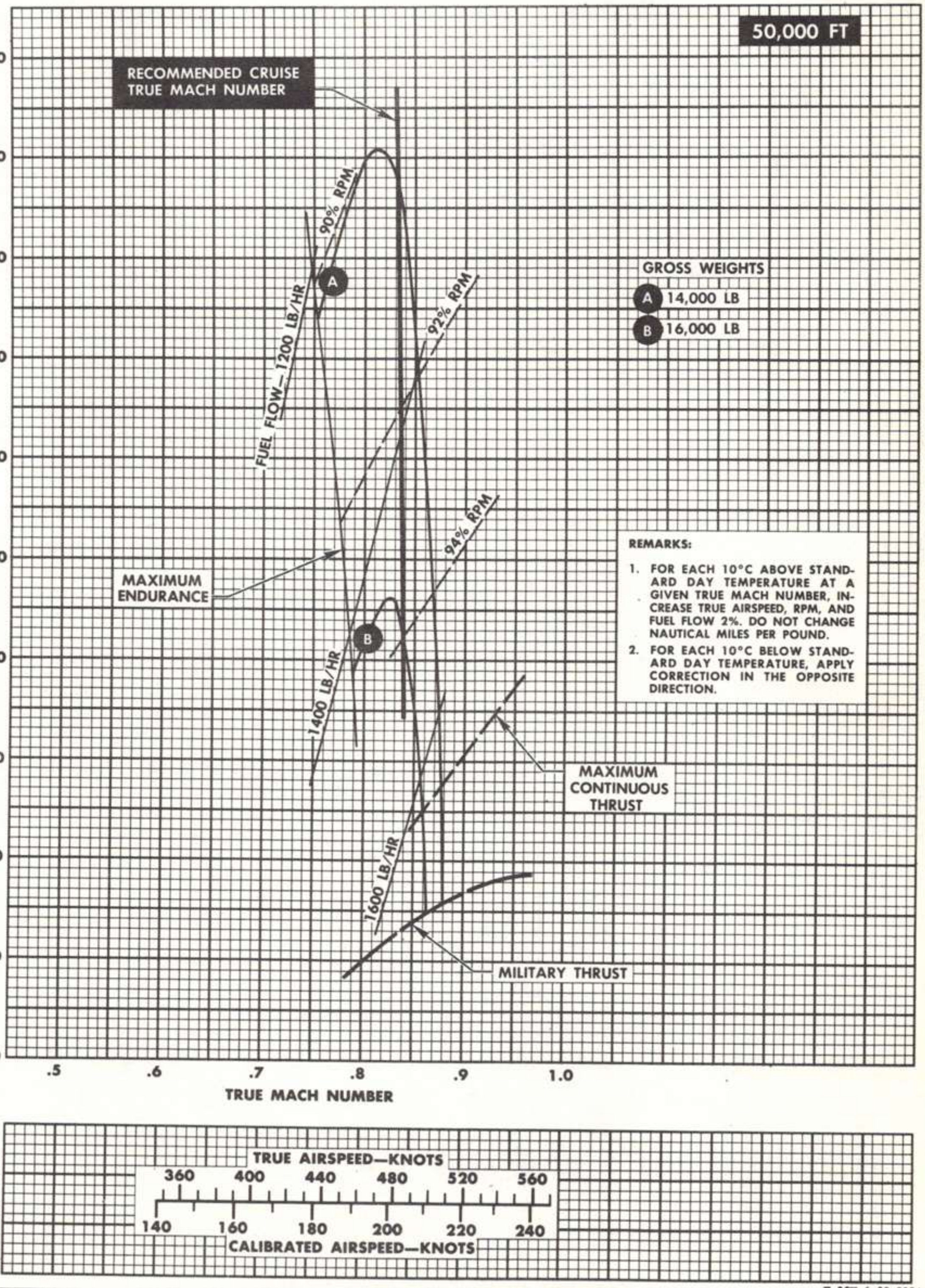


Figure A-80

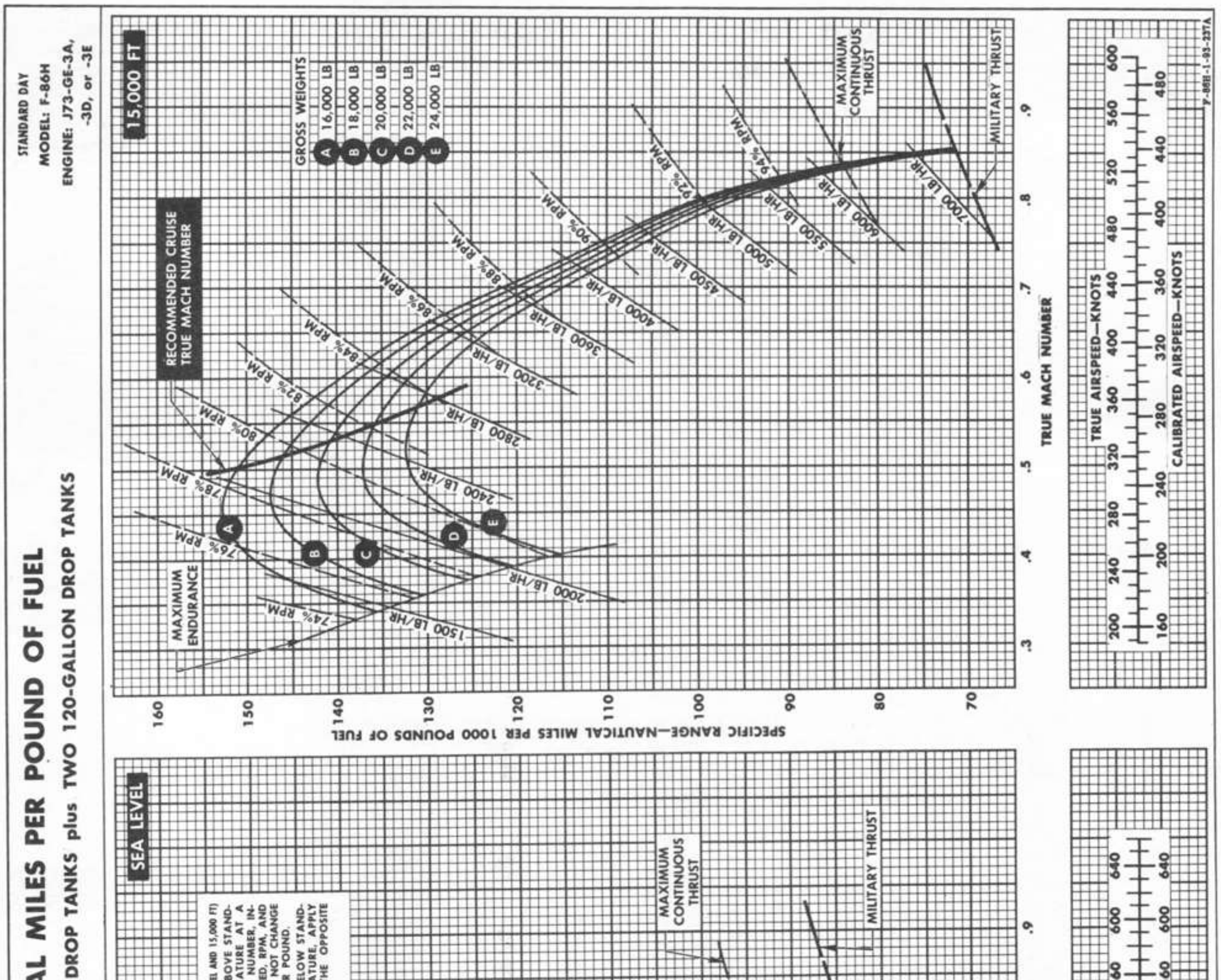

NAUTICAL MILES PER POUND OF FUEL
TWO 200-GALLON DROP TANKS plus TWO 120-GALLON DROP TANKS
STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, -3D, or -3E
DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST
15,000 FT
SEA LEVEL
GROSS WEIGHTS
A 16,000 LB
B 18,000 LB
C 20,000 LB
D 22,000 LB
E 24,000 LB
RECOMMENDED CRUISE TRUE MACH NUMBER
MAXIMUM ENDURANCE
MAXIMUM CONTINUOUS THRUST
MILITARY THRUST
REMARKS: (SEA LEVEL AND 15,000 FT)
1. FOR EACH 10°C ABOVE STANDARD DAY TEMPERATURE AT A GIVEN TRUE MACH NUMBER, INCREASE TRUE AIRSPEED, RPM, AND FUEL FLOW 2%. DO NOT CHANGE NAUTICAL MILES PER POUND.
2. FOR EACH 10°C BELOW STANDARD DAY TEMPERATURE, APPLY CORRECTION IN THE OPPOSITE DIRECTION.
TRUE MACH NUMBER
SPECIFIC RANGE—NAUTICAL MILES PER 1000 POUNDS OF FUEL
TRUE AIRSPEED—KNOTS
CALIBRATED AIRSPEED—KNOTS

Figure A-81

NAUTICAL MILES PER POUND OF FUEL

TWO 200-GALLON DROP TANKS
plus TWO 120-GALLON DROP TANKS

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, 3D, or -3E

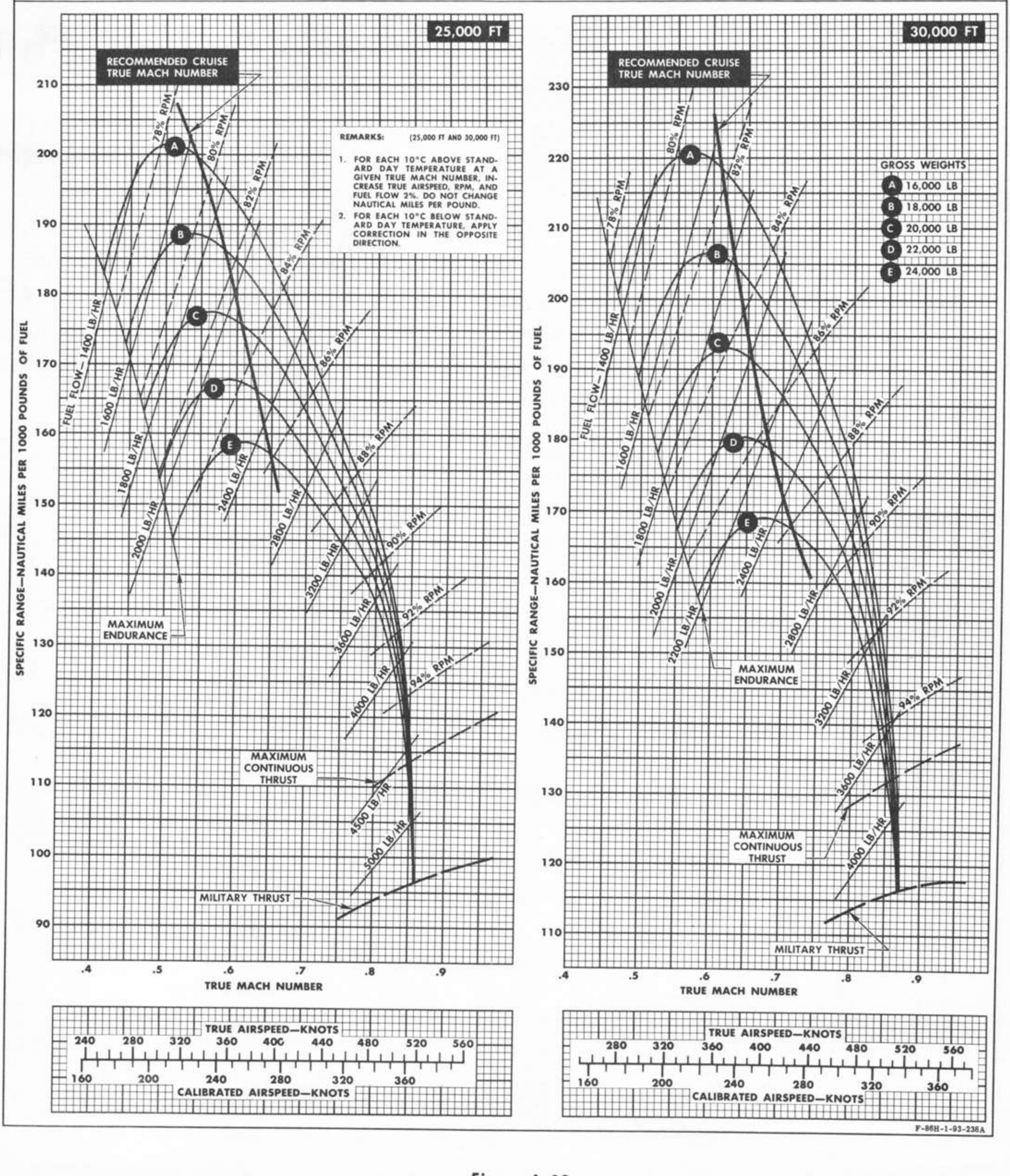


Figure A-82

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST

NAUTICAL MILES PER POUND OF FUEL

TWO 200-GALLON DROP TANKS
plus TWO 120-GALLON DROP TANKS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, 3D, or -3E

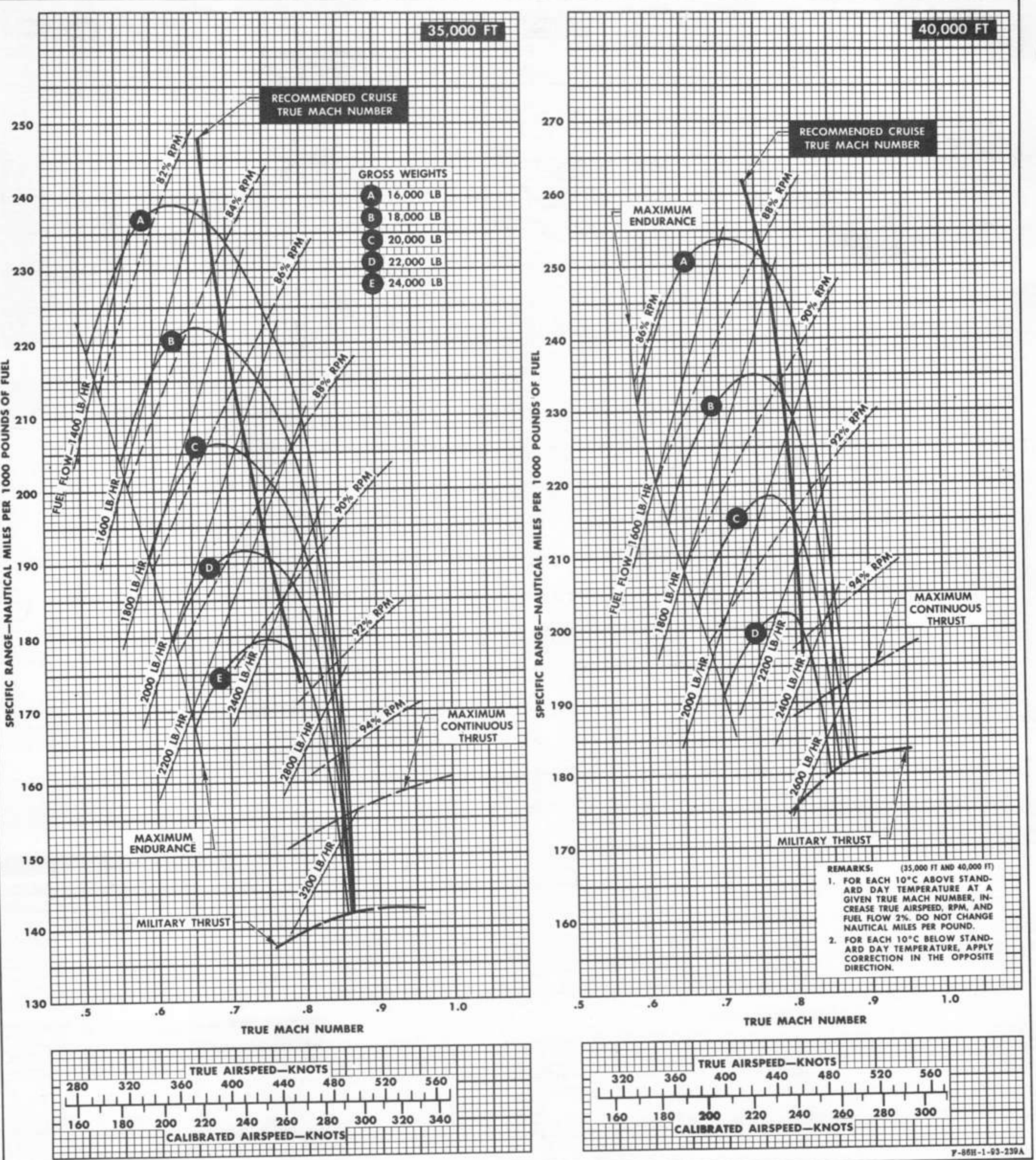


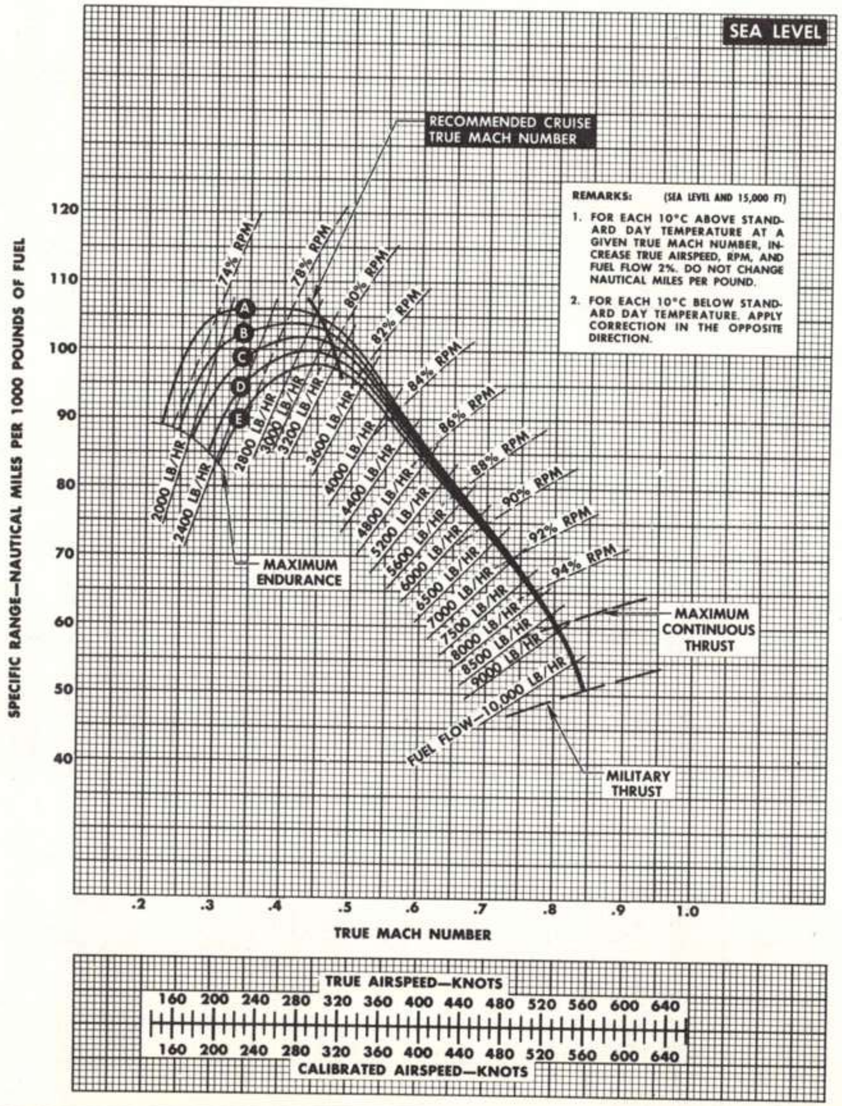
Figure A-83

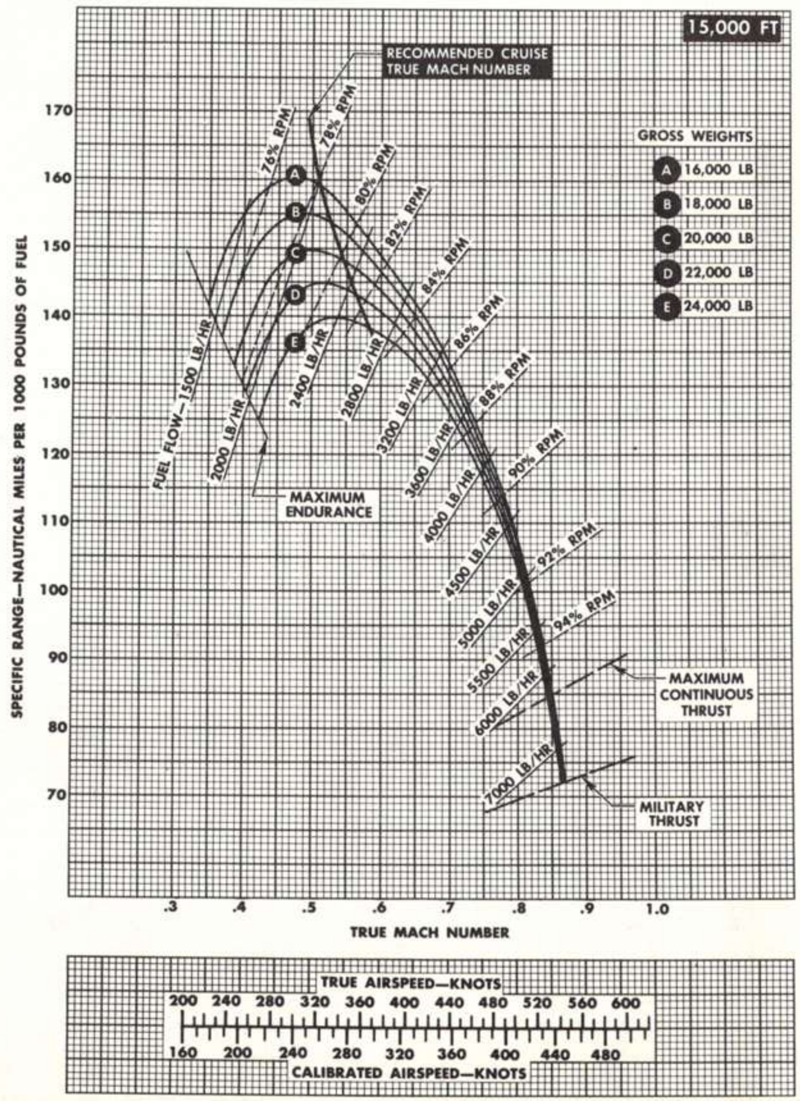
DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST

NAUTICAL MILES PER POUND OF FUEL

TWO 200-GALLON DROP TANKS PLUS TWO 750-POUND NAPALMS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE -3A, -3D, or -3E





F-86H-1-93-241A

Figure A-84

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST

NAUTICAL MILES PER POUND OF FUEL

TWO 200-GALLON DROP TANKS
PLUS TWO 750-POUND NAPALMS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE -3A, -3D, or -3E

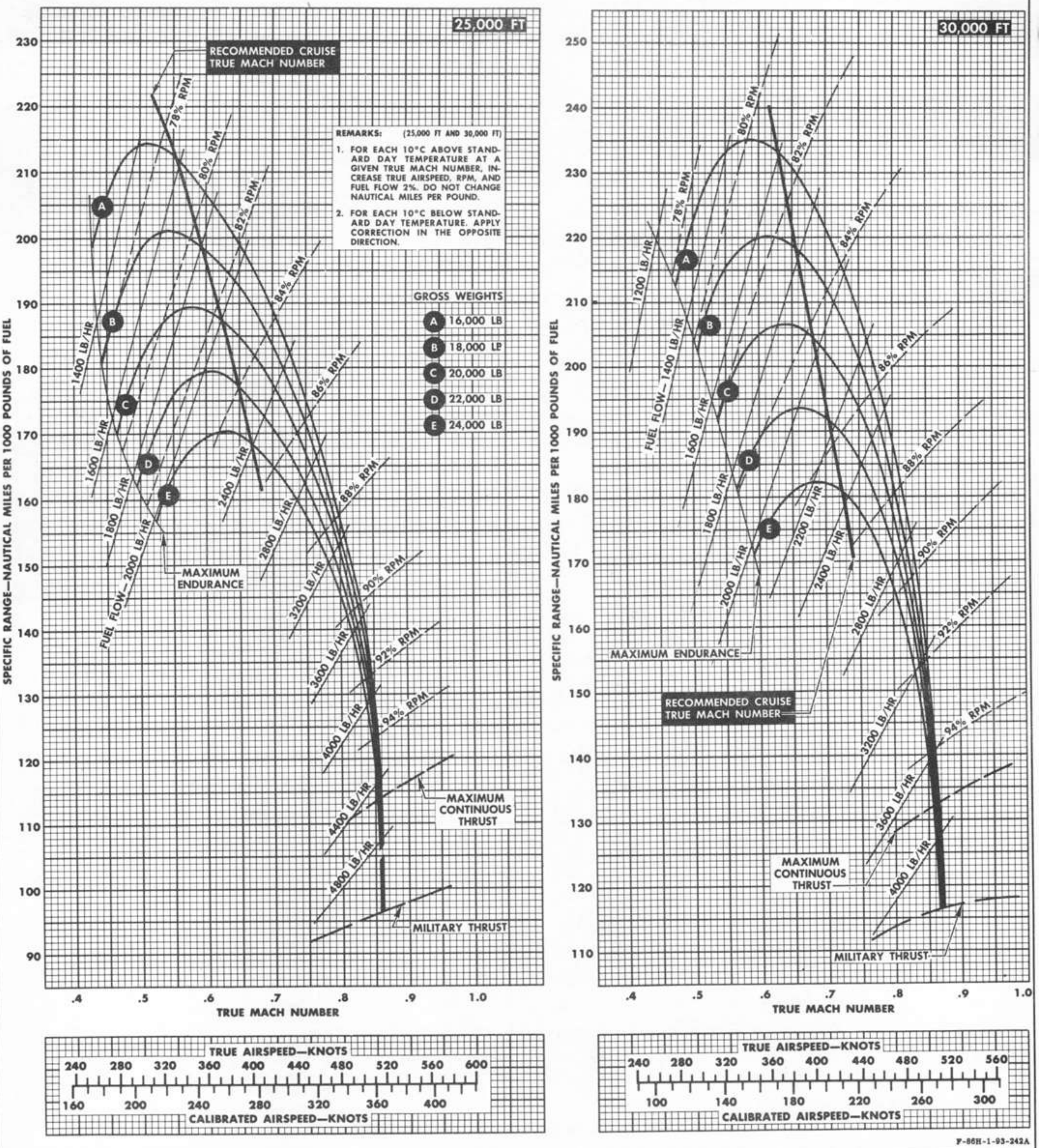


Figure A-85

NAUTICAL MILES PER POUND OF FUEL

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST

TWO 200-GALLON DROP TANKS
plus TWO 750-POUND NAPALMS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE -3A, -3D, or -3E

REMARKS: (35,000 FT AND 40,000 FT)

1. FOR EACH 10°C ABOVE STANDARD DAY TEMPERATURE AT A GIVEN TRUE MACH NUMBER, INCREASE TRUE AIRSPEED, RPM, AND FUEL FLOW 2%. DO NOT CHANGE NAUTICAL MILES PER POUND.
2. FOR EACH 10°C BELOW STANDARD DAY TEMPERATURE, APPLY CORRECTION IN THE OPPOSITE DIRECTION.

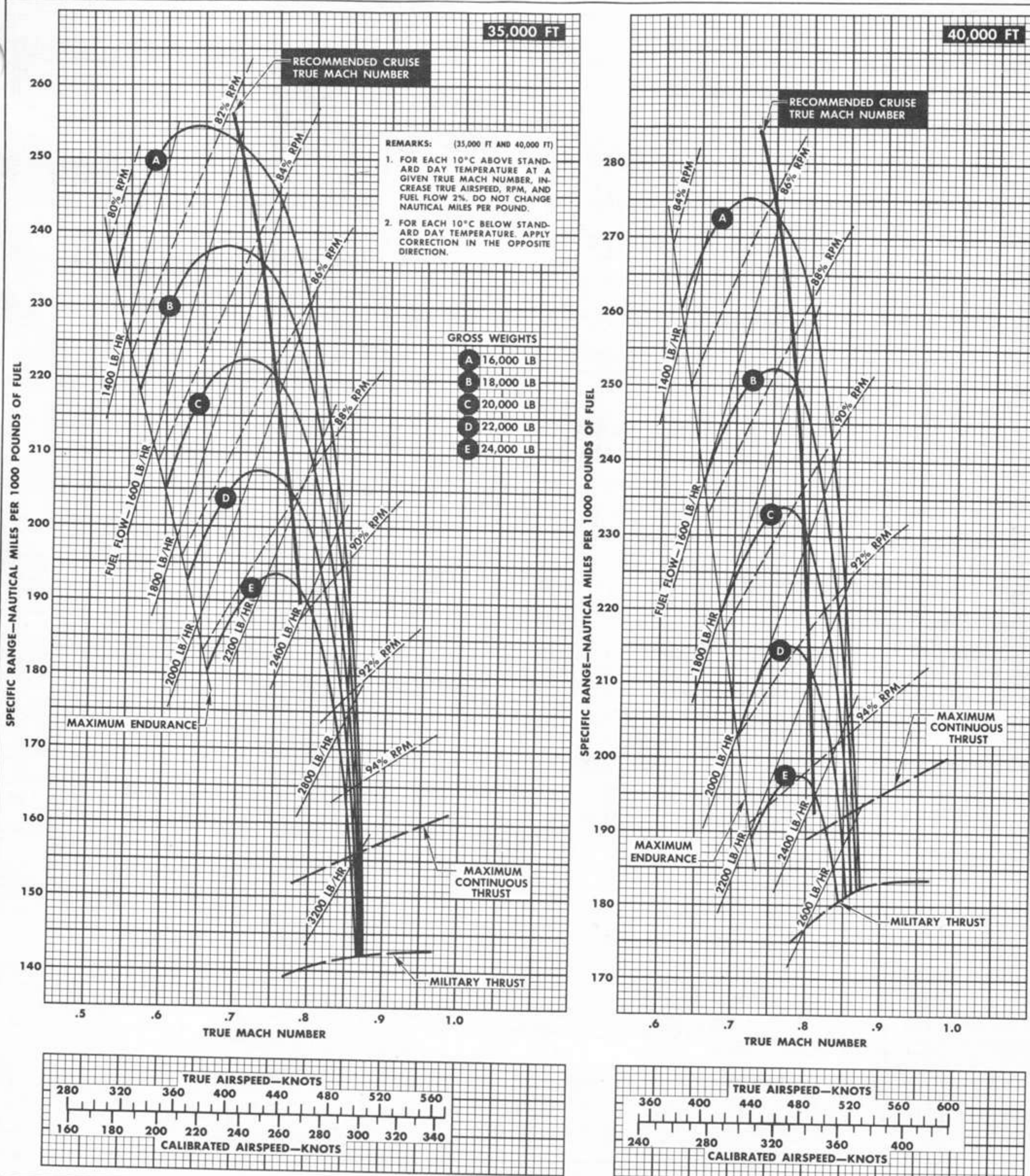


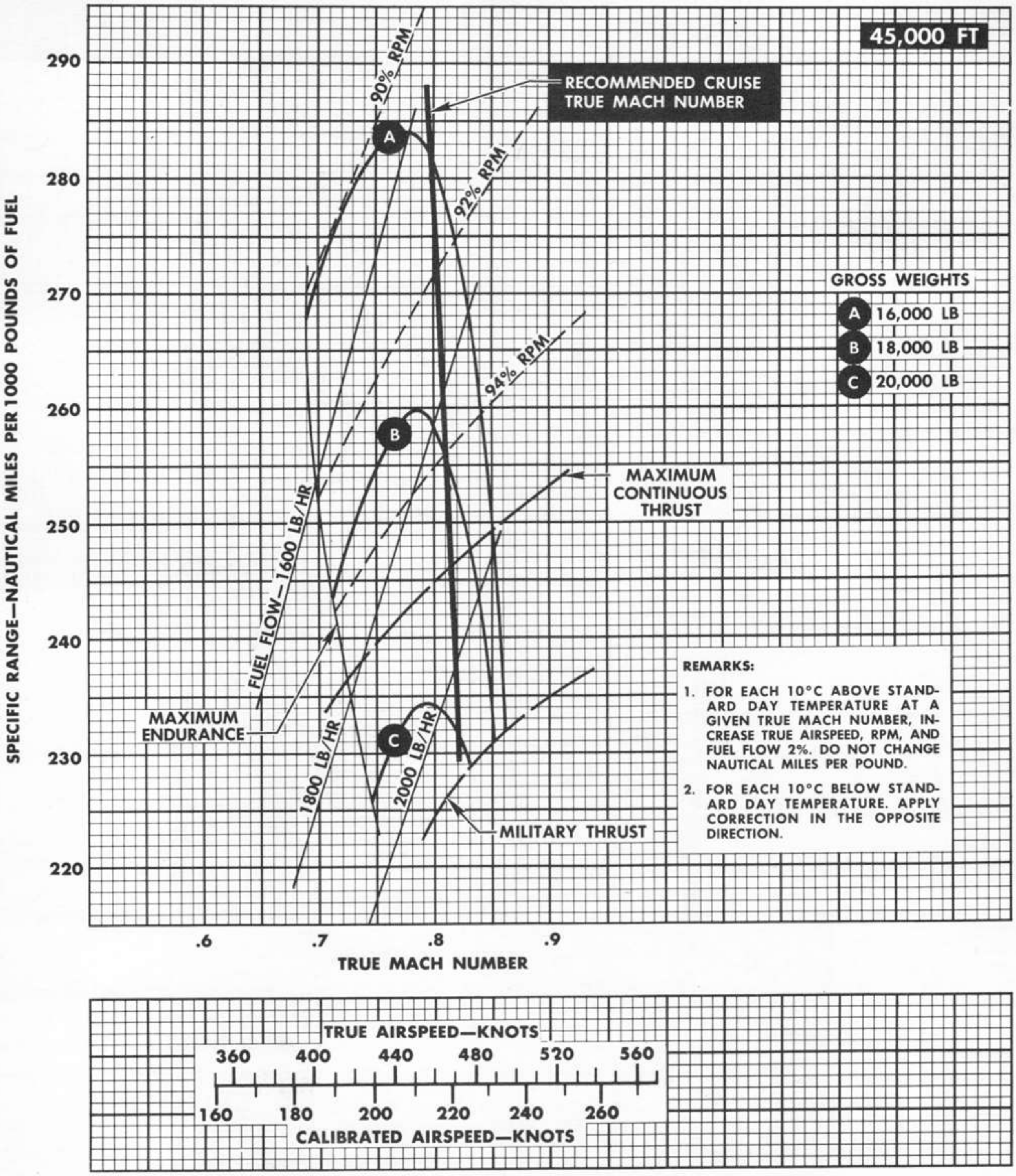
Figure A-86

NAUTICAL MILES PER POUND OF FUEL

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE -3A, -3D, or -3E

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST

TWO 200-GALLON DROP TANKS plus TWO 750-POUND NAPALMS



REMARKS:

1. FOR EACH 10°C ABOVE STANDARD DAY TEMPERATURE AT A GIVEN TRUE MACH NUMBER, INCREASE TRUE AIRSPEED, RPM, AND FUEL FLOW 2%. DO NOT CHANGE NAUTICAL MILES PER POUND.
2. FOR EACH 10°C BELOW STANDARD DAY TEMPERATURE. APPLY CORRECTION IN THE OPPOSITE DIRECTION.

F-86H-1-93-244A

Figure A-87

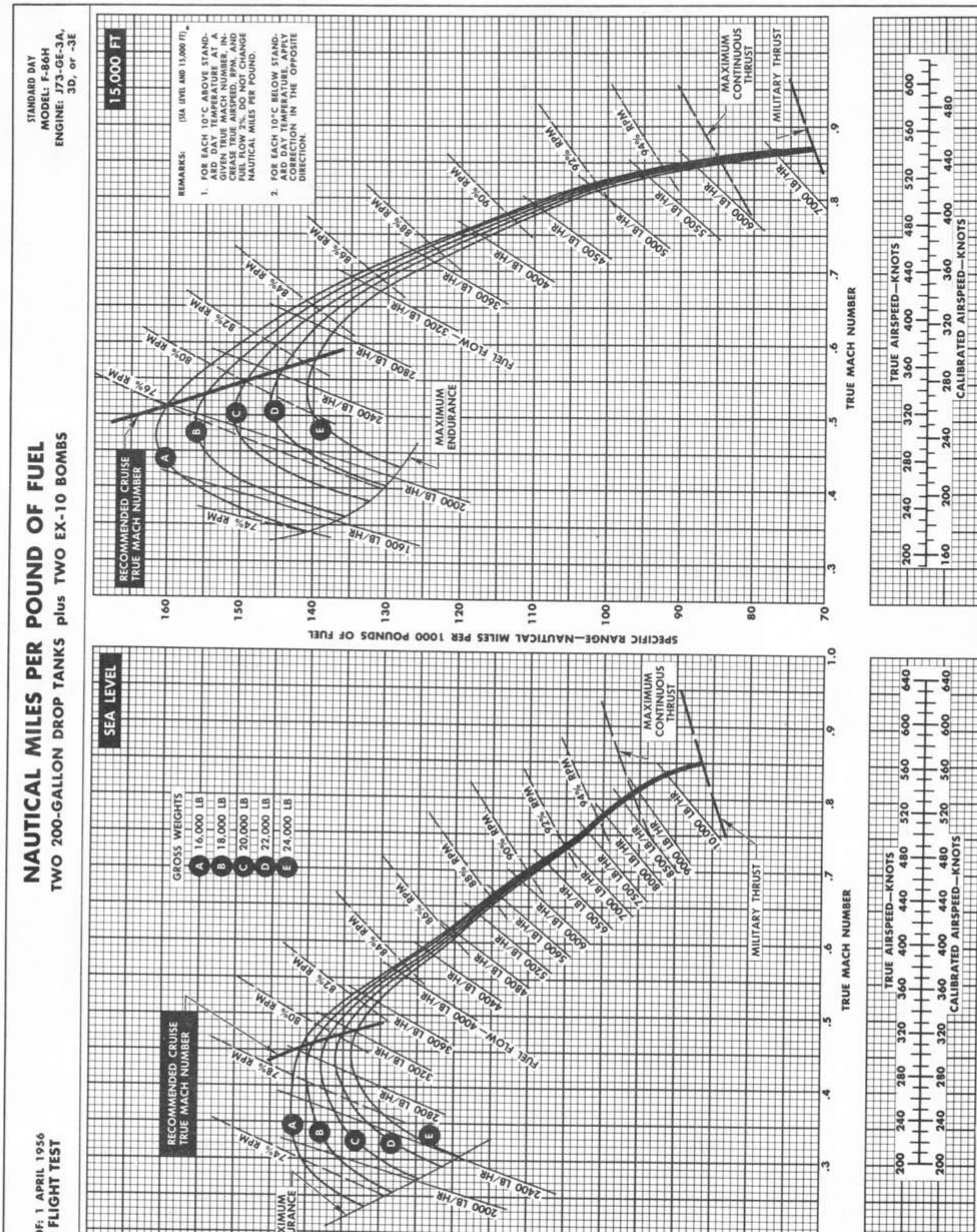

NAUTICAL MILES PER POUND OF FUEL
TWO 200-GALLON DROP TANKS plus TWO EX-10 BOMBS
STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, 3D, or -3E
DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST
15,000 FT
SEA LEVEL
REMARKS: (SEA LEVEL AND 15,000 FT)
1. FOR EACH 10°C ABOVE STANDARD DAY TEMPERATURE AT A GIVEN TRUE MACH NUMBER, INCREASE TRUE AIRSPEED, RPM, AND FUEL FLOW 2%. DO NOT CHANGE NAUTICAL MILES PER POUND.
2. FOR EACH 10°C BELOW STANDARD DAY TEMPERATURE, APPLY CORRECTION IN THE OPPOSITE DIRECTION.
GROSS WEIGHTS
A 16,000 LB
B 18,000 LB
C 20,000 LB
D 22,000 LB
E 24,000 LB
RECOMMENDED CRUISE TRUE MACH NUMBER
MAXIMUM ENDURANCE
MAXIMUM CONTINUOUS THRUST
MILITARY THRUST
FUEL FLOW—3200 LB/HR
FUEL FLOW—4000 LB/HR
SPECIFIC RANGE—NAUTICAL MILES PER 1000 POUNDS OF FUEL
TRUE MACH NUMBER
TRUE AIRSPEED—KNOTS
CALIBRATED AIRSPEED—KNOTS
F-86H-1-93-215A

Figure A-88

DATA AS OF: 1 APRIL 1956
BASED ON: **FLIGHT TEST**

NAUTICAL MILES PER POUND OF FUEL

TWO 200-GALLON DROP TANKS plus TWO EX-10 BOMBS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, 3D, or -3E

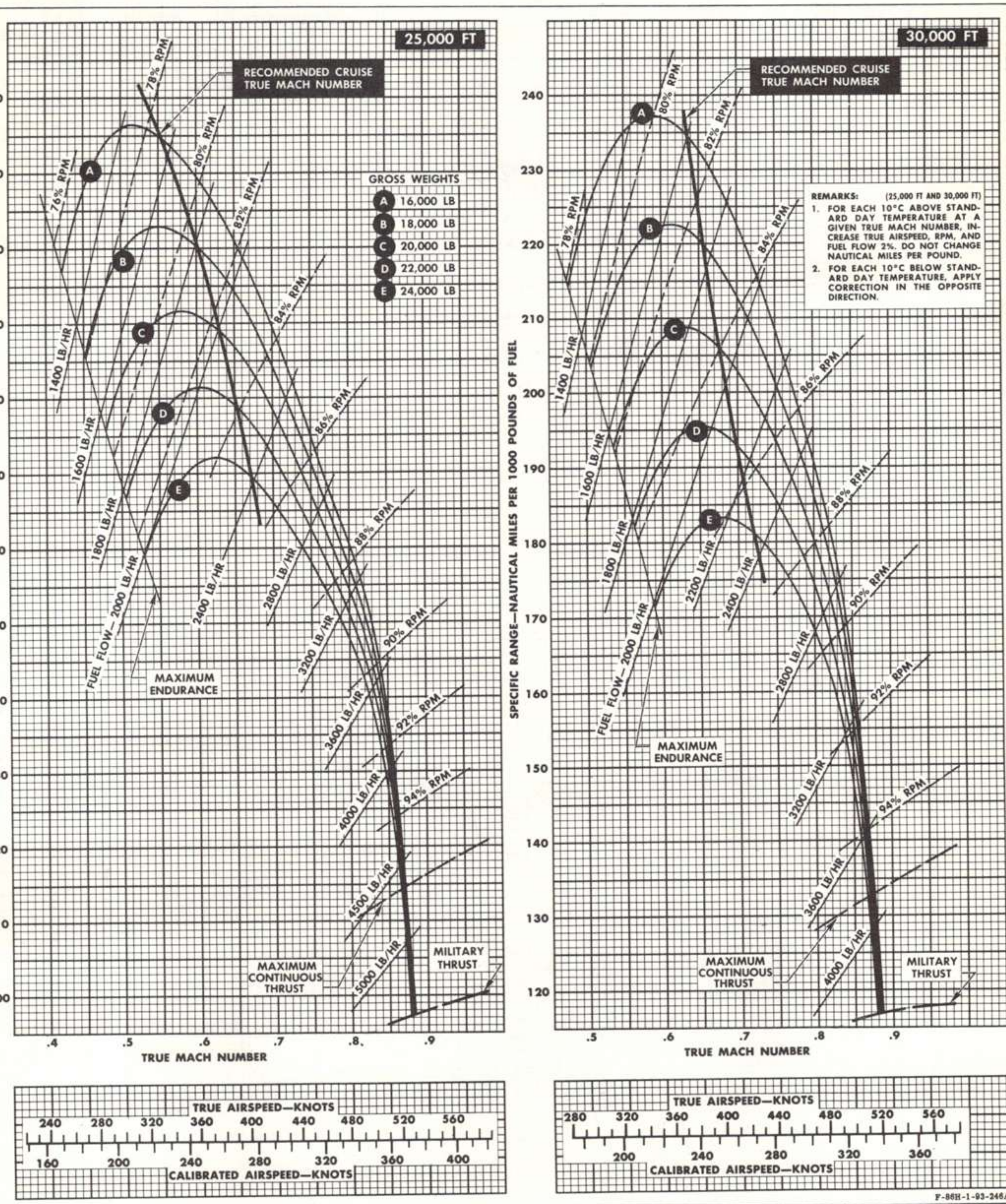


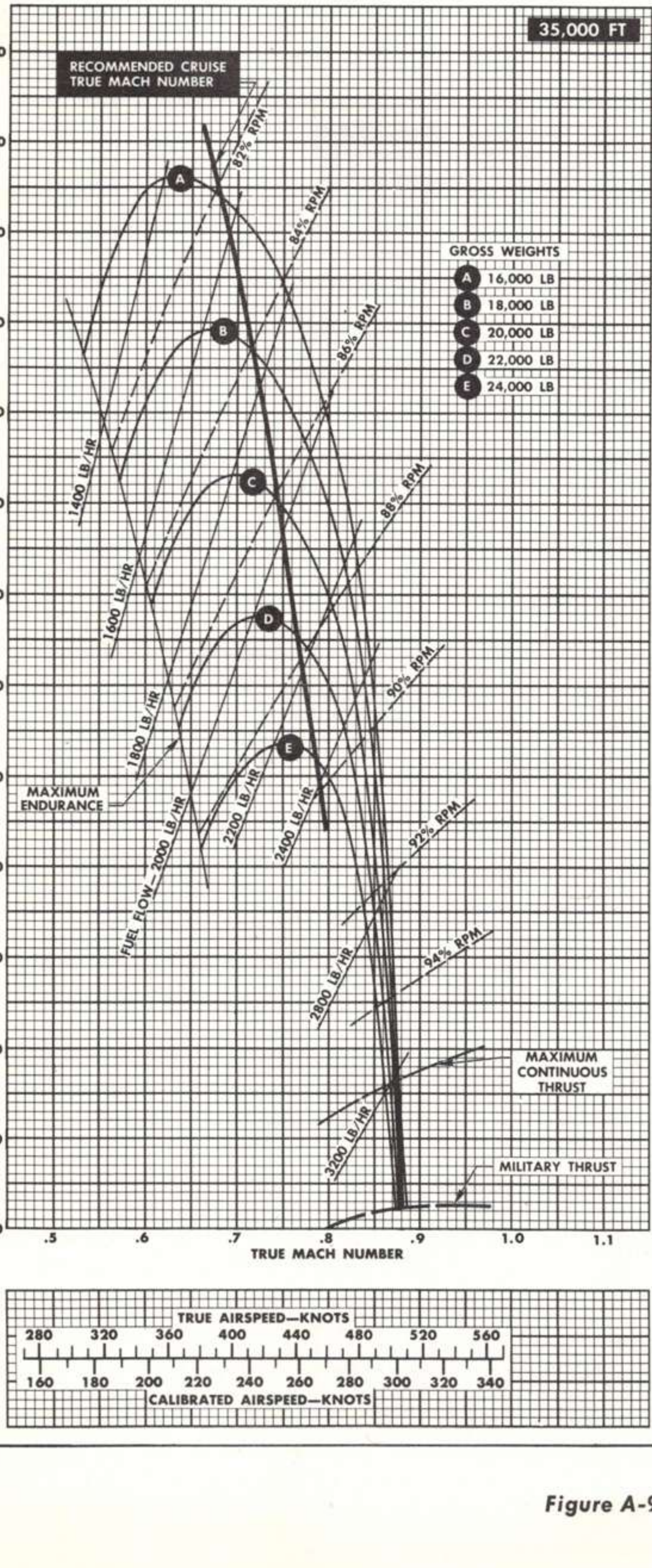
Figure A-89

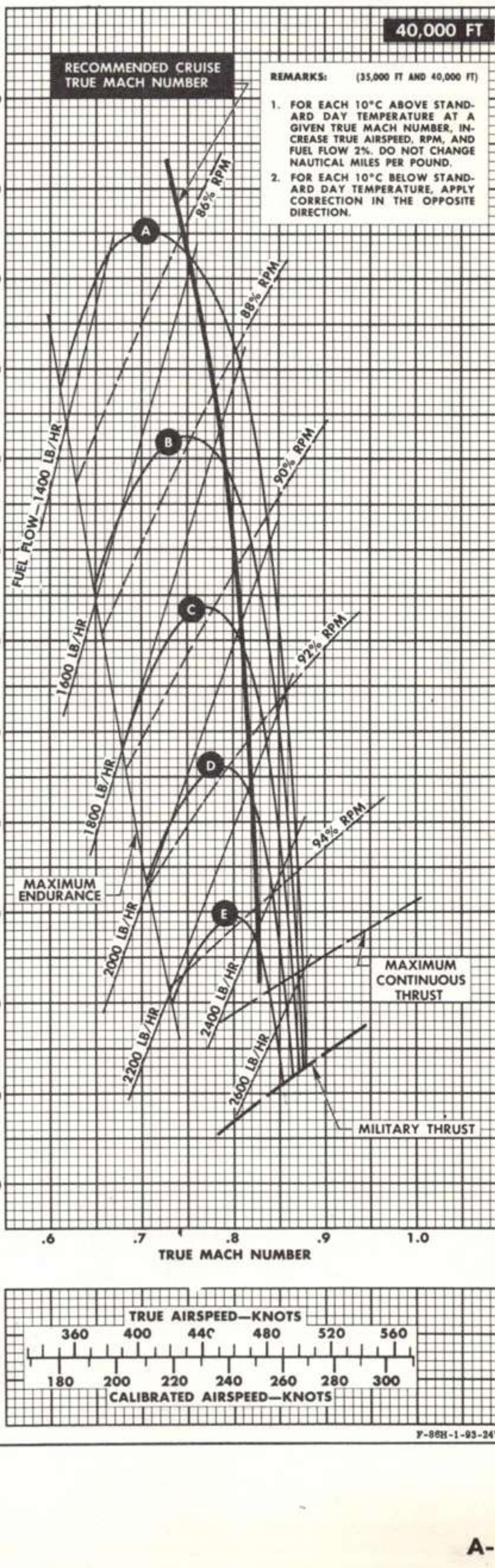
DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST

NAUTICAL MILES PER POUND OF FUEL

TWO 200-GALLON DROP TANKS plus TWO EX-10 BOMBS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE-3A, 3D, or -3E





REMARKS: (35,000 FT AND 40,000 FT)

1. FOR EACH 10°C ABOVE STANDARD DAY TEMPERATURE AT A GIVEN TRUE MACH NUMBER, INCREASE TRUE AIRSPEED, RPM, AND FUEL FLOW 2%. DO NOT CHANGE NAUTICAL MILES PER POUND.
2. FOR EACH 10°C BELOW STANDARD DAY TEMPERATURE, APPLY CORRECTION IN THE OPPOSITE DIRECTION.

F-86H-1-93-247A

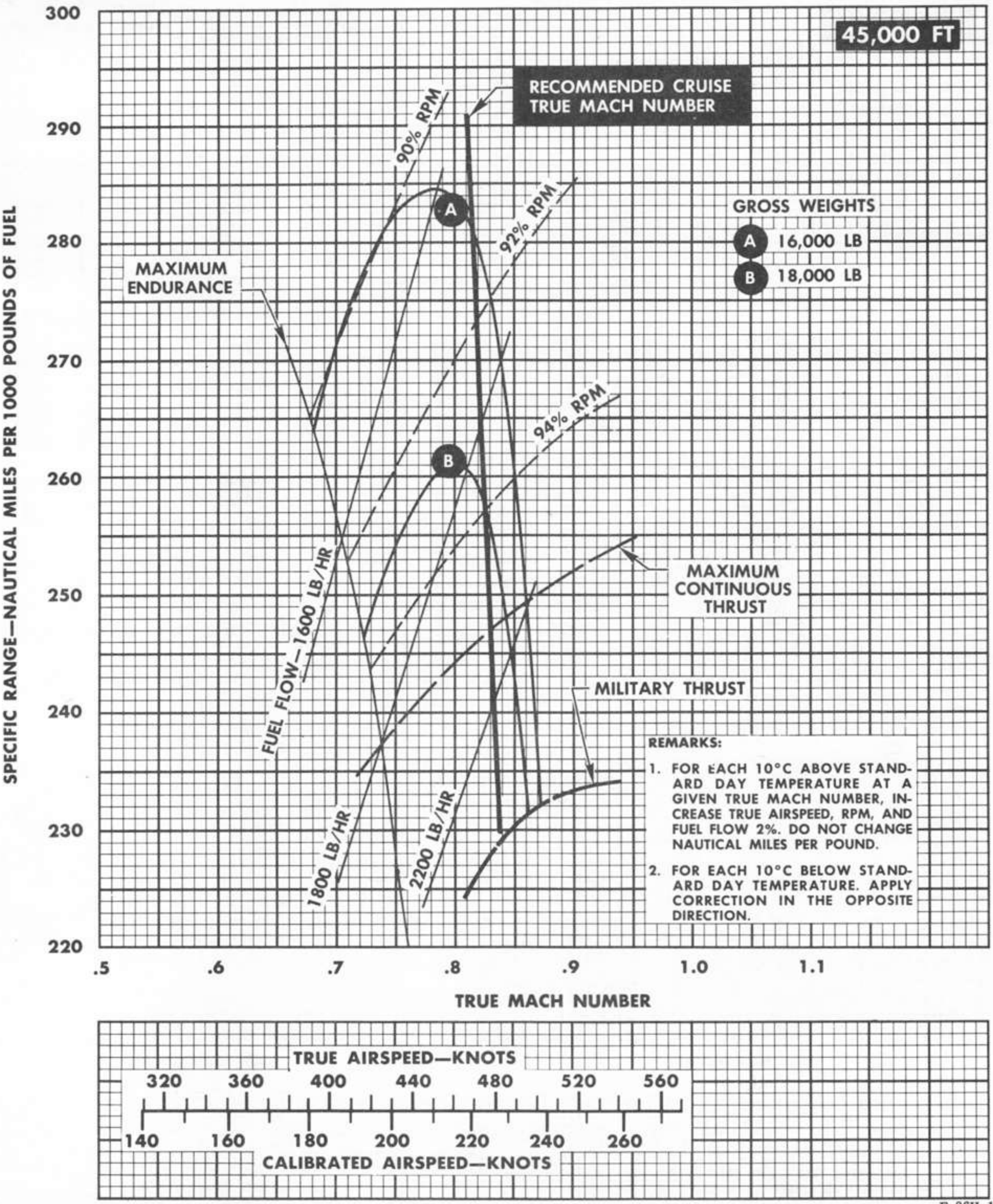
Figure A-90

NAUTICAL MILES PER POUND OF FUEL

TWO 200-GALLON DROP TANKS plus TWO EX-10 BOMBS

STANDARD DAY
MODEL: F-86H
ENGINE: J73-GE -3A, -3D, or -3E

DATA AS OF: 1 APRIL 1956
BASED ON: FLIGHT TEST



REMARKS:

1. FOR EACH 10°C ABOVE STANDARD DAY TEMPERATURE AT A GIVEN TRUE MACH NUMBER, INCREASE TRUE AIRSPEED, RPM, AND FUEL FLOW 2%. DO NOT CHANGE NAUTICAL MILES PER POUND.
2. FOR EACH 10°C BELOW STANDARD DAY TEMPERATURE, APPLY CORRECTION IN THE OPPOSITE DIRECTION.

F-86H-1-93-248A

Figure A-91