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1 Sept. 1954 Revision entered 12 May 1955

Flight Handbook

NAVY MODEL

AD-6

AIRCRAFT

THIS PUBLICATION SUPERSEDES AN 01-40ALF-1
DATED 15 OCTOBER 1953

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AD-6

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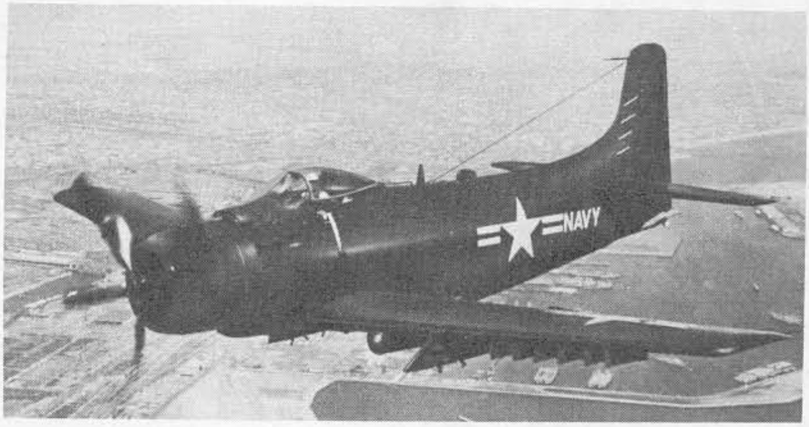

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TABLE OF CONTENTS

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IMPORTANT

In order to gain the maximum benefits from this handbook, it is imperative that you read this page carefully.

FOREWORD

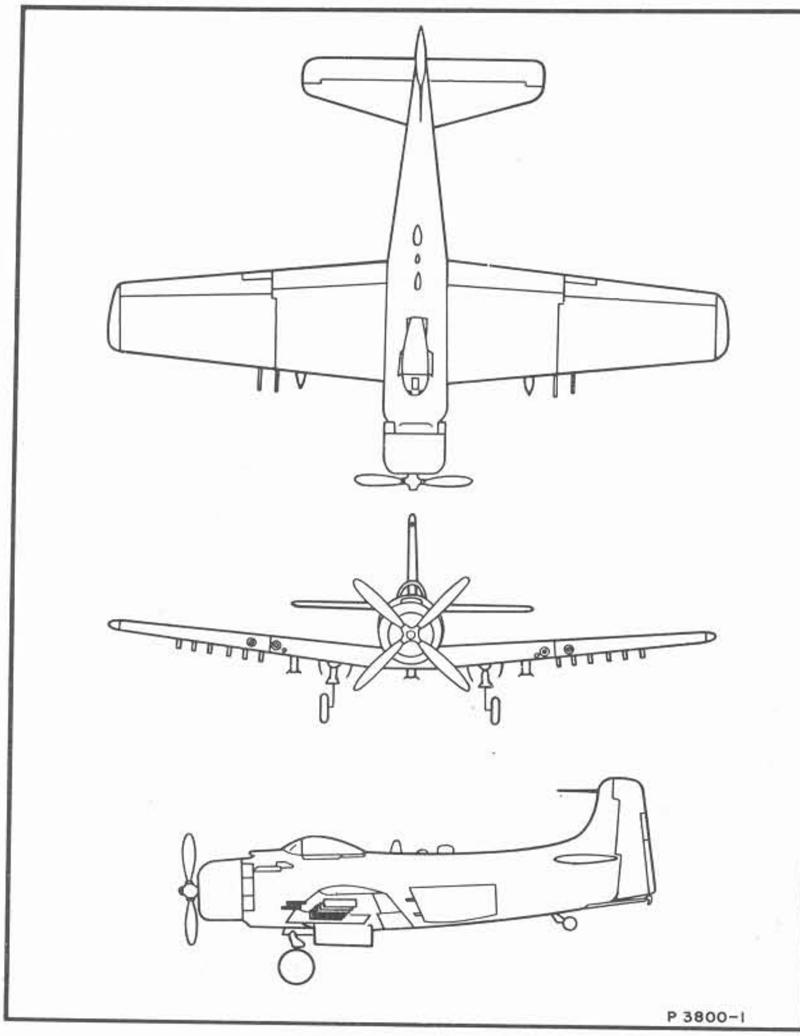
This handbook is written as a text for the pilot for immediate study and later reference, in order that he may gain complete familiarity with the airplane he is assigned to fly. As complete a picture as practicable of the basic structure and installations of the airplane along with the fundamental operating procedures involved is included. It is not the function of the handbook to teach the pilot how to fly the airplane, as it is assumed he is competent in this matter. However, the handbook contains information regarding behavior peculiar to the aircraft in various conditions of flight and ground operation.

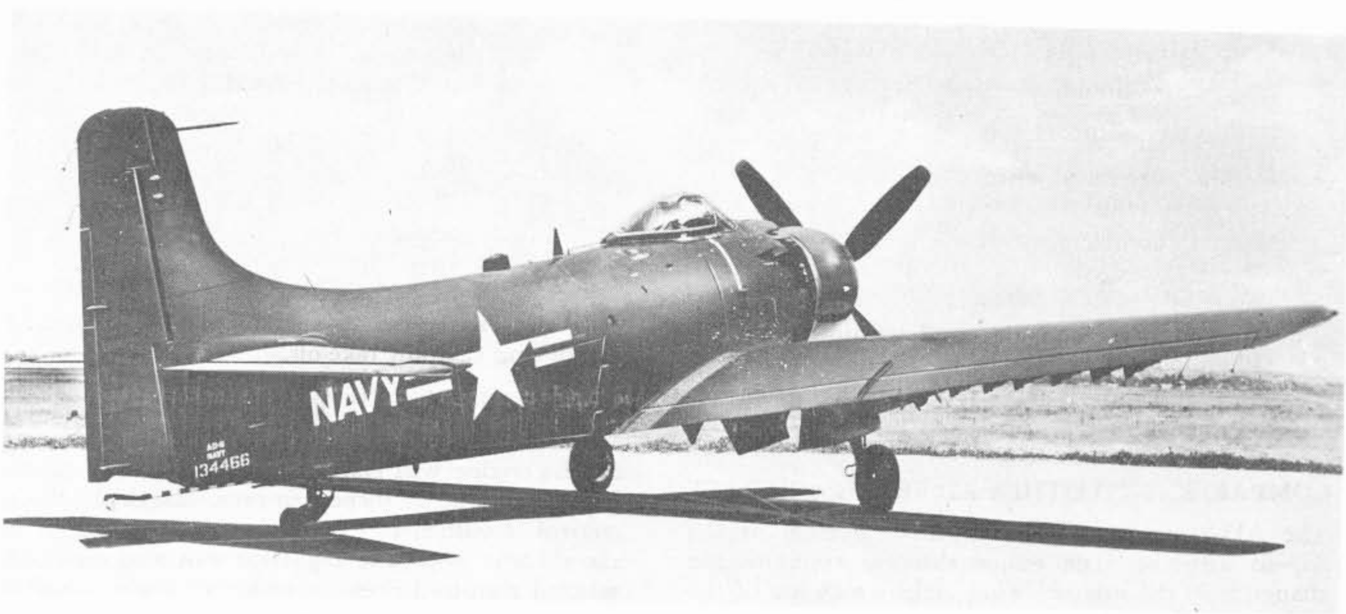
The handbook is divided into nine sections. An Appendix, containing supplementary operating data for the aircraft, is included. Sections I, II and III are closely interrelated and contain complete information relative to the physical act of flying the airplane. Section I provides a complete description of the aircraft and its systems, instruments and controls. Emergency equipment that is not a part of an auxiliary system is also described. Section II contains information for the normal operation of the airplane and describes all procedures to be accomplished by the pilot from the time the aircraft is approached until it is left parked on the flight line after completing one non-tactical flight under ordinary conditions. Section III describes the procedures to be followed in meeting any emergency, except those in connection with auxiliary equipment, that could reasonably be expected to be encountered.

Section IV contains the description and operation of all auxiliary equipment which does not actually contribute to flight but enables the aircraft to perform specialized functions. All limitations and restrictions that must be observed during normal operation are discussed in Section V, while Section VI attempts to evaluate any unusual flight characteristics both advantageous and disadvantageous, that the aircraft may possess. A discussion relative to the operation of the various systems in the airplane is contained in Section VII. Section VIII is not applicable to this airplane. Finally, Section IX consists of instructions for operating the aircraft under all weather conditions including instrument flight. It should be noted that the information in this handbook will be kept current by frequent revisions. Since, however, a slight delay in the dissemination of revision material is to be expected, it is imperative that flight crews stay abreast of pertinent technical directives which frequently cover critical flight restrictions or new techniques involved in operation of the aircraft.

In order to make the text as specific as possible, the nomenclature used to identify controls and other equipment is identical wherever possible to that used in the airplane itself. Such nomenclature is capitalized. Also capitalized, and enclosed in quotation marks, are the control positions as they are identified in the aircraft. For example, 'The COWL FLAP switch is spring-loaded in the "OPEN" or "CLOSE" position and returns to "OFF" when released.

An alphabetical index by subject material appears in the back of the book.





Model AD-6 Airplane
Figure 1-1. Airplane Recognition

SECTION I

DESCRIPTION

THE AIRCRAFT

The Model AD-6 airplane is a low wing, all metal, single engine, single-place attack land plane, manufactured by Douglas Aircraft Company, Inc., El Segundo, California. Three dive brakes are installed, one on each side and one on the bottom of the fuselage, aft of the wing trailing edge. The airplane is equipped for catapult take-offs and arrested landings. Four 20-mm cannons are installed in the wings with provisions for 200 rounds of ammunition for each cannon. Six rocket launchers are installed under each outer wing panel. Each inboard wing bomb rack is capable of carrying one 2000 pound bomb or one MK 13-3 torpedo, while the center line bomb rack has a maximum capacity of 3600 pounds. The airplane is equipped with an autopilot and instrumentation for all weather operations. For general arrangement of the airplane, see figure 1-2.

DIMENSIONS

The principal three-point dimensions and the weight of the airplane are as follows:

Length	39′ 2 3/4″
Span (wings spread)	50′ 1/4″
Span (wings folded)	23′ 11 1/8″
Height (maximum propeller)	15′ 8″
Height (over folded wings)..	16′ 7 5/8″
Height (maximum during wing folding)	19′ 4 7/8″
Weight (normal gross)	17,982 lbs.

Note

The weight as given above is determined with 380 gallons (2280 pounds) of fuel aboard and one 2000 pound bomb attached to the center line bomb rack.

COMPARISON TO OTHER AD SERIES AIRCRAFT

The AD-6 airplane is an improved version of the AD-4B airplane. The major external configuration change is in the inboard wing racks which are of the pylon type extending a greater distance below the wing and slanting forward from the leading edge of the wing. A jettisonable canopy is incorporated. The arresting hook is raised hydraulically while on earlier AD series airplanes it is raised manually. The front bank oil pressure gage has been removed and pressure from the rear bank only is indicated. A marker beacon light is installed, and an improved cockpit and instrument lighting system is incorporated. A radio magnetic course indicator is included in the navigational equipment.

Later aircraft(1) are modified for increased bombing facilities and have an improved instrument panel arrangement. Essential instruments are located near the center of the panel. An elapsed time clock and a non-tumbling gyro horizon are installed. The volt-ammeter is deleted and the G-2 compass, used to govern the ID-250 course indicator, is now installed in back of the instrument panel directly behind the elapsed time clock. The ID-250 radio magnetic indicator is slaved to the G-2 compass and is utilized as the master direction indicator. Provisions are made for installation of a Mk 3 Mod 5 bomb director system and kits are provided for installation of a water injection system. A Mk 20 Mod 4 gunsight(2) replaces the former gunsight installation. Prior aircraft are being reworked by service change to accomplish the foregoing modifications.

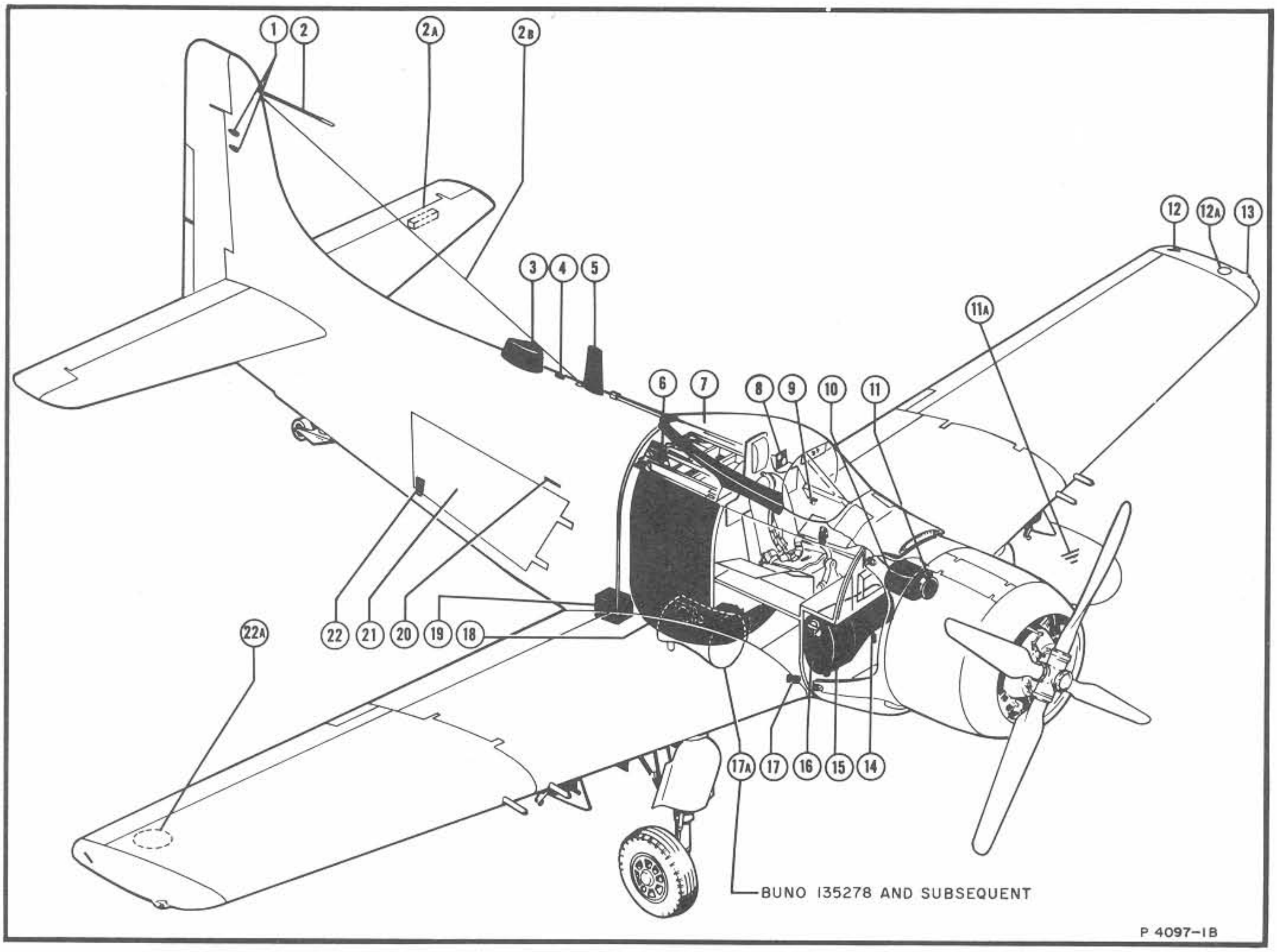
POWER PLANT

The engine, rated at 2700 horsepower at take-off, is a twin row, radial type, air cooled 18 cylinder Wright Model R-3350-26WA engine with a single stage, two speed supercharger. The engine is equipped with a Stromberg PR58U1 carburetor and a spinner injection system. The lubrication system is a dry sump type, in which oil is supplied under pressure to almost all moving engine parts except the propeller shaft and crankshaft anti-friction bearings. Lubrication to each individual piston and cylinder wall is supplied by jets.

POWER PLANT CONTROLS

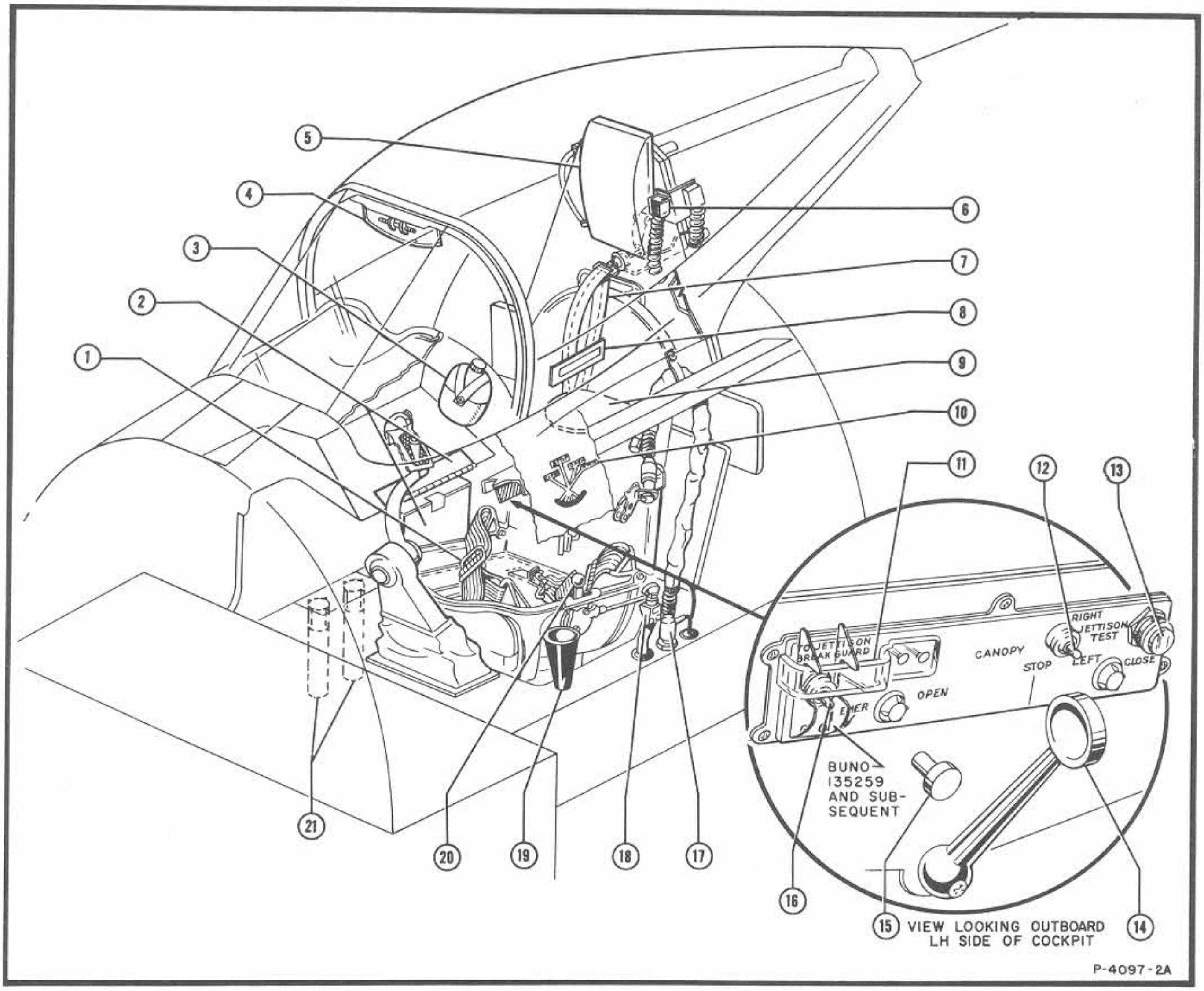
THROTTLE. The throttle control (18, figure 1-3) is located on the left-hand console. A throttle stop, adjusted to indicate the throttle position for take-off manifold pressure, is incorporated in the throttle quadrant. The throttle stop is set to allow engine operation at between 56 and 58 inches Hg during a ground power check. An increase of one inch in manifold pressure can be expected during actual take-off. A microphone

(1) BuNo. 135278 and subsequent.
(2) BuNo. 135223 and subsequent.



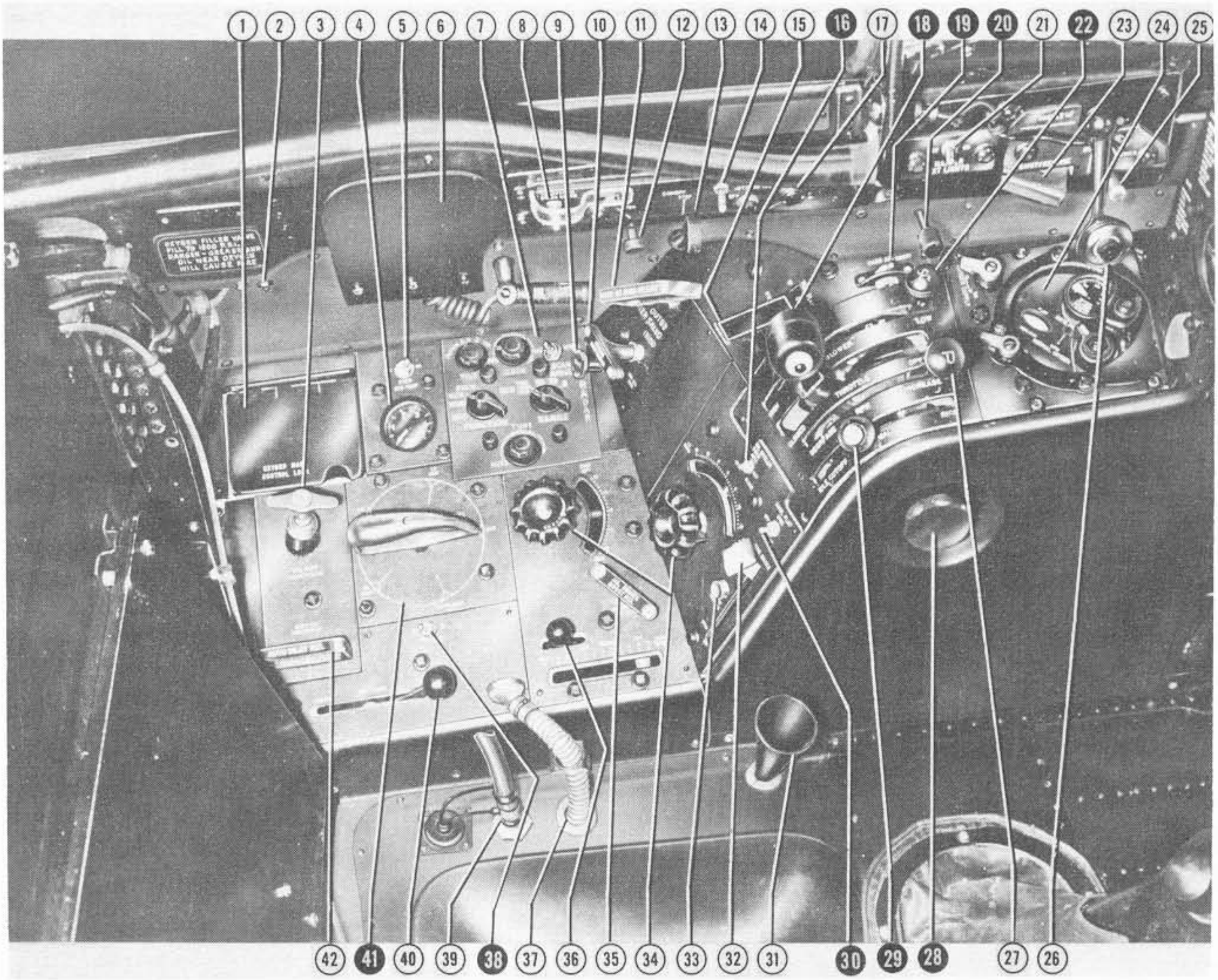
1. Tail position lights
2. Pitot tube — static boom
2A. AN/APN-22 antenna
2B. AN/ARN-6 sense antenna
3. RT-101/ARN-6 antenna housing
4. Fuselage position lights
5. AT-141A/ARC-27A antenna
6. Fuel cell filler
7. Canopy
8. Canopy air bottle pressure gage and filler valve
9. Oxygen filler valve
10. Hydraulic system reservoir and accumulator
11. Hydraulic system reservoir filler
11A. AN/APS-19C radar unit
12. Wing tip formation light
12A. AN/ARN-12 marker beacon receiver antenna
13. Wing tip position light
14. Jack pad container
15. Oil system tank
16. Oil system tank filler
17. External power receptacle
17A. Water injection tank
18. Fuel cell
19. Battery
20. Fuselage formation light
21. Dive brake
22. AS-133/APX-6 IFF antenna
22A. AN/ARA-25 UHF direction finder antenna

Figure 1-2 (Sheet 1 of 2). General Arrangement Diagram



1. Safety belt
2. Map cases
3. Canteen
4. Rear view mirror
5. Headrest
6. Microphone-headset extension
7. Shoulder harness
8. Enclosure handle
9. Arm rest
10. Canopy control (external)
11. Canopy jettison switch guard
12. Canopy jettison test switch
13. Canopy jettison test light
14. Cockpit canopy control
15. Canopy control release plunger
16. Canopy jettison switch
17. Personnel gear receptacle
18. Anti-G disconnect
19. Relief tube
20. Inertia reel control
21. Night drift signals

Figure 1-2 (Sheet 2 of 2). General Arrangement Diagram



1. Stowage — Oxygen mask and control lock
2. Oxygen filler valve
3. Hydraulic emergency by-pass valve control
4. Hydraulic system pressure gage
5. Emergency hydraulic pump switch
6. Arm rest
7. Radar set control C 1184/APS-19C
8. Canopy jettison switch
9. Center wing bomb release lock (or) Centerline bomb rack lock*
10. Center wing bomb release
11. Outboard wing bomb release
12. Canopy control release plunger
13. Canopy control
14. Canopy jettison test switch
15. Wing flap control
16. Oil cooler door control switch
17. Canopy jettison test light
18. Throttle control and microphone switch
19. Carburetor air switch
20. Throttle static grip
21. Master exterior light switch
22. Supercharger control
23. Landing gear safety control lock
24. Oxygen regulator panel
25. Landing gear control release plunger
26. Landing gear control
27. Propeller control
28. Engine controls friction lock
29. Mixture control
30. Cowl flap control switch
31. Relief tube
32. Dive brake control
33. Dive brake solenoid safety release
34. Trim tab controls
35. Aileron power boost release
36. Horizontal stabilizer control
37. Anti-G receptacle
38. Fuel boost pump switch
39. Personnel gear disconnect
40. Tail wheel lock control
41. Fuel tank selector
42. Automatic pilot emergency release

*BuNo. 134582 and subsequent.

Figure 1-3. Cockpit — L.H. Side

switch incorporated on the inboard end of the throttle control is depressed for radio transmission. A throttle static grip, installed directly forward of the control quadrant, can be extended from within its bracket for use during catapult take-off.

AUTOMATIC MANIFOLD PRESSURE REGULATOR. An automatic manifold pressure regulator on the engine will restrict take-off manifold pressure (without water injection) between 56 and 59 inches Hg even though the throttle control is pushed to its full forward position beyond the throttle stop. The regulator will also maintain a selected manifold pressure under all flight conditions and will reset manifold pressure when changing supercharger speeds. Because the regulator maintains a constant selected manifold pressure, icing within the engine induction system will not be revealed by a drop in manifold pressure.

MIXTURE CONTROL. The mixture control lever (29, figure 1-3) located on the left-hand console, has "IDLE CUTOFF," "NORMAL," and "RICH" positions. There are detents on the control quadrant at "RICH" and "NORMAL" positions. These detents prevent the mixture control from being moved toward the "IDLE CUTOFF" position without first depressing a spring-loaded button installed in the mixture control lever.

CONTROL FRICTION LOCK. A knob on the inboard side of the control quadrant (28, figure 1-3) can be adjusted to increase friction on the throttle and propeller controls thus eliminating any "creeping" of the two controls.

CARBURETOR AIR. The carburetor air door is electrically operated and is controlled by a switch (19, figure 1-3) on the left-hand console. Switch positions are "DIRECT" and "ALT." When the carburetor air switch is placed in the "ALT" position, warm (non-ram) air from the engine accessory section is directed to the carburetor.

CARBURETOR AIR TEMPERATURE INDICATOR. An air temperature indicator (20, figure 1-4), located on the instrument panel, normally indicates carburetor air temperature. Outside air temperature is obtained from the same indicator by selecting the "FREE AIR" position of the associated momentary contact switch.

SUPERCHARGER. The supercharger control (22, figure 1-3), located on the control quadrant just outboard of the throttle control, has "LOW" and "HIGH" blower positions.

WATER INJECTION.(1) Aircraft having a water injection system installed are provided with a WATER INJECTION master switch on the left-hand side of the instrument panel (32A, figure 1-4, sheet 2). The water injection system is controlled by the throttle after the master switch is turned on. When the throttle is moved beyond contact with the take-off power stop, the water injection pump is turned on. A 20-gallon tank supplies fluid for approximately ten minutes of operation, depending upon power settings and other related factors. The tank filler is located in a well above the right-hand wing root. Kits are provided for installations in prior aircraft by service change.

(1) BuNo. 135278 and subsequent.

COWL FLAPS. The cowl flaps are electrically operated and are controlled by a three position momentary contact switch (30, figure 1-3) on the left-hand console. The switch is moved to "OPEN" or "CLOSE" for operation of the cowl flaps and automatically returns to "OFF" when released, thus maintaining the cowl flaps in any selected position.

NOSE FLAPS. Nose flaps are installed in addition to normal cowl flaps to reduce the cooling airflow during cold weather operations. The nose flaps are actuated by the COWL FLAPS switch in a sequence controlled by a limit switch arrangement. The nose flaps open first, and at their full open position, the cowl flaps open. Closing of the cowl flaps and nose flaps is the reversal of the opening sequence. An indicator, visible from the cockpit, is mechanically linked to the nose flaps and extends upward through the anti-drag ring to the right of the top centerline when the nose flaps are closed. The landing gear retraction release switch is attached to the left-hand landing gear telescoping mechanism in such a manner that whenever the weight of the airplane is on the landing gear, the nose flaps, and subsequently, the cowl flaps, extend to the full open position.

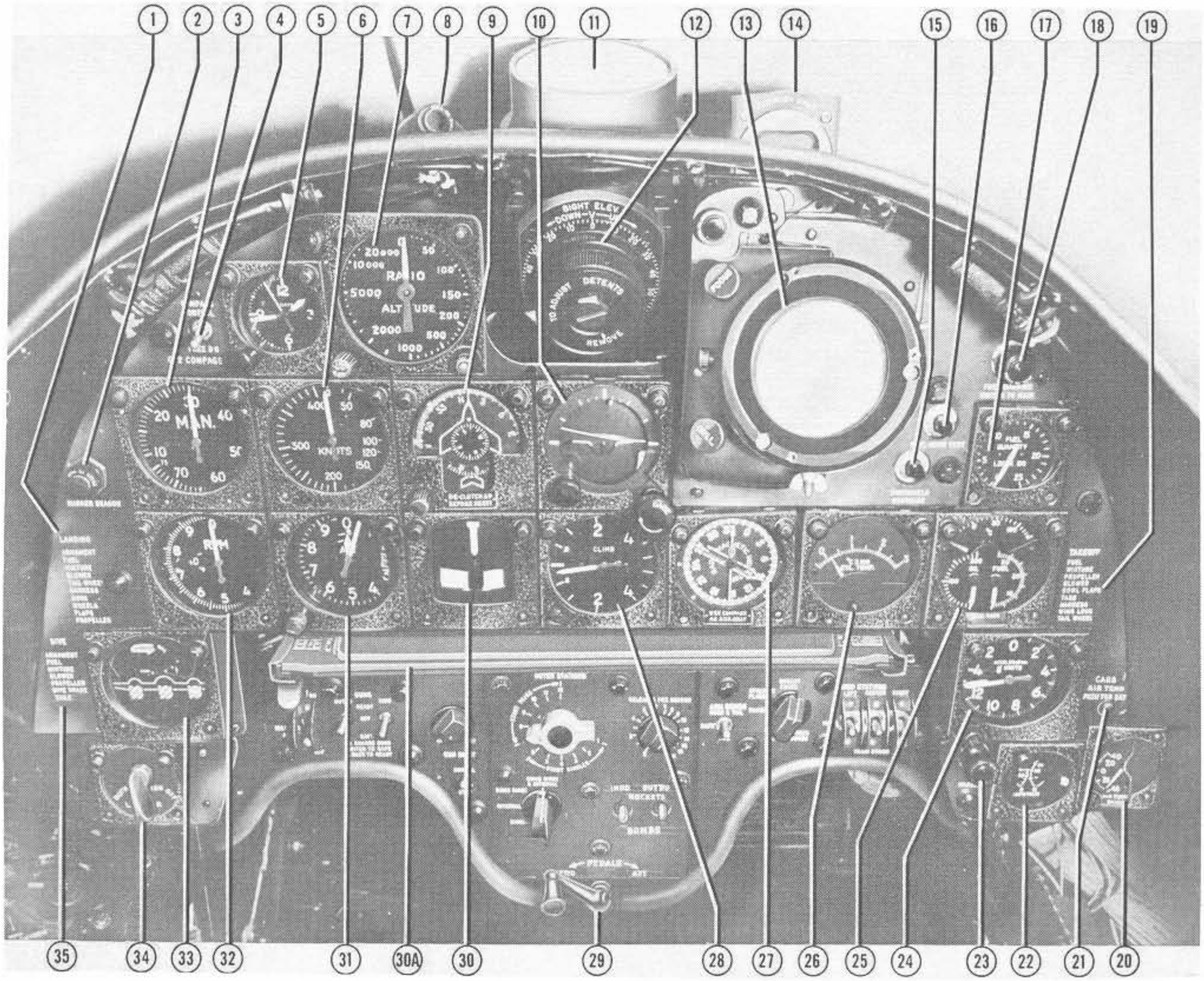
IGNITION. Ignition for the R3350-26WA engine is furnished by a dual magneto (Scintilla type DF18LN-2), providing true double ignition from a single unit. The ignition switch (34, figure 1-4) is located on the lower left-hand side of the instrument panel.

PRIMER. An engine priming valve is attached to the aft side of the carburetor. Fuel flows directly from the pressure side of the carburetor into the priming valve, and then through three lines to the blower case of the engine. The engine is primed by building up pressure with the fuel booster pump and then operating the PRIMER switch (8, figure 1-5) located on the right-hand console.

STARTER. The starter is the direct cranking electric type and is controlled by a switch (7, figure 1-5) located on the right-hand console.

PROPELLER

The airplane is equipped with an Aeroproducts A642-G804/M20A2-162-0 constant speed, hydraulically actuated, variable pitch propeller, 13 feet 6 inches in diameter. The propeller pitch control lever (27, figure 1-3), located on the throttle quadrant, has the indicated



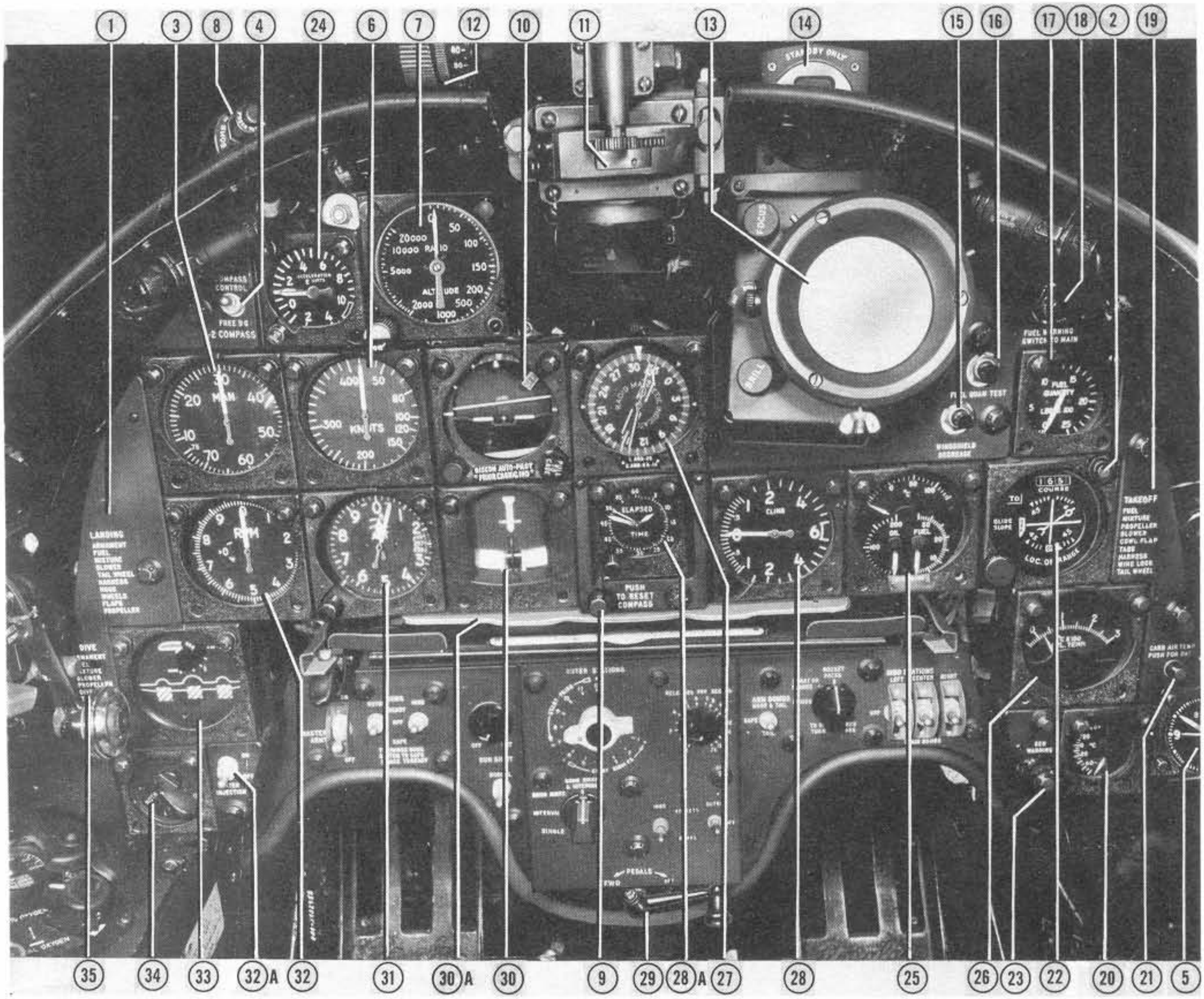
Airplanes prior to BuNo. 135278

1. Landing check list
2. Marker beacon
3. Manifold pressure gage
4. G-2 compass control switch
5. Clock
6. Airspeed indicator
7. AN/APN-22 radar altimeter
8. Bomb director indicator
9. G-2 compass
10. Gyro-horizon indicator
11. Gunsight
12. Sight elevation control
13. Search radar scope
14. Standby compass
15. Windshield degrease
16. Fuel quantity test switch
17. Fuel quantity indicator
18. Fuel pressure warning light
19. Take-off check list
20. Carburetor air — free air temperature indicator
21. Outside air temperature switch
22. Volt-ammeter
23. Generator warning light
24. Accelerometer
25. Engine gage unit
26. Cylinder head temperature indicator
27. Radio magnetic (course) indicator
28. Rate of climb indicator
29. Rudder pedal adjustment crank
30. Turn and bank (air driven) indicator

30A. Mk 6A chartboard (R-88-B-645)

31. Altimeter
32. Tachometer
33. Wheels and flaps position indicator
34. Ignition switch
35. Dive check list

Figure 1-4 (Sheet 1). Instrument Panel



Airplanes BuNo. 135278 and subsequent

1. Landing check list
2. Marker beacon light [1]
3. Manifold pressure gage
4. G-2 compass control switch
5. Eight-day clock
6. Airspeed indicator
7. AN/APA-22 radar altimeter
8. Bomb director indicator
9. G-2 compass caging knob
10. Gyro-horizon indicator
11. Gunsight [2] (see figure 4–3A)
12. Sight elevation control
13. Search radar scope
14. Standby compass
15. Windshield degrease
16. Fuel quantity test switch
17. Fuel quantity indicator
18. Fuel pressure warning light
19. Take-off check list
20. Carburetor air-free air temperature indicator
21. Outside air temperature switch
22. ID-249 radio course indicator [3]
23. Generator warning light
24. Accelerometer
25. Engine gage unit
26. Cylinder head temperature indicator
27. Radio magnetic (course) indicator
28. Rate of climb indicator

28A. Elapsed time clock

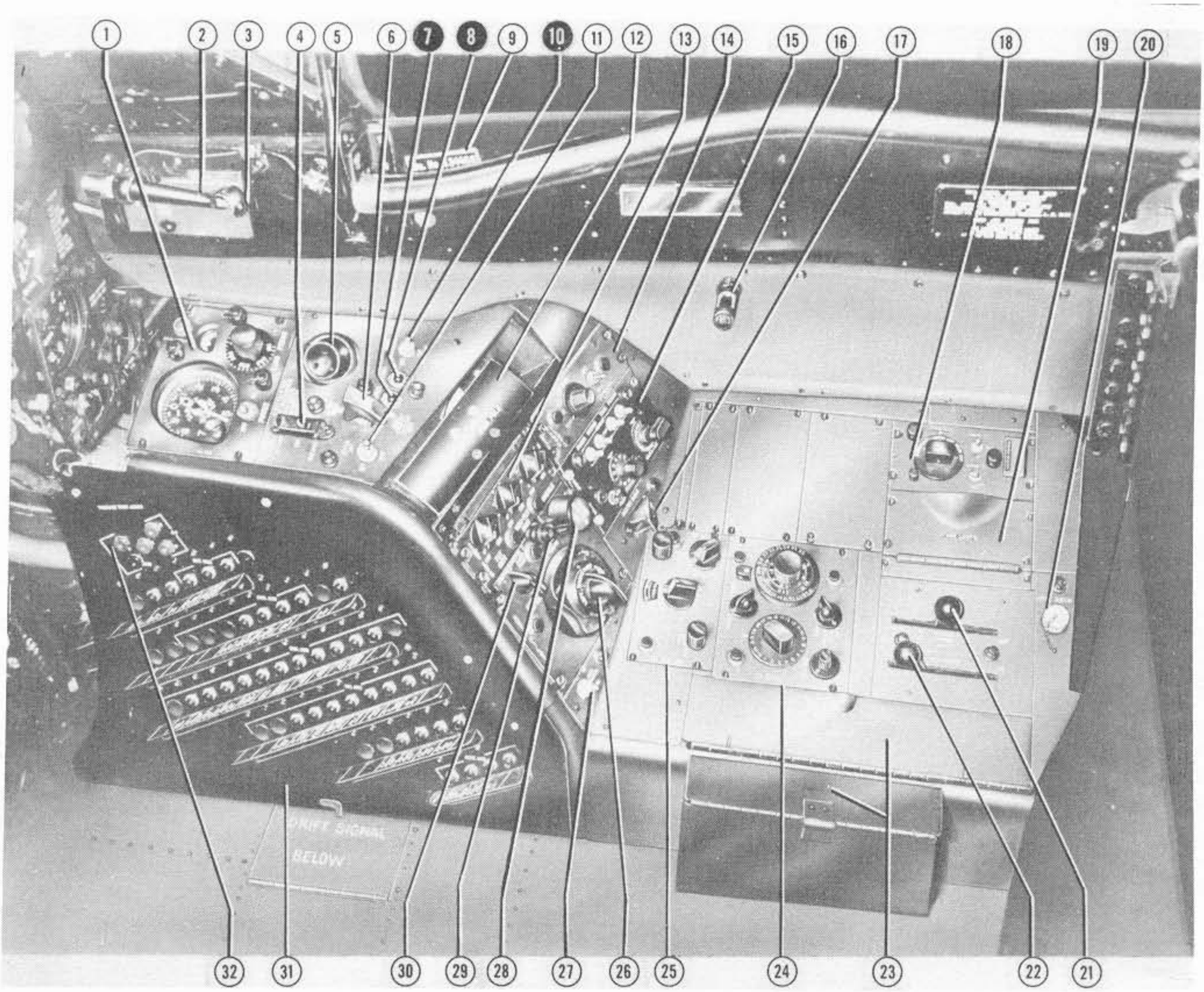
29. Rudder pedal adjustment crank
30. Turn and bank (air driven) indicator
31. Altimeter
32. Tachometer

32A. Water injection switch

33. Wheels and flaps position indicator
34. Ignition switch
35. Dive check list

[1] BuNo. 135382 and subsequent.
[2] BuNo. 135223 and subsequent.
[3] Provisions for installation only.

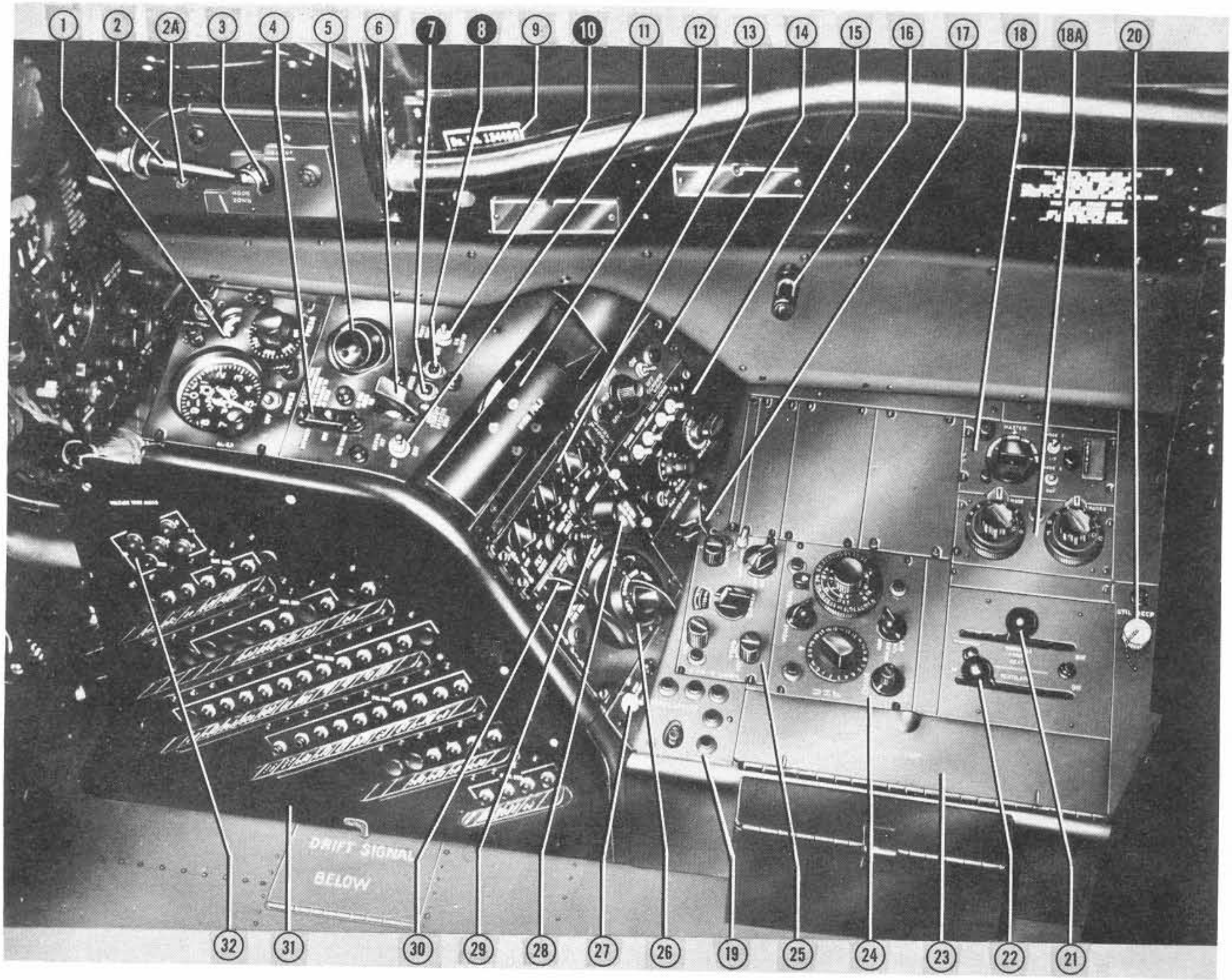
Figure 1-4 (Sheet 2). Instrument Panel



Airplanes prior to BuNo. 135258

1. Bomb director panel
2. Arresting hook control
3. Arresting hook control light
4. Battery-generator switch
5. Ventilating air outlet
6. A-c generator field switch
7. Engine starter switch
8. Engine primer switch
9. Airplane bureau number
10. Pitot heat — Oil dilution switch
11. A-c power selector switch
12. Wing fold control
13. Interior lights control panel
14. Flood light control panel
15. Exterior lights control panel
16. Cockpit utility light
17. Master radio switch
18. C-629/APX-6 control panel
19. Spare lamps stowage
20. Utility receptacle
21. Heat control
22. Ventilator control
23. Map cases
24. C-1015/ARC-27A control panel
25. AN/ARN-6 control panel
26. Automatic pilot controller
27. Seat adjustment switch
28. Automatic pilot clutch switch
29. Flight instrument power failure warning light
30. Inverter selector switch
31. Circuit breaker panel
32. D-c generator and a-c generator test jacks

Figure 1-5 (Sheet 1). Cockpit — R.H. Side



Airplanes BuNo. 135258 and subsequent

1. Bomb director panel
2. Arresting hook control
2A. Arresting hook positive latch [1]
3. Arresting hook control light
4. Battery-generator switch
5. Ventilating air outlet
6. A-c generator field switch
7. Engine starter switch
8. Engine primer switch
9. Airplane bureau number
10. Pitot heat-oil dilution switch
11. A-c power selector switch
12. Wing fold control
13. Interior lights control panel
14. Flood light control panel
15. Exterior lights control panel
16. Cockpit utility light
17. Master radio switch
18. C-629/APX-6 control panel
18A. C-1272/APA-89 control panel [2]
19. Spare lamps stowage [2]
20. Utility receptacle
21. Heat control
22. Ventilator control
23. Map cases
24. C-1015/ARC-27A control panel
25. AN/ARN-6 control panel [3]
26. Automatic pilot controller
27. Seat adjustment switch
28. Automatic pilot clutch switch
29. Flight instrument power failure warning light
30. Inverter selector switch
31. Circuit breaker panel
32. D-c generator and a-c generator test jacks

[1] BuNo. 135258 and subsequent.
[2] BuNo. 135304 and subsequent.
[3] BuNo. 135382 and subsequent.

Figure 1-5 (Sheet 2). Cockpit — R.H. Side

FUEL QUANTITY DATA
(GALLONS)

TANKS	USABLE FUEL	UNUSABLE FUEL—LEVEL FLIGHT	EXPANSION SPACE	TOTAL VOLUME
MAIN (FUSELAGE CELL)	377	3	0	380
LH DROP (EXTERNAL AUXILIARY)				
MK12, OR AERO IA	150	*	*	150
AERO IA OR MK8-MOD I	300	*	*	300
CENTER DROP (EXTERNAL AUXILIARY)				
AERO IA	150	*	*	150
AERO IA OR MK 8-MOD I	300	*	*	300
RH DROP (EXTERNAL AUXILIARY)				
MK12, OR AERO IA	150	*	*	150
AERO IA OR MK 8-MOD I	300	*	*	300

REMARKS:

USABLE FUEL TOTALS	GALLONS
FUSELAGE CELL AND 3 SMALL AUXILIARY EXTERNAL TANKS	827
FUSELAGE CELL, 2 SMALL AND I LARGE AUXILIARY EXTERNAL TANK	977
FUSELAGE CELL AND 2 SMALL AUXILIARY EXTERNAL TANKS	677
FUSELAGE CELL AND 2 LARGE AUXILIARY EXTERNAL TANKS	977

*INFORMATION TO BE SUBMITTED WHEN AVAILABLE

P 3804-IA

Figure 1-6. Fuel Quantity Data Table

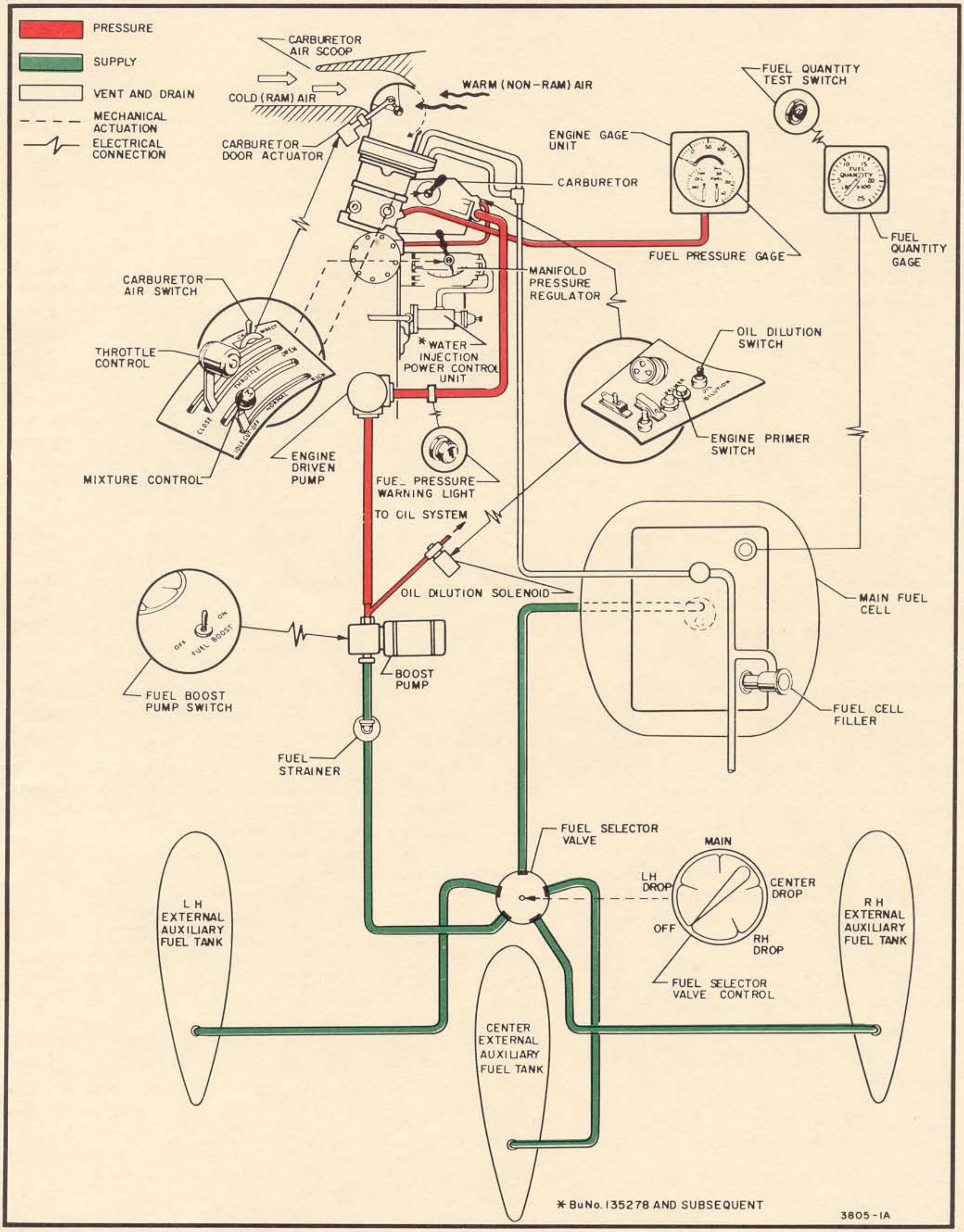


Figure 1-7. Fuel System Diagram

positions "INCREASE" and "DECREASE." With the control lever in the full "INCREASE" position, the take-off rpm should be 2900 ± 15.

OIL SYSTEM

The oil system is automatic in operation. Oil dilution controls are located on the right-hand console. The oil temperature and oil pressure are indicated on the engine gage unit (25, figure 1-4). The oil tank is located forward of the firewall and has a service capacity of 36 U.S. gallons. (See figure 1-12 for oil grade and specification.) The oil tank contains a separate compartment which aids in rapid warm-up during cold starts. A diverter valve facilitates warm-up by returning engine oil with a temperature below 55°C to the warm-up compartment.

OIL DILUTION. Oil dilution is controlled by the OIL DILUTE - PITOT HEAT switch (10, figure 1-5) located on the right-hand console. Moving the switch to "OIL DILUTION" turns on the fuel booster pump to supply fuel under pressure to the oil dilution system, shifts the oil tank diverter valve to the warm-up compartment, and opens the oil dilution solenoid valve.

OIL COOLER DOOR. The oil cooler door is electrically operated and may be set for either automatic or manual operation by the oil cooler door switch (16, figure 1-3) on the left-hand console below the throttle quadrant. Indicated positions are "AUTO," "OPEN," "CLOSE," and "OFF."

FUEL SYSTEM

A 380 gallon (2280 pound) capacity self-sealing fuel cell is provided in the fuselage aft of the cockpit (18, figure 1-2). A MK 12, 150 U.S. gallon (900 pound) capacity or a MK 8 MOD 1, 300 U. S. gallon (1800 pound) capacity external auxiliary fuel tank can be carried on any of the three center wing bomb racks. An Aero 1A, 150 U.S. gallon (900 pound) capacity or an AERO 1A 300 U.S. gallon (1800 pound) capacity tank can be carried on the center wing or outer wing stations. Fuel is selected from any one of the tanks by the tank selector control on the left-hand console. A fuel flow diagram appears in figure 1-7. See figure A-6 for operating limits when using either the normal or the alternate fuel grade. For fuel grades and specifications see figure 1-12.

FUEL TANK SELECTOR. Fuel is selected from any one of the tanks by the fuel tank selector (41, figure 1-3) on the left-hand console. Fuel tank selector positions are labeled "RH DROP," "CENTER DROP," "MAIN," "LH DROP" and "OFF."

FUEL BOOST PUMP. An electrically-driven fuel boost pump is provided and is controlled by a switch (38, figure 1-3) on the left-hand console just inboard of the fuel tank selector. In addition to supplying fuel under pressure to the engine-driven pump, the boost pump also supplies fuel under pressure to the primer and oil dilution systems. The fuel boost pump is turned on automatically by the oil dilution switch.

FUEL PRESSURE WARNING LIGHT. A warning light (18, figure 1-4) mounted on the instrument panel, warns the pilot of loss in fuel pressure. After the pilot changes the fuel tank selector to a tank of greater fuel quantity, the warning light is automatically extinguished after the fuel pressure has been regained. The warning light, labeled FUEL WARNING, is a "push-to-test" type.

FUEL QUANTITY INDICATOR. A "capacitance" type fuel quantity indicating system is provided. The gage (17, figure 1-4), located on the instrument panel, indicates in pounds the quantity of fuel in the main fuel cell. A fuel quantity indicator is not provided for the external auxiliary tanks.

Note

Fuel varies in weight per gallon dependent upon its specific gravity and temperature; therefore, the indication "FULL" does not appear on the indicator dial and the pilot should anticipate variations in the reading when the tank is full.

FUEL QUANTITY INDICATOR TEST SWITCH. A push button switch labeled FUEL QUAN TEST (16, figure 1-4) is mounted on the instrument panel for use in testing the operation of the fuel quantity indicator. When the test switch is pushed in, a "fuel-tank-empty" impulse is fed to the fuel quantity indicator circuit. The fuel quantity indicator will move toward a zero reading, and then will return to the actual fuel quantity indication when the button is released if the indicator is functioning properly.

EXTERNAL TANK MANUAL RELEASE CONTROLS. If the electrically operated release is inoperative the external fuel tanks may be jettisoned by pulling the red CTR. WING BOMB RELEASE handle, located on the left console (10, figure 1-3), to its full travel position.

CAUTION

The red knob marked PULL TO LOCK—CENTER STATION, which is located outboard on the left-hand console (9, figure 1-3), may be pulled to secure the centerline store. Pulling the CTR WING BOMB RELEASE to its full travel position will then jettison the stores on the remaining inner wing stations. (On earlier aircraft[1], the operation of the locking control is reversed. A red knob marked PULL TO LOCK—WING RACKS will secure the two stores on the inner wing stations allowing only the centerline store to be jettisoned. Modification of these aircraft is now in process by service change to install the system first described.)

(1) BuNo. 134581 and prior.

Note

Safety bolts may be inserted on the ground by maintenance personnel to prevent manual jettisoning of the external fuel tanks. Electrical operation is independent of the manual release system and the manual locks do not prevent the tanks from being jettisoned by the electrical release system.

ELECTRICAL SYSTEM

The electrical system of the aircraft is supplied d-c power by a 24-volt 34-ampere hour storage battery and a d-c generator, which delivers a full load of 400 amperes at 30 volts. A-c power is supplied by the a-c generator, delivering a full load of 115 volts, and two inverters. For ground check or starting operation, an a-c and a d-c external power receptacle (17, figure 1-2) are recessed together outboard of the oil cooler door. The d-c external power receptacle and circuit are designed to allow one airplane to supply power to another for starting, through use of a jumper cable. Adjoining the d-c receptacle is a momentary contact switch that must be depressed in order to transfer power during such a starting operation.

D-C- POWER DISTRIBUTION

D-c power distribution is accomplished by means of six major buses; primary, secondary, monitor, battery, armament, and radio bus. Each of these buses has several distribution points or minor buses. The main circuit breaker panel, accessible to the pilot, is located on the right-hand console (see figure 1-9).

PRIMARY BUS. The primary bus, energized when the battery-generator switch is placed in the "BAT ONLY" or "BAT & GEN" position, is supplied power by the battery, the d-c generator, or when external d-c power is connected to the aircraft's external d-c power receptacle.

SECONDARY BUS. The secondary bus is energized by primary bus power when the d-c generator is charging and the battery-generator switch is in the "BAT & GEN" position. In event of d-c generator failure, all loads operating from the secondary bus will be without power as long as the landing gear control is in the "UP" position. The secondary bus can be re-energized with power from the battery by placing the battery-generator switch in "BAT ONLY," or by placing the landing gear control in the "WHEELS DOWN" position.

MONITOR BUS. The monitor bus is energized by primary bus power only when the d-c generator is operating or if external d-c power is connected to the d-c external power receptacle.

BATTERY BUS. The battery bus is always energized when the battery is connected in the aircraft.

ARMAMENT BUS. The armament bus is energized when the primary and secondary buses are energized and the master armament switch is turned "ON." To preclude inadvertent firing of the guns or releasing of external stores during landing, an armament safety circuit is incorporated. An armament safety circuit disabling switch, located in the left wheel well, is provided for energizing the armament bus during ground operation tests.

RADIO BUS. The radio bus is energized when the MASTER RADIO switch (17, figure 1–5) is placed in the "ON" position if the primary and secondary busses are energized.

D-C POWER CONTROLS AND INDICATORS

BATTERY-GENERATOR SWITCH. Battery power to the primary bus is controlled by the battery-generator switch (4, figure 1-5) which has three positions: "BAT & GEN," "BAT ONLY," and "OFF." The switch is normally placed in the "BAT & GEN" position. The "BAT ONLY" position is for emergency use.

WARNING

To prevent rapid depletion of battery power if generator fails, turn off non-essential loads before switching to "BAT ONLY."

GENERATOR WARNING LIGHT. A generator warning light (identified as DC GEN WARNING) which is illuminated in the event of generator failure, is located on the lower right hand side of the instrument panel (23, figure 1-4).

VOLT-AMMETER.(2) The d-c volt-ammeter (22, figure 1–4, sheet 1), located on the instrument panel, indicates the presence of d-c voltage or current. The voltmeter section of the instrument is calibrated to read primary bus voltage from 15 to 33 volts. The ammeter section of the instrument indicates generator amperage from 0 to 450 amperes. (This instrument is deleted on later aircraft.)

CIRCUIT BREAKER PANELS. Two circuit breaker panels carrying d-c circuits are installed in the aircraft, one on the side of the right-hand console (31, figure 1-5) and the other on the right-hand side of the forward equipment compartment. The latter is inaccessible to the pilot during flight.

TEST JACKS. To aid in checking the a-c or d-c generator output, or to check the volt-ammeter, test jacks are provided on the cockpit circuit breaker panel (see figure 1-9).

A-C POWER DISTRIBUTION

A-c power is distributed to the a-c electrical system by the a-c generator and two inverters. With failure of the a-c generator, circuits connected to the a-c bus become

(2) BuNo. 135277 and prior.

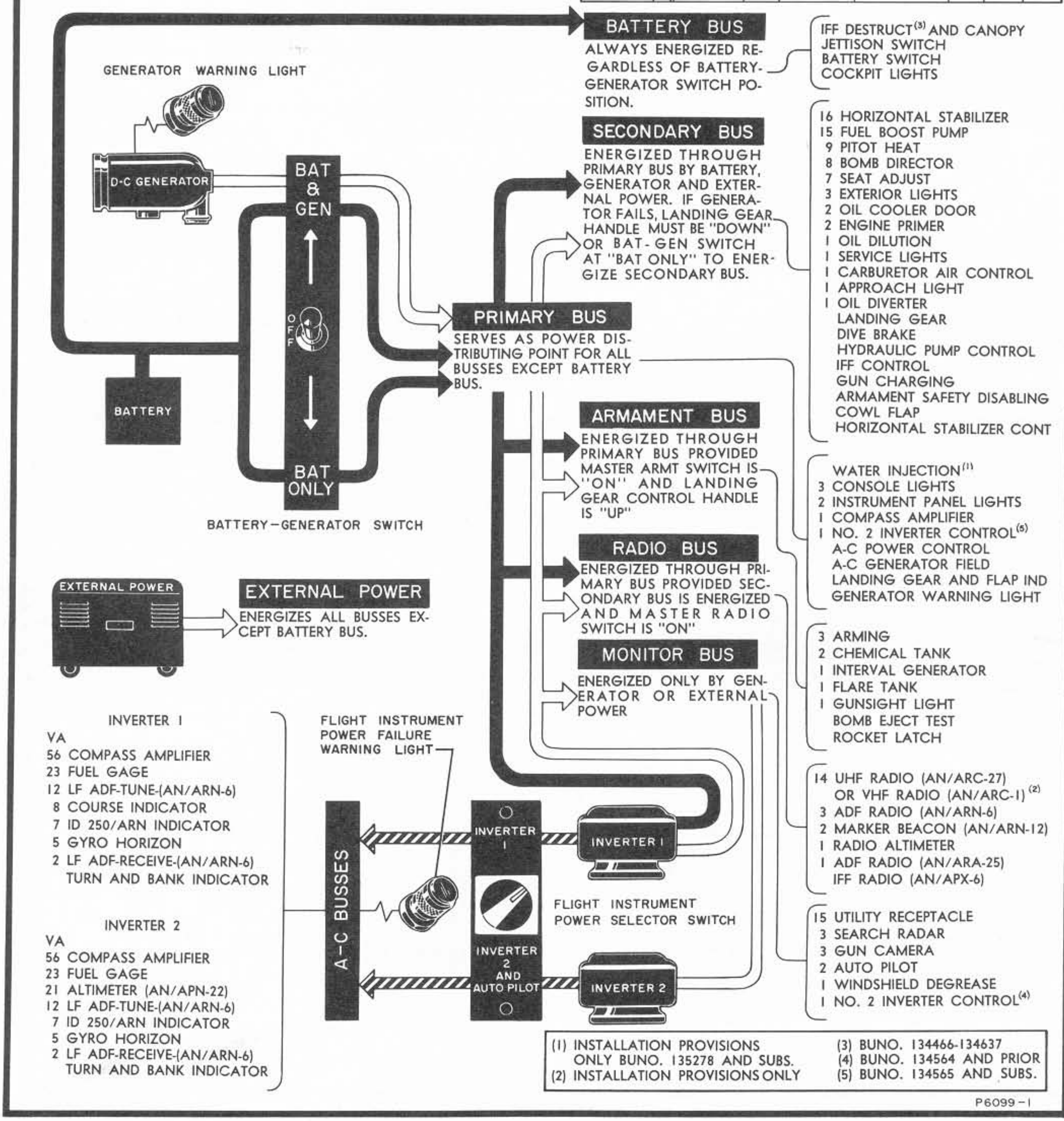
(solid black)	BATTERY POWER
(white)	GENERATOR POWER
(hatched)	INVERTER POWER

NOTES

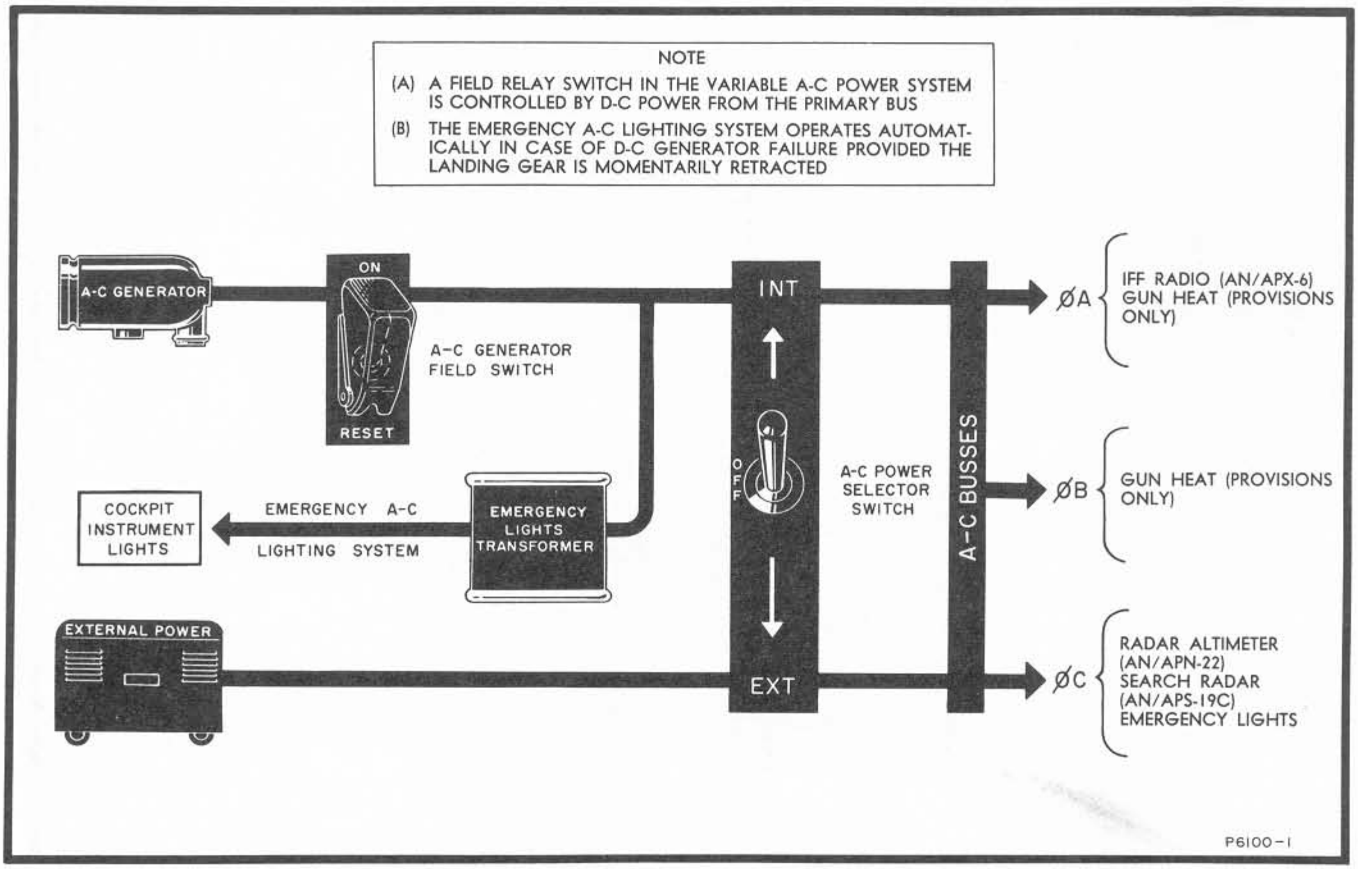
(A) NUMBERS PRECEDING ELECTRICAL UNITS INDICATE LOAD AMPERAGE.

(B) LOADS NOT GIVEN ARE CONSIDERED NEGLIGIBLE.

	CONDITION	ELECTRICAL POWER SWITCH POSITION		GENERATOR	LANDING GEAR CONTROL HANDLE POSITION	PRIMARY BUS	SECONDARY BUS	MONITOR BUS
WITHOUT EXT. PWR.	1	BAT-GEN		OPERATING	UP OR DOWN	HOT	HOT	HOT
	2	BAT-GEN	NOT	OPERATING	UP	HOT	OFF	OFF
	3	BAT-GEN	NOT	OPERATING	DOWN	HOT	HOT	OFF
	4	BAT ONLY	NOT	OPERATING	UP OR DOWN	HOT	HOT	OFF
	5	OFF	NOT	OPERATING	UP OR DOWN	OFF	OFF	OFF
WITH EXT. PWR.	6	OFF	NOT	OPERATING	DOWN	HOT	HOT	HOT
	7	OFF	NOT	OPERATING	UP	HOT	OFF	HOT



D-C Power and Inverter Power Distribution
Figure 1-8 (Sheet 1). Electrical System



Variable Frequency A-C Power Supply
Figure 1-8 (Sheet 2). Electrical System

inoperative and should be turned off. The inverters receive power from the d-c generator and will continue to supply power to their circuits regardless of the a-c generator output. If both generators fail, the battery will supply power to the number one inverter to operate essential a-c equipment.

VARIABLE A-C POWER. Variable frequency a-c power, derived from the engine driven a-c generator, is available when the engine is running above 1400 rpm.

CONSTANT A-C POWER. The constant frequency a-c power supply is derived from either one of two inverters. Constant frequency power is therefore available when d-c power to operate the inverter is supplied.

NUMBER ONE INVERTER. The number one inverter is supplied power from the primary bus through a 25-ampere circuit breaker and operates the following essential equipment:

Gyro horizon	AN/ARN-6 Radio Compass[1]
Fuel gage	ID-250/ARN indicator
G-2 compass	AN/APN-22 Radio Altimeter
Turn and bank indicator (electrical)	

Manual selection is obtained by placing the FLT INSTR PWR SEL switch in the "INVERTER 1" position. Failure of any phase of the inverter turns on the FLT INSTR PWR FAILURE light.

NUMBER TWO INVERTER. The number two inverter is supplied power from the primary bus[3] (or from the monitor bus in later aircraft[4]) when the FLT INSTR PWR SEL switch is placed in the "INVERTER 2 & AUTO PILOT" position. The inverter is the power source for all essential and non-essential equipment listed below:

Gyro horizon	AN/ARN-6 Radio Compass
Fuel gage	ID-250/ARN Indicator
G-2 compass	AN/ARA-25 UHF DF
Auto pilot	Chemical tank
Turn and bank indicator (electrical)	

A-C POWER CONTROLS AND INDICATORS

A-C EXTERNAL POWER SWITCH. The a-c power select switch with three positions – "INT," "OFF," and "EXT" is used to provide a choice of a-c power. The "INT" position connects the a-c generator to the a-c loads, while the "EXT" position permits an external source of a-c power to be connected to the a-c loads.

A-C GENERATOR FIELD SWITCH. The AC GEN FIELD switch (6, figure 1-5) is used to disconnect the a-c generator from the a-c bus system in the event of generator failure and should be used only in an emergency or to reset the fault protection system after a fault has been corrected. The AC GEN FIELD switch should be "ON" at all times during normal operations.

FLIGHT INSTRUMENT POWER SELECT SWITCH (INVERTER SELECTOR SWITCH). The FLT INSTR PWR SEL switch is installed on the auto pilot control panel (26, figure 1-5). Essential equipment receives power through "INVERTER 1" and "INVERTER 2 & AUTO PILOT" positions. Essential and non-essential equipment receive power through "INVERTER 2 & AUTO PILOT" position.

FLIGHT INSTRUMENT POWER FAILURE LIGHT (INVERTER WARNING LIGHT). The FLT INSTRUMENT PWR FAILURE WARNING light (29, figure 1-5) located on the auto pilot control panel will

(1) BuNo. 135278 and subsequent.
(3) BuNo. 134564 and prior.
(4) BuNo. 134565 and subsequent.

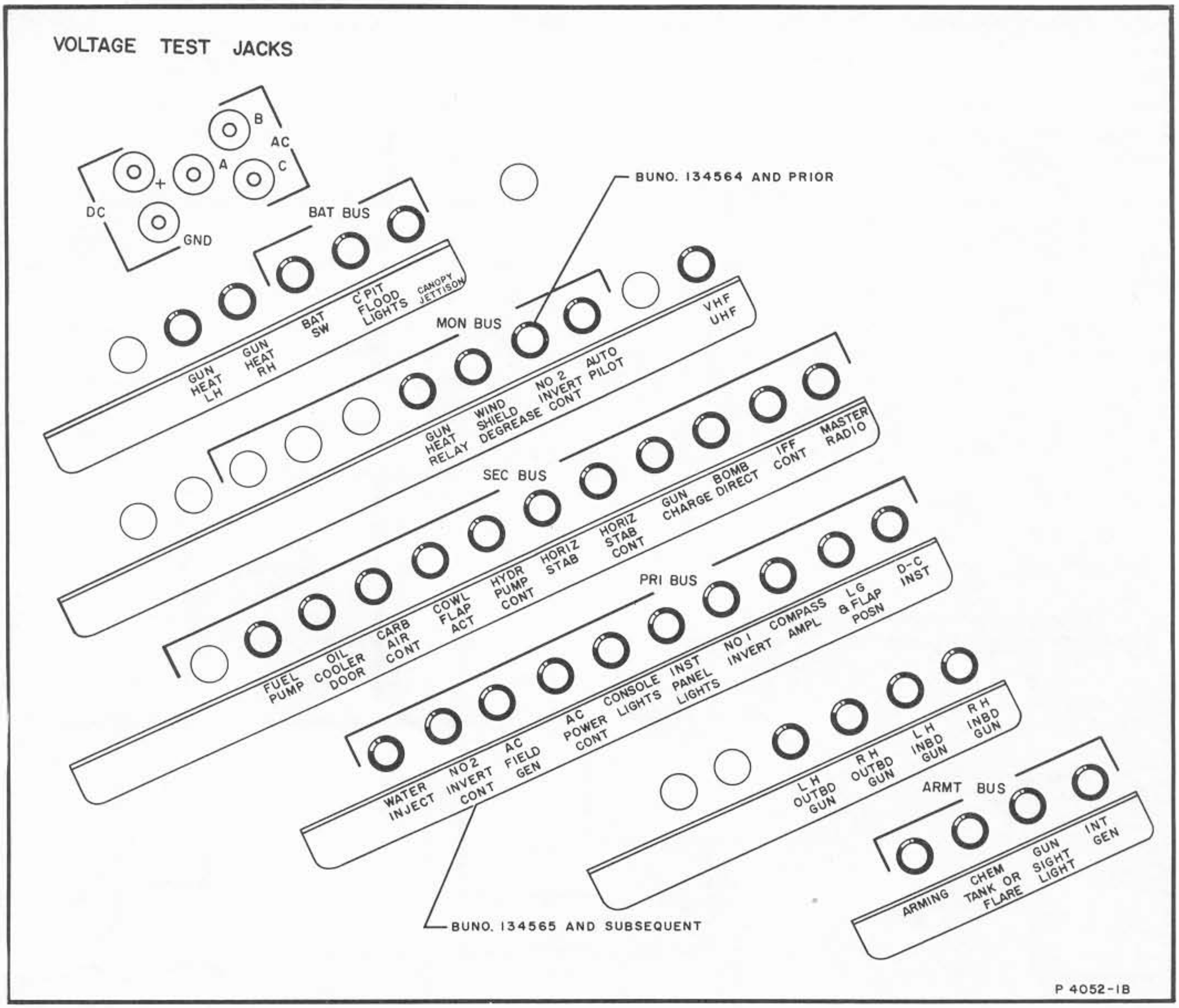


Figure 1-9. Circuit Breaker Diagram

illuminate when any phase of the selected inverter fails. When inverter failure occurs, the FLT INSTR PWR SEL switch must be placed to the alternate inverter position. If the light does not go out within a few seconds, the alternate inverter is not operating and consequently there will be no power for flight instruments.

EMERGENCY A-C LIGHTING SYSTEM. If the d-c generator should fail during flight, an emergency lights relay will connect an emergency a-c lighting system. The a-c generator will then supply a-c power to the FLT INSTR and the NON-FLT INSTR lights. The emergency system operates automatically unless the landing gear has been extended before d-c generator failure occurs. In the latter case, the lights will continue to operate on battery power a sufficient length of time for landing.

CAUTION

Conserve battery power by turning off nonessential electrical equipment when flight cannot be terminated. With the d-c generator inoperative, only the equipment operating directly from the primary bus will be available as long as the battery-generator switch remains in the "BAT & GEN" position. (Refer to Section III, D-C GENERATOR FAILURE.)

HYDRAULIC POWER SUPPLY SYSTEM

Three hydraulic systems with separate hydraulic pumps are provided; the main 3000 psi system, the emergency

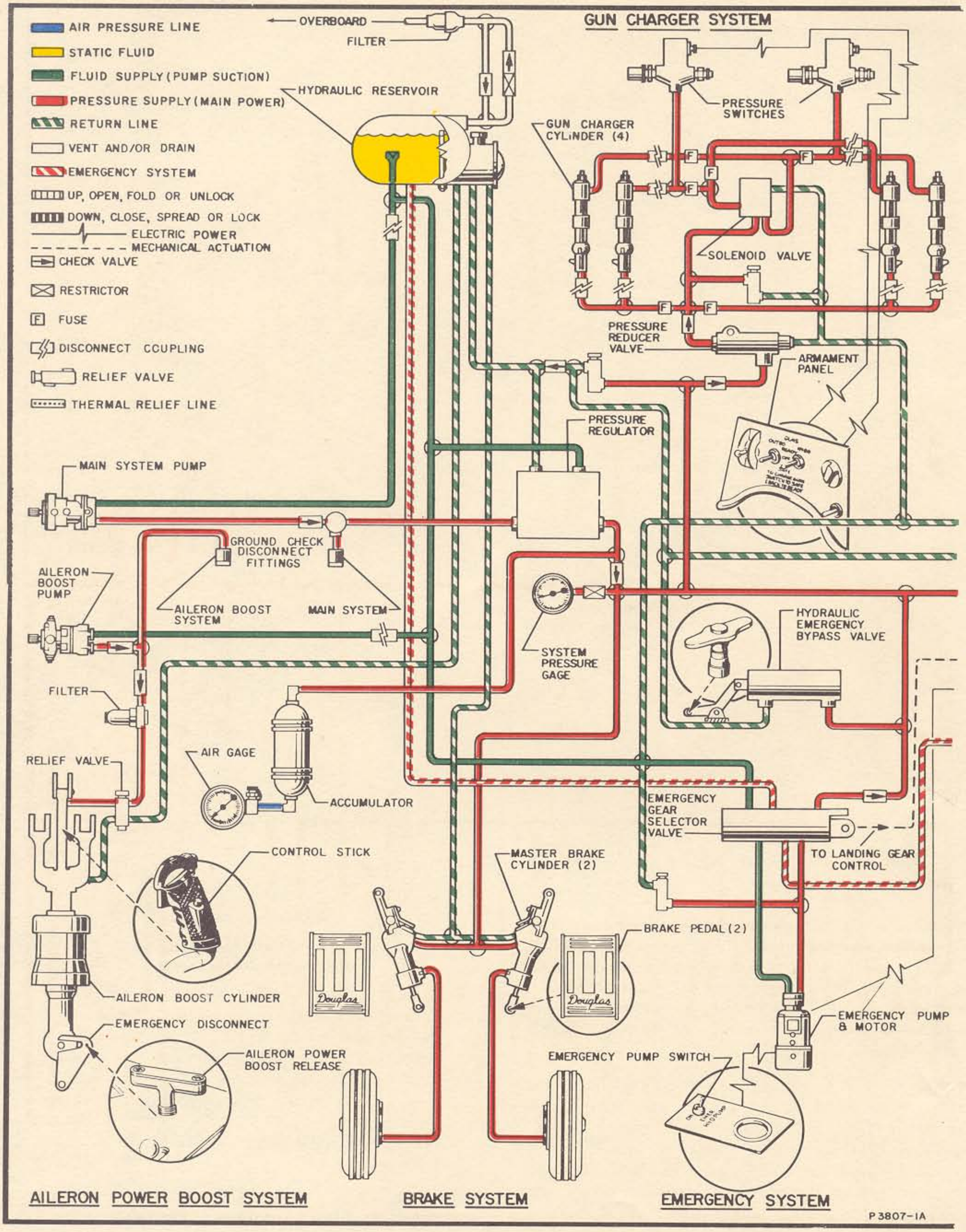


Figure 1-10 (Sheet 1 of 2). Hydraulic System Schematic

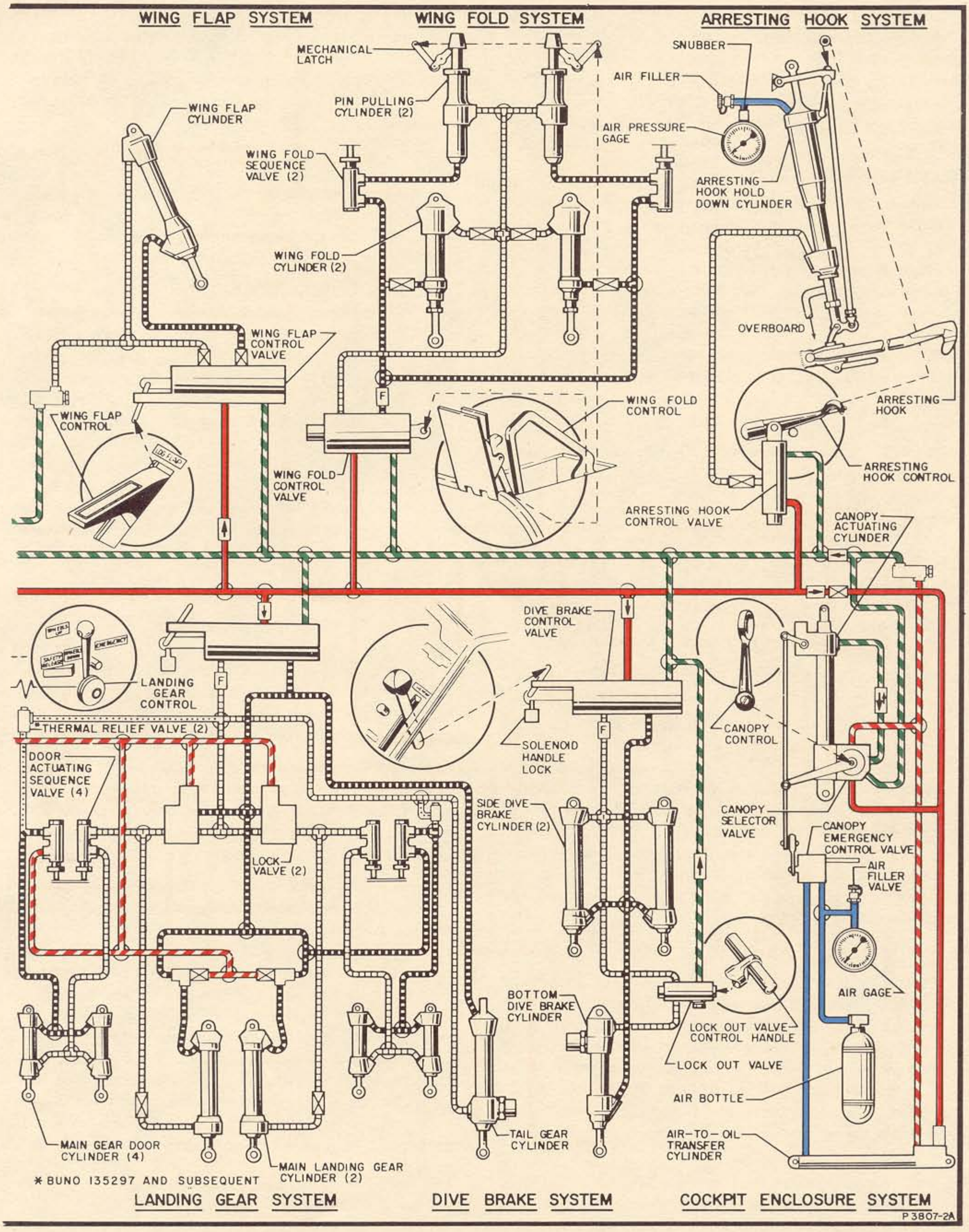


Figure 1-10 (Sheet 2 of 2). Hydraulic System Schematic

3000 psi system and the 1500 psi aileron boost system. One pressurized hydraulic fluid reservoir supplies all three pumps. The reservoir, with its arrangement of standpipes and outlets, reserves enough fluid for emergency extension of the landing gear by means of the emergency system if fluid loss through line failure occurs.

MAIN HYDRAULIC SYSTEM

The main hydraulic system, operating with a pressure of 2700 to 3050 psi, receives its pressure from one engine-driven hydraulic pump. The hydraulic system pressure gage (4, figure 1-3) indicates the pressure of the main system only. This system, which incorporates the accumulator, supplies pressure for operating the power boost wheel brakes, actuating the cockpit canopy, opening and closing the dive brakes, extending and retracting the landing gear and wing flaps, retracting the arresting hook, folding and spreading the wings, and charging the guns.

ACCUMULATOR. The main hydraulic system accumulator (10, figure 1-2, sheet 1 of 2) and attached air pressure gage are located at the lower left side of the firewall. With all hydraulic system pressure exhausted, the accumulator air pressure should be 1500 to 1900 psi. The accumulator serves to absorb surges within the system and should not be relied upon as an added source of reserve power. After engine pump and emergency pump failure, the accumulator hydraulic pressure will dissipate within a few minutes.

EMERGENCY HYDRAULIC BY-PASS VALVE. An emergency by-pass valve is installed in the main hydraulic system to provide a means of depressurizing the system when surging of the regulator or failure in the system is evident. *The valve is for emergency use only and is not to be used to depressurize the hydraulic system during normal flight conditions.* The control handle (3, figure 1-3), located on the left-hand console, is pulled up to depressurize the system. If subsequent operation of the system is desired, the button on top of the handle must be depressed in order to return the handle to its original position.

EMERGENCY HYDRAULIC SYSTEM

An electrically-driven emergency hydraulic pump can be turned on by a momentary contact switch (5, figure 1-3), located on the left-hand console, to provide pressure to the main hydraulic system in event of main hydraulic system pump failure. The emergency pump which operates only as long as the switch is held "ON," can also be used to check out the main hydraulic system when the engine is not running.

Note

Speed of operation of equipment, when operating on emergency pump pressure alone, is considerably reduced.

When the landing gear control is moved to the "EMER" position, the landing gear emergency selector valve is shifted from the system position to the landing gear emergency down position. This automatically turns on the emergency pump to supply fluid from the reserve supply in the hydraulic reservoir to lower the main landing gear only (refer to LANDING GEAR, Section I).

System pressure is indicated on the hydraulic pressure gage when the emergency pump is actuated by use of the momentary contact switch if the main hydraulic system is not pressurized. If the emergency pump is actuated by placing the landing gear control in the "EMER" position, no pressure is indicated.

AILERON POWER BOOST HYDRAULIC SYSTEM. An aileron power boost hydraulic system, operated on pressure from a separate engine-driven hydraulic pump, is provided to reduce stick control forces. No pressure indication is provided. If the system pressure should fail, the boost system can be mechanically disconnected from the aileron control system by pulling the emergency release handle (35, figure 1-3). When the boost system is disconnected, control stick forces for aileron operation will increase approximately four times, but will still permit adequate aileron control at lower speeds for approach and landing. Once disconnected, the boost system cannot be re-engaged during flight.

FLIGHT CONTROL SYSTEM

The primary flight control surfaces are conventionally operated by a control stick and rudder pedals which are mechanically connected to the control surfaces. The position of both rudder pedals may be adjusted simultaneously with the rudder pedal adjustment crank (29, figure 1-4) located just below the armament panel.

CONTROL STICK. The control stick (figure 1-11) is of the conventional type and incorporates a hand grip with the following switches; horizontal stabilizer trim switch, inner stations release switch, outer stations release switch and gun trigger switch.

TRIM TABS. Aileron and rudder trim tabs, manually operated by mechanical linkage, are located on the rudder and the left-hand aileron. The trim tab controls (34, figure 1-3) and the indicators are located on the left-hand console. The rudder trim tab control indicator indicates the number of degrees (0° to 10°) nose left or nose right. The aileron trim tab control indicator indicates the number of degrees (0° to 15°) left-hand (wing) down or right-hand (wing) down. Fixed trim tabs, adjustable on the ground only, are provided on the right-hand aileron and on each elevator. A spring tab, which is linked directly to the surface to reduce control forces, is provided on the rudder.

CAUTION

Do not operate the aileron trim tab control when the wings are folded.

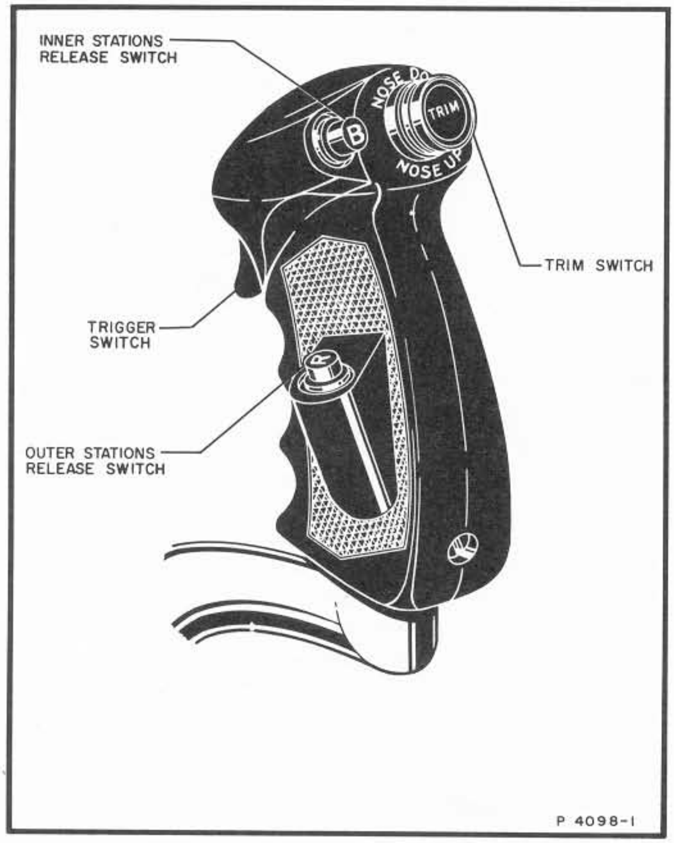


Figure 1-11. Control Stick

HORIZONTAL STABILIZER. Longitudinal trim is accomplished by an adjustable stabilizer in lieu of elevator tabs. The stabilizer, electrically operated, is controlled by the trim switch (see figure 1-11) on the control stick.

Note

The trim switch on the control stick is operable only on aircraft which have horizontal stabilizer limit switches installed.(1) Prior models require use of the manually operated solenoid switch (left-hand console) to trim the horizontal stabilizer.

In event of failure of the trim switch circuit, the horizontal stabilizer control (36, figure 1-3) located on the left-hand console, controls the horizontal stabilizer through the manually operated solenoid switch. A position indicator, showing the recommended setting in degrees (0° to 3° nose down and 0° to 6° nose up) of the stabilizer for various flight conditions, is provided on the left-hand console adjacent to the AILERON POWER BOOST RELEASE handle.

WARNING

At speeds above 200 knots, do not set stabilizer in nose up range as shown by position indicator. With dive brakes extended, do not operate the airplane at any speed with the horizontal stabilizer trim set in the nose up range.

HORIZONTAL STABILIZER LIMIT SWITCHES.(1) When the dive brakes are extended, two limit switches prevent trimming of the horizontal stabilizer into the nose up range of the position indicator. (Refer to Section VI, HORIZONTAL STABILIZER LIMIT SWITCH.)

WING FLAPS. The wing flaps are hydraulically operated and are controlled mechanically by a lever (15, figure 1-3) located on the left-hand console just outboard of the engine controls. A wing flap position indicator (33, figure 1-4) is mounted on the instrument panel. The flaps should not be lowered at speeds in excess of 130 knots. The control lever should not be placed in the "STOP" position unless an intermediate flap position is desired.

DIVE BRAKES. Hydraulically operated fuselage side and bottom dive brakes are regulated by a control (32, figure 1-3) on the left-hand console. The dive brakes open in approximately 2.5 seconds. The bottom dive brake has a lockout valve which is manually controlled from the lower access door. This lockout valve prevents the operation of the lower dive brake during flights when large stores are carried on the center line rack. A solenoid, safety lock, actuated by the landing gear strut, prevents movement of the dive brake control to the "OPEN" position when the airplane is on the ground. If the safety lock fails to operate properly in flight, the control lever may be moved to "OPEN" by depressing the solenoid SAFETY RELEASE lever (33, figure 1-3) located adjacent to the dive brake control.

CAUTION

Prior to starting the engine make certain that the DIVE BRAKE switch is in the "CLOSED" position. If the control lever has been placed inadvertently in the "OPEN" position past the SAFETY RELEASE plunger, the dive brakes will immediately extend and probably cause damage to the lower brake.

RUDDER GUST LOCK. Flight controls are secured externally on the parked airplane by the use of the rudder gust lock consisting of a cable, a felt-padded jaw assembly, two brackets and a locking latch to take up slack on the cable. To secure the elevator and

(1) BuNo. 134630-134637, 135225 and subsequent.

ailerons, the control stick is tied in the aft position with the pilot's seat belt.

WING FOLDING SYSTEM

The wings are folded and spread by hydraulic pressure from either the main or emergency hydraulic system. A non-hydraulic locking mechanism operates latches to safety the hydraulically operated locking pins. Tubular warning "flags," located in the leading edge of the wing at the fold joints, extend when the latches are not engaged with the locking pins.

WING-FOLDING CONTROL. The wing-folding controls (12, figure 1-5) are located on the right-hand console. A door type control labeled WING FOLD operates the locking pin latches. The PULL TO FOLD handle, controlling the folding operation, is located in the recess under the WING FOLD control. To fold the wings, firsts move the WING FOLD control up to unlatch the wing locking pins and expose the PULL TO FOLD handle. Raise the PULL TO FOLD handle to fold the wings. To spread wings, reverse this process. After the wings are fully spread, close the WING FOLD control, and check to ascertain that the two warning "flags" are retracted into the leading edge of the wing.

CAUTION

Both the WING FOLD control and the PULL TO FOLD control should be kept in the open (unlocked and folded) position at all times when the wings are folded.

LANDING GEAR SYSTEM

The landing gear is retracted and extended by either the main or the emergency hydraulic system. The actuating linkage which raises and lowers the gear causes the strut to pivot so that the wheel is stowed flush with and in the same plane as the wing lower surface. The landing gear struts also telescope automatically upon retraction in order for the wheels to fit into the wheel wells between the wing spars.

LANDING GEAR CONTROL. The landing gear control (26, figure 1-3) incorporates three positions: "WHEELS UP," "WHEELS DOWN," and "EMER." When the airplane is on the ground, the control handle cannot be moved to "WHEELS UP" unless the SAFETY RELEASE (23, figure 1-3) located adjacent to the control handle, is manually depressed. This safety latch is automatically pulled out of the way by an electrical solenoid when the airplane is airborne. A red warning light in the landing gear control handle will come on whenever the control handle is moved to either "WHEELS DOWN" or "WHEELS UP," and will remain on until all three gears are locked in the respective position. The wheels and flaps position indicator (33, figure 1-4) showing the position of all three gears, is on the pilot's instrument panel.

WARNING

When moving the landing gear control to any position make sure that the control handle stops in its detent by "click and feel" rather than position indication alone. In the "WHEELS DOWN" position, make certain that the handle is forward of the solenoid operated SAFETY RELEASE.

The landing gear control can be moved to "EMER" by manually depressing the landing gear control release plunger (25, figure 1-3) located between the "WHEELS DOWN" and the "EMER" positions. Approximately three times the normal landing gear control force is required to reach "EMER" from "WHEELS DOWN." Moving the landing gear control to "EMER" simultaneously starts the emergency hydraulic pump and shifts an emergency selector valve from the system position to the landing gear emergency down position. In this position of the emergency selector valve, an emergency hydraulic pump pressure operates the main landing gear only. The engine-driven hydraulic pump pressure is completely cut off from the landing gear system. No pressure indication is provided for emergency gear extension. The landing gear control handle can be returned from "EMER" by first depressing the release plunger.

CAUTION

During flight, do not return landing gear handle directly to the "WHEELS DOWN" position after it has been placed in the "EMER" position as pressure to extend the tail wheel and main landing gear doors is shut off. The handle should either be left in "EMER" or returned to "WHEELS UP" and then to "WHEELS DOWN." If the control handle is moved inadvertently to the "EMER" position, under otherwise normal conditions, the control linkage can be reset in flight by moving the control handle to "WHEELS UP" position. To reset the linkage while the airplane is on the ground and after the engine is shut down, have the ground crew move the control from "EMER" to "WHEELS DOWN," and reset the linkage at the valve. When the airplane is on the ground, do not move the control handle to "WHEELS UP."

BRAKE SYSTEM. The airplane is equipped with Goodyear single disc "spot" brakes operated with power boost derived from the main or emergency hydraulic systems. The brakes are directly operated by toe pressure on the rudder-brake pedals. In event of hydraulic system failure, pressure will be available for braking by exerting approximately twice the normal force on the brake pedals.

Note

Although power boost will be furnished to the brakes by the emergency hydraulic system if the EMER HYDRAULIC PUMP switch is turned "ON," boost will not be provided for the brakes if the emergency hydraulic system is actuated by placing the landing gear control handle in the "EMER" position.

ARRESTING HOOK. The arresting hook control (2, figure 1-5) is located on the right side of the cockpit. Moving the control lever to the "HOOK DOWN" position lowers the hook, disconnects the gun switch circuits and, in conjunction with the landing gear, turns on the landing approach light. A red warning light in the arresting hook control will come on when the control is moved to the "HOOK DOWN" position. The light will remain on until the hook reaches the full down position. Normally, the light will come on as the handle is moved to the "HOOK DOWN" position and will go off almost immediately. Lifting the control lever to the "HOOK UP" position hydraulically returns the hook to the up position. On later aircraft* a PUSH TO RELEASE plunger springs out as the control lever is moved down, preventing accidental retraction of the arresting hook. When retracting the arresting hook, the plunger must be depressed with the thumb before the control handle may be placed in the "HOOK UP" position. Prior aircraft are being reworked by service change.

Note

If the arresting hook control cable system should fail, the "fail-safe" mechanical linkage will automatically release the up-latch. However, the arresting hook will remain retracted until the control lever is lowered, relieving hydraulic pressure in the up line. Lowering of the arresting hook is assisted by air pressure inside the hold down cylinder.

TAIL WHEEL LOCK CONTROL. The tail wheel lock control (40, figure 1-3) is located on the left-hand console.

INSTRUMENTS

A conventional instrument panel contains all the flight instruments necessary for all-weather operations. The gyro instruments, electrically driven, further serve to control the auto pilot. The turn and bank indicator mounted on the instrument panel is air driven. The electrically operated turn and bank indicator which provides the references needed to produce coordinated turns through the auto-pilot, is located in the electronic equipment compartment. A pitot-static system is connected to the altimeter and the airspeed and rate of climb indicators. The static boom projects forward from the leading edge of the vertical stabilizer and the pitot head is located on the underside of the right-hand outboard wing panel.

G-2 COMPASS (MASTER DIRECTION INDICATOR)

The G-2 compass consists of a compass controlled directional gyro indicator (9, figure 1-4), an amplifier and a remote compass transmitter. Approximately three minutes are required for the gyro to reach operating speed after the battery-generator switch has been turned to "BAT-GEN" or "BAT ONLY." Refer to NAVIGATION EQUIPMENT, Section IV for operational data. On aircraft which have a modified instrument panel[1], the master direction indicator is buried behind the elapsed time clock (28A, figure 1-4, sheet 2) and the caging knob for the directional gyro is located below and on the left side of the elapsed time clock. Prior aircraft are being reworked by service change.

GYRO HORIZON

Approximately two minutes are required for the gyro to reach a normal operating speed after the battery-generator switch is turned to "BAT-GEN" or "BAT ONLY." Caution must be exercised not to exceed 70 degrees pitch or 110 degrees bank while the gyro horizon is uncaged as it will tumble at attitudes in excess of these limits.

NON-TUMBLING GYRO HORIZON[1]

The non-tumbling gyro horizon (10, figure 1-4, sheet 2) does not require caging before or after maneuvers. Following maneuvers, the gyro horizon may not be perfectly erect, but will align itself within three to six minutes through action of a gravity erection system. The angle of climb and dive may be read on the dial in the center of the gyro horizon. Prior aircraft will be reworked by service change.

CAUTION

Observe the warning sign on the gyro horizon, DISCONNECT AUTO-PILOT PRIOR TO CAGING INDICATOR, as operation of the automatic de-clutch mechanism can cause violent maneuvers. Modifications are being made on the instrument to correct this condition.

STANDBY COMPASS

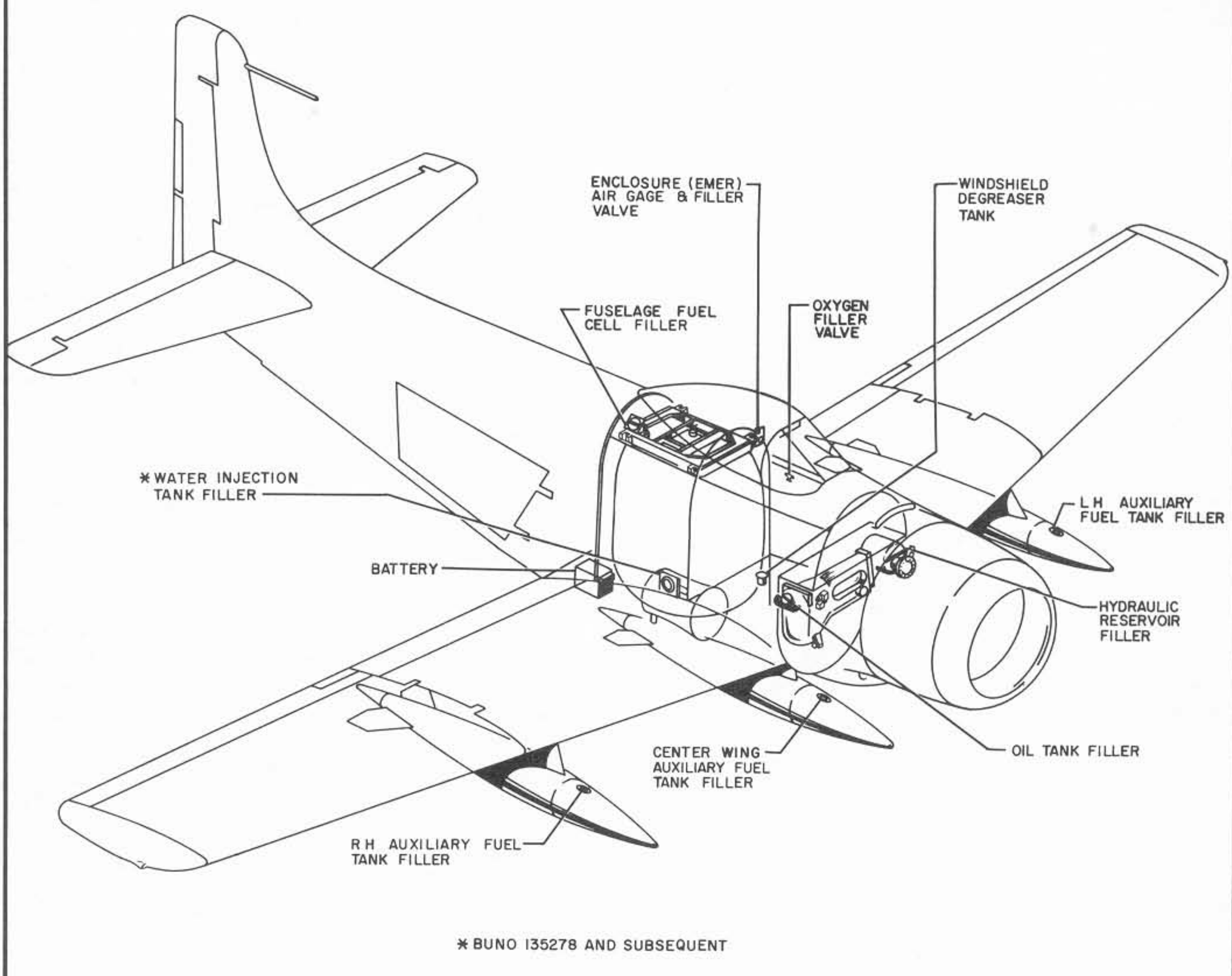
A standby compass is mounted above the glare shield to the right of the gunsight.

EMERGENCY EQUIPMENT

Several items of emergency gear are readily available to the pilot's compartment. Two MK 5 Drift Signal containers, which are also designed to accommodate

* BuNo. 135258 and subsequent.

(1) BuNo. 135278 and subsequent.



GRADE AND SPECIFICATION

FUEL	RECOMMENDED...........	MIL–F–5572 115/145
	ALTERNATE	MIL–F–5572 100/130

OIL..............................	MIL–O–6082	SUMMER 1100 WINTER 1065
HYDRAULIC FLUID	MIL–F–7083	
DEGREASER FLUID......	P–S–661 OR TT–T–291	

Figure 1-12. Servicing Diagram

thermos bottles, are located under the cockpit floor adjacent to the circuit breaker panel. A water canteen is located to the right of the pilot's seat.

CANOPY

The cockpit canopy is hydraulically operated and is controlled by a lever (13, figure 1-3), on the left-hand side of the cockpit, or handle (10, figure 1-2, sheet 2) accessible from outside the airplane on the left-hand side of the fuselage. When the airplane is on the ground with no pressure in the hydraulic system, the canopy can be operated manually by moving the control to "OPEN" or "CLOSE" and then sliding the canopy to the respective position. Handles are provided at the forward end of the canopy. With the hydraulic system functioning, the canopy moves in the direction of control movement and stops when the control is placed in the intermediate "STOP" position. The control handle should normally be kept in the "CLOSED" position during flight to preclude the possibility of the canopy creeping open. Emergency opening of the canopy with air pressure, if the hydraulic system fails, is accomplished by moving the control handle aft to "EMERGENCY"; however, a release plunger, installed to prevent inadvertent emergency operation, must first be depressed. The emergency system air pressure gage and filler valve (8, figure 1-2, sheet 1) are aft and to the left of the pilot's headrest. Normal air pressure is 1980 psi; satisfactory emergency operation cannot be obtained with the pressure below 1750 psi.

Note

Do not place control lever in "EMERGENCY" for routine ground operation since this discharges the air bottle and renders the system inoperative until recharged.

CANOPY JETTISONING. The forward end of the canopy frame is fastened by two jettisoning detonator shafts to two forward trucks which ride on tracks inboard of the cockpit rails. The aft end of the canopy is provided with rollers which ride on a track aft of the canopy. The canopy is jettisoned by breaking a plastic guard (protected by a metal guard[(1)]) and operating the jettison switch (16, figure 1-2, sheet 2) located aft of the canopy control lever. The canopy jettison control circuit includes a canopy jettison test switch (14, figure 1–3) with three positions, "RIGHT," "OFF," and "LEFT," and a "PRESS to TEST" type canopy jettison test light (17, figure 1–3). The circuit is tested by moving the canopy jettison test switch to the "RIGHT" and then to the "LEFT" positions, checking that the canopy jettison test light illuminates with the switch in each position. Illumination of the light indicates the circuit and the detonator cartrdge are in operable condition. The canopy jettison test light is tested by pressing to ascertain if the lamp will illuminate. If the lamp does not illuminate, it should be replaced with a new lamp.

CAUTION

If the canopy jettison lamp must be replaced, use only an AN 3140-327 type.

PERSONNEL GEAR ATTACHMENT

Two headphone and microphone connections (6 & 17, figure 1-2, sheet 2) are provided; one incorporated with the oxygen tube located to the left of the pilot's seat and the other located to the left of the pilot's headrest.

PILOT'S SEAT. The pilot's seat will accommodate a seat pan, a back pan, a PK-2 pararaft kit and a seat-type parachute. The seat is electrically adjustable and is controlled by a switch (27, figure 1-5) on the right hand console. The seat moves upward and forward when the switch is moved "UP" and downward and aft when moved to "DOWN."

Note

It is not possible to adjust the pilot's seat unless an external d-c power source is connected to the airplane or the battery switch is turned on.

SHOULDER HARNESS ADJUSTMENT. The lower two free ends of the harness fit into the safety belt catch and are held securely as long as the catch is closed. To release the harness and safety belt, open the safety belt catch. Clips on the front of the harness permit it to be adjusted. An inertia reel shoulder harness take up mechanism is provided. The harness is normally in a locked position unless the control handle (20, figure 1-2 sheet 2) on the left hand side of the seat is placed in the "UNLOCK" position. In all positions the inertia reel is automatically locked when subjected to deceleration along the thrust line of the airplane (as in a head-on crash) in excess of 2.5 g.

AUXILIARY EQUIPMENT

Section IV contains information concerning the following auxiliary equipment:

- Heating and ventilating system
- Defrosting system
- De-icing system
- Communication and associated electronic equipment
- Lighting equipment
- Oxygen system
- Automatic pilot
- Automatic approach equipment
- Gunnery equipment
- Bombing equipment
- Rocket equipment
- Torpedo equipment
- Miscellaneous equipment

(1) BuNo. 135259 and subsequent.

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SECTION II

NORMAL PROCEDURES

BEFORE ENTERING THE AIRCRAFT

FLIGHT RESTRICTIONS

Refer to Section V for flight restrictions and limitations on the aircraft.

CRUISE CONTROL

Preflight planning must include a determination of power settings versus fuel available, desired airspeed, required range, etc., as necessary to complete the proposed mission. Refer to operating graphs and charts contained in the Appendix.

WEIGHT AND BALANCE

Determine weight of ammunition, bombs or other stores which have been loaded. Check gross weight and center of gravity for take-off, and determine the anticipated loading for landing. Refer to Section V for weight limitations involved. Consult Handbook of Weight and Balance, AN-01-1B-40, for loading information. It is necessary to complete Weight and Balance Clearance Form F prior to flight whenever an airplane is loaded in a manner for which no previous valid Form F has been filed.

EXTERIOR INSPECTION

Consult the Naval Aircraft Flight Record (yellow sheet) prior to flight to determine the status of the airplane. Certification by the plane captain of servicing accomplished should be checked, and the pilot must sign for acceptability of the airplane. Visual inspection of the airplane must be conducted to determine general conditions of all specific details as shown in figure 2-1.

UPON ENTERING THE AIRCRAFT

ENTRANCE TO THE COCKPIT. Entrance to the cockpit is obtained by moving the canopy external control (10, figure 1-2, sheet 2 of 2) to "OPEN" and manually sliding the canopy aft.

CAUTION

Make certain the canopy control is in the "OPEN" position until ready to close the canopy, otherwise inadvertent closing of the canopy will occur when hydraulic pressure develops upon starting the engine.

INTERIOR CHECK (ALL FLIGHTS)

An inspection of the interior of the cockpit must be made to check the general condition of the airplane and to determine that all gear is properly stowed and secured. After fastening the safety belt and the shoulder harness, the following check is to be made:

a. Connect oxygen, anti-g, and radio equipment as required.

b. Battery-generator switch....."BAT & GEN"

Note

If available, an external d-c power supply should be plugged into the aircraft system. In this event, leave thebattery-generator switch "OFF" until the external power supply has been disconnected.

c. Adjust the seat and rudder pedals as necessary.

d. Check canopy jettison control circuit (refer to CANOPY JETTISONING, Section I).

e. Fuel tank selector..........."MAIN"

f. Cowl flaps ...."OPEN"

g. Oil cooler door............."AUTO"

h. Carburetor air switch......."DIRECT"

i. Mixture control ...."IDLE CUTOFF"

j. Propeller control ...."INCREASE"

k. Throttle ...."CLOSED"

l. Dive brake ...."CLOSE"

m. Supercharger ...."LOW" blower

n. Check oxygen regulator and shutoff valve (refer to OXYGEN SYSTEM, Section IV)

o. Landing gear control........"DOWN"

p. Ignition switch ...."OFF"

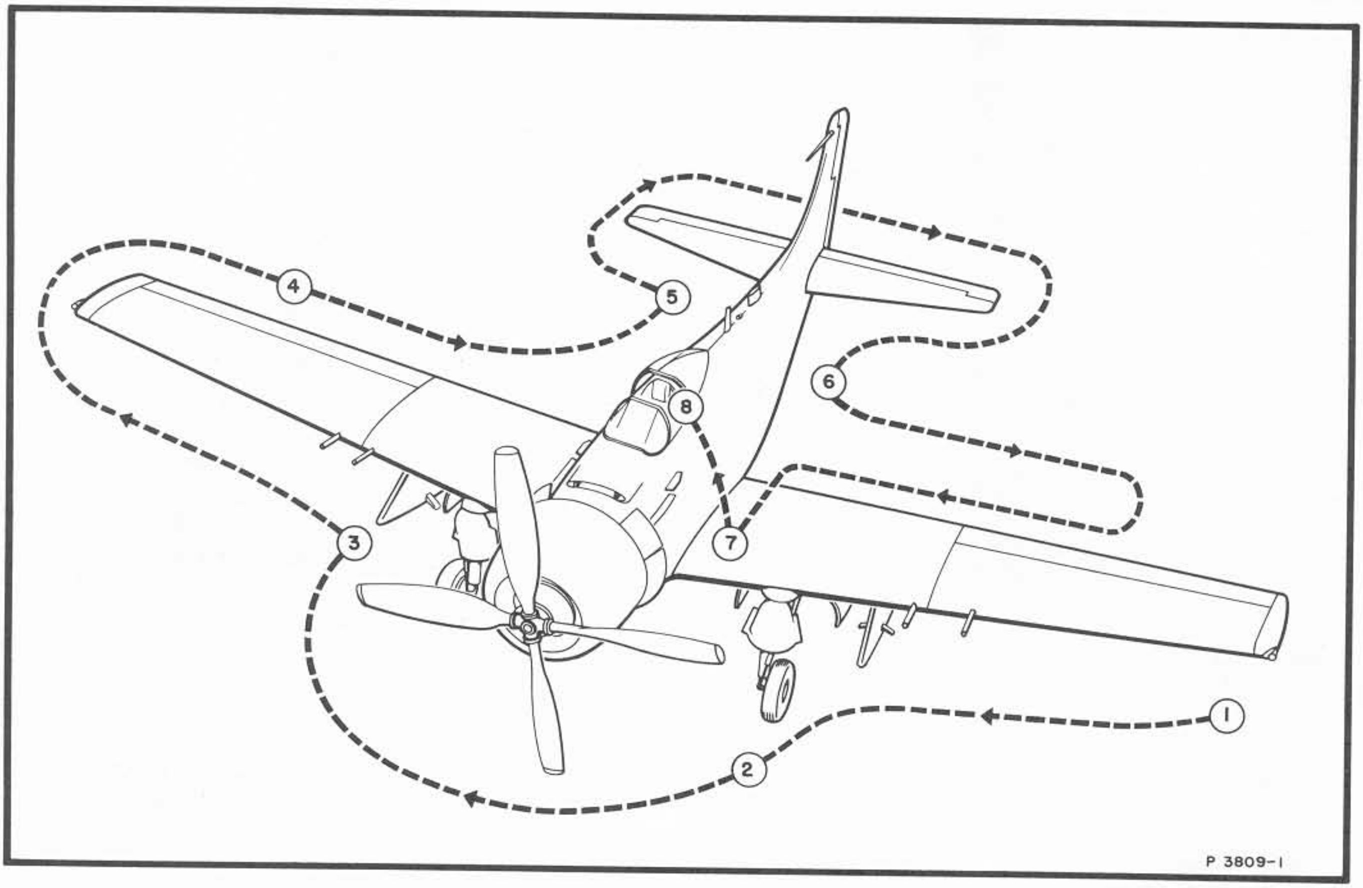
q. Set pressure altimeter and clock ....

r. Uncage gyro instruments....

s. Tail hook control.........."UP"

t. FLT INST PWR SEL ...."INVERTER 1"

u. Auto-pilot clutch switch....."DISENGAGED"



1-2 LEFT WING LEADING EDGE

Wing position light – Condition
Inspection covers – Secured
External stores– Proper loading

2-3 CENTER WING AND NOSE SECTION

Wheel brake discs – Condition
Tires – Pressure: 100 psi
Wheel wells – Hydraulic leaks and ammunition boxes
Brake lines – Condition
Landing gear shock struts – Proper extension
Landing gear down locks – Removed
Propeller – Condition
Oil leakage – Excessive
Cowl latches – Latched
Accessory cowling Dzus fasteners – Secured

3-4 RIGHT WING LEADING EDGE

Gun camera window – Clean
Pitot cover – Removed
Repeat procedure 1-2

4-5 RIGHT WING TRAILING EDGE

Aileron battens – Removed
Ammunition boxes and gun access covers – Secured
Aileron fabric seals – Condition
Aileron hinge assemblies – Condition
Fuselage fuel cell filler – Secured
Water injection tank filler – Secured

5-6 AFT FUSELAGE AND EMPENNAGE

Dive brakes – Condition
Access and inspection covers – Secured
Trim tabs – Condition
Elevator and rudder hinge assemblies – Condition
Elevator and rudder fabric seals – Condition
Elevator and rudder battens – Removed

6-7 LEFT WING TRAILING EDGE

Repeat procedure 4-5 except last two items

7-8 COCKPIT AREA

Canopy and windshield – Clean
Canopy control handle –"OPEN" position
Canopy air bottle pressure gage – 1980

Figure 2-1. Exterior Inspection

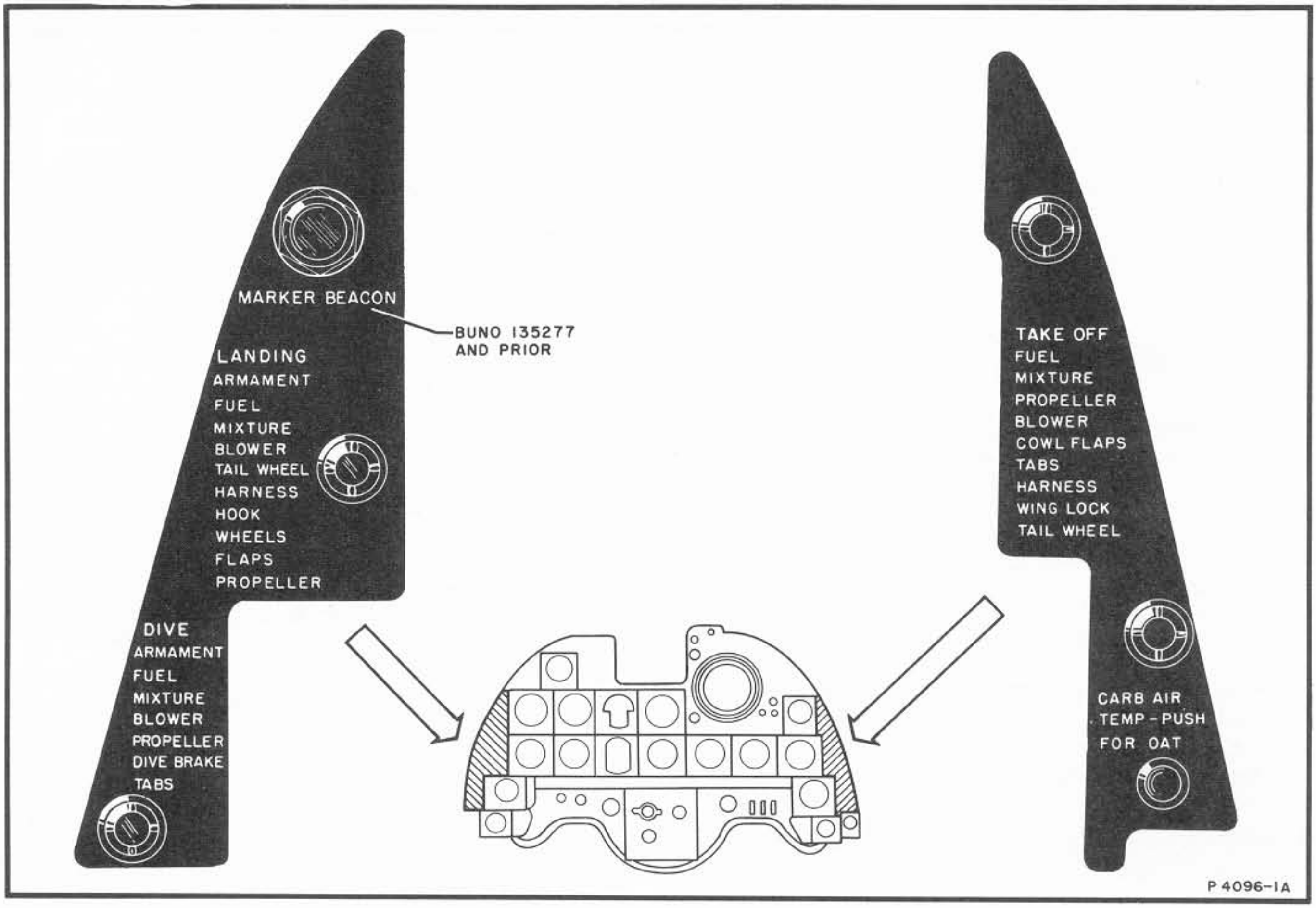


Figure 2-2. Check-off List

v. Wing pin lock door and wing fold lever—Should be in the open position if wings are folded, or closed if wings are spread.

w. Check the surface controls for free and correct movement.

INTERIOR CHECK (NIGHT FLIGHTS)
Check the operation of all interior and exterior lights.

BEFORE STARTING ENGINE

EMERGENCY HYDRAULIC PUMP CHECK
With external power applied or the battery-generator switch in either position, actuate the emergency hydraulic pump switch and check for pressure on the hydraulic pressure gage. This will indicate that the pump is in good operating condition.

CLEARING THE ENGINE
To clear the engine, turn propeller through four revolutions (16 blades) with the engine starter.

CAUTION

The above procedure is necessary to prevent liquid lock, caused by an accumulation of fuel or oil in the lower cylinders, which may cause extensive damage to the engine. Clearing the engine may be done by the ground crew immediately prior to flight. If unusually high compression is present, the spark plugs must be removed from the lower cylinders and the liquid allowed to drain. The propeller should never be turned opposite to normal rotation, as this may force liquid into the intake pipes from where it is apt to be drawn back into the cylinders when the engine is started.

ALTERNATE FUEL

The engine can be operated on an alternate grade of fuel; however, certain additional limitations apply in this case. Refer to Section V, ENGINE LIMITATIONS and also figure 1-12 when an alternate grade of fuel is used.

STARTING ENGINE

a. Set throttle friction as desired.

b. Adjust the throttle to obtain the following recommended engine speeds during a start:

(1) 1100-1200 rpm for OAT of 5° to 16°C (40° to 60°F)

(2) 1300-1400 rpm for OAT of 18° to 32°C (65° to 90°F)

(3) 1400-1450 rpm for OAT of 38°C (100°F) or higher

c. Fuel boost pump........................."ON"

CAUTION

During cold weather operations, except in cases of emergency, an external power supply must be used when starting the engine. The cowl flaps should be open when starting the engine even under cold weather conditions. No attempt should be made to accelerate the warming-up period by closing the cowl flaps.

d. Energize the starter, and after the propeller has turned through two complete revolutions (8 blades), press the primer button and turn the ignition switch to "BOTH" in that order in rapid succession.

Note

The primer button must be held down for continuous delivery of fuel. Intermittent operation results in an exceedingly erratic fuel/-air ratio during the attempt to start and increases the possibility of severe backfiring. After the engine starts, adjust the airflow with the throttle to obtain a smoothly running engine.

e. Should the engine fail to start within 30 seconds, let the starter cool and then repeat the starting procedure.

f. When the engine is operating smoothly on the primer alone, move the mixture control to "RICH." Release the primer when a drop in rpm indicates fuel from the carburetor has reached the cylinders. Priming can be continued as needed for smooth engine operation; if the engine ceases to fire, then increase priming, or if the engine runs rough and smokes, then stop priming.

CAUTION

Do not start the engine with the mixture control out of "IDLE CUTOFF" as the engine may "liquid lock" and cause damage which may not be immediately detected.

g. After the engine is running smoothly on the carburetor, reset the throttle for 1200 rpm. Do not allow engine speed to exceed 1450 rpm during start. Do not "pump" the throttle. Operate the throttle smoothly and slowly even after the engine is running smoothly.

h. Check the oil pressure. Stop the engine if the oil pressure gage does not register within ten seconds or does not reach 40 psi within 20 seconds. See STARTING ENGINE paragraph, Section IX for cold weather procedure.

i. Refer to Section III for instructions concerning engine fire while starting.

j. If the engine does not start, wait a few minutes to allow any excess fuel to drain out of the blower drain. Inspection of the exhaust stack outlets should indicate whether the engine has been over-primed or under-primed. Excessive black smoke indicates over-priming. The use of the primer switch should be governed accordingly. If the engine is over-primed, turn all switches off, open the throttle, put mixture control in "IDLE CUTOFF" position, and turn the propeller through with the starter six revolutions.

k. Fuel boost pump ...."OFF"

ALTERNATE/EMERGENCY STARTING PROCEDURE. When no other external power source is available, an aircraft that has already been started may be used to start another through use of a jumper cable engaged to both external d-c power receptacles. The aircraft supplying the power must maintain approximately 1850 rpm in order to bring its electrical output up to that required for an engine start. After the engine has been run up to this speed, in order to transfer power to the other aircraft it is necessary to depress the momentary contact switch adjoining the external power receptacle. When the start has been completed it is only necessary to disconnect the jumper cable from both aircraft.

ENGINE GROUND OPERATION

a. Warm up engine at approximately 1200 to 1400 rpm.

b. Head the airplane into the wind when ground operation for an extended period of time is anticipated.

c. For all ground operations, except as specified in GROUND TESTS and PRE-FLIGHT ENGINE CHECK, keep the propeller in full "INCREASE" rpm position, the mixture control in "RICH," and the supercharger control in "LOW" blower.

d. Continue the warm-up until the oil pressure shows stability during throttle manipulation.

GROUND TESTS

ELECTRICAL SYSTEM

D-C POWER SUPPLY CHECK

a. Disconnect the external power source, if used, and place the battery-generator switch in the "BAT-GEN" position.

b. Determine that all circuit breakers are pushed in.

c. With the engine idling, place a light load on the electrical system, such as instrument or cockpit lights.

d. Increase the engine speed gradually until the d-c voltmeter reads approximately 27 volts. If the d-c GEN-WARN light goes off, it is an indication that the reverse-current relay is functioning properly. Push in the warning light to test it.

e. Increase the engine speed and check the d-c voltmeter. The voltmeter reading should increase until it reaches approximately 28 volts and remain at that reading regardless of any further increase in engine speed.

f. A take-off should not be made if the GEN-WARN LIGHT is on or if the d-c voltmeter reading is too low (below 26.7 volts) or too high (above 28.7 volts).

INVERTER WARNING AND SELECTION CHECK

While maintaining sufficient engine speed for d-c generator output, check inverter operation by first placing the FLT INSTR PWR SEL switch on "INVERTER 2 & AUTO PILOT." The FLT INSTR PWR FAILURE warning light should be out.

a. Turn the battery-generator switch to "BAT ONLY." The warning light should illuminate.

b. Switch to "INVERTER 1." The warning light should go out.

c. Turn the battery-generator switch to "BAT & GEN." Remain on "INVERTER 1" for take-off.

WARNING

The number two inverter cuts out at an engine speed below approximately 1200 rpm, therefore the gyros may not come up to a safe operating speed during normal taxi operations. Do not take-off on "NO. 2 INVERTER & AUTO PILOT" except in an emergency.

HYDRAULIC SYSTEM CHECK

The following check should be made for normal operation of the hydraulic system:

a. Emergency hydraulic bypass valve .... Handle Depressed
b. Emergency hydraulic switch . "OFF"
c. Aileron boost release handle . . In

The hydraulic pressure should be 2700 to 3050 psi.

FUEL SYSTEM CHECK

Run engine at 1500 to 1800 rpm and with the fuel boost pump switch "OFF," check the operation of the engine-driven fuel pump. Fuel pressure should be 19 to 21 psi. With the fuel boost pump "ON," fuel pressure may increase as much as two and one-half pounds. If external auxiliary tanks are installed, the engine should be run on each tank long enough to see that all fuel lines are clear. Return the fuel tank selector valve to "MAIN" for take-off.

OIL SYSTEM CHECK

With the engine running at 1500 to 1800 rpm, check the oil pressure and oil temperature.

Note

The oil pressure may be as low as 15 psi when the engine is idling.

TAXIING INSTRUCTIONS

The airplane is equipped with a conventional tail wheel type landing gear, and standard taxiing procedures should be followed. The controls should be set as follows for taxiing:

a. Wing flaps .... "UP"
b. Mixture control .... "RICH"
c. Propeller control .... "INCREASE"
d. Carburetor air .... "DIRECT"
e. Tail wheel .... "UNLOCK"

Lock the tail wheel for extended cross-wind taxiing to relieve excessive breaking action. Use power as required without necessitating undue use of the brakes.

WARNING

During extended periods of cross-wind taxiing, it is recommended that the canopy be closed to prevent carbon monoxide contamination in the cockpit.

BEFORE TAKE-OFF

PRE-FLIGHT ENGINE CHECK

IDLE MIXTURE. With the engine idling at 650 ± 50 rpm and the fuel boost pump "OFF," move the mixture control slowly toward "IDLE CUTOFF" and observe any change in engine speed. Return the mixture control to "RICH" before the engine cuts out. A rise of more than ten rpm indicates too rich an idle mixture, and no rise or drop in engine speed indicates that the idle mixture is too lean. A rise of five to ten rpm is desired for adjustment purposes; however, due to varying atmospheric conditions from day to day a rise of from zero to twenty rpm is satisfactory. This will permit idling at low speed without fouling the plugs and also affords good accelerating characteristics. A momentary slight drop in manifold pressure may be used as an indication of a slight rise in rpm.

IGNITION SWITCH AND MAGNETO CHECK

At the start of the day's flying, the "OFF" position of the ignition switch should be checked to assure proper connection of the ground wires.

a. At 700 rpm turn the ignition switch "OFF" momentarily to see if the engine stops firing.

b. Return the switch to "BOTH."

c. Run the engine up to 2300 rpm for magneto check.

WARNING

In order to preclude the possibility of the airplane nosing over, do not exceed 2400 rpm or 30 inches Hg manifold pressure during any engine run-up on the ground unless the tail of the airplane is adequately tied down.

d. Place the ignition switch in the "LEFT" position and observe the rpm.

e. Return the switch to "BOTH" to stabilize the engine speed.

f. Repeat this procedure for the "RIGHT" position.

g. Atmospheric conditions will influence the readings obtained. However, a drop of 75 rpm or less when operating on one magneto is considered satisfactory providing no engine roughness is encountered.

PROPELLER CHECK

a. Run the engine at 1600 rpm but do not exceed 25 inches Hg during the following check.

b. Note rpm reaction as control is placed in full "DECREASE" position. The engine speed should be governed within 1100-1300 rpm. Surging within these speeds is normal.

c. Return the control to the full "INCREASE" position.

d. Check for reduction and full recovery of rpm.

SUPERCHARGER CLUTCH CHECK

a. Set the engine speed at 1600 rpm with the throttle and note manifold pressure.

b. Move the supercharger control to the "HIGH" position and lock.

c. Open the throttle to obtain 30 inches Hg manifold pressure.

CAUTION

Make sure stick is held back to prevent airplane from nosing over.

d. Move the supercharger control to the "LOW" position and lock. A sudden increase in rpm indicates that the two-speed mechanism is working properly.

CAUTION

Do not repeat supercharger clutch shift check at less than five minute intervals.

e. Set engine speed at 1600 rpm and check manifold pressure against that obtained at the beginning of the check. The readings should be the same.

Note

The engine is equipped with a roller type clutch which does not need to be desludged.

PRE-FLIGHT AIRCRAFT CHECK

AIRFIELD AND CARRIER CHECK

a. Cockpit canopy .... "OPEN"
b. Shoulder harness and safety belt . Adjusted and locked
c. Tail wheel: Airfield .... "LOCK"
Carrier .... "UNLOCK"
d. Fuel boost pump .... "ON"
e. Fuel tank selector .... "MAIN"
f. Cowl flaps .... "OPEN"
g. Oil cooler door .... "AUTO"
h. Carburetor air .... "DIRECT"
i. Wing flaps: Airfield .... As desired
Carrier .... "DOWN"
j. Rudder tab .... 3°-5° Nose right

CAUTION

After actuation of the rudder trim tab from one limit to the other or the equivalent, a three minute cooling period must be allowed to prevent burning out the actuator.

k. Horizontal stabilizer .... 0°

Note

- Insure that the horizontal stabilizer control is returned to the neutral position after actuation.
- A radio noise may be heard during actuation of the horizontal stabilizer. On some aircraft this noise will not be heard due to the installation of a noise filter.

l. Aileron tab .... 0°
m. Throttle friction control .... Adjusted as needed
n. Mixture .... "RICH"
o. Propeller control .... "INCREASE"
p. Dive brake .... "CLOSE"
q. Supercharger .... "LOW" blower
r. Wings .... Spread and locked
s. Check controls for free and correct movement
t. Run up engine
u. Check all instruments for indications within the required limits.
v. Erect and uncage gyros as necessary.

CATAPULT CHECK

In addition to the preceding check, the following should be accomplished during catapult take-off:

a. Tail wheel .... "UNLOCK"
b. Catapult hand grip .... Down
c. Throttle friction control .... Tightened
d. Position head firmly against headrest.
e. Place feet against rudder pedals with legs stiff.
f. Brace right arm, locking elbow against abdomen.
g. Push throttle forward to obtain take-off settings and grasp catapult handgrip.

TAKE-OFF

The airplane is inherently stable and has no unusual take-off characteristics. Typical take-off speeds with flaps "UP" are 80 to 85 knots IAS at 18,500 pounds gross weight and 85 to 90 knots at 21,000 pounds. Use of flaps during take-off from a smooth paved runway is unnecessary. In order to maintain good directional control during take-off until rudder control is effective, it may be necessary to apply a little right brake if power is applied gradually. Rudder control becomes effective at approximately 15 to 20 knots. However, with brakes held and power applied prior to the take-off run, as recommended in MINIMUM RUN TAKE-OFF paragraph, it is not necessary to use brakes, as the rudder control is effective immediately.

MINIMUM RUN TAKE-OFF

For a minimum take-off, the controls, with the exception of the flaps, should be set in the same position as for normal take-off. To clear a 50 foot obstacle use half flaps, however for an absolute minimum run take-off, such as from a carrier deck, the flaps must be full "DOWN" (40 degrees) to obtain the take-off performance as tabulated in the Appendix, figure A-9. Hold the brakes and advance the throttle to obtain 30 inches of manifold pressure, taking care to keep the tail on the ground. Release the brakes and smoothly but quickly add full take-off power. Raise the tail quickly to reduce drag. The airplane may be pulled off at an IAS varying from 80 knots at 18,500 pounds to 85 knots at 21,000 pounds.

ENGINE FAILURE DURING TAKE-OFF

Refer to Section III for procedures concerning engine failure during take-off.

AFTER TAKE-OFF

a. Retract the landing gear as soon as the airplane reaches a point beyond which a safe landing cannot be made on the runway or in any level space available for landing beyond the runway.

Note

The landing gear will retract in a maximum time of seven seconds.

b. The flaps, if used, will begin to blow back at airspeeds above 110 knots, however, the flap control lever should be placed in the "CLOSE" position before 130 knots IAS is attained. This blow back feature allows the flaps to be retracted after take-off with little or no settling of the airplane and with a minimum change in trim setting.

c. Close the canopy.

d. The fuel boost pump should be turned off after the climb out is established, however, selection of the droppable wing tank should be made before the boost pump is turned off. Refer to Section VII for additional information concerning fuel system management.

CLIMB

The characteristics of the airplane in a climb are normal. The best climbing speed at sea level is 140 knots IAS with the normal rated power setting of 48 inches Hg and 2600 rpm. However, manifold pressure must be reduced to stay within the BMEP limits of the engine as altitude is increased. A constant power setting of 45.5 inches Hg and 2600 rpm will permit climb from sea level to full throttle altitude without exceeding the BMEP limits. (Refer to figures A-6 and A-10 in Appendix I for additional data on climbing speeds and power settings.)

a. Climb with cowl flaps positioned so as not to exceed the engine operating limitations (refer to Section V). A material reduction in cylinder head and oil temperatures can be obtained by climbing at an IAS 15 to 20 knots faster than the best climbing speed. A tendency for oil to over-heat can be checked more quickly by reducing engine speed than by throttling alone.

b. After the climb has been established, it may be necessary to use the fuel boost pump at higher altitudes, if the engine pump does not maintain sufficient pressure.

DURING FLIGHT

FLIGHT CHARACTERISTICS

Refer to Section VI for information regarding flight characteristics.

SYSTEMS OPERATION

Refer to Section VII for information regarding the operation of the various systems.

APPROACH AND LANDING

For landing gross weights allowed and center of gravity limitations, refer to Section V.

PRE-TRAFFIC PATTERN CHECK LIST

a. Shoulder harness and safety belt . "LOCKED"
b. Exterior lights: Carrier .... "DIM"
Airfield .... "BRIGHT"
c. Master armament switch .... "OFF"
d. Gun charger switch .... "OFF"
e. Tail wheel: Carrier .... "UNLOCK"
Airfield .... "LOCK"
f. Fuel boost pump .... "ON"
g. Fuel tank .... "MAIN"
h. Cowl flaps .... As needed
i. Oil cooler door .... "AUTO"
j. Carburetor air .... "DIRECT"
k. Horizontal stabilizer .... "NOSE UP" as required
l. Trim tabs .... As desired
m. Dive brake .... "CLOSE"
n. Mixture .... "RICH"
o. Supercharger .... "LOW" blower
p. Canopy .... "OPEN"
q. FLT INSTR PWR SEL switch . . . "INVERTER 1"

TRAFFIC PATTERN CHECK LIST

a. Arresting hook .... "DOWN" for carrier landing
b. Landing gear control .... "DOWN"

Note

A red light in the landing gear control handle will come on and remain on until all three wheels are in the latched down position.

c. Landing flap control .... "DOWN"

Note

Full flaps are normally used during a landing on an airfield, however, lesser degree flap settings are desirable during high wind conditions. Full flaps should be used for all carrier landings.

d. Propeller controls .... 2600 rpm

CAUTION

Check position of the landing gear and flaps on the wheel and flap indicator.

LANDING

Make a normal approach at approximately 80 to 85 knots IAS.

CAUTION

If sufficient altitude is not available for stall recovery, an ample margin of speed above the stall should be maintained. In the approach and landing, the aerodynamic stall warning may not occur enough above the stalling speed to denote a dangerously slow attitude. Any abrupt application of power at a speed just above the stall may result in a torque roll which can not be controlled with the ailerons and rudder.

CARRIER

To minimize the severity of carrier landings, it is urged that any combination of conditions resulting in a high "cut" height and a low airspeed at the time of the "cut" be avoided. The following conditions for carrier landings are recommended:

a. The height above the deck at the time of the "cut" should not be greater than 25 feet.

b. Carrier landing approaches should be slightly fast and flat but should not exceed power-off stalling speed plus 10 knots. Properly flared landings substantially reduce the severity of landing loads. Fully stalled landings should be avoided. Refer to discussion on stalls, both power on and power off in Section VI.

HEAVY LOAD

Any approach and landing made in a heavily loaded aircraft must be made at a proportionately higher airspeed. For example, the power-off stalling speed of this airplane at 21,000 pounds gross weight, gear extended and flaps full down, is approximately 87 knots IAS. Since the aircraft is restricted to 17,500 pounds for arrested landings, jettisoning of stores is necessary before landing aboard a carrier if the aircraft is exceeding its gross weight limitations.

CROSS WIND

Cross wind landings can best be made by landing with the tail slightly up and using somewhat less than full flaps. Crab into the wind to correct for drift and just prior to contact with the ground, use some downwind rudder to line the airplane up with the runway. During the roll-out after landing there will be the normal tendency for the up-wind wing to rise or for the airplane to turn into the wind. Use a little rudder as needed for counteraction.

MINIMUM RUN

Use full flaps, have the propeller in full low pitch, and the throttle as required to make an approach similar to a carrier landing. Come in over the end of the runway at about ten feet, close the throttle and make a normal flared-out landing. Use the brakes as necessary. Leave the flaps down until the end of the roll-out to assure maximum drag effect.

CAUTION

If a wave-off must be accomplished when using full increase rpm, care must be taken to increase power smoothly. An abrupt jamming forward of the throttle at an airspeed close to the stall may result in an uncontrollable torque roll.

LANDING EMERGENCIES

Refer to Section III for procedures set forth concerning emergencies during landing.

WAVE-OFF

With a propeller control setting of 2600 rpm, 48 inches of manifold pressure can be used during a wave-off without exceeding the limiting BMEP of the engine. A rapid opening of the throttle at this governing rpm can be accomplished without danger of overspeeding the engine. This is sufficient power to make a smooth wave-off. The use of a higher rpm and more manifold pressure can cause torque forces which may be difficult to control at speeds near a stall. Trimming the right wing down three degrees will help to overcome this tendency.

AFTER LANDING

a. Raise landing flaps upon completion of landing roll. Excessive taxiing with flaps lowered may cause damage to flaps by particles thrown back by the propeller blast.

b. Propeller control .... "INCREASE"

POST FLIGHT ENGINE OPERATION

The engine should be run at idle rpm to allow best oil scavenging and to reduce cylinder head temperatures below 150°C. It is advisable to manually lean the carburetor by adjusting the mixture control between "NORMAL" and "IDLE CUT-OFF" positions until a 50 rpm drop-off in idle speed is obtained. The resulting mixture will contain excess air for burning off the carbon and oil deposits. This operation may be utilized while taxiing the aircraft if excessive rpm is not required for taxiing.

CAUTION

Do not manually lean the carburetor with the engine running at more than 1200 rpm, as detonation and overheating may result.

A post flight check should be made if any phase of engine operation has been questionable.

STOPPING THE ENGINE

a. Propeller control .... "INCREASE"

b. FUEL boost pump .... "OFF"

c. Throttle ...."CLOSED"
d. Mixture control ...."IDLE CUTOFF"
e. Ignition switch ...."OFF" after propeller stops rotating

f. With engine oil still warm following engine shutdown and battery switch "ON" or battery-generator switch in the "BAT ONLY" or "BAT-GEN" position, accomplish the following steps to override thermoswitch and properly position the oil diverter valve for a cold start.

g. Oil dilution switch – "OIL DILUTION" for five seconds.

Note

Manual shut-off valve is kept closed when not diluting oil (see Section VII, OIL SYSTEM).

h. Battery switch or battery-generator switch ...."OFF"
i. Oil dilution switch........"OFF"

Note

Steps g, h, and i may be accomplished following step a, providing that the engine is idling below generator cut-in rpm.

OIL DILUTION

Refer to COLD WEATHER ENGINE OPERATION, Section IX for complete information on oil dilution.

BEFORE LEAVING THE AIRPLANE

a. Fuel tank selector ...."OFF"
b. All electrical switches....."OFF"
c. Gyro instruments ....Uncage
d. Landing gear ...."WHEELS DOWN"
e. Wing flaps ...."UP"
f. Dive brake ...."CLOSE"
g. Throttle ...."CLOSED"

CAUTION

If the throttle is opened or left in the open position while the engine is not running, sludge or congealed oil may cause the pilot valve and/or the servo piston of the manifold pressure regulator to stick in the increase throttle position resulting in a "run away" condition during the next start. This condition is more likely to occur during cold weather.

MOORING

a. Install surface controls lock
b. Lock tail wheel
c. Check wheels
d. If gusty wind conditions prevail, the airplane should be tied down. See figure 2-3.

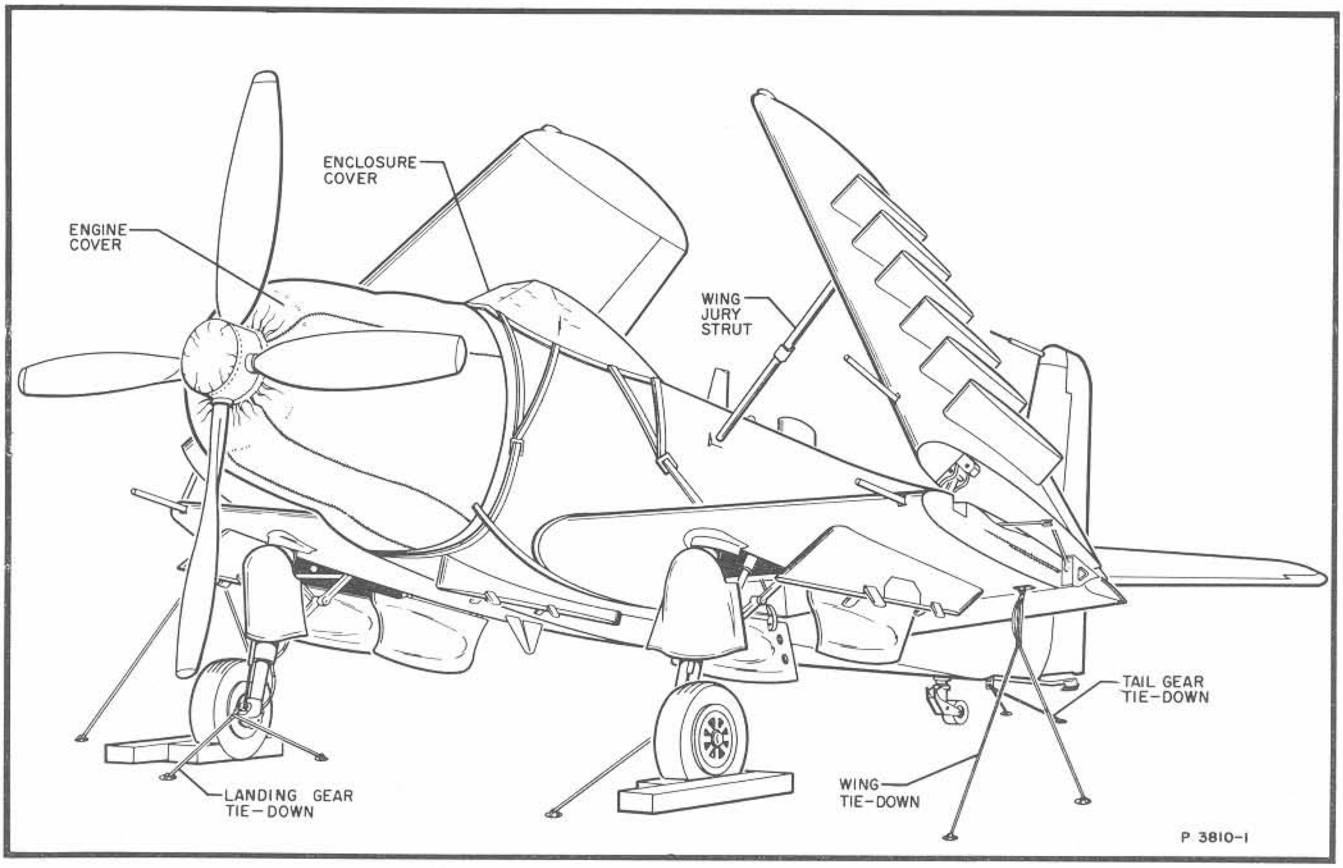


Figure 2-3. Mooring Diagram

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SECTION III

EMERGENCY PROCEDURES

ENGINE FAILURE

If engine failure occurs, the primary rule of flight governs the immediate action to be taken — maintain flying speed. Set up a safe gliding attitude, and if altitude permits, attempt to remedy the cause of the engine failure through the procedure as outlined in the following paragraph.

PROCEDURE ON ENCOUNTERING ENGINE FAILURE

a. In rapid succession:

Switch to a tank known to contain fuel.

Mixture control .... "RICH"

Fuel boost pump .... "ON"

Throttle — one-fourth open

CAUTION

The engine should never be started at full throttle, since a momentary but serious over-speeding of the engine would result.

b. If engine failure has been caused by fuel starvation, the foregoing steps may be sufficient to re-establish engine operation. If not, then continue as follows:

c. Move mixture control to "IDLE CUTOFF" until adequate fuel pressure is built up, then move to "RICH" to prevent premature starting and backfiring.

d. Use primer as necessary until engine is firing smoothly.

e. If, after completing the preceding operations, the engine does not start, prepare for an emergency landing or bail-out.

ENGINE FAILURE UNDER SPECIFIC CONDITIONS

ENGINE FAILURE DURING TAKE-OFF

In the event of engine failure during take-off, LAND STRAIGHT AHEAD. As many as possible of the operations listed below should be performed in the order given.

a. Release external stores.

b. Landing gear .... "UP" unless sufficient runway is available for a landing in the normal ("DOWN") position.

c. Wing flaps .... full "DOWN"

d. Lower the seat

e. Battery-generator and ignition switch .... "OFF"

f. Fuel selector .... "OFF"

ENGINE ROUGHNESS

If the engine is popping and losing power during take-off, the trouble may be fouled plugs. The engine will often run normally at a reduced manifold pressure. This reduced manifold pressure, however, is generally sufficient to maintain level flight.

MANIFOLD PRESSURE REGULATOR FAILURE.

In the event of loss of engine oil pressure to the manifold pressure regulator and subsequent regulator failure, manual over-ride is possible. Movement of the throttle to the full open position will, in most cases, provide up to 40 inches of manifold pressure. Under certain conditions, the use of this procedure may allow the pilot to reach a landing field prior to complete engine failure due to lack of oil.

ENGINE FAILURE DURING FLIGHT

The maximum gliding ratio of the airplane is 12.6 to 1 at approximately 120 knots IAS with the wheels and flaps up and the propeller in full high pitch. Do not lower wheels or flaps until the need for either has been positively determined. If engine failure should occur during daylight visual flight conditions, an attempt to effect an emergency landing should be made. At night or under instrument conditions it is up to the discretion of the pilot whether to attempt a landing or to bail out.

LANDING WITH NO POWER

Certain actions must be taken to insure a successful forced landing. The following steps are organized in order of importance, however, the complete check should be accomplished if time permits.

a. Jettison external stores

b. Tighten safety belt and lock shoulder harness
c. Open canopy
d. Lower the seat
e. Turn battery-generator and ignition switches ...."OFF"
f. Place goggles over eyes
g. Mixture control ...."IDLE CUTOFF"
h. Fuel tank selector ...."OFF"
i. Landing gear ....As desired
j. Wing flaps ....full "DOWN" when landing is imminent

PROPELLER FAILURE

Failure of the governor to operate properly may result in a runaway propeller. A runaway propeller goes to full low pitch and may result in an engine speed as high as 3600 rpm or more. When such a failure occurs, the only method of reducing the engine speed is to throttle back and decrease the airspeed. In doing this, it is desirable to use 2900 rpm and reduce the indicated airspeed to the approximate values shown in the table below:

		Indicated Airspeed (knots)	
Weight (pounds)	*Altitude (feet)*	*Flaps down Gear down*	*Flaps up Gear up*
14,000	S.L.	118	138
14,000	5,000	107	126
14,000	10,000	96	112
16,000	S.L.	115	136
16,000	5,000	104	122
16,000	10,000	90	107

If more power is mandatory, increase rpm to the maximum allowable of 3120 rpm. Fly at the lowest altitude consistent with safety and stay in the "clean" condition until landing is imminent.

Note

The pilot should keep in mind that if 3120 rpm is used for more than approximately 30 seconds, engine failure may result.

FIRE

ENGINE FIRE WHILE STARTING

Backfiring sometimes causes fire in the induction system as a result of the presence of excessive fuel after priming. Allowing the engine to run will often cause the fire to be drawn out through the engine. If the fire continues, place the mixture control in "IDLE CUT-OFF," turn the ignition switch and fuel tank selector to "OFF" and vacate the airplane. An outside portable fire extinguisher should then be used to quench the fire.

FIRE DURING TAKE-OFF

If a fire occurs during take-off, a landing should be made as quickly as possible.

FIRE DURING FLIGHT

The best means of preventing an engine fire is through a rigid ground inspection and maintenance of those items which might fail and cause a fire. If altitude and other factors permit, the following steps should be carried out. However, it is left to the pilot's discretion whether to attempt to extinguish the fire or to bail out.

a. Propeller ...."DECREASE" rpm
b. Throttle ...."CLOSE"
c. Turn fuel selector ...."OFF"
d. Cowl flaps ...."OPEN"
e. Mixture control ...."IDLE CUTOFF"
f. Ignition ...."OFF"
g. Electrical switches ...."OFF"
h. Ventilation system ...."OFF"
i. Lower landing gear if practicable (if tires are in the path of the flames when retracted).

FUSELAGE FIRE

If a fuselage fire occurs it is probably electrical in origin. Refer to the paragraph on ELECTRICAL FIRE for the procedure to be followed. In any event, it is of the discretion of the pilot whether or not to effect an emergency landing or to abandon the airplane in flight.

WARNING

Opening the cockpit canopy during a fuselage fire may cause a draft which may increase the intensity of the fire and draw flames into the cockpit area. If the decision has been made to bail out, be prepared to do so immediately after the canopy is opened.

WING FIRE

a. Release external stores.

b. If a wing fire occurs during night flight operation, turn off the switches which control all the lights within the wing.

c. Attempt to extinguish the fire by side-slipping the airplane away from the wing fire.

ELECTRICAL FIRE

In the event of a fire in the electrical system, the following applies:

a. Turn battery-generator switch "OFF."

b. Turn off all other electrical equipment except the ignition switch.

c. If the fire is extinguished and certain circuits are needed for the operation of the airplane, turn the circuits on one at a time starting with the battery-generator switch, and watch for the one which caused the fire.

SMOKE ELIMINATION

If smoke or toxic fumes enter the cockpit, the pilot should immediately obtain a supply of uncontaminated air. Use the oxygen mask with the regulator set for "100% OXYGEN." Ventilate the cockpit by throwing the VENT lever to "ON." Opening the canopy may alleviate the condition, but this may cause additional smoke to be drawn into the cockpit by the increased draft with the canopy opened.

LANDING EMERGENCIES (EXCEPT DITCHING)

In the event of a forced landing over land, the pilot should consider a number of variables in order to determine his best landing attitude. These include altitude, type of terrain, and the characteristics of the airplane. Landings in terrain such as golf courses, plowed fields, swamps, mud, or sand should be made with wheels up. Most nose-overs occur as a result of landing in such territory with the landing gear down, and nearly all serious injuries and fatalities result from nosing over. Pilots should remember that ground which appears smooth and level from the air frequently turns out to be rough, crossed with ditches, soft, or full of obstructions. All forced landings should be made well above the stalling speed. There will be little or no control of the airplane if an attempt is made to land at or slightly above the stalling speed.

WARNING

Release all external stores before making a forced landing.

EMERGENCY ENTRANCE

Entrance into the aircraft may be accomplished by operating the external canopy control. If the airplane has overturned and the canopy cannot be opened, axes or other cutting tools must then be used to gain entrance.

DITCHING

Experience with airplanes of this type indicated that this aircraft has good ditching characteristics. The decision to ditch is left to the discretion of the pilot, however, it is recommended that the aircraft be abandoned in flight during instrument conditions or at night, particularly if no power is available for landing. Procedures to follow in preparation for ditching are as follows:

a. Release all eternal stores

b. Landing gear .... "WHEELS UP"

c. Wing flaps .... full "DOWN"

d. Shoulder harness and safety belt .... Locked

e. Lower seat to lowest position

f. Depress release plunger and move canopy control lever aft to "EMERGENCY" position.

Note

If canopy cannot be opened, it will be necessary to operate the canopy jettison switch. Flight records and static tests show that damage to the vertical stabilizer may result from jettisoning the canopy while in a normal flight attitude, with the possibility of losing control of the airplane.

This hazard may be reduced, however, by slowing the airplane to a minimum safe airspeed and assuming a fairly high angle of attack while jettisoning the canopy. Following this procedure at a high altitude affords the pilot the opportunity to bail out if the control surfaces are severely damaged. As an alternate procedure, the canopy can be jettisoned during the flare-out *just prior to touchdown.* The decision is left to the discretion of the pilot whether to jettison the canopy at a high altitude or at the lowest possible altitude.

g. Mixture control .... "IDLE CUTOFF"

h. Battery-generator and ignition switches .... "OFF"

LANDING TECHNIQUE (DITCHING)

a. Maintain the lowest possible forward speed commensurate with safe control of the aircraft. Because of the inherent difficulty in accurately judging the height above water, the aircraft should not be fully stalled. (If the arresting hook is extended, the pilot should be able to sense the drag when the hook strikes the water, thus improving his judgment of the airplane's attitude prior to the touchdown.)

b. Maintain the lowest possible rate of descent. One hundred feet per minute is recommended.

c. It is recommended that the aircraft be ditched along the top of and parallel to the swells if the wind does not exceed 20 knots. In higher winds, land upwind to take advantage of the lowered forward speed. The possibility of ramming nose-on into a wave is increased during a cross-swell landing, as is the possibility of striking the tail on a wave crest and nosing in.

BAIL-OUT PROCEDURE

Before bailing out, slow the aircraft down. Operate canopy control to "EMERGENCY" position. If canopy fails to open, break the guard on the canopy jettison switch and place in "EMER" position to jettison can-

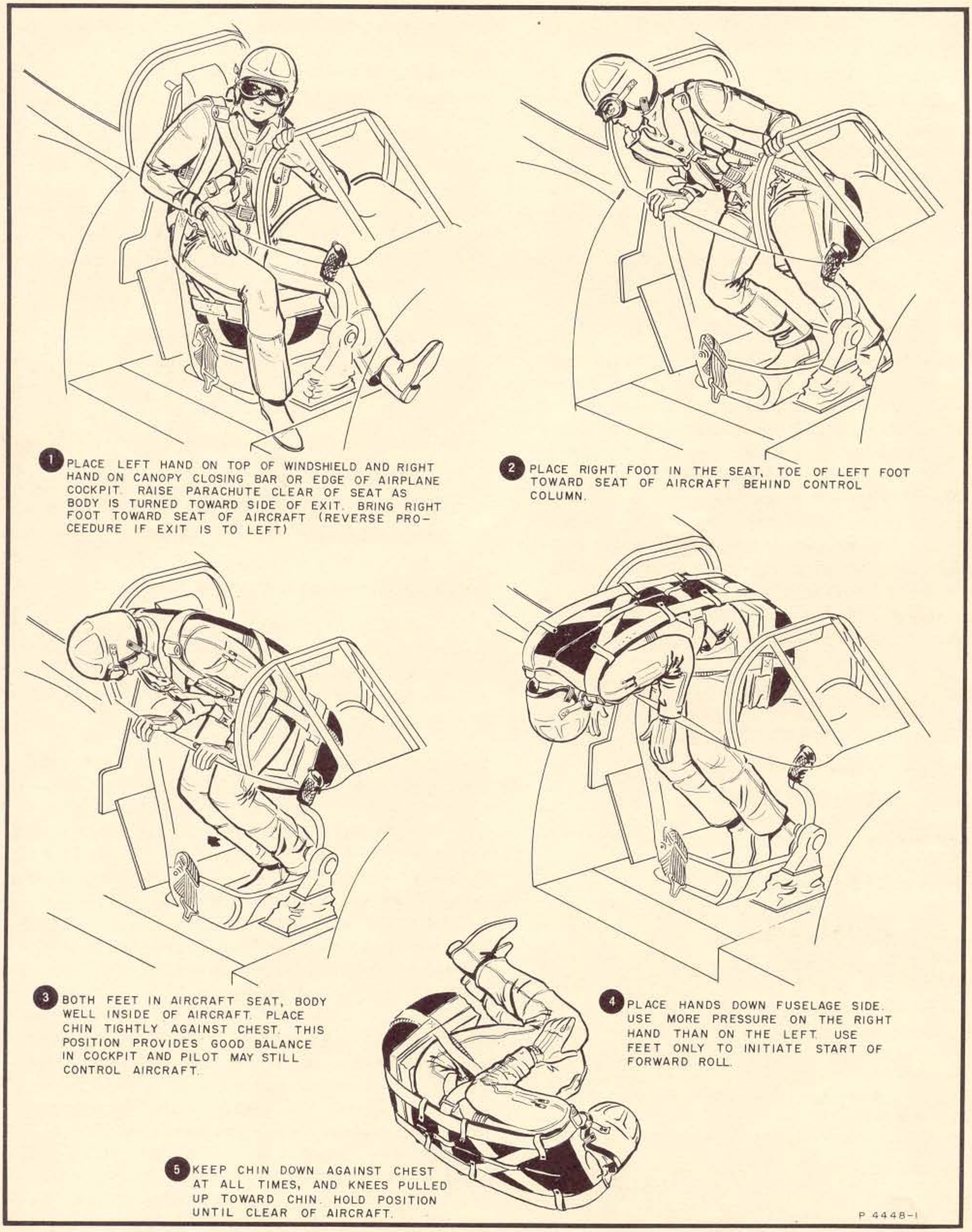

Figure 3-1. Bail-out Procedure

opy. (See figure 3–1 for recommended bailout procedure.)

AIRCRAFT SYSTEMS EMERGENCY OPERATION

FUEL SYSTEM

LOSS OF FUEL PRESSURE

If fuel pressure is lost, proceed as follows:

a. Check position of fuel tank selector and set to tank containing sufficient fuel.

b. Turn fuel boost pump .... "ON"

CAUTION

If boost pump is turned on before selection of a fuel tank has occurred, an air lock may occur in the fuel line.

JETTISONING EXTERNAL STORES. The external stores can be jettisoned in an emergency by pulling out on the OUTBOARD WING BOMB RELEASE and the CTR WING BOMB RELEASE located on the left-hand console (10 and 11, figure 1-3).

ELECTRICAL POWER SYSTEM

D-C GENERATOR FAILURE. Failure of the d-c generator is indicated by a GEN WARNING light. With battery generator switch in "BAT-GEN" position, power will be automatically disconnected from the monitor bus and the secondary bus (including radio and armament busses) to conserve battery power.

The emergency a-c lighting system is automatic and provides a-c generator power to the FLT INSTR lights and the NON-FLT INSTR lights (refer to Section I, EMERGENCY A-C LIGHTING SYSTEM).

CAUTION

Turn off console lights and other non-essential equipment operating on d-c power when flight cannot be terminated.

A-c circuits supplied by number two inverter become de-energized. The FLT INSTR PWR FAILURE warning light will be illuminated if the FLT INSTR PWR SEL switch is in "INVERTER 2 & AUTO-PILOT" position. When the switch is turned to "INVERTER 1" position the light should extinguish. If it should be necessary to re-energize some of the circuits connected to the secondary bus, switch off all non-essential equipment on that bus and then turn battery-generator switch to "BAT ONLY."

Note

Since the secondary bus is also energized by moving the landing gear control to "DOWN," turn off all non-essential equipment on that bus before lowering the landing gear.

EXCESSIVE D-C VOLTAGE. If excessive voltage is indicated on the d-c voltmeter (over 30 volts), turn the BAT-GEN switch to "OFF" immediately. Turn off all non-essential circuits connected to the primary and secondary busses and then turn the BAT-GEN switch to "BAT ONLY." The FLT INSTR PWR SEL switch must be turned to "INVERTER 1."

A-C GENERATOR FAILURE. Failure of one or more phases of the a-c generator will result in the loss of operation of one or more units dependent upon a-c generator power. If complete loss of power is indicated, turning the AC GEN FIELD switch momentarily to "RESET" and then returning it to "ON" may restore the lost power. If power cannot be regained by this action, turn the AC GEN FIELD switch off ("RESET" position).

INVERTER FAILURE. If failure of the selected inverter is indicated by the FLT INSTR PWR FAILURE warning light, turn the FLT INSTR PWR SEL switch to the other inverter. If the warning light fails to go out, the selected inverter is not functioning properly and no a-c power will be available for the gyro-horizon, the G-2 compass, the fuel gage or any of the equipment dependent upon the number two inverter.

HYDRAULIC POWER SYSTEM

EMERGENCY HYDRAULIC BYPASS VALVE. If surging of the pressure regulator or failure within the hydraulic system (other than main pump failure) is evident, pull up the HYD EMER BYPASS VALVE to depressurize the main hydraulic system.

HYDRAULIC FAILURE WITHIN COCKPIT. Failure within the cockpit of some section of the high pressure hydraulic system can produce a fog resembling smoke. This fog can easily be misinterpreted as caused by fire. Evidence that there is no fire can be detected by the odor and moisture of the fog. If such failure occurs, immediately depressurize the main system by pulling the HYD EMER BYPASS VALVE control. With the system depressurized, the landing gear can be lowered with the emergency hydraulic pump only (refer to LANDING GEAR SYSTEM).

EMERGENCY HYDRAULIC PUMP. In event of engine-driven hydraulic pump failure, system pressure (but no pressure indication) can be obtained by operating the EMER HYD PUMP switch. The emergency pump operates only when the switch is "ON" or the landing gear control is in the "EMER" position. All units normally operated by the main hydraulic system can be operated with emergency pump pressure, however the speed of operation of such equipment is considerably reduced.

LANDING GEAR SYSTEM

LANDING GEAR SAFETY SOLENOID. A safety circuit operates a solenoid which prevents the landing gear control lever from being moved to the "WHEELS UP" position when the landing gear is extended and the weight of the airplane is on the shock struts (struts compressed). If the circuit fails so that the landing gear cannot be raised during flight, manually depress the solenoid release lever adjacent to the landing gear control.

LANDING GEAR EMERGENCY EXTENSION. If the engine-driven hydraulic pump fails, the landing gear may be lowered by placing the landing gear control in the "WHEELS DOWN" position and operating the emergency hydraulic pump. If the landing gear should fail to extend because of loss of hydraulic fluid, an emergency supply of fluid is provided in the reservoir which is utilized by moving the landing gear control to "EMER." This procedure will extend the main gear only. The tail gear will automatically extend when main hydraulic system pressure fails.

Note

If the landing gear control has been moved to the "EMER" position, manually reset the emergency control valve when the aircraft is on the ground by moving the landing gear control from "EMER" to the "WHEELS DOWN" position, and have the ground crew reset the control linkage at the valve.

CAUTION

When the airplane is on the ground, do not attempt to reset the emergency control valve by moving the landing gear control to "WHEELS UP."

EMERGENCY BRAKE OPERATION. The brakes are operated by a power boost system from the main hydraulic system. If loss of hydraulic system pressure occurs, the brakes can be operated by depressing the rudder brake pedals with approximately two times the normal foot pressure.

FLIGHT CONTROL SYSTEM

AILERON POWER BOOST EMERGENCY RELEASE. If the aileron boost hydraulic system fails, causing high control forces, the aileron power boost system should be disconnected by pulling the emergency release handle. The required force to operate the ailerons will be increased approximately four times after aileron boost has been disconnected.

DAMAGED CONTROL SURFACES. If damage has occurred to the control surfaces from gunfire, collision, etc., check the slow flight characteristics of the aircraft at an altitude above 5000 feet. Approach the stalling speed with caution, and determine the minimum airspeed that can be maintained during a landing.

SECTION IV

DESCRIPTION AND OPERATION OF AUXILIARY EQUIPMENT

HEATING AND DEFROSTING SYSTEM

Air is taken in through an intake duct on top of the fuselage forward of the cockpit, circulated through a heater muff around the exhaust stacks, and carried to a distributor valve. The distributor valve control handles (figure 4-1) are located aft on the right-hand console. Indicated positions are: "WINDSHIELD," "WINDSHIELD & CABIN," and "OFF." Selection of the "WINDSHIELD" position directs all of the hot air against the windshield for defrosting purposes. Intermediate heat can be obtained by placing the control lever in any desired intermediate position.

VENTILATOR SYSTEM

Air from the intake duct is routed to a diffuser outlet at the fire wall which is controlled by a VENTILATOR lever (figure 4-1) on the right console. The lever can be moved to any intermediate position and to "OFF" or "ON." In addition to the main ventilator outlet, an adjustable "eyeball" outlet (5, figure 1-5) is located outboard on the right console which furnishes a directable supply of air independent of the main system.

CAUTION

Place the HEAT and VENTILATOR levers to the "OFF" position when entering a dive or combat, or when there is a fire forward of the firewall.

ANTI-ICING AND DE-ICING SYSTEMS

CARBURETOR ALTERNATE AIR. Icing in the carburetor induction system can be prevented or corrected by placing the CARB AIR switch in the "ALT" (alternate source position). The engine mixture control should be in the "RICH" position during the shift to prevent engine "popping." For further information on the use of alternate air, refer to CARBURETOR AIR CONTROL, Section IX.

PITOT HEAT. Icing at the pitot and static boom heads is prevented by the use of electrical heaters. To operate the heating units, place the PITOT HEAT-OIL DILUTE switch to "PITOT HEAT" when there is a possibility of ice formation.

COMMUNICATIONS AND ASSOCIATED ELECTRONIC EQUIPMENT

The communications and associated electronic gear installed in the airplane is of several types, each of which is listed in figure 4-2.

OPERATING INSTRUCTIONS

MASTER RADIO SWITCH. The MASTER RADIO switch (17, figure 1-5) is located on the right console below the EXTR LTS panel. This switch controls secondary bus power to the AN/ARC-27A, AN/ARA-25, AN/ARN-6 and AN/ARN-12. Other communications and electronic equipment is turned on at the particular control panel only.

Note

During ground operation, the secondary bus is energized by battery power only if the engine is operated at an rpm which is below the d-c generator cut-in speed. During such operations turn on only those units of the communications equipment as are necessary in order to prevent excessive drain on the battery.

THROTTLE MICROPHONE SWITCH. The throttle microphone switch is installed on the throttle control lever. The switch closes the microphone circuit to the receiver-transmitter when depressed.

UHF RADIO AN/ARC-27A

The AN/ARC-27A communication radio provides two way voice communication with other aircraft and surface stations. The system operates within a frequency range of 225 to 400 megacycles. Channels are remotely selected at the UHF control panel. The system is energized when the circuit breaker is depressed and the master radio switch is closed. The transmitter may be tone-modulated at 1020 cycles per second for emergency or direction finding purposes. A selection of 1750 frequency channels is provided in the operating range.

RECEIVER-TRANSMITTER AN/ARC-27

The AN/ARC-27 receiver-transmitter is installed in the radio compartment on the left side of the lower radio equipment shelf. The unit incorporates two transmitting and two receiving circuits. The receiving circuits are referred to as MAIN, and GUARD. The main re-

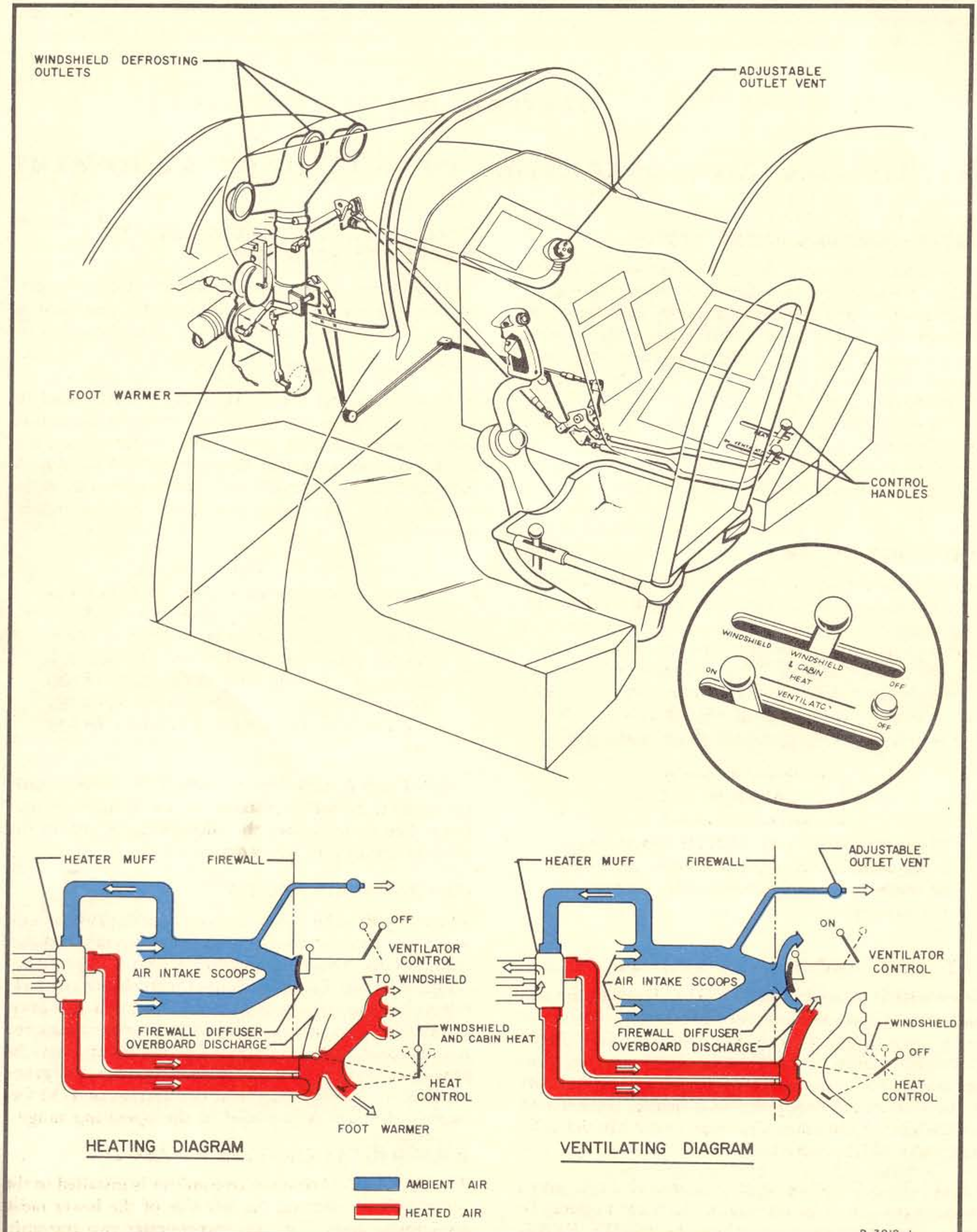

Figure 4-1. Heating and Ventilating System

ceiver is used when the equipment is receiving on any channel except the guard channel. The guard receiver, being fixed-tuned, may be used for constant monitoring of the guard frequency.

C-1015/ARC-27A CONTROL PANEL

The AN/ARC-27A control panel is installed on the right hand console and is identified as UHF. The unit contains three rotary selector switches identified as PRESET-MANUAL, CHAN, and ADF-T/R + G REC-T/R. The PRESET-MANUAL switch is used to select preset or manual tuning. The CHAN selector switch permits the selection of 18 preset frequencies and one guard frequency. The ADF-T/R + G REC-T/R switch performs the following functions at the following settings:

SETTING	FUNCTION
"ADF"	Places transmitter in stand-by, AN/-ARA-25 direction finding system in operation through the main receiver.
"ADF"	[2]Places transmitter in use in conjunction with AN/ARA-25 direction finding system which operates through the main receiver.
"T/R + G REC"	Places transmitter and main receiver in operation; permits monitoring of guard frequency through guard receiver.
"T/R"	Places transmitter and main receiver in operation; guard receiver in stand-by.

Note

The AN/ARC-1 may be used as an alternate installation[3].

AN/ARA-25 AUTOMATIC DIRECTION FINDING SYSTEM

The AN/ARA-25 automatic direction finding system operates in conjunction with the AN/ARC-27A UHF communication radio system to provide a continuous indication in degrees of the relative direction of arrival of amplitude modulated or unmodulated signals in the 225 to 400 megacycles signal band. The received signals are reflected on the AN/ARN-6 course indicator for the purpose of providing homing or similar navigational information. The system is placed in operation when the ADF T/R + G REC-T/R switch on the UHF control console is set to "ADF" position.

RADIO MAGNETIC COMPASS

An ID-250/ARN course indicator is installed in the pilot's instrument panel and is identified as RADIO MAGNETIC COMPASS. The unit operates in conjunction with the AN/ARA-25 direction finding system and the AN/ARC-27A receiver-transmitter to provide homing information. Directional information is provided by the number 1 needle of the ID-250/ARN course indicator. The #2 needle also furnishes course information when functioning in the AN/ARN-6 radio compass system.

RADIO MAGNETIC COMPASS (COURSE INDICATOR)[1]

The compass card on the ID-250/ARN course indicator serves as the MDI since the directional gyro indicator (G-2 compass) is not visible to the pilot. (Refer to INSTRUMENTS, Section I.)

RADIO COMPASS EQUIPMENT

The AN/ARN-6 radio compass is designed to guide the aircraft to a transmitting station or to take bearings on transmitting stations as an aid to navigation. It may also be used as a radio communication receiver. The equipment has a frequency range of 100 to 1750 kilocycles.

RADIO COMPASS CONTROL UNIT. The R-101/-ARN-6 receiving set is remotely tuned by means of the ADF control panel (25, figure 1-5). Three rotary control switches and a volume control knob are located on the ADF panel. The VOL control is for adjustment of the audio signal strength. The BAND switch is used to select the desired frequency band. Tuning within the selected band is accomplished electrically and is controlled by means of the FREQ tuning switch. This switch has two indicated positions, "DEC" (decrease frequency) and "INC" (increase frequency), and returns to a neutral point when released. The rate of tuning increases as the control is turned farther toward either extreme position. The third rotary switch is identified by its three marked position; "OFF," "ADF," and "ANT."

On later aircraft[4] the control panel is labeled RADIO COMP, and a CW-VOICE switch and loop position control are added. A "LOOP" position on the function selector switch provides for directional positioning of the loop with the LOOP L-R switch.

RADIO COMPASS OPERATION. Turning the function switch from "OFF" to either of the remaining positions turns the receiving set on if the MASTER RADIO switch is "ON." When turned to "ADF," the set receives through both a loop and a long wire antenna. As the set is tuned for maximum signal strength, the loop antenna will automatically align itself with the direction of travel of the signal. A visual indication of the signal direction is presented by the number 2 needle of the ID-250/ARN radio compass indicator (27, figure 1-4) on the pilot's instrument panel. When the "ANT" position is selected, the loop antenna is switched out of the circuit and the set operates as a low frequency receiver only.

Operation of the RADIO COMP panel on later aircraft[4] is the same as in the preceding instructions

(1) BuNo. 135278 and subsequent.
(2) BuNo. 135223 and subsequent.
(3) Installation provisions only.
(4) BuNo. 135382 and subsequent.

except for the following procedure: With the function selector switch on "LOOP" position, the loop antenna may be set on a fixed position or rotated in either direction by turning the LOOP L-R switch to left or right. The CW-VOICE switch may be set on "CW" position for greater accuracy in tuning in a station and then placed on "VOICE" for normal operation.

MARKER BEACON EQUIPMENT

The AN/ARN-12 marker beacon receiving system is provided as a radio navigation aid. Functionally, the system receives a 75 megacycle signal, modulated at 400, 1300, or 3000 cycles, from marker beacon transmitters. From these signals, the relative position of the airplane can be checked with respect to specific marker beacon stations. Aural and visual indications are provided by the inter-communication radio and a marker beacon indicating light respectively. The system is energized when the MASTER RADIO switch is set to "ON."

MARKER BEACON VISUAL INDICATOR. The marker beacon indicating light (2, figure 1-4) is installed on the pilot's instrument panel for visual presentation of the marker beacon code. The light is a "press-to-test" type.

TABLE OF COMMUNICATIONS AND ASSOCIATED ELECTRONICS EQUIPMENT

TYPE	DESIGNATION	FUNCTION	RANGE	LOCATION OF CONTROLS
UHF COMMUNICATION	AN/ARC-27A	SHORT RANGE, TWO-WAY VOICE COMMUNICATIONS	LINE OF SIGHT	RIGHT-HAND CONSOLE
VHF COMMUNICATION	AN/ARC-1	SHORT RANGE, TWO-WAY VOICE COMMUNICATIONS	LINE OF SIGHT	INSTALLATION PROVISIONS ONLY
UHF HOMING ADAPTER	AN/ARA-25	PROVIDES MEANS OF HOMING ON UHF TRANSMISSIONS	LINE OF SIGHT	RIGHT-HAND CONSOLE
RADIO COMPASS	AN/ARN-6	RECEPTION OF VOICE OR CODE SIGNALS FOR DIRECTION FINDING AND BEARINGS	500 MILES	RIGHT-HAND CONSOLE
MARKER BEACON RECEIVER	AN/ARN-12	RECEPTION OF LOCATION MARKER BEACON SIGNALS FROM INSTRUMENT APPROACH STATIONS		INDICATOR LIGHT ON INSTRUMENT PANEL
RADAR ALTIMETER	AN/APN-22	INDICATES ALTITUDE ABOVE TERRAIN	0 TO 10,000 FT. (OVER LAND) 0 TO 20,000 FT. (OVER WATER)	INDICATOR ON INSTRUMENT PANEL
RECOGNITION RADAR IDENTIFICATION SET IFF	AN/APX-6	RECEPTION AND TRANSMISSION OF IDENTIFICATION SIGNALS	LINE OF SIGHT	RIGHT-HAND CONSOLE
SEARCH RADAR	AN/APS-19C	RADAR DETECTION OF SURFACE OBJECTS AND OTHER AIRCRAFT	LINE OF SIGHT	LEFT-HAND CONSOLE
OMNI-RANGE RECEIVER	AN/ARN-14E	VOR, VAR AND LOCALIZER SIGNALS	LINE OF SIGHT	INSTALLATION PROVISIONS ONLY

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Figure 4-2. Table of Electronic Equipment

On later aircraft[1] the marker beacon indicator is located on the right hand side of the instrument panel (2, figure 1-4, sheet 2).

Note

The installation schedule described here pertains to aircraft condition at time of delivery from the factory. Following modifications in the field, the marker beacon light may be in either location previously described.

RADAR ALTIMETER EQUIPMENT

The AN/APN-22 radar altimeter is designed to provide reliable operation from 0 to 10,000 feet over land and 0 to 20,000 feet over water. The accuracy of indication is plus or minus 2 feet from 0 to 40 feet and plus or minus 5 percent of the indicated altitude from 40 to 20,000 feet.

HEIGHT INDICATOR ID-257/APN-22. The height indicator (7, figure 1-4) is located on the pilot's instrument panel and shows, on a "single-turn" type of indicator, the true altitude of the aircraft above the surface. The altitude pointer advances linearly over the range from 0 to 200 feet and proportionally from 200 to 20,000 feet. The only operating control, the ON-LIMIT switch, is located on the lower left corner of the height indicator. This switch incorporates the off-on control and is also used to select the limit altitude by adjustment of a bug pointer on the outside of the calibrated scale.

LIMIT INDICATOR SYSTEM. An altitude limit indicator system is included to provide a visual indication of flight at or below a preset altitude. When at or below the preset altitude, a red warning light on the lower right corner of the height indicator is illuminated. As long as the aircraft remains above the preset altitude the light will remain off.

DROP-OUT. The drop-out altitude (altitude at which the signal becomes too weak to operate the radar altimeter) is above 10,000 feet over land and at a higher altitude when over water. The drop-out altitude is reduced in banks of 60 degrees and climbs or dives of approximately 70 degrees. When drop-out occurs an electrical circuit disables the indicator and moves the indicator needle behind a mask to prevent the pilot from using the indicator when the signals are too weak to give a reliable indication.

OPERATION OF THE AN/APN-22 RADAR ALTIMETER.

a. Turn the ON-LIMIT control on the height indicator in a clockwise direction.

b. Allow approximately three minutes for the equipment to start operating.

[1] BuNo. 135278 and subsequent.
[2] BuNo. 135223 and subsequent.

CAUTION

Allow at least 12 minutes warm-up time after starting to insure final accuracy. If the temperature is −40°C, 25 minutes should be allowed.

c. With the ON-LIMIT switch, set the bug pointer to the desired limit altitude.

d. To stop the AN/APN-22 radar altimeter, turn the ON-LIMIT switch in a counterclockwise direction to its fullest extent.

RADAR IFF SYSTEM

The AN/APX-6 recognition radar system provides the airplane with a means of identifying itself when correctly challenged by an interrogator-responsor associated with surface or airborne radar equipment. The system also permits surface tracking of the airplane in which it is installed. Functionally, the AN/APX-6 system receives challenges originated by an interrogator-responsor and transmits coded replies to the interrogator-responsor for display on the challenger's radar indicator.

IFF CONTROL. A C-269/APX-6 control panel (18, figure 1-5) is installed in the right-hand console and is identified as IFF. The unit contains a rotary selector switch identified as MASTER with five designated positions: "OFF," "STDBY," "LOW," "NORM," and "EMERGENCY." Also included are two toggle switches identified as MODE 2 and MODE 3 and a DESTRUCT switch which is guarded to prevent its being inadvertently actuated. The system is energized when the MASTER switch on the IFF control panel is set to any position other than "OFF."

DESTRUCTOR CIRCUIT. A destructor circuit is incorporated into the system for the purpose of destroying the RT-82/APX-6 receiver-transmitter to prevent its falling intact into enemy hands. Power for the destructor circuit is obtained from the battery bus through a 10-ampere circuit breaker installed in the right-hand circuit breaker panel and identified as IFF DESTR. (On later aircraft[2] the destructor circuit is removed or disconnected.)

CAUTION

Closing the DESTRUCT switch when the destructor circuit is energized by the battery bus will detonate the destructors in the RT-82/APX-6 receiver-transmitter regardless of the MASTER switch setting.

AN/APA-89 CODER GROUP[3]. Provisions are made for installation of the AN/APA-89 coder (19, figure 1-5, sheet 2) which operates in conjunction with the AN/APX-6 IFF system.

[3] BuNo. 135304 and subsequent.

SEARCH RADAR EQUIPMENT

The AN/APS-19C search radar equipment is capable of performing the function and search and detection of land, sea, and air targets, and radar beacons for tactical and navigational purposes. In addition to the above functions, the scope will indicate identifying responses from aircraft and ships suitably equipped to respond to IFF equipment. The radar unit is normally located on the left inner wing rack. Provisions have been incorporated for alternate installation of the AN/APS-19C radar nacelle on the left hand outboard wing.[1]

OPERATING CONTROLS. A C-1184/APS-19C control panel is located on the left-hand console and the radar scope is located on the instrument panel. Operation of the various controls is as follows:

a. FUNCTION SWITCH. This switch turns the AN/APS-19C equipment on and off and selects for "STDBY," "BCN," and "SRCH" operation. When the switch is turned through the "STDBY" position, a time-delay relay is actuated. This relay automatically postpones operation of the equipment until a three-minute warm-up period has elapsed. If the pilot desires temporarily to discontinue operation, the FUNCTION switch can be turned to "STDBY" until another tactical operation is wanted. In this way the equipment is kept ready for instant use.

b. TUNE KNOB. This control is an emergency manual tuner to be used if the automatic frequency control (AFC) becomes inoperative. When used in the MANUAL range, the control tunes the receiver for maximum echoes. To retain maximum echoes, adjustment of the control at regular intervals is necessary when the AFC is inoperative. When the control is turned to the extreme counterclockwise "AUTO" position the AFC is in operation and will normally maintain echoes automatically.

c. TILT KNOB. This adjustment is used to change the vertical angle of antenna tilt for the "SRCH" scan. The angular tilt limit is 3° up and 5° down.

d. GAIN CONTROL KNOB. The GAIN control regulates the strength of the signals coming from the receiver and the amount of "snow" that appears on the indicator screen. When the GAIN control is in the extreme counterclockwise position, the gain adjustment becomes automatic.

e. SCAN ANGLE TOGGLE SWITCH. This switch controls the selection of the "WIDE" (135°) or "NAR." (30°) scan angle. Both the 30° search scan and the 135° search scan travel at 15 cycles per minute, covering the field of view 30 times per minute.

f. RANGE KNOB. The range switch is used to select the scanning range of the radar equipment. The ranges 100, 50, 20 and 8 can be used on all positions of the FUNCTION control. Range "150 BCN" can be used when the FUNCTION switch is on "BCN" only.

g. A filter is provided on the indicator screen to allow adjustment for varying ambient light conditions. Moving the filter lever adjusts the amount of light penetration by means of sliding polaroid filters.

h. FOCUS and BRILL CONTROLS. These two controls located on the scope adjust the clarity and brilliance of the cathode-ray tube display. They should be adjusted to give a sharp, clear display on the indicator screen.

OPERATING PROCEDURE

Note

In the following procedure, it is assumed that careful pre-flight radar adjustments and all screw-driver potentiometer adjustments have been made, and that the controls are in an inoperative position.

SEARCH

a. Turn the FUNCTION selector to "SRCH." After a delay of approximately three minutes, the equipment should be operative.

Note

Check scope for "snow" indication. If the snow indication is not satisfactory, or if the target echo is difficult to discern because of too great an amount of snow, "MANUAL" operation of the GAIN control is necessary.

b. When a target echo appears on the screen, turn RANGE switch to the shortest range at which target can be seen. The sequence of operating ranges permits switching to lower ranges, as the aircraft approaches closer to the target.

c. When the operation is completed, turn all controls back to their original positions unless further operations are to be made. In that case, switch the FUNCTION control to the net operation desired or to "STDBY."

BEACON

The procedure for beacon operation is like that of "SRCH" except that the FUNCTION selector is placed on "BCN." RANGE selector is placed on "BCN 100/-150."

AN/ARN-14E RADIO. On later aircraft[2] provisions are made for the installation of the AN/ARN-14E radio. Prior aircraft are being similarly reworked by service change. The omni-range receiver provides VOR, VAR and localizer signals. An ID-249 course indicator provides VOR information and the number 2 needle of the ID-250 radio magnetic indicator gives visual indication of signal direction.

LIGHTING SYSTEM

EXTERIOR LIGHTS

The exterior light system includes the approach light, position lights, formation and fuselage lights.

APPROACH LIGHTS. The approach light is located in the leading edge of the left wing. A push type switch

(1) BuNo. 134603 and subsequent.

(2) BuNo. 135278 and subsequent.

for the approach light, located in the left wheel well, is for steady operation of the light whenever the landing gear is locked down and the arresting gear is not used during night field carrier landing practice. The normal position of the switch is for automatic operation of the light for carrier landings. With the exterior lights MASTER switch on the right-hand console in "CODE," "FLASH," or "STDY" and the MASTER EXT LIGHTS switch located outboard of the throttle quadrant in the "ON" position, and the approach light switch "OFF," the approach light will operate as follows:

LANDING GEAR	ARRESTING HOOK	APPROACH LIGHT
Not locked down	Any position	Off
Locked down	Not down	Flash
Locked down	Down	Steady

POSITION LIGHTS

Standard wing tip position lights are installed on the airplane. The tail light consists of one amber and one white light mounted on each side and near the top of the vertical stabilizer.

FORMATION LIGHTS. The formation lights consist of flush-mounted rectangular windows illuminated from within the airplane structure. These lights are situated one on each side of the fuselage just above the leading edge of the dive brake and one on top and bottom of each wing tip trailing edge. The fuselage formation lights are amber; the wing tip formation lights are red and green similar to the position lights.

FUSELAGE LIGHTS. The fuselage lights are white and are located one on the top of the fuselage aft of the canopy and one on the bottom of the fuselage forward of the dive brake. Steady fuselage light operation is provided when the code switch is in "AUTO" and the MASTER switch is in "MAN."

EXTERIOR LIGHTS CONTROL. A MASTER EXT LIGHTS switch is located on the left side of the cockpit aft of the landing gear control. The EXTR LTS control panel is located on the right console. Four toggle switches with the indicated positions "BRIGHT," "OFF," and "DIM" are labeled FUSEL (fuselage lights) WING and TAIL (position lights), and FORM (formation lights). A five position MASTER switch is used to select the desired function of the lights for STDY, FLSH, CODE or MAN operation. A lettered rotary switch labeled FUSEL is used for letter selection for automatic coding of fuselage lights. A switch labeled PUSH TO KEY and a monitor light are included for manual coding of the fuselage lights. The monitor light reflects fuselage light operation. The exterior lights receive power from the secondary bus.

INTERIOR LIGHTS

The interior lighting system includes all panel and console lights, compartment flood and utility lights, and fuselage service lights.

INTERIOR LIGHTS CONTROL PANEL. The INT LTS control panel (13, figure 1-5) is located on the right console adjacent to the WING FOLD control. The panel contains three switches labeled FLT INST, NON FLT INST, and CONSOLE. Brightness is controlled by rotating the switches clockwise from the "OFF" position toward the "BRT" position.

PILOT'S UTILITY LIGHTS & CHARTBOARD LIGHTS. Utility lights are provided above each console. The left light is equipped with an extension cord and may be pulled out of its socket for cockpit use. The utility lights are equipped with a red and white filter which may be selected by rotation of the end section of the light. The light is directed by rotation of the entire light case. The FLOODLIGHT control panel (14, figure 1-5) is located on the right console. The switch rotates clockwise from OFF, to DIM, MED, and BRIGHT. A compass light with an ON-OFF toggle switch is operated from the same panel. Chartboard lights in the glare shield on each side of the instrument panel operate with the unlatching of the chartboard when the CONSOLE switch is turned out of the "OFF" position. When the FLOODLIGHT control is turned to "BRIGHT" the chartboard lamps will light. These lights are connected to the battery bus.

AUTOMATIC INSTRUMENT LIGHTING

If the power from the d-c generator fails, the FLT INST and the NON-FLT INST lights are automatically switched to the a-c generator through a 115-26 volt transformer if the landing gear handle is in the "WHEELS UP" position. If d-c generator failure occurs after the landing gear has been extended, when making a landing approach, the cockpit lights will continue to operate on battery power a sufficient length of time for landing.

CAUTION

To conserve battery power, turn off all non-essential equipment when flight cannot be terminated.

OXYGEN SYSTEM

A composite dilutor-demand oxygen regulator is located on the left-hand console (24, figure 1-3). Air and oxygen are mixed automatically and delivered to the pilot's mask, the ratio of oxygen and air depending upon the altitude, quantity depending on the demand. A supply cylinder of 514 cubic inch capacity supplies oxygen under pressure to the regulator.

OXYGEN SYSTEM CONTROLS

OXYGEN SUPPLY SHUT-OFF VALVE

An oxygen supply shut-off valve, located on the left-hand console adjacent to the oxygen regulator, has two positions; "ON" and "OFF."

OXYGEN REGULATOR. When the regulator control is placed in "NORMAL," the regulator automatically mixes varying quantities of oxygen and air in ratio depending upon altitude and delivers this mixture on demand. When the regulator control is placed in "100% OXYGEN," the regulator delivers 100 per cent oxygen on demand. At pressure altitudes above 30,000 feet, the regulator automatically delivers 100 per cent oygen with the regulator control in either "NORMAL" or "100% OXYGEN" position.

PREFLIGHT CHECK

The following items should be checked at regular intervals when the airplane is on the ground, and whenever possible before flights in which oxygen is likely to be used, to assure proper functioning of the oxygen system:

a. The oxygen supply pressure gage should read 1800 (± 50) psi if cylinder is fully charged. If the cylinder pressure has decreased more than 50 pounds in 24 hours, the leakage is excessive and the system should be repaired.

b. Fully engage the mating portions of the disconnect coupling to connect the mask to the personnel gear receptacle.

c. Breathe several times with the regulator air valve in both "NORMAL OXYGEN" and "100% OXYGEN" positions to check regulator operation and observe the flow indicator for "blink," verifying the positive flow of oxygen.

d. Put on the mask. Check the mask fit by placing the thumb over the disconnect at the end of the mask tube and inhale lightly. If there is no leakage, the mask should adhere tightly to the face and a definite resistance to inhalation should be encountered. If the mask leaks, tighten the mask suspension straps. DO NOT USE A MASK THAT CONTINUES TO LEAK. The characteristics of the A-13A mask exhalation valve are such that with the breathing tube sealed by the thumb, after the first inhalation the exhalation valve may remain open. In testing, release the thumb after each inhalation.

OPERATING INSTRUCTIONS

The following procedures should be followed when oxygen is used during flight:

a. Set air valve to "NORMAL OXYGEN" for all normal flight operations.

OXYGEN DURATION

MAN–HOURS PER CYLINDER

ALTITUDE FEET	AIR VALVE	GAGE PRESSURE P.S.I.								
		1800	1600	1400	1200	1000	800	600	400	BELOW 300
30,000	NORMAL	3.9	3.4	2.9	2.3	1.8	1.3	0.8	0.2	EMERGENCY DESCEND TO ALTITUDE NOT REQUIRING OXYGEN
	100% OXYGEN	3.9	3.4	2.8	2.3	1.8	1.3	0.8	0.2	
25,000	NORMAL	4.5	3.8	3.3	2.7	2.1	1.5	0.8	0.3	
	100% OXYGEN	2.7	2.3	1.9	1.6	1.2	0.9	0.5	0.2	
20,000	NORMAL	5.5	4.8	4.0	3.3	2.6	1.8	1.1	0.3	
	100% OXYGEN	1.9	1.7	1.4	1.1	0.9	0.6	0.4	0.1	
15,000	NORMAL	6.2	5.4	4.5	3.7	2.9	2.1	1.2	0.4	
	100% OXYGEN	1.4	1.2	1.0	0.8	0.6	0.5	0.3	0.1	
10,000	NORMAL	6.1	5.2	4.4	3.6	2.8	2.0	1.2	0.4	
	100% OXYGEN	1.1	0.9	0.8	0.6	0.5	0.3	0.2	0.1	
5000	NORMAL	4.5	3.9	3.3	2.7	2.1	1.5	0.9	0.3	
	100% OXYGEN	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.1	

REMARKS:
Above table based on installation of one cylinder. Multiply man-hours given by number of cylinders installed for total man-hours available.

NOTE:
Do not exhaust supply below 300 psi except in an emergency.

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Figure 4-3. Oxygen Duration Chart

b. Put the mask on. Fully engage the mating portions of couplings.

While using oxygen, check the following frequently:

a. Cylinder pressure gage for remaining oxygen supply.

b. Oxygen flow indicator for flow of oxygen through regulator.

c. Mask fit for leaks, and breathing tube connection for security.

WARNING

In the event of loss of radio communication, check to see that the breathing tube is properly connected to the receptacle. Headset and microphone connections are closely tied-in with this union and may indicate a disconnection at this location.

SAFETY PRESSURE LEVER. By manually turning the lever marked SAFETY PRESSURE, to "ON," a pressure of 1 3/4 + 1/4 inches is delivered to the mask. Safety pressure should be used at all times when above 35,000 feet. Safety pressure should not be used routinely at lower altitudes since the use of safety pressure reduces the effectiveness of the air diluter and causes increased oxygen consumption. The increased pressure inside the mask eliminates air leakage into the mask.

CAUTION

In order to utilize the safety pressure of this type oxygen regulator, it is necessary to use the type A-13 or A-13A pressure breathing oxygen mask.

WARNING

The SAFETY PRESSURE lever must be "OFF" whenever the oxygen mask is not in use, otherwise there will be a continuous flow of oxygen from the regulator which will exhaust the supply and in the presence of oil or grease will cause a violent explosion.

EMERGENCY CONDITIONS

a. Should symptoms occur which suggest the onset of anoxia, immediately turn the SAFETY PRESSURE lever "ON" and descend below 10,000 feet. If for any reason the regulator should become inoperative and a constant flow of oxygen is not obtainable by use of safety pressure, activate the oxygen bailout equipment, if available, and descend below 10,000 feet as rapidly as possible.

b. Whenever excessive carbon monoxide or other noxious or irritating gas is present or suspected, regardless of altitude. the diluter valve should be turned to "100% OXYGEN," and undiluted oxygen used until the danger is passed or the flight is completed.

WARNING

- Do not exhaust supply cylinder below 300 psi except in an emergency.
- Use of safety pressure does not give undiluted oxygen.

Figure 4-3 may be used to determine the amount of oxygen available at various altitudes in man-hours at normal consumption. Should brief removal of the mask from the face be necessary at high altitude, the following procedure should be used:

a. Take three or four deep breaths of 100 percent oxygen.

b. Hold breath and remove mask from face.

c. As soon as practicable, replace mask to face and take three or four deep breaths of 100 percent oxygen.

d. Reset air valve to normal operating position.

ANTI-G SYSTEM

The anti-G equipment provides the pilot with protection against "grey-out," "blackout" and unconsciousness, alleviates fatigue and decreased mental alertness which may result from repeated acceleration below the blackout level. It also provides the pilot with an indication of the acceleration to which the plane is being subjected. The control valve in the system automatically adjusts itself to the G applied and reduces the pressure as the airplane returns to the level flight attitude. The suit is inflated with approximately 1.0 psi per G after 1.80 G is attained. At five G's the valve is fully open and admits a maximum of 6 psi of air to the suit. When there is no G load, the control valve vents the pressurized air overboard. For operation of the anti-G system, plug the suit connection into the anti-G receptacle.

WARNING

The limiting load factor given in figure 5-2 must be observed during all maneuvers even though anti-G equipment is being used.

AUTOMATIC PILOT

A P-1 Automatic Pilot, electrically powered by the number two inverter, is installed in the aircraft. Directional flight reference for the automatic pilot is established by the G-2 compass gyro; the roll and pitch flight references are established by the gyroscope in the gyro-horizon. In addition an electrically driven turn and bank indicator located in the electronic equipment compartment, provides the references needed to produce coordinated turns when the airplane is maneuvered through the automatic pilot. All controls for the normal operation of the automatic pilot are on a single control panel (26, figure 1-5) on the right hand console. In addition, an emergency handle (42, figure 1-3) for mechanically disconnecting the auto-pilot from the control system is provided on the left-hand console.

AUTOMATIC PILOT CONTROL PANEL. Selection of power, engagement of the auto-pilot and subsequent trimming and control of the aircraft is accomplished through the AUTO PILOT control panel. The FLT INSTR PWR SEL switch is turned to "INVERTER 2 & AUTO PILOT" to energize various components of the auto-pilot system. A clutch switch, labeled PUSH AUTO-PILOT ON is used to engage the auto-pilot after it has been warmed up. The controller, located in the center of the AUTO PILOT panel, provides controls for bank and pitch trim and for maneuvering the aircraft through the auto-pilot.

AUTOMATIC PILOT PRE-FLIGHT CHECK

a. With the battery-generator switch at "BAT & GEN," the generators charging, and the FLT INST PWR SEL switch on "INVERTER 2 & AUTO PILOT," allow at least two minutes for the gyros to come up to speed and for other components of the system to warm up. Erect the gyro-horizon by first caging and then uncaging.

Note

The automatic pilot clutch switch is interlocked with the caging mechanism of the gyro horizon so that the auto-pilot cannot be engaged whenever the gyro is caged. Also, should the gyro be accidentally caged while the auto-pilot is in operation, the clutches will be automatically disengaged, returning the airplane to manual operation.

CAUTION

Observe the warning nameplate, DISCONNECT AUTOPILOT PRIOR TO CAGING INDICATOR, which is affixed to the non-tumbling gyro horizon instrument installed in later aircraft[1]. (Refer to Section I, NON-TUMBLING GYRO HORIZON.)

b. Center the surface controls and engage the auto-pilot by pressing the clutch switch in.

c. Operate the surface controls manually. Resistance to movement will indicate an operative auto-pilot.

d. Move the turn control, pitch trim control and bank trim control and observe corresponding surface controls to see that their movement is in proportion to adjustment at the controller.

e. Pull out on the clutch switch. The auto-pilot should release as indicated by normal manual operation of controls.

f. Turn the FLT INST PW SEL switch to "INVERTER 1" for taxi and take-off.

IN-FLIGHT OPERATION

TO ENGAGE

a. Erect the gyro-horizon as needed.

b. With the G-2 compass switch in the "COMPASS CONTROL" position, cage the directional gyro and set indicator (outer dial) to agree with the magnetic indicator reading (inner dial). Hold the indicator in this position for at least two seconds and then release straight out.

Note

In aircraft with the modified instrument panel[1], the directional gyro is aligned by turning the caging knob of the G-2 compass (9, figure 1-4, sheet 2) and setting the radio magnetic (course) indicator card to match the reading of the standby compass.

WARNING

Do not, under any circumstances, set or reset the G-2 compass while the P-1 auto-pilot is engaged. This may cause abrupt rudder forces exceeding the design limits of the airplane.

c. Turn the FLT INST PWR SEL switch to "INVERTER 2 & AUTO PILOT."

d. Allow two minutes for the amplifier to warm up.

e. Center the turn-control knob in its detent position; also center the pitch-trim control and the bank-trim adjustment on the controller.

f. Trim the airplane in the desired attitude of flight.

g. Engage the automatic pilot by pressing the clutch switch in.

CAUTION

Do not engage the automatic pilot while in a turn, or in climbs, dives or banks of more than 10 degrees.

OPERATION DURING FLIGHT

a. To climb, turn the pitch-trim control counterclockwise "UP."

b. To dive, turn the pitch-trim control clockwise "DOWN."

c. To trim bank, turn the BANK-TRIM adjustment clockwise to raise the left wing; counterclockwise to raise the right wing.

d. To turn or to trim course, displace the turn-control knob out of its central detent position until the desired heading is obtained. To return to straight flight, the turn-control knob should be centered.

(1) BuNo. 135278 and subsequent.

Note

Generally, when flying the automatic pilot, it is well to retrim the airplane in manual flight every hour.

WARNING

Do not adjust trim tabs while the automatic pilot is engaged.

TO DISENGAGE. The return to manually controlled flight is achieved by pulling out the clutch switch.

EMERGENCY RELEASE. If the auto-pilot malfunctions to the point where it jams the controls, complete mechanical disengagement can be accomplished by pulling out the emergency release handle which is located on the left console and marked AUTO PILOT RELEASE.

Note

After the emergency release has been pulled, the automatic pilot cannot be used until the mechanical servo disconnects have been re-engaged.

As a last resort, the auto-pilot can be overpowered by strong application of the manual surface controls.

NAVIGATION EQUIPMENT

G-2 COMPASS

The G-2 compass consists of a remote compass transmitter, an amplifier and a master direction indicator containing a directional gyro element. The compass gyro is non-tumbling and does not require caging before or after maneuvers. The master direction indicator (9, figure 1-4, sheet 1) contains a magnetic compass card and a directional gyro indicator. For use, the gyro is caged and set to correspond with the directional indication of the miniature dial in the center of the indicator face. To correctly set the directional gyro indicator, *the caging knob must be kept fully depressed at the new heading for at least two seconds, and then must be released straight out, avoiding any twisting motion.* A switch (4, figure 1-4) which controls the compass slaving system is located on the left hand side of the instrument panel. The switch must be in the "COMPASS CONTROL" position for the directional gyro indicator to be subject to compass control. In this condition the directional gyro will be stabilized by the remote compass transmitter and amplifier and will provide a continuous indication of the magnetic heading of the airplane. Moving the switch to the "FREE DG" position disconnects the gyro torque motor from the compass circuit, allowing the indicator to operate as a free directional gyro. The "FREE DG" position is used to prevent the directional indications from becoming erratic due to excessive "dip" of the earth's magnetic field in the polar regions.

Note

The G-2 compass operates the automatic pilot in both the "COMPASS CONTROL" or "FREE DG" position, so the course should be checked if the unit is in the "FREE DG" position and corrected periodically for precession.

G-2 COMPASS (CONCEALED)[(1)]

The G-2 compass in later aircraft is installed in back of the instrument panel with caging knob (9, figure 1-4, sheet 2) located beneath and on the left side of the elapsed time clock. Since the G-2 compass indicator is not visible to the pilot, the compass card of the radio magnetic (course) indicator is utilized as the MDI, repeating the reading of the directional gyro. With the compass slaving switch in the "COMPASS CONTROL" position, the radio magnetic indicator gives the magnetic heading, but when in the "FREE DG" position, the reading will be the same as the free directional gyro. Resetting the directional gyro is accomplished by turning the caging knob and setting the radio magnetic indicator card to match the reading of the standby compass.

CAUTION

Make certain that the compass slaving switch is on "COMPASS CONTROL" position so that the G-2 compass gyro is slaved when using the radio magnetic indicator. It is recommended that the pilot check the aircraft heading with the standby compass as often as required to assure himself that the radio magnetic indicator is repeating the magnetic heading and not the free directional gyro reading.

MAGNETIC STANDBY COMPASS

An auxiliary magnetic compass (14, figure 1-4) is located on top of the instrument glare shield.

RADIO MAGNETIC INDICATOR

The RADIO MAGNETIC INDICATOR located on the instrument panel (27, figure 1-4) combines a magnetic direction compass card with two radio compass indicator needles. The indicator needle number "1" is connected to the Directional Homing Radio AN/ARA-25. The number "2" needle is connected to the AN/ARN-6 Homing and Range Radio Receiver. This system combines the magnetic compass data with the radio compass data, indicating the magnetic course of the aircraft under the top lubber line, and the relative bearings of two radio stations by the respective needles.

Note

Use this instrument as an auxiliary compass only. Primary magnetic course readings are taken from the G-2 compass.

(1) BuNo. 135278 and subsequent.

COURSE INDICATOR (RADIO MAGNETIC INDICATOR)[1]

On aircraft which have the G-2 Compass buried in the instrument panel[1], the radio magnetic (course) indicator is utilized as the MDI (master direction indicator). The modified instrument has a compass card slaved to the directional gyro indicator of the G-2 compass and indicates a magnetic compass reading when the compass slaving switch is on "COMPASS CONTROL" position. The number "2" needle is connected to the AN/ARN-6 Homing and Range Radio Receiver. (Number "2" needle may be used as an indicator for an alternate installation, the AN/ARN-14E VHF Radio[2]. Indicator needle number "1" is connected to the Directional Homing Radio, AN/ARA-25, operating in conjunction with the AN/ARC-27A receiver.

Note

Both number "1" and number "2" needles are aligned and connected to the AN/ARN-6 receiver except when "ADF" position is selected on the AN/ARC-27A control panel. (Refer to C-1015/ARC-27A CONTROL PANEL.)

CHARTBOARD

A MK 6A chartboard is installed directly below the instrument panel (30A, figure 1-4). To place the chartboard in the operative position it is necessary to depress the spring lever located on the left hand side and pull the board out until a detent drops into a hole on the left track. To remove the chartboard from the aircraft depress the spring lever again and pull out on the chartboard assembly.

ARMAMENT EQUIPMENT

All rockets, bombs and other droppable stores are carried externally. Twelve Aero 14D-2 or Aero 14E racks are hung beneath the outboard wing panels for mounting rockets or bombs, while three bomb racks, one on each inboard wing panel and one on the centerline of the fuselage, are used for mounting bombs, torpedoes, mines or other stores. In addition to the external armament, four M-3 20-MM guns are installed in the wings.

Control of all armament is effected through an armament panel (figure 4-5) located beneath the pilot's instrument panel, and, when certain special stores are carried, through additional panels installed on the right-hand console. Electrical release of stores can be controlled directly by the pilot or indirectly through a Mk 3 Mod 4 bomb director. (On later aircraft[1] provisions are made for installation of the Mk 3 Mod 5 bomb director system. Prior aircraft are being similarly reworked by service change.) External stores can be jettisoned manually through emergency release handles located in the cockpit.

ARMAMENT FIRING SWITCHES. The control stick incorporates a trigger switch for firing guns, a release switch identified by a "B" for releasing stores on the center wing racks, and a release switch identified by an "R" to release stores on the outer wing stations.

MASTER ARMAMENT SWITCH. A MASTER ARMT switch (1, figure 4-5) controls the operation of all armament equipment. Unless this switch is "ON," no armament circuits can be energized. A safety feature in the armament circuit causes the MASTER ARMT switch, which is a circuit breaker type, to open whenever the landing gear is extended. When the airplane is on the ground this safety circuit can be by-passed for check of the armament system by momentarily closing a DISABLING SWITCH in the left-hand wheel well. Raising the landing gear or turning the battery-generator switch "OFF" will restore the armament safety circuit for normal operations.

GUNNERY EQUIPMENT

Four forward firing M3 20MM guns are mounted in the wing panels, one of each side of each wing fold joint. A gun sight is provided which may also be used as a bomb and torpedo sight. Provisions have been made for mounting a gun camera in the leading edge of the wing, inboard of the inboard right-hand gun.

GUN SIGHT (MARK 8 MOD 12)

A Mark 8 Mod 12 illuminated gun sight, mounted above the glare shield (11, figure 1-4), utilizes the windshield to reflect the reticle image to the pilot. The sight is used for aiming when firing the guns or releasing weapons with the bomb or rocket release switches. The sight also is used in conjunction with the bomb director which releases the weapons automatically. The sight elevations may be adjusted by the pilot with the SIGHT ELEVATION dial. The sight elevation dial is set to zero when firing the guns. When firing rockets or bombing, the pilot can select the number of mils (UP or DOWN) as required. However, the sight elevation control can also be preset for rapid change from one pre-determined mil setting to another by removing the cover marked TO ADJUST DETENTS and having selected adjustments made prior to flight. The setting of the number of mils depends on the angle of dive and airspeed (refer to ANGLE OF ATTACK RELATIONSHIP charts, figure 6-4). For negative angle of attack (a minus mil reading on the ANGLE OF ATTACK RELATIONSHIP chart) turn the control knob to the right ("UP") to raise the reticle image. For a positive angle of attack (a plus mil reading on the ANGLE OF ATTACK RELATIONSHIP chart) turn the control knob to the left ("DOWN") to lower the reticle image.

GUNSIGHT (MARK 20 MOD 4)[3]

The Mark 20 Mod 4 gunsight (figure 4-3A) is provided with an adjustable glass reflector through which the pilot views the reticle image. The SIGHT ELEVATION knob on the left-hand side of the instrument adjusts the angle of the glass reflector. The "O" mark

(1) BuNo. 135278 and subsequent.
(2) Installation provisions only.

(3) BuNo. 135223 and subsequent.

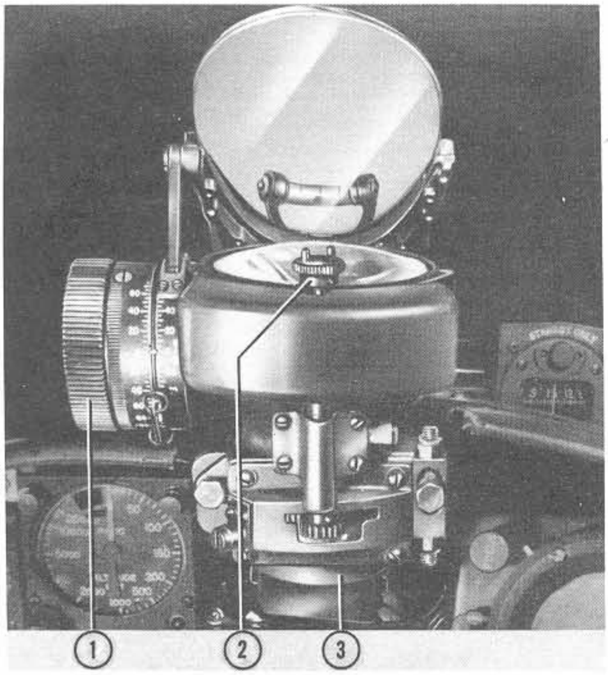


Figure 4-3A. Mk 20 Mod 4 Gunsight

on the knob is turned down to raise the elevation of the image and turned up to lower the image. A small selector knob on top of the gunsight (2, figure 4-3A) can be set at three separate detents for reticle selection. This gunsight will be installed in earlier aircraft by service change.

GUN SIGHT SWITCHES. A gun sight light selector switch and rheostat (4 & 5, figure 4-5) are adjacent to the gun control switches. Rotating the rheostat clockwise from the "OFF" position turns the light on and increases the intensity of the reticle image. The selector switch is primarily left in the "NORMAL" position. If this light burns out or is inoperative, another filament can be turned on by moving the selector switch to "STBY."

TO OPERATE THE GUN SIGHT

a. Battery-generator switch ......"BAT-GEN"
b. MASTER ARMT switch .... "ON"
c. Gun sight light switch ...."ON"
d. Adjust rheostat to desired brilliance. If light does not come on, move light switch to "STDBY."
e. Adjust gun sight elevation dial if required.
f. Center ball in gunsight level during bomb release.

Note

To ground test the gun sight, it is necessary to close the DISABLING SWITCH, located in the left wheel well, prior to step "b" above.

GUN CONTROL SWITCHES

The gun control switches, located on the armament panel (2 & 3, figure 4-5), are used to charge the guns. The left-hand switch controls the two outboard guns and the right-hand switch controls the two inboard guns. The indicated positions are "READY," "OFF," and "SAFE." The guns are charged in pairs and can be fired simultaneously or in pairs as desired. A safety feature overrides the gun control switch circuit when the tail hook or landing gear is extended, to place the gun firing circuit in "SAFE" condition (gun bolts retracted).

TO FIRE THE GUNS

a. Firing of either the two inboard guns or the two outboard guns can be selected by leaving the respective gun control switches in "SAFE."
b. Charge the guns by moving the gun control switch from "OFF" to "SAFE" to "READY."
c. Squeeze the trigger switch on the control stick.

CAUTION

In the event a stoppage occurs during the firing of high explosive-incendiary ammunition, the gun charger shall not be operated more than two cycles in an attempt to clear the stoppage. Operation of the charger through more than two cycles may cause the jammed rounds to explode.

BOMBING EQUIPMENT

A bomb ejector is installed on the fuselage centerline station. A bomb director control panel located on the right-hand console (1, figure 1-5) controls the release of bombs, rockets, or other stores (through the bomb director) automatically during toss-bombing attacks. The center wing stations of the airplane are designed for the installation of the Douglas 30-inch, four-hook rack or the Mark 51 bomb rack with Aero 1A Adapters. The two inner wing racks are each capable of carrying one 2000-pound store or one Mk 13-3 torpedo, while the centerline rack has a maximum capacity of 3600 pounds. Bombs can also be carried on the Aero 14D-2 or Aero 14E racks of the outer wing panels.

BOMB ARMING SWITCH. Bombs and rockets are armed by means of a switch labeled ARM BOMBS (11, figure 4-5) which is adjacent to the INTERVAL SELECTOR SWITCH. Selection of "TAIL" or "NOSE & TAIL" arming is possible. The switch can be centered on "SAFE" for releasing stores unarmed.

INNER STATIONS SELECTOR SWITCH. A selector switch (12, figure 4-5) adjacent to the ARM BOMBS switch must be set relative to the type of store currently being carried on the inner station racks. Three indicated positions are provided. To drop any type of stores loaded on the inner station racks, the switch must be set on "BOMBS." If spray tanks are to be operated or flares are to be released, the selector switch must be turned to "SPRAY OR FLARES." Turning the switch to "ROCKET PACKS" will allow ripple fire of rockets from packages installed on the inner wing racks.

OUTER STATIONS SELECTOR. A selector labeled OUTER STATIONS (7, figure 4-5) is used to set the release sequence of the outer station wing racks. Firing rockets either singly or in pairs from the outer stations is also selected through this selector. To fire rockets singly the selector is set on station "1." To fire pairs, the selector is set on station "7." The OUTER STATIONS selector switch must also be set when bombs are to be released from the outer station racks.

INTERVAL SELECTOR SWITCH. A selector labeled RELEASES PER SECOND (10, figure 1-5) is used to set the number of bombs to be dropped or the number of rockets to be fired per second. The METHOD selector switch with the four indicated positions "SINGLE," "INTERVAL," "BOMB DIREC" and "BOMB DIREC and INTERVAL" must be placed on "INTERVAL" for use of the INTERVAL SELECTOR SWITCH.

INBD STATIONS SELECTOR SWITCHES. Three INBD STATIONS switches (13, figure 1-5) for selection of any of the inner station racks are provided. If the INBD STATIONS switches are set to "LEFT," "CENTER" and "RIGHT," all stores on the inboard stations will be salvoed when the inner stations release switch on the control stick is depressed, regardless of the setting of the interval selector switch. If the INBD STATIONS switches are set to "TRAIN BOMBS" and the interval selector switch is set to "SINGLE," the stores will be released singly in the sequence, left, right, and center, one each time the inner stations release switch is depressed. If, however, the intervalometer switch is set to "INTERVAL," the release sequence will be at the interval rate set on the RELEASES PER SECOND selector switch. The switches can be centered on "OFF" as necessary.

EMERGENCY RELEASE HANDLES. Two handles located on the left-hand console are for emergency jettisoning of stores on all wing racks. The CTR WING BOMB RELEASE handle (10, figure 1-3) is used to jettison stores on the three inner stations. Associated with this control is another handle (9, figure 1-3) identified by the attendant instruction - PULL TO LOCK WING RACKS. Use of this control will lock the inner wing racks so that the centerline store only may be jettisoned with the CTR WING BOMB RELEASE handle. On later aircraft[1] this control is identified by the instruction PULL TO LOCK CENTER STATION. Use of this control in this case will lock the centerline rack only to allow jettisoning of the remaining inner wing racks by use of the CTR WING BOMB RELEASE. The other handle (11, figure 1-3), labeled OUTBD WING BOMB RELEASE is used to jettison all stores hung on the outer wing racks (except rockets loaded on rocket launchers) including rocket packages. (Prior aircraft are being reworked by service change to install the center station lock in lieu of the former system.)

METHOD SELECTOR SWITCH. The METHOD SELECTOR SWITCH (6, figure 4-5) located on the armament panel contains switches which are set to direct control of bomb and rocket releases for the pilot. The selector switch on the panel has four indicated positions, "SINGLE," "INTERVAL," "BOMB DIREC" and "BOMB DIREC & INTERVAL." For control by the pilot of all ordnance releases, this switch is set to "SINGLE" or "INTERVAL." Selection of the "BOMB

[1] BuNo. 134582 and subsequent.

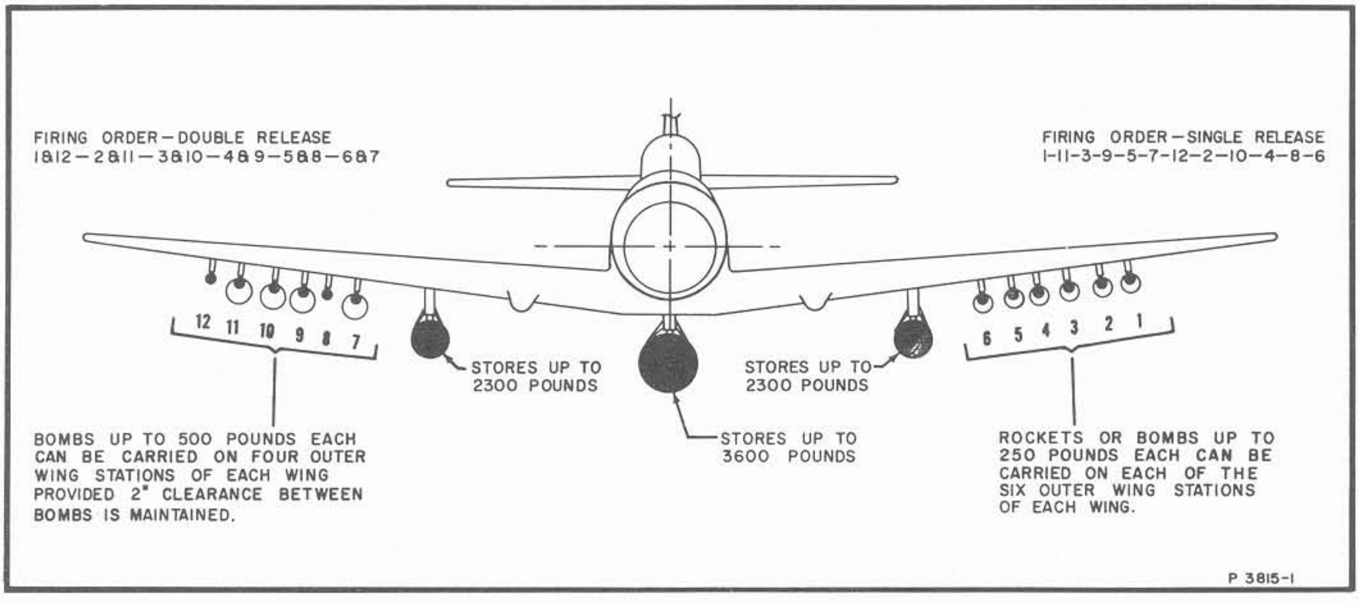


Figure 4-4. External Loads

DIREC" position changes a control of all bomb and rocket releases to the bomb director. The "BOMB DIREC & INTERVAL" position provides for release of bombs through the combined control of the bomb director and interval selector. The interval selector is not in the circuit for rocket-tossing regardless of the setting of the METHOD SELECTOR switch with regard to the "BOMB DIREC" or "BOMB DIREC & INTERVAL" positions. In addition to the METHOD selector switch the INBD ROCKET-BOMB switch and the OUTBD ROCKET-BOMB switch must be set to correspond with the type of stores loaded on the inner or outer stations (i.e., bombs or rockets). The OUTBD ROCKET-BOMB switch(1) is provided with an intermediate "OFF" position to prevent accidental triggering of the outboard stations release switch when dropping inboard stores.

BOMB DIRECTOR. The Mk 3 Mod 4 Bomb Director installed in the aircraft is an electronic control unit designed to release bombs, rockets or other stores automatically at the proper instant during the pull-out phase of a toss-bombing attack. (The Mk 3 Mod 5 bomb director(2) system includes an interval timer for lob-bombing in addition to toss-bombing capabilities.)

BOMB EJECTOR. The bomb ejector rack, which can be installed on the fuselage centerline station, is designed to displace the bomb from the airplane to clear the propeller sufficiently during the steep dive bombing. The bomb ejector circuit should be tested prior to each flight by means of the BOMB EJECTOR TEST SWITCH located in the left-hand wheel well.

TESTING BOMB EJECTOR SYSTEM. With a cartridge installed in the bomb ejector, make the following check:

a. MASTER ARM switch .... "OFF"
b. Battery-generator switch .... "BAT & GEN" or "BAT ONLY"
c. BOMB EJECTOR TEST SWITCH .... "LAMP TEST"

If test lamp on the BOMB EJECTOR TEST panel lights, the circuit is complete. If it does not light, continue with the check as follows:

d. BOMB EJECTOR TEST SWITCH .... "CARTRIDGE TEST"

If the test lamp now lights, the bomb ejector cartridge circuit is open and the cartridge should be replaced. If the lamp does not light, the lamp is probably defective and should be replaced.

e. If it has been necessary to replace the lamp, repeat bomb ejector system check. If the lamp now fails to light in the "CARTRIDGE TEST" position, the cartridge circuit is open and should be checked.

(1) BuNo. 135278 and subsequent.
(2) Installation provisions only BuNo. 13578 and subsequent.

RELEASING BOMBS

SINGLE RELEASE

INNER STATIONS

a. MASTER ARMT switch .... "ON"
b. INBD ROCKET-BOMB switch .... "BOMBS"
c. ARM BOMBS switch .... As Required
d. INNER STATIONS SELECTOR switch .... "BOMBS"
e. INBD STATIONS SELECTOR . "LEFT," "CENTER," and/or "RIGHT"
f. METHOD SELECTOR switch.. "SINGLE"
g. Inner stations release switch.... Depress

Note

Bombs will be released singly, one each time the inner stations release switch is depressed. Sequence of release is left, right, and center.

OUTER STATIONS

a. MASTER ARMT switch....... "ON"
b. OUTER STATIONS SELECTOR switch .... As needed
c. INTERVAL SELECTOR switch. "1"
d. OUTBD ROCKET-BOMB switch .... "BOMBS"
e. ARM BOMBS switch.......... As required
f. METHOD SELECTOR switch .. "SINGLE"
g. Outer stations release switch.... Depress

Note

Five hundred pound bombs loaded as indicated in figure 4-4 are released by setting the OUTER STATIONS SELECTOR switch to positions 2, 11, 3, 10, 4, 9, 6, and 7.

TRAIN RELEASE

INNER STATIONS

a. MASTER ARMT switch....... "ON"
b. INTERVAL SELECTOR switch. As required
c. ARM BOMBS switch .... As required
d. INNER STATIONS SELECTOR switch .... "BOMBS"
e. INBD STATIONS SELECTOR switch .... "TRAIN BOMBS"
f. INBD ROCKET-BOMBS switch .... "BOMBS"
g. METHOD SELECTOR switch .. "INTERVAL"
h. Inner stations release switch.... Depress

OUTER STATIONS

a. MASTER ARMT switch....... "ON"
b. OUTER STATIONS SELECTOR switch .... As required

c. INTERVAL SELECTOR switch . As required

d. ARM BOMBS switch . . . . As required

e. OUTBD ROCKETS-BOMBS switch . . . . "BOMBS"

f. METHOD SELECTOR switch . . "INTERVAL"

g. Outer stations release switch . . . . Depress

SALVO RELEASE

INNER STATIONS

a. MASTER ARMT switch . . . . "ON"

b. ARM BOMBS switch . . . . As required

c. INNER STATIONS SELECTOR switch . . . . "BOMBS"

d. INBD STATIONS SELECTOR switch . . . . "LEFT," "CENTER," and "RIGHT"

e. INBD ROCKET-BOMBS switch . . . . "BOMBS"

f. METHOD SELECTOR switch . . "SINGLE"

g. Inner stations release switch . . . . Depress

OUTER STATIONS

a. MASTER ARMT switch . . . . "ON"

b. OUTER STATIONS SELECTOR switch . . . . "7"

c. INTERVAL SELECTOR switch . "20"

d. ARM BOMBS switch . . . . As required

e. OUTBD ROCKETS-BOMBS switch . . . . "BOMBS"

f. METHOD SELECTOR switch . . "SINGLE"

g. Outer stations release switch . . . . Depress

MANUAL JETTISON

CENTERLINE RACK ONLY(1)

a. WING RACKS LOCKING CONTROL . . . . . Pull

b. CTR WING BOMB RELEASE handle . . . . . . Pull

ALL INNER STATIONS EXCEPT CENTERLINE(2)

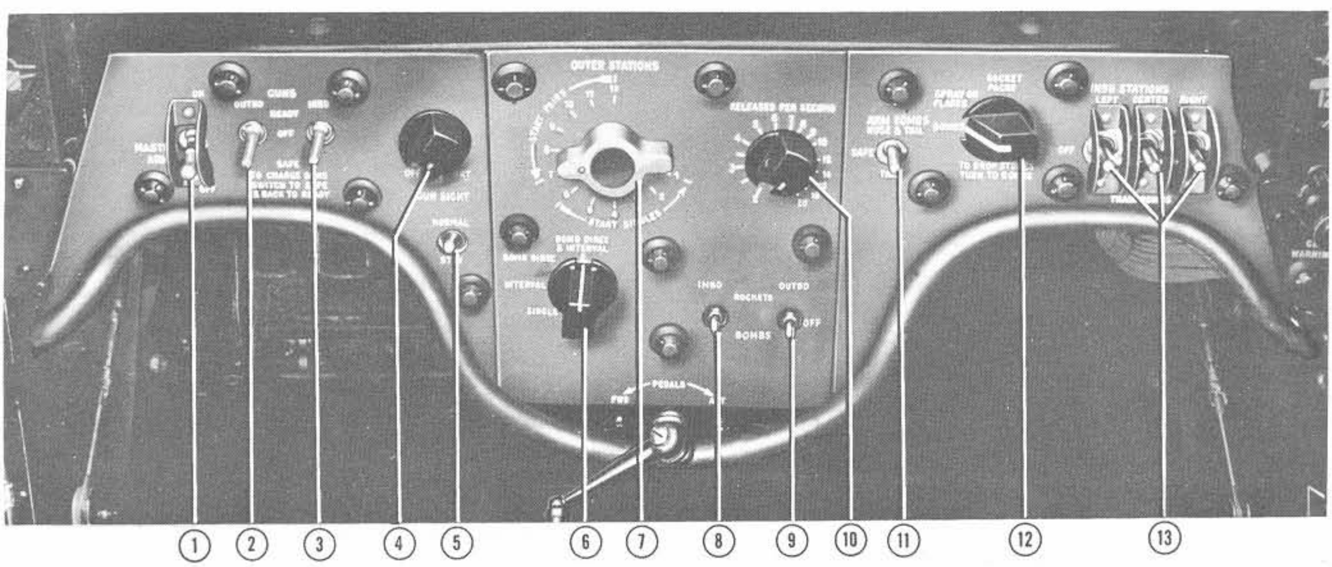
a. CENTER STATION LOCKING CONTROL . . . . Pull

b. CTR WING BOMB RELEASE handle . . . . . . Pull

ALL INNER STATIONS
CTR WING BOMB RELEASE handle . . . . Pull

OUTER STATIONS
OUTBD WG BOMB RELEASE . . . . Pull

(1) BuNo. 134466 through 134581.
(2) BuNo. 134582 and subsequent.



1. Master armament switch
2. Outboard gun control switch
3. Inboard gun control switch
4. Gunsight light rheostat
5. Gunsight light selector switch
6. Method selector switch
7. Outer stations selector
8. Inboard rocket-bomb switch
9. Outboard rocket-bomb switch
10. Interval selector switch
11. Arm bombs switch
12. Inner stations selector switch
13. Inboard stations selector switches

Figure 4-5. Armament Panel

AUTOMATIC BOMB RELEASE

BOMB DIRECTOR CONTROLS. Set the BARO PRESS dial to the current atmospheric pressure, corrected to sea-level, of the target area. If the barometric pressure at the target is not known, the BARO PRESS dial is set with the aid of the null-test meter as follows:

a. Turn the POWER switch "ON" and allow a short warm-up period.

b. Set the TARGET ALTITUDE dial to the actual altitude above sea-level of the airplane.

c. Depress the BARO PRESS dial and rotate it until the arm of the null-test meter is vertically centered.

Note

The reading of the BARO PRESS dial now indicates the current local atmospheric pressure corrected to sea-level value. If the current atmospheric pressure (corrected to sea-level value) of the target is known, this value may be set directly on the BARO PRESS dial.

d. Reset the TARGET ALTITUDE dial to the actual altitude above sea-level of the target.

e. Turn bomb director POWER switch "OFF."

PRE-FLIGHT ADJUSTMENT AND CHECK. Before any toss-bombing mission, the Mk 63 Mod 2 Computer dials, located in the electronic equipment compartment, must be properly adjusted by ground personnel to correspond with the type of ordnance to be released, the expected dive velocity and the type of attack to be made. (Aircraft[(1)] with the Mk 3 Mod 5 bomb director system installed require adjustments to the Mk 63 Mod 3 computer for both toss bombing and lob bombing.)

Diving conditions can be simulated by use of the TEST switch located on the BOMB DIRECTOR control panel for ground testing of the bomb director equipment. This test necessarily requires the use of power from the armament bus, therefore it is of extreme importance that all armament switches be placed in such a position that no stores can be inadvertently released during testing operations. The ground testing procedure listed below, if properly followed, will preclude inadvertent release of stores loaded on the airplane.

WARNING

Do not test bomb director circuits while stores are loaded on the airplane unless absolutely necessary. The TEST switch, when operated in proper sequence with the inner stations release switch, will energize the armament circuits.

(1) Installation provisions only BuNo. 135278 and subsequent.

a. Battery-generator switch .... "BAT & GEN" or "BAT ONLY"

b. ARMAMENT DISABLING switch .... Momentarily depressed

c. MASTER ARMT switch.... "ON"

d. Method selector switch ...... "BOMB DIREC"

e. INBD STATIONS selector switches .... "OFF"

f. Inner stations selecor switch. "BOMBS"

g. ARM BOMBS switch....... "SAFE"

h. OUTER STATIONS selector. Empty rack

i. OUTBD ROCKET-BOMB switch .... "BOMBS"

j. INBD ROCKET-BOMB switch .... "BOMBS"

k. POWER switch .... "ON"

After a short warm-up period, depress the TEST switch for about 12 seconds, then release it and immediately depress the bomb release switch. Hold down the release switch until the pilot's indicator light is illuminated and goes out automatically. If the system is working properly the indicator light should become illuminated approximately two seconds after the inner stations release switch is depressed and should remain illuminated about five times that length of time.

Note

This test is used to check operation only and gives no indication of accuracy of calibration.

ATTACK PROCEDURE

TOSS BOMBING.

a. Turn bomb director POWER switch "ON" from 15 to 30 minutes before bomb director is to be used.

b. Turn gun sight on and make proper off-set adjustment. See Angle of Attack Relationship Curve, figure 6-4.

c. Set armament control panel switches for required settings as given under RELEASING BOMBS.

d. Set METHOD SELECTOR switch as required for particular attack.

e. Begin dive. When dive velocity reaches a relatively constant value and the aim is satisfactory, depress the appropriate release switch (B for inner stations release, R for outer stations release) and hold depressed throughout the attack.

Note

The indicator light will illuminate to indicate the completion of the time-in portion of the dive. The pull-out should be made as soon as possible after the light is illuminated. It will remain illuminated until the bombs are released.

f. Release the switch after the bombs have been released.

Note

If it is decided not to release ordnance after starting a dive, let up on the bomb release switch at any time before the stores are dropped and release will be withheld. This will clear the circuits and reset the computer for a new timing run, which may be started immediately.

K-2 INTERVALOMETER. Aircraft equipped with the Mk 3 Mod 5 bomb director system[1], including an interval timer (figure 4-5A), are adaptable to lob bombing as well as toss bombing. The K-2 Intervalometer is a modified instrument used only for lob bombing in this installation (disregard notation on instrument which reads "Modified For Toss Bombing"). The timer is located forward of the control column on the cockpit floor. Prior aircraft are being similarly equipped by service change.

TIMER CONTROLS. The K-2 Intervalometer has a selector switch marked LOB-TOSS, two dials for setting the time interval and a test light for testing operation of the unit. If required to set the timer during night flight, the pilot may find it necessary to use the cockpit emergency light.

Note

Each K-2 Intervalometer is pretested and provided with a calibration chart for setting the dials in combination to the desired time interval. When setting the timer, use only the chart which applies to the particular unit being used.

LOB BOMBING

Use of the Mk 3 Mod 5 bomb director system for lob bombing necessitates pre-setting of controls according to a detailed plan of attack. Adjustments will be made to the gunsight, timer and computer by an ordnanceman before flight.

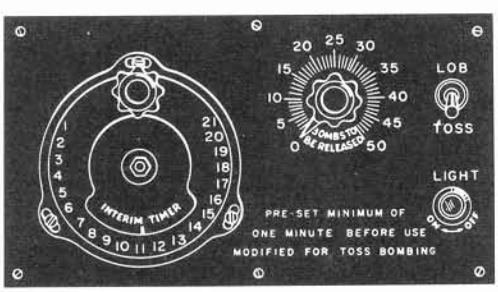


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Figure 4-5A. Interval Timer[1]

[1] Installation provisions only BuNo. 135278 and subsequent.

a. Turn bomb director POWER switch "ON" from 15 to 30 minutes before bomb director is to be used.

b. Turn gunsight on.

c. Place LOB-TOSS switch on timer to "LOB."

d. Set K-2 Intervalometer dials for proper timing if timer has not already been adjusted.

e. Set armament control panel switches for required settings as given under RELEASING BOMBS.

f. Set METHOD SELECTOR switch as required for particular attack.

g. Approach target area according to flight plan. (The airplane's relationship to the initiation point landmark is established by use of the external sightpost and sight dots on the windshield.) At the moment of closing the landmark with the sight, depress release switch (B for inner stations release, R for outer stations release) and hold depressed throughout attack.

Note

The indicator light will illuminate to indicate the pull-up point. The pull-up should be made immediately and according to flight plan.

h. Release the switch after the bombs have been released.

ROCKET EQUIPMENT

Rockets can be carried on the 12 Aero 14D-2 or Aero 14E outer wing racks or on the two inner station wing racks. In addition to suspension of rockets directly on the racks, rocket packages can be hung on any of these stations for increasing the fire-power of the airplane.

FIRING ORDER. Rockets are fired singly from the outer stations in the order indicated in figure 4-4. Sequence of firing pairs is 1 and 12, 2 and 11, 3 and 10, 4 and 9, 5 and 8, 6 and 7. The firing order of the inner stations is the left-hand rack followed by the right-hand rack.

FIRING ROCKETS

SINGLE FIRE

INNER STATIONS. Rockets in packages hung directly on the inner stations racks (e.g., 2.75-inch aircraft rockets) are fired as follows:

a. MASTER ARMT switch .... "ON"

b. Interval selector switch .... "1"

c. Inner stations selector switch.... "ROCKET PACK"

d. INBD ROCKET-BOMBS switch .... "ROCKETS"

e. INBD STATIONS selector switch .... "LEFT," and/or "RIGHT"

f. METHOD selector switch ...... "SINGLE"

g. Inner stations release switch.... Depress

OUTER STATIONS

a. MASTER ARMT switch .... "ON"
b. OUTER STATIONS selector ... "1"
c. Interval selector switch .... "1"
d. OUTBD ROCKET-BOMBS switch .... "ROCKETS"
e. METHOD selector switch...... "SINGLE"
f. Outer stations release switch... Depress

The procedure for single fire of 11.75 inch aircraft rockets is the same as that for BOMBS SINGLE RELEASE.

Note

- To fire rockets in pairs, place the OUTER STATIONS selector on "7."
- The single fire procedure for outer stations will cause ripple fire of all rockets within a package hung on the selected station.

TRAIN RELEASE

INNER STATIONS. Rockets in packages hung directly on the inner stations racks (e.g., 2.75-inch aircraft rockets) are fired as follows:

a. MASTER ARMT switch .... "ON"
b. Interval selector switch......... As required
c. INBD ROCKET-BOMBS switch .... "ROCKETS"
d. INNER STATIONS SELECTOR switch .... "ROCKET PACK"
e. INBD STATIONS selector switches .... "LEFT," and/or "RIGHT"
f. METHOD SELECTOR SWITCH .... "INTERVAL"
g. Inner stations release switch.... Depress

The procedure for train release of 11.75 inch aircraft rockets is the same as that for BOMBS TRAIN RELEASE.

Note

Rockets will ripple fire simultaneously from packages on both inner wing racks. No other firing selection is possible.

OUTER STATIONS

a. MASTER ARMT switch .... "ON"
b. OUTER STATIONS selector... "1" for single release; "7" for paired release
c. Interval selector switch......... As required
d. OUTBD ROCKET-BOMBS switch .... "ROCKETS"
e. METHOD SELECTOR SWITCH .... "INTERVAL"
f. Release switch .... Depress

SALVO RELEASE

INNER STATIONS. The procedure for salvo release of rockets or rocket packages hung directly on the inner stations racks (e.g., 11.75-inch aircraft rockets) is the same as that for SALVO RELEASE INNER STATIONS.

OUTER STATIONS. The procedure for salvo release of rockets on the outer stations is the same as that for TRAIN RELEASE.

MANUAL JETTISON

OUTER STATIONS. Manual jettisoning of rockets from the outer stations is not possible.

INNER STATIONS. Rockets and rocket packages hung on the inner stations are jettisoned by the same procedure as for bombs.

ROCKET TOSSING

The procedure for firing rockets through the Mk 3 Mod 4 (or Mk 3 Mod 5) bomb director is the same as that for a toss-bombing attack with the following exceptions.

a. Set armament control panel switches for required settings given under FIRING ROCKETS.

b. Set the INBD ROCKET-BOMB or OUTBD ROCKET-BOMB switches to "ROCKETS."

Note

The INTERVAL SELECTOR switch is not included in the firing circuit when the ROCKET-BOMB switches are set at "ROCKETS," therefore outer station rockets can be fired at a maximum of one pair only per dive and cannot be salvoed.

TORPEDO EQUIPMENT

A Mk 13 Mod 3 torpedo can be carried on each rack of the three inner stations. Torpedoes are released in the same manner as the bombs. Refer to RELEASING BOMBS. No provisions are made for depth setting from the cockpit.

SPRAY TANK EQUIPMENT

Spray tanks can be carried on each rack of the three inner stations. The control and operation of the spray tanks is through the pilot's armament panel, a special SPRAY TANKS panel on the right-hand console, and the bomb release switch. Armament panel controls are set as follows for operation of the spray tanks:

a. MASTER ARMT switch .... "ON"
b. Function selector switch........ "SPRAY FLARES"
c. SPRAY TANKS panel......... Set switches as required
d. Inner stations release switch.... Depress

Refer to applicable spray tank handbooks for additional operating instructions.

RELEASING SPRAY TANKS. Spray tanks can be jettisoned either electrically or manually as outlined under RELEASING BOMBS.

AERO 2A SONOBUOY FLARE DISPENSER

The three inboard bomb racks are equipped to carry the Aero 2A or 3C Sonobuoy Flare dispenser.

The operation of the flare dispenser is controlled through the pilot's armament panel by a special FLARES panel which is installed on the right hand console as needed, and inner stations release switch on the control stick. No provision has been made for the train release of flares; they may be released singly only.

CAUTION

The maximum speed permitted for flare launching is 220 knots IAS.

RELEASE OF FLARES

a. MASTER ARMT switch .... "ON"

b. Function selector switch........ "SPRAY FLARES"

c. LEFT flare dispenser switch..... "READY"
CENTER and RIGHT switch... "SAFE"

d. Inner stations release switch.... Depress

Note

As each flare is released, the red indicator light associated with the flare dispenser switch will be illuminated until another flare moves into the release position. The light will remain illuminated when its respective dispenser is empty.

e. When the LEFT flare dispenser has been emptied, set RIGHT flare dispenser switch to "READY" and continue releases.

f. Repeat with CENTER switch on "READY."

Note

If flares are dropped in any other sequence than outlined, each flare dispenser switch must be returned to the "SAFE" position before the next switch is placed in the "READY" position.

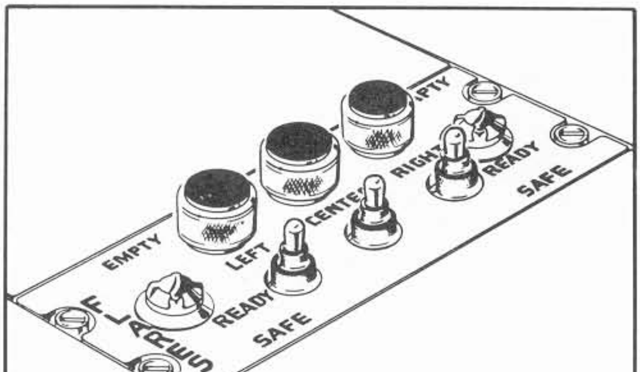


Figure 4-6. Flare Dispenser Control

RELEASING FLARE DISPENSERS

Flare dispensers can be jettisoned electrically or manually as outlined under RELEASING BOMBS.

MISCELLANEOUS EQUIPMENT

KIT BAG. Stowage of a standard 12" x 18" x 24" kit bag (AN-6505), is provided for in the aft section of the fuselage. Access is through the radio compartment door.

NIGHT DRIFT SIGNALS. Two AN-MK 5-1 night drift signals are located under the deck near the right console. An access door through the deck is opened by releasing the lock and lifting up on the door.

PARARAFT KIT

The pilot's seat is designed to accommodate a type PK-2 pararaft kit (figure 1-2) and a seat type parachute. After descending to land or into water, the pararaft kit may be separated from the harness by removing the release link on the container and pulling out the kit by the handle provided for that purpose.

Note

During flight, the pararaft should be attached to the life vest or belt by means of the lanyard provided. The pararaft may be lost after the parachute harness is removed if this attachment is not correctly made.

MAP CASE. Two map cases are located on the right-hand console (23, figure 1-5).

WINDSHIELD DEGREASER SYSTEM

A windshield degreasing system is provided to improve visibility. A momentary push button type control switch (15, figure 1-4), is located on the right-hand side of the instrument panel. The one pint of degreasing fluid provided permits approximately 30 seconds of continuous degreasing. However, for normal degreasing, only a few seconds of operation at a time are required.

Note

Close canopy before degreasing windshield, as fluid enters cockpit area with canopy open. Yawing the airplane will assist the degreasing operation. Although installed primarily for degreasing the windshield the system is equally effective for the removal of ice or dirt, provided the proper fluid is utilized in the system. Type of fluid to be used would be determined by probable flight conditions. If a grease film on the windshield is anticipated, a degreasing agent should be used. If icing conditions are probable, the use of de-icing fluid is indicated; for mud or dirt, plain water is most effective.

SECTION V

OPERATING LIMITATIONS

INTRODUCTION

This section deals with all important limitations that must be observed during normal operation of the airplane. This section also refers to any unusual restrictions which are characteristic of this particular airplane. Limitations during special operations are covered in other sections in conjunction with the operation in question, (e.g., instrument flight, turbulent air, cold weather operation, etc.).

Special cognizance must be taken of the instrument markings as illustrated in figure 5-1, since the limitations presented there are not necessarily repeated within the text.

The restrictions indicated in this section are mandatory. The limitations and restrictions set forth are subject to change, however, and reference must be made to current pertinent technical directives and orders.

ENGINE LIMITATIONS

LIMITING FACTORS OF ENGINE OPERATION BASED ON GRADE 115/145 AVIATION FUEL

a. Take-off power
- Manifold pressure .... 59 inches Hg
- Rpm 2900
- Mixture .... Rich
- Cylinder head temperature ..... 260°C

b. Military power
- Manifold pressure .... see figure A-7
- Rpm—Low blower............ 2900
- —High blower........... 2600
- Cylinder head temperature ..... 260°
- Mixture .... Normal
- Duration at military power..... 30 minutes

c. Maximum allowable engine speed
- Diving rpm 3120
- Duration .... 30 seconds

d. Zero or negative load factor
- Duration .... 10 seconds

e. Minimum recommended cruise
- Rpm 1400

f. Minimum manifold pressure
- In dives .... 15 inches Hg

g. Maximum allowable ground check without tiedown
- Manifold pressure .... 30 inches Hg

h. Shift blower at 1600 rpm.
Maximum allowable 2600 rpm (only when tactically required).

LIMITING FACTORS WHEN USING ALTERNATE FUEL (GRADE 100/130)

a. Take-off power
- Manifold pressure .... 46 inches Hg
- Rpm 2900
- Mixture .,................... Rich

b. Military power
- Manifold pressure .... 46 inches Hg
- Rpm—Low blower............ 2900
- —High blower........... 2600
- Mixture .... Normal
- Duration..................... 30 minutes

c. Normal power
- Manifold pressure .... 40.5 inches Hg
- Rpm — Low blower 2600
- Mixture .... Normal

d. Maximum cruise power
- Manifold pressure .... 29 inches Hg
- Rpm 2200
- Mixture .... Normal

AIRSPEED LIMITATIONS

The maximum permissible indicated airspeeds are as follows:

In smooth or moderately turbulent air, with landing gear and dive brakes retracted and flaps up, as shown in figure 5-2.

In severe turbulence, speeds in the range from 150 to 310 knots are recommended.

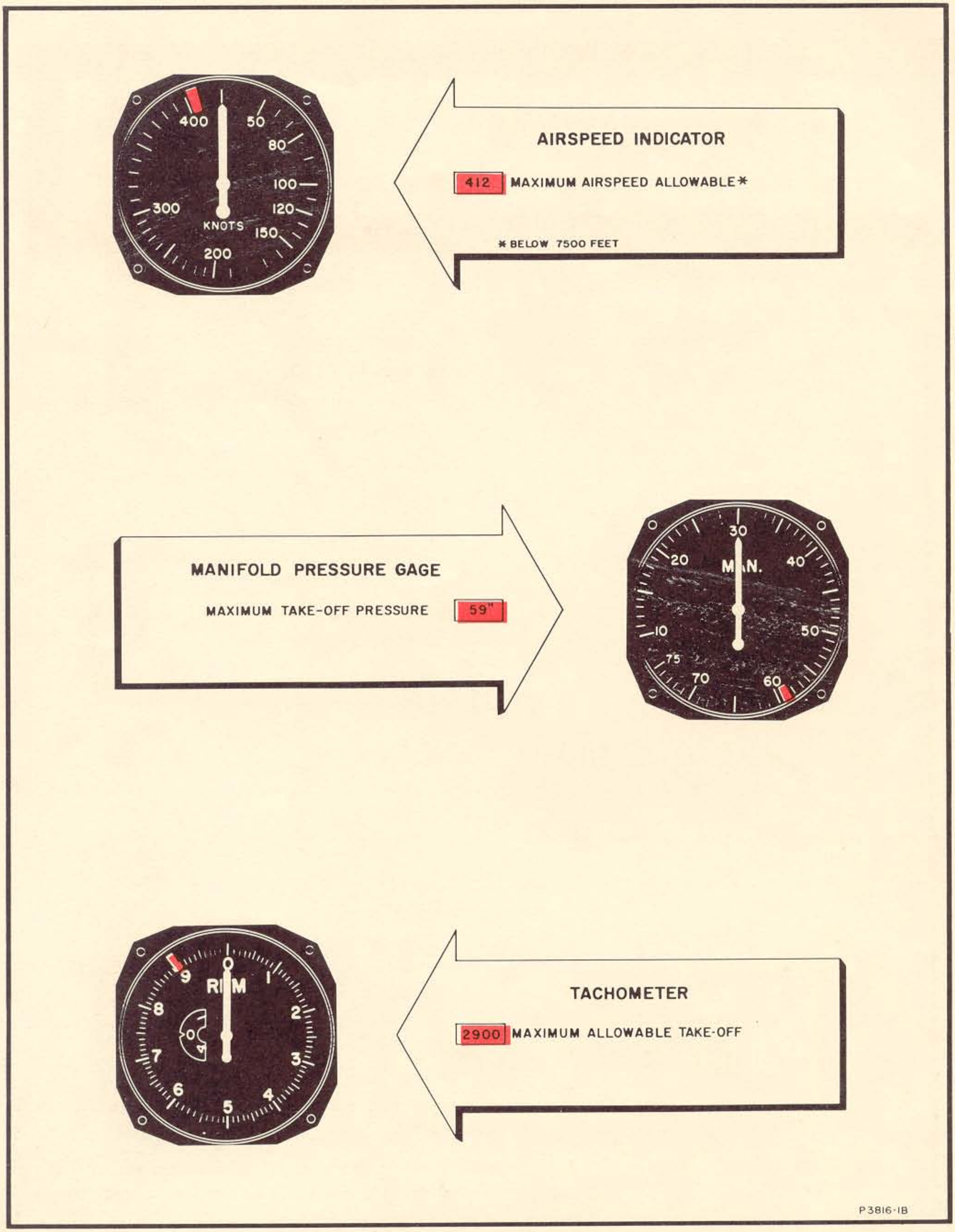


Figure 5-1 (Sheet 1 of 2). Instrument Markings Based on 115/145 Octane Fuel

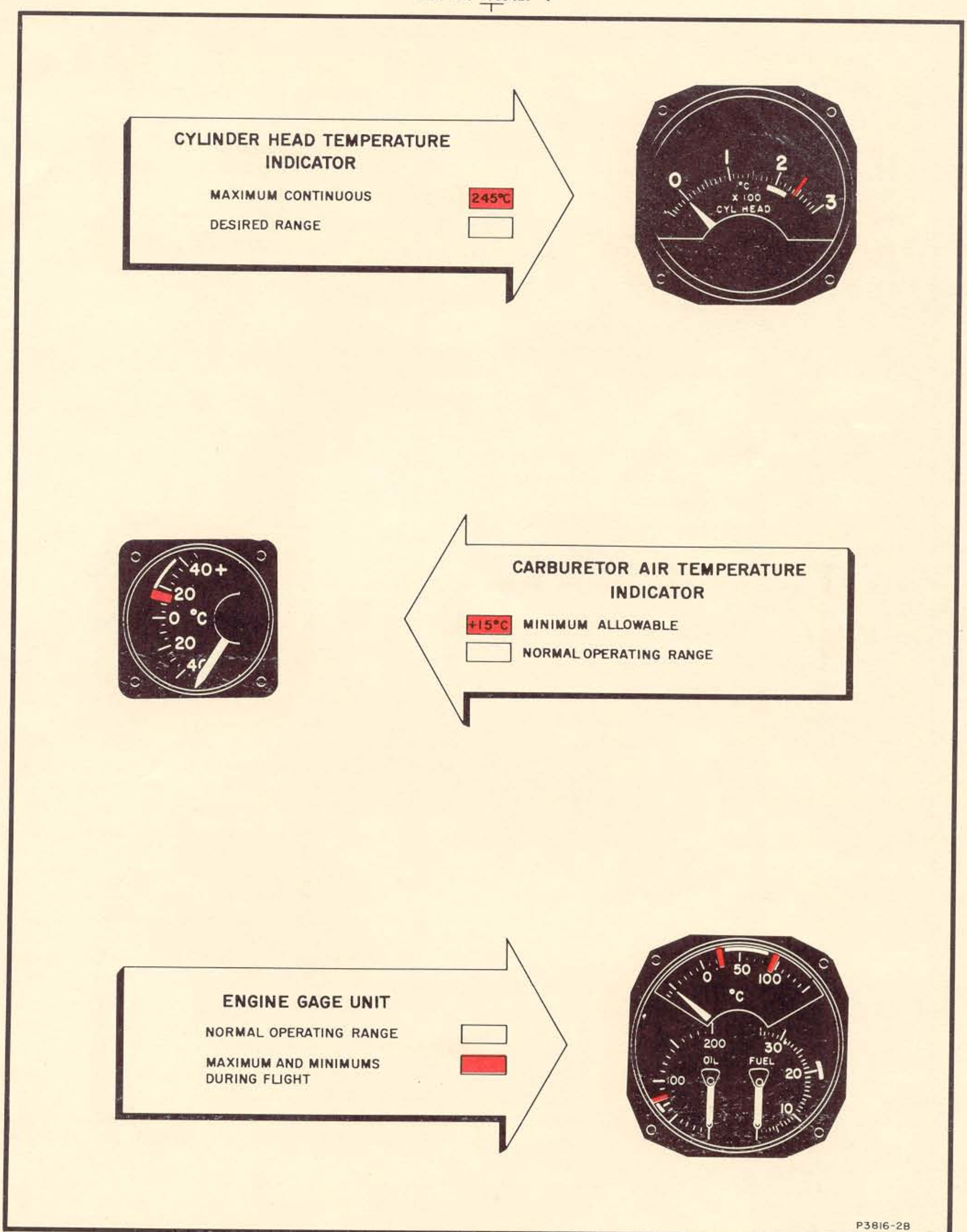


Figure 5-1 (Sheet 2 of 2). Instrument Markings Based on 115/145 Octane Fuel

DIVE BRAKES. Limitations on opening of the dive brakes vary with altitude as follows:

10,000 feet or below..............350 knots
20,000 feet.......................290 knots
30,000 feet.......................235 knots

WING FLAPS. Lowering of the wing flaps is not permissible at speeds in excess of 130 knots. Although a blow-back feature allows automatic retraction, damage to the flaps may result from operation at high speed.

LANDING GEAR. Lowering of the landing gear should be restricted to speeds of less than 200 knots for normal operation. When it is necessary to use the landing gear as a dive brake, the gear may be lowered at speeds up to an IAS of 235 knots, which is the maximum speed at which the gear will fully extend in 1 G flight. The landing gear shall be down and locked before entering dives after which 360 knots shall not be exceeded. The landing gear should not be retracted above an IAS of 350 knots and an acceleration of 3 G because the gear may not fully retract. Trim change during retraction is equivalent to approximately 20 pounds push force on the stick at 350 knots with a momentary pull force at the start of retraction. The landing gear should be used as a dive brake only as necessary in training and operational flights because repeated use may result in damage to the gear and associated doors and fairings.

AILERONS. The maximum permissible indicated airspeeds for full abrupt deflection of ailerons are as given below:

At 10,000 feet or below..........300 knots
At 20,000 feet...................245 knots
At 30,000 feet...................200 knots

At higher speeds the use of the ailerons shall be limited to the same stick force as is required for full throw at the airspeeds given above.

RUDDER. The variation of permissible rudder pedal deflection with indicated airspeed during yawing or skidding maneuvers (in terms of maximum pedal deflection available) is as follows:

	ALTITUDE		
Pedal Deflection	10,000 feet or below	20,000 feet	30,000 feet
Full	260	215	175
3/4	310	270	220
1/2	380	335	275

Abrupt yawing and skidding maneuvers at indicated airspeeds greater than 200 knots shall not intentionally be performed; at these speeds the rudder shall be applied and released smoothly and uniformly. The time for such application or release shall not intentionally be less than two seconds. Flight test information and design data for these airplanes indicate that more rapid application or release will probably damage the structure. Frequent attainment of the tabulated limits should be avoided because these conditions impose severe vibratory stresses on the propeller. Intentional yawing at indicated airspeeds above 200 knots shall be limited as much as is practicable, since frequent attainment of the tabulated limits may result in serious reduction in the service life of the propeller, or, in extreme cases, in propeller blade failure.

HORIZONTAL STABILIZER TRIM. Airspeed is limited to 200 knots with the horizontal stabilizer trim in the nose up range.

WARNING

When the AN/APS-19C nacelle is carried on the inner wing station rack the pilot should be alert to detect and avoid buffeting since wing flap failures have been reported, apparently due to this cause. When the AN/APS-19C nacelle is carried on the alternate location of outer left wing rack number four, the yaw limitations should be reduced 50 per cent.

MANEUVERS

a. The following maneuvers are permitted with or without external load items:

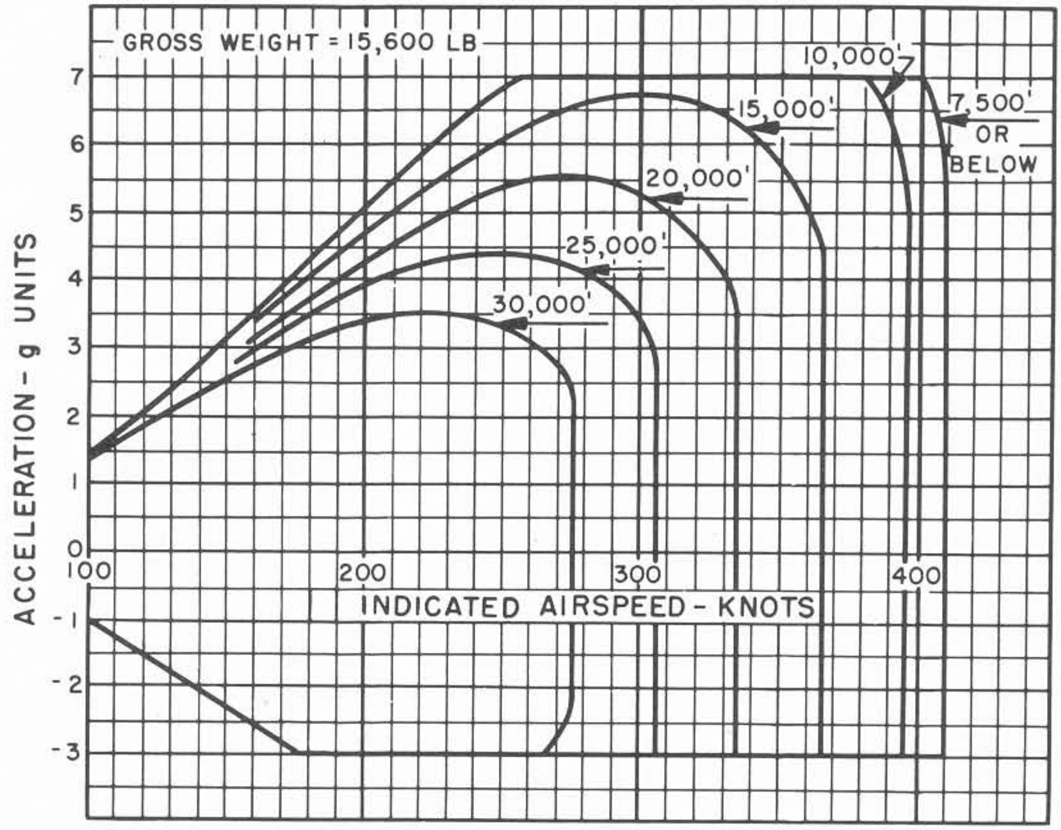
Loop	Aileron roll
Chandelle	Vertical turn
Immelman turn	Wingover
Inverted flight (10 second limit)	

ACCELERATION LIMITATIONS

OPERATING FLIGHT STRENGTH DIAGRAM. The Operating Flight Strength Diagram (figure 5-2) graphically portrays critical acceleration and airspeed factors at various altitudes under conditions of symmetrical flight and with a symmetrical load. Symmetrical flight is defined as flight in which the air load on each wing is equal. A symmetrical load is a condition where the distribution of the external stores does not create an imbalance in excess of 1200 pounds on one wing. The acceleration limitations given indicate the maximum G load that the airframe structure will safely withstand or, in the lower airspeed range, the G factor at which a stall will occur. Note that the maximum acceleration allowable at a gross weight of 15,600 pounds is 7 G at altitudes up to 7500 feet. At an airspeed of 160 knots, however, the limitation given is 3.5 G, for in this case a stall will occur before the allowable load factor of 7 G is attained.

A factor which further restricts the allowable G load is an increase in the weight of the airplane. As gross weights are increased above 15,600 pounds, permissible accelerations decrease. To determine the maximum permissible acceleration at a gross weight in excess of 15,600 pounds, multiply the acceleration permitted at 15,600 pounds by the ratio of 15,600 pounds to the new gross weight. This relationship is shown in figure 5-4 for conditions where the permissible acceleration is 7 G at a gross weight of 15,600 pounds. For example, when the airplane is being operated at a gross weight

OPERATING FLIGHT STRENGTH DIAGRAM



DATA AS OF: 4 February 1952
DATA BASIS: Technical Order 15-52.

P2356D

Figure 5-2. Operating Flight Strength Diagram

of 20,000 pounds, the allowable acceleration is reduced to a maximum value slightly under 5.5 G for the same range of speeds and altitudes that 7 G is permitted at a gross weight of 15,600 pounds.

The maximum airspeed limitations given are based on values beyond which compressibility effects such as buffeting and tuck-under will occur. The airspeed at which buffeting becomes so severe as to endanger the structural integrity of the airplane varies with the altitude and with the amount of acceleration combined with the speed. As altitude is increased, therefore, the acceleration and airspeed limitations become more restrictive. In view of this, at 20,000 feet the permissible acceleration is 4.8 G and the maximum allowable airspeed is slightly over 320 knots.

Since the Operating Flight Strength Diagram defines only those maximum limits which are permissible during symmetrical flight (balanced air load on each wing), it is necessary to consider the effects of asymmetrical flight, such as a rolling pull-out, at which time the loading on one wing or the other may be considerably increased. To compensate for this adverse factor, the G loading during asymmetrical flight must be reduced. An accurate rule-of-thumb is to always reduce the load factor below that normally allowed by an amount of one G during a rolling pull-out. Reference must also be made to the restriction on the use of the ailerons at high speeds, as outlined in AIRSPEED LIMITATIONS.

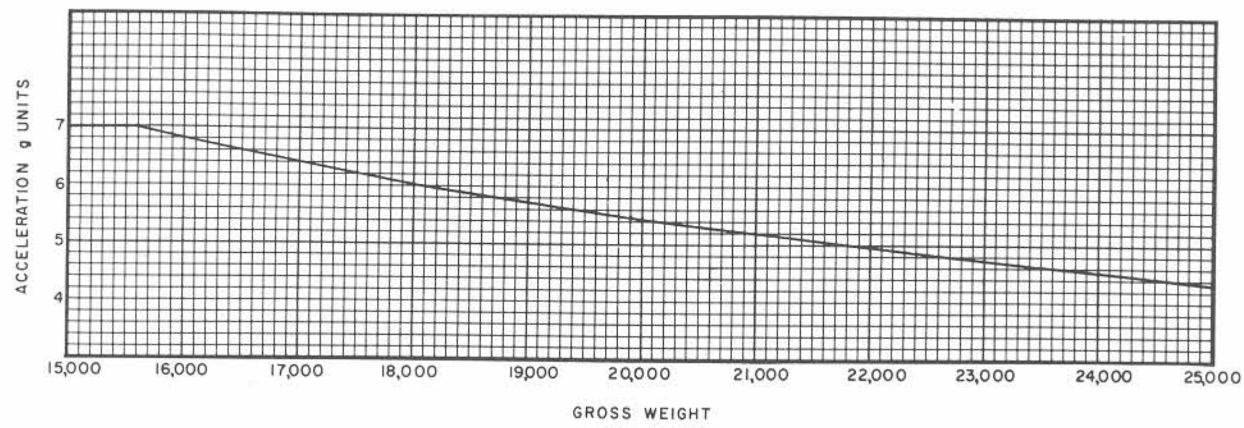
Flight involving conditions where the airplane is asymmetrically loaded makes it necessary to observe further restrictions. When external stores are asymmetrically distributed in excess of 1200 pounds on one wing, the airspeed must not exceed 400 knots IAS and the normal allowable load factor must be reduced by one G.

Since a combination of asymmetrical flight and asymmetrical loading would necessitate even greater restrictions on the aircraft, it is recommended that whenever flight in an asymmetrical condition of one type is necessary, the remaining asymmetrical condition be avoided. If a combination of both asymmetrical conditions is unavoidable, however, a good rule-of-thumb is to reduce the normal allowable load factor by 1.5 G.

Flight in turbulent air creates an additional problem in that a typical gust can readily increase the momentary load factor by as much as 2.5 G at speeds over 300 knots. If this gust-induced load factor were added to a

Figure 5-3. Deleted

PERMISSIBLE ACCELERATION VS. GROSS WEIGHT
(SMOOTH AIR)



DATA AS OF: 4 February 1952
DATA BASIS: Technical Order 15-52

P 3817-2

Figure 5-4. Permissible Acceleration vs. Gross Weight (Smooth Air)

pull-out acceleration of 5 G, the airplane would obviously be exceeding the maximum value allowed. Maneuvers causing high acceleration forces in turbulent air should therefore be avoided. Figure 5-3 shows the maneuvering accelerations which can be safely imposed by pilots in turbulent air.

Worthy of serious consideration is the fact that a built in safety margin may allow the limiting acceleration factor of the airplane to be exceeded without apparent structural damage. A danger, however, is that even though the limiting acceleration factor has been successfully exceeded once or twice, there is no assurance that the airplane will withstand a third maneuver entailing excessive G forces. It is immediately apparent from this that one pilot who thoughtlessly ignores the limitations of the Flight Strength Diagram may be directly responsible for the later destruction of the same airplane in a situation where another pilot, confronted by an emergency, is forced to exceed the limiting load factor in an attempt to survive.

WEIGHT LIMITATIONS

Field take-offs .... 25,000 lbs.
Field landing .... 21,000 lbs.
Catapulting .... 25,000 lbs.
Arrested landing .... 17,000 lbs.

Whenever it is operationally practicable, arrested landings should be made at gross weights of 15,600 pounds or less in order to increase the service life of the airplanes by reducing the number of repeated high loads placed on the airframes.

STORES

External stores of weights not greater than those indicated in figure 4-4 may be carried singly or in combination under the same restrictions during flight, and arresting that apply without such stores, except as noted in the following paragraphs.

a. Unbalanced loads which place more weight on the left wing aggravate the propeller torque effect at low airspeeds. The maximum unbalanced loads permitted on the inboard wing racks during take-off and landing are as follows:

Left wing —Load not to exceed 540 pounds more than right wing load.

Right wing—Load not to exceed 1115 pounds more than on the left wing.

With this amount of imbalance on the inboard racks, the outer stations should be symmetrically loaded.

Note

It is recommended that asymmetrical wing loads (with the exception of the AN/APS-19C radar nacelle) be jettisoned before making a carrier landing if the aileron boost system is inoperative.

With no imbalance on the inboard racks, an unbalanced load may be carried on the outer stations provided the weight moment of such a load about the airplane centerline does not exceed the weight moment created under the specified limitations. For practical purposes, an unbalanced load of half the amounts specified for the inboard racks is permissible on the outer stations.

An unbalanced condition may be corrected by adding ballast to the light side of the aircraft, provided that an opposite moment (load x distance from CG) about the aircraft center of gravity is not induced and that the maximum gross weight is not exceeded. For example, when carrying the AN/APS-19C radar nacelle on the left-hand wing pylon and a 2000-pound load on the right-hand wing pylon, the load may be balanced by placing a 500-pound load on the number 5 rack on the left-hand outboard wing panel. Ballast load may be jettisoned after take-off.

Note

Use of ballast should be avoided whenever possible because of the undesirable effects of extra load on aircraft performance.

b. When torpedoes or 2000-pound bombs are carried on wing racks, 6.0 G shall not be exceeded.

EXTERNAL FUEL TANKS

OPERATING RESTRICTIONS AND LIMITATIONS

TANK TYPE	CAPACITY GALLONS	RACK	TANK CONFIGURATION	HOOK SUSPENSION	OPERATING RESTRICTIONS	RELEASE METHOD	MAXIMUM SPEED FOR JETTISONING
MK 8 MOD I	300	CENTER	WITHOUT FINS	30"	NONE	MANUAL OR EJECTION (1)	255 KNOTS
				14"	50% YAW		
		WING	WITH DISPLACING STRUTS AND WITHOUT FINS (2)	30" (3)	NONE	ELECTRICAL OR MANUAL	
				14"	50% YAW		
MK 12	150	CENTER	WITHOUT FINS	30" OR 14"	NONE	MANUAL ONLY	165 KNOTS
		WING	WITH FINS (2)	30" (3)	NONE	ELECTRICAL OR MANUAL	
				14"	50% YAW		
AERO 1A	300	CENTER	SHORT TAILCONE WITHOUT FINS	30"	NONE	MANUAL OR EJECTION (1)	255 KNOTS
				14"	50% YAW		
		WING	LONG TAILCONE WITH HORIZONTAL FINS ONLY	30" (3)	NONE	ELECTRICAL OR MANUAL	
				14"	50% YAW		
	150	CENTER	HORIZONTAL FINS OR WITHOUT FINS	14"	NONE	MANUAL OR EJECTION (1)	
		WING	HORIZONTAL FINS ONLY	14"	NONE	ELECTRICAL OR MANUAL	

REMARKS:

(1) Release by ejection when possible.

(2) In emergencies, tanks without fins and/or displacing struts may be jettisoned with minor flap damage resulting. The extent of damage increases with speed.

(3) Use Aero 1A adapters.

DATA AS OF: May 1954
DATA BASIS: Contractor's flight tests of Models AD-5, AD-6

P6085-1

Figure 5-5. Operating Limitations With External Tanks

c. Arrested landings are not permitted when carrying torpedoes or Mk 8 Mod 1 external tanks with fuel on 14-inch suspension Mark 51 bombracks.

d. When carrying an AN/APS-19 type radar, pilots shall be alert to detect and avoid buffeting, since wing flap failures may result. When an AN/APS-19 type radar is carried on the alternate location at outer left wing rack number four, the yaw limitations in the paragraph entitled RUDDER should be reduced 50 percent.

e. At the time of release of a store from the fuselage rack, the angle between the armament datum line and the horizontal shall not exceed 85 degrees when cartridge ejection is used and shall not exceed 50 degrees when cartridge ejection is not used.

f. The carrying of Mark 8 external fuel tanks is not permitted.

g. When Mk 8 Mod 1 external fuel tanks are carried on the wing racks, 360 knots IAS, 0.66 Mach number, or the speed at which mild buffet is encountered, whichever is least, shall not be exceeded. Complete data on operating limitations and restrictions when carrying external fuel tanks is presented in figure 5-5.

h. The maximum permissible indicated airspeed for flare launching from sonobuoy-flare dispensers is 220 knots.

FOLDING AND SPREADING WINGS

Wing folding and spreading must be governed by the following rules:

a. If the aircraft is stationary, the wings may be folded or spread with up to six 250-pound stores on each outer wing, or with three 500-pound stores on alternate racks beginning with the innermost rack (this includes ammunition load for outboard guns).

Note

To fold wings, with more than four rockets on the innermost stations of the outboard wing racks (no outboard guns or ammunition), or with any load of the same hinge moment, will require manual assistance. An outboard gun with ammunition is equivalent to one 250-pound store on the second rack from the wing fold joint.

b. The aircraft may be taxied on a carrier deck or a smooth runway during the wing folding or extending cycle when loaded with up to four 250-pound stores on the innermost racks of each outboard wing or with up to two 500-pound stores on alternate racks beginning with the innermost rack of each outboard wing (outboard guns installed with a full ammunition load); however, manual assistance will be required to initiate the folding cycle before the airplane is taxied.

c. Wings may be spread or folded while taxiing on a rough runway only if no external stores are carried on the outboard wing.

d. The wing fold control should not be moved from the fold to the spread position or vice versa, once the folding or spreading cycle has been started, unless the wings are between the vertical and the folded position.

WARNING

Failure to observe the above listed restrictions can result in structural failures within the wing that may not be evident until flight.

ARRESTING ACCELERATIONS. The maximum permissible arresting hook load is 48,500 pounds and the maximum permissible longitudinal deceleration for arrested landing is 3.3 G. The ultimate barrier engagement force is 65,500 pounds and the ultimate strength longitudinal deceleration for barrier engagement is 4.5 G.

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SECTION VI

FLIGHT CHARACTERISTICS

GENERAL FLIGHT CHARACTERISTICS

The airplane has positive stability characteristics over the normal operating speed range for any power condition. The airplane will maintain a given trim speed without appreciable application of the controls. Elevator control forces tend to become heavy at high diving speeds, but adequate speed control is available with use of the dive brakes.

STALLS

Stall warning is light so the pilot should become familiar with stalling speeds at all weights and configurations. Refer to STALLING SPEED CHART, figure 6-1.

POWER-OFF STALLS. With power off, the stall warning is characterized by a slight buffeting of the ailerons. The stall is followed by a nose down pitch and a mild roll to the left. A normal recovery is easily accomplished by moving the stick forward; however, a loss of altitude of approximately 400 to 500 feet can be expected before level flight is resumed.

POWER-ON STALLS. Warning of stalls in the power approach configuration is slight. Although stalls in this configuration are not severe, the roll to the left is somewhat more pronounced in comparison with the power-off stall. This is particularly true during a turn to the left, when the stall may be accompanied by a definite tendency to spin to the left. Control is good up to the stall and recovery can be accomplished with a loss of approximately 300 feet, except when the stall occurs during a turn to the left. Recovery in this latter situation will take considerably more altitude.

ACCELERATED STALLS. Stalls during accelerated turns to the left or the right are characterized by a roll to the left accompanied by a nose down pitch. The airplane exhibits a tendency to spin to the left when stalled from a left turn. The airplane can be forced to spin to the right when stalled from a right turn; however, there is no tendency for this to occur.

SPINS

Airplanes of similar type have been flight tested for spins of up to two turns. Spinning characteristics are satisfactory and no vicious tendencies are manifest. Spins in either direction are accompanied by a nose-down pitching attitude, followed by a nose-up pitching attitude during each turn. Recovery may be readily accomplished, however, difficulty may be experienced if the recovery is attempted during the nose-up pitching attitude. Recovery from spins when external stores are suspended from the airplane is more difficult than for the clean airplane; intentional spins should therefore be avoided with stores loaded.

SPIN RECOVERY. Recovery from spins can be accomplished by using the normal procedure of stopping the rotation with forceful application of the rudder against the spin, followed by a rapid displacement of the stick forward of neutral. The ailerons should be maintained in the neutral position during recovery. The wheels and flaps, if down, should be retracted. Recovery should be initiated during the nose-down pitching attitude to achieve the best results. A two-turn spin followed by a normal recovery will result in the loss of approximately 5000 feet of altitude.

CAUTION

Reduce power immediately upon entering a spin. If a spin is inadvertently entered with external stores loaded, attempt an immediate recovery. If recovery has not been accomplished by the end of two turns, jettison all external stores and repeat recovery procedure. If a lack of altitude will not permit such a procedure, immediately jettison stores and effect a recovery.

FLIGHT CONTROLS

AILERONS. The aileron boost system increases the force transmitted by the stick approximately four times. If this system fails in flight it may be disconnected. Aileron force is thus increased, but adequate control remains for safe flight operations, including landings.

ELEVATORS. The elevators are operated by a direct mechanical system relying on aerodynamic balance to furnish light control forces. Because elevator forces tend to become heavy in dives, a small bobweight has been attached to the elevator system in the forward equipment compartment. An increase in the load factor causes the bobweight to exert increasingly large forces tending to aid the pilot in moving the stick aft.

RUDDER. The rudder is mechanically actuated, assisted by a springtab. This tab reduces necessary control forces at high speeds, and reduces the required amount of trim.

DIVE BRAKES

Operation of the dive brakes causes a change in trim characterized by a nose-up pitch when the dive brakes are extended or a nose-down pitch when the brakes are closed. For further information on use of the dive brakes, see DIVING.

TRIM TABS. The aileron and rudder trim tabs provided are capable of reducing control forces to zero for all stabilized, level flight conditions. The adjustable horizontal stabilizer is electrically actuated, receiving power from the secondary bus. Failure of the d-c generator will cause a loss of power to the secondary bus and consequently loss of trim control until the secondary bus has been re-energized by throwing the battery-generator switch to "BAT-ONLY" or by lowering the landing gear. Furthermore, if the HORIZ STAB CONT circuit breaker should pop out, the horizontal stabilizer trim switch on the pilot's control stick will become inoperative; however, the horizontal stabilizer control on the left-hand console can be used to direct actuation of the horizontal stabilizer in this event. Power to the horizontal stabilizer actuating motor is from the secondary bus through the HORIZ STAB circuit breaker. After any elevator or stabilizer change, care should be taken to note any longitudinal unbalance in flight and to insure that adjustment of the elevator trim tab within allowable limits is effected. The necessary level flight trim of the airplane, as indicated on the horizontal stabilizer indicator, is 1 to 1½ degrees nose down at 230 IAS knots. All airplanes must be checked periodically to insure that this trim condition is maintained.

FLAPS. The wing flaps are actuated from a common cylinder located at the fuselage center line. Since the flaps are coupled through the torque tubes and the common actuating mechanism, the danger of operation of one flap without the other has been eliminated. A nose-up trim change is necessary whenever the flaps are extended. Whenever the flaps are retracted, a nose-down trim is necessary. This latter trim change may be somewhat objectionable during instrument take-offs using full flaps; however, "milking" the flaps up by utilizing the "STOP" position of the flap control will aid in maintaining safe flight performance. The flaps will begin to blow back at speeds in excess of 100 knots. The flaps should be raised, however, before exceeding 130 knots, as the blow-back feature will not allow sufficient flap retraction to prevent possible aero-

STALLING SPEEDS

STANDARD DAY

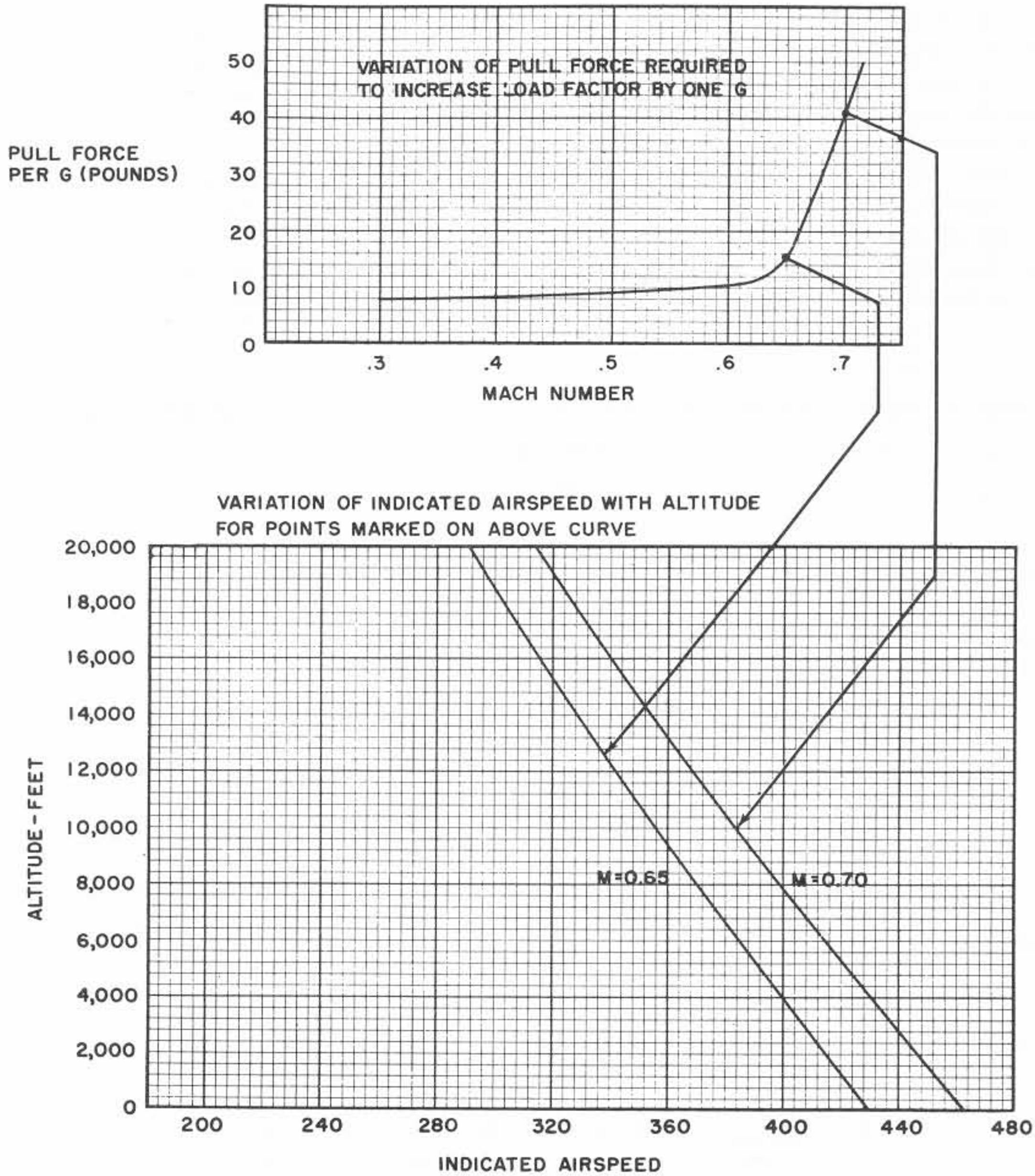
CONFIGURATION GEAR UP OR DOWN	ANGLE OF BANK (DEG)	KNOTS — IAS					
		POWER ON			POWER OFF		
		GROSS WEIGHT-POUNDS					
		15,000	20,000	25,000	15,000	20,000	25,000
FLAPS UP	0	82	95	105	89	101	112
	30	88	102	113	95	107	119
	45	97	113	125	103	118	132
FLAPS HALF DOWN (25°)	0	72	83	93	79	89	99
	30	78	90	100	85	96	107
	45	86	100	111	92	105	118
FLAPS FULL DOWN (40°)	0	69	79	88	77	86	95
	30	73	85	95	81	92	102
	45	81	94	105	88	101	112

REMARKS: "Power on" is power required to maintain level flight at an airspeed 20% above the power off stalling speed.
DATA AS OF: 1 June 1953
DATA BASIS: Patuxent and Contractor's flight test of Models AD-2, AD-3, AD-4 airplanes.

P-3818-1

Figure 6-1. Stalling Speed Chart

STICK FORCES DIAGRAM



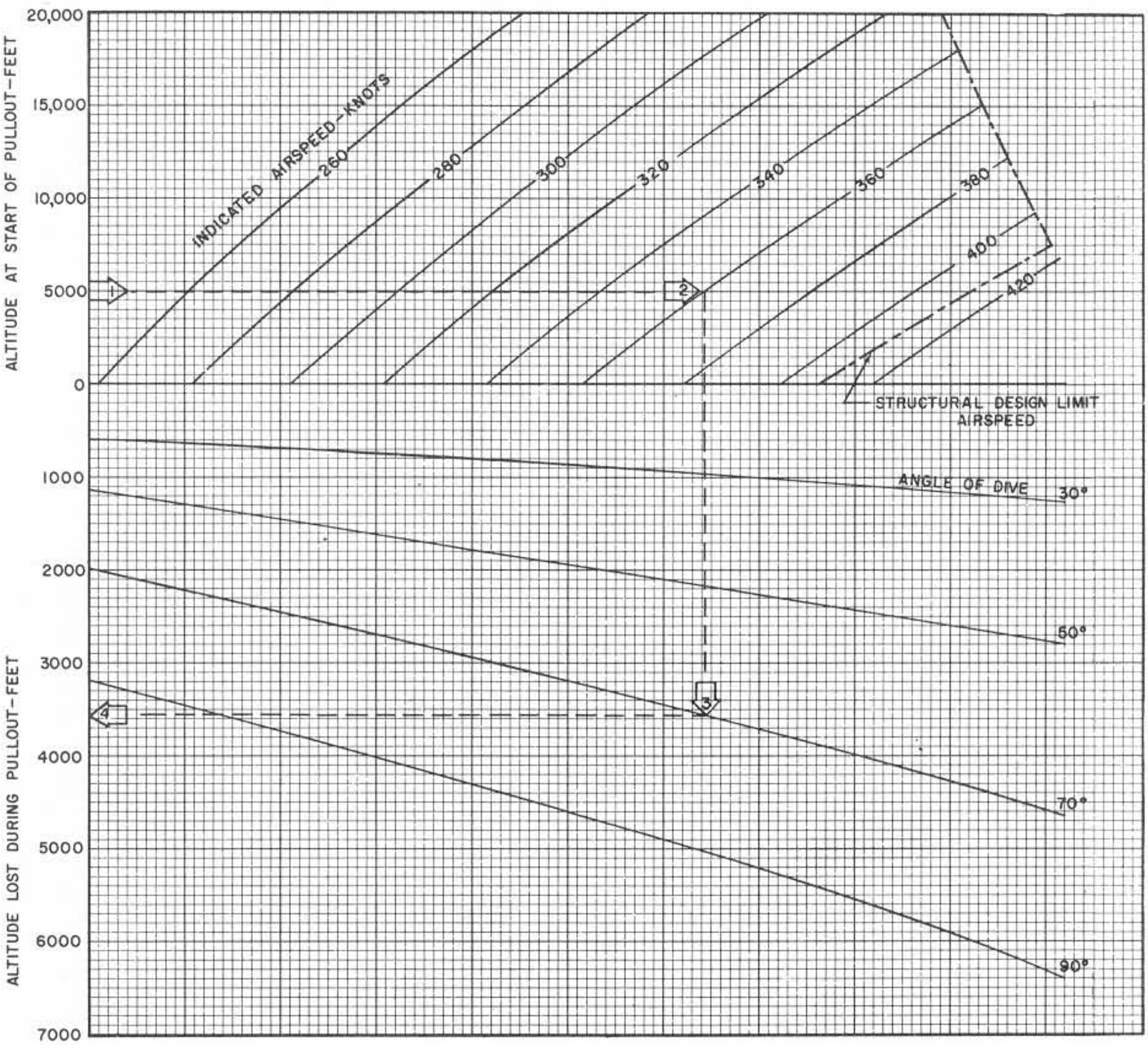
DATA AS OF: 1 June 1953
DATA BASIS: Contractor's Calculations

P3819-1

Figure 6-2. Stick Forces Diagram

DIVE RECOVERY CHART

ALTITUDE LOSS DURING A CONSTANT
4G
PULLOUT



REMARKS:

HOW TO USE CHART:

Select appropriate chart, depending on load factor (4g or 6g) to be held in pullout, then:

1. Enter chart at altitude line nearest actual altitude at start of pullout (for example, 5,000 feet).
2. On scale along altitude line, select point nearest the constant IAS curve at which pullout is started (for example, 360 knots).
3. Move vertically down to intersection with curve of dive angle (for example, 70°) directly below airspeed.
4. Read altitude lost during pullout on lower left-hand scale = 3550 feet.

DATA AS OF: 1 June 1953
DATA BASIS: Calculations

3820-1

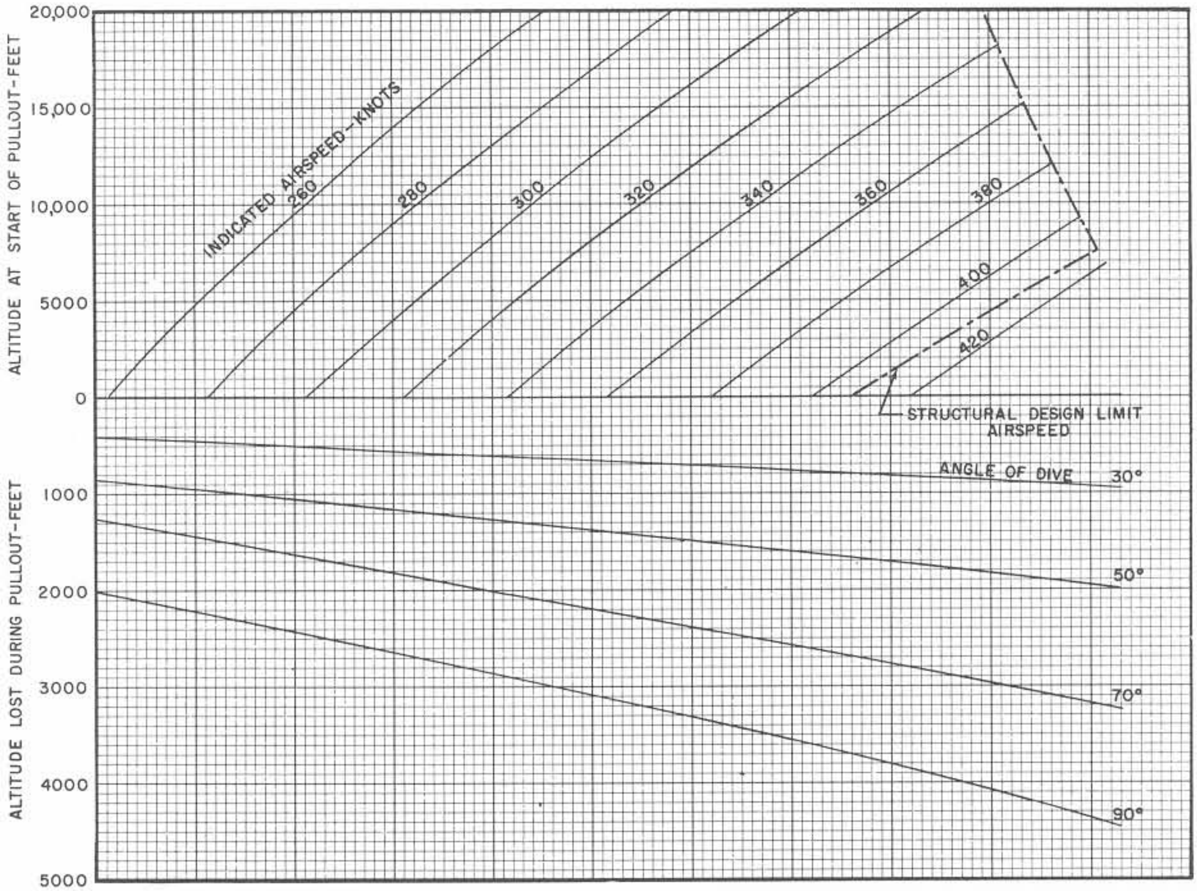
Figure 6-3 (Sheet 1 of 2). Dive Recovery Chart

DIVE RECOVERY CHART

ALTITUDE LOSS DURING A CONSTANT

6G

PULLOUT



REMARKS:

DATA AS OF: 1 June 1953
DATA BASIS: Calculations

HOW TO USE CHART:

See sheet 1 of 2 sheets.

3820-2

Figure 6-3 (Sheet 2 of 2). Dive Recovery Chart dynamic overloads on the flap structure. Because of this blow-back feature the flaps will not extend fully when lowered at 130 knots. As the airspeed is reduced, however, the flaps will extend proportionately, as long as the flap control is left in the "DOWN" position, until they are full down. This will occur at approximately 100 to 110 knots IAS.

LEVEL FLIGHT CHARACTERISTICS

Due to engine torque effects always present on single engine propeller driven airplanes, lateral and directional trim settings must be changed when any appreciable change in speed is desired. This is particularly true at low airspeeds and high engine powers. Aileron and rudder tabs are capable of reducing control forces to zero for all stabilized level flight conditions.

SLOW FLIGHT. Control is good during slow flight at all normal approach and landing speeds. Adding full power during a "wave-off" causes no torque-roll tendency which cannot be controlled at normal approach speeds. However, the aerodynamic stall warning, during approach and landing, may not occur high enough above the stalling speed to warn against an airspeed so low that settling of the aircraft may result in a severe hard landing. Also at this low speed the application of sufficient power to maintain flight will cause a torque roll that cannot be controlled with the ailerons and rudder. The tendency for the airplane to stall with only a slight warning and with a roll to the left, dictates that a "wave-off" must not be accompanied by a climb which would cause a dangerous sacrifice in airspeed.

WARNING

During an approach and landing, the aerodynamic warning of an impending stall may not occur until an airspeed dangerously close to the actual stalling speed of the airplane is reached. A sudden reduction of power, when in this condition, will cause a severe landing impact. An abrupt application of power, on the other hand, will result in an uncontrollable torque roll. Furthermore, the increase in the stalling speed as the angle of bank is increased must be thoroughly understood, as the danger of torque roll, obviously, is further aggravated as the angle of bank is increased. See figure 6-1.

CRUISING. The elevators on this airplane are fitted with a small sheet metal tab used to adjust trim to within certain prescribed limits in the cruise condition at 230 knots. It is important that the trim be checked periodically to insure that the cockpit trim setting falls within the prescribed region. This check should always be made when a new set of elevators are installed or when any damage to the elevators has been sustained. Large deviations from the normal trim setting may lead to structural damage of the empennage during high speed flight.

HIGH SPEED FLIGHT
Refer to DIVING.

MANEUVERING FLIGHT. Maneuvering characteristics are normal except for a heavying of elevator control forces at extreme dive speeds.

DIVING

The diving characteristics of the airplane are normal except in the case of steep clean dives from high altitudes at speeds approaching limiting speeds on the aircraft. As the maximum design speed is approached, flow changes occur over the wings which result in an appreciable increase in the control force required to execute a pullout. There is little evidence of this change during the dive and no particular tendency for the dive to steepen. The increase in control force is illustrated in figure 6-2 where the force for one g change in load factor is plotted versus Mach number. Indicated speeds and altitudes at which control forces for dive recovery may be expected to increase, may also be read from figure 6-2. Experience has shown that normal tactical usage of the airplane will not require entering the maximum design speed region.

OPERATION OF THE HORIZONTAL STABILIZER IN THE NOSE-UP RANGE WITH DIVE BRAKES EXTENDED. Operation of the horizontal stabilizer into the nose up range while the dive brakes are extended may result in the aircraft "tucking under." This condition can only occur when dive brakes and nose-up trim settings are used simultaneously, the latter having been set either prior to or during the dive. Little or no warning occurs on approaching or entering this attitude. If "tuck under" occurs, the control stick may be pulled from the pilot's grasp and moved to the full forward position. There is a definite possibility that the pilot will not be able to return the stick to its normal position. If "tuck-under" is encountered while in a dive, immediate retraction of the dive brakes and use of stick back pressure alone will permit recovery. Stick forces will be high due to the dive brakes having been closed.

WARNING

Actuation of the horizontal stabilizer while in a dive is prohibited. Use of the stabilizer for dive recovery may lead to an excessive load factor as the speed decreases and "tuck-under" may result.

HORIZONTAL STABILIZER LIMIT SWITCH[1]. Two limit switches, effective whenever the dive brakes

(1) BuNo. 134630-134637, 135225 and subsequent.

are extended, prevent operation of the horizontal stabilizer trim control into the nose up range. However, should a nose up trim condition exist at the time the dive brakes are extended, the horizontal stabilizer can be trimmed back into the safe nose down range.

WARNING

Do not enter dives with the horizontal stabilizer trimmed in the nose up range of the position indicator as "tuck under" may occur when the dive brakes are opened.

USE OF THE DIVE BRAKES

Diving speeds with dive brakes open will be limited to low enough values so that the force increase as discussed will not be encountered. When making braked dives, the speed brakes should not be retracted, except in an emergency, until the pull-out is well under way and the airplane is near the level attitude. If retracted in the dive prior to initiating the pull-up, the airplane will accelerate rapidly and this speed increase, along with the nose-down trim change which accompanies brake retraction, may lead to high control forces and difficulty in dive recovery.

DIVE TRIM. Dive trim should be established prior to entering a dive. Trim for dives should be established on the basis of experience and a knowledge of the individual airplane being flown. All airplanes will require somewhat different trim settings for a given speed so that it is inadvisable to recommend a fixed trim setting for all airplanes. Most pilots prefer to trim so that a small amount of push force is required to hold the airplane in the dive just prior to pull-out.

DIVING CHECK LIST. The controls should be set as follows for diving:

a. Windshield defogger ..... "WINDSHIELD & CABIN" (at least 30 minutes before entering dive)
b. Cockpit canopy .... "CLOSED"
c. Fuel tank selector .... "MAIN"
d. Fuel boost pump .... "ON"
e. Horizontal stabilizer ..... "NOSE DOWN"
f. Trim tabs .... As required
g. Cowl flaps .... "CLOSE"
h. Oil cooler door .... "AUTO"
i. Carburetor air .... "DIRECT" unless icing conditions prevail
j. Supercharger .... "LOW"
k. Throttle .... 15 inches Hg minimum
l. Propeller .... 2050 to 2250 rpm
m. Mixture .... "RICH"
n. Dive brake .... "OPEN"

CAUTION

Caution should be exercised when entering push-over dives not to exceed an absolute maximum of ten seconds at zero or negative acceleration, as the engine will not maintain oil pressure under these conditions. Tests have shown that the loss of oil pressure for more than 10 or 12 seconds will normally result in either a master rod or second order balancer bearing failure.

FLIGHT WITH EXTERNAL STORES

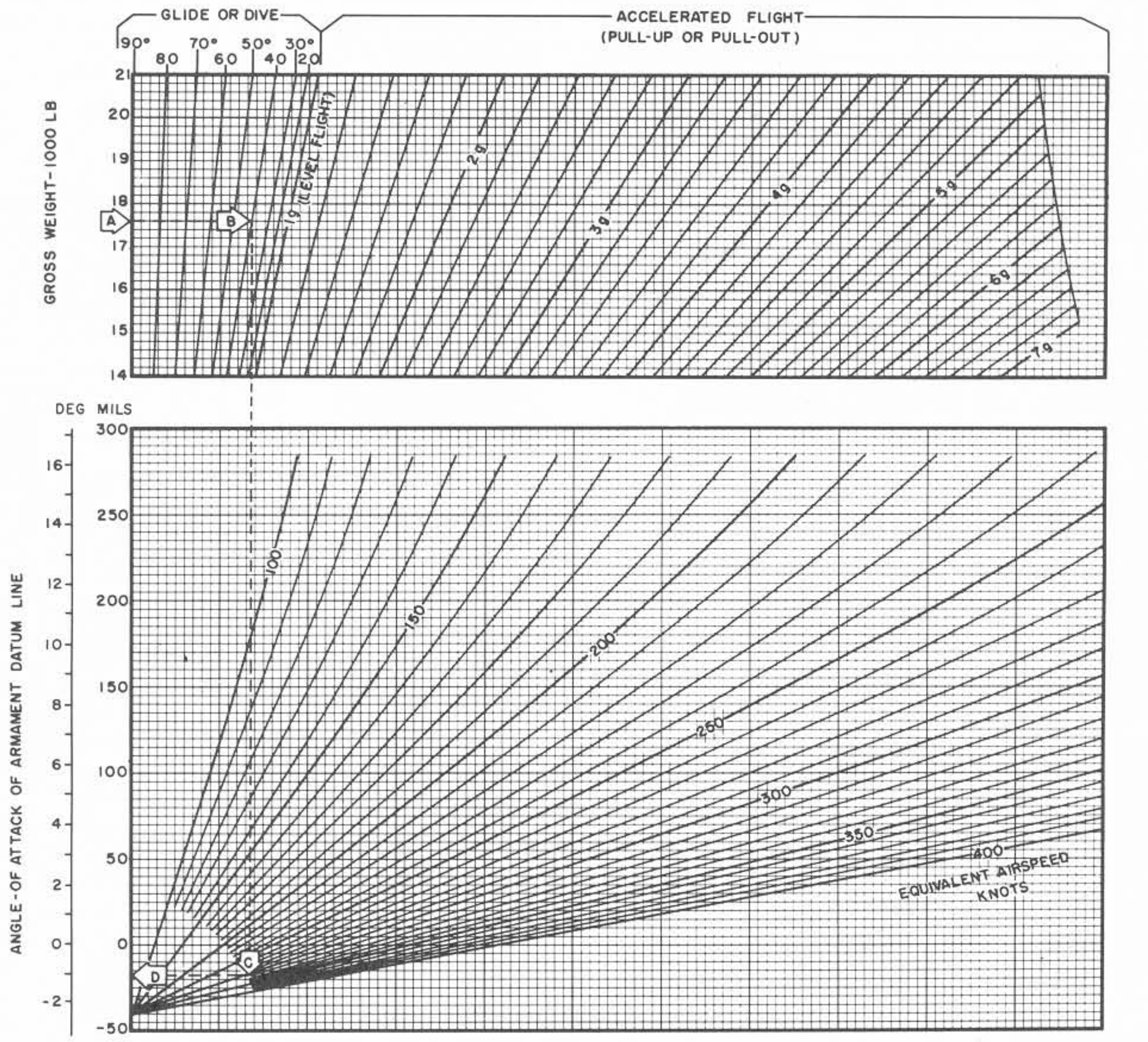
Whenever the tactical situation permits the pilot to drop external stores in any sequence of his choice, consideration should be given to the effect of releasing certain stores first. For instance, during successive bombing runs in which the load factor during the pull-out is necessarily high, it is advisable to release the center line load on the first run. This action will relieve the wing load stress during the succeeding pull-out. On subsequent runs of this type, loads on the wing bomb racks should be released in a sequence from the center toward the tips of the wings. On the other hand, in operational cases where diving pull-up stresses are light, the smaller, more numerous bombs should be released first to reduce drag and improve the operational performance of the airplane.

ANGLE OF ATTACK RELATIONSHIP

One of the basic assumptions upon which the Mark 3 Mod 4 (or Mk 3 Mod 5) bomb director system operates is that during an attack the aircraft flies on a straight line toward the target. Since the sight is boresighted parallel with the armament datum line of the airplane rather than the flight path line, the pilot must sight off-target by an amount in mils equal to the difference between the armament datum line and the flight path in order to maintain a collision course toward the target. It is therefore necessary for the pilot to calculate the number of mils off-set required by the condition of the anticipated dive. The amount of off-set necessary depends upon the angle of attack of the airplane, which varies with the weight of the aircraft, the dive angle, and the dive speed in effect at the time of the attack. Using these factors, the sighting off-set, or the angle of attack of the armament datum line in mils, can be determined by use of the Angle of Attack Relationship Curve (figure 6-4.).

USE OF THE CURVE. To determine the number of mils of off-set required by a given tactical mission, the Angle of Attack Relationship Chart must be entered at a point on the scale which indicates the pre-determined gross weight of the aircraft at the moment of release. This is represented as point A on the sample problem indicated on the graph. A line is then extended horizontally from the gross weight factor to a

ANGLE OF ATTACK RELATIONSHIP



REMARKS:

(1) Dive brakes closed.

(2) Subtract 0.6 degrees (10.5 Navy mils) for dive brakes open.

(3) Subtract 2.2 degrees (38.4 Navy mils) to obtain angle of attack of fuselage reference line.

(4) Zero propeller thrust.

(5) To determine E.A.S., refer to AIRSPEED CORRECTIONS in Appendix 1.

DATA AS OF: 1 March 1954

DATA BASIS: Wind tunnel tests of full scale Douglas XBT2D

EXAMPLE:

Determine the gunsight offset in mils for a dive bombing run under the following condition WITH DIVE BRAKES OPEN.

(a) Gross weight at time of release = 17,600 lb (A).
(b) Dive angle = 40 degrees (B).
(c) Stabilized dive speed = 300 knots E.A.S. (C).
(d) Angle of attack of armament datum line = −17 mils (D) −10.5 mils (Note 2) = −27.5 mils.

Therefore reticle of sight should be raised 27.5 mils.

Figure 6-4. Angle of Attack Relationship Chart point intersecting the intended stabilized dive angle of the aircraft prior to the pull-out (represented on the example as point B). A vertical line is then traced to a point intersecting the line representing the expected airspeed of the airplane at the moment of pull-out (point C). From this point a horizontal line is traced to the left to the "mil" scale at the edge of the graph (point D). The reading on the mil scale indicates the value to be used as the sighting off-set necessary so that a precise collision course toward the target can be maintained. It must be noted that the reading obtained from the mil scale may have either a plus or minus value. If a plus value reading is obtained, the reticle image must be off-set from the boresighted position by the given number of mils by rotating the sight elevation control counterclockwise toward the "DOWN" range. Conversely, if a minus value is obtained, the pip is off-set over the target by the given number of mils and the knob is rotated clockwise, or toward the "UP" range.

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SECTION VII

SYSTEMS OPERATION

POWER PLANT OPERATION

General engine smoothness coupled with stable instrument readings give the most satisfactory indications of engine performance. If any irregularity becomes apparent, the engine should be throttled down, and if the trouble cannot be remedied in flight, a landing should be made for further investigation. The following information on operation of the engine is given in the interest of maintaining optimum engine performance.

GROUND OPERATION

Extended ground operation should be avoided whenever possible. If it is necessary to operate the engine for any considerable period of time while the aircraft is motionless, head the airplane into the wind for adequate cooling.

USE OF THE COWL FLAPS. It is not generally necessary to position the cowl flaps during ground operation, as they are automatically fully opened whenever the weight of the aircraft causes compression of the landing gear shock struts. This automatic opening feature can be overridden, however, by use of the COWL FLAPS switch on the left console. The cowl flaps should not be closed during ground operation when warming up the engine, but may be closed after shutdown when the engine is cooled to protect the engine from existing weather conditions. Closing the cowl flaps in the air will not override the automatic feature and the cowl flaps will immediately open after the aircraft has landed. If the cowl flaps have been closed on the ground, any interruption of the d-c power supply will reinstate the automatic opening feature. Therefore the cowl flaps, if closed, should automatically open immediately after d-c power is supplied to the secondary bus, as, for instance, during the engine starting procedure.

ALTERNATE AIR. Use of alternate air for ground operation during extreme cold is of value as an aid to fuel vaporization. If alternate air is used for any reason during ground operations, however, caution must be observed that direct air is again selected prior to take-off.

CLEARING A FOULED ENGINE. The spark plugs may sometimes become fouled during a period of extensive ground operation, particularly if the idle mixture is too rich or if the engine is allowing an excessive amount of oil to enter the cylinders. The much used procedure of running the engine at high power in an attempt to unfoul spark plugs has probably worked in a number of cases, but in more instances the plugs have been fouled to a greater degree because of the deficiency of air in the rich mixtures used for high powers and by a hardening of the substance already on the plugs. Plugs that are marginal in firing ability have their ability to fire lessened by increasing the heat and pressure in the cylinders. Because of these factors, the recommended procedure for "burning out" the engine is as follows:

a. Reduce the engine rpm to the idle range (800 to 1200 rpm).

b. Pull the mixture control back toward "IDLE CUTOFF" until a 50 rpm drop-off in idle speed is obtained. The resulting mixture will contain excess air that will burn off the carbon and oil deposits.

c. Idle for two minutes.

d. Replace mixture control to "RICH" and repeat the magneto check.

Note

The mixture control should remain in "RICH" for all ground operation except as noted.

IN FLIGHT OPERATION

When changing power settings during flight, care must be taken to reduce manifold pressure before reducing rpm and to increase rpm before increasing manifold pressure. To do otherwise would be to risk exceeding the limiting BMEP of the engine. A study of the Engine Operating Limits Curve, figure A-6, will reveal that when cruising at 2300 rpm and 35 inches manifold pressure, advancing the throttle without reference to the rpm as is sometimes necessary during formation flight, can cause a dangerous exceeding of the indicated BMEP limit.

USE OF MIXTURE CONTROL. The "RICH" position shall be used during all take-off, approach, and landing operations. It is also advisable to use a rich mixture during let-downs to prevent engine backfiring. This is particularly true at rates of descent, or in climatic conditions which tend to over-cool the engine. The "NORMAL" position may be used during all other flight operations, provided that the cylinder head temperature does not become excessive. Refer to ENGINE OPERATING LIMITS, Section V.

MANIFOLD PRESSURE REGULATOR. When the throttle is positioned to give a desired manifold pressure, the manifold pressure regulator, which is located in the linkage between the cockpit throttle lever and the carburetor throttle lever, automatically maintains the selected manifold pressure at all altitudes below the critical altitude for the setting. If the critical altitude for the selected manifold pressure is exceeded, pushing the throttle lever further forward will have no effect, as the carburetor is already at "full throttle." Power can be increased, in this situation, only by increasing the engine speed.

If the engine oil pressure drops below approximately 25 psi, the spring loaded piston in the manifold pressure regulator will drop to a full low manual schedule where the actual throttle position is about one half the corresponding position of the cockpit throttle lever. The maximum manifold pressure obtainable at military rpm under this condition is about 1.5 times the outside air pressure in low blower and 2.3 times the outside air pressure in high blower.

HIGH POWER SETTINGS. Engine detonation or roughness at high power settings will be minimized by the use of the "RICH" mixture control setting.

SUPERCHARGER CONTROL. High blower should be used only at altitudes where the desired power is not available in low blower. When operating at normal rated power, do not shift to high blower unless not more than 36 inches of manifold pressure can be obtained at full throttle in low blower, otherwise less power will be available in high blower than could be obtained by remaining in low. If operating at military power, the shift should be made when no more than 40 inches of manifold pressure can be obtained.

When shifting blowers at an engine speed lower than 2600 rpm, it is advisable to shift when the manifold pressure has decreased to 28 inches Hg. This is to insure that the greater power might be available without the manifold pressure rise associated with a shift to high blower exceeding the engine limitations. At low powers in low blower, it is usually advantageous to obtain more power by increasing engine speed up to 2600 rpm before shifting to high.

BLOWER SHIFTING. To shift from low to high blower:

a. Mixture control – "RICH," to lessen any tendency of the engine to cut out or run roughly.

b. Throttle – reduce manifold pressure to 20 inches Hg.

c. Propeller control – the engine speed should be reduced to 1600 rpm in order to reduce the possibility of twisting the engine tail shaft, hence putting the engine in an out-of-time condition.

Note

When justified by emergencies or tactical requirements, blower shifts may be made at engine speeds of up to 2600 rpm, but such shifts also decrease clutch life and should be kept to a minimum.

d. Supercharger control – Shift rapidly and evenly to "HIGH." Be prepared to retard the throttle to check any tendency of the manifold pressure to rise excessively.

Note

While the manifold pressure regulator is normally capable of maintaining any selected manifold pressure below critical altitude, it should not be expected to control manifold pressure during a blower shift, because changes occur too rapidly for the regulator to follow. Manual operation of the throttle is essential to proper control of manifold pressure during blower shifting.

To shift from high to low blower; shifting from "HIGH" to "LOW" blower may be done at any engine operating condition.

OPERATION IN HIGH BLOWER. Since operation in high blower, particularly at high power settings, makes a more severe demand upon the engine, certain specific procedures should be followed to prevent detonation and engine roughness.

a. Use the "RICH" mixture position throughout any high blower, high power climbs.

b. A rich mixture may also be necessary for high power level flight, particularly following any prolonged climb.

c. Deleted.

d. It is recommended that the use of military power while in high blower be avoided in hot or humid weather, when tactically feasible.

USE OF WATER INJECTION[1]. Water injection allows the pilot to draw all the additional power the engine can provide without causing overheating or detonation. A coolant, a mixture of water and methyl-alcohol, is introduced into the cylinders to effectively reduce the mixture temperature during high power operations. The additional power gained from the use of water injection results primarily from derichment of the carburetor to the best power mixture by a water pressure control line. This pressure line also links the water injection power control unit to the manifold pressure regulator, permitting an increase in the maximum allowable manifold pressure when the water injection system is in use.

Note

To avoid the danger of exceeding safe operating limits with possible engine failure while using the water injection system, the water pressure control (or reset line) will be connected only when a torquemeter is installed in the airplane to provide the pilot with an accurate indication of power output. (Installation of the water injection system is to be

(1) BuNo. 135278 and subsequent.

completed at squadron level.) The normal dry MAP limit of 59 inches can be used for "wet" operation with only a slight reduction from the maximum power available when the water reset line is connected, provided OAT'S are between −20°C (−4°F) and 15°C (59°F).

COMBAT POWER. Combat ratings are based on engine structural limitations, water injection being used to suppress detonation during limited operation with maximum power output. To obtain combat power, set the controls as follows:

a. Fuel tank selector – Main tank

b. Mixture – "RICH" or "NORMAL"

c. Master water injection switch – "ON"

d. Propeller – Full "INCREASE" (2900 rpm in low blower, 2600 rpm in high blower)

e. Throttle – Advance beyond normal take-off power stop

WARNING

A manifold pressure in excess of 61.5 inches Hg during "wet" operation may result in immediate engine failure.

ENGINE CONTROL DURING A DIVE. To avoid faulty oil scavenging or to prevent the engine nose section from loading up with oil during prolonged dives, it is recommended that the propeller governor be set for the maximum cruising rpm, plus or minus 100 rpm, during dives. In addition, a minimum manifold pressure of 15 inches Hg is recommended during prolonged dives. Any manifold pressure above 15 inches Hg that is within engine limits for the engine speed, mixture control position and altitude may be used. If a manifold pressure below 15 inches Hg is held during a prolonged dive, the engine will foul up in the same manner as it does when the throttle is closed during prolonged glides. Of further importance is the fact that the engine, which was not dive-tested at a manifold pressure of less than 15 inches Hg, may be subject to master rod bearing failure if less than 15 inches of manifold pressure is used.

Caution should be observed during extended dives from high altitudes to prevent the manifold pressure from building up rapidly during altitude changes which are beyond the range within which the manifold pressure regulator can function.

ENGINE OVERSPEED. If the engine should exceed the maximum limit of 3120 rpm, immediately close the throttle, pull the propeller control back toward the "DECREASE" rpm position and reduce the airspeed to a minimum commensurate with maintaining safe flight. This action will help to reduce engine speed and will thereby effectively reduce the centrifugal forces which would otherwise be detrimental to the bearings.

CARBON MONOXIDE CONCENTRATIONS. The possibility of carbon monoxide concentrations in the cockpit exists if the sealing is not meticulously maintained. The highest CO concentrations are most likely under high power, low airspeed climb conditions. Tests for the presence of carbon monoxide contamination should be conducted for all operating conditions at every 120 hour check. If contamination is indicated, the airplane should be subjected to a preventive maintenance program for effective resealing.

WARNING

Remedial action in case of suspected or indicated CO concentration should consist of opening the enclosure and breathing 100 per cent oxygen. Increased power should be avoided and a landing should be made as soon as possible. Avoid, as far as possible, taxiing or standing with the canopy open with the wind from either beam.

FUEL SYSTEM

FUEL FLOW. Flow of fuel directed by the fuel tank selector valve is from the selected tank directly to the carburetor; no fuel transfer between tanks is possible. The fuel flows through the selector valve to the electrical fuel boost pump, to engine driven fuel pump, past the fuel pressure warning light sensing unit and then to the carburetor. A carburetor vapor vent returns excess fuel to the main tank. The vapor vent line can return fuel from the carburetor at a maximum rate of 10 U.S. gallons per hour; however, normally there is little or no return.

FUEL BOOST PUMP. The electrically energized fuel boost pump is normally used during starting, take-off, and landing. It may also be used to aid the engine-driven fuel pump in maintaining adequate fuel pressure at altitude or when a shift is made from one tank to another, and to serve as an emergency fuel pump in the event that the engine-driven pump fails. Use of the fuel boost pump during ground operations under hot climatic conditions is an aid to the prevention of vapor lock.

FUEL TANK SELECTION. The main tank should be used for starting, warm-up, take-off, climb and landing. Fuel from the auxiliary tanks should be used for level flight only. Selection of the main tank during flight should be made for combat, maneuvers or when entering areas of severe turbulence.

Note

Since the main tank is used for starting, takeoff and climb, sufficient fuel will be used to avoid the possibility of the tank overflowing due to fuel returning through the vapor vent line.

SELECTION SEQUENCE. In flight, the fuel should be used from the installed tanks in the following sequence; left hand auxiliary, right hand auxiliary, center wing auxiliary, and fuselage cell. The reason for selecting the tanks in this order is to maintain as favorable a loading condition as possible during any imbalance which occurs as fuel is consumed. This practice also allows the maximum use of the external fuel loading prior to dropping the tanks upon approaching a combat area.

SELECTION PROCEDURE. To change the selection of fuel flow from one tank to another:

a. Fly the airplane in a level attitude.
b. Fuel boost pump .... "ON"
c. Fuel tank selector.............. Desired tank
d. Fuel booster pump............. "OFF"

Care must be taken in the selection of the proper tank as the indicated progressive positions of the fuel selector valve handle are not in the same order as the required fuel tank selection sequence.

FUEL PRESSURE WARNING LIGHT. A pressure sensitive switch in the fuel line down stream of the engine-driven pump will cause the fuel pressure warning light to glow whenever the fuel pressure drops below approximately 17 psi. An illuminated warning light indicates that the engine will operate for approximately 10 seconds before fuel starvation will occur. Some flickering of the warning light may occur when the aircraft is in a steep climb, or dive, or flying through extremely rough air when the selected tank is low on fuel, but this characteristic is not considered objectionable.

OIL SYSTEM

The oil system, although normally automatic in operation, has several features over which the pilot has a degree of control. Operation or use of the oil cooler doors, the oil warm-up compartment of the oil tank, and oil dilution can be controlled from the cockpit.

OIL COOLER DOOR. The oil cooler door is thermostatically operated whenever the OIL COOLER DOOR switch is in "AUTO." If some malfunction of the automatic feature occurs, the cooler door can be opened or closed at the discretion of the pilot by means of the OIL COOLER DOOR switch. No indication of the position of the cooler door is available to the pilot other than the resulting oil temperature change. The pilot must open or close the doors, readjusting as necessary, until the desired oil temperature indication is maintained.

Note

An oil cooler door actuator limit switch, installed above the actuator, prevents the oil cooler door from opening fully when a torpedo or a large bomb is carried on the centerline bomb ejector rack.

WARM-UP COMPARTMENT. For an aid in rapid warm-up after starting a cold engine, the main oil tank contains a smaller warm-up compartment from which the engine draws and returns oil whenever the oil temperature is below 55°C. The flow of oil is directed to and from the warm-up compartment by a thermostatically controlled diverter valve. This valve is positioned electrically whenever the battery switch is turned on. Whenever the oil is cold, the resulting high viscosity causes a great deal of resistance to the diverter valve which increases the possibility of creating an overload on the actuating motor. This overload can burn the motor out. To prevent this, it is recommended that the oil diverter valve be preset during every shut-down of the engine. This is accomplished, through use of the oil dilution switch, by following the procedure outlined in Section II under STOPPING THE ENGINE.

OIL DILUTION. Oil dilution should be used during engine shut-down whenever an anticipated engine start is to be made at temperatures approaching or below the freezing level. This procedure should not be confused with that which outlines the positioning of the oil diverter valve. Although the oil dilution switch is used in either case, the oil diverter valve should be positioned during every engine shut-down while dilution of the oil supply need be used only for extremely cold operating conditions. Refer to Section IX, COLD WEATHER OPERATING PROCEDURES.

A feature of the oil dilution system requires that a ground crewman must turn on an oil dilution shut off valve, located in the oil cooler section just forward of the fire wall, whenever oil dilution is to be accomplished. The pilot must then place the oil dilution switch on "OIL DILUTE" for the required period. This positioning of the oil dilution switch will cause the oil diverter valve to divert oil flow to the warm-up compartment of the oil tank and will actuate the electrical fuel boost pump. Turning the battery-generator switch off before turning the oil dilution switch off at the completion of the process will cause the diverter valve to remain in the correct position for the next engine start.

SECTION VIII

CREW DUTIES

THIS SECTION IS NOT APPLICABLE TO THIS AIRPLANE.

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SECTION IX

ALL WEATHER OPERATION

INTRODUCTION

This section contains only those procedures that differ from, or are in addition to, normal operating instructions contained in Section II. Any discussion relative to operation of the various systems is covered in Section VII. Where repetition occurs, it is only as needed for emphasis, clarity, or continuity.

NIGHT FLYING

Night flying procedures are conventional in this airplane. Night lighting provisions are excellent, and no objectionable glare is caused by the canopy. Exhaust shields on the fuselage forward of the cockpit serve to protect the pilot's eyes from the exhaust glare.

OPERATION UNDER INSTRUMENT FLIGHT CONDITIONS

The airplane is inherently stable and has no unusual instrument flight characteristics. No difficulties other than those normally associated with instrument flight will be encountered.

AFTER STARTING THE ENGINE. The following check should be carefully made before take-off:

a. Radar altimeter . . . . "ON"
b. Altitude limit . . . . As desired
c. G-2 compass control switch . . . . "CONTROL"

Note

It may be desirable to set the G-2 compass control switch to "FREE" for an instrument take-off from a carrier deck, as shipboard magnetic disturbances may have considerable influence on the controlling magnetic compass.

e. Gyro horizon . . . . Uncage
f. FLT INST PWR SEL switch . . . "INVERTER 1"

TAXIING. During turns while taxiing, the turn and bank indicator should be checked for proper operation, the G-2 compass for changes in heading, and the stand-by compass for freedom of operation. Check the gyro horizon for proper erection.

INSTRUMENT TAKE-OFF. Prior to take-off the engine must be checked thoroughly and the check-off list reviewed. Take-off power should be applied smoothly and evenly while directional control is maintained by reference to the directional gyro. The rudder will become effective almost immediately and use of the brakes will not be required. No attempt should be made to raise the landing gear until the altimeter has indicated a positive reading above the field elevation. Cross reference should be made with the radar altimeter. Take-off power should be maintained until an altitude of 500 feet over the field elevation has been reached.

HOLDING. To conserve fuel all holding should be conducted at speed and power for maximum endurance. Refer to Maximum Endurance Charts in the Appendix. See also figure 9-1.

INSTRUMENT APPROACHES

No problems peculiar to this airplane are anticipated during instrument approaches. Equipped as it is with radio compass, UHF direction finder marker beacon receiver and auto-pilot, radio range let-downs or GCA approaches can be made readily.

RADIO RANGE LET-DOWN. Reference should be made to figure 9-1, Instrument Approach and Landing Power Requirements, for concise information on approximate power settings which are necessary during the various stages of an instrument let-down.

GROUND CONTROL APPROACH. See figure 9-1 for approximate power settings to be used for best economy during GCA landings. During the final let-down, it is recommended that the flaps be placed half down and the airspeed be maintained at 105 knots for the most "comfortable" approach conditions. The flaps should be lowered to full down when visual contact with the runway is made.

ICE, SNOW AND RAIN. Dry snow and rain will have little effect on airplane characteristics other than restricting vision. A rain repellent compound in accordance with Specification MIL-K-6882 is recommended for application on the canopy panels. The compound is effective for approximately two hours in rain, or for one week if not subjected to cleaning, de-icing or de-greasing fluids, or salt sprays. Re-applications should be made at weekly intervals or whenever the compound may have been removed by any of the physical causes noted above.

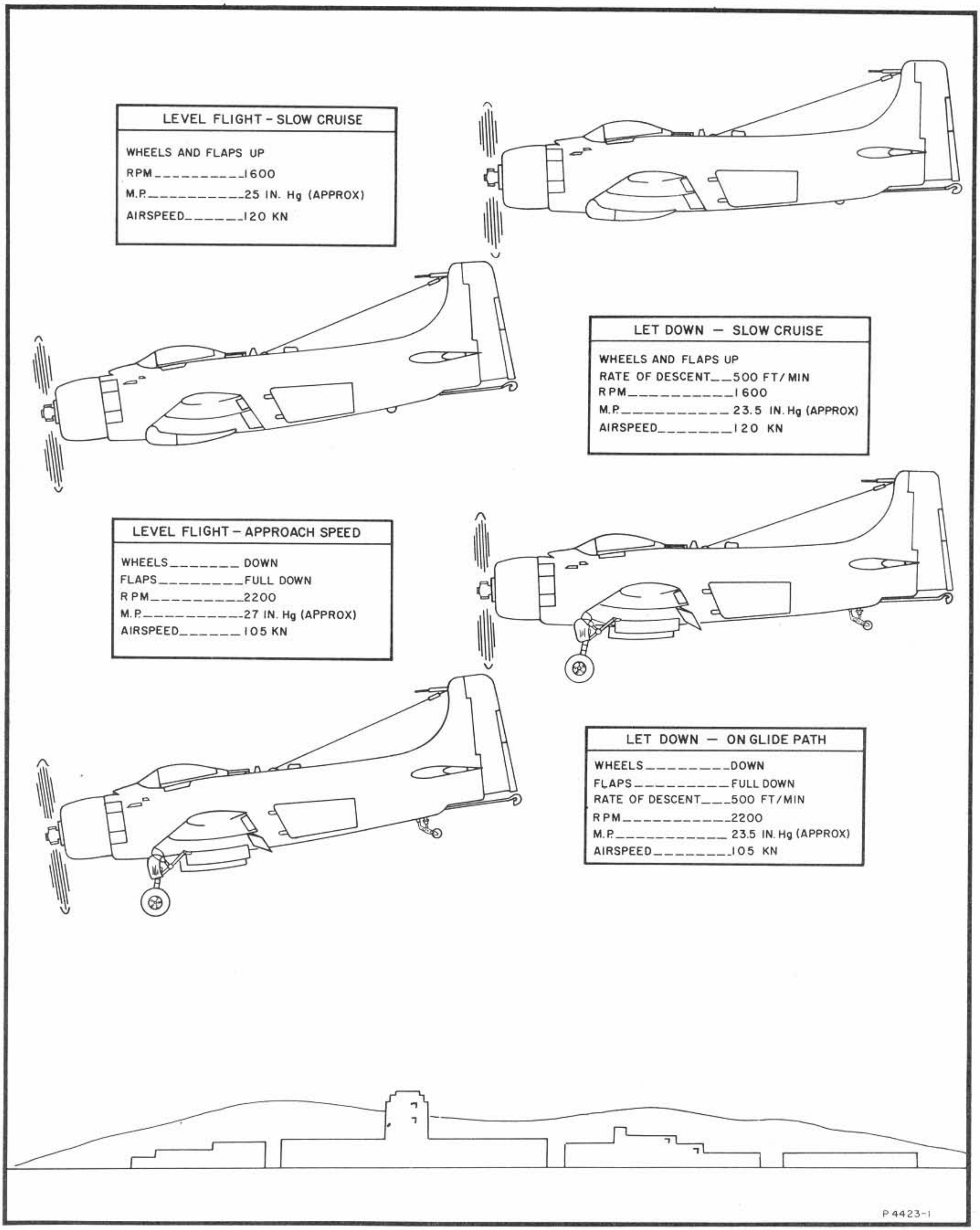


Figure 9-1. Instrument Approach and Landing Power Requirements
Figure 9-2. Deleted

Note

Retouching is not acceptable since it causes smudging.

Wet snow, freezing rain and ice will adhere to skin surfaces and cause hazardous loss of lift if corrective measures are not taken. Ice or snow conditions existing on ground prior to flight will increase taxi and take-off hazards. The following precautions should be observed whenever ice, snow, or freezing rain is encountered or anticipated:

a. Before entering cockpit, check wings, wheels, control surface hinge points, pitot tube, etc. Make certain all ice and snow is removed.

WARNING

Loose snow cannot be depended upon to blow off, and only a thin layer of frost is necessary to cause a loss of lift and treacherous stalling characteristics. It is extremely important that the propeller be free of ice before take-off.

b. When taking off on an icy runway, minimum use of brakes is recommended.

FLIGHT IN TURBULENCE AND THUNDERSTORMS

Since the airplane is inherently stable, a pilot with proper instrument flying proficiency should anticipate no difficulty in flying through turbulent air. Airspeed must be reduced as turbulence increases to avoid severe stress on aircraft. Gear and flaps should be left in the up position. Refer to Section V for limitations.

COLD WEATHER OPERATING PROCEDURES

Successful cold weather operation is dependent primarily on post-flight servicing and preparation of the airplane in anticipation of the requirements for operation on the following day.

BEFORE ENTERING THE AIRCRAFT

a. Check that all protective covers have been removed.

b. Check that all surfaces, controls, shock struts, and drains have been cleared of snow, frost, and ice.

WARNING

The collection of snow, frost and ice on the airplane surfaces constitutes one of the major flight hazards in low temperature operation and will result in the loss of lift and treacherous stalling characteristics.

c. At temperatures of -20°C (-4°F) or below it is recommended that the cockpit and engine be pre-heated, even if oil dilution has been used. If oil dilution has not been used, engine pre-heat should be used at temperatures below 2°C (35°F).

CAUTION

Apply heat until oil will flow freely from the drain valve and the propeller can be pulled through with comparative ease.

d. Have fuel filters and fuel drain cocks checked for ice. Apply heat if necessary to drain moisture.

ALTERNATE OIL

Grade 1100 lubricating oil shall be used at ground starting temperatures down to plus 35°F (2°C). When temperatures below plus 35°F are expected, or if it would be necessary to use oil dilution, use grade 1065 lubricating oil. When using grade 1065 lubricating oil, inlet temperatures shall be maintained between 65°C and 75°C to obtain proper engine lubrication during engine operation and to prevent accumulation of moisture and volatile products of oxidation in the oil. If it is not possible to maintain these temperature limits, oil pressure should be maintained within the normal operating range and oil temperatures should be kept above 60°C. Grade 1065 oil will generally require preheat for starting at temperatures below 0°F (-18°C).

STARTING ENGINE

a. Set the throttle to obtain the following recommended engine speeds during a start:

700 to 800 rpm (throttle closed) for OAT of -20°C (-4°F) or lower.

900 to 1000 rpm for OAT of -20°C (-4°F) to -1°C (-30°F).

b. During cold weather operations, except in cases of emergency, an external power supply must be used when starting the engine.

c. Priming the engine before the starter is engaged should be avoided. Prime continuously while cranking until the engine fires and accelerates to several hundred rpm. At this time advance the mixture control to "RICH."

d. The only use for the primer after the engine is operating on the carburetor fuel (mixture "RICH") is to occasionally add the primer flow to keep the engine running for the first one or two minutes of warm-up time. This is necessary in extreme cold OAT, i.e., -1°C (30°F) or below.

Note

If the engine shows a marked tendency to backfire during the start, abort the starting procedure and investigate the automatic manifold pressure regulator. Experience indicates that the manifold pressure regulator lever may not readily follow the throttle lever toward the idle range under cold weather conditions. Since the throttle should be barely "cracked" for cold weather starts, manual adjustment of the regulator lever may be necessary.

e. The throttle should be retarded to a minimum idle during the early stages of warm-up to maintain a stabilized oil pressure. Advancing the throttle while the oil is cold will result in cavitation within the oil pump and a loss of oil pressure. If the oil pressure does not stabilize, the engine should be stopped and heat applied locally. Excessive pressure should not last over 30 seconds after starting. If it does, stop the engine and ascertain the cause. When the oil pressure shows stability during manipulation of the throttle, increase the engine speed to approximately 1200 rpm and continue the warm-up.

WARM-UP. Normal warm-up procedures will usually evaporate sufficient gasoline from the engine oil to eliminate any difficulty with scavenging. If time permits, run the engine at least thirty minutes with the oil temperature above 50°C to rid the oil of gasoline.

GROUND TESTS

Supplemental to the normal procedures for ground tests, the following should be accomplished:

a. Operate all hydraulic systems, except landing gear and speed brake, several times.

b. Operate all flight controls several times and check for freedom of movement.

c. Check gyro instruments for proper operation. As much as 10 to 15 minutes may be required for gyros to erect in cold weather.

TAXIING INSTRUCTIONS

If taxiing in loose snow, hold control stick back, and use sufficient power to keep momentum. Avoid sharp turns, but if they must be made, use a minimum of differential braking so a wheel will not pivot and dig in. Exercise extreme caution and use reduced engine speeds while taxiing on ice. Use alternate air while taxiing to improve fuel vaporation, prevent fouling of the spark plug, and to eliminate icing of the induction system.

Operating at reduced engine speeds will cause the generator to cut out, consequently, only essential electrical equipment should be used in order to conserve battery power. To assure a minimum drain upon the battery, the following equipment should be turned off as indicated unless use prior to take-off is absolutely essential.

a. Keep all interior and exterior lighting at a minimum.

b. Fuel boost pump .... "OFF" until just before take-off.

c. Pitot heater .... "OFF" until initiating the take-off run.

d. Mk3 Mod 4 Bomb Director .... "OFF"

e. AN/APN-22 radar altimeter...... "OFF" until just before take-off.

f. AN/APX-6 IFF set .... "OFF"

g. AN/ARN-6 radio compass .... "OFF"

BEFORE TAKE-OFF

a. Turn on pitot heat just prior to take-off.

b. Switch to "DIRECT" carburetor air just prior to take-off.

Note

Take-off in alternate air is not recommended at ambient air temperatures above –20°C (–4°F).

c. Place cockpit heater lever in "WINDSHIELD" position.

AFTER TAKE-OFF

Operate the landing gear, flaps, and hook through several cycles to prevent them from freezing in the up position, but do not set the brakes as they may freeze in the locked position. Expect slow operation of the hydraulic system due to stiffening of all lubricants and fluids. Operate the trim tabs and control surfaces to rid them of slush or moisture which may tend to freeze. Guns should be charged as soon after take-off as practical as hydraulic action becomes sluggish due to cold. Pilots should never fire trial bursts after take-off as plastic covers or tampions are used in the muzzles to prevent cold air from blowing down the bores.

CARBURETOR AIR CONTROL. The "ALTERNATE" air position should be used as a normal operation when flying in any conditions conducive to the formation of induction system ice, and, when cruising under cold weather conditions, to improve fuel vaporization. The shift to alternate air should be made before carburetor icing conditions are encountered. When making the shift to or from alternate air, it is desirable to use "RICH" mixture during the shift. The manifold pressure lost in the use of alternate air will automatically be compensated for by the manifold pressure regulator. If the carburetor air temperature exceeds 38°C (low blower) or 16°C (high blower) in alternate air, reduced maximum allowable manifold pressure limits one inch for each 6°C in excess of these temperatures.

Pilots must be on the alert for atmospheric conditions that may cause carburetor icing. The normal drop in manifold pressure that occurs when the carburetor screen starts to ice is concealed because the manifold pressure regulator automatically opens the carburetor throttle to compensate for the loss in manifold pressure. Throttle or refrigerative ice is not encountered in spinner injection engines. Carburetor ice in these engines consists of moisture or ice in the air metering passages of the boost venturi hanger. Blockage of these passages causes loss of metering suction and eventual fuel starvation without affecting manifold pressure. The pilot therefore, may receive no warning until the carburetor is heavily iced. Use of "ALTERNATE" air must be based on judgment rather than on any definite indication of icing. Carburetor icing can occur at ambient air temperatures of 15°C and below.

ICING. If icing conditions should be inadvertently encountered, the altitude should be changed immediately in an attempt to find a level free of the hazard. If a climb should be attempted, a high airspeed in the climb should be maintained. Underwing icing, particularly prevalent in an airplane with external stores under the wing, is retarded if high angle of attack climbs are avoided.

DESCENT

Keep cylinder head temperature above 100°C and oil temperature above 30°C during descent. If the engine should tend to cool below these limits during an extended let-down lower the speed brake so that more engine power will be required.

APPROACH

a. Landing gear and landing flaps require more time to operate in extremely low temperatures. Actuate brake pedals when lowering landing gear and on downwind leg to insure circulation of the sluggish fluid.

b. If icing conditions prevail, use alternate air.

LANDING. Use brakes sparingly and with caution. All unnecessary electrical loads should be reduced as soon as possible.

STOPPING OF ENGINES

OIL DILUTION. If temperatures below 2°C (35°F) are anticipated prior to the next start when using grade 1100 oil or below –12°C (10°F) when using grade 1065 oil, the oil must be diluted as follows:

a. Request ground crew member to open the oil dilution manual shut-off valve.

Note

The oil dilution shut-off valve must be closed and safety-wired prior to flight.

b. Operate engine at 1000 to 1200 rpm.

c. Maintain the oil pressure above 15 psi.

d. Hold oil dilution switch in "OIL DILUTION" position for six minutes.

e. Throttle ...."CLOSED"

CAUTION

If throttle is opened or left in the open position while the engine is shut down, sludge or congealed oil may cause the pilot valve or servo piston of the manifold pressure regulator to stick in the "increase throttle" position, resulting in a "run-away" condition during the next start.

f. Mixture control ...."IDLE CUTOFF"

g. Ignition switch ...."OFF"

h. Battery-generator switch ...."OFF"

i. Oil dilution switch ...."OFF" (After propeller stops turning)

j. Have ground crew member close oil dilution manual shut-off valve.

Note

Battery-generator switch must be turned "OFF" before oil dilution switch is turned "OFF" in order to properly position the oil diverter valve for a cold start.

CAUTION

Use of oil dilution reduces the maximum amount of oil that can be carried. This should be considered in planning flights of long duration.

BEFORE LEAVING THE AIRCRAFT

a. Have dirt and ice cleaned from shock struts.

b. Leave canopy slightly open for air circulation to prevent cracking of canopy due to differential contraction. Air circulation also retards formation of frost.

c. Check that protective engine coverings are installed.

d. Have fuel strainer, pitot static drains, and fuel tank sump condensate drained within 30 minutes after stopping engines.

e. Whenever possible leave airplane parked with full fuel tanks as this prevents moisture from entering the fuel system.

f. If temperature below –4°C (–25°F) are anticipated and airplane is to remain idle for more than four hours, have batteries removed and stored in a heated room.

g. Throttle ...."CLOSED"

HOT WEATHER OPERATING PROCEDURES

Hot weather demands changes in the normal operating procedures for two reasons; first, air becomes less dense as temperature increases; and second, rubber and plastic components of the airplane are subject to damage by excessive heat. Take-off and landing rolls are longer. Excessive heat makes additional precautions necessary to protect tires and canopy from damage.

BEFORE TAKE-OFF

a. Check tires for blisters.

b. Keep engine operation and taxi time to a minimum.

c. Use of the fuel boost pump during ground operation will help prevent vapor lock.

TAKE-OFF. Anticipate a longer take-off distance.

BEFORE LEAVING AIRPLANE

a. Leave canopy slightly open to permit air circulation within cockpit.

b. Make sure that protective covers are installed on pitot head, canopy, and intake ducts.

DESERT OPERATION

Desert operation is distinct from normal hot weather operation because of the presence of dust and sand. When operating under desert conditions, the normal hot weather procedure must be used, and in addition, it is extremely important to prevent external abrasion, and to prevent dust and sand from entering the aircraft systems. No single procedure can be given to cover all possible conditions of desert operation. The following recommended procedure should be augmented whenever unique situations are encountered.

BEFORE ENTERING THE AIRPLANE

a. Check that exposed portions of shock struts and actuating cylinders are free from dust and sand. Clean with a cloth moistened with hydraulic fluid if necessary.

b. Check all air intakes (pitot tubes, carburetor air scoop, etc.) for accumulation of sand and dust.

c. Make sure that air, oil, and instrument filters are clean.

WARNING

Do not attempt to take off in a sandstorm or dust storm. Park airplane down wind, and shut off engine.

APPENDIX I

OPERATING DATA CHARTS

INTRODUCTION

It is the purpose of this appendix to present sufficient operating and performance data for complete pre-flight planning. Take-off, climb, cruise, and landing charts are provided which detail operational performance of the airplane for a variety of configurations. In addition, charts are provided for airspeed and temperature corrections, standard altitude data, and engine operating limits and performance.

The data contained herein are for the most part based on flight tests of the Model AD-4 airplane, and engine calibration and fuel consumption data obtained from the Model AD-2 airplane. All performance is based on operation with 115/145 grade fuel with a density of 6.0 pounds per U. S. gallon. No conservatism factors have been included since the data are based on flight tests.

It must be noted that airplane performance data are representative of what can be anticipated under somewhat ideal conditions. In other words, no allowances have been made for wind, formation flight, or combat. Any allowances to be made for each of these items will be dictated by local doctrine.

To facilitate use of the range and endurance charts, they have been prepared to reveal airplane performance under five gross weight conditions. These five conditions are as follows: Clean Configuration, Light Attack, Medium Attack, Long Range Attack, and Heavy Attack. A variety of alternate loadings which will give the same drag configuration have been included with each chart as an aid in determining the proper data to be used for a particular problem. Various operating factors, such as cowl flaps position, mixture setting, and oil cooler door placement are also included with each chart.

Descriptive information and general instructions for the use of each type of chart is included throughout the appendix in association with the charts in question. Reference to this material will facilitate use of the respective chart and will result in worthwhile gains in flight performance.

ABBREVIATIONS AND SYMBOLS. Many familiar symbols and abbreviations and some perhaps not so familiar are used throughout the appendix. For the sake of accuracy, a complete listing and identification of those used follows:

V = True airspeed in knots
V_c = Calibrated airspeed in knots
M = Mach number
IAS = Indicated airspeed = instrument reading corrected for instrument error
CAS = Calibrated airspeed = IAS corrected for position error
EAS = Equivalent airspeed = calibrated airspeed corrected for compressibility
TAS = True airspeed
MAP = Manifold pressure
KN = Knots
F.T. = Full throttle
ρ = Density of the atmosphere at any altitude in slugs/cubic feet
ρ_0 = Density of the atmosphere at sea level in slugs/cubic feet
$\rho/\rho_0 = \sigma$ = Ratio of density at altitude to density at sea level
P = 29.921 in. of Hg.

AIRSPEED CORRECTIONS

Several corrections must be made to the airspeed indicator reading to obtain the correct airplane speed. The first is a correction for instrument error. This correction must be determined for each airspeed indicator since it is primarily a result of manufacturing tolerances. The airspeed indicator reading so corrected is indicated airspeed.

The second correction is for the error which develops from the airspeed system installation. This is known as position error. This correction can be obtained from figure A-1, Airspeed Correction for Position Error, and when applied to IAS, results in calibrated airspeed.

The next correction is for the effect of compressibility. This correction can be obtained, when calibrated airspeed and pressure altitude are known, from figure A-2, Airspeed Correction for Compressibility. When this correction is added to CAS, the result is equivalent airspeed.

True airspeed is equal to EAS multiplied by $1/\sqrt{\sigma}$. $1/\sqrt{\sigma}$ may be obtained from figure A-4, Density Altitude Chart, or if conditions for a standard atmosphere are desired, from figure A-5, Standard Altitude Table.

To find the correct density altitude for determination of $1/\sqrt{\sigma}$, the true ambient temperature must be known. Cockpit indicator readings will always be high. The true ambient temperature is obtained from the cockpit temperature indicator reading plus a correction for installation and compressibility errors as given in figure A-3, Temperature Correction for Compressibility. The corrected temperature can then be used in conjunction with figure A-4 for the determination of $1/\sqrt{\sigma}$.

EXAMPLE. Assume the airplane is at a pressure altitude of 10,000 feet with flaps and gear up, power on,

AIRSPEED CORRECTIONS FOR POSITION ERROR

(CORRECTION TO BE ADDED)

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA

CONFIGURATION	INDICATED AIRSPEED—KNOTS						
	100	150	200	250	300	350	400
	CORRECTION TO BE ADDED						
FLAPS HALF OR FULL DOWN (POWER ON)	1	(1)					
FLAPS HALF OR FULL DOWN (POWER OFF)	0	1					
FLAPS UP (POWER OFF)	−2	1	2				
FLAPS UP SPEED BRAKES CLOSED (POWER ON)	0	1	2	2	3	(4)	(5)
FLAPS UP SPEED BRAKES OPEN (POWER ON)	0	0	1	2	2	(3)	(4)

REMARKS:

(a) Add correction to IAS (instrument reading corrected for instrument error) to obtain calibrated airspeed (CAS).
(b) Above corrections are the same for all operating altitudes.
(c) Values in parentheses are extrapolated.

DATA AS OF: 28 April 1950
DATA BASIS: Contractor's flight test of AD-4 aircraft.

P3838-1

Figure A-1 (Sheet 1 of 2)

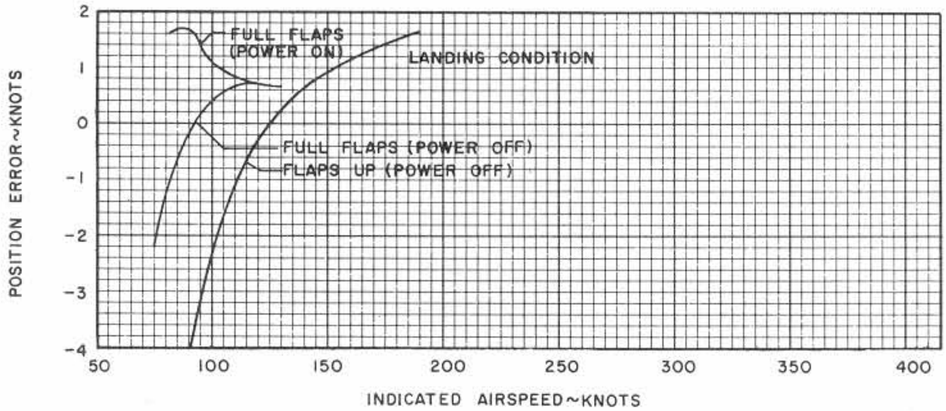
AIRSPEED CORRECTIONS FOR POSITION ERROR

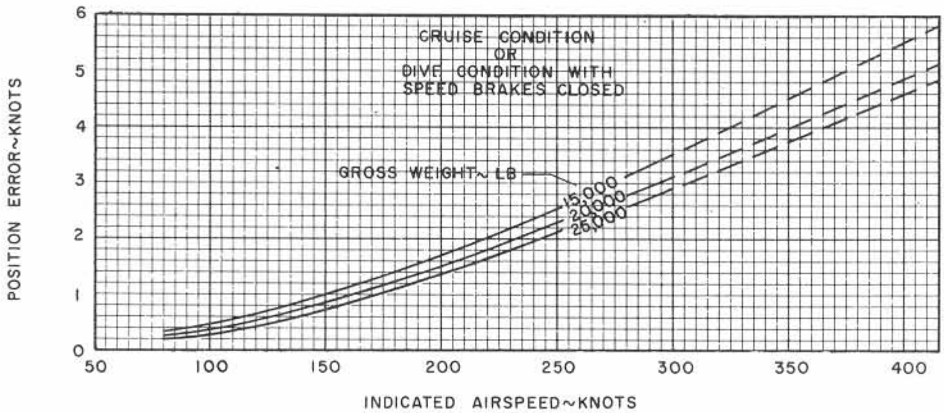
(CORRECTION TO BE ADDED)

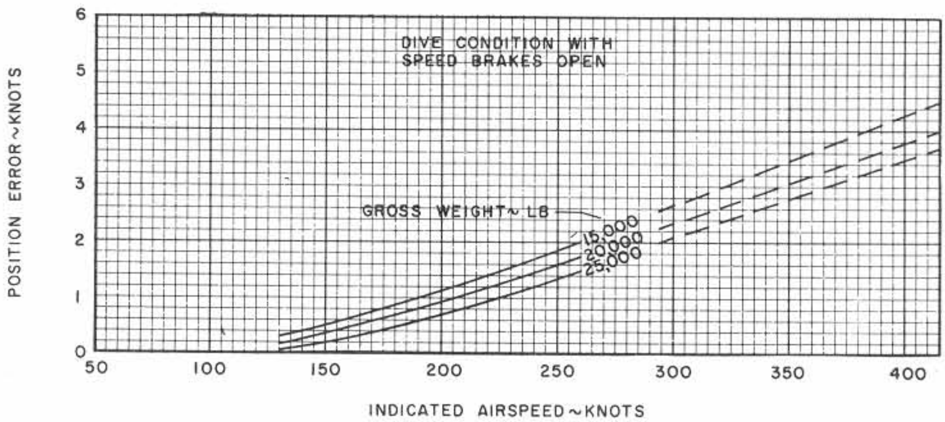
MODEL: AD-6

PROPELLER: A642-G 804/M20A2-162-0

ENGINE: R3350-26WA







REMARKS:

(a) IAS = Instrument reading corrected for instrument error.
(b) Add correction to IAS to obtain calibrated airspeed (CAS).

EXAMPLE:

Flaps up, power off: IAS = 100 Kts.
Position error = −2 Kts.
CAS = 100 +(−2) = 98 Kts.

DATA AS OF: 28 April 1950
DATA BASIS: Contractor's flight test of AD-4 aircraft.

P3838-2

Figure A-1 (Sheet 2 of 2)

AIRSPEED CORRECTION FOR COMPRESSIBILITY

MODEL: AD-6

PRESSURE ALTITUDE FEET	CALIBRATED AIRSPEED—KNOTS						
	100	150	200	250	300	350	400
SEA LEVEL	0	0	0	0	0	0	0
5,000	0	0	1	1	1	2	3
10,000	0	1	1	2	3	5	7
15,000	0	1	2	3	5	8	12
20,000	1	1	3	5	8	12	17
25,000	1	2	4	7	11		
30,000	1	2	5	9	15		
35,000	1	3	7	12			

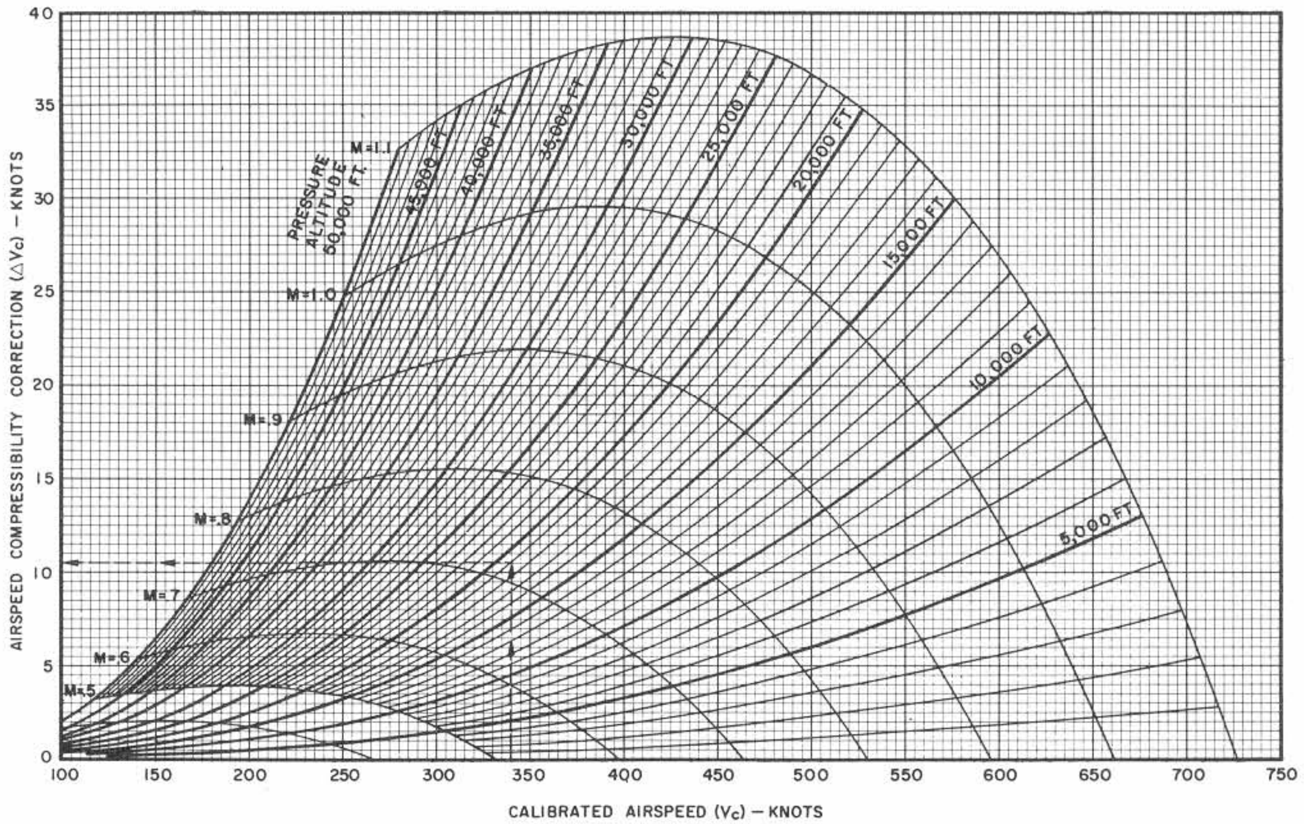
REMARKS:

(1) Subtract correction from calibrated airspeed to obtain equivalent airspeed. (EAS = CAS — CORRECTION)

P3825-1

Figure A-2 (Sheet 1 of 2)

AIRSPEED CORRECTION FOR COMPRESSIBILITY



REMARKS:

$V = \frac{V_c - \triangle V_c}{\sqrt{\sigma}}$

V = TRUE AIRSPEED

Vc = CALIBRATED AIRSPEED

$\sigma = \frac{\rho}{\rho_0}$ = DENSITY RATIO (SEE FIG A-4)

M = MACH NUMBER

EXAMPLE:

If Vc is 340 knots and pressure altitude is 19,000 feet, enter the chart at 340 knots and move vertically to pressure altitude line corresponding to 19,000 ft. Mach No. is noted to be 0.72. Move horizontally to the left and read △Vc = 10.5 knots. Subtract △Vc from Vc and multiply the result by $\frac{1}{\sqrt{\sigma}}$ (see Figure A-4) to obtain true airspeed.

P3825-2

Figure A-2 (Sheet 2 of 2)

TEMPERATURE CORRECTION FOR COMPRESSIBILITY

MODEL: AD-6

PRESSURE ALTITUDE	CALIBRATED AIRSPEED—KNOTS						
FEET	100	150	200	250	300	350	400
SEA LEVEL	1	2	4	7	10	14	18
5000	1	3	5	8	12	16	20
10,000	2	3	6	9	13	18	23
15,000	2	4	7	11	15	21	27
20,000	2	5	8	13	8	24	31
25,000	3	5	10	15	21		
30,000	3	6	11	17	24		
35,000	4	8	13	21			

REMARKS:

(1) *85% of full adiabatic temperature rise.
(2) Indicated temperatures read high.
(3) Subtract correction from indicated air temperature (°C) to obtain free air temperature (°C).

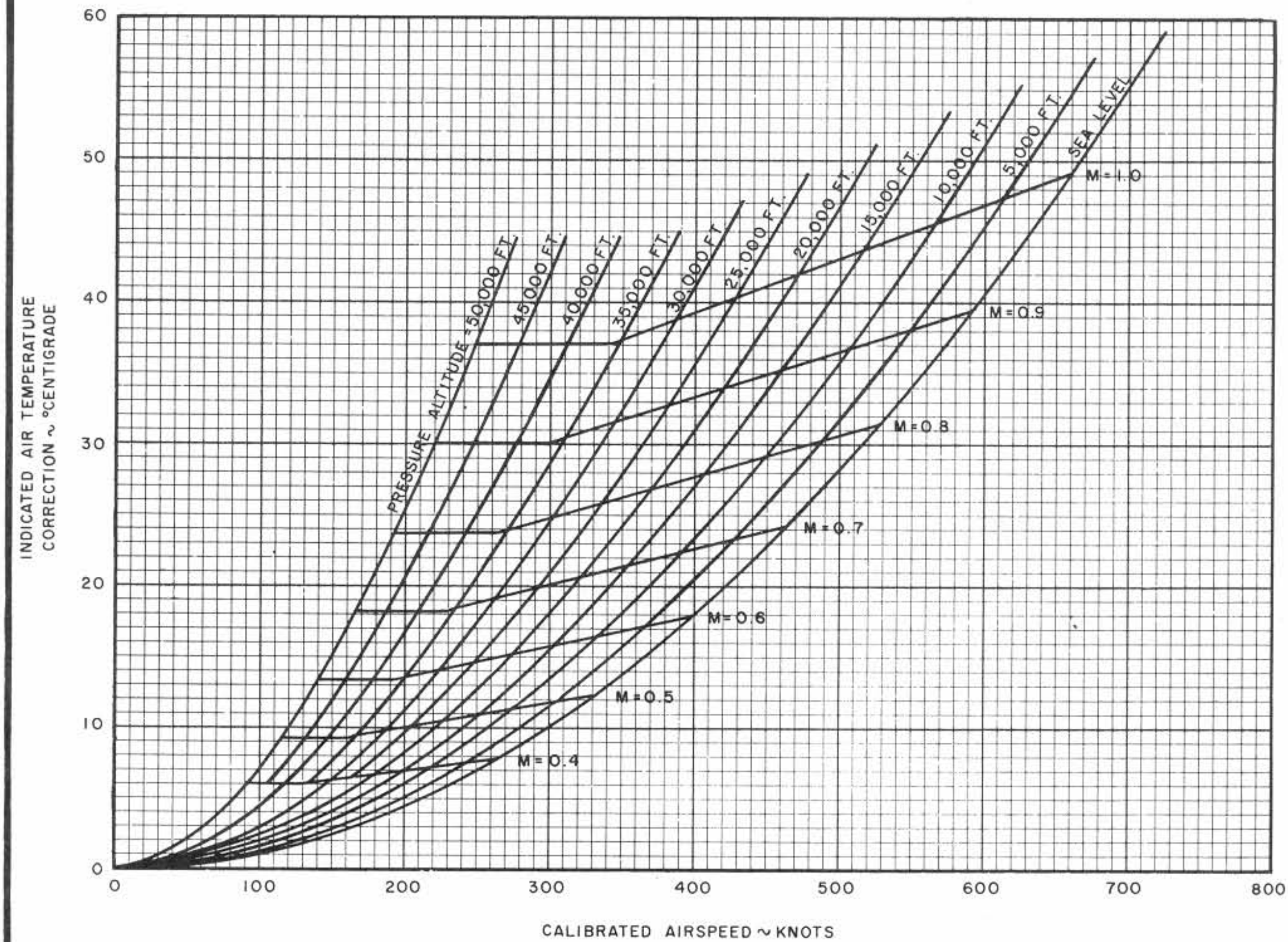
DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Model AD-1 aircraft*

P3826-2

Figure A-3 (Sheet 1 of 2)

TEMPERATURE CORRECTION FOR COMPRESSIBILITY

MODEL: AD-6



REMARKS:

(1) *85% of full adiabatic temperature rise.

(2) Indicated temperatures read high.

(3) Subtract correction from indicated air temperature (°C) to obtain free air temperature (°C).

DATA AS OF: 1 June 1953

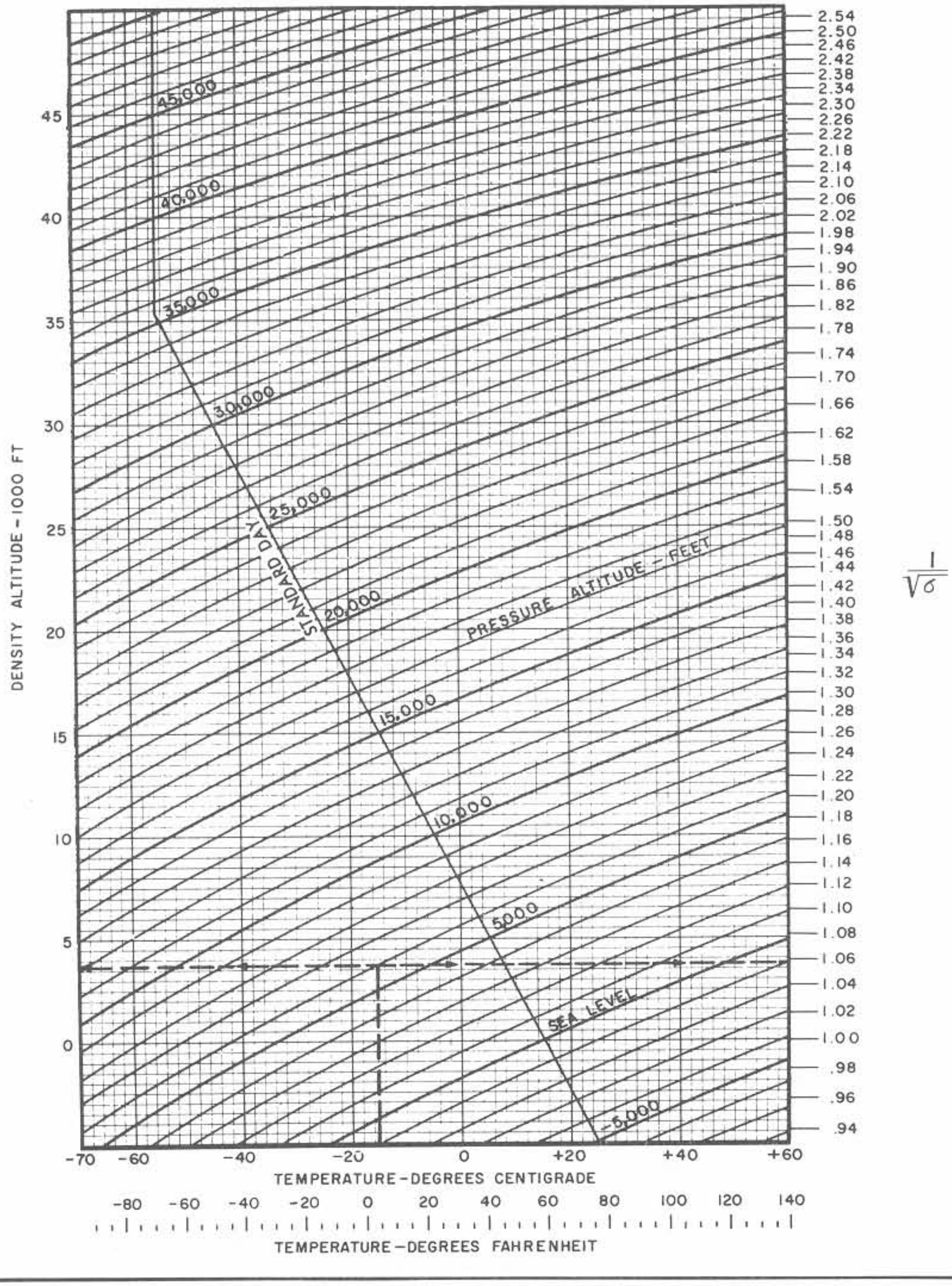
DATA BASIS: Model AD-1 Flight Test*

P3826-1

Figure A-3 (Sheet 2 of 2)

DENSITY ALTITUDE CHART

MODEL: AD-6



P4150-1A

REMARKS:

EXAMPLE:

If ambient temperature is −15°C and pressure altitude is 6000 ft., the density altitude is 3700 ft. and $\frac{1}{\sqrt{\sigma}}$ is 1.058.

Figure A-4

STANDARD ALTITUDE TABLE

MODEL: AD-6

Altitude feet	σ = Density Ratio ρ/ρ_o	$\frac{1}{\sqrt{\sigma}}$	Temperature Deg. C	Temperature Deg. F	Speed of Sound Ratio a/a_o	Pressure In. of Hg.	Pressure Ratio P/Po
0	1.0000	1.0000	15.000	59.000	1.0000	29.92	1.0000
1000	.9710	1.0148	13.019	55.434	.997	28.86	.9644
2000	.9428	1.0299	11.038	51.868	.993	27.82	.9298
3000	.9151	1.0454	9.056	48.301	.990	26.81	.8962
4000	.8881	1.0611	7.075	44.735	.986	25.84	.8636
5000	.8616	1.0773	5.094	41.169	.983	24.89	.8320
6000	.8358	1.0938	3.113	37.603	.979	23.98	.8013
7000	.8106	1.1107	1.132	34.037	.976	23.09	.7716
8000	.7859	1.1280	-0.850	30.471	.972	22.22	.7427
9000	.7619	1.1456	-2.831	26.904	.968	21.38	.7147
10000	.7384	1.1637	-4.812	23.338	.965	20.58	.6876
11000	.7154	1.1822	-6.793	19.772	.962	19.79	.6614
12000	.6931	1.2012	-8.774	16.206	.958	19.03	.6359
13000	.6712	1.2206	-10.756	12.640	.954	18.29	.6112
14000	.6499	1.2404	-12.737	9.074	.950	17.57	.5873
15000	.6291	1.2608	-14.718	5.507	.947	16.88	.5642
16000	.6088	1.2816	-16.699	1.941	.943	16.21	.5418
17000	.5891	1.3029	-18.680	-1.625	.940	15.56	.5202
18000	.5698	1.3247	-20.662	-5.191	.936	14.94	.4992
19000	.5509	1.3473	-22.643	-8.757	.932	14.33	.4790
20000	.5327	1.3701	-24.624	-12.323	.929	13.75	.4594
21000	.5148	1.3937	-26.605	-15.890	.925	13.18	.4405
22000	.4974	1.4179	-28.586	-19.456	.922	12.63	.4222
23000	.4805	1.4426	-30.568	-23.022	.917	12.10	.4045
24000	.4640	1.4681	-32.549	-26.588	.914	11.59	.3874
25000	.4480	1.4940	-34.530	-30.154	.910	11.10	.3709
26000	.4323	1.5209	-36.511	-33.720	.906	10.62	.3550
27000	.4171	1.5484	-38.493	-37.287	.903	10.16	.3397
28000	.4023	1.5768	-40.474	-40.853	.899	9.720	.3248
29000	.3879	1.6056	-42.455	-44.419	.895	9.293	.3106
30000	.3740	1.6352	-44.436	-47.985	.891	8.880	.2968
31000	.3603	1.6659	-46.417	-51.551	.887	8.483	.2834
32000	.3472	1.6971	-48.399	-55.117	.883	8.101	.2707
33000	.3343	1.7295	-50.379	-58.684	.879	7.732	.2583
34000	.3218	1.7628	-52.361	-62.250	.875	7.377	.2465
35000	.3098	1.7966	-54.342	-65.816	.871	7.036	.2352
36000	.2962	1.8374	-55.000	-67.000	.870	6.708	.2242
37000	.2824	1.8818	-55.000	-67.000	.870	6.395	.2137
38000	.2692	1.9273	-55.000	-67.000	.870	6.096	.2037
39000	.2566	1.9738	-55.000	-67.000	.870	5.812	.1943
40000	.2447	2.0215	-55.000	-67.000	.870	5.541	.1852
41000	.2332	2.0707	-55.000	-67.000	.870	5.283	.1765
42000	.2224	2.1207	-55.000	-67.000	.870	5.036	.1683
43000	.2120	2.1719	-55.000	-67.000	.870	4.802	.1605
44000	.2021	2.2244	-55.000	-67.000	.870	4.578	.1530
45000	.1926	2.2785	-55.000	-67.000	.870	4.364	.1458
46000	.1837	2.3332	-55.000	-67.000	.870	4.160	.1391
47000	.1751	2.3893	-55.000	-67.000	.870	3.966	.1325
48000	.1669	2.4478	-55.000	-67.000	.870	3.781	.1264
49000	.1591	2.5071	-55.000	-67.000	.870	3.604	.1205
50000	.1517	2.5675	-55.000	-67.000	.870	3.436	.1149

REMARKS:

(1) 1" Hg. = 70.732 Lb/Sq. Ft. = 0.4912 Lb/Sq. In.

(2) STANDARD SEA LEVEL AIR

$T = 15°C.$

$P_o = 29.921$ in. of Hg.

$a_o = 1116$ ft./sec.

$\rho_o = .002378$ slugs/cu. ft.

DATA BASIS: NACA Technical Report No. 218

P4436-1B

Figure A-5

an airspeed indicator reading of 200 knots and with a temperature indicator reading of 36°C. The true airspeed and the correct ambient temperature, assuming zero instrument error, are calculated as follows:

Airspeed indicator reading	200 knots
Correction for instrument error	0 knots
Indicated airspeed	200 knots
Correction for position error	+2 knots (see figure A-1, sheet 1)
Calibrated airspeed	202 knots
Correction for compressibility error	−1 knot (see figure A-2, sheet 2)
Equivalent airspeed	201 knots
Temperature indicator reading	36°C
Correction for instrument error	0
Indicated temperature	36°C
Correction for compressibility	−6 (see figure A-3)
Ambient temperature	30°C

At 10,000 feet and 30°C, $1/\sqrt{\sigma} = 1.24$ (see figure A-4). The true airspeed is $201 \times 1.24 = 249$ knots.

ENGINE OPERATING DATA

ENGINE OPERATING LIMITS CURVE

The engine operating limits curve (figure A-6) presents the maximum allowable brake horsepower (BHP) and corresponding power control settings as a function of altitude for NACA Standard Conditions. It is presented without ram since the gross weight, drag configuration, etc. will affect the level flight speed and hence, the amount of ram attainable. These maximum BHP's are engine operating limits because of (1) Engine structural or detonation limits (part throttle engine limits to the left of the curved, broken line in figure A-6, (2) Incapability of the blowers to maintain a constant air density as altitude is increased (full throttle limits to the right of the curved, broken line in figure A-6).

The latter (full throttle) limits are relatively obvious. They are the result of the engine being incapable of producing any more power at the particular altitude due to the reduced density of the air at that altitude. The part throttle limits are established by the strength or detonation limits of the engine and generally shown in terms of maximum BMEP (e.g., 150 BMEP) or "PROP LOAD." In low blower the R-3350-26W engine must never exceed 150 BMEP or detonation will most likely occur. Note that BMEP, or brake mean effective pressure, is an indirect measurement of the cylinder pressure developed during a power stroke and is expressed in lbs./sq. inch. As shown by the formula

$$\text{BMEP} = \frac{792{,}000 \times \text{BHP}}{\text{Engine Displacement} \times \text{RPM}}$$

BMEP varies directly as the brake horsepower and indirectly as the RPM. Consequently, a pilot who drastically reduces his RPM without first reducing his brake horsepower (by lowering his manifold pressure) runs the risk of increasing his BMEP beyond allowable limits. Conversely, any substantial increase in brake horsepower can be dangerous unless preceded by a rise in RPM. Above 2200 RPM, 150 BMEP may be exceeded without danger of detonation. A detonation and engine structural limitation, however, is still imposed on the engine. This limitation, defined as "prop load," is merely a relationship between brake horsepower and RMP, namely $\frac{\text{BHP}_2}{\text{BHP}_1} = \left(\frac{\text{RPM}_2}{\text{RPM}_1}\right)^3$. This limitation is applicable up to and including 2600 RPM. The relationship can be checked simply by noting the horsepower and RPM at normal power (2300 BHP, 2600 RPM) and calculating the brake horsepower at, say, 2300 RPM. Thus, it is found:

$$\text{BHP}_2 = \text{BHP}_1 \times \left(\frac{\text{RPM}_2}{\text{RPM}_1}\right)^3 = 2300\left(\frac{2300}{2600}\right)^3$$

$$= 2300 \times .693 = 1500 \text{ BHP}$$

This can be verified in figure A-6. Since these aircraft are not equipped with torquemeters or BMEP gages, the pilot's only indication of such limitations on the engine is the reading on the manifold pressure gage. For this reason limiting MAP's are provided on the Engine Operating Limits chart. These MAP's are shown only at sea level and at the critical altitude, but may be obtained at intermediate altitudes by interpolation between the constant MAP lines noted. Above the critical altitude, the maximum expected MAP can also be obtained by interpolation between the constant MAP lines for a particular RPM and altitude without ram. MAP corrections for non-standard conditions should be made as outlined in the paragraph titled TEMPERATURE CORRECTIONS.

To illustrate the use of the constant BHP-RPM lines (horizontal lines), suppose it is desirable to begin a climb with a manifold pressure setting of 36.2 inches Hg and 2300 RPM at sea level. Note that the MAP must continually be reduced in order to stay within the 1590 BHP limit. When the aircraft has climbed to approximately 13,000 feet altitude, the MAP is down to 32.6 inches Hg at the full throttle point. A climb in which the original throttle and propeller pitch settings are maintained is illustrated by the sloping constant MAP-RPM line which shows that BHP increases with altitude. Thus, when the pilot begins a climb with a part-throttle setting, the chart may be used to indicate the limit altitude at which he must change the power setting to stay within BHP limits.

USE OF THE CURVE. Example: To determine the highest altitude at which a power setting of 35 inches MAP and 2300 RPM may be used without exceeding maximum BMEP. (Use sheet 1).

a. Extend the 2300 RPM full throttle line and the 35 inches constant MAP line to their point of inter-

ENGINE OPERATING LIMITS CORRECTION CHART

MODEL: AD-6 | PROPELLER: A642-G 804/M20A2-162-0 | ENGINE: R3350-26WA

RPM	C.A.T. RANGE (°C)	CORRECTION TO BE APPLIED TO STANDARD DAY MAP LIMITS FOR EACH 6°C VARIATION OF C.A.T. FROM STANDARD TEMPERATURE (1)			
		LOW BLOWER		HIGH BLOWER	
		C.A.T. BELOW STANDARD TEMP.(1)	C.A.T. ABOVE STANDARD TEMP.(1)	C.A.T. BELOW STANDARD TEMP.(1)	C.A.T. ABOVE STANDARD TEMP.(1)
LESS THAN 2500	BELOW 15	DECREASE 1/4"	INCREASE 1/4"	DECREASE 1/4"	INCREASE 1/4"
↓	15-38	—	INCREASE 1/4"	—	DECREASE 1"
↓	ABOVE 38	—	DECREASE 1"	—	DECREASE 1"
2500 OR HIGHER	BELOW STAND. TEMP.(1)	DECREASE 1/4"	—	DECREASE 1/4"	—
↓	STAND. TEMP.(1) TO 15	—	NONE	—	NONE
↓	15-38	—	NONE	—	DECREASE 1"
↓	ABOVE 38	—	DECREASE 1"	—	DECREASE 1"

Remarks:
(1) Standard temperature (°C) = $15 - 2 \times \frac{\text{Pressure altitude}}{1000}$

DATA AS OF: December 1948
DATA BASIS: Wright Company Calibration of R-3350-26WA engine

P3827-2

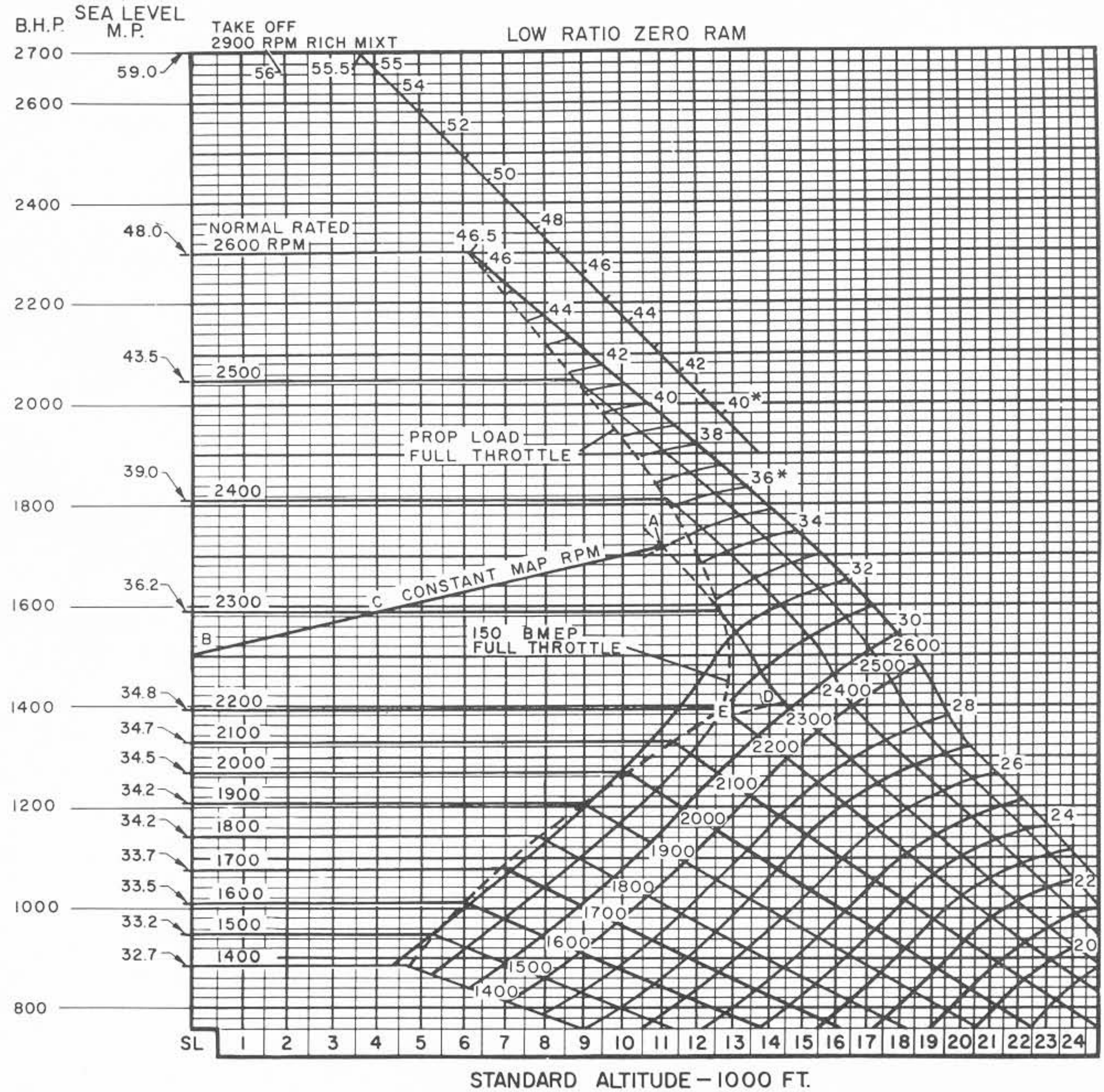
FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

Figure A-5A

ENGINE OPERATING LIMITS

LOW BLOWER STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Use rich mixture for take-off, approach, landing and all ground operations. Use normal mixture for all other operations unless cylinder temperatures exceed limits, then use rich mixture.

(2) For limits when using grade 100/130 fuel, see (b) under LIMITATIONS of Combat Allowance Chart, Figure A-7.

*(3) To maintain power at same rpm and higher altitude shift to high blower when manifold pressure drops to this value. For all lower rpms shift when manifold pressure drops to 28 in.Hg.

(4) Horsepower drops off approximately 1% for each 6°C (10°F) increase above standard temperature (15°C or 59°F at sea level). Adding one inch of manifold pressure will give an approximate increase of 50 brake horsepower.

DATA AS OF: December 1948
DATA BASIS: Wright Company Calibration of R-3350-26WA engine (SP-782)

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

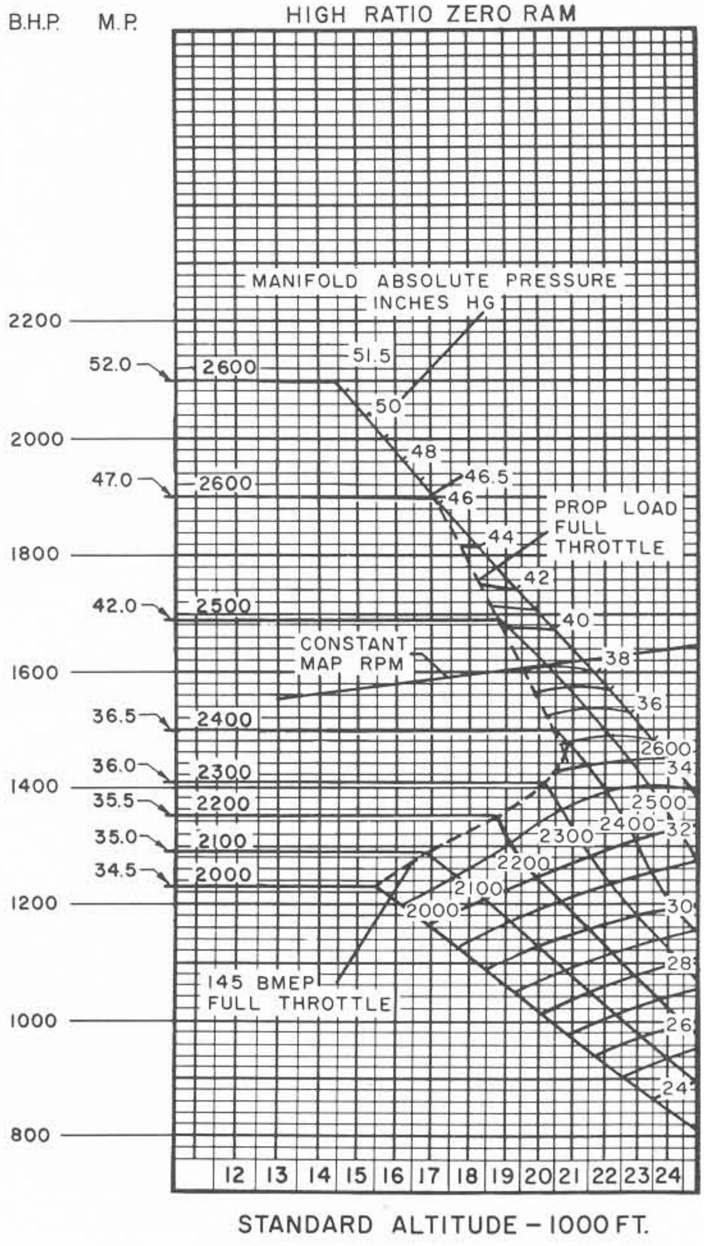
P3827-3

Figure A-6 (Sheet 1)

ENGINE OPERATING LIMITS

HIGH BLOWER STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:
Refer to Figure A-6 (Sheet 1 of 2).

DATA AS OF: December 1948
DATA BASIS: Wright Company Calibration of R3350-26WA engine (SP-782)

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

P3827-4

Figure A-6 (Sheet 2)

section (point A). This occurs at the 1720 BHP and 11,000 foot altitude reference lines.

b. Through this point of intersection draw a line parallel to the CONSTANT MAP-RPM line. (The line used in this example is the CONSTANT MAP-RPM line which establishes the slope for any similar problem). This line will represent operation at a constant 35 inches Hg and 2300 RPM, and will intersect the sea level reference line at 1500 BHP (point B).

c. Where this line crosses the 2300 RPM limit line (point C) may be found the maximum BHP for this setting and the maximum altitude at which it may safely be used without exceeding the BMEP limit of the engine. As previously stated, this altitude limitation is due to the increase in BHP output of the engine with increase in altitude, as indicated by the slope of the CONSTANT MAP-RPM line.

RAM EFFECT. The carburetor air intake scoop is usually faced into the slipstream in such a way as to gain supercharging effect from the velocity pressure of the air stream. This will provide a considerable pressure rise, or ram, at the carburetor deck. The result is to increase the altitude at which full throttle operation is reached for any given combination of RPM and manifold pressure, or, in other words, to increase the critical altitude or to give an increase in manifold pressure for a given RPM and altitude.

Note in figure A-6 (sheet 1) that without ram at 14,000 feet and 2200 RPM it is possible to obtain only 29.5 inches of manifold pressure. In order to find the effect of ram or the increase in manifold pressure, enter the chart, for example, at the CONSTANT 1400 BHP-2200 RPM line and read right to the intersection with the 14,000 foot (cruise) altitude line (point D). Draw a line from this point parallel to the CONSTANT MAP-RPM line, to intersect the 2200 RPM (no ram) line (point E). At this point can be read the maximum allowable manifold pressure at 14,000 feet for 1400 BHP and 2200 RPM (30.7 inches). Note that this is an increase of 1.2 inches over the manifold pressure attainable without ram effect.

The amount of ram depends on airspeed and on the design of the installation. It will therefore be different for every type of operation (climb, cruise, military power, etc.). Since it is impractical to make charts to meet all these conditions, power curves are constructed for operation without ram, and the effect of the latter is computed as above after the relevant data have been obtained.

TEMPERATURE CORRECTIONS. The Engine Operating Limits Curve is based on Standard Conditions which are defined by a Standard Temperature of 15°C (59°F) and a Standard Lapse Rate of −2°C per thousand feet. Adjustment for deviations from standard temperature, depending upon RPM, blower position, and carburetor air temperature, must be made to the data obtained from the Engine Operating Limits curve by applying the corrections contained in figure A-5A.

COMBAT ALLOWANCE CHART. Figure A-7 presents the engine settings corresponding to maximum level flight speeds at various altitudes. Cylinder head temperature limits and fuel flow are also presented. These data include the effects of carburetor ram air as developed by the aircraft when flying in a clean configuration and therefore should never be exceeded under standard atmospheric conditions. Reference to the Engine Operating Limits chart, figure A-6, is advisable to establish the limits under any non-standard condition.

COMBAT ALLOWANCE CHART

MILITARY POWER (1) STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G804/M20A2-162-0 ENGINE: R3350-26WA

PRESSURE ALTITUDE (FT)	RPM	MANIFOLD PRESSURE (IN. Hg)	(2) BLOWER POSITION	(3) MIXTURE POSITION	TIME LIMIT (MIN)	LIMIT CYLINDER TEMP. (DEG-C.)	FUEL FLOW (LB/MIN)
SEA LEVEL	2900	56.0	LOW	NORMAL	30 MIN	260	37.1
2000	2900	55.5	LOW	↑	↑	↑	37.1
4000	2900	55.0	LOW				37.1
6000	2900	54.5	LOW				37.1
8000	2900	52.5 (F.T.)	LOW				36.3
10,000	2900	49.0 (F.T.)	LOW				34.6
12,000	2900	45.5 (F.T.)	LOW				32.5
14,000	2900	42.0 (F.T.)	LOW				29.9
16,000	2600	51.5	HIGH		↓		28.6
18,000	2600	48.0 (F.T.)	HIGH		30 MIN		26.6
20,000	2600	44.5 (F.T.)	HIGH		NO LIMIT		23.5
22,000	2600	41.0 (F.T.)	HIGH		↑		20.3
24,000	2600	38.0 (F.T.)	HIGH				17.3
26,000	2600	34.5 (F.T.)	HIGH				14.9
28,000	2600	31.5 (F.T.)	HIGH	↓	↓	↓	13.0
30,000	2600	29.0 (F.T.)	HIGH	NORMAL	NO LIMIT	260	11.7

REMARKS:

LIMITATIONS:
(a) Maximum permissible diving RPM: 3120 (maximum 30 seconds)
(b) Conditions to avoid: Do not exceed zero or negative "g" for more than ten (10) seconds. Do not shift blower at more than 20 in. Hg and 1600 rpm.
(c) Following limits are observed when using grade 100/130 fuel:
Do not use high blower.
Take-off: 46 in. Hg, 2900 RPM, RICH mixture.
Military: 46 in. Hg, 2900 RPM, NORMAL mixture.

DATA AS OF: November 1949
DATA BASIS: Contractor flight test and NATC Patuxent combat evaluation (AD-2)

NOTES:
(1) Values are for level flight with ram.
(2) To maintain power at same RPM and higher altitude, shift to high blower when manifold pressure drops to 40.0 in. Hg.
(3) Use rich mixture for take-off, approach, landing and all ground operations ; use normal mixture for all other operations unless cylinder temperatures exceed limits, then use rich mixture.

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 lb/gal

P3834-1B

Figure A-7

TAKE-OFF CHARTS

The several charts following present the complete take-off performance of the airplane, including the effect of humidity on take-off power, the take-off distance required under various conditions, and the rate of climb following take-off. Examples of use are included with the charts.

Figure A-8, Effect of Humidity on Take-Off Power, indicates the amount of loss in take-off power which can be anticipated because of the effect of humidity. The specific humidity correction as obtained from this chart is used in figure A-9 when determining take-off distances. Since the airplane is equipped with an automatic manifold pressure regulator, no increase in take-off manifold pressure can be made to offset the power lost due to the effects of humidity. It is important to note, therefore, the loss of take-off performance brought about by an increase in humidity.

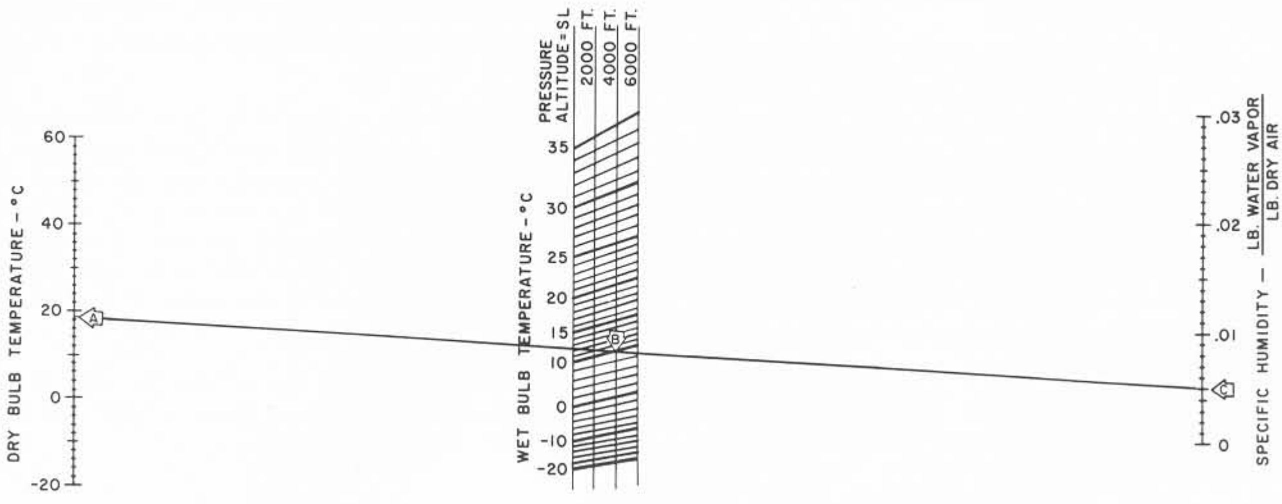
Figure A-9, Take-Off Distance, presents the take-off characteristics of the airplane as a function of ambient air temperature, pressure altitude, gross weight, specific humidity, and head wind. Data are presented on sheet 1 of figure A-9 for a full flap setting and on sheet 2 of figure A-9 for half flaps. Note that the total distance to clear a height of 50 feet after take-off is presented on sheet 2 of figure A-9 as a function of the ground distance to the object. Refer to the examples in figure A-9 for detailed instruction on use of the charts.

It should be noted that these charts give no indication of the external drag items loaded aboard the airplane for a given gross weight, since the take-off distance is not significantly affected by such drag. As the gross weight increases, however, an increase in drag due to an external loading compatible with each weight has been incorporated in the calculation of the take-off distances.

The rate of climb after take-off can be determined from figure A-10 for various gross weights and flap settings with gear up or down.

EFFECT OF HUMIDITY ON TAKE-OFF POWER

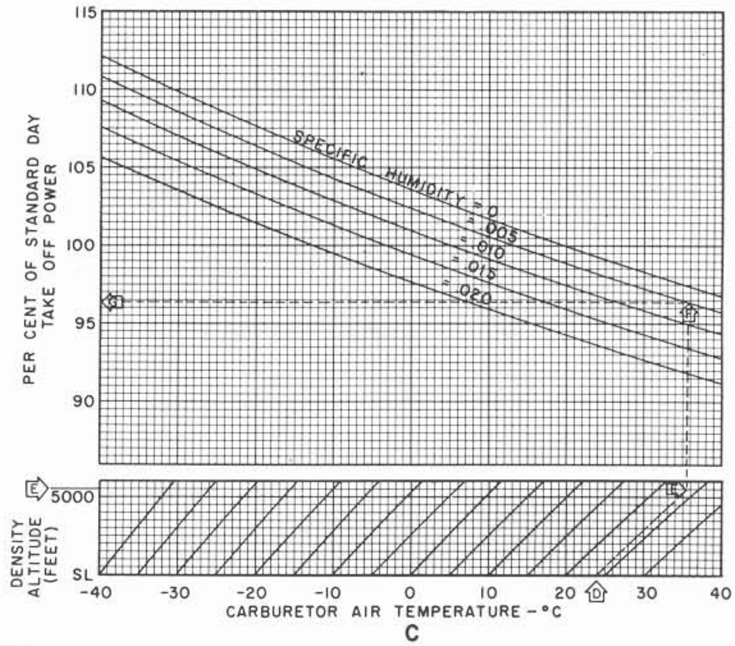
MODEL: AD-6 | PROPELLER: A642-G804/M20A2-162-0 | ENGINE: R3350-26WA



A

DEW POINT-°C	SPECIFIC HUMIDITY LB. WATER VAPOR / LB. DRY AIR
−20	.00078
−10	.00155
0	.00370
10	.00795
20	.01450
30	.02680

B



C

REMARKS:

(1) If wet and dry bulb temperatures and pressure altitude are known, read specific humidity from nomograph (figure A).

(2) If dew point is known, read specific humidity from table B.

(3) Determine effects of C.A.T. and specific humidity on BHP from figure C. (On the basis of past performance data, C.A.T. is normally 5°C above O.A.T.)

DATA AS OF: 1 March 1954
DATA BASIS: Calculations

EXAMPLE:

Given:

Pressure altitude = 4000 feet
Dry bulb temperature = 19°C
Wet bulb temperature = 10°C
C.A.T. = 24°C

(1) Determine density altitude from figure A-4.

(2) Draw straight line between dry bulb temperature (A) and wet bulb temperature (B) at 4000 feet.

(3) Read specific humidity (C) = .005.

(4) With C.A.T. 24°C (D), density altitude = 5500 feet (E), specific humidity = .005 (F), take-off power available (G) = 96.3%.

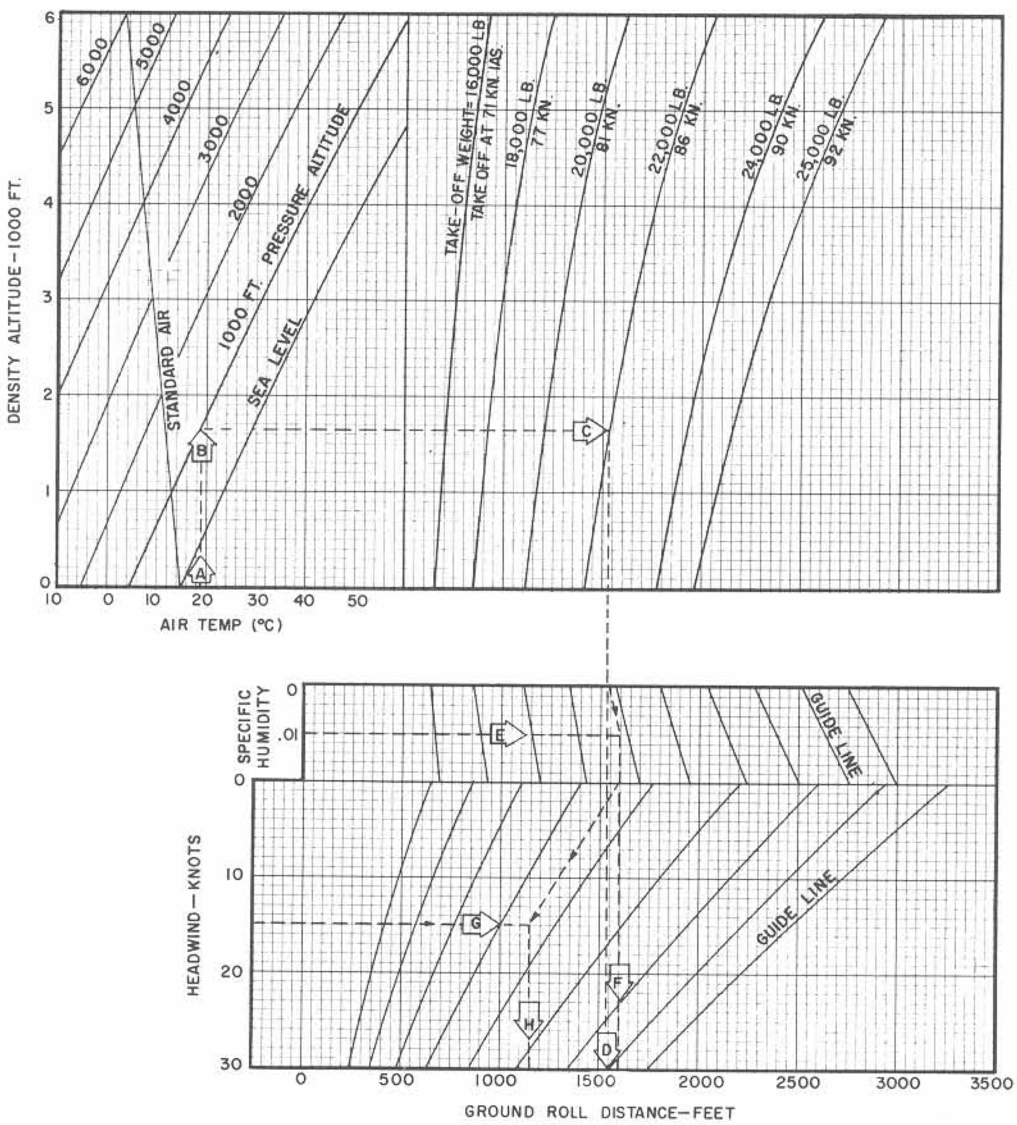
P 3828-1A

Figure A-8

TAKE-OFF DISTANCE

(FULL FLAPS)

MODEL: AD-6 | PROPELLER: A642-G 804/M20A2-162-0 | ENGINE: R3350-26WA



REMARKS:

(1) Take-off distances are based on engine operating at full throttle military power.

(2) Wing flaps full down (40°).

(3) Take off at airspeeds shown on chart.

DATA AS OF: 1 June 1953
DATA BASIS: Calculations

EXAMPLE:
(1) Under the following conditions:
(a) Air temperature = 19°C (point A)
(b) Pressure altitude = 1000 feet (point B)
(c) Gross weight = 22,000 pounds (point C)
Then: Take-off distance = 1540 feet (point D)
(2) With the added condition:
Specific humidity = 0.010 (E)
Then: Take-off distance = 1590 feet (F)
(3) Adding another condition:
Headwind = 15 knots (G)
Then: Take-off distance = 1150 feet (H)

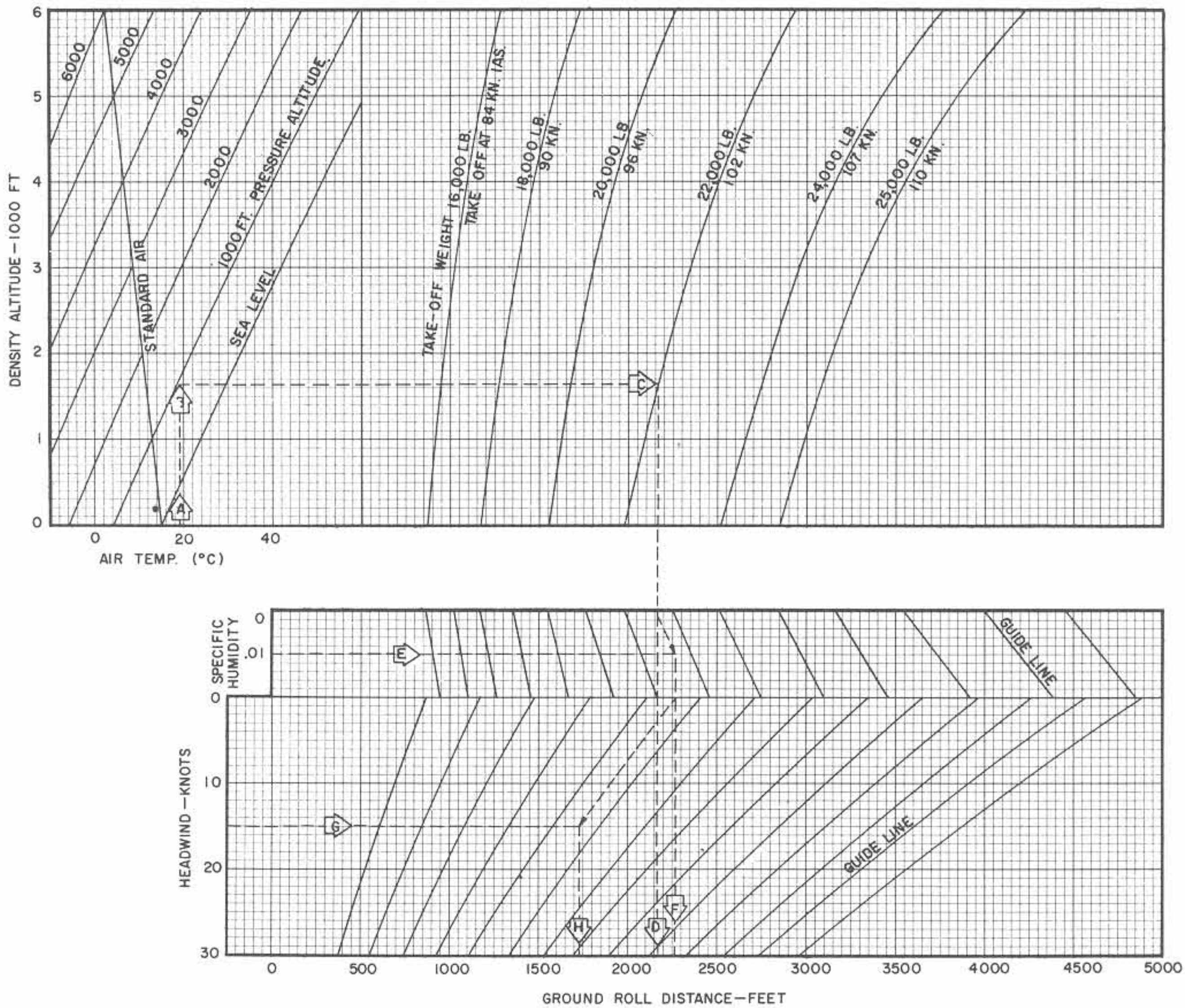
FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal
P3829-1

Figure A-9 (Sheet 1 of 2)

TAKE-OFF DISTANCE

(HALF FLAPS)

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) To find total distance required to clear 50', multiply chart distances by 130 percent.
(2) Take-off distances are based on engine operating at full throttle military power.
(3) Wing flaps half down (25°).
(4) Take-off at airspeeds shown on chart.

EXAMPLE:

(1) Under the following conditions:
 (a) Air temperature = 19°C (point A)
 (b) Pressure altitude = 1000 feet (point B)
 (c) Gross weight = 22,000 pounds (point C)
 Then: Take-off distance = 2170 feet (point D)
(2) With the added condition:
 Specific humidity = 0.010 (E)
 Then: Take-off distance = 2260 feet (F)
(3) Adding another condition:
 Headwind = 15 knots (G)
 Then: Take-off distance = 1730 feet (H)
(4) Distance to clear 50-foot obstacle = 1730 × 1.30 = 2249 feet

DATA AS OF: 1 June 1953
DATA BASIS: Calculations

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

P3829-2

Figure A-9 (Sheet 2 of 2)

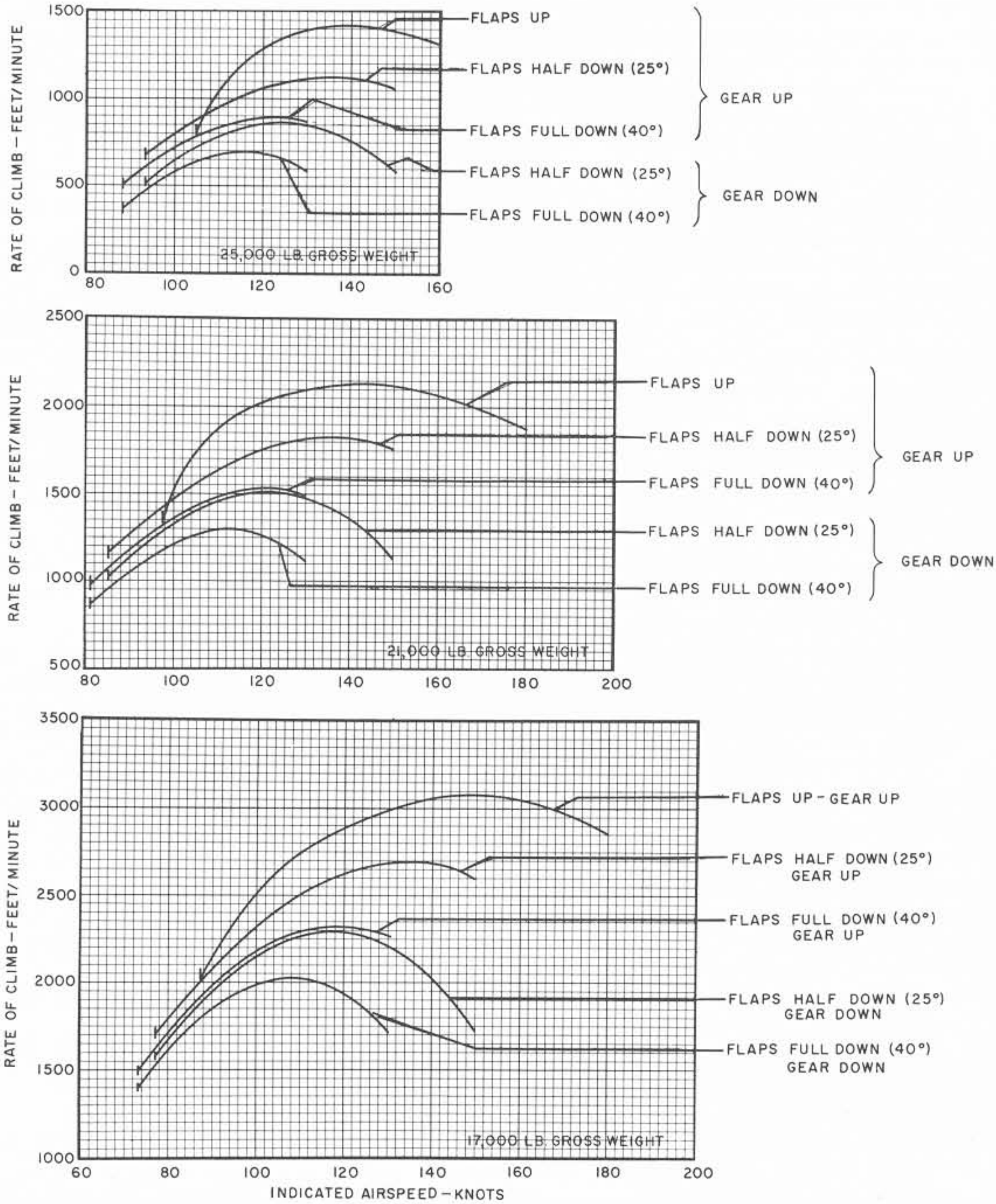
CLIMB AFTER TAKE-OFF

MILITARY POWER SEA LEVEL STANDARD DAY

PROPELLER: A642-G 804/M20A2-162-0

MODEL: AD-6

ENGINE: R3350-26WA



REMARKS:
(1) For each 10°C increase in ambient temperature, decrease chart values by 25 feet/minute.

CONDITIONS:
(1) Cowl flaps full open
(2) Nose flaps open
(3) Oil cooler door faired

DATA AS OF: 1 June 1953
DATA BASIS: Calculations.

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

P3831-1A

Figure A-10

CLIMB PERFORMANCE

Climb performance for normal and military power climbs is presented in figures A-11 and A-12. Figure A-11 presents climb distance vs gross weight and figure A-12 presents climb time vs gross weight. The time required to climb to an altitude, the horizontal distance traveled during the climb, and the gross weight change during climb (due to fuel consumption) can be obtained from these charts. These data can be corrected further for temperature variations above the standard day temperature (15°C at sea level). These corrections are determined through use of the small graphs located on each chart.

Each chart is graduated in gross weights up to 25,000 pounds and altitudes as high as the service ceiling when using either normal or military power. Guide lines are provided for reference in plotting gross weight loss and time or distance in climb.

It should be noted here that these charts are independent of the number of external drag items on the airplane for a given gross weight since the effect on fuel consumption, elapsed time and distance flown is relatively small. An assumed increase in drag with increased gross weight has been incorporated in the calculations.

Airspeeds are presented in figures A-11 and A-12 which will result in the maximum rate of climb for the particular gross weight and power setting. Although it is desirable to climb at the recommended airspeeds, a five knot variation either above or below those airspeeds will not noticeably affect the climb performance of the aircraft.

USE OF THE CHARTS

The following examples apply to figure A-11, the climb distance vs gross weight charts:

Example (sheet 1): If the initial climb weight is 19,000 pounds, and the ambient air temperature at sea level is 35°C (20°C above standard at all altitudes), find fuel used and distance covered in a normal power climb to 15,000 feet.

a. Enter the chart at 19,000 pounds (A) and follow parallel to guide lines until 15,000-foot altitude line is reached.

b. Move horizontally to the distance scale and read 24 nautical miles (B) as distance covered on a standard day.

c. Move vertically downward to gross weight scale and read gross weight at end of climb = 18,720 pounds (C). Fuel to climb on standard day = 19,000 — 18,720 = 280 pounds.

d. Enter distance correction curves at 15,000 feet (D), and read distance correction = 4 nautical miles (E).

e. Determine number of 10° increments above standard temperature $\left(\frac{20}{10}\right)$.

Distance covered is $24+\left(\frac{20}{10}\times 4\right)=32$ **nautical miles.**

f. Enter fuel correction curves at 15,000 feet (F), and read fuel correction = 12 pounds (G).

Fuel used $=280+\left(\frac{20}{10}\times 12\right)=304$ **pounds (51 gallons).**

Example (sheet 2): If the initial climb weight is 19,000 pounds, and the ambient air temperature at sea level is 5°C (10°C below standard at all altitudes), find fuel used and distance covered in a military power climb to 15,000 feet.

a. Enter the chart at 19,000 pounds (A) and follow parallel to guide lines until 15,000 feet altitude line is reached.

b. Move horizontally to the distance scale and read 20 nautical miles (B) as the distance covered on a standard day.

c. Move vertically downward to gross weight scale and read gross weight at end of climb = 18,770 pounds (C). Fuel to climb on standard day = 19,000 —18,770 = 230 pounds.

d. Enter distance correction curves at 15,000 feet (D), and read distance correction = 2 nautical miles (E).

e. Determine number of 10° increments below standard temperature $\left(\frac{10}{10}\right)$.

Distance covered is $20-\left(\frac{10}{10}\times 2\right)=18$ **nautical miles.**

f. Enter fuel correction curves at 15,000 feet (F), and read fuel correction = 12 pounds (G).

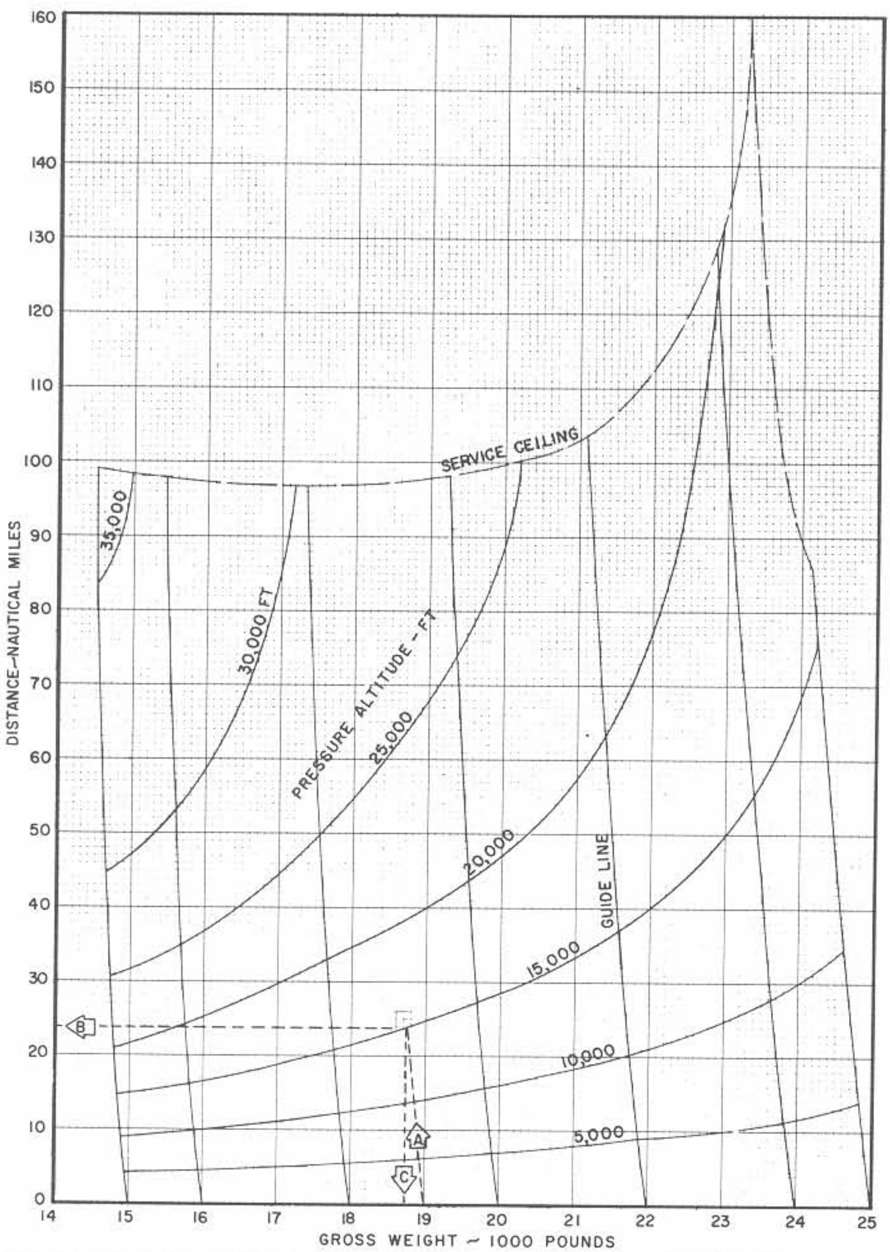
Fuel used $=230-\left(\frac{10}{10}\times 12\right)=218$ **pounds (36 gallons).**

Reference should be made to figure A-12 for examples on the use of the climb time vs gross weight chart.

CLIMB DISTANCE VS GROSS WEIGHT

NORMAL POWER STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA

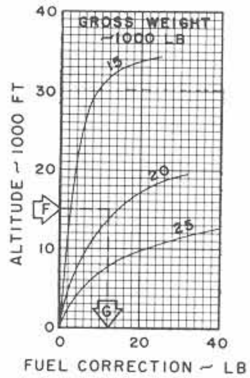


CLIMB AIRSPEED SCHEDULE

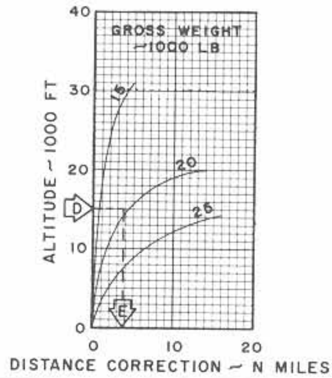
CLIMB AT THE FOLLOWING CAS — KNOTS

PRESSURE ALTITUDE	GROSS WEIGHT ~ POUNDS		
FEET	15,000	20,000	25,000
SL.	140	150	145
10,000	135	145	140
20,000	125	140	135
30,000	115	135	130

FUEL CORRECTION FOR EACH 10°C CHANGE IN AMBIENT TEMPERATURE



DISTANCE CORRECTION FOR EACH 10°C CHANGE IN AMBIENT TEMPERATURE



REMARKS:

(1) Data are valid for all external stores configurations (depending on gross weight), cowl and nose flaps full open, oil cooler door faired, normal mixture and no wind.

(2) For each 10° C above standard temperature add application distance and fuel correction to chart values.

(3) If detonation occurs during climb in high blower with normal mixture, change to rich mixture.

(4) Use straight line interpolation between altitude curves.

(5) See discussion under CLIMB PERFORMANCE for example.

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of models AD-2, AD-3, AD-4 and AD-4B airplanes

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Ga

P3830-1B

Figure A-11 (Sheet 1 of 2)

CLIMB DISTANCE VS GROSS WEIGHT

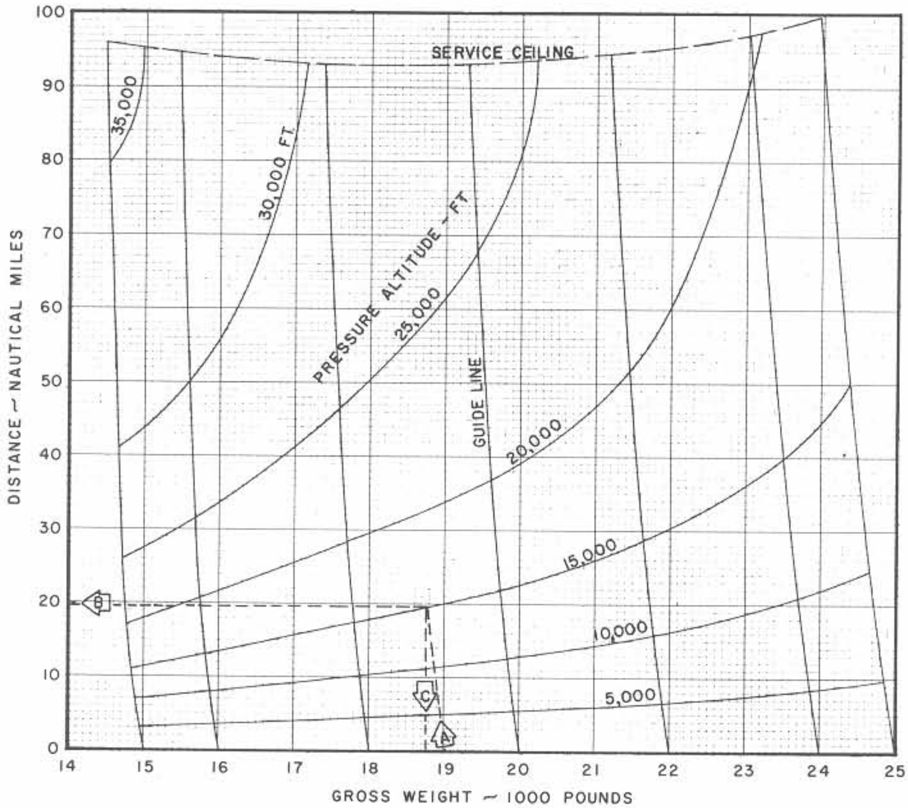
MILITARY POWER STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA

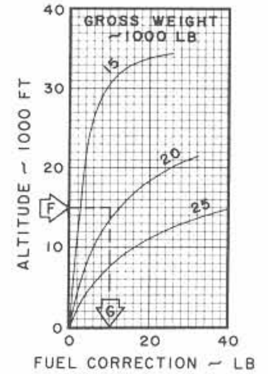
CLIMB AIRSPEED SCHEDULE

CLIMB AT THE FOLLOWING CAS~KNOTS

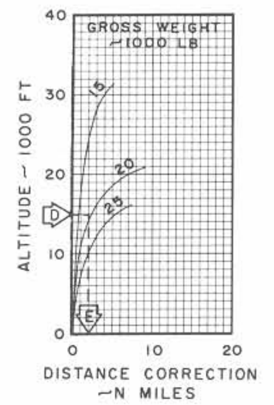
PRESSURE ALTITUDE	GROSS WEIGHT~POUNDS		
FEET	15,000	20,000	25,000
SL.	140	150	145
10,000	135	145	140
20,000	125	140	135
30,000	115	135	130



FUEL CORRECTION FOR EACH 10°C CHANGE IN AMBIENT TEMPERATURE



DISTANCE CORRECTION FOR EACH 10°C INCREASE IN AMBIENT TEMPERATURE



REMARKS:

(1) Data are valid for all external stores configurations (depending on gross weight), cowl and nose flaps full open, oil cooler door faired, normal mixture and no wind.

(2) For each 10° C above standard temperature add application distance and fuel correction to chart values.

(3) If detonation occurs during climb in high blower with normal mixture, change to rich mixture.

(4) Use straight line interpolation between altitude curves.

(5) See discussion under CLIMB PERFORMANCE for example.

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of models AD-2, AD-3, AD-4 and AD-4B airplanes

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

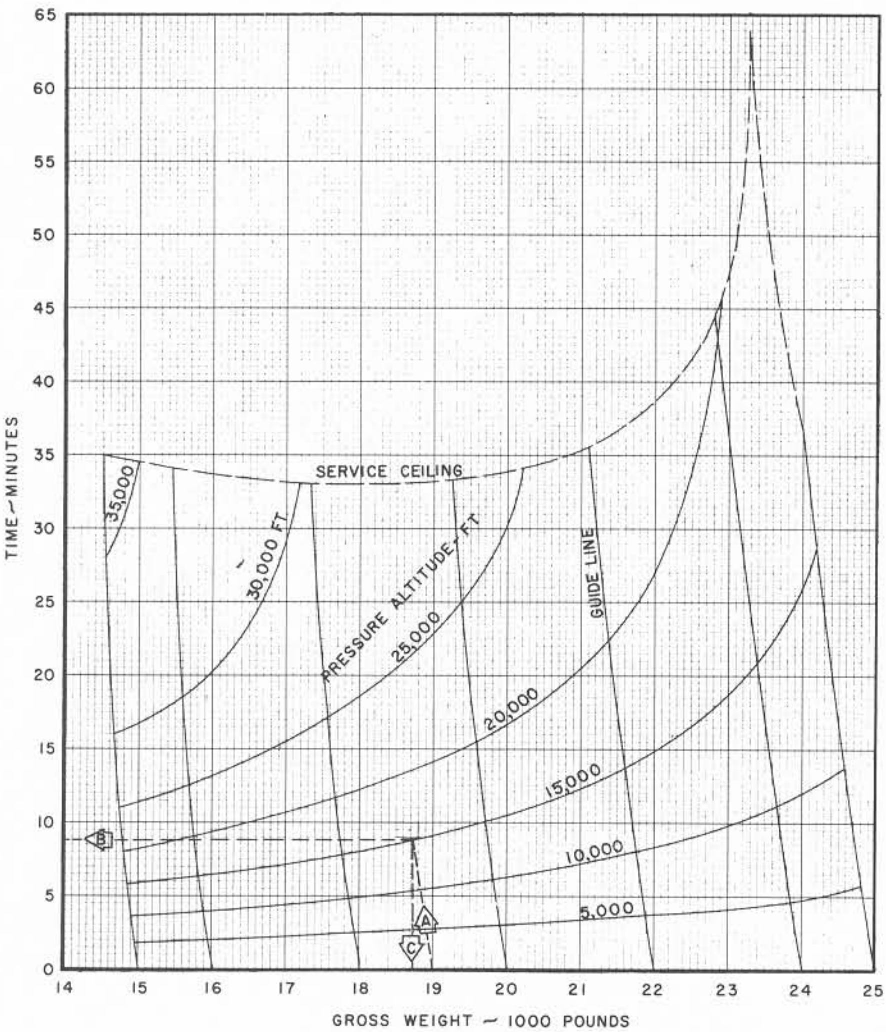
P3830-2B

Figure A-11 (Sheet 2 of 2)

CLIMB TIME VS GROSS WEIGHT

NORMAL POWER STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA

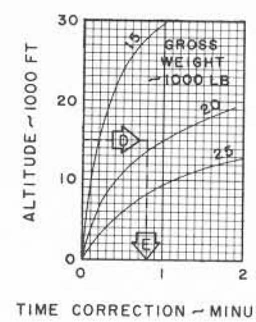


CLIMB AIRSPEED SCHEDULE

CLIMB AT THE FOLLOWING CAS~KNOTS

PRESSURE ALTITUDE	GROSS WEIGHT~POUNDS		
FEET	15,000	20,000	25,000
SL	140	150	145
10,000	135	145	140
20,000	125	140	135
30,000	115	135	130

TIME CORRECTION FOR EACH 10°C CHANGE IN AMBIENT TEMPERATURE



REMARKS:

(1) Data are valid for all external stores configurations (depending on gross weight), cowl and nose flaps full open, oil cooler door faired, normal mixture and no wind.
(2) For each 10° C above standard temperature add applicable time correction to chart values.
(3) If detonation occurs during climb in high blower with normal mixture, change to rich mixture.
(4) Use straight line interpolation between altitude curves.

EXAMPLE:

If the initial climb weight is 19,000 pounds, and the ambient air temperature at sea level is 35° C (20° C above standard), find time to climb to 15,000 feet at normal power.

(1) Enter the chart at 19,000 pounds (A) and follow parallel to guide lines until 15,000 feet altitude line is reached.
(2) Move horizontally to the time scale and read 8.8 minutes (B) as the time to climb to 15,000 feet on a standard day.
(3) Enter time correction curves at 15,000 feet (D) and read time correction = .8 minutes (E).
Time to climb is $8.8 + (\frac{20}{10} \times .8) = 10.4$ minutes.

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of models AD-2, AD-3, AD-4 and AD-4B airplanes

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

P4451-1B

Figure A-12 (Sheet 1 of 2)

CLIMB TIME VS GROSS WEIGHT

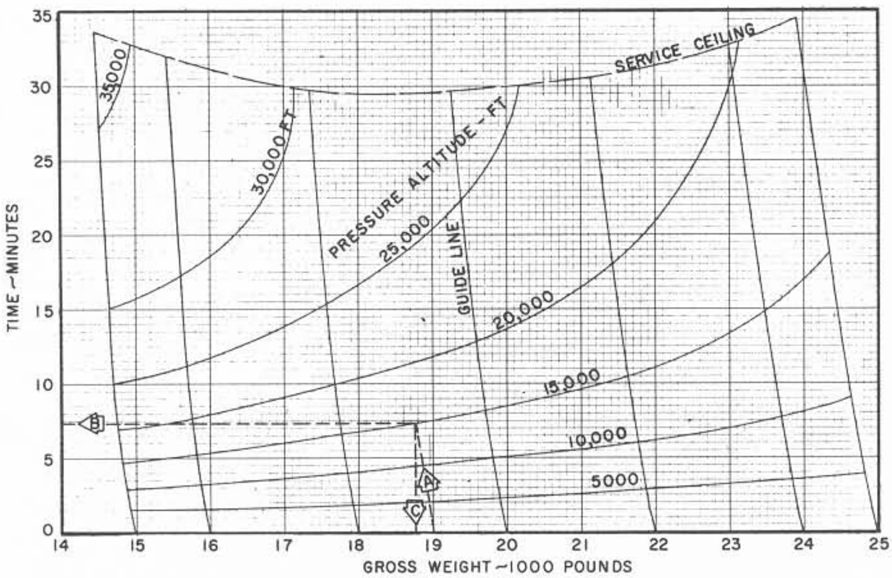
MILITARY POWER STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA

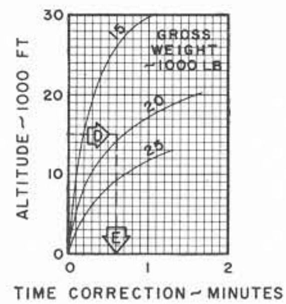
CLIMB AIRSPEED SCHEDULE

CLIMB AT THE FOLLOWING CAS~KNOTS

PRESSURE ALTITUDE	GROSS WEIGHT~POUNDS		
FEET	15,000	20,000	25,000
SL	140	150	145
10,000	135	145	140
20,000	125	140	135
30,000	115	135	130



TIME CORRECTION FOR EACH 10°C CHANGE IN AMBIENT TEMPERATURE



REMARKS:

(1) Data are valid for all external stores configurations (depending on gross weight), cowl and nose flaps full open, oil cooler door faired, normal mixture and no wind.
(2) For each 10° C above standard temperature add applicable time correction to chart values.
(3) If detonation occurs during climb in high blower with normal mixture, change to rich mixture.
(4) Use straight line interpolation between altitude curves.

EXAMPLE:

If the initial climb weight is 19,000 pounds, and the ambient air temperature at sea level is 5° C (10° C below standard), find time to climb to 15,000 feet at military power.

(1) Enter the chart at 19,000 pounds (A) and follow parallel to guide lines until 15,000 feet altitude line is reached.
(2) Move horizontally to the time scale and read 7.4 minutes (B) as the time to climb to 15,000 feet on a standard day.
(3) Enter time correction curves at 15,000 feet (D) and read time correction = .6 minutes (E).
Time to climb is 7.4 — ($\frac{10}{10}$ × .6) = 6.8 minutes.

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of models AD-2, AD-3, AD-4 and AD-4B airplanes

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

P4451-2B

Figure A-12 (Sheet 2 of 2)

CRUISE PERFORMANCE

Cruise performance is presented in figures A-13 through A-27 for various loading conditions, gross weights and altitudes. These data are presented as: (a) specific range vs calibrated airspeed and gross weight for a given altitude and airplane configuration; (b) maximum range power conditions vs gross weight and altitude for a given airplane configuration; and (c) maximum endurance power conditions vs gross weight and altitude for a given airplane configuration.

SPECIFIC RANGE DATA. Specific range data are presented as nautical miles per pound of fuel vs calibrated airspeed at several gross weights for each 5000 feet of altitude. These data are presented for the following airplane configurations in the particular figures noted below:

Clean Configuration	A-13
Light Attack Configuration	A-16
Medium Attack Configuration	A-19
Long Range Attack Configuration	A-22
Heavy Attack Configuration	A-25

It should be noted that these configurations have been so designated only to make it possible to segregate the various charts. A particular alternate loading of the airplane as listed on the chart may not appear to comprise the configuration noted in the title block; however, these alternate loadings all have configurations equivalent to the loading on which the chart data are based.

In order to use the charts it is necessary to select the proper figure depending upon the airplane configuration and the desired cruise altitude. Enter the chart with the average cruise weight at the desired cruising speed (maximum range or maximum endurance) or the average cruise weight and desired power plant setting (RPM and MAP), and read the specific range in nautical miles per pound of fuel.

When flying in a wind, the maximum range true airspeed should be adjusted by adding to or subtracting from the no-wind true airspeed 1/4 of the head wind or tail wind component, respectively. The effect of wind and ground speed on the nautical miles per pound of fuel may be determined directly from the nautical miles per pound curves by the following method:

a. Determine the no-wind engine settings as described above for the particular configuration, cruise altitude and average cruise weight at the recommended CAS for maximum range.

b. Apply the "rule of thumb" described above to determine the true airspeed for flight in the head wind or tail wind.

c. Determine the actual ground speed. Move along the engine setting line (or parallel to an adjacent engine setting line if necessary) to the ground speed figure and then read opposite on the vertical axis the actual ground miles per pound of fuel.

EXAMPLE. Assuming an average gross weight of 18,000 pounds, various uses of the charts are described as follows (see figure A-13, sheet 1):

a. If an airspeed of 200 knots is desired, determine the nautical miles per pound of fuel. Draw line A to intersect the 18,000 pound curve at point B. Draw line C and read .38 nautical miles/lb fuel. This figure, when multiplied by the available cruise fuel in pounds will yield the air range in nautical miles (nautical miles/lb of fuel $\times$ pounds of fuel available = range).

b. If an engine power setting of 2100 rpm and 32.5 inches MAP is desired, find the corresponding airspeed and the nautical miles/lb fuel. Follow the 18,000 pound average gross weight line to point D at the intersection with the line corresponding to the desired power setting. Read on the horizontal axis the airspeed (187 knots), and on the vertical axis read the nautical miles/lb fuel (.355).

c. The chart contains two dashed lines labeled RECOMMENDED AIRSPEED FOR MAXIMUM RANGE and RECOMMENDED AIRSPEED FOR MAXIMUM ENDURANCE. To find recommended airspeed and corresponding nautical miles/lb fuel, follow the 18,000 pound average gross weight line to the intersection with the "maximum range" or the "maximum endurance" line, whichever is desired. Again, the corresponding airspeed can be read from the horizontal axis and the nautical miles/lb of fuel from the vertical axis.

Note that for each engine setting (RPM and MAP), the fuel consumption is given in pounds per hour. If maximum flight time is desired (as in the case of endurance), therefore, the fuel available for the particular operation need only be divided by the fuel consumption in pounds per hour to determine the endurance.

MAXIMUM RANGE POWER CONDITIONS. The following charts present the maximum range power condition vs gross weight:

Clean Configuration	A-14
Light Attack Configuration	A-17
Medium Attack Configuration	A-20
Long Range Attack Configuration	A-23
Heavy Attack Configuration	A-26

From these charts can be obtained figures on nautical miles per pound of fuel, fuel flow, MAP, RPM, and calibrated airspeed vs gross weight for various altitudes, which correspond to the recommended airspeed for maximum range. If it is desirable, therefore, to cruise at maximum range speeds, it is more convenient to use these charts than the specific range data charts (Nautical Miles per Pound of Fuel), since presented here in summary form are all the data needed for maximum range flight. It is only necessary to enter the chart with the average cruise weight and altitude for the particular configuration and read off the engine setting, fuel consumption figures, and the calibrated airspeed. It might be noted in this case that the airspeed and engine setting do not exactly correspond at all times. In this event, experience has shown that the airspeed should be maintained and the manifold pressure adjusted accordingly.

EXAMPLE (see figure A-14, sheet 1). Assuming an average cruise weight of 16,000 pounds and an altitude of 15,000 feet, find engine settings for maximum range power conditions. Draw line A to intersection B. Draw line C to left and read 22.4 inches Hg on the MANIFOLD PRESSURE chart (similarly, read 1800 rpm on the RPM chart and 151 knots on the AIRSPEED chart). Engine settings, fuel consumption and airspeed figures are determined by the same method on related charts in the various weight configurations.

MAXIMUM ENDURANCE POWER CONDITIONS. The following charts present the maximum endurance power conditions vs gross weight:

Clean Configuration	A-15
Light Attack Configuration	A-18
Medium Attack Configuration	A-21
Long Range Attack Configuration	A-24
Heavy Attack Configuration	A-27

These charts give the fuel flow, MAP, RPM, and calibrated airspeed figures which correspond to the recommended airspeed for maximum endurance flight. Again, if it is desirable to fly at maximum endurance, these charts are more convenient to use than the specific range data charts since contained here is a summary of all the data necessary for flight with minimum fuel consumption. Data may be readily obtained by entering the chart with the average cruise weight and altitude for the proper configuration.

It is recommended that the calibrated airspeeds shown be flown using the designated RPM and adjusting the MAP to maintain the given airspeed.

EXAMPLE (see figure A-15, sheet 1). Assuming an average cruise weight of 16,000 pounds and an altitude of 10,000 feet, find engine settings for maximum endurance power conditions. Draw line A to intersection B. Draw line C to left and read 23 inches Hg on the MANIFOLD PRESSURE chart (similarly, read 1400 rpm on the RPM chart). Engine settings, fuel flow, and calibrated airspeed figures are determined by the same method on related charts in the various weight configurations.

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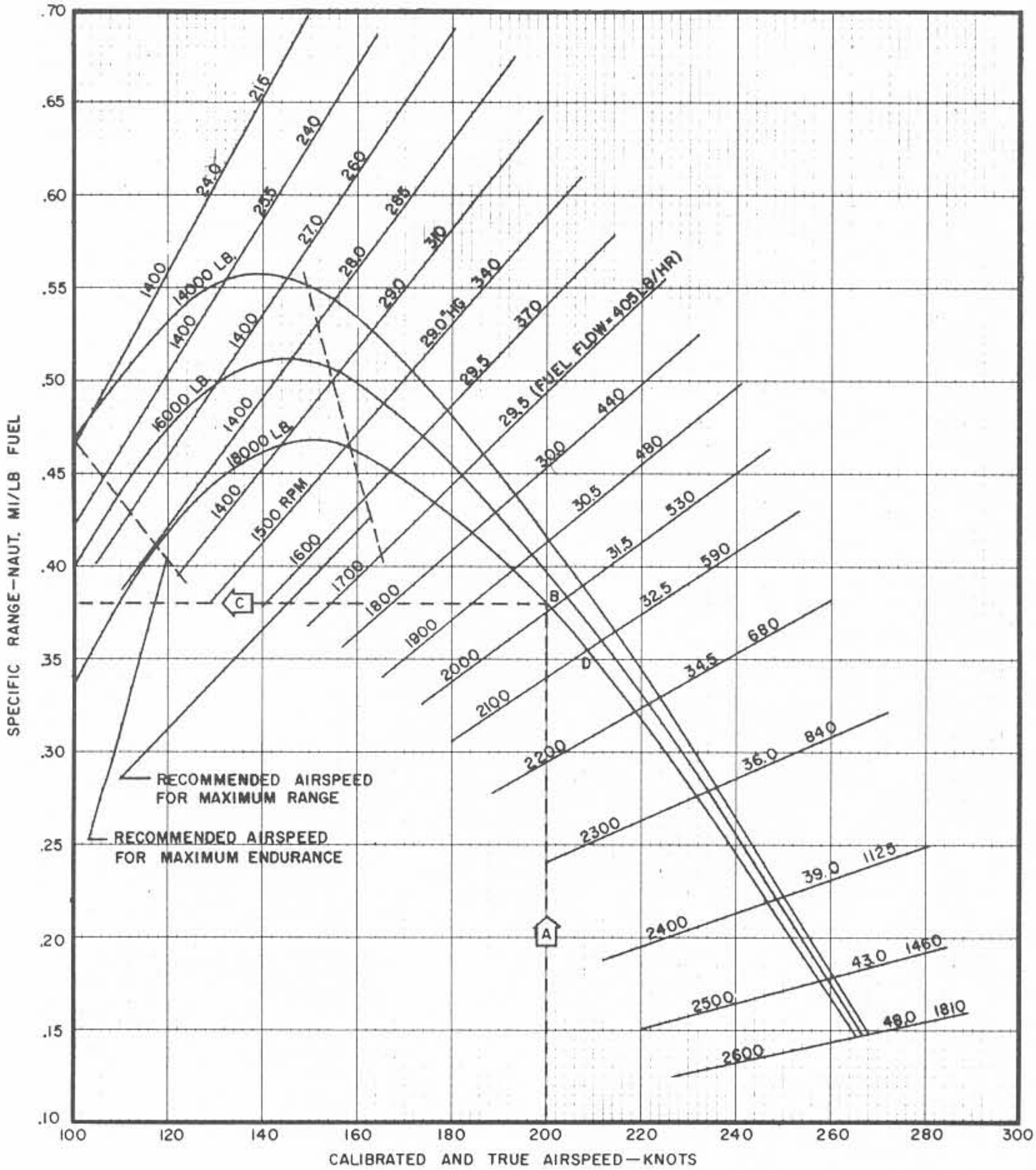
NAUTICAL MILES PER POUND OF FUEL

CLEAN CONFIGURATION SEA LEVEL STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes fuselage centerline rack and all wing racks.

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's Flight Test of Models AD-2, AD-3, AD-4

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

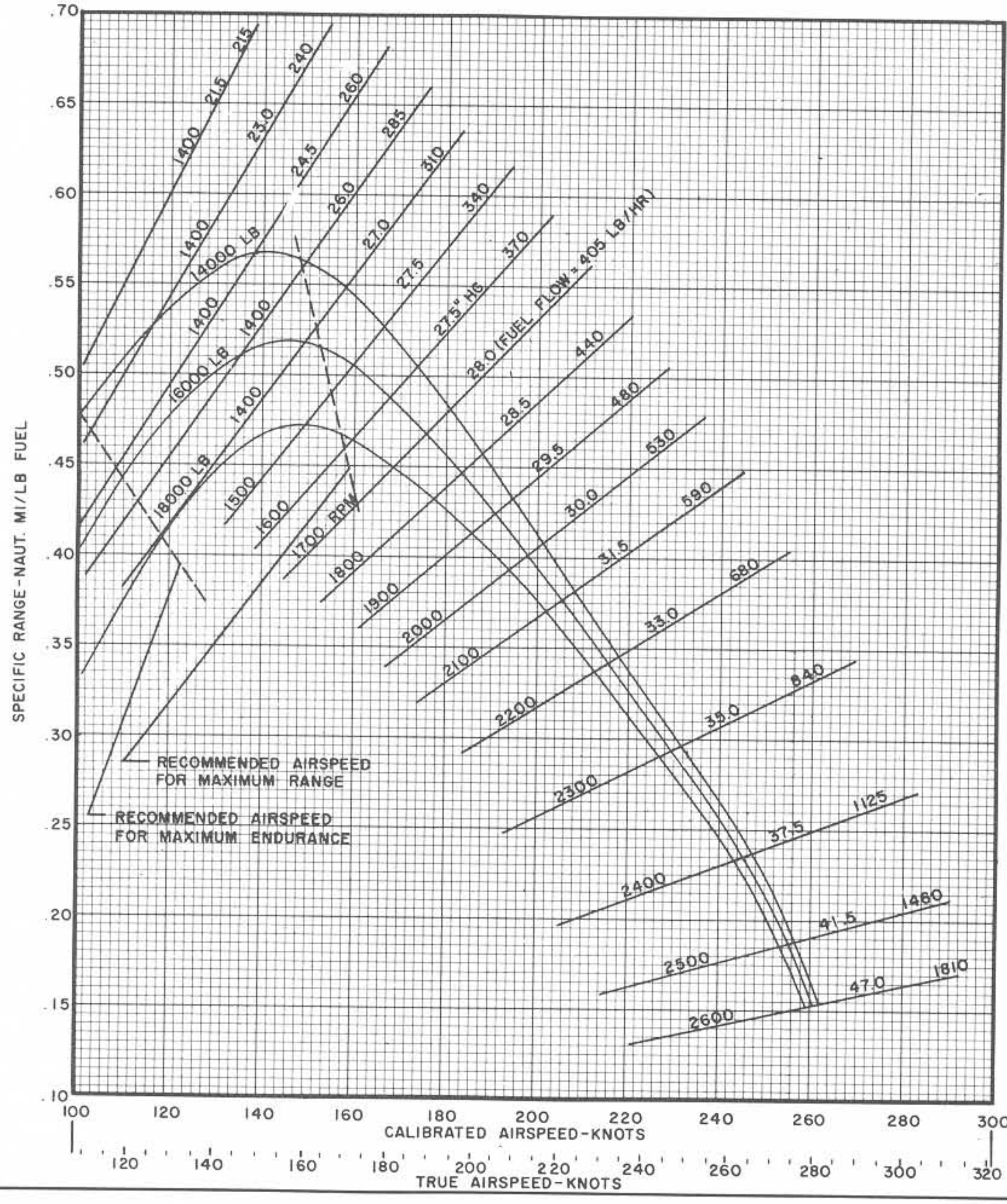
P3837-1B

Figure A-13 (Sheet 1 of 6)

NAUTICAL MILES PER POUND OF FUEL

CLEAN CONFIGURATION ALTITUDE 5,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes fuselage centerline rack and all wing racks.

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's Flight Test of Models AD-2, AD-3, AD-4

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

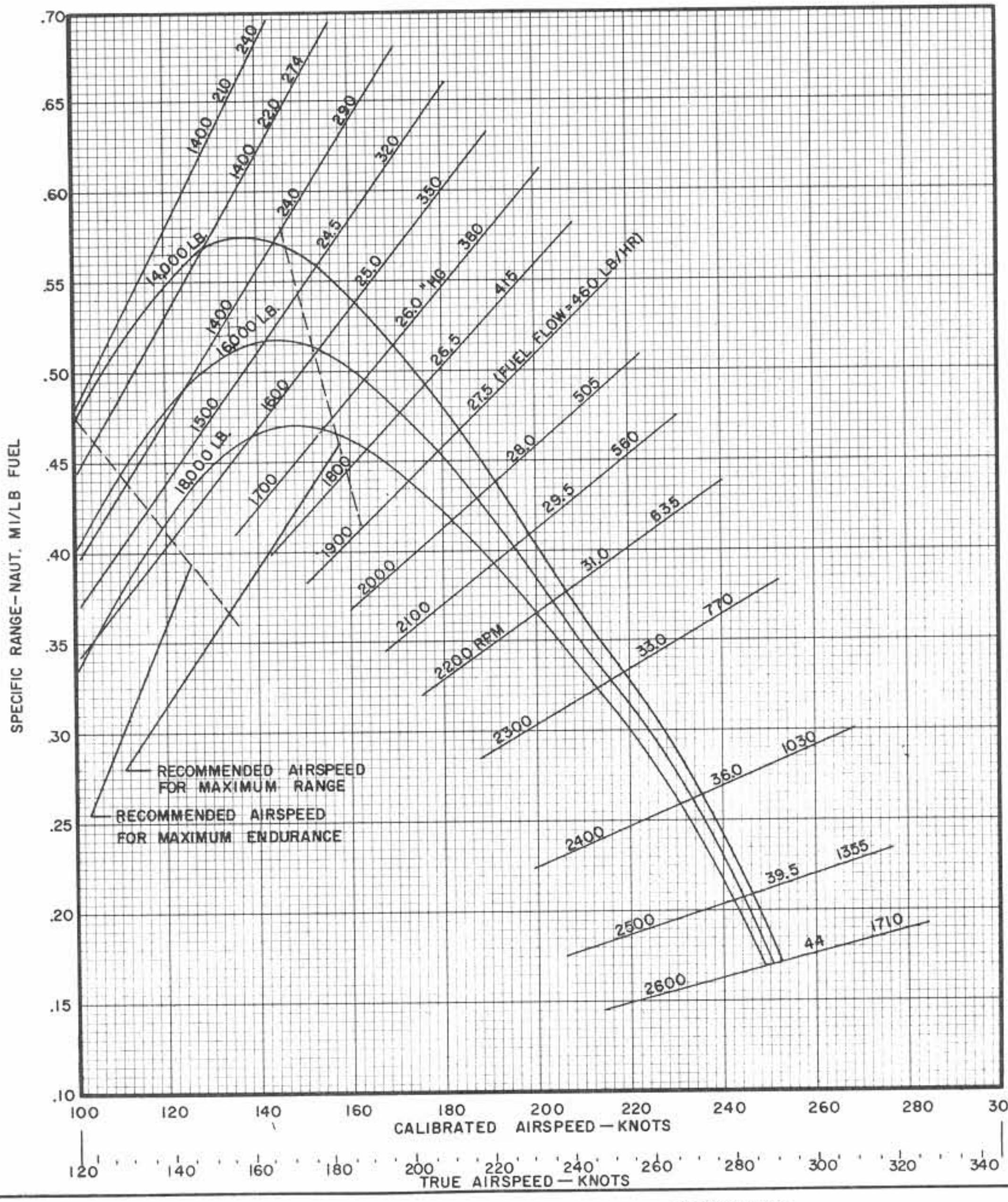
FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal
P3837-2A

Figure A-13 (Sheet 2 of 6)

NAUTICAL MILES PER POUND OF FUEL

CLEAN CONFIGURATION ALTITUDE 10,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes fuselage centerline rack and all wing racks.

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's Flight Test of Models AD-2, AD-3, AD-4

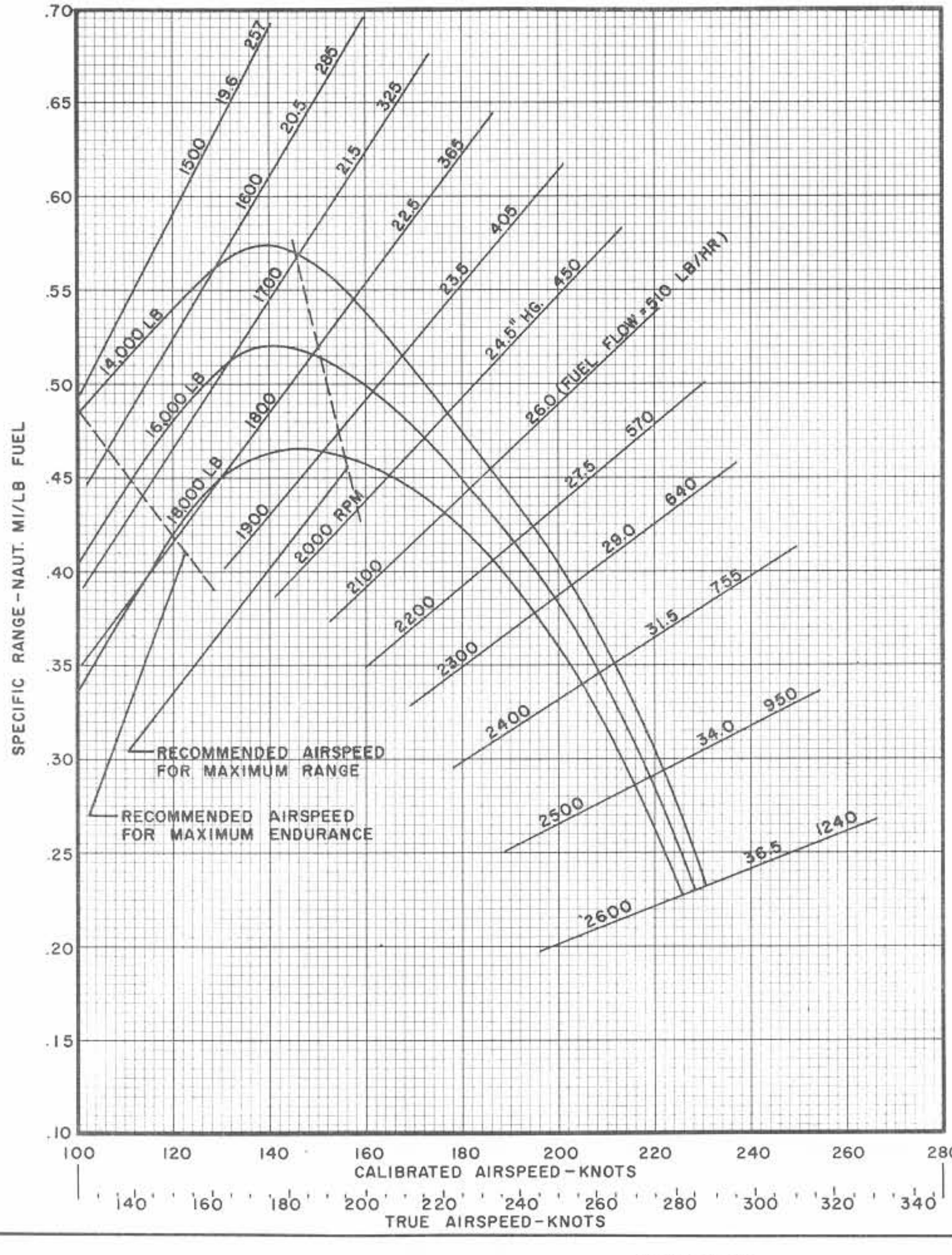
FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal
P 3837-3

Figure A-13 (Sheet 3 of 6)

NAUTICAL MILES PER POUND OF FUEL

CLEAN CONFIGURATION | ALTITUDE 15,000 FT | STANDARD DAY

MODEL: AD-6 | PROPELLER: A642-G 804/M20A2-162-0 | ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes fuselage centerline rack and all wing racks.

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's Flight Test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

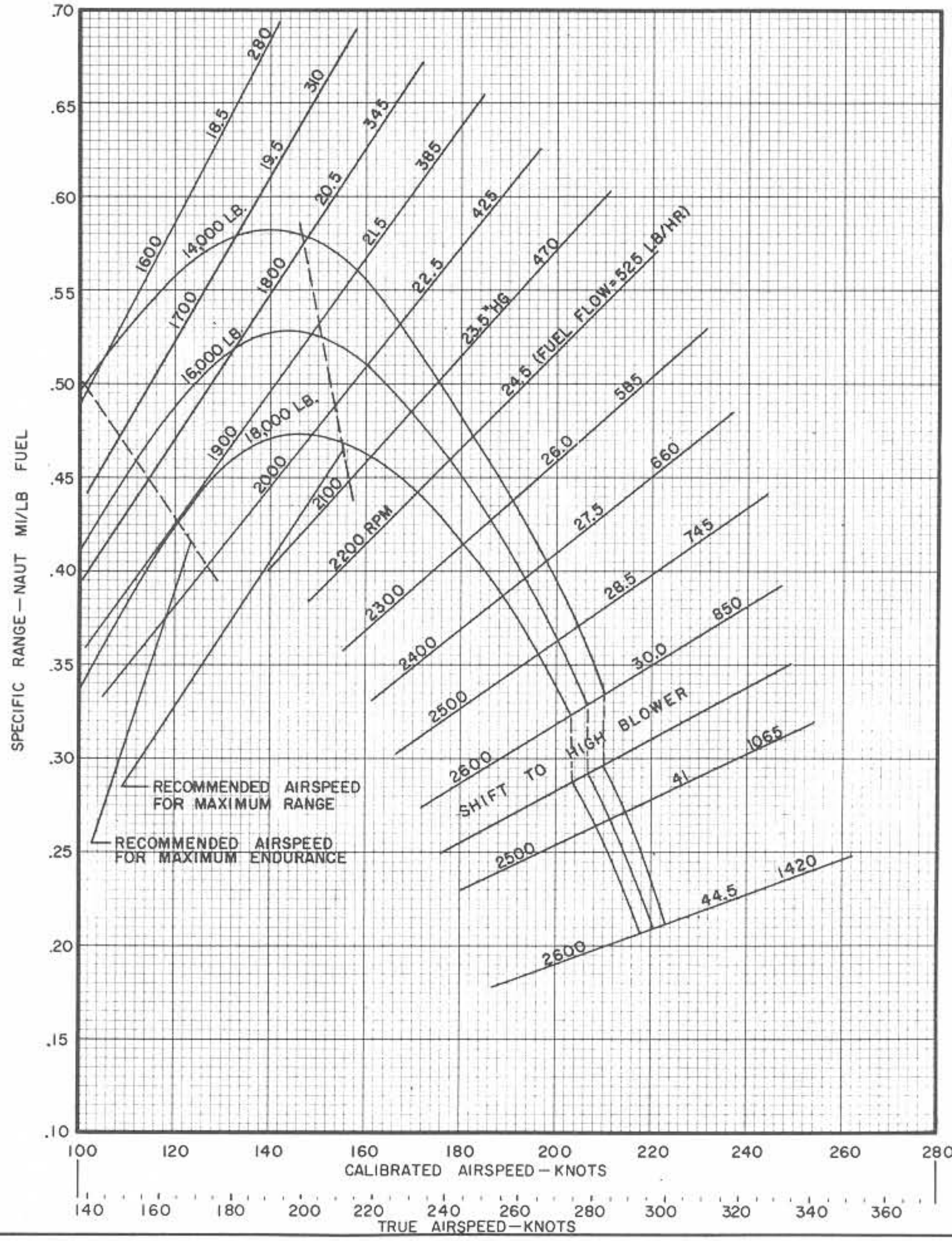
P3837-4

Figure A-13 (Sheet 4 of 6)

NAUTICAL MILES PER POUND OF FUEL

CLEAN CONFIGURATION ALTITUDE 20,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes fuselage centerline rack and all wing racks.

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's Flight Test of Models AD-2, AD-3, AD-4

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

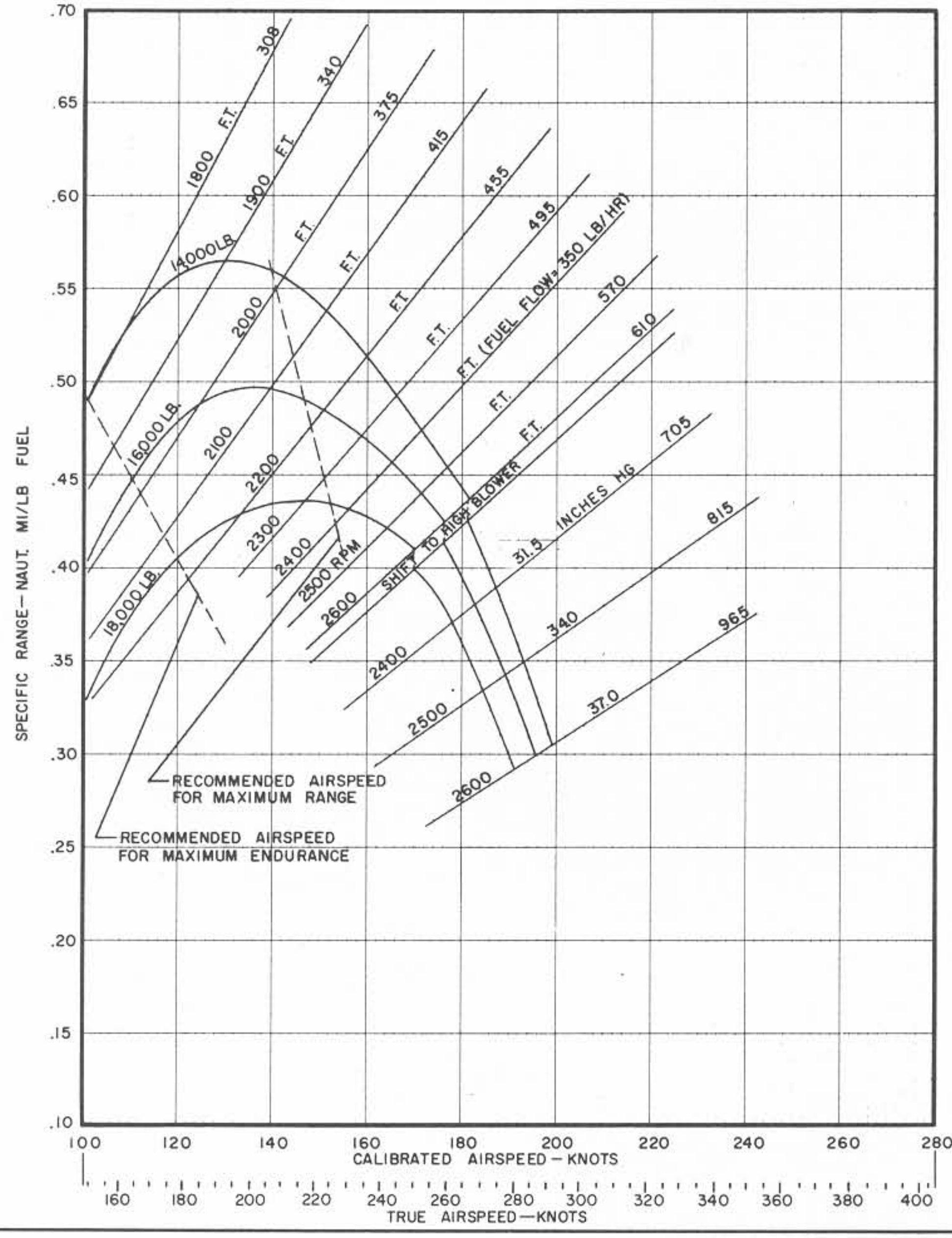
FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal
P3837-5

Figure A-13 (Sheet 5 of 6)

NAUTICAL MILES PER POUND OF FUEL

CLEAN CONFIGURATION ALTITUDE 25,000 FT. STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes fuselage centerline rack and all wing racks.
(2) F.T. denotes Full Throttle

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's Flight Test of Models AD-2, AD-3, AD-4

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower unless otherwise noted

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

P3837-6

Figure A-13 (Sheet 6 of 6)

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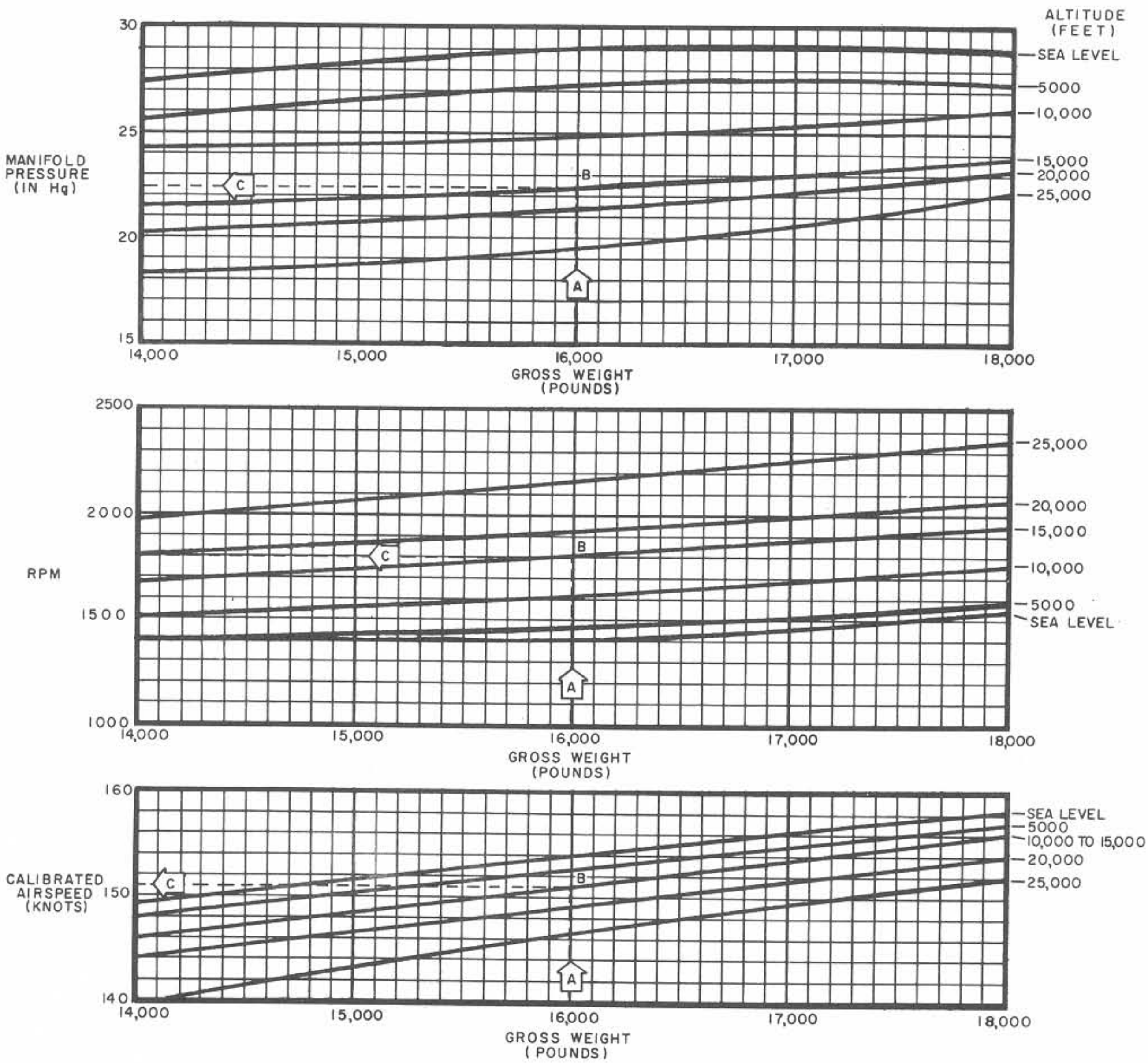
MAXIMUM RANGE POWER CONDITIONS VS GROSS WEIGHT

CLEAN CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes fuselage centerline rack and all wing racks.

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's Flight Test of Models AD-2, AD-3, AD-4

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

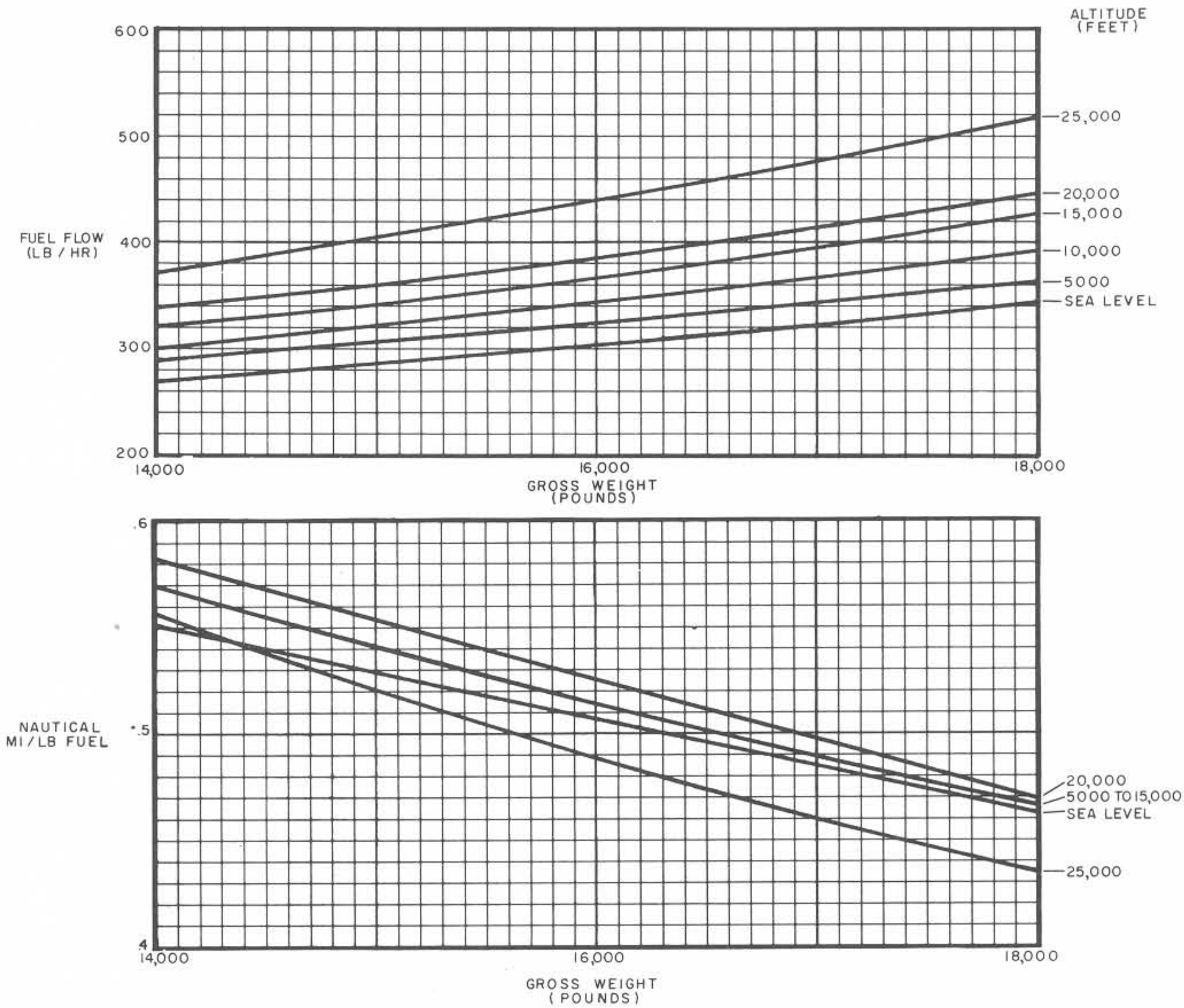
FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal
P4151-1B

Figure A-14 (Sheet 1 of 2)

MAXIMUM RANGE POWER CONDITIONS VS GROSS WEIGHT

CLEAN CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes fuselage centerline rack and all wing racks.

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's Flight Test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

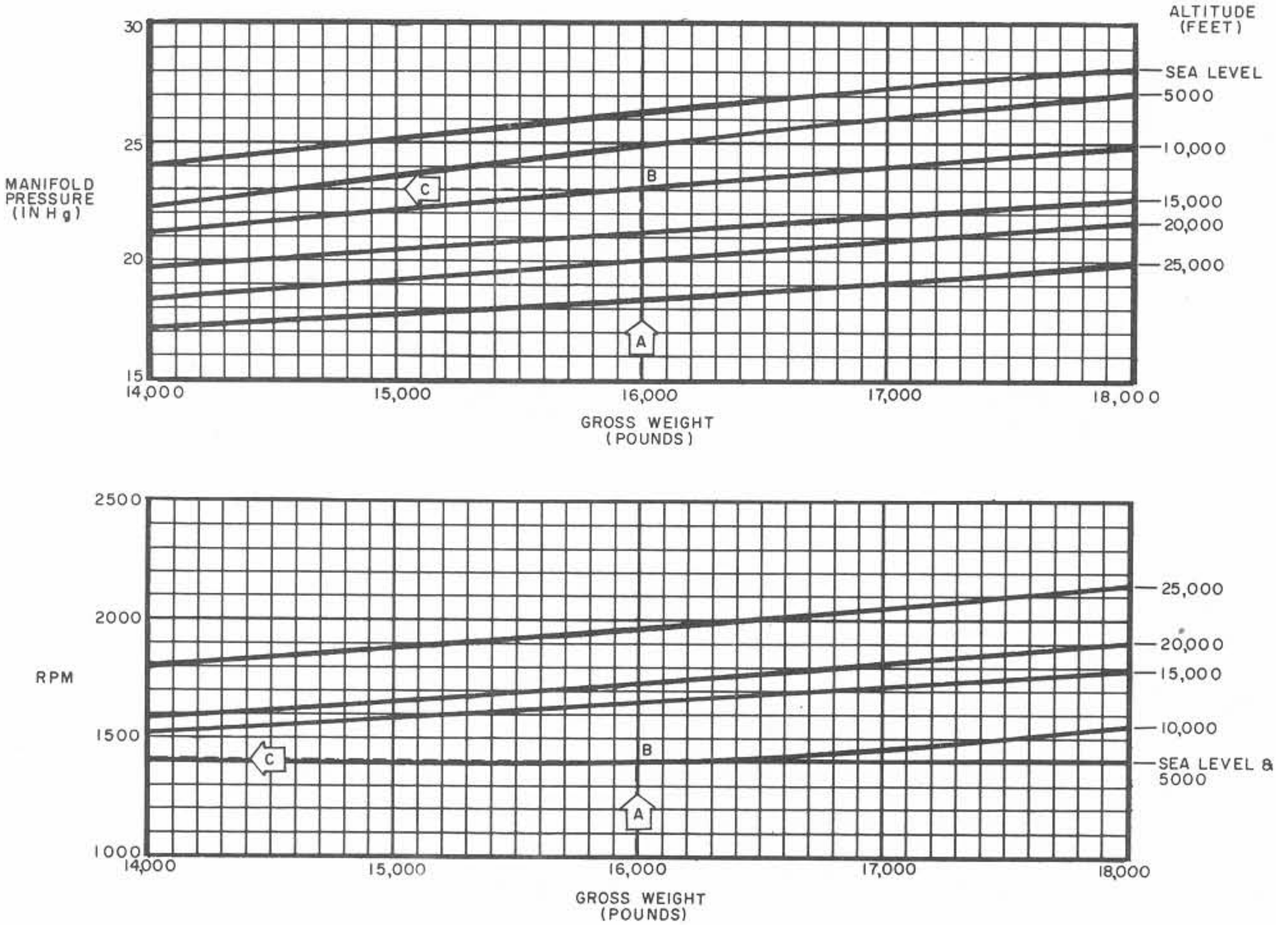
P4151 2

Figure A-14 (Sheet 2 of 2)

MAXIMUM ENDURANCE POWER CONDITIONS VS GROSS WEIGHT

CLEAN, CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes fuselage centerline rack and all wing racks.

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's Flight Test of Models AD-2, AD-3, AD-4

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) Mixture: Normal
(5) Low blower

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

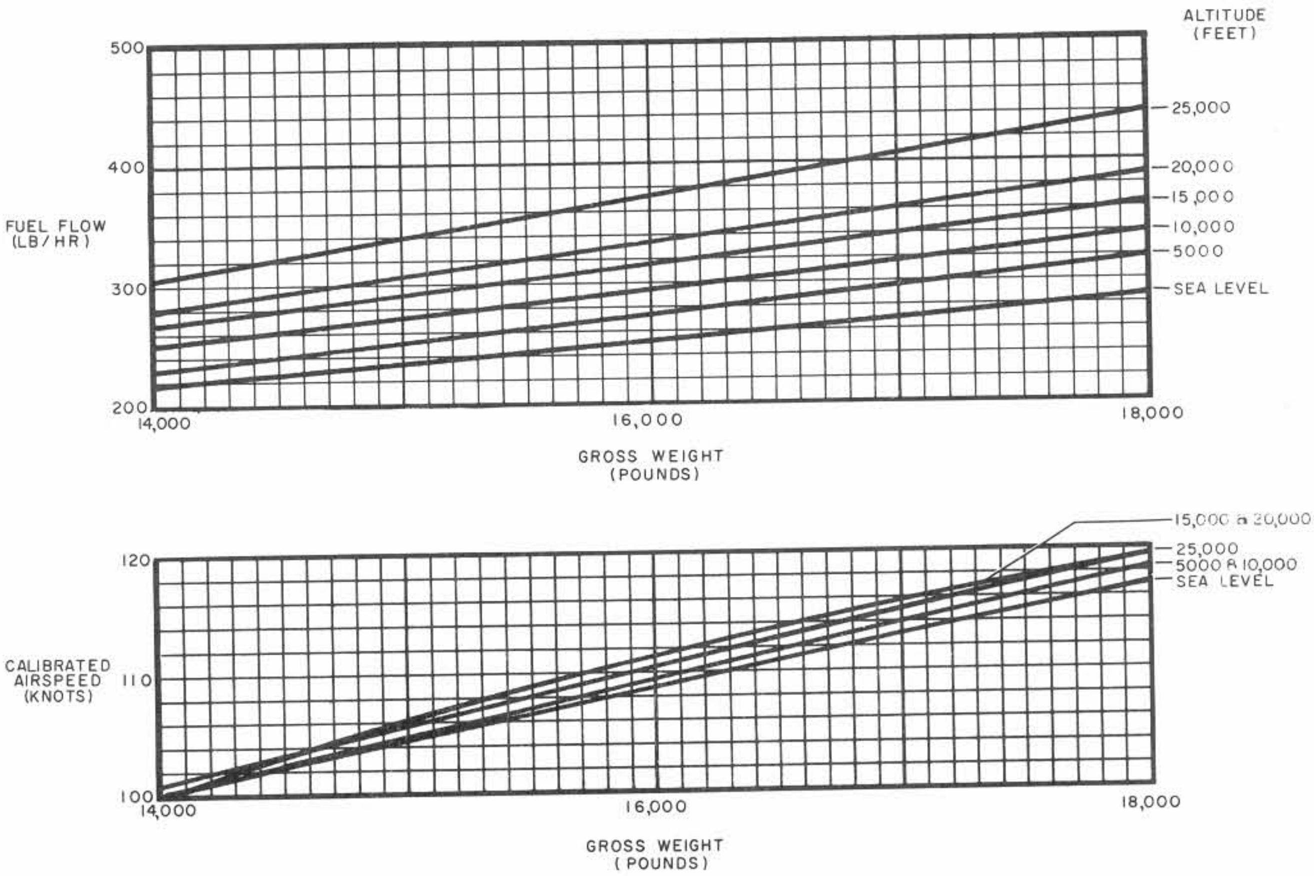
P3833-1B

Figure A-15 (Sheet 1 of 2)

MAXIMUM ENDURANCE POWER CONDITIONS VS GROSS WEIGHT

CLEAN CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes fuselage centerline rack and all wing racks.

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) Mixture: Normal
(5) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's Flight Test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

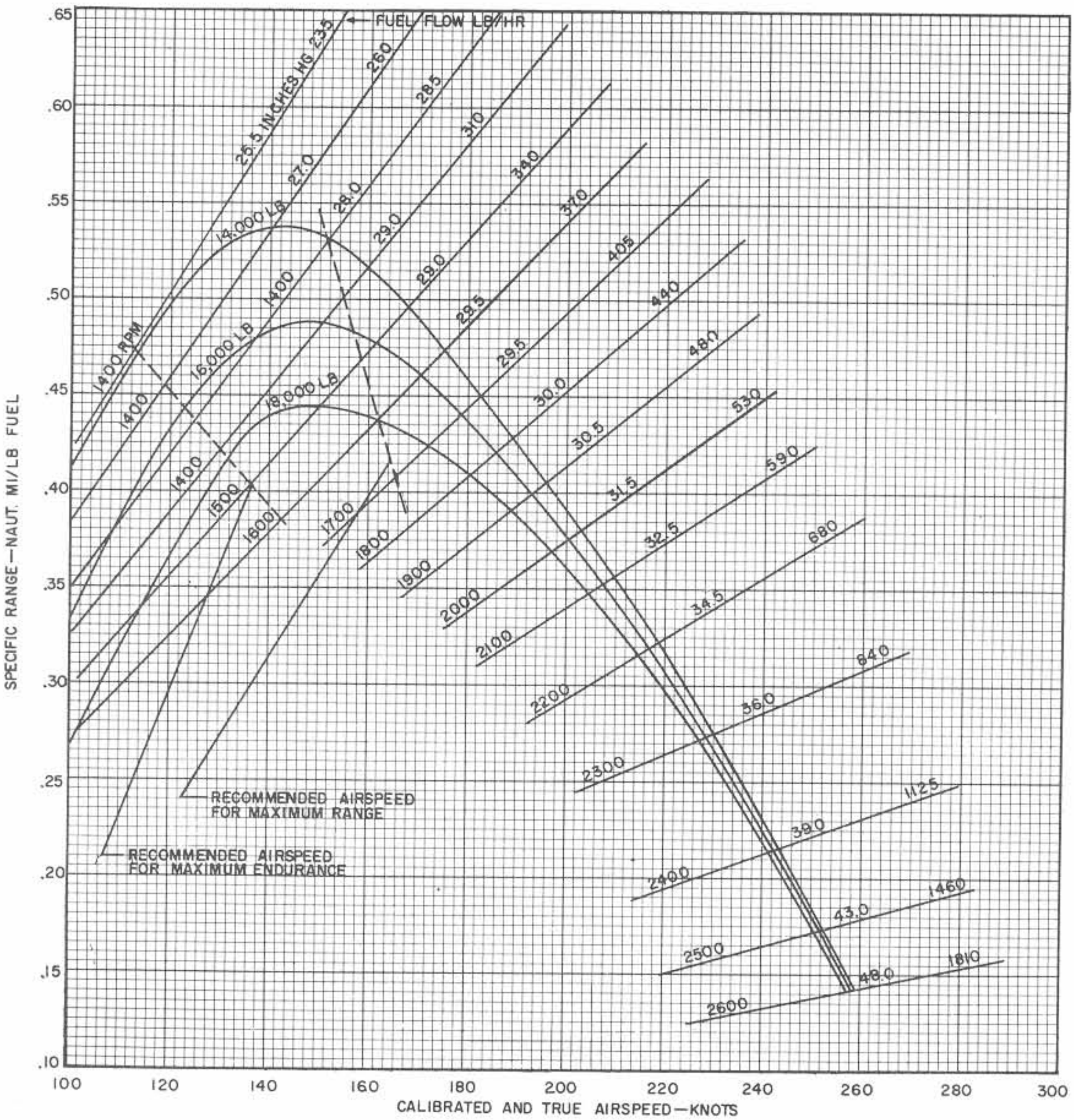
P3833-2

Figure A-15 (Sheet 2 of 2)

NAUTICAL MILES PER POUND OF FUEL

LIGHT ATTACK CONFIGURATION SEA LEVEL STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 Lb. bomb or one torpedo.
(b) One external fuel tank
(c) 8-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

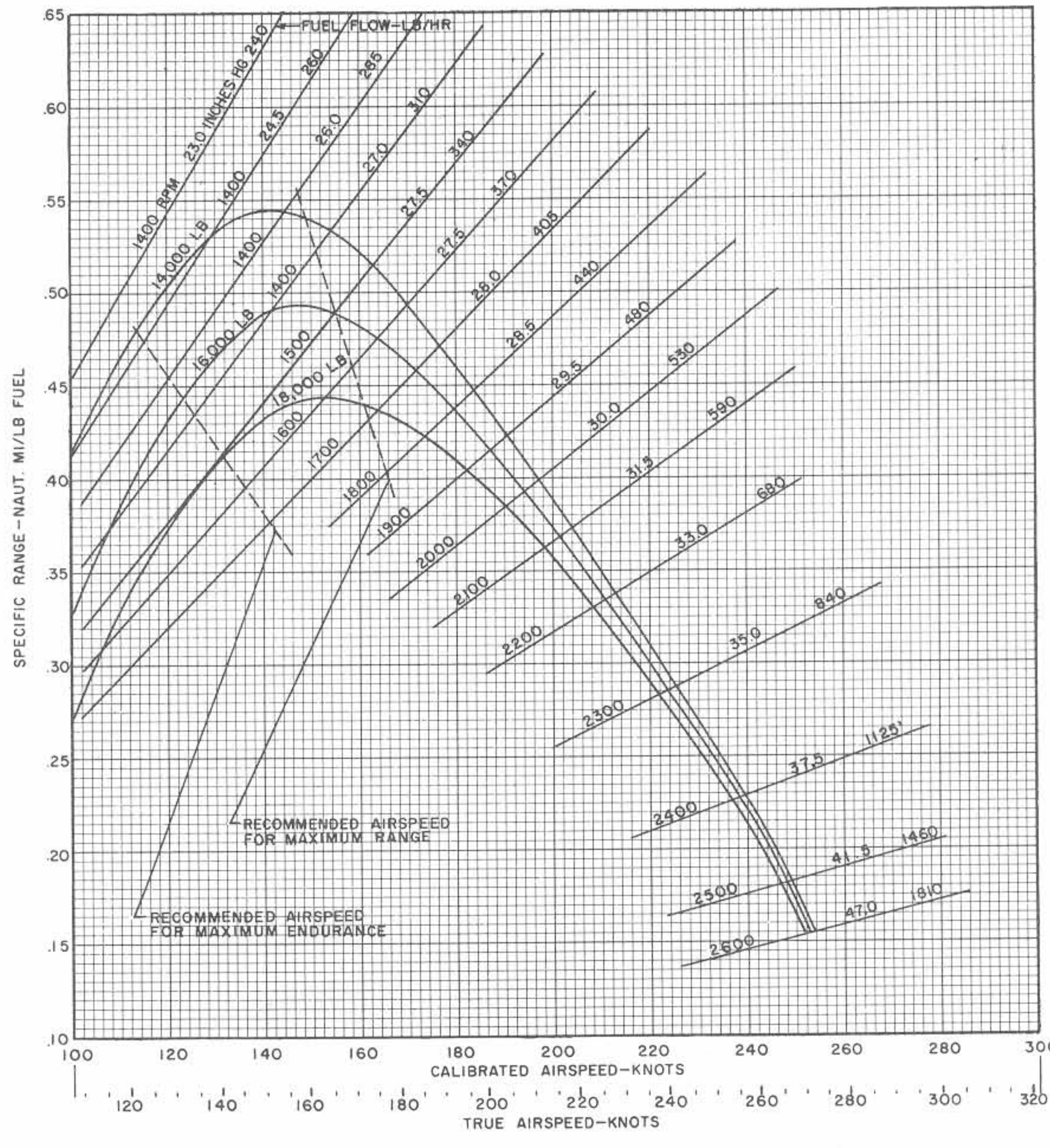
FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal
P3836-1A

Figure A-16 (Sheet 1 of 6)

NAUTICAL MILES PER POUND OF FUEL

LIGHT ATTACK CONFIGURATION ALTITUDE 5,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 Lb. bomb or one torpedo.
(b) One external fuel tank
(c) 8-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower unless noted otherwise

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

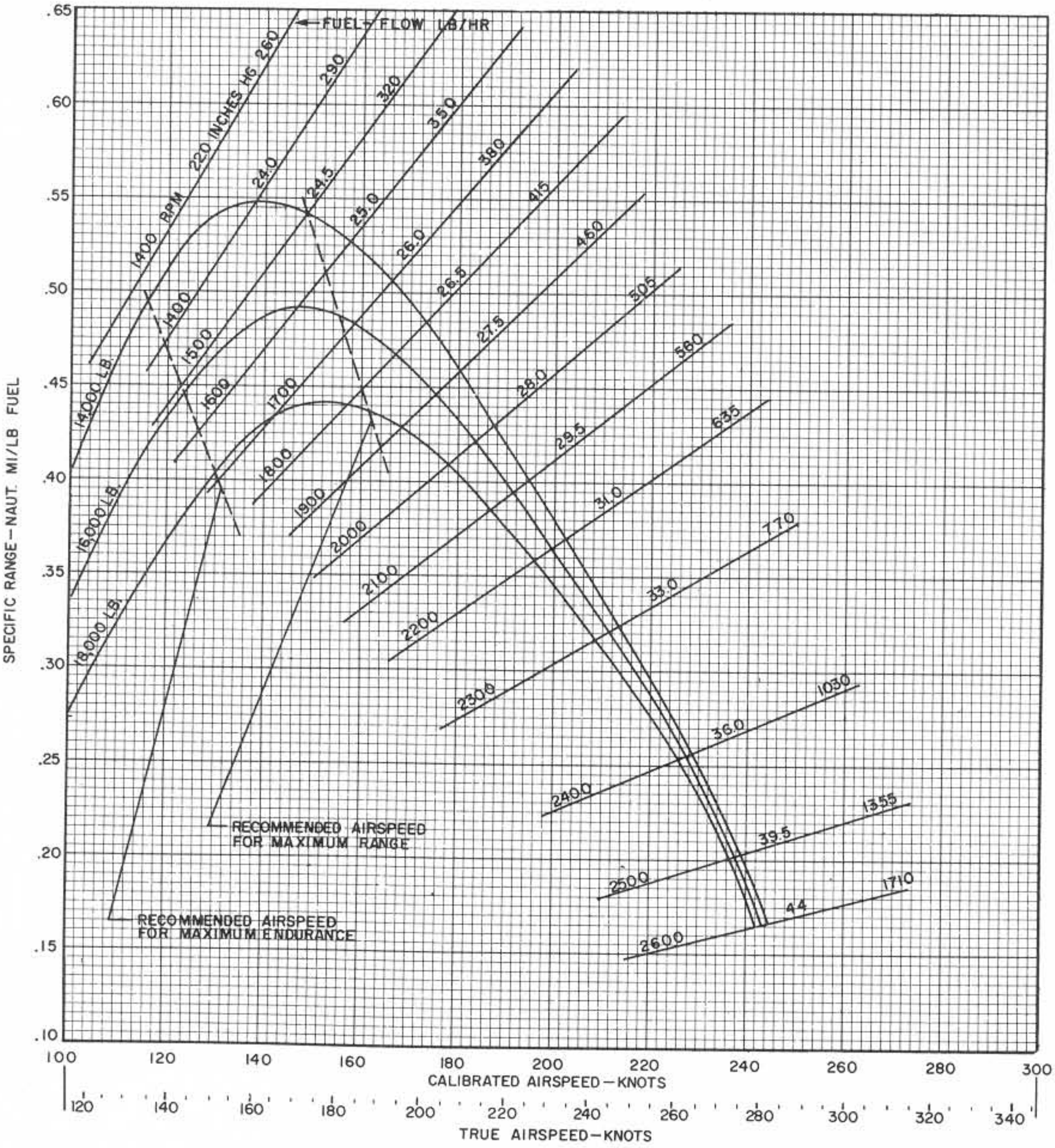
FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal
P3836-2A

Figure A-16 (Sheet 2 of 6)

NAUTICAL MILES PER POUND OF FUEL

LIGHT ATTACK CONFIGURATION ALTITUDE 10,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 Lb. bomb or one torpedo.
(b) One external fuel tank
(c) 8–5″ HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler doors faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

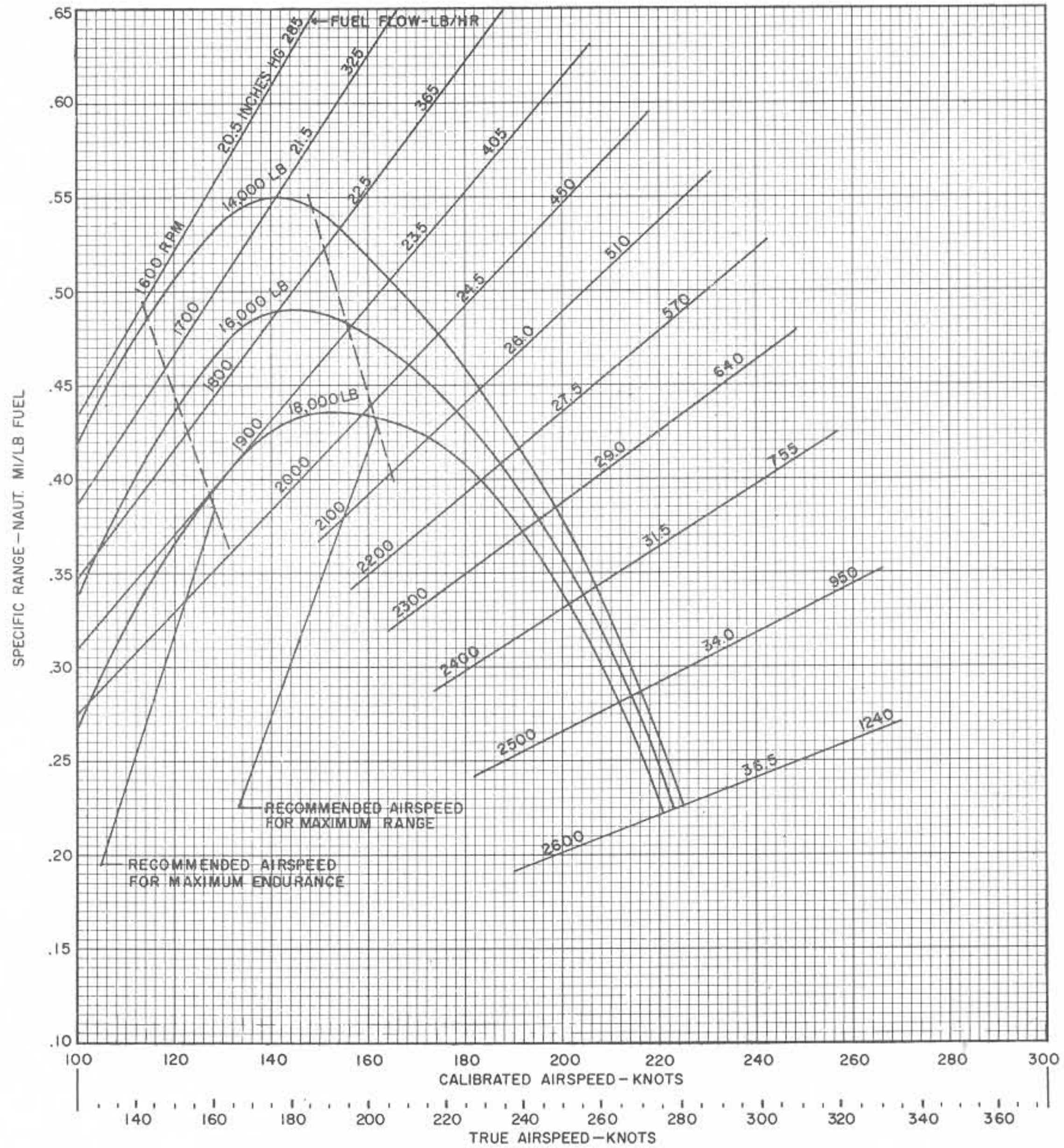
P3836-3

Figure A-16 (Sheet 3 of 6)

NAUTICAL MILES PER POUND OF FUEL

LIGHT ATTACK CONFIGURATION   ALTITUDE 15,000 FT   STANDARD DAY

MODEL: AD-6   PROPELLER: A642-G 804/M20A2-162-0   ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 Lb. bomb or one torpedo.
(b) One external fuel tank
(c) 8-5″ HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

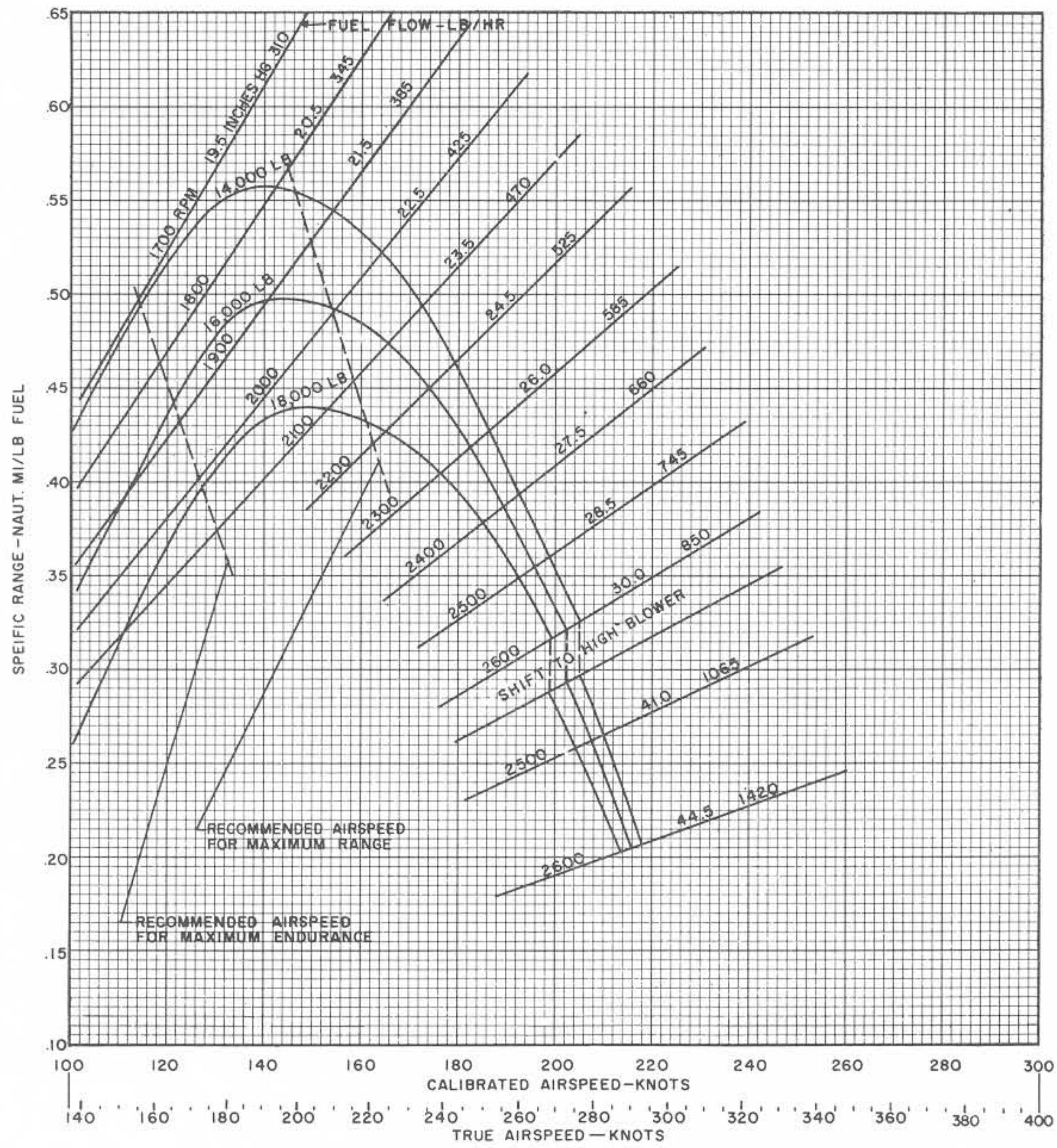
P3836-4

Figure A-16 (Sheet 4 of 6)

NAUTICAL MILES PER POUND OF FUEL

LIGHT ATTACK CONFIGURATION ALTITUDE 20,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 Lb. bomb or one torpedo.
(b) One external fuel tank
(c) 8–5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower unless noted otherwise

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

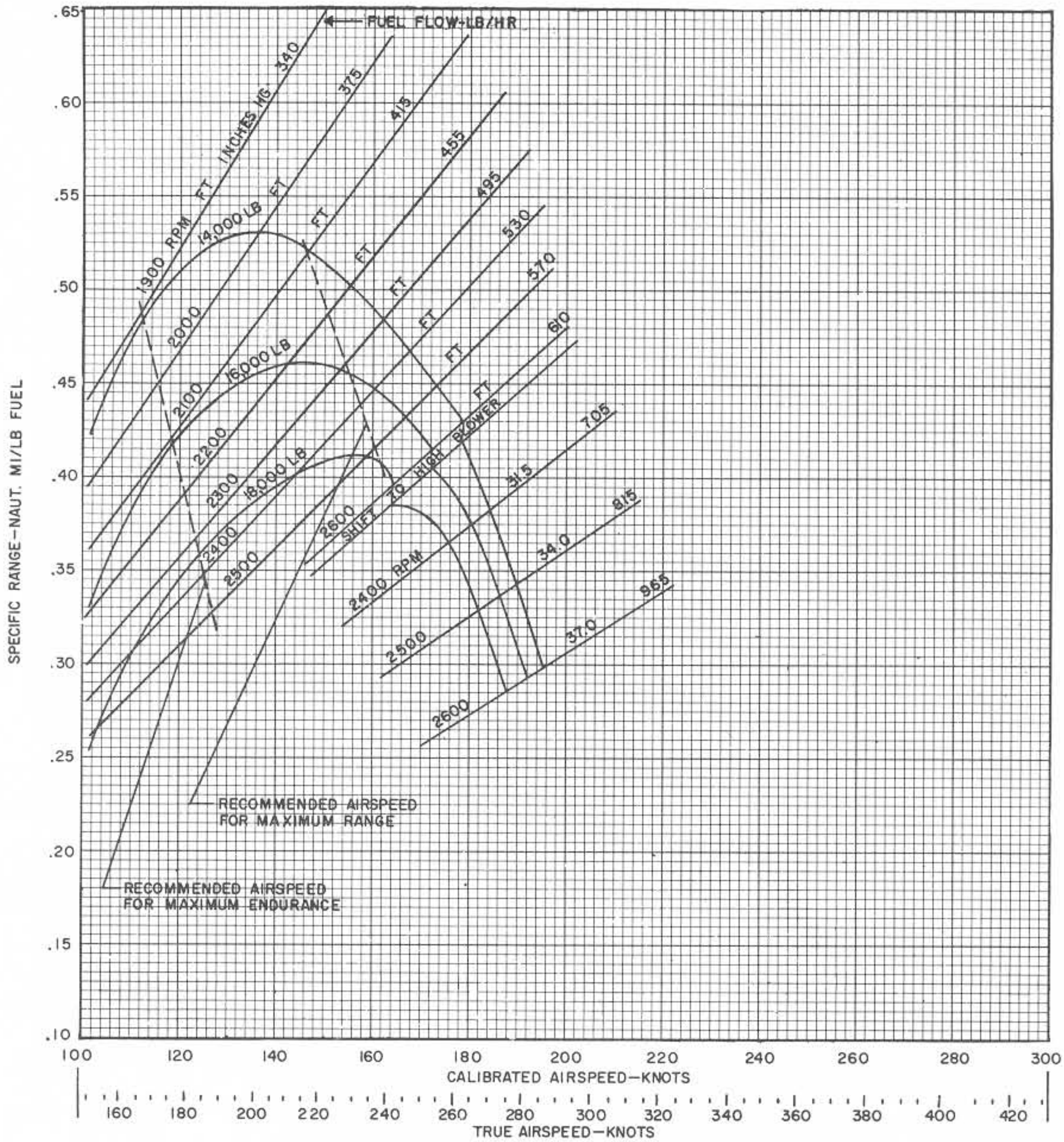
P 3836-5

Figure A-16 (Sheet 5 of 6)

NAUTICAL MILES PER POUND OF FUEL

LIGHT ATTACK CONFIGURATION ALTITUDE 25,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 lb bomb or one torpedo.
(b) One external fuel tank
(c) 8-5″ HVAR

(2) FT denotes full throttle

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower unless noted otherwise

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

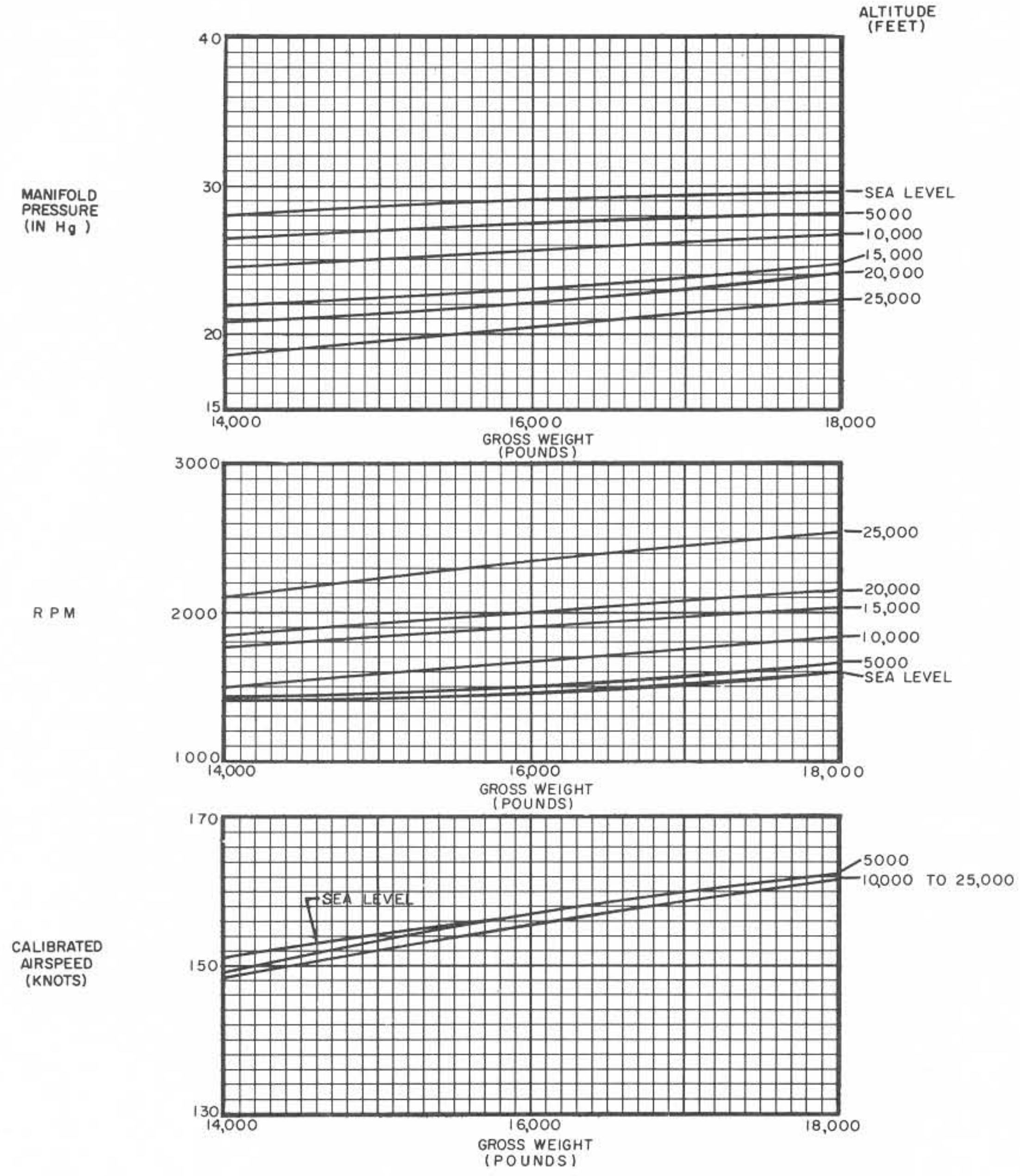
P3836-6

Figure A-16 (Sheet 6 of 6)

MAXIMUM RANGE POWER CONDITIONS VS GROSS WEIGHT

LIGHT ATTACK CONFIGURATION   STANDARD DAY

MODEL: AD-6   PROPELLER: A642-G 804/M20A2-162-0   ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 Lb bomb or one torpedo
(b) One External Fuel Tank
(c) 8–5″ HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

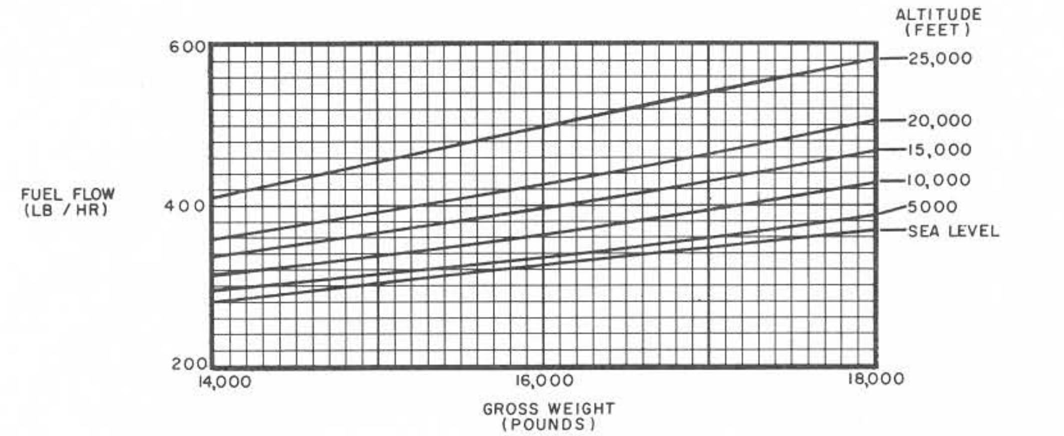
P4152-1A

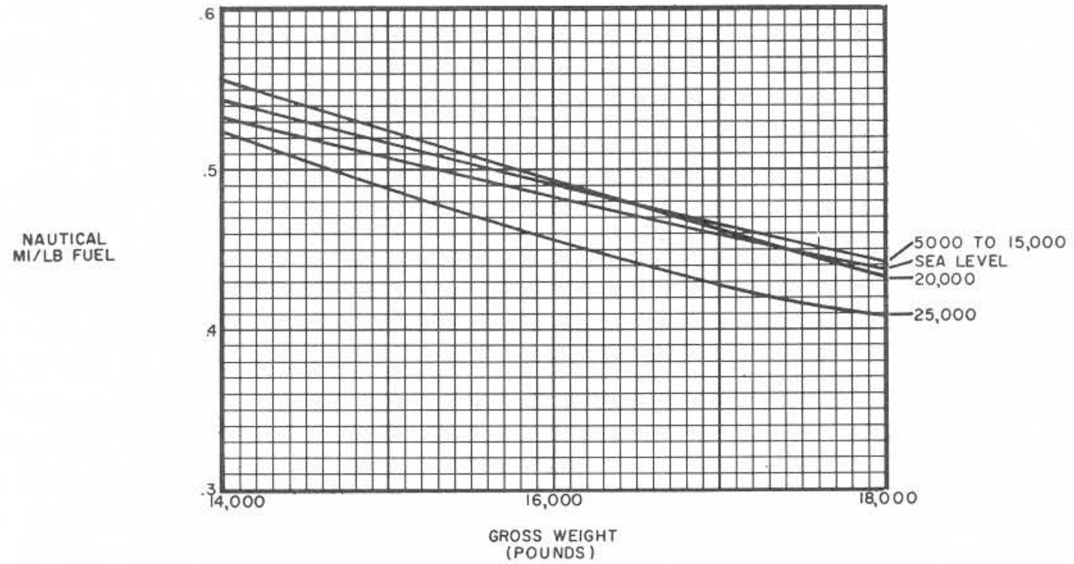
Figure A-17 (Sheet 1 of 2)

MAXIMUM RANGE POWER CONDITIONS VS GROSS WEIGHT

LIGHT ATTACK CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA





REMARKS:

(1) Configuration includes all wing racks, centerline rack, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 Lb bomb or one torpedo
(b) One External Fuel Tank
(c) 8–5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

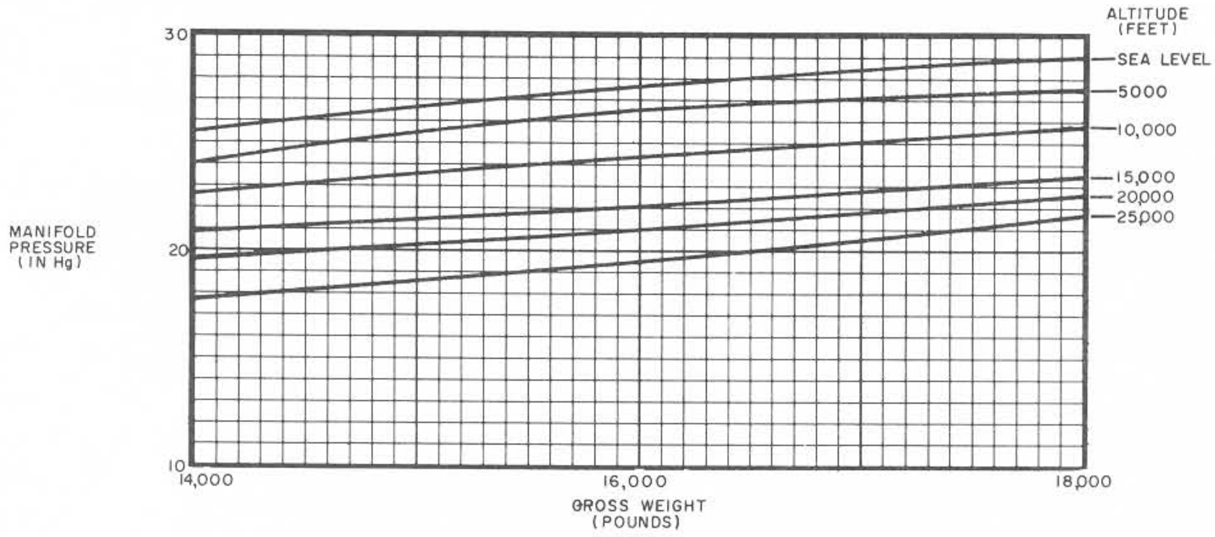
P4152-2

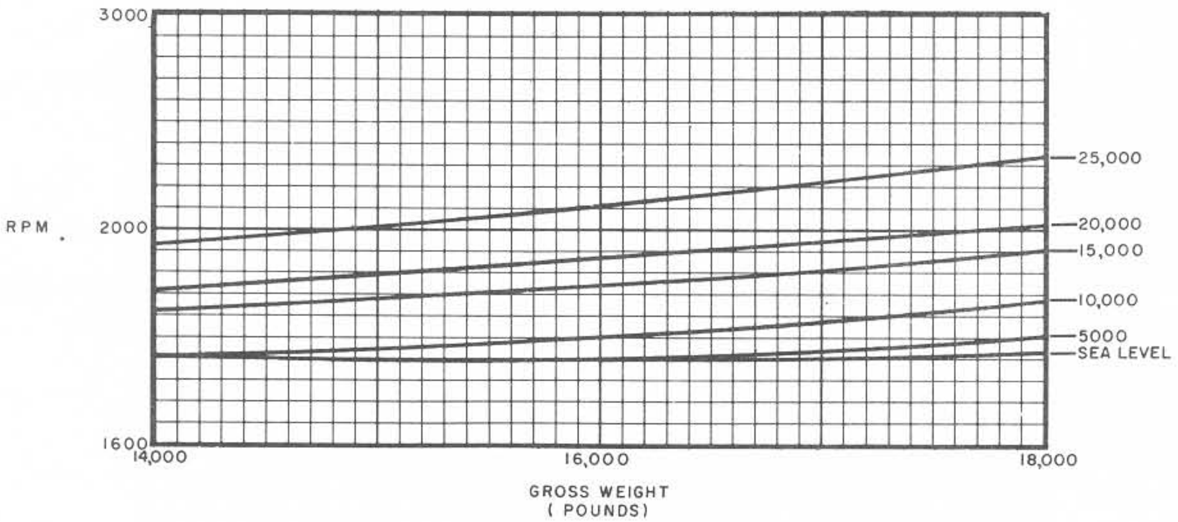
Figure A-17 (Sheet 2 of 2)

MAXIMUM ENDURANCE POWER CONDITIONS VS GROSS WEIGHT

LIGHT ATTACK CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA





REMARKS:

(1) Configuration includes all wing racks, centerline rack, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 lb bomb or one torpedo.
(b) One External Fuel Tank
(c) 8-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) Mixture: Normal
(5) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

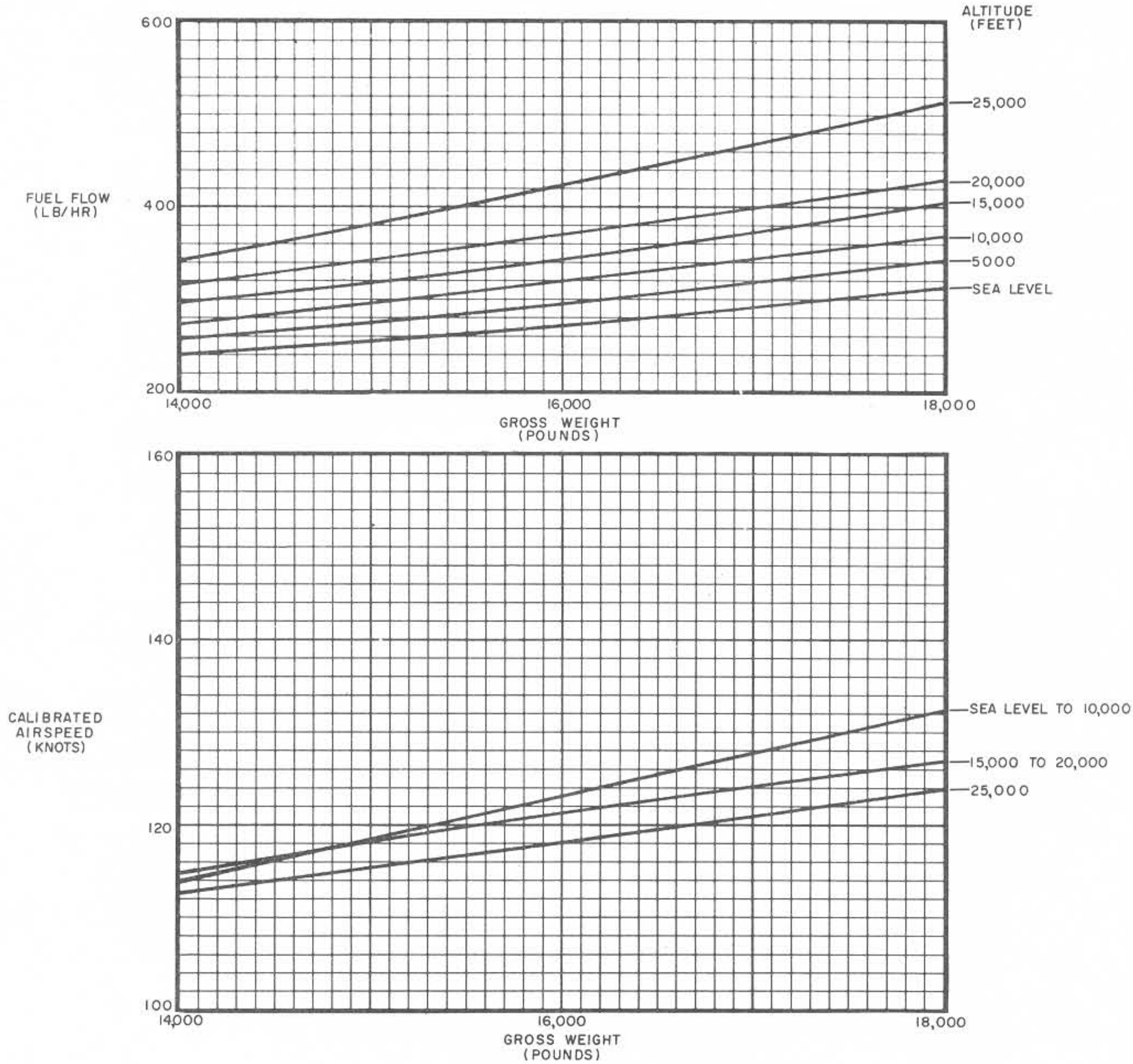
P4153-1A

Figure A-18 (Sheet 1 of 2)

MAXIMUM ENDURANCE POWER CONDITIONS VS GROSS WEIGHT

LIGHT ATTACK CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 lb bomb or one torpedo.
(b) One External Fuel Tank
(c) 8-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) Mixture: Normal
(5) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

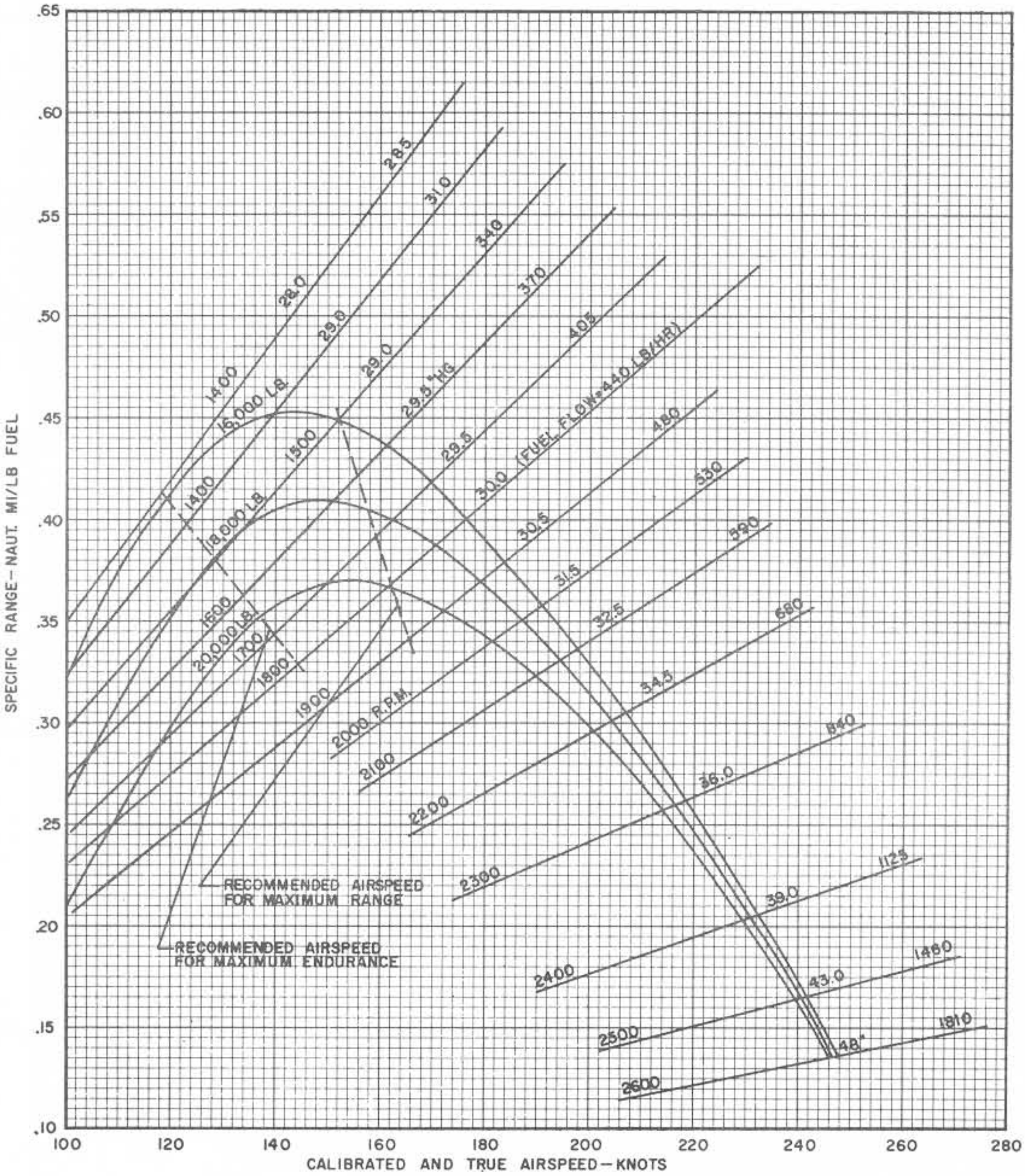
P4153-2

Figure A-18 (Sheet 2 of 2)

NAUTICAL MILES PER POUND OF FUEL

MEDIUM ATTACK CONFIGURATION SEA LEVEL STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack plus 1-2000 Lb bomb and 8 HVAR or an alternate item shown below:
(a) One 2000 Lb. bomb or one torpedo + AN/APS-19C radar
(b) One 2000 Lb. bomb or one torpedo + 2-150 Gal fuel tanks
(c) 2-1000 Lb bombs + 6-5" HVAR
(d) 1-2000 Lb bomb + 8-5" HVAR

CONDITIONS:
(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight tests of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

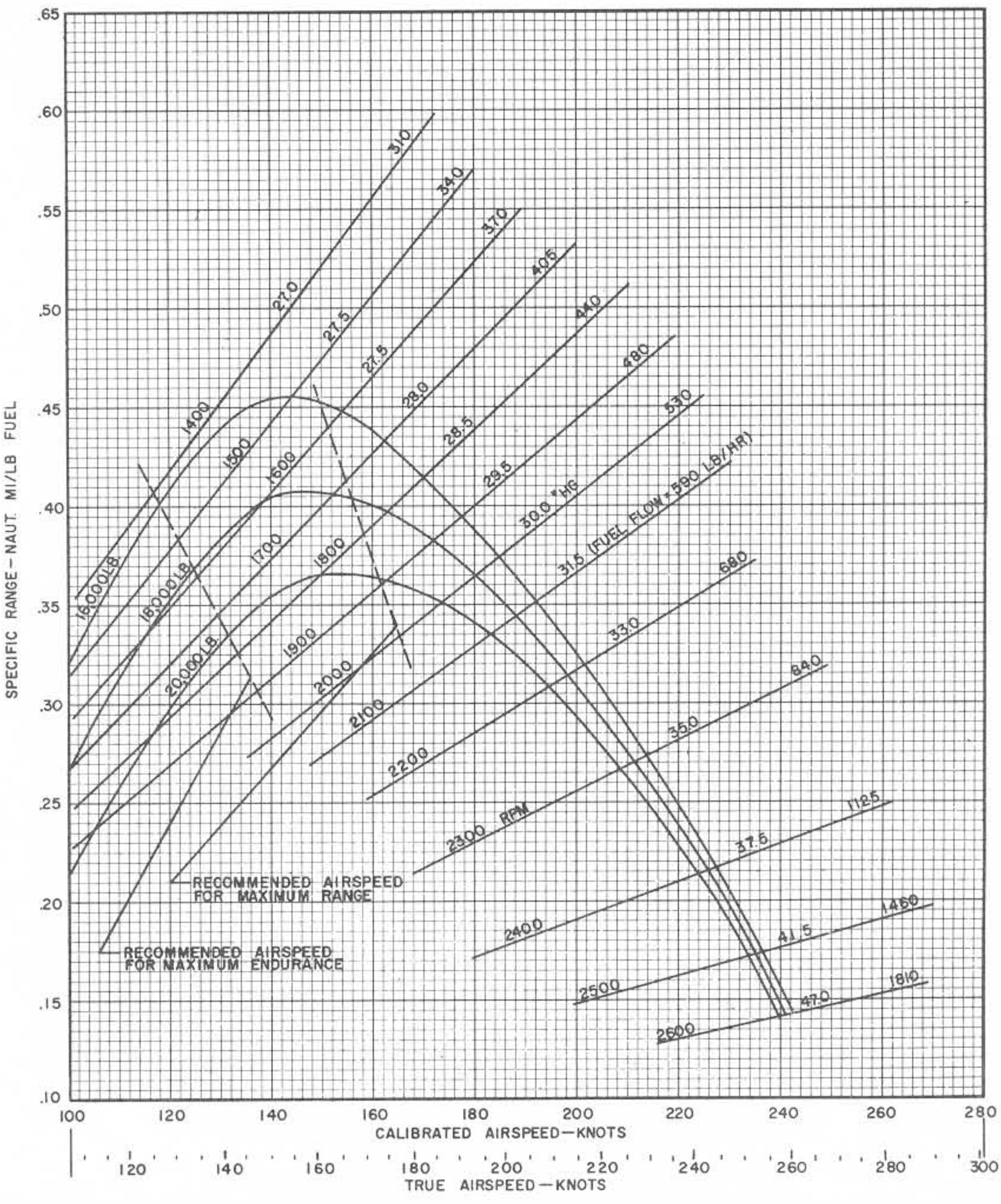
P4154-1A

Figure A-19 (Sheet 1 of 6)

NAUTICAL MILES PER POUND OF FUEL

MEDIUM ATTACK CONFIGURATION. ALTITUDE 5,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack plus 1-2000 Lb bomb and 8 HVAR or an alternate item shown below:
(a) One 2000 Lb. bomb or one torpedo + AN/APS-19C radar
(b) One 2000 Lb. bomb or one torpedo + 2-150 Gal fuel tanks
(c) 2-1000 Lb bombs + 6-5" HVAR
(d) 1-2000 Lb bomb + 8-5" HVAR

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight tests of Models AD-2, AD-3, AD-4

CONDITIONS:
(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

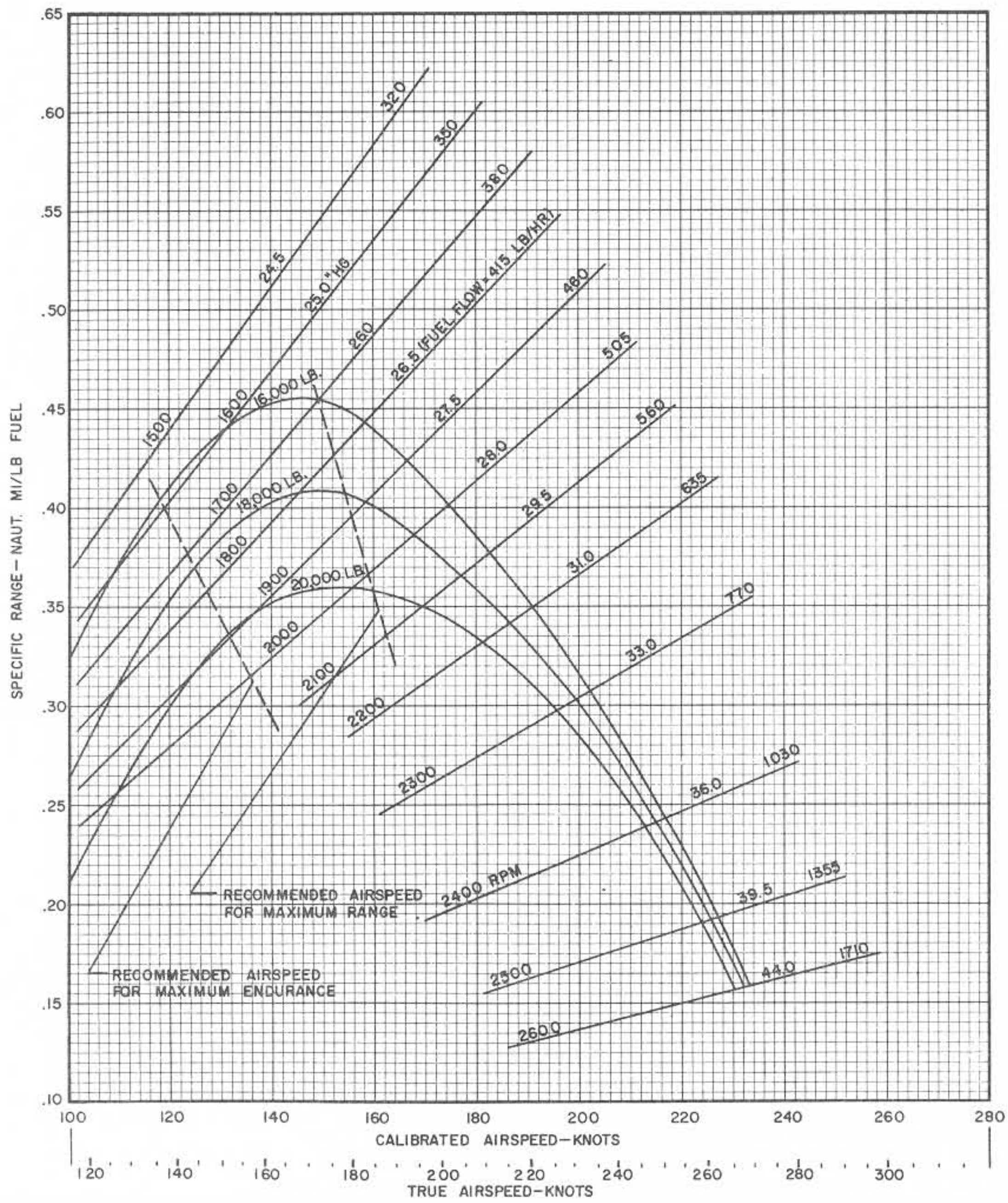
P4154-2A

Figure A-19 (Sheet 2 of 6)

NAUTICAL MILES PER POUND OF FUEL

MEDIUM ATTACK CONFIGURATION ALTITUDE 10,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack plus 1-2000 Lb bomb and 8 HVAR or an alternate item shown below:
- (a) One 2000 Lb. bomb or one torpedo + AN/APS-19C radar
- (b) One 2000 Lb. bomb or one torpedo + 2-150 Gal fuel tanks
- (c) 2-1000 Lb bombs + 6-5" HVAR
- (d) 1-2000 Lb bomb + 8-5" HVAR

CONDITIONS:
- (1) Cowl flaps closed
- (2) Nose flaps open
- (3) Oil cooler door faired
- (4) No wind
- (5) Mixture: Normal
- (6) Low blower

DATA AS OF: 1 June 1953

DATA BASIS: Contractor's flight tests of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145

FUEL DENSITY: 6.0 Lb/Gal

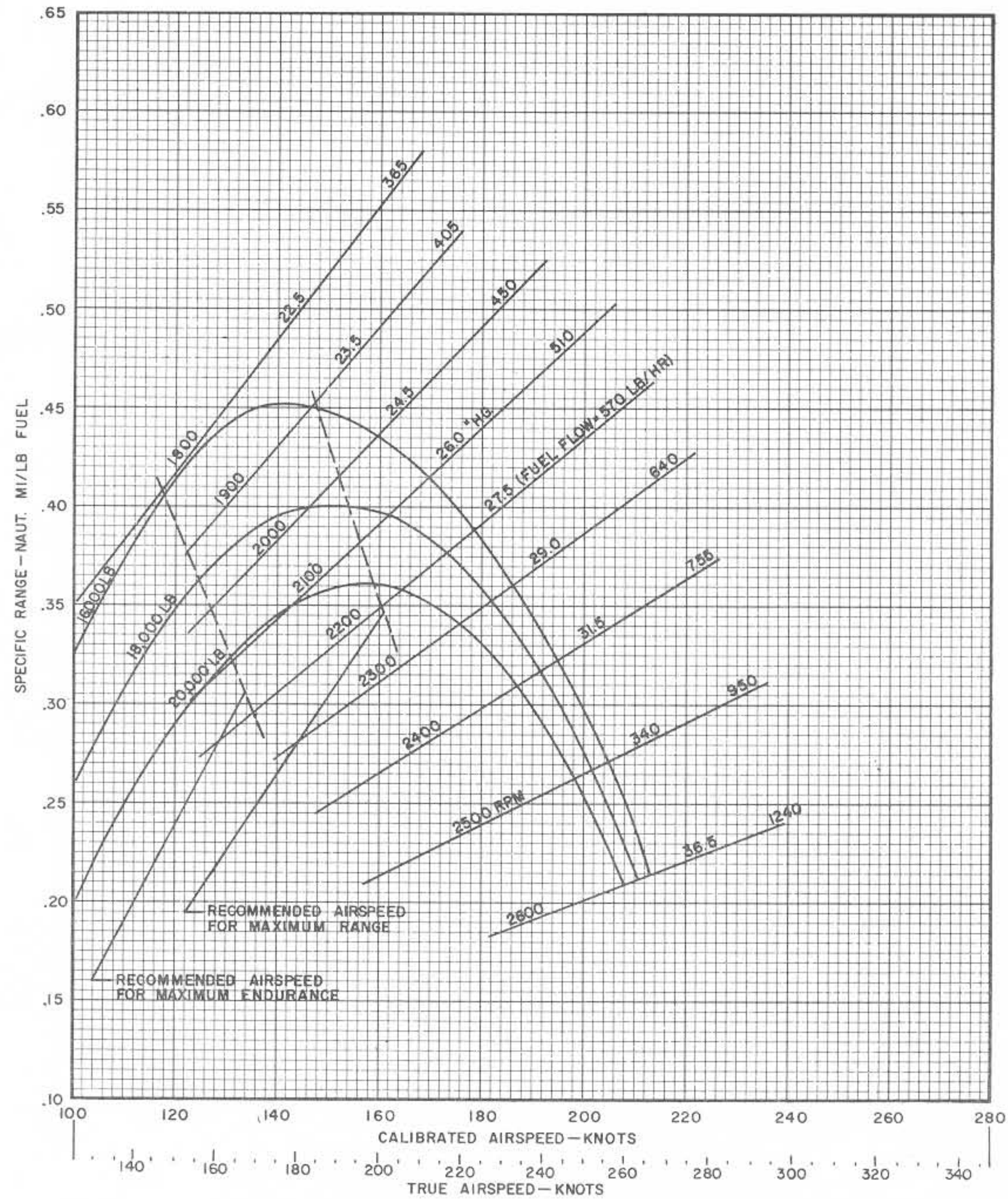
P4154-3A

Figure A-19 (Sheet 3 of 6)

NAUTICAL MILES PER POUND OF FUEL

MEDIUM ATTACK CONFIGURATION ALTITUDE 15,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack plus 1-2000 Lb bomb and 8 HVAR or an alternate item shown below
(a) One 2000 Lb. bomb or one torpedo + AN/APS-19C radar
(b) One 2000 Lb. bomb or one torpedo + 2-150 Gal fuel tanks
(c) 2-1000 Lb bombs + 6-5" HVAR
(d) 1-2000 Lb bomb + 8-5" HVAR

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight tests of Models AD-2, AD-3, AD-4

CONDITIONS:
(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

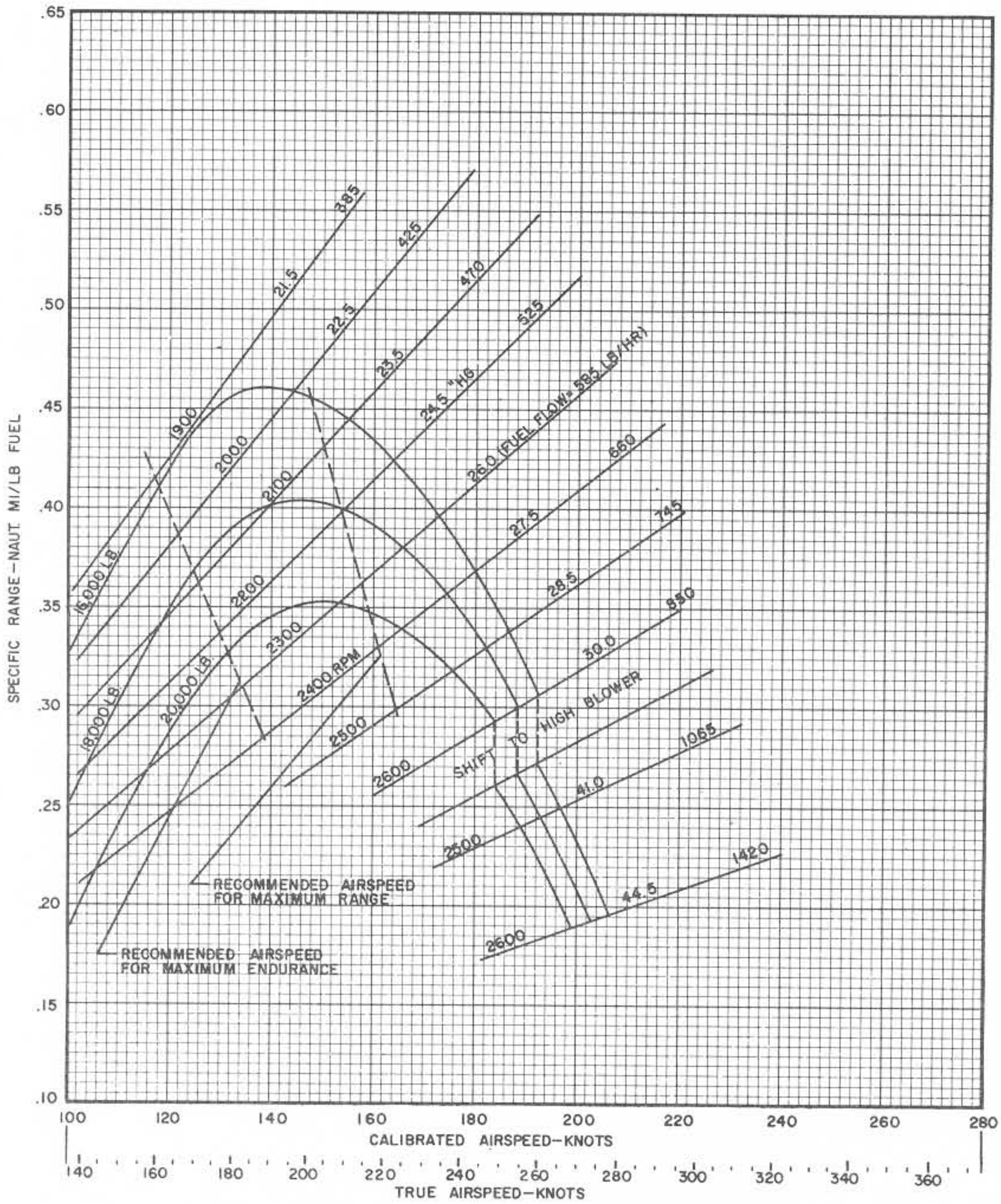
P4154-4A

Figure A-19 (Sheet 4 of 6)

NAUTICAL MILES PER POUND OF FUEL

MEDIUM ATTACK CONFIGURATION ALTITUDE 20,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack plus 1-2000 Lb bomb and 8 HVAR or an alternate item shown below:
- (a) One 2000 Lb. bomb or one torpedo + AN/APS-19C radar
- (b) One 2000 Lb. bomb or one torpedo + 2-150 Gal fuel tanks
- (c) 2-1000 Lb bombs + 6-5" HVAR
- (d) 1-2000 Lb bomb + 8-5" HVAR

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight tests of Models AD-2, AD-3, AD-4

CONDITIONS:
- (1) Cowl flaps closed
- (2) Nose flaps open
- (3) Oil cooler door faired
- (4) No wind
- (5) Mixture: Normal
- (6) Low blower unless noted otherwise

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

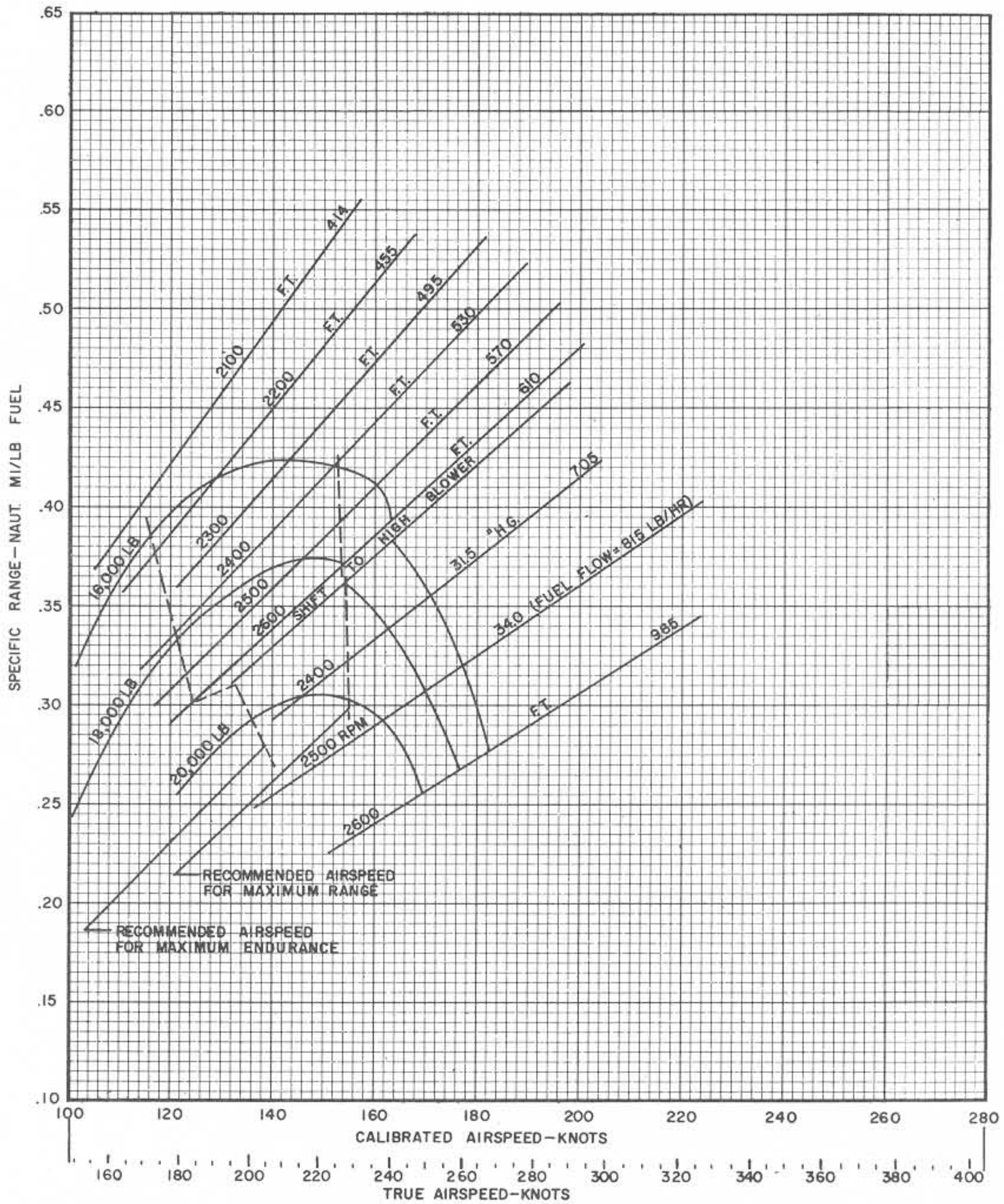
P4154-5A

Figure A-19 (Sheet 5 of 6)

NAUTICAL MILES PER POUND OF FUEL

MEDIUM ATTACK CONFIGURATION ALTITUDE 25,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack plus 1-2000 Lb bomb and 8 HVAR or an alternate item shown below:
  (a) One 2000 Lb. bomb or one torpedo + AN/APS-19C radar
  (b) One 2000 Lb. bomb or one torpedo + 2-150 Gal fuel tanks
  (c) 2-1000 Lb bombs + 6-5" HVAR
  (d) 1-2000 Lb bomb + 8-5" HVAR

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight tests of Models AD-2, AD-3, AD-4

CONDITIONS:
(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower unless noted otherwise

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

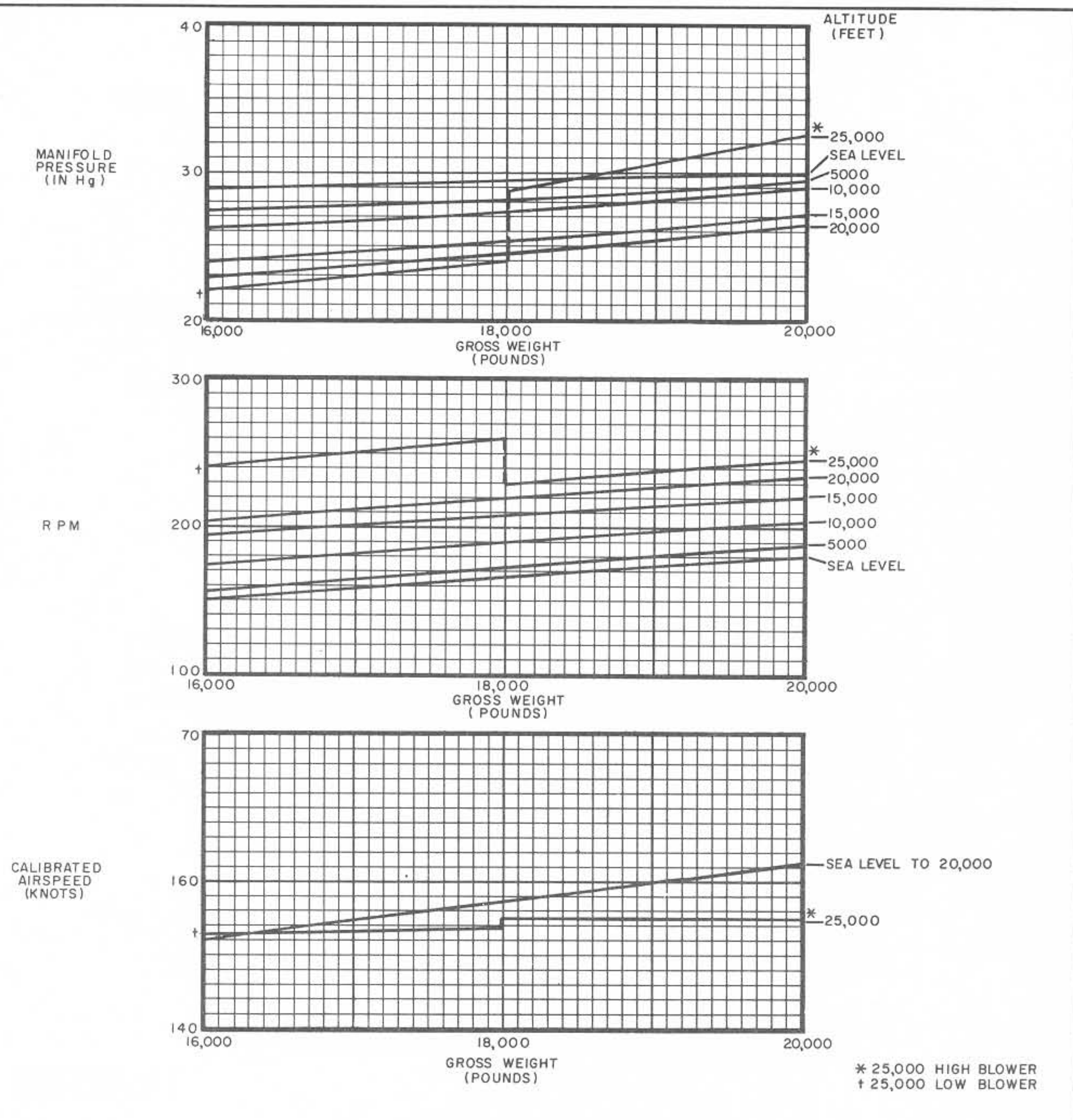
P4154-6A

Figure A-19 (Sheet 6 of 6)

MAXIMUM RANGE POWER CONDITIONS VS GROSS WEIGHT

MEDIUM ATTACK CONFIGURATION   STANDARD DAY

MODEL: AD-6   PROPELLER: A642-G 804/M20A2-162-0   ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, 1-2000 Lb bomb, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 Lb bomb or one torpedo + AN/APS-19C radar
(b) One bomb or torpedo + 2-150 Gal fuel tanks
(c) 2-1000 Lb bombs + 6-5" HVAR
(d) 1-2000 Lb bomb + 8-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower unless noted otherwise

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

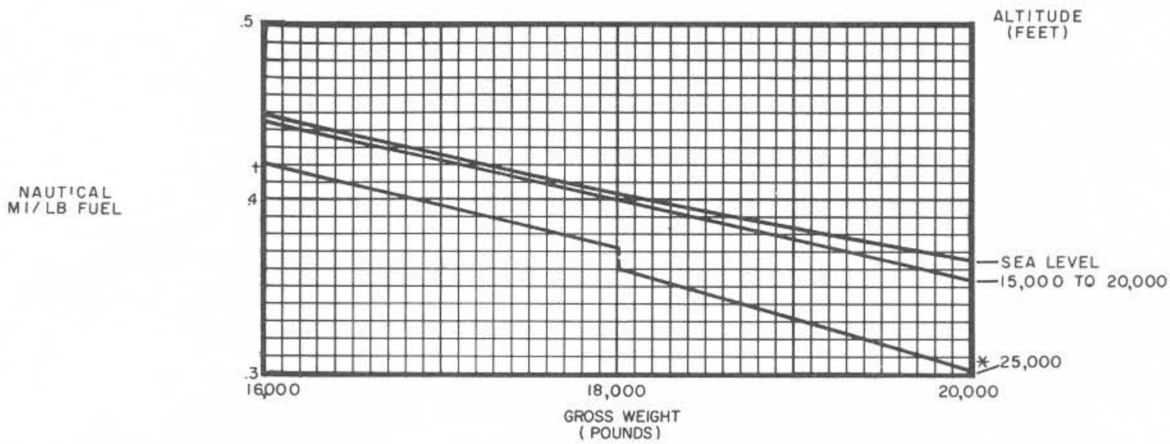
P4155-1A

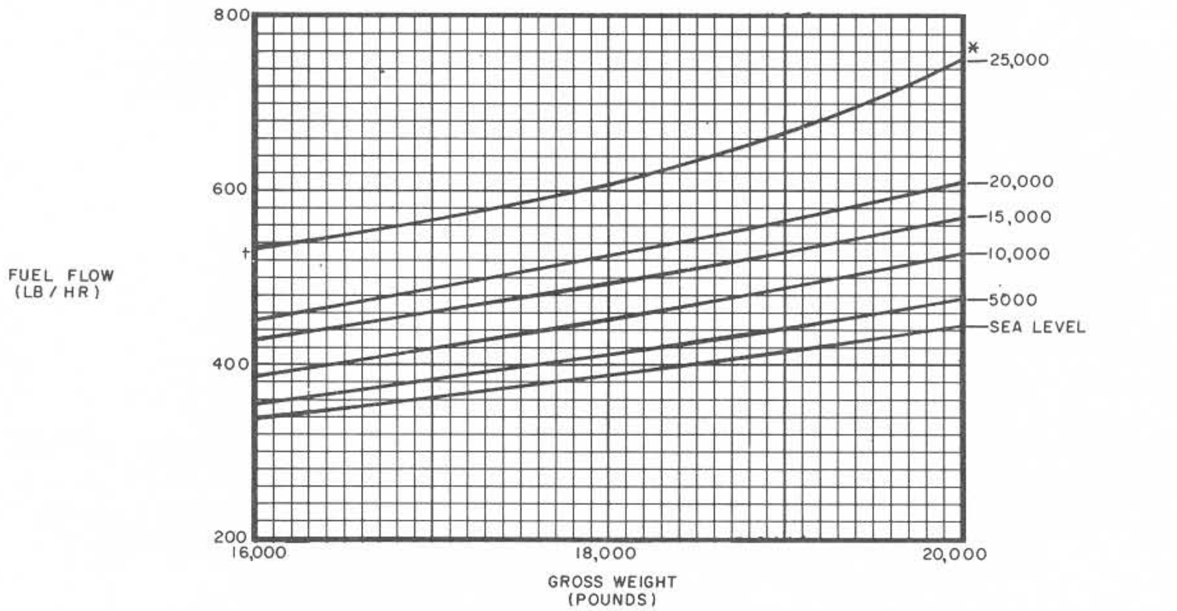
Figure A-20 (Sheet 1 of 2)

MAXIMUM RANGE POWER CONDITIONS VS GROSS WEIGHT

MEDIUM ATTACK CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA





* 25,000 HIGH BLOWER
+ 25,000 LOW BLOWER

REMARKS:

(1) Configuration includes all wing racks, centerline rack, 1-2000 Lb bomb, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 Lb bomb or one torpedo + AN/APS-19C radar
(b) One bomb or torpedo + 2-150 Gal fuel tanks
(c) 2-1000 Lb bombs + 6-5" HVAR
(d) 1-2000 Lb bomb + 8-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower unless noted otherwise

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

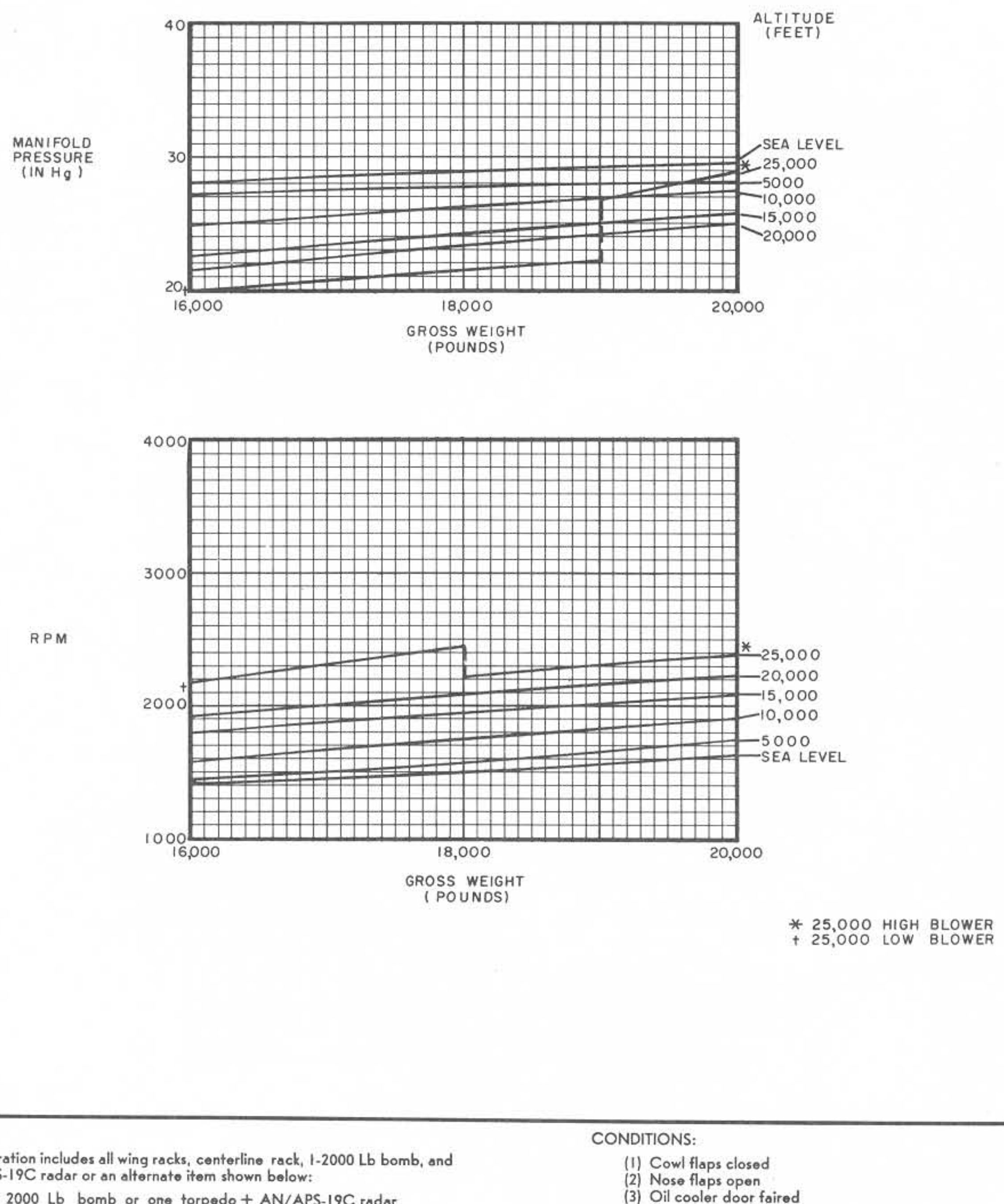
P4155-2

Figure A-20 (Sheet 2 of 2)

MAXIMUM ENDURANCE POWER CONDITIONS VS GROSS WEIGHT

MEDIUM ATTACK CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, 1-2000 Lb bomb, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 Lb bomb or one torpedo + AN/APS-19C radar
(b) One 2000 Lb bomb or one torpedo + 2-150 Gal fuel tanks
(c) 2-1000 Lb bombs + 6-5" HVAR
(d) 1-2000 Lb bomb + 8-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) Mixture: Normal
(5) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

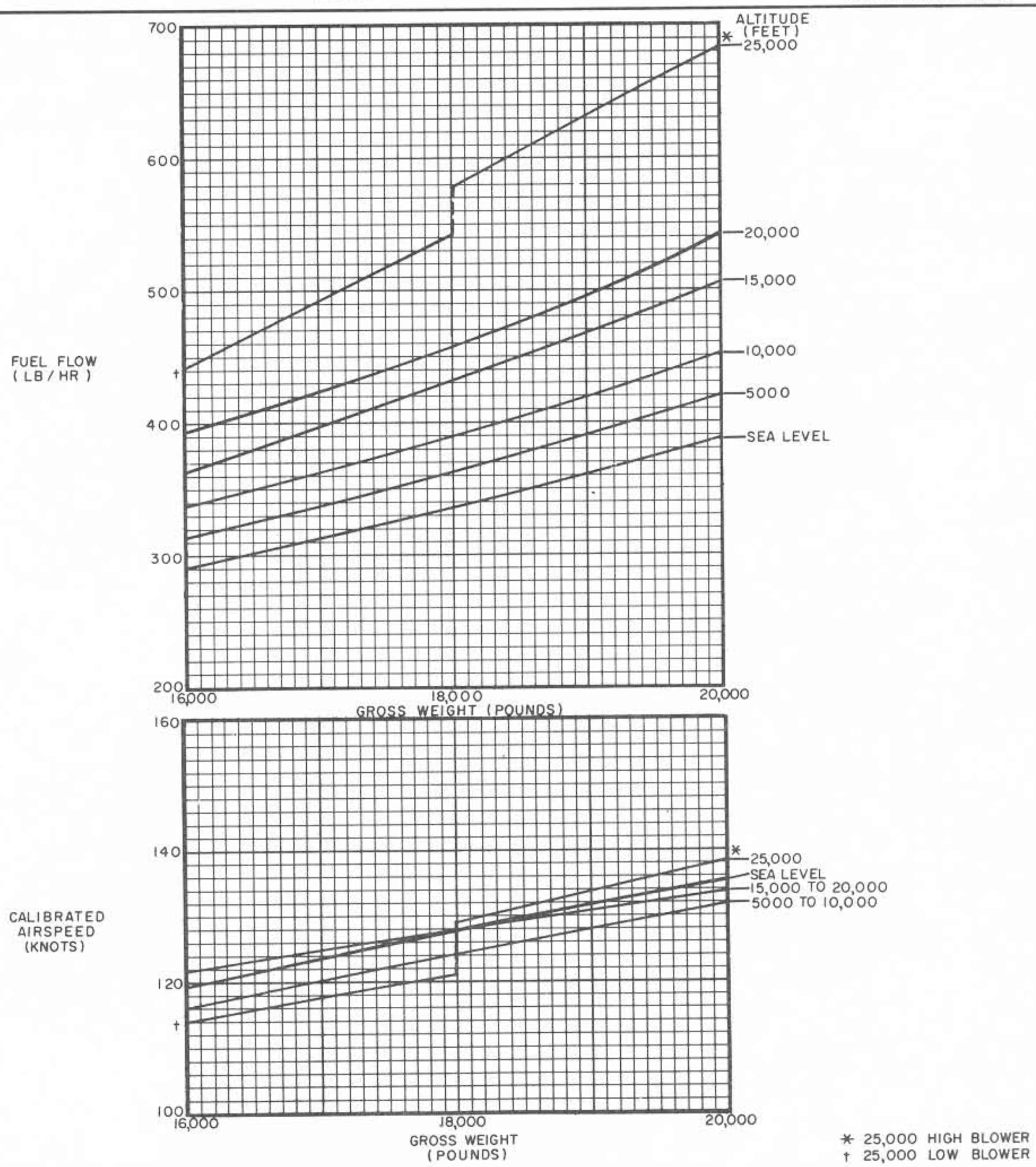
P4156-1A

Figure A-21 (Sheet 1 of 2)

MAXIMUM ENDURANCE POWER CONDITIONS VS GROSS WEIGHT

MEDIUM ATTACK CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, 1-2000 Lb bomb, and AN/APS-19C radar or an alternate item shown below:

(a) One 2000 Lb bomb or one torpedo + AN/APS-19C radar
(b) One 2000 Lb bomb or one torpedo + 2-150 Gal fuel tanks
(c) 2-1000 Lb bombs + 6-5" HVAR
(d) 1-2000 Lb bomb + 8-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) Mixture: Normal
(5) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

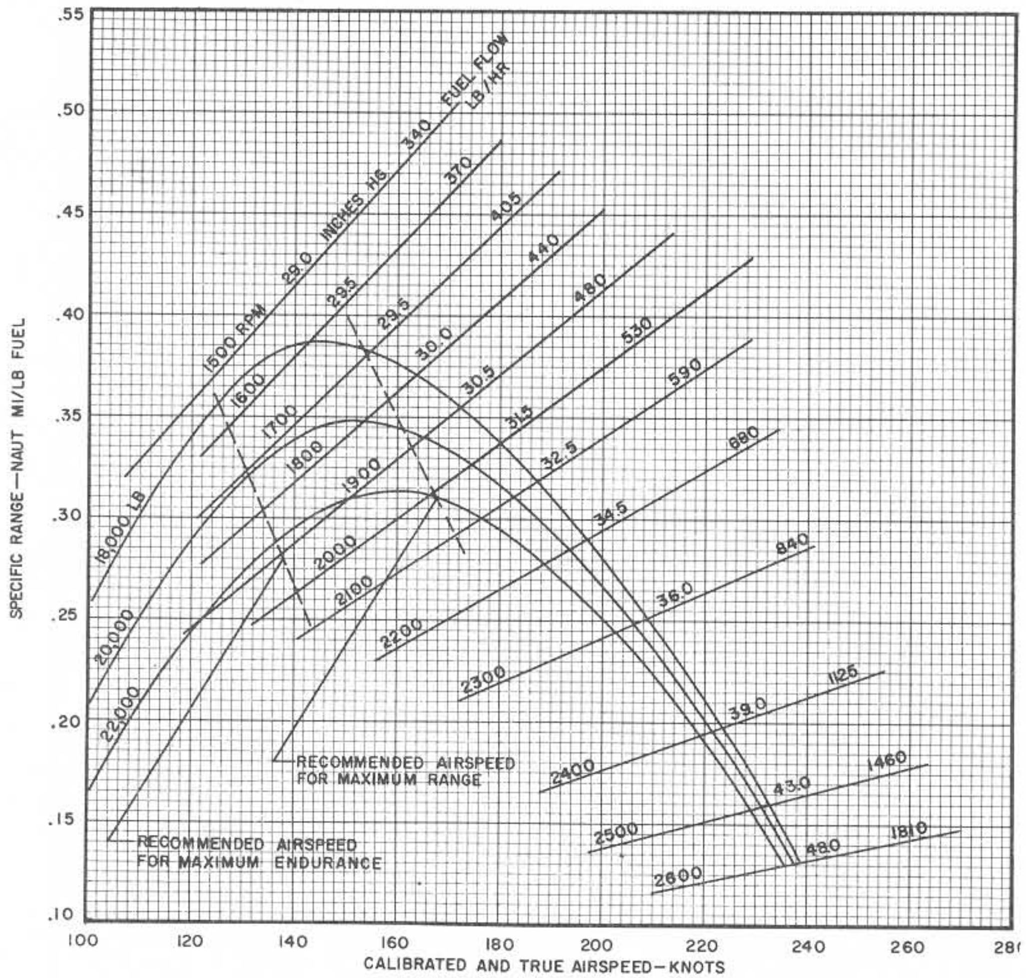
P4156-2

Figure A-21 (Sheet 2 of 2)

NAUTICAL MILES PER POUND OF FUEL

LONG RANGE ATTACK CONFIGURATION   SEA LEVEL   STANDARD DAY

MODEL: AD-6   PROPELLER: A642-G 804/M20A2-162-0   ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 1-2000 Lb bomb or torpedo and 2-300 Gal tanks, or an alternate item shown below:

(a) 1-2000 Lb and 2-1000 Lb bombs
(b) 3-2000 Lb bombs or torpedoes
(c) 2-1000 Lb bombs and 12-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

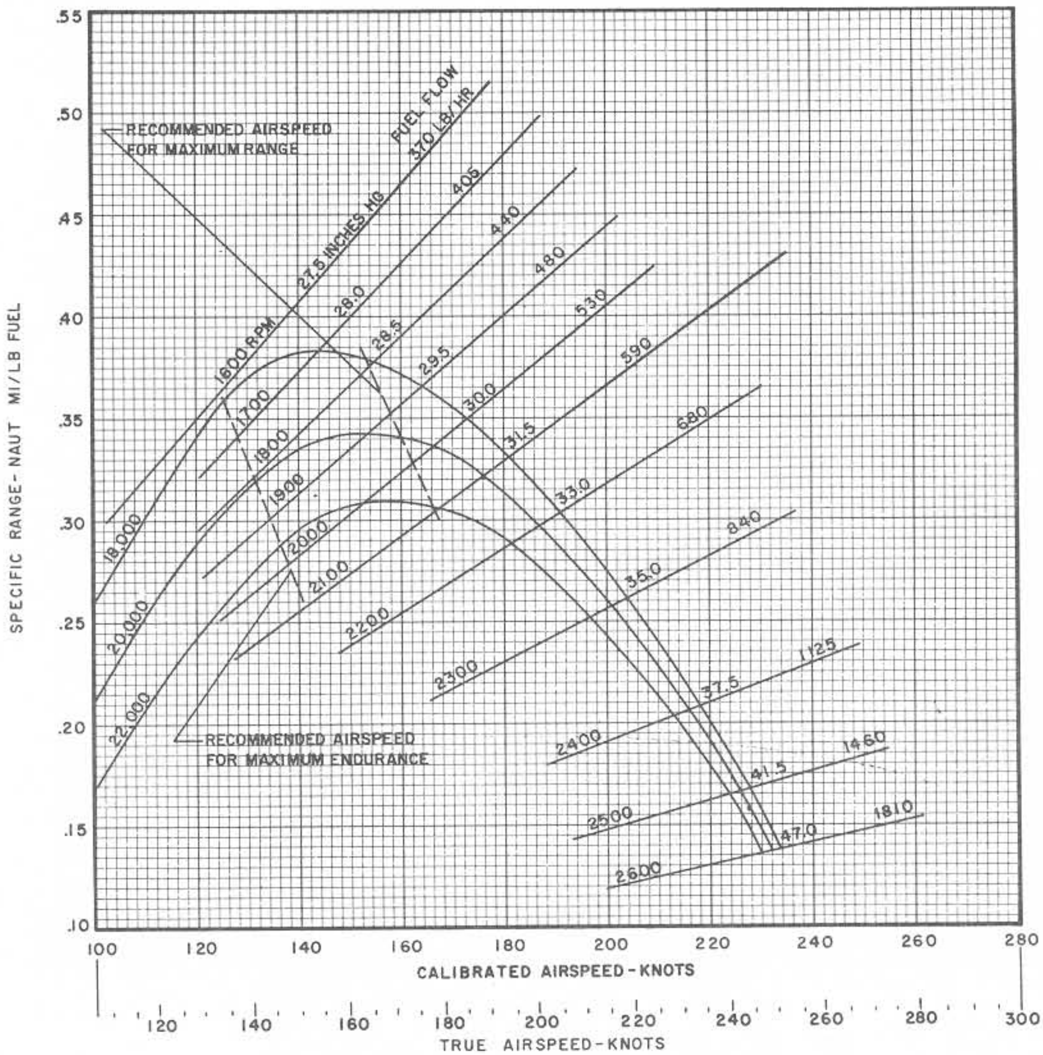
P4157-1A

Figure A-22 (Sheet 1 of 5)

NAUTICAL MILES PER POUND OF FUEL

LONG RANGE ATTACK CONFIGURATION ALTITUDE 5,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 1-2000 Lb bomb or torpedo and 2-300 Gal tanks, or an alternate item shown below:

(a) 1-2000 and 2-1000 Lb bombs
(b) 3-2000 Lb bombs or torpedoes
(c) 2-1000 Lb bombs and 12-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

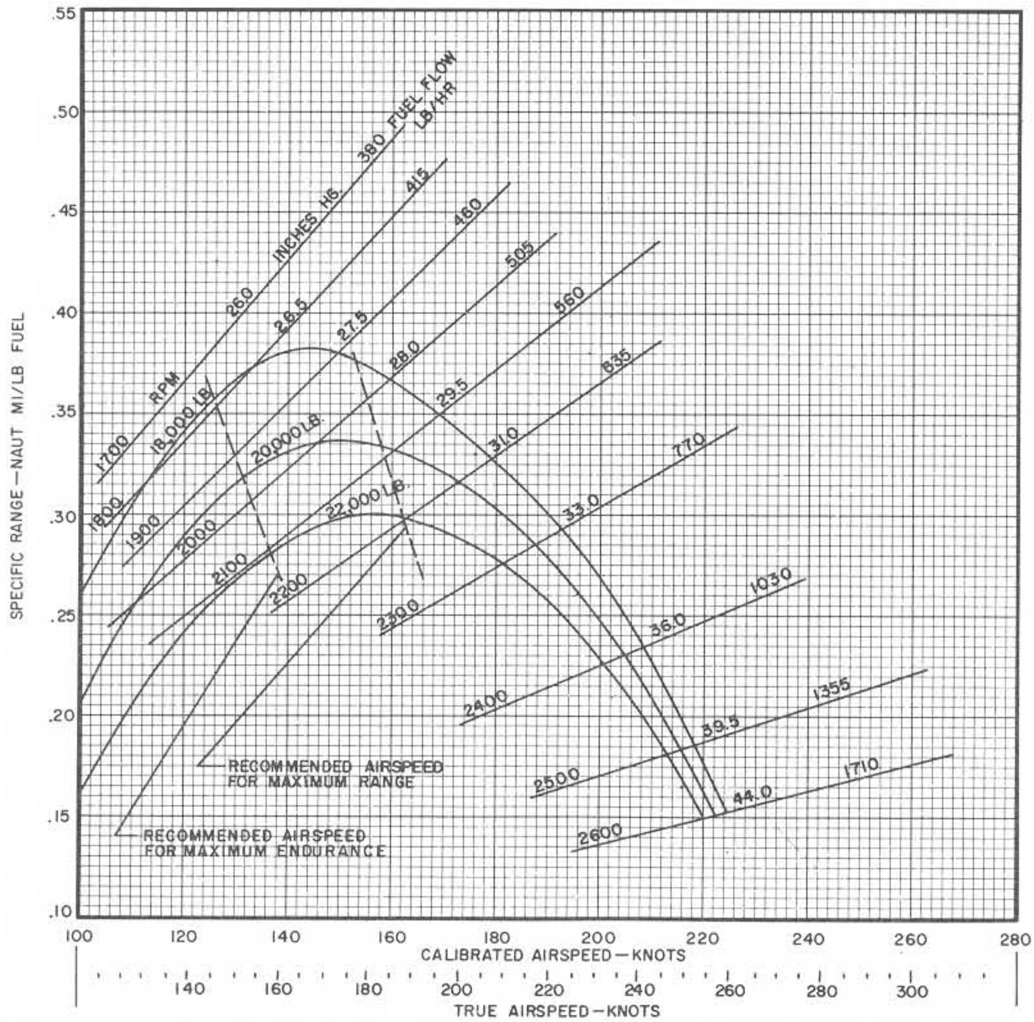
P4157-2A

Figure A-22 (Sheet 2 of 5)

NAUTICAL MILES PER POUND OF FUEL

LONG RANGE ATTACK CONFIGURATION ALTITUDE 10,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 1-2000 Lb bomb or torpedo and 2-300 Gal tanks, or an alternate item shown below:

(a) 1-2000 Lb and 2-1000 Lb bombs
(b) 3-2000 Lb bombs or torpedoes
(c) 2-1000 Lb bombs and 12-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

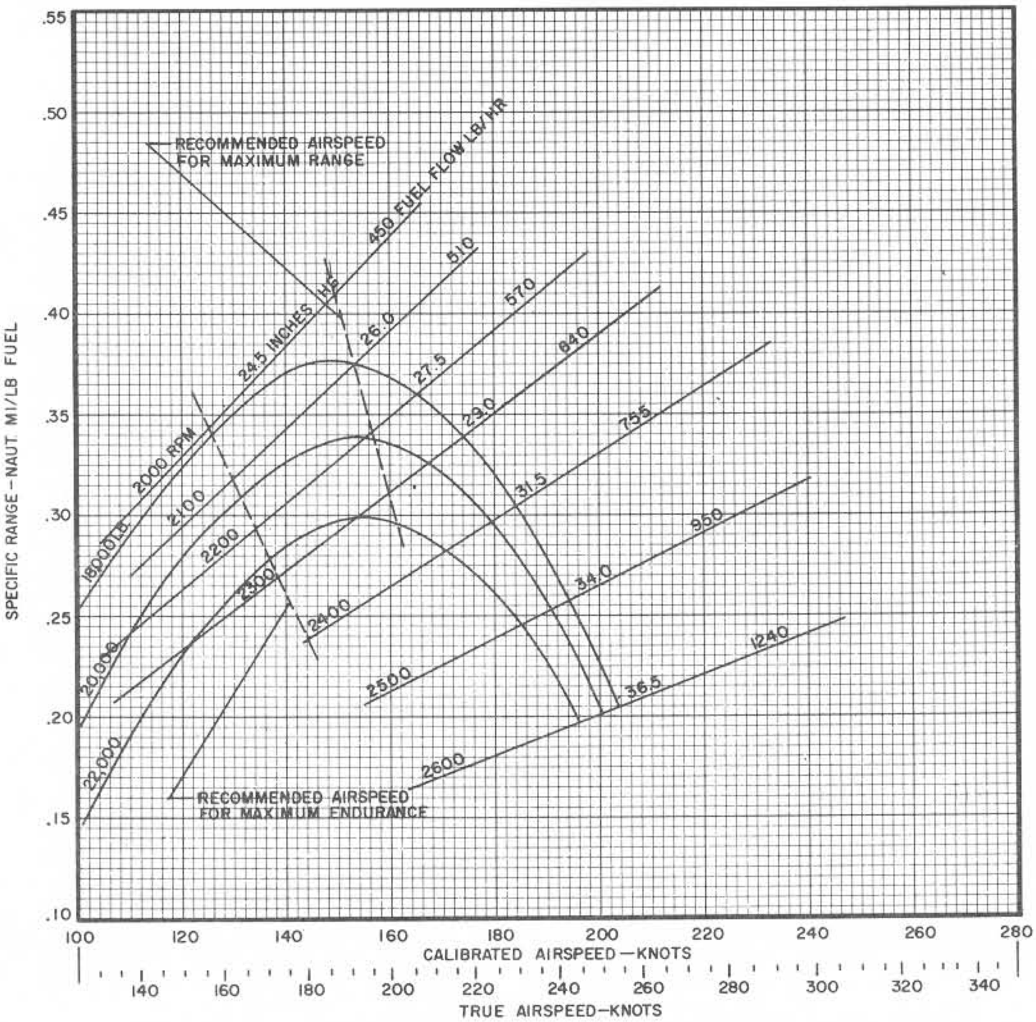
P4157-3A

Figure A-22 (Sheet 3 of 5)

NAUTICAL MILES PER POUND OF FUEL

LONG RANGE ATTACK CONFIGURATION ALTITUDE 15,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 1-2000 Lb bomb or torpedo and 2-300 Gal tanks, or an alternate item shown below:

(a) 1-2000 Lb and 2-1000 Lb bombs
(b) 3-2000 Lb bombs or torpedoes
(c) 2-1000 Lb bombs and 12-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

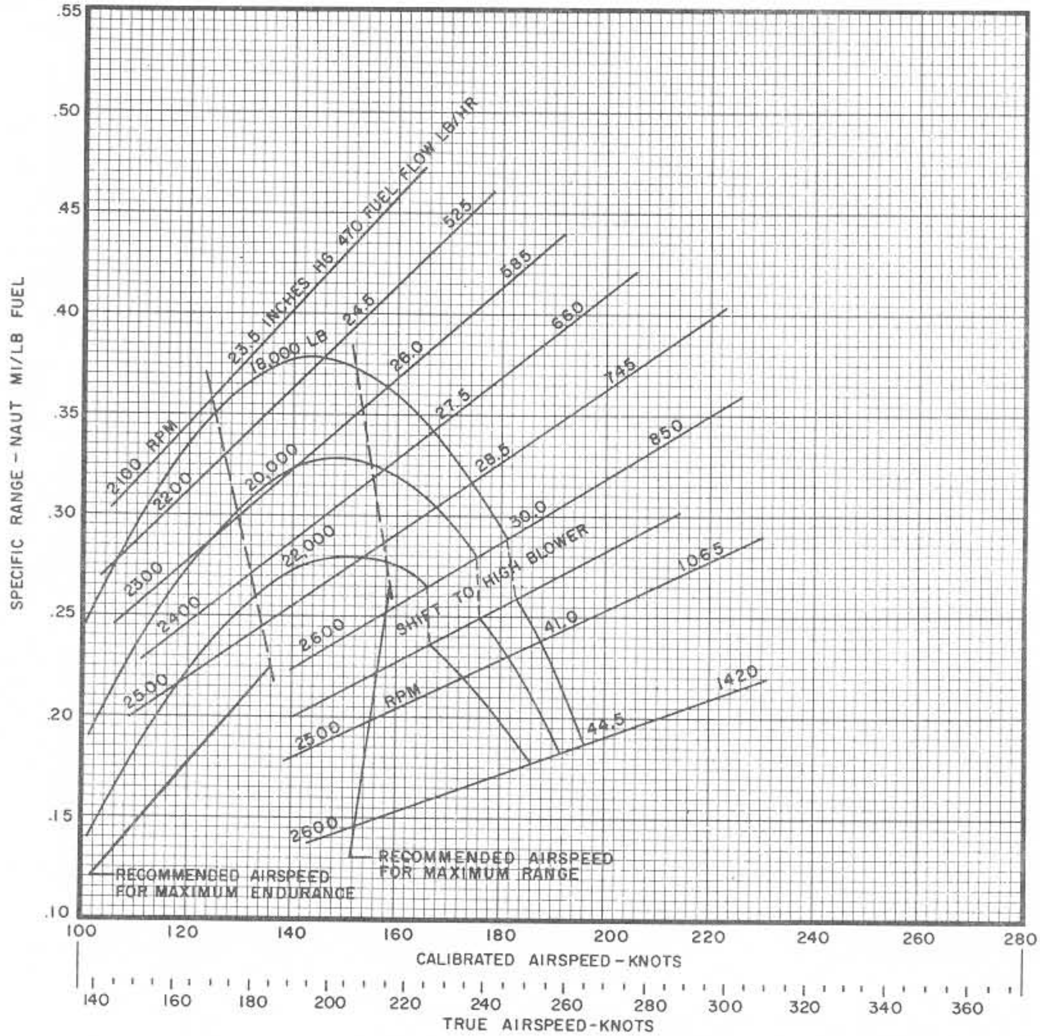
FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal
P4157-4A

Figure A-22 (Sheet 4 of 5)

NAUTICAL MILES PER POUND OF FUEL

LONG RANGE ATTACK CONFIGURATION ALTITUDE 20,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 1-2000 Lb bomb or torpedo and 2-300 Gal tanks, or an alternate item shown below:

(a) 1-2000 Lb and 2-1000 Lb bombs
(b) 3-2000 Lb bombs or torpedoes
(c) 2-1000 Lb bombs and 12-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower unless noted otherwise

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal
P-4157-5A

Figure A-22 (Sheet 5 of 5)

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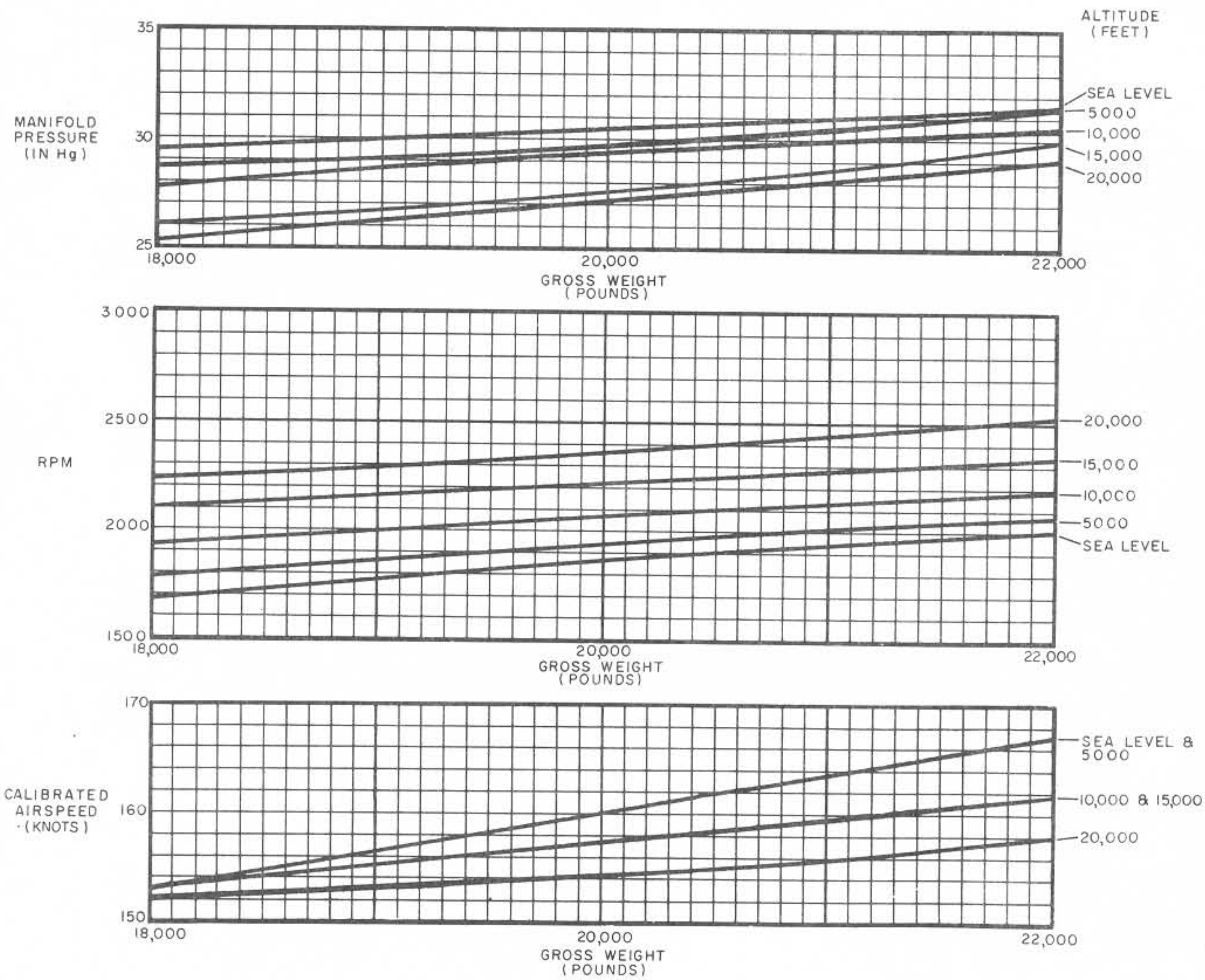
MAXIMUM RANGE POWER CONDITIONS VS GROSS WEIGHT

LONG RANGE ATTACK CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 1-2000 Lb bomb or torpedo and 2-300 Gal tanks, or an alternate item shown below:

(a) 1-2000 Lb and 2-1000 Lb bombs
(b) 3-2000 Lb bombs or torpedoes
(c) 2-1000 Lb bombs and 12-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

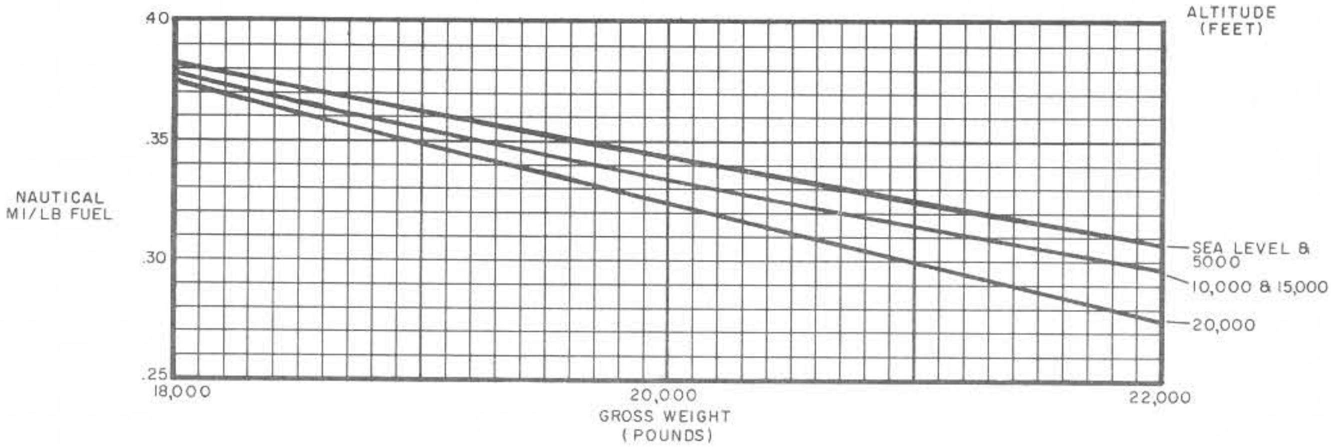
P4158-1A

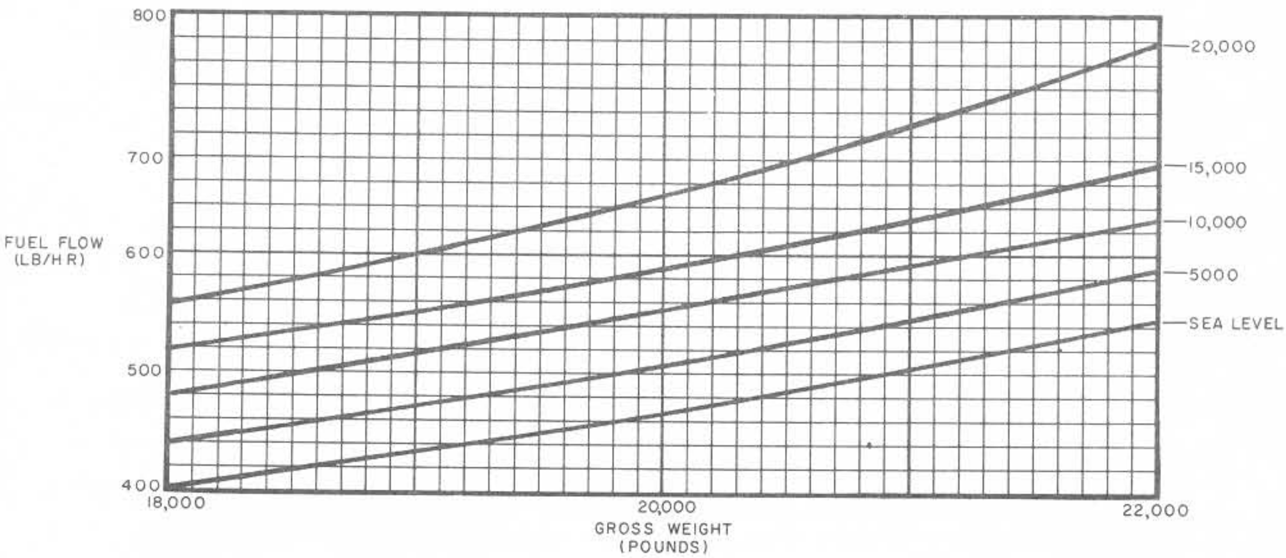
Figure A-23 (Sheet 1 of 2)

MAXIMUM RANGE POWER CONDITIONS VS GROSS WEIGHT

LONG RANGE ATTACK CONFIGURATION   STANDARD DAY

MODEL: AD-6   PROPELLER: A642-G 804/M20A2-162-0   ENGINE: R3350-26WA





REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 1-2000 Lb bomb or torpedo and 2-300 Gal tanks, or an alternate item shown below:

(a) 1-2000 Lb and 2-1000 Lb bombs
(b) 3-2000 Lb bombs or torpedoes
(c) 2-1000 Lb bombs and 12-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

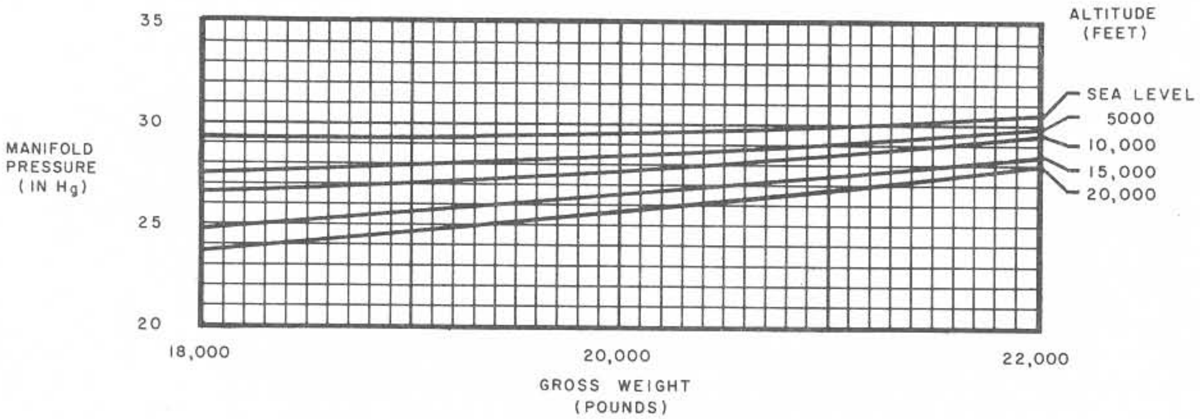
P4158-2

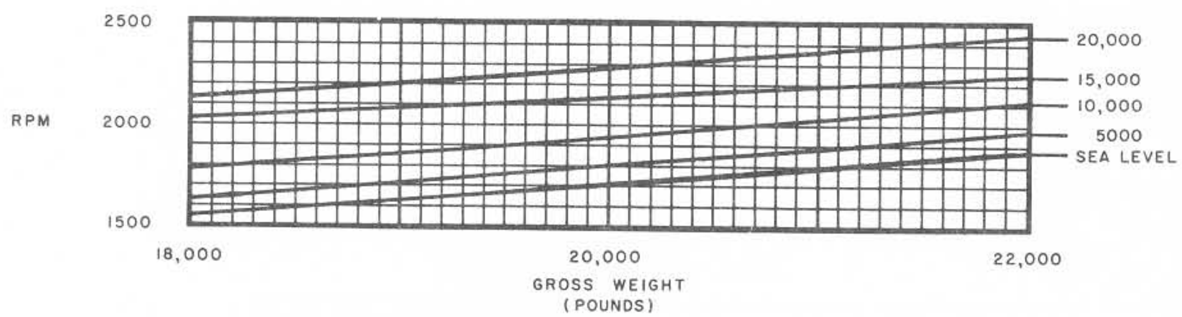
Figure A-23 (Sheet 2 of 2)

MAXIMUM ENDURANCE POWER CONDITIONS VS GROSS WEIGHT

LONG RANGE ATTACK CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA





REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 1-2000 Lb bombs or torpedo and AN/APS-19C radar or alternate items shown below:

(a) 1-2000 Lb and 2-1000 Lb bombs
(b) 3-2000 Lb bombs or torpedoes
(c) 2-1000 Lb bombs and 12-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) Mixture: Normal
(5) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight tests of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

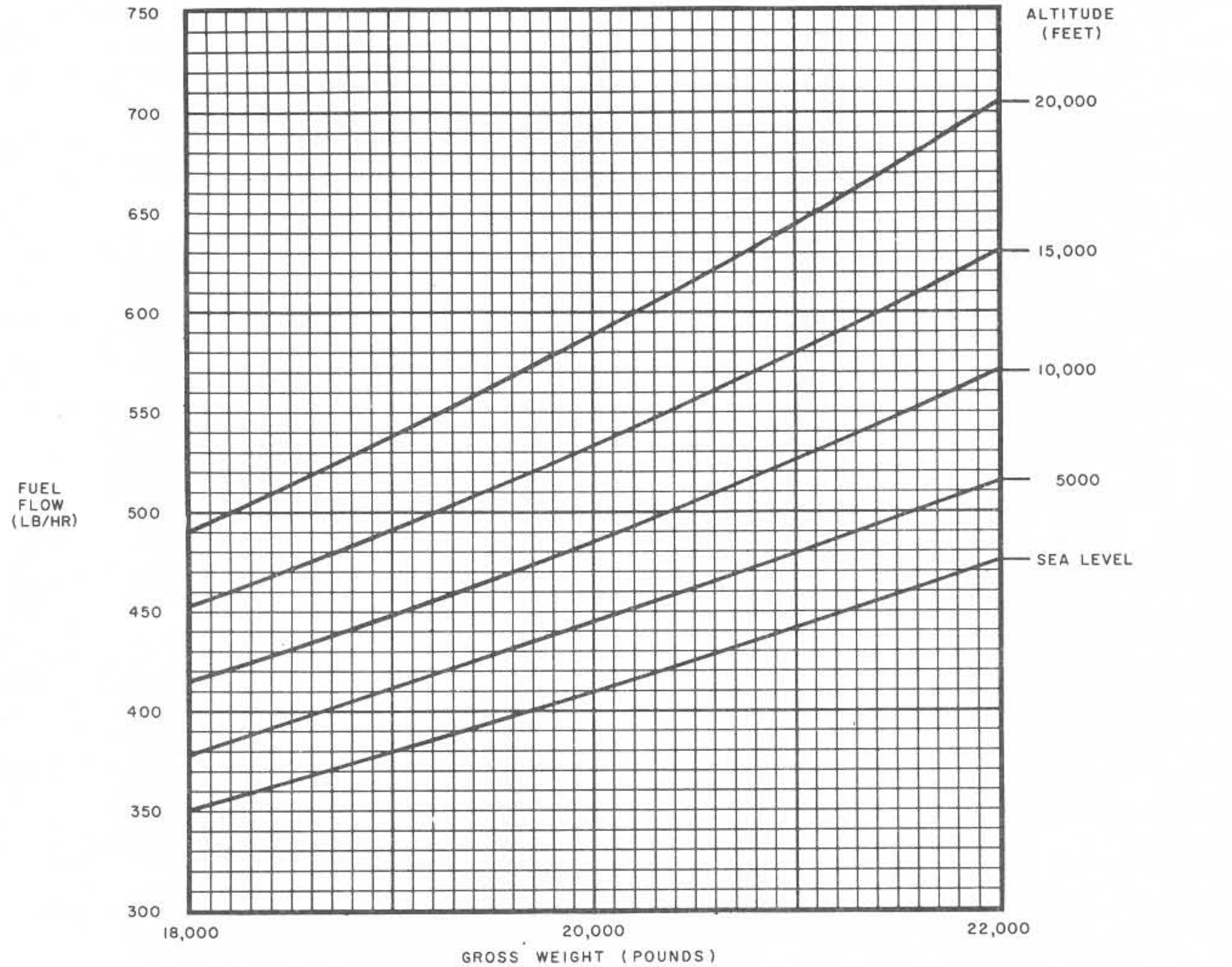
P4159-1A

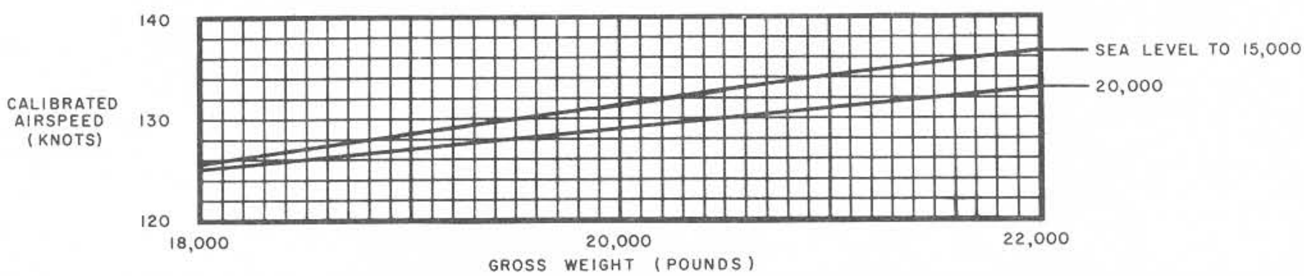
Figure A-24 (Sheet 1 of 2)

MAXIMUM ENDURANCE POWER CONDITIONS VS GROSS WEIGHT

LONG RANGE ATTACK CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA





REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 1-2000 Lb bomb or torpedo and AN/APS-19C radar or alternate items shown below:

(a) 1-2000 Lb and 2-1000 Lb bombs
(b) 3-2000 Lb bombs or torpedoes
(c) 2-1000 Lb bombs and 12-5" HVAR

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) Mixture: Normal
(5) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight tests of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

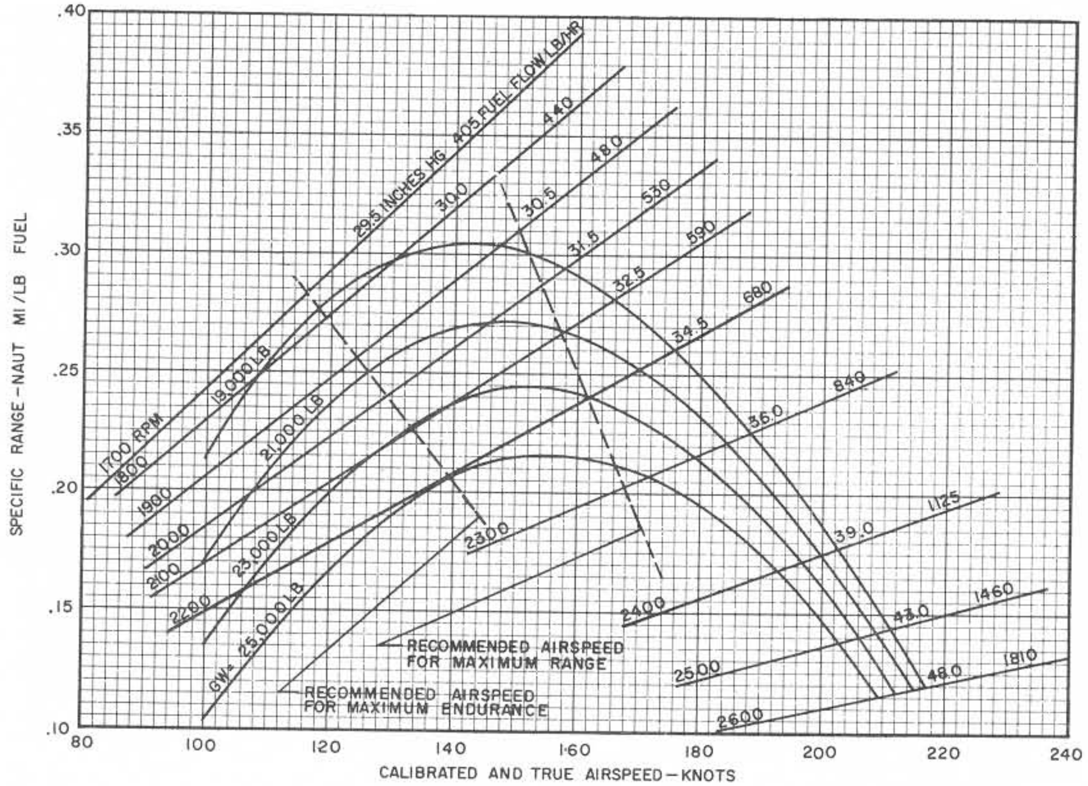
P4159-2

Figure A-24 (Sheet 2 of 2)

NAUTICAL MILES PER POUND OF FUEL

HEAVY ATTACK CONFIGURATION SEA LEVEL STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 3-2000 Lb bombs or torpedoes and 6-500 Lb bombs or an alternate item shown below:

(a) 1-2000 Lb bomb, 2-300 Gal tanks and 6-500 Lb bombs
(b) 3 Mk 25 mines

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

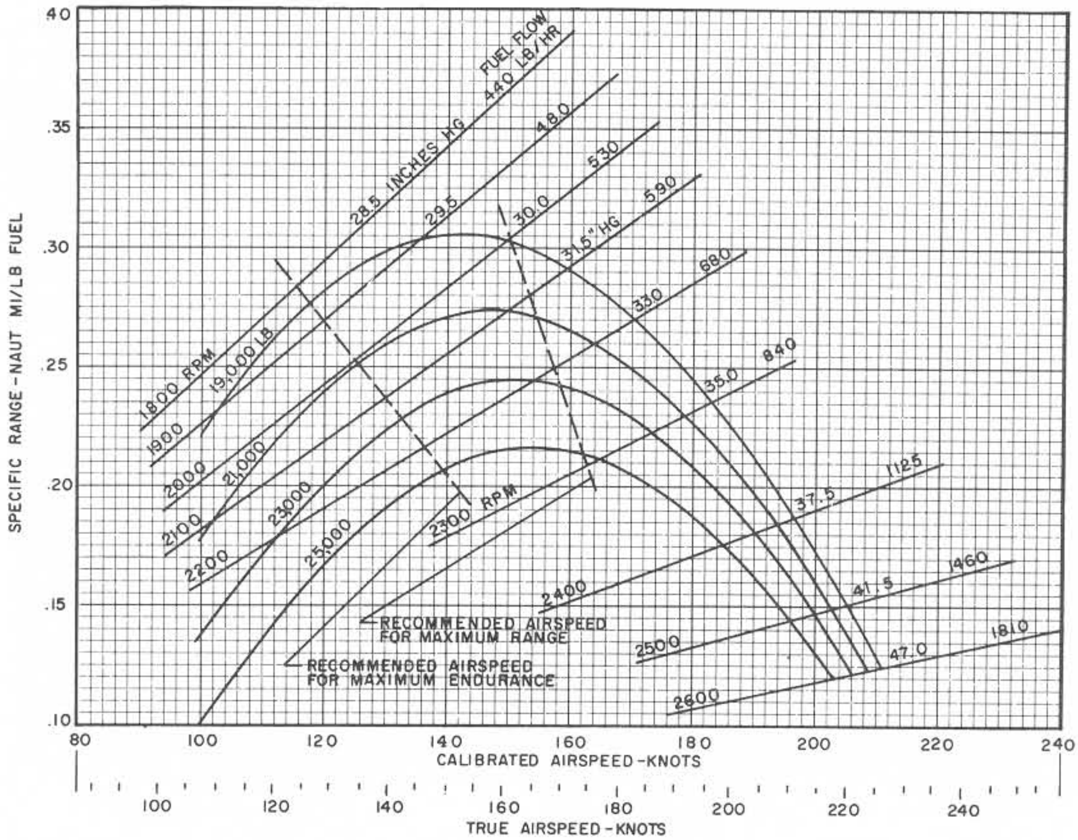
P4452-1A

Figure A-25 (Sheet 1 of 5)

NAUTICAL MILES PER POUND OF FUEL

HEAVY ATTACK CONFIGURATION ALTITUDE 5,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 3-2000Lb bombs or torpedoes and 6-500 Lb bombs or an alternate item shown below:

(a) 1-2000 Lb bomb, 2-300 Gal tanks and 6-500 Lb bombs
(b) 3 Mk 25 mines

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

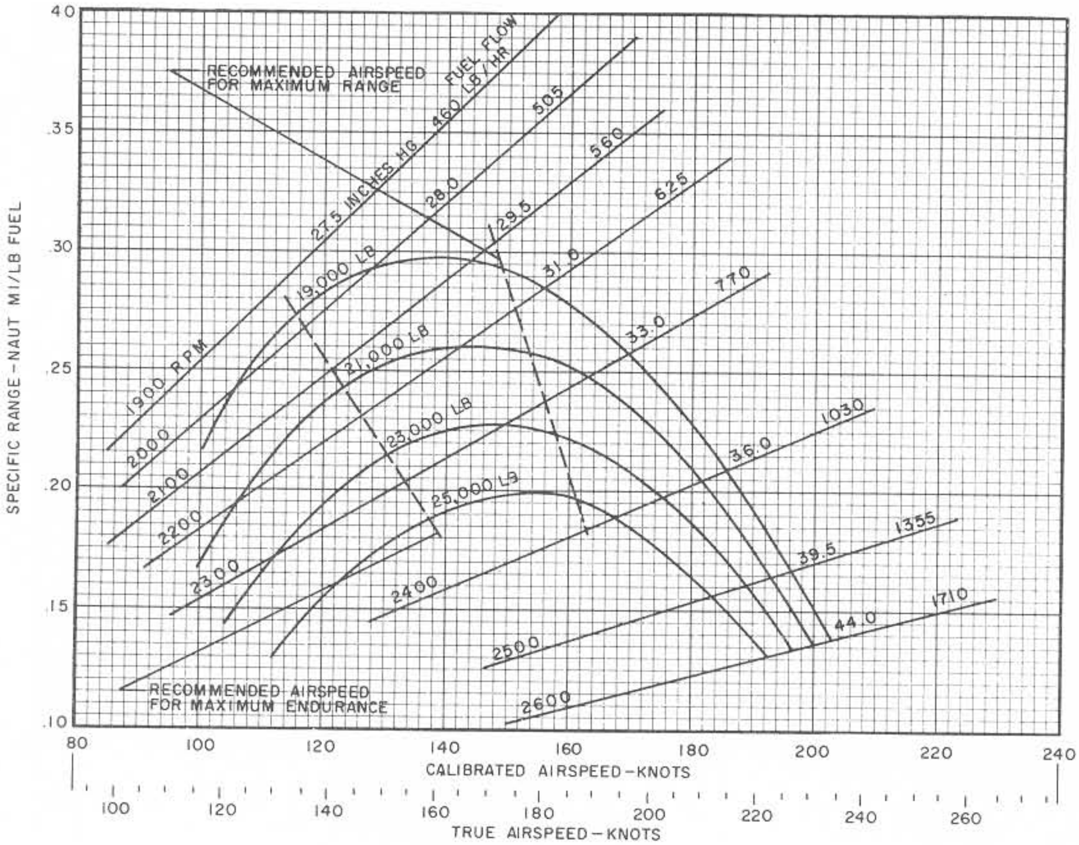
P4452-2A

Figure A-25 (Sheet 2 of 5)

NAUTICAL MILES PER POUND OF FUEL

HEAVY ATTACK CONFIGURATION ALTITUDE 10,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 3-2000 Lb bombs or torpedoes and 6-500 Lb bombs or an alternate item shown below:

(a) 1-2000 Lb bomb, 2-300 Gal tanks and 6-500 Lb bombs
(b) 3 Mk 25 mines

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

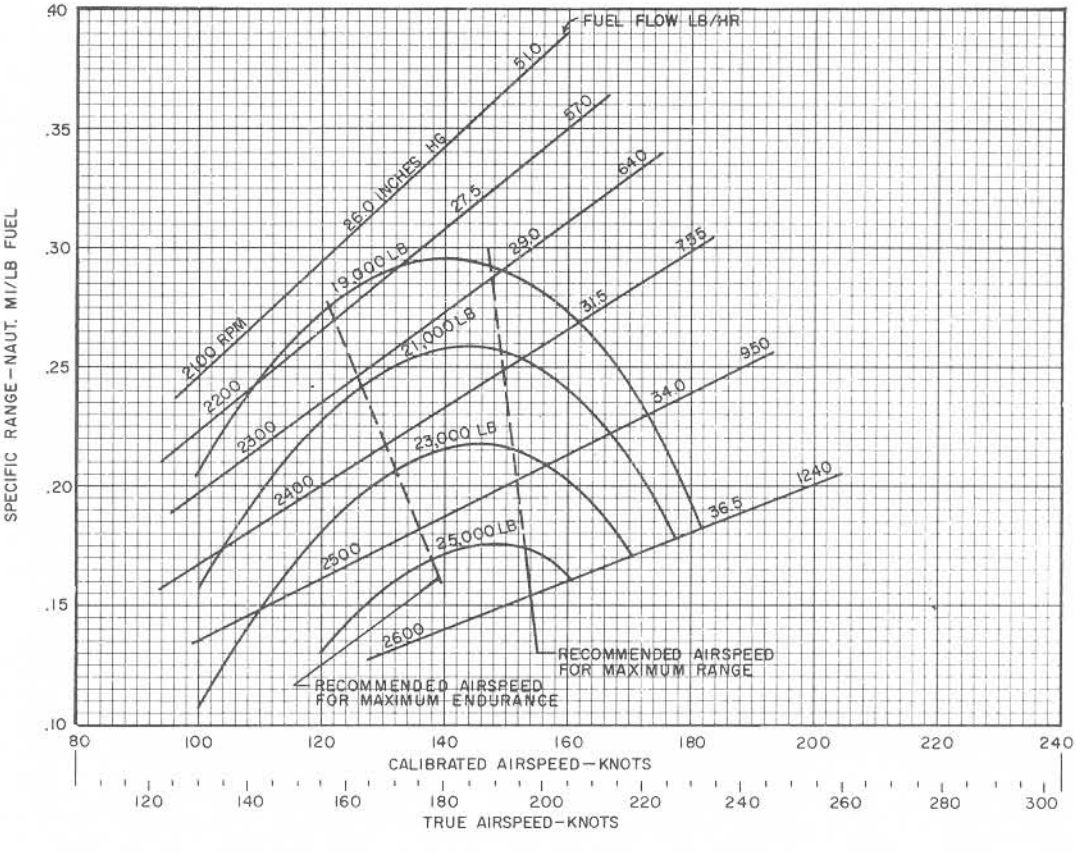
P4452-3

Figure A-25 (Sheet 3 of 5)

NAUTICAL MILES PER POUND OF FUEL

HEAVY ATTACK CONFIGURATION ALTITUDE 15,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 3-2000 Lb bombs or torpedoes and 6-500 Lb bombs or an alternate item shown below:

(a) 1-2000 Lb bomb, 2-300 Gal tanks and 6-500 Lb bombs
(b) 3 Mk 25 mines

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower unless noted otherwise

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

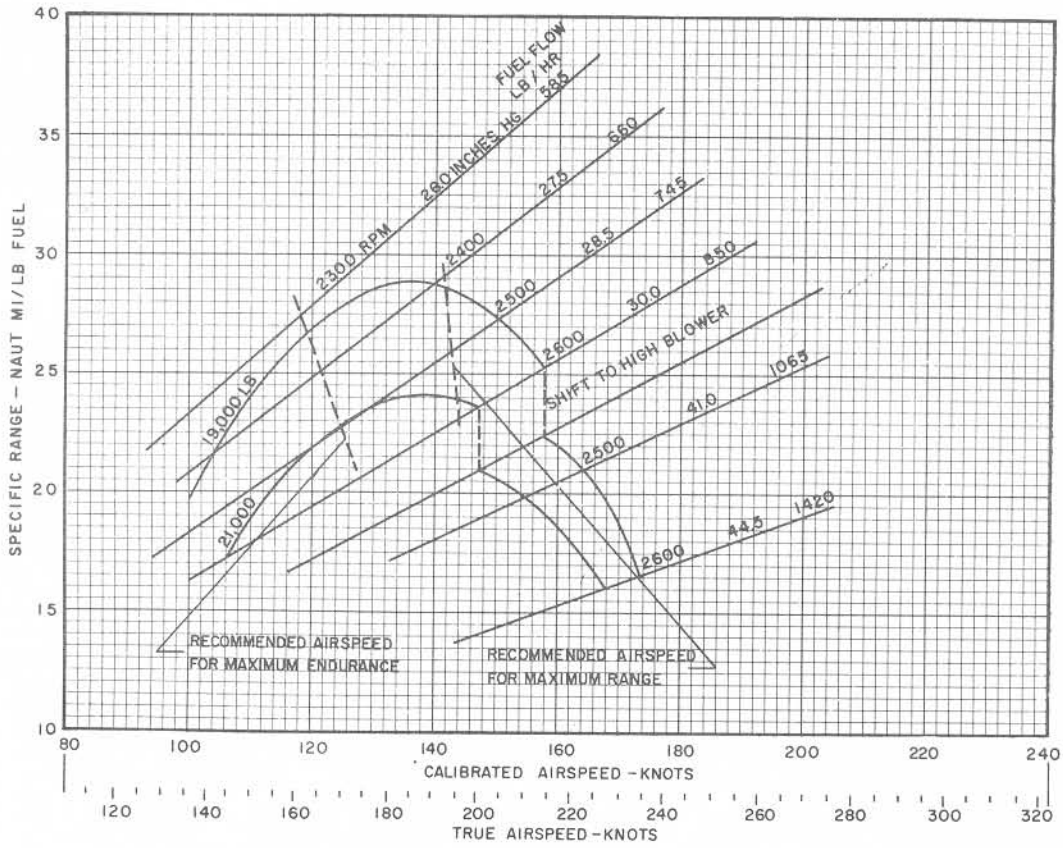
P4452-4

Figure A-25 (Sheet 4 of 5)

NAUTICAL MILES PER POUND OF FUEL

HEAVY ATTACK CONFIGURATION ALTITUDE 20,000 FT STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 3-2000 Lb bombs or torpedoes and 6-500 Lb bombs or an alternate item shown below:

(a) 1-2000 Lb bomb, 2-300 Gal tanks and 6-500 Lb bombs
(b) 3 Mk 25 mines

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower unless noted otherwise

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
P4452-5 FUEL DENSITY: 6.0 Lb/Gal

Figure A-25 (Sheet 5 of 5)

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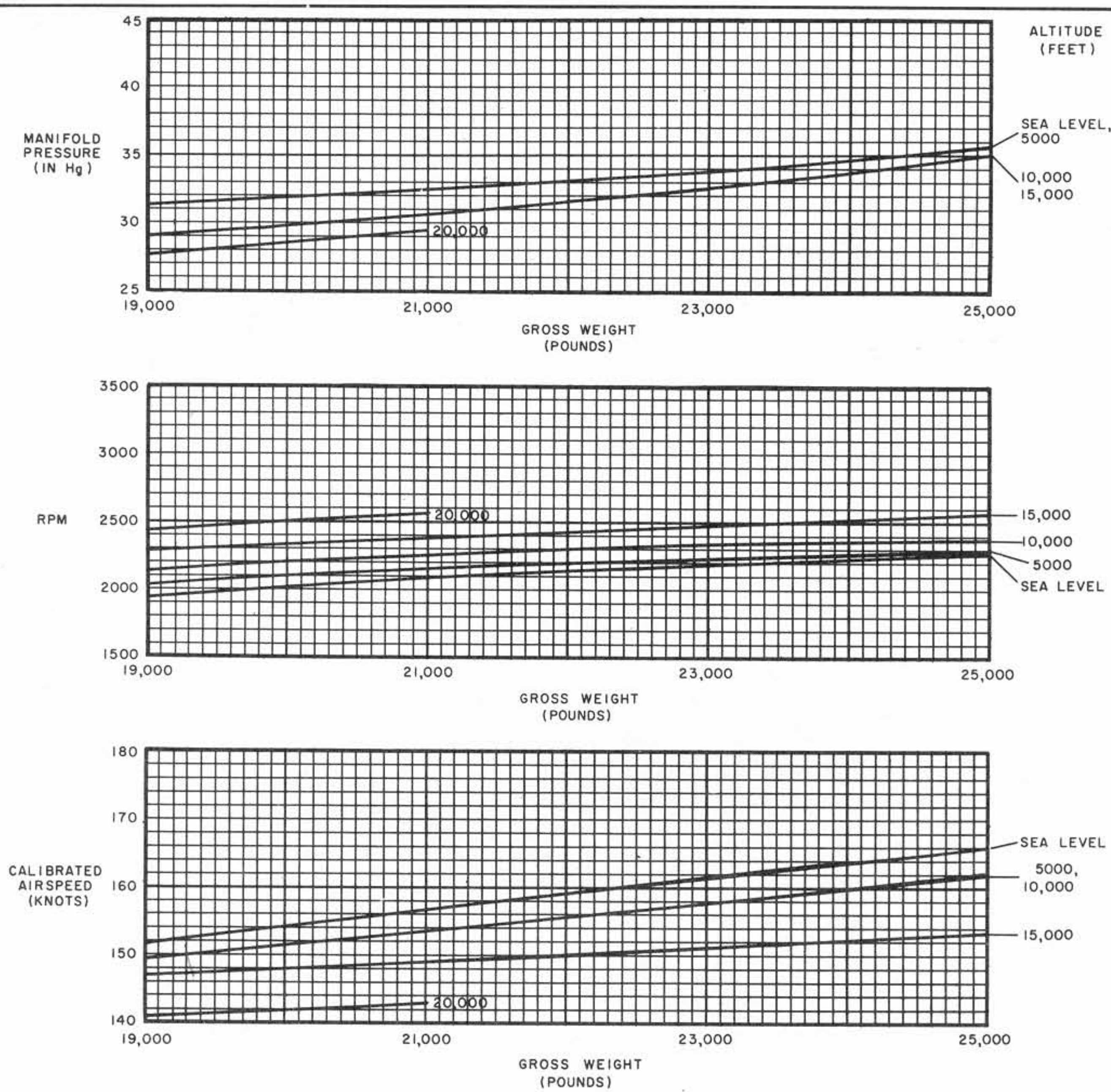
MAXIMUM RANGE POWER CONDITIONS VS GROSS WEIGHT

HEAVY ATTACK CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA



REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 3-2000 Lb bombs or torpedoes, 6-500 Lb bombs or an alternate item shown below:
- (a) 1-2000 Lb bomb, 2-300 Gal tanks and 6-500 Lb bombs
- (b) 3 Mk 25 mines

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

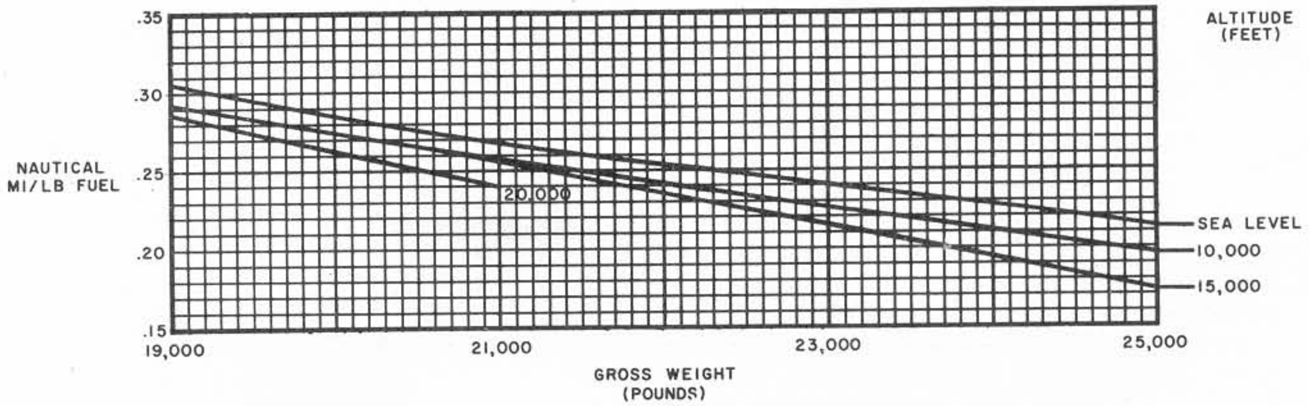
P4453-1A

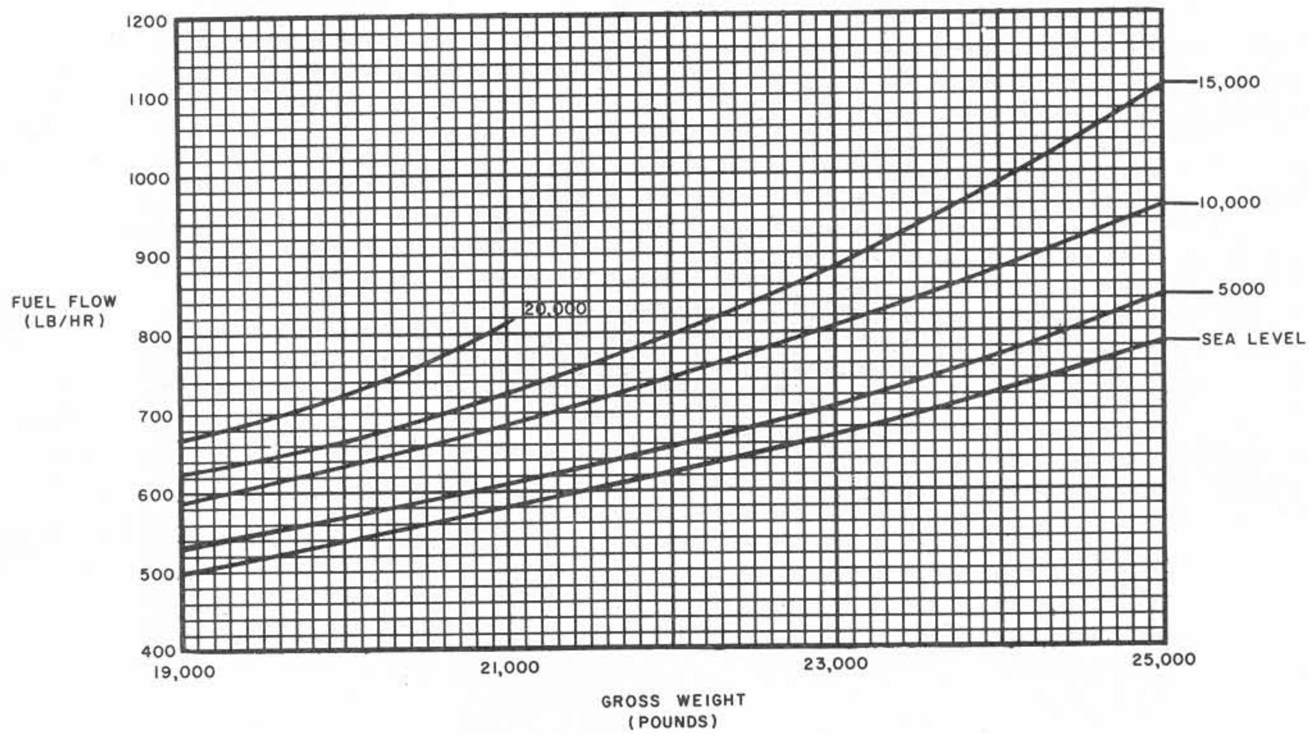
Figure A-26 (Sheet 1 of 2)

MAXIMUM RANGE POWER CONDITIONS VS GROSS WEIGHT

HEAVY ATTACK CONFIGURATION   STANDARD DAY

MODEL: AD-6   PROPELLER: A642-G 804/M20A2-162-0   ENGINE: R3350-26WA





REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 3-2000 Lb bombs or torpedoes, 6-500 Lb bombs or an alternate item shown below:

(a) 1-2000 Lb bomb, 2-300 Gal tanks and 6-500 Lb bombs
(b) 3 Mk 25 mines

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) No wind
(5) Mixture: Normal
(6) Low blower

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

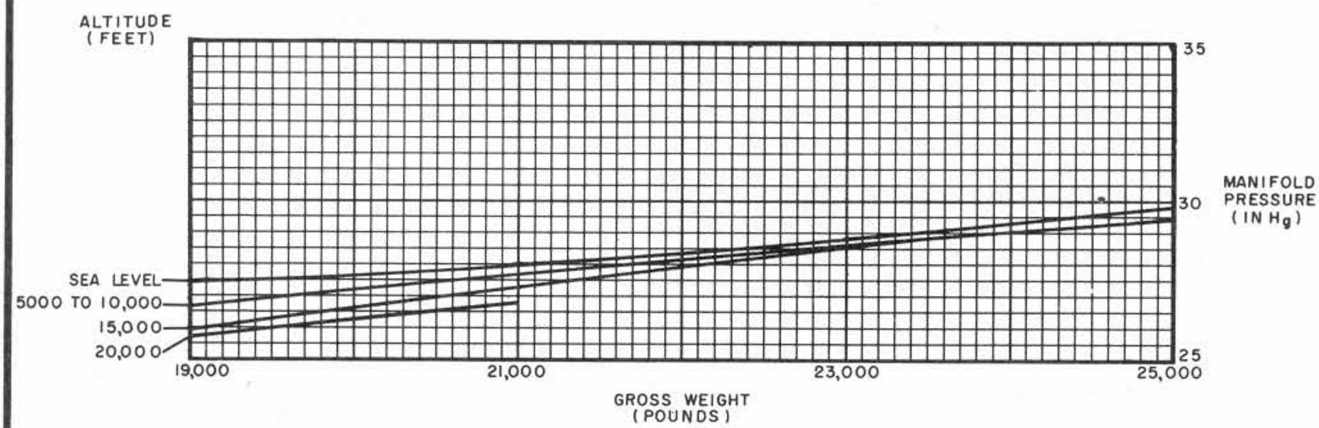
P4453-2

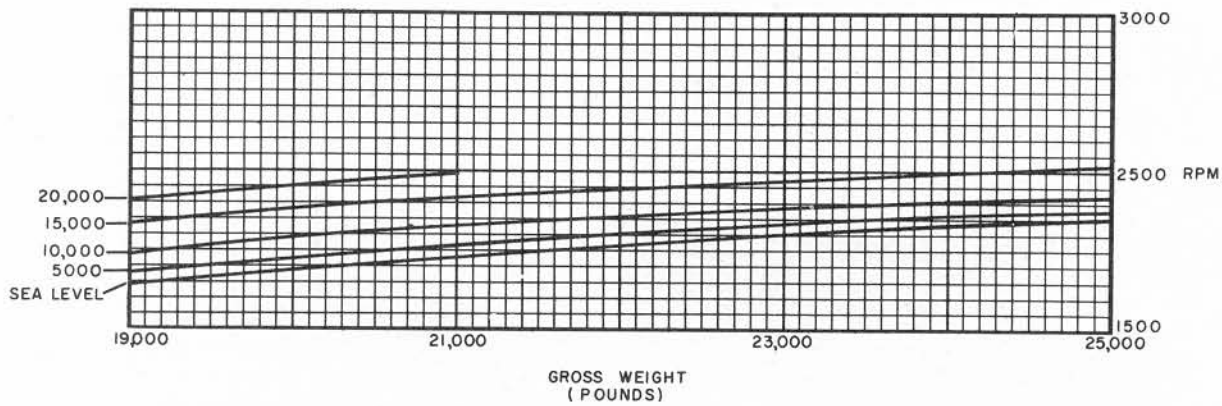
Figure A-26 (Sheet 2 of 2)

MAXIMUM ENDURANCE POWER CONDITIONS VS GROSS WEIGHT

HEAVY ATTACK CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA





REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 3-2000 Lb bombs or torpedoes and 6-500 Lb bombs or an alternate item shown below:

(a) 1-2000 Lb bomb, 2-300 Gal tanks and 6-500 Lb bombs
(b) 3 Mk 25 mines

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) Mixture: Normal
(5) Low blower unless noted otherwise

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

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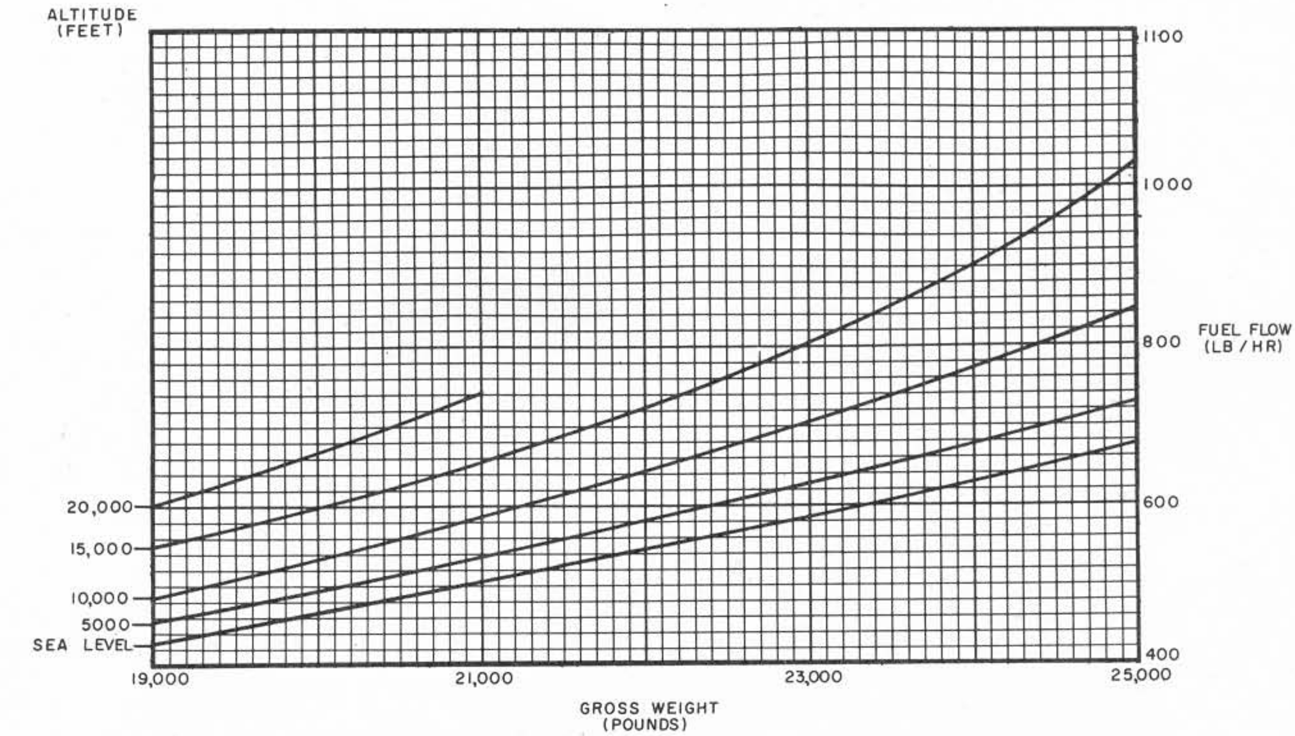
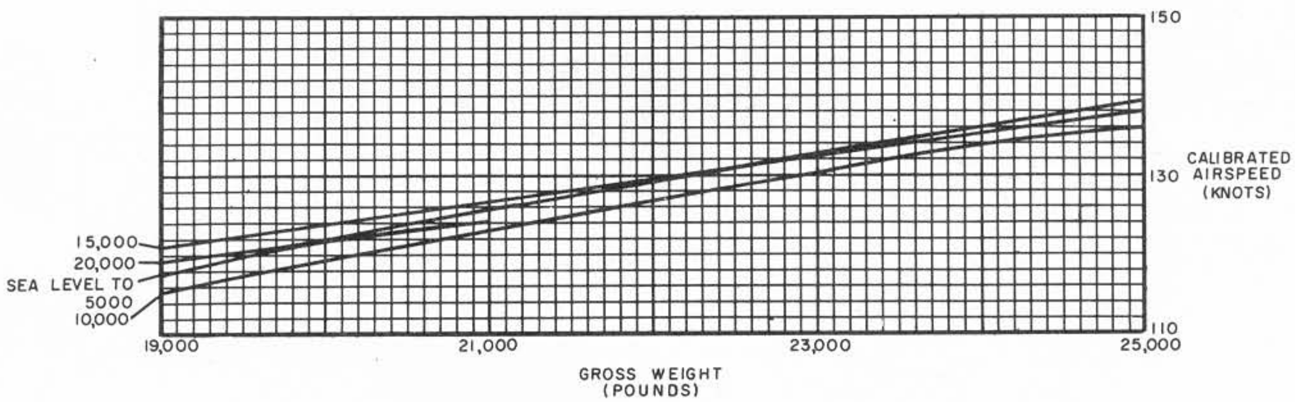
Figure A-27 (Sheet 1 of 2)

MAXIMUM ENDURANCE POWER CONDITIONS VS GROSS WEIGHT

HEAVY ATTACK CONFIGURATION STANDARD DAY

MODEL: AD-6 PROPELLER: A642-G 804/M20A2-162-0 ENGINE: R3350-26WA





REMARKS:

(1) Configuration includes all wing racks, centerline rack, and 3-2000 Lb bombs or torpedoes and 6-500 Lb bombs or an alternate item shown below:

(a) 1-2000 Lb bomb, 2-300 Gal tanks and 6-500 Lb bombs
(b) 3 Mk 25 mines

CONDITIONS:

(1) Cowl flaps closed
(2) Nose flaps open
(3) Oil cooler door faired
(4) Mixture: Normal
(5) Low blower unless noted otherwise

DATA AS OF: 1 June 1953
DATA BASIS: Contractor's flight test of Models AD-2, AD-3, AD-4

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 Lb/Gal

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Figure A-27 (Sheet 2 of 2)

LANDING CHART

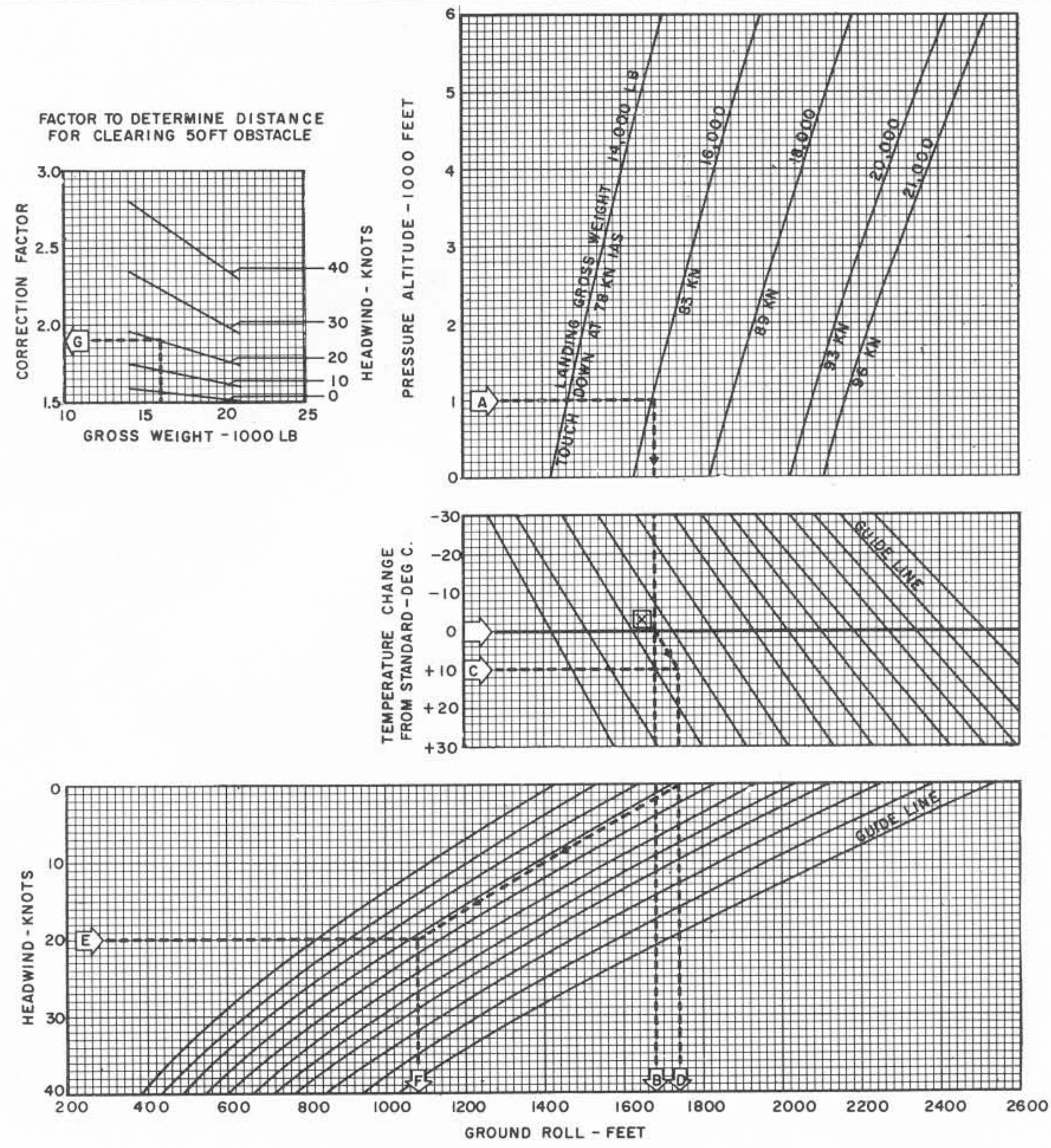
The landing ground roll of the aircraft is dependent on five factors; airport altitude, airport temperature, gross weight of the aircraft, the force of the headwind, and the braking action. The ground roll distance as given has been predicated on a nominal use of braking action on a smooth dry surface such as a paved runway. In figure A-28 the ground roll distance can be obtained for various gross weights including the maximum landing weight, for temperatures 30°C above or below standard temperature (15°C at sea level), and for headwinds as high as 40 knots. The chart also presents the distance required for the landing ground roll when it is necessary to clear a 50 foot obstacle. The distance is given as a percent of the normal landing ground roll distance and is measured from the 50 foot obstacle to the end of the landing roll.

Guide lines are provided for use as reference lines in obtaining ground roll distance. An example for the use of the various graphs within the chart is presented in figure A-28.

LANDING DISTANCE CHART

HARD SURFACE RUNWAY

MODEL: AD-6 | PROPELLER: A642-G804/M20A2-162-0 | ENGINE: R3350-26WA



REMARKS:

(1) Wing flaps full down.
(2) Chart distance will be obtained using normal operating procedure.
(3) Maximum allowable landing weight is 21,000 lb.

EXAMPLE:

Assume that a landing is to be made over a 50 ft obstacle at 16,000 lb gross weight. Airport pressure altitude is 1000 ft and the ambient temperature is +23°C (10°C above standard). Headwind (HW) is 20 knots.

(1) Enter upper chart at 1000 ft (A). At intersection of 16,000 lb weight line sight vertically down and read 1680 ft ground roll (B) for standard day with no wind.

(2) Enter center chart at 0°C. At intersection with line "B" (point X) draw line parallel to guide lines from "X" to temperature line (10° above standard). Read down to "D" (1740 ft) the ground roll distance required at 23°C with no wind.

(3) Enter lower chart at 20 knots (E). At intersection of guide line, sight vertically down and read 1080 ft ground roll distance (F) for 23°C and 20 knots HW.

(4) Enter left chart at 16,000 lb gross weight. At intersection of 20 knots HW line read 1.9 correction factor (G). Total landing distance to clear 50 ft obstacle at 23°C in 20 knots HW is approximately 1080 ft X 1.9 = 2052 ft.

DATA AS OF: 1 January 1954
DATA BASIS: Calculations

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FUEL GRADE: 115/145
FUEL DENSITY: 6.0 lb/gal.

Figure A-28

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