AN 01-5EUA-1

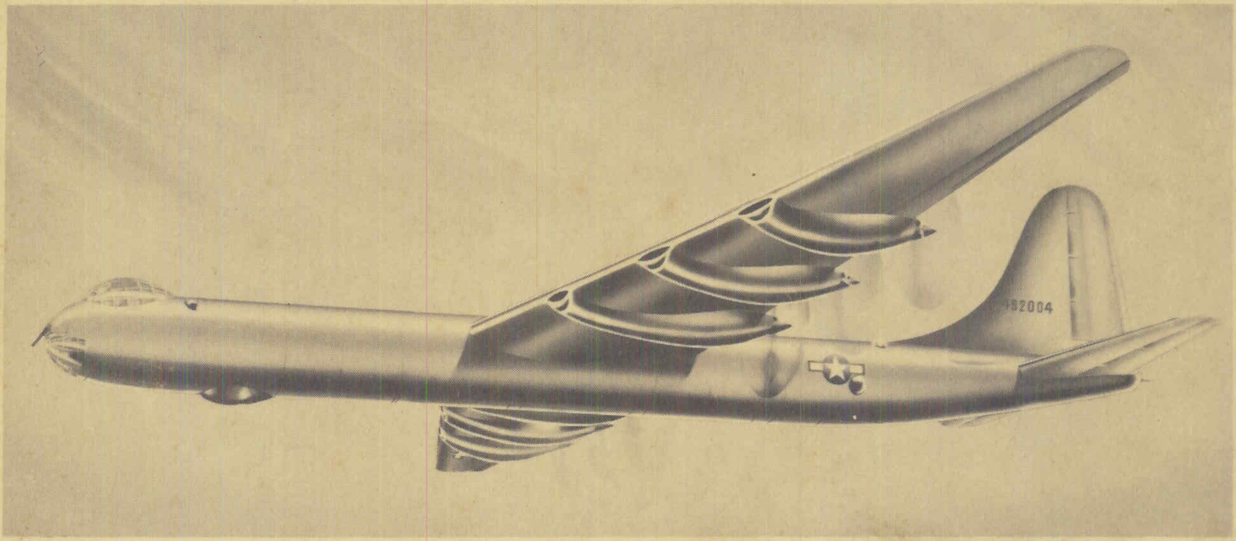
HANDBOOK

FLIGHT OPERATING INSTRUCTIONS

USAF MODEL

B-36

AIRPLANES



Appendixes I and IA of this publication shall not be carried in aircraft on missions where there is a reasonable chance of their falling into the hands of an unfriendly nation.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE
AND THE CHIEF OF THE BUREAU OF AERONAUTICS.

NOTICE: This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, 50 U. S. C., 31 and 32, as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

ROSS-GOULD CO., ST. LOUIS, MO.-10/47-2000

15 OCTOBER 1947

LIST OF REVISED PAGES ISSUED

NOTE: A heavy black vertical line to the left or in outer margin of text on revised pages, indicates the extent of the revision. This line is omitted where more than 50 percent of the page is revised. A black horizontal line to the left of page numbers listed below indicates pages revised, added or deleted by current revision. This line is used only on second and subsequent revisions.

USAF

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED AS FOLLOWS:

USAF ACTIVITIES.—In accordance with Technical Order No. 00-5-2.

NAVY ACTIVITIES.—Submit request to nearest supply point listed below, using form NavAer-140: NAS, Alameda, Calif.; ASD, Guam; NAS, Jacksonville, Fla.; NAS, Norfolk, Va.; NASD, Oahu; NASD, Philadelphia, Pa.; ASD, Samar-Leyte; NAS, San Diego, Calif.; NAS, Seattle, Wash.

For complete listing of available material and details of distribution see Naval Aeronautics Publications Index, NavAer 00-500.

TABLE OF CONTENTS

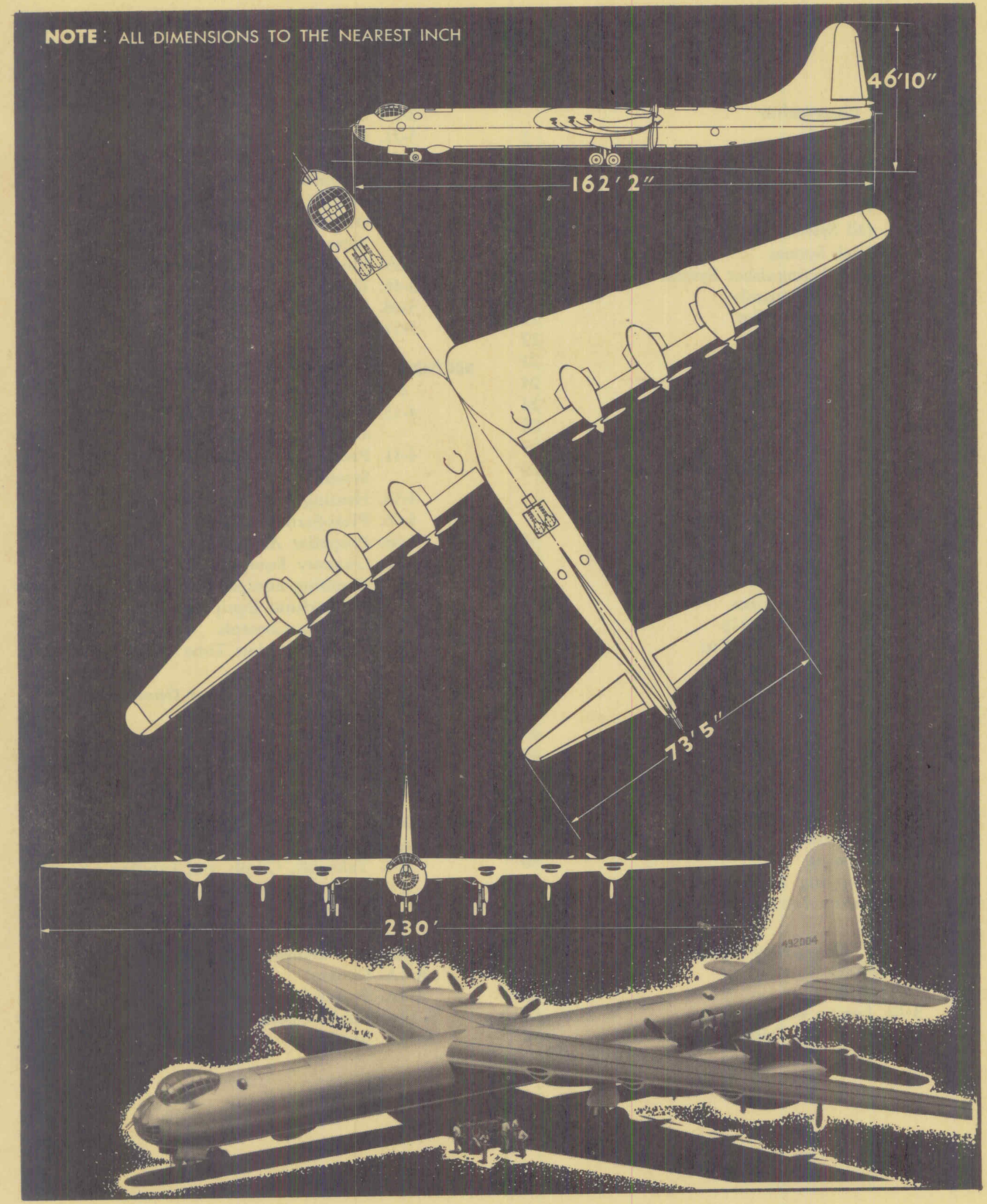


Figure 1. B-36 Airplane

DESCRIPTION

SECTION I

1-1. GENERAL.

1-2. The model B-36, manufactured by Consolidated Vultee Aircraft Corporation, is a long-range, six-engine, very heavy bombardment airplane. Pratt and Whitney engines drive six pusher-type Curtiss propellers capable of being automatically synchronized in normal or reverse pitch. The design gross weight is 278,000 pounds and maximum fuel capacity is approximately 21,000 gallons. Three sets of slotted flaps and servo-tab-operated ailerons, elevators, and rudder make up the surface controls. Three a-c alternators, driven by three of the engines through constant speed drives, furnish all the power to operate the systems. This a-c power operates electrical actuators and is rectified for d-c power and electrical control. Hydraulic power is used for operation of the landing gear, brakes, and nose wheel steering. Crew compartments are pressurized, heated, ventilated, and provided with a regular oxygen system for emergency use. Cabin heating; defrosting of blisters and enclosures; and propeller, wing, and tail anti-icing are accomplished by heated air. Heat for the air is obtained through the use of heat exchangers installed in the engine exhaust systems. Four bomb bays and eight remotely controlled turrets, containing two twenty-millimeter guns each, are the main armament components. Nose and tail turrets are nonretractable. All other turrets retract within the fuselage, and the turret bays are faired by turret doors.

1. Turret (8)
2. Portable Oxygen Bottle Recharger (8)
3. Sun Visor
4. Pilots' Night-flying Curtain (Stowed)
5. Pilots' Station
6. Engineer's Station
7. Toilet Curtain (Stowed)
8. Portable Oxygen Bottle (5)
9. Water Basin
10. Catwalk Door
11. Turbosupercharger Amplifiers (6)
12. Bomb Racks
13. Catwalk
14. Methyl Bromide Containers
15. Relief Container (2)
16. Cup Dispenser (2)
17. Water Beaker (2)
18. Sighting Station (8)
19. Parachute Stowage (2)
20. Rear Entrance Ladder (Stowed)
21. Altitude Warning Equipment
22. Bombardier's Window
23. Bombardier's Station
24. Radar Operator's Station
25. Navigator's Station
26. Drift Signal Chute
27. Forward Entrance Hatch
28. Forward Entrance Ladder (Stowed)
29. Toilet
30. Ditching Jacket Stowage
31. Food Locker
32. Sighting Station Blackout Curtain Stowage
33. Battery
34. Radio Operator's Station
35. Communication Tube Door
36. Spare Turbosupercharger Amplifier
37. Communication Tube
38. Communication Tube Cart
39. Interphone Ground Connection
40. Wing Crawlway Entrance
41. Oxygen Filler Valve
42. Fuel Filler Cap (6)

43 Oil Filler Cap (6)

44. Wing Crawlway
45. Communication Tube Emergency Door Stowage
46. Aft Cabin Walkway
47. Bunks (6)
48. Rear Entrance Hatch
49. Scanning Platform
50. Tail Bumper
51. Tail Compartment Walkway
52. Crawlway Interphone Station (6)
53. External Power Receptacle

Variable Stowage Items
A. Covers:
Engine (6)
Turret (6)
Sighting Blister (6)
Pilots' Enclosure (1)
Bombardier's Enclosure (1)
Pitot Mast (2)

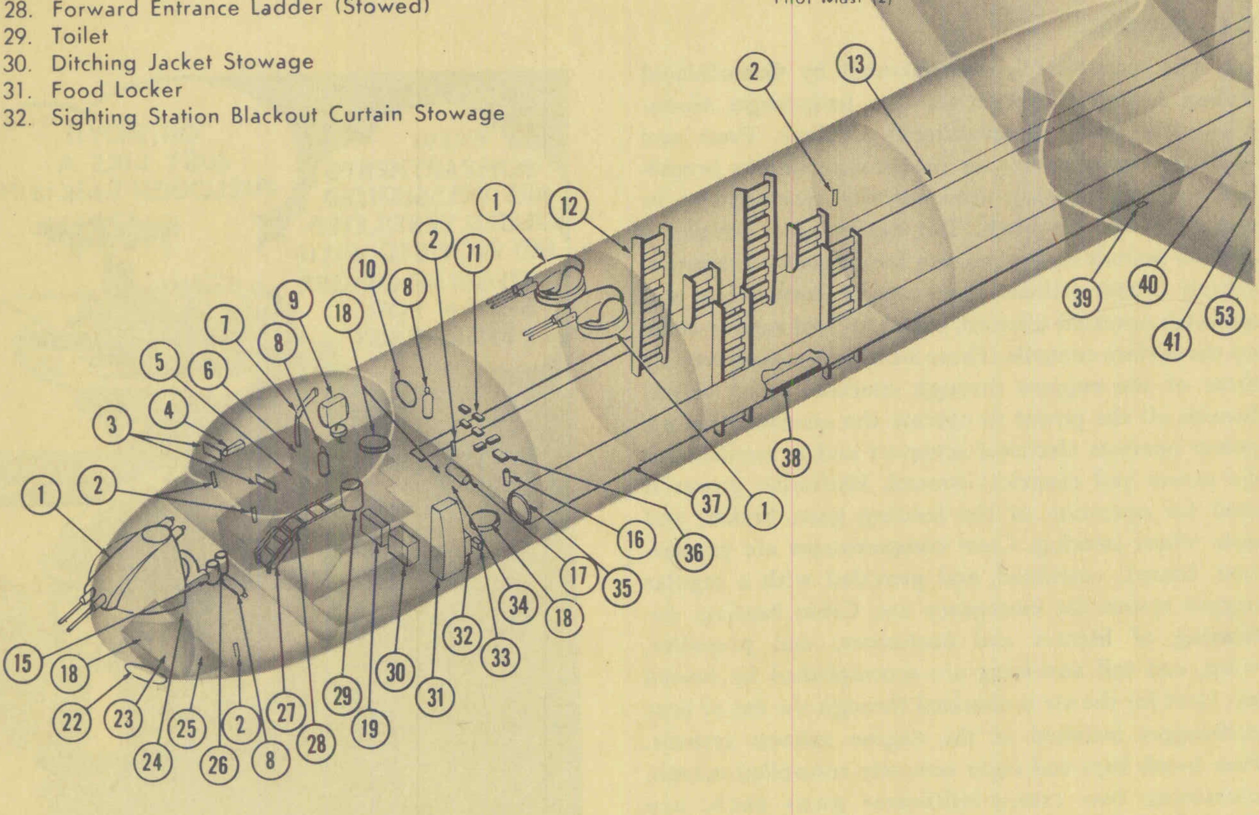
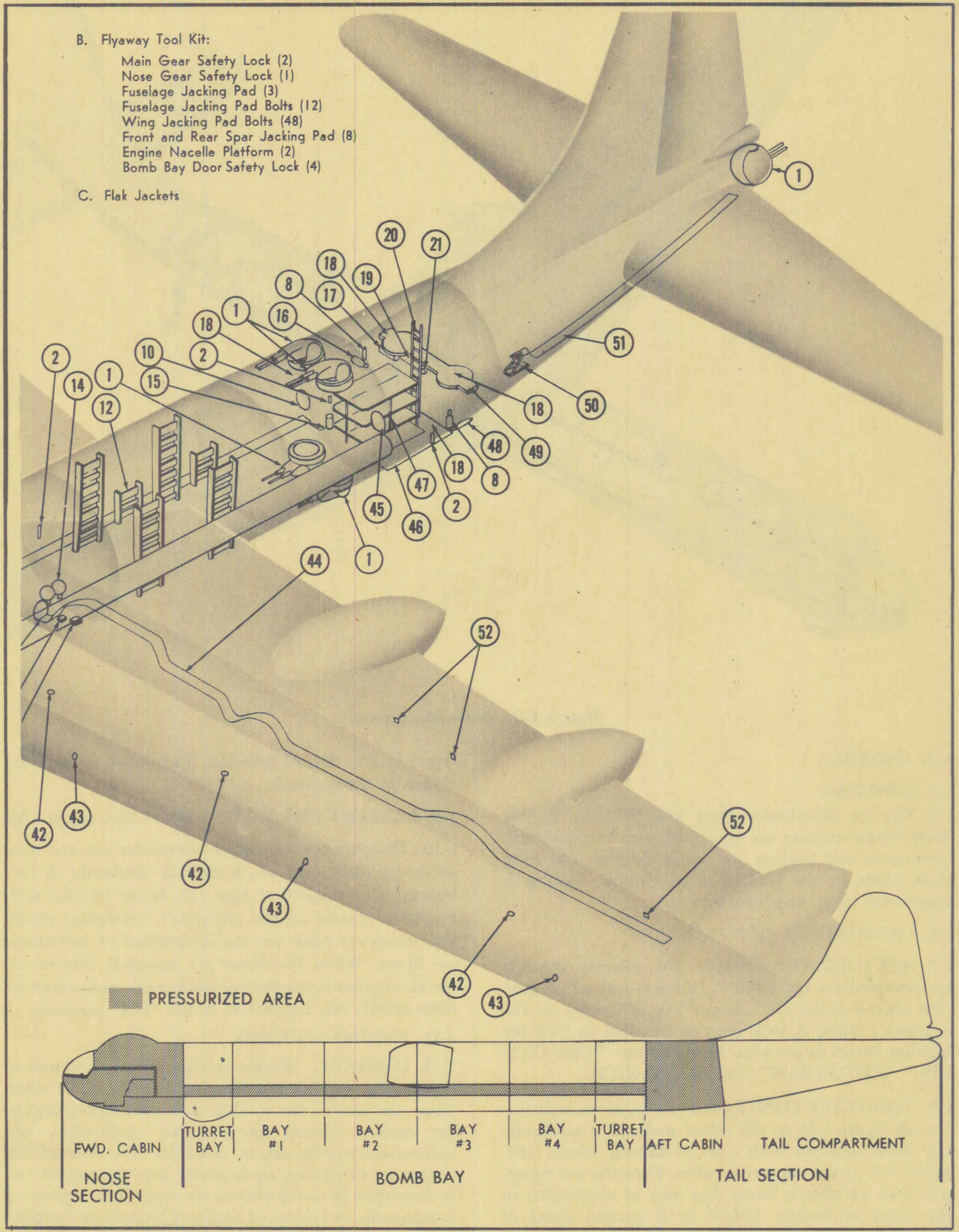


Figure 1-1. (Sheet 1 of 2 Sheets) General Arrangement Diagram



B. Flyaway Tool Kit:
- Main Gear Safety Lock (2)
- Nose Gear Safety Lock (1)
- Fuselage Jacking Pad (3)
- Fuselage Jacking Pad Bolts (12)
- Wing Jacking Pad Bolts (48)
- Front and Rear Spar Jacking Pad (8)
- Engine Nacelle Platform (2)
- Bomb Bay Door Safety Lock (4)

C. Flak Jackets

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

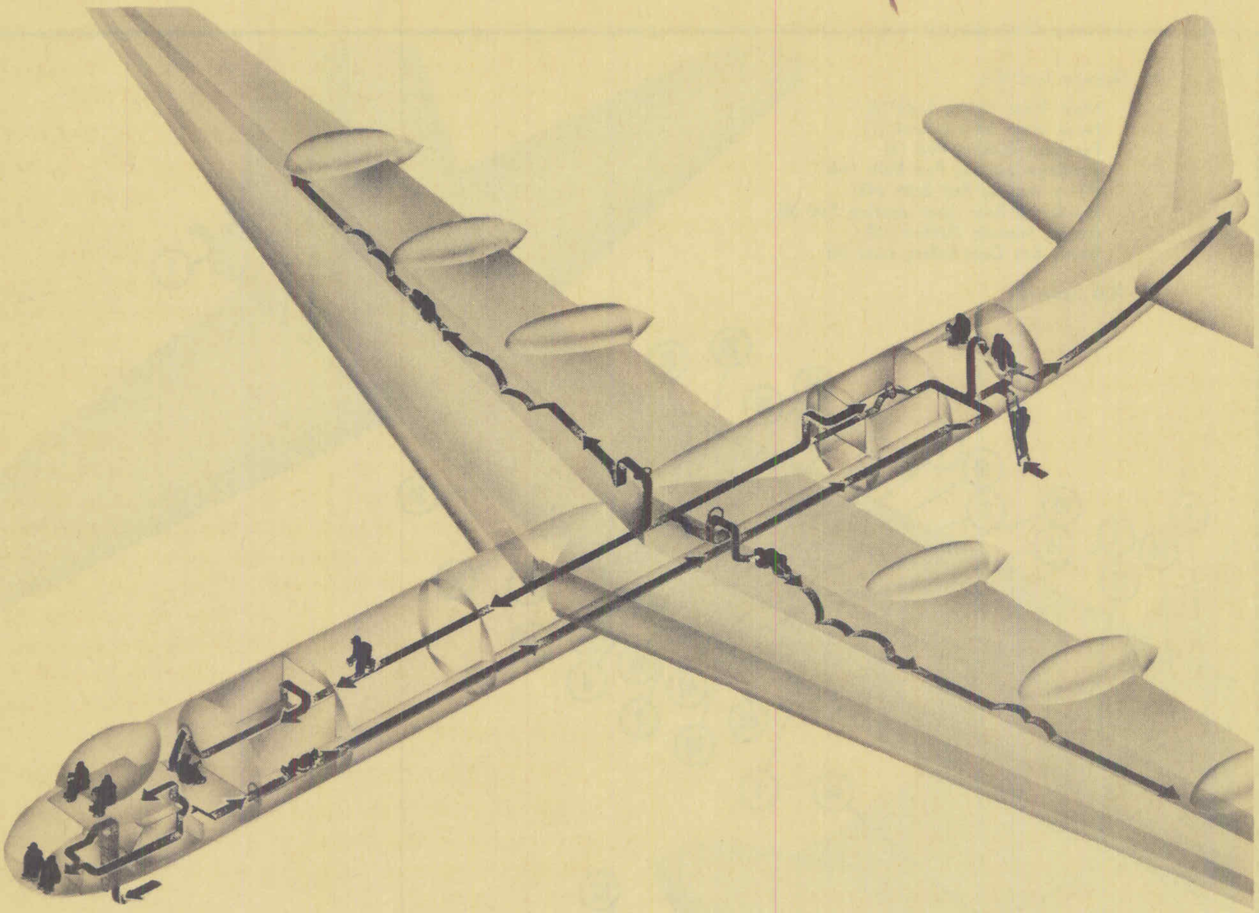


Figure 1-2. Crew Movement

1-3. ENGINES.

1-4. GENERAL.

1-5. The six 28-cylinder Pratt and Whitney R-4360 Wasp Major engines are equipped with torquemeters. Carburetor and cooling air passes through the wing from inlets in the leading edge. Engine cooling is augmented by an engine-driven fan.

1-6. CARBURETOR CONTROLS.

1-7. MIXTURE CONTROLS. No mixture controls are provided for the pilot. A conventional set of mixture control levers (106, figure 1-4) is located on the engineer's table. A lock lever is installed to lock the mixture levers in position. Positions are "IDLE CUT-OFF," "AUTO-LEAN," and "AUTO-RICH."

1-8. THROTTLE CONTROLS. A set of throttle levers (48, figure 1-3) on the pilots' pedestal is mechanically interconnected with a set of throttle levers (108, figure 1-4) at the engineer's table. Throttles are equipped with an electric boost that may be overridden in the event of booster failure or if greater speed of throttle operation is required. A lock lever on the left side of the pilots' throttle levers will lock the throttle levers in any desired position. This lock can be overridden by the engineer.

1-9. CARBURETOR AIR CONTROL. (See figure 1-5.)

1-10. Temperature control of intercooler air, and consequently carburetor air, is entirely automatic. A carburetor air temperature gage (12, figure 1-4) for each engine is located on the engineer's instrument panel. Provisions are made for the installation of carburetor air filters. When the filters are installed, filtered air for all engines is selected by placing the carburetor air filter switch (47, figure 1-4) in the "ON" position.

1-11. ENGINE COOLING.

1-12. GENERAL. Engine cooling air is introduced to the nacelle through a cooling air tunnel. Air is taken from the tunnel for cooling the turbosuperchargers, the exhaust system, the propeller mechanism, and various electrically driven actuators. The flow of the remainder of cooling air is routed over the engine and is controlled by a ring-shaped air plug whose operation is automatic. A two-speed engine-driven fan is installed in the air tunnel to increase the volume of cooling air flow.

1-13. FAN SPEED CONTROL SWITCHES. Six two-position switches (46, figure 1-4) control the high and low speeds of the six engine-driven fans.

1-14. STARTING SYSTEM.

1-15. The six direct-cranking starters are controlled by their three-position switches (52, figure 1-4). These switches are marked "OFF" in the center position with engine numbers above and below.

1-16. IGNITION SYSTEM.

1-17. A master ignition switch and individual engine switches (53, figure 1-4) for checking magnetos are provided the flight engineer. Positions of the individual switches are marked "OFF," "L," "R," and "BOTH." The unmarked indent between "L" and "R" is another "BOTH" position. An emergency ignition switch (33, figure 1-3) which may be pulled to stop all engines is located on the pilots' panel.

1-18. TURBOSUPERCHARGER SYSTEM.

1-19. GENERAL.

1-20. Each engine is equipped with two turbosuperchargers to provide cabin pressurization and an airplane service ceiling of 40,000 feet. Single or dual turbosupercharger operation is possible.

1-21. TURBOSUPERCHARGER CONTROLS.

1-22. ENGINE SUPERCHARGER SWITCHES. The six engine supercharger selector switches (49, figure 1-4) located on the engineer's control panel, control the position of a valve in the exhaust system. Placing the switch in the "R.H. ONLY" position diverts all exhaust gas through the right turbosupercharger. The alternate switch position is labeled "BOTH."

1-23. TURBOSUPERCHARGER BOOST SELECTOR LEVER. A turbo boost selector lever (56, figure 1-3) on the pilots' pedestal is interconnected by a cable to a similar lever (110, figure 1-4) on the engineer's table. Both installations have lever travel graduated from zero to 10. The number seven graduation is the position used for take-off and contains an indent to stop the lever at this position. The lever can be forced past the stop toward position "10" to obtain additional boost.

1-24. CALIBRATION POTENTIOMETER KNOBS. To equalize manifold pressures during flight, small individual adjustments of manifold pressures are made through the use of six calibration potentiometer knobs (111, figure 1-4) located to the right of the engineer's turbosupercharger boost selector lever. Each knob contains an indexing mark, as does its corresponding housing. The marks on the knobs and the marks on the housings are lined up before and during take-off. During cruise the knobs are moved as required to obtain equal manifold pressures.

1-25. TURBOSUPERCHARGER INDICATORS.

1-26. Three dual manifold pressure gages (8, figure 1-4) are supplied the engineer. The pilots have a single manifold pressure gage (17, figure 1-3) connected to No. 4 engine.

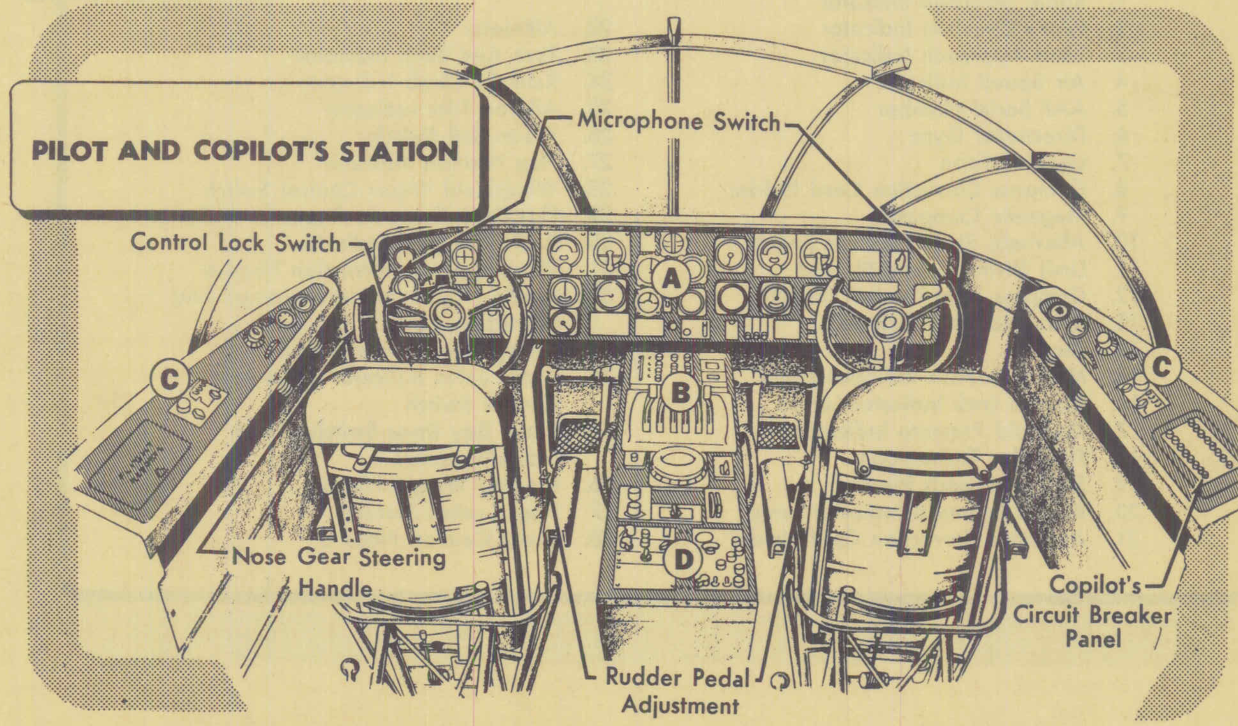
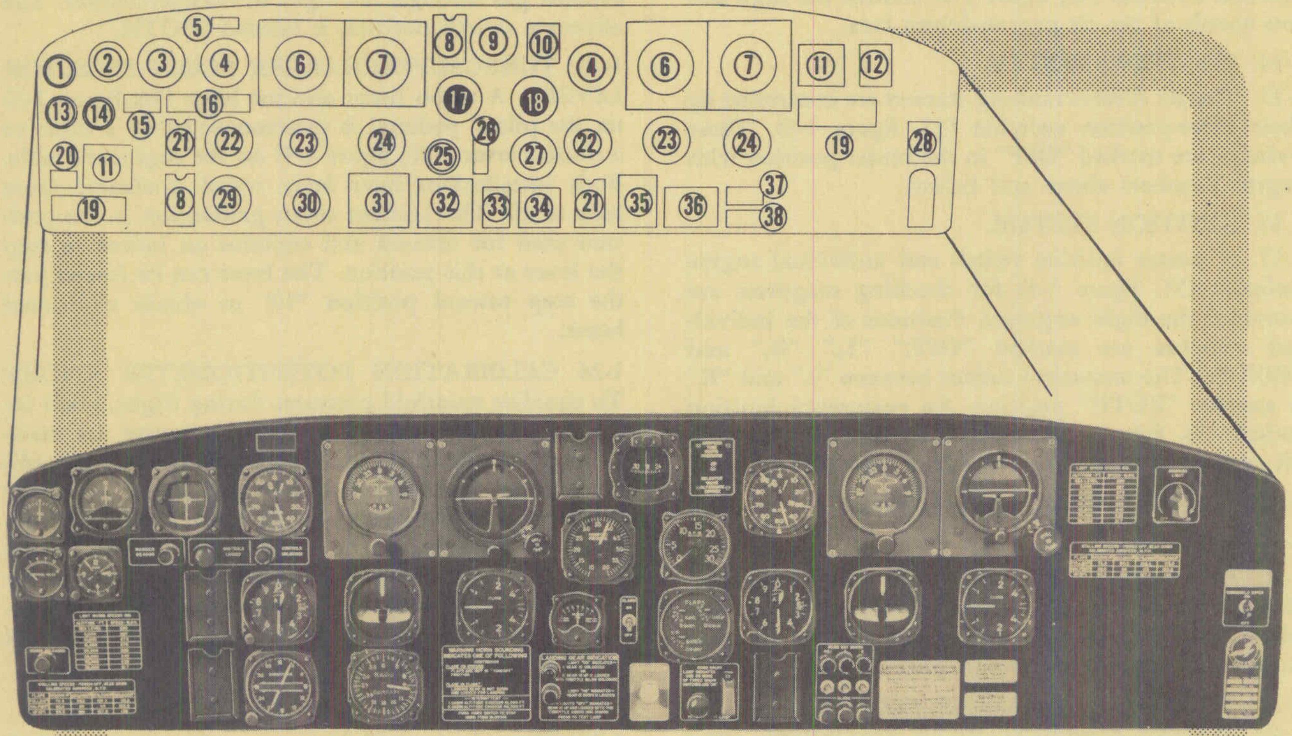


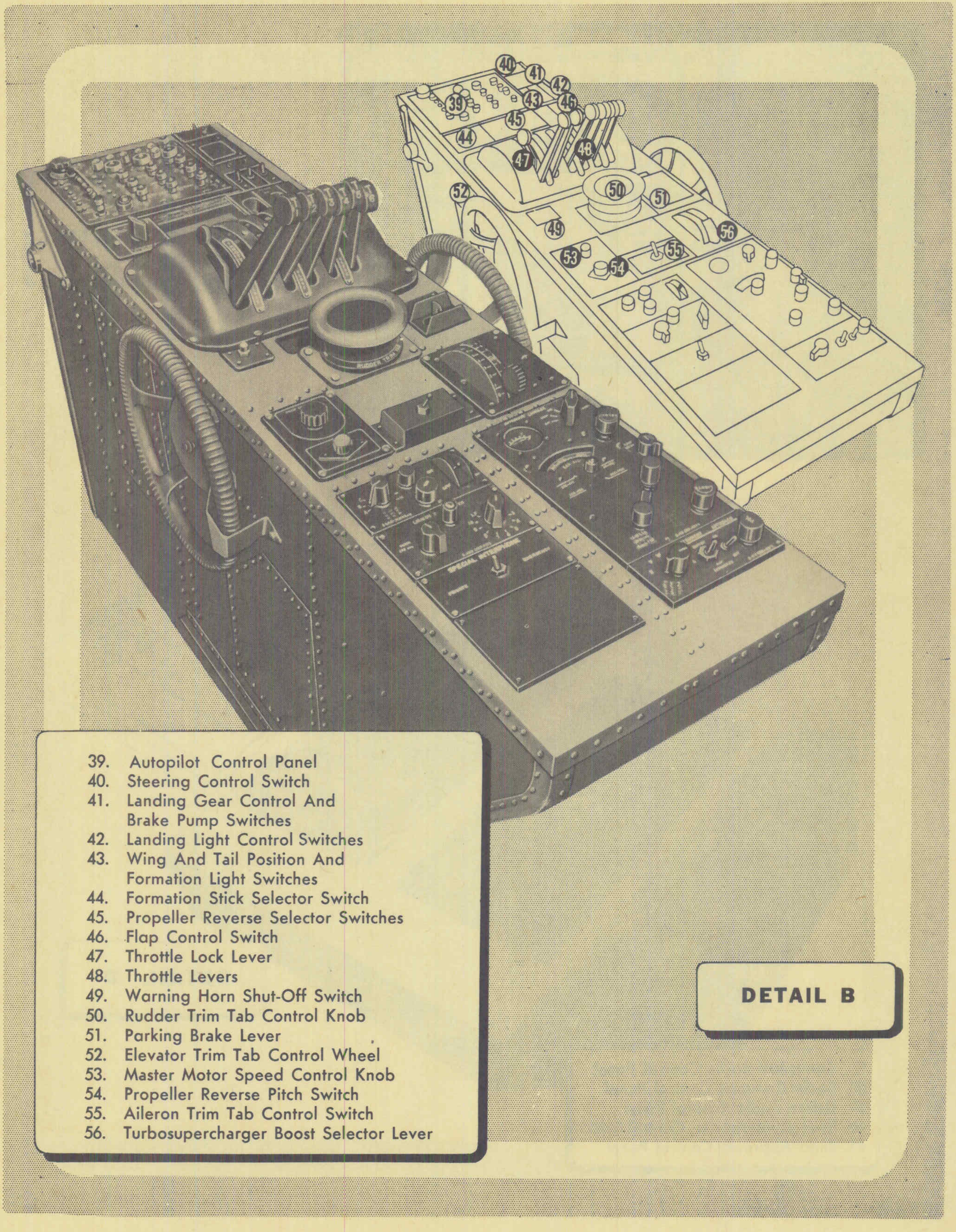
Figure 1-3. (Sheet 1 of 4 Sheets) Pilot and Copilot's Station



DETAIL A

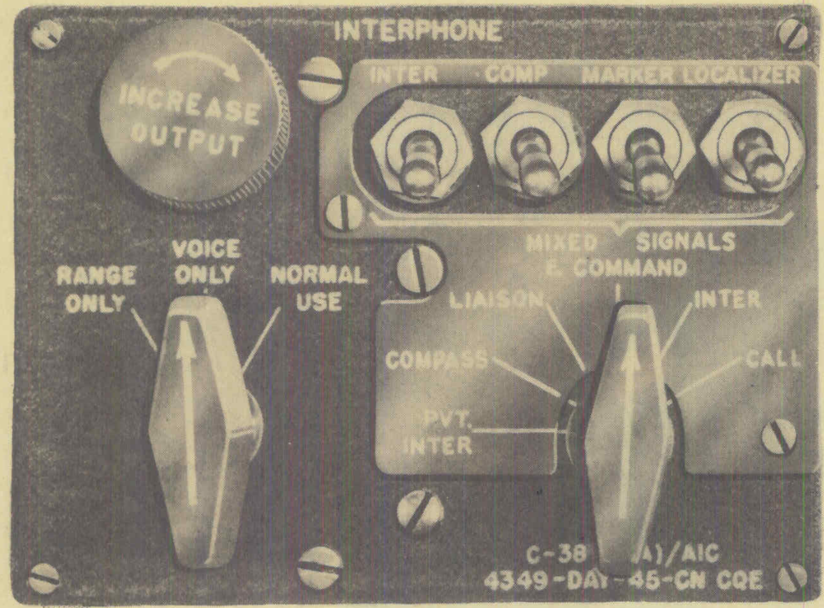
1. Radar Direction Indicator
2. Pilot's Direction Indicator
3. Blind Approach Indicator
4. Air Speed Indicator
5. AAF Serial Number
6. Directional Gyro
7. Gyro Horizon
8. Compass Correction Card Holder
9. Magnetic Compass
10. Alternate Static Pressure Switch
11. Limit Diving Speed Placard
12. Compass Light Control Switch
13. Radar Range Indicator
14. Clock
15. Marker Beacon Indicator Lamp
16. Control Lock Indicator Lamps
17. Manifold Pressure Indicator
18. Propeller Tachometer
19. Stalling Speeds Placard
20. Bombs Released Indicator Lamp
21. Altimeter Correction Card Holder
22. Altimeter
23. Turn And Bank Indicator
24. Rate Of Climb Indicator
25. Aileron Trim Indicator
26. Alarm Bell Switch
27. Flap Position Indicator
28. Windshield Wiper Control Switch
29. Flux Gate Compass Repeater Indicator
30. Radio Compass Indicator
31. Warning Horn Instruction Placard
32. Landing Gear Indication Lamps And Instruction Panel
33. Emergency Ignition Switch
34. Bomb Salvo Indicator Lamp And Control Switch
35. Bomb Bay Door Switches And Indicator Lamps
36. Landing Weight Placard
37. Flap Caution Placard
38. Brake Caution Placard

Figure 1-3. (Sheet 2 of 4 Sheets) ***Pilot and Copilot's Station***

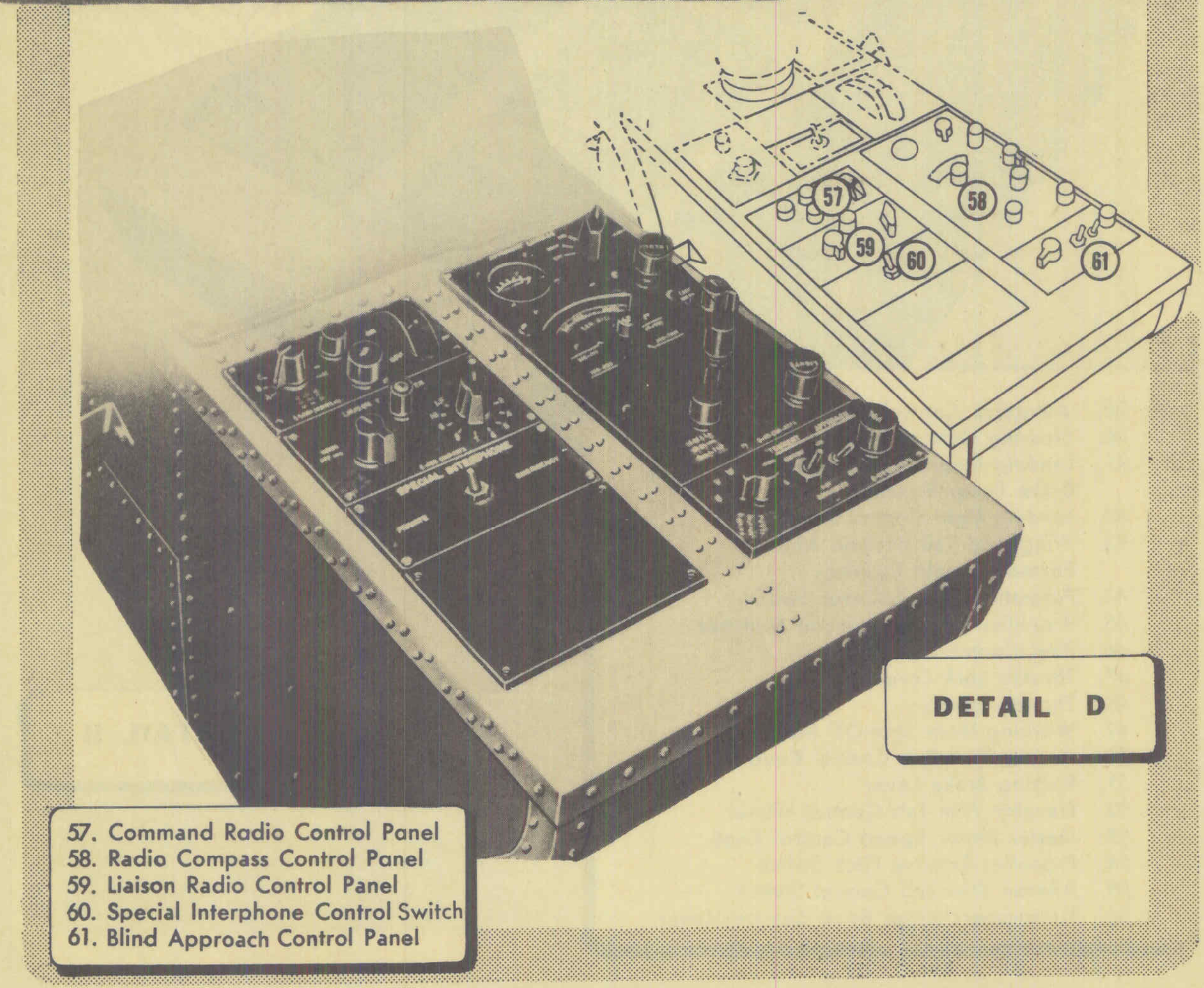


39. Autopilot Control Panel
40. Steering Control Switch
41. Landing Gear Control And Brake Pump Switches
42. Landing Light Control Switches
43. Wing And Tail Position And Formation Light Switches
44. Formation Stick Selector Switch
45. Propeller Reverse Selector Switches
46. Flap Control Switch
47. Throttle Lock Lever
48. Throttle Levers
49. Warning Horn Shut-Off Switch
50. Rudder Trim Tab Control Knob
51. Parking Brake Lever
52. Elevator Trim Tab Control Wheel
53. Master Motor Speed Control Knob
54. Propeller Reverse Pitch Switch
55. Aileron Trim Tab Control Switch
56. Turbosupercharger Boost Selector Lever

Figure 1-3. ***(Sheet 3 of 4 Sheets) Pilot and Copilot's Station***



DETAIL C
INTERPHONE SELECTOR PANEL



DETAIL D

57. Command Radio Control Panel
58. Radio Compass Control Panel
59. Liaison Radio Control Panel
60. Special Interphone Control Switch
61. Blind Approach Control Panel

Figure 1-3. (Sheet 4 of 4 Sheets) Pilot and Copilot's Station

1-27. PROPELLERS.

1-28. GENERAL.

1-29. The airplane is equipped with six Curtiss constant-speed, full-feathering, reversible propellers. The propeller control system employed is similar to that used on previous models of synchronizer-equipped electric propellers, with the exception that synchronized operation is possible in the reverse range. The method of accomplishing pitch change differs considerably however.

1-30. PITCH CHANGE SYSTEM. Pitch change is accomplished mechanically—the power for this operation is taken from the engine at the propeller shaft. Clutch engagement for operation of the pitch change mechanism is accomplished hydraulically. The hydraulic power is controlled by solenoids. A small electric motor drives the blades in the last of the feathering and the beginning of the unfeathering cycles when the engine is operating below 450 rpm and is unable to furnish power.

1-31. PITCH CHANGE RATE. Pitch change during feather and reverse is 45 degrees per second. Normal pitch change rate is 2 1/2 degrees per second.

1-32. NORMAL CONTROLS.

1-33. GENERAL. Control of propeller speed is conventional but synchronization is accomplished by making the speed of all engines compare with the speed of an electrically driven master motor. A propeller alternator on each engine supplies an electrical indication of engine speed to the master motor. If the speed does not coincide with that of the master motor, corrective impulses will be transmitted to the pitch changing mechanism until the engine is operating at master motor rpm. All engines will operate at master motor rpm when their respective propeller selector switches are set at "AUTO." In the event of master motor failure, the propellers will remain at the pitch in effect when its failure occurred. Pitch changes will then be accomplished by moving the selector switches to the "INC. RPM" or the "DEC. RPM" position.

1-34. PROPELLER SELECTOR SWITCHES. (See 116, figure 1-4.) Six conventional propeller selector switches having four positions—"AUTO," "DEC. RPM," "INC. RPM," and "FIXED PITCH"—are provided on the engineer's table. Normal control indication is given by the engine tachometers. When propellers are operating in the "AUTO" position, the rpm indication on the engine tachometer and propeller tachometer will be identical.

1-35. MASTER MOTOR SWITCH. (See 115, figure 1-4.) The master motor is turned "ON" and "OFF" by means of this switch.

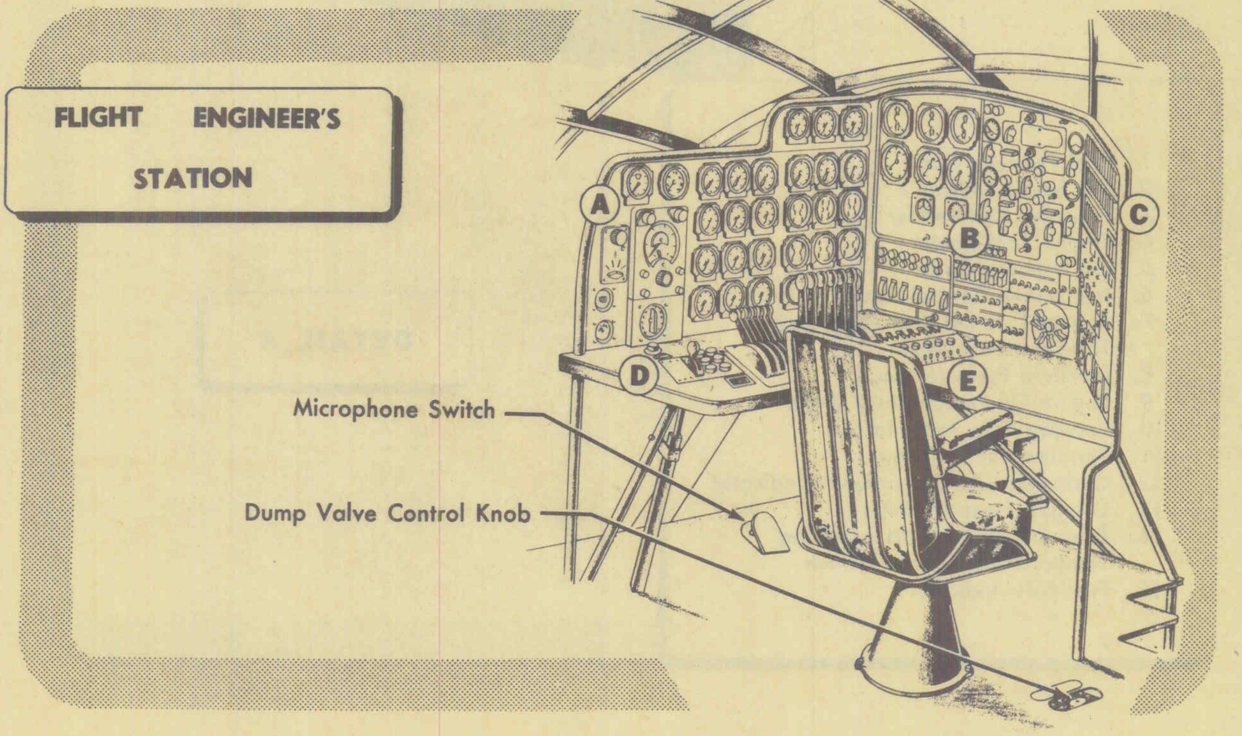
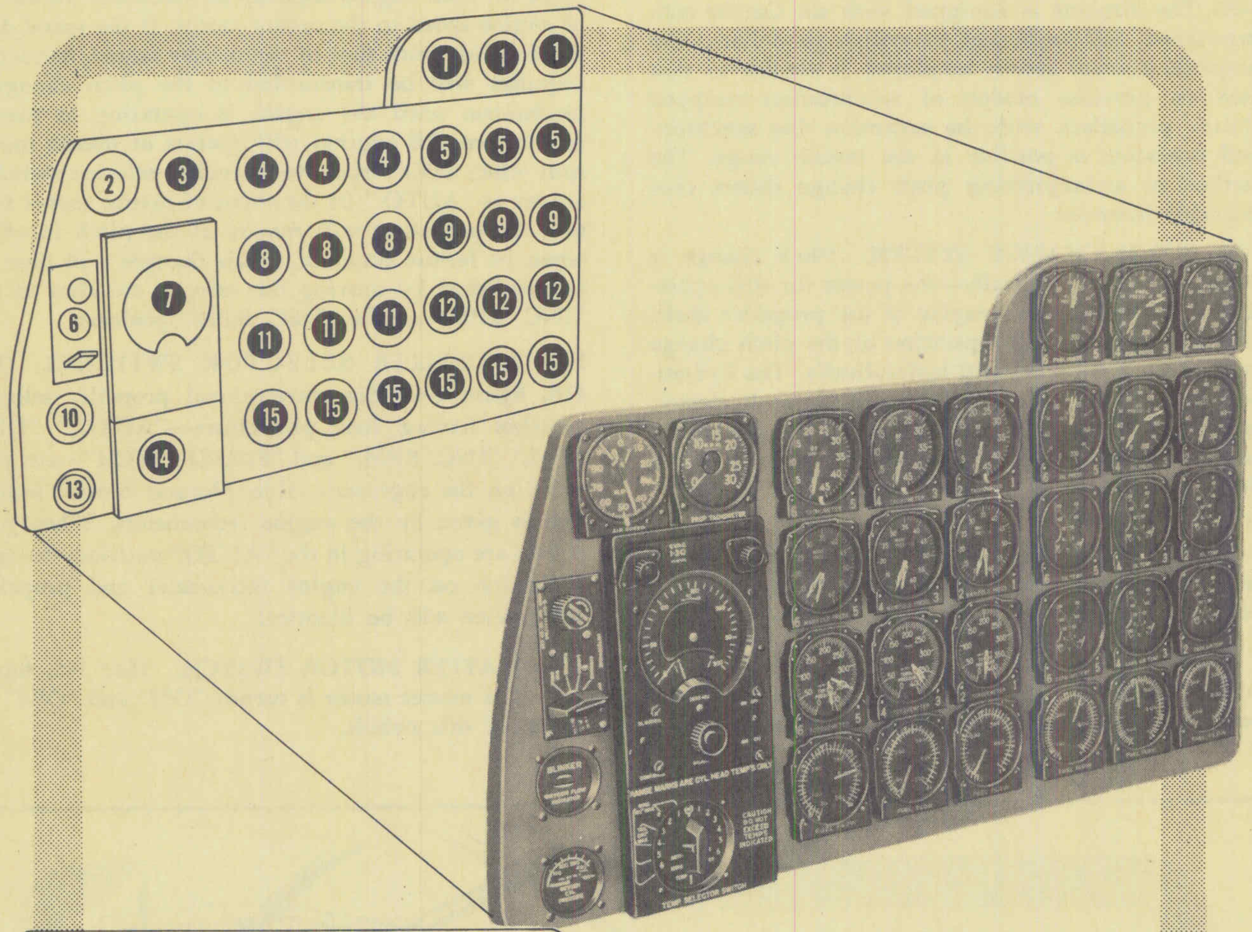


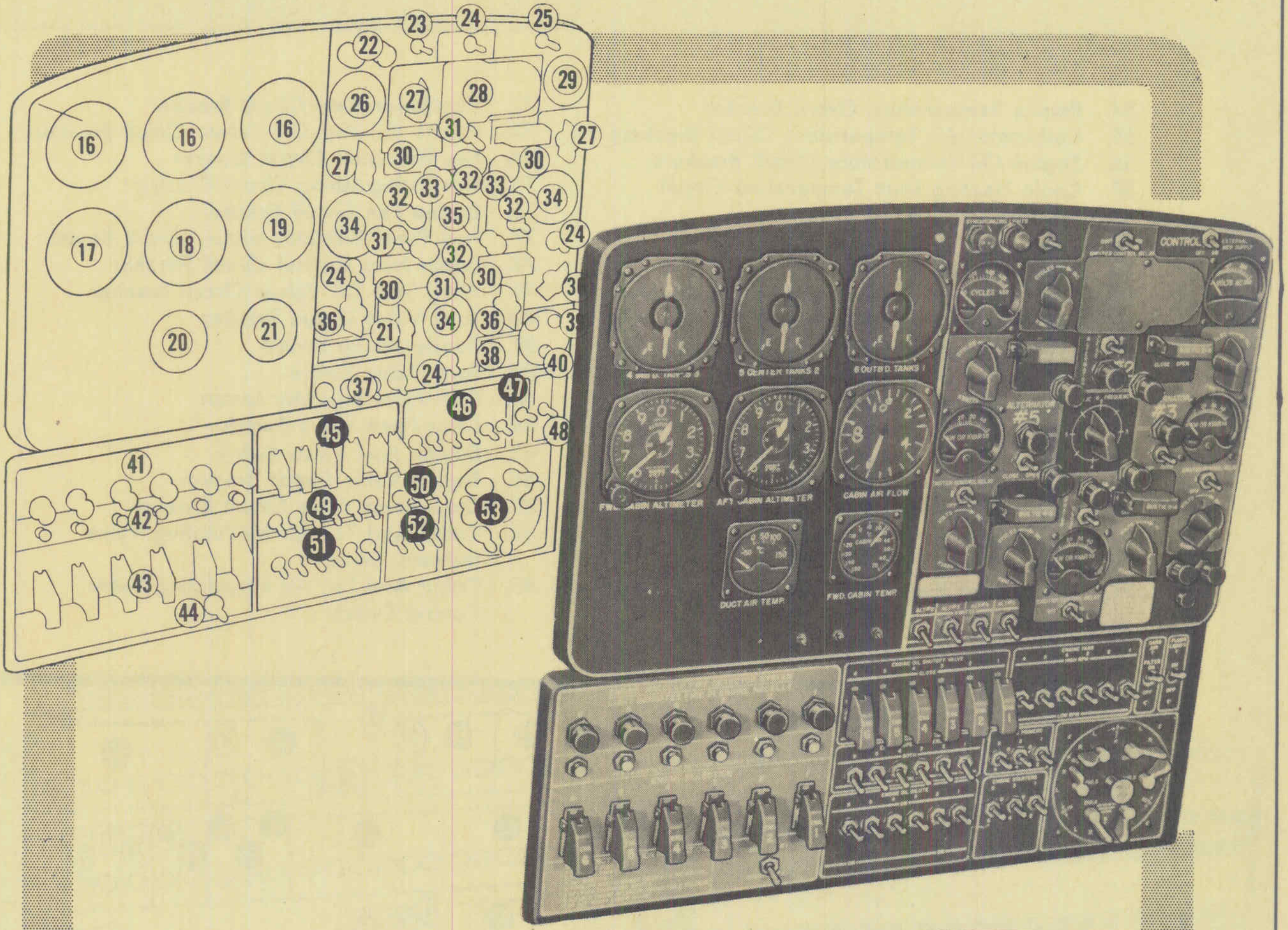
Figure 1-4. (Sheet 1 of 6 Sheets) Flight Engineer's Station



1. Fuel Pressure Gage
2. Air Speed Indicator
3. Propeller Tachometer
4. Engine Tachometer
5. Oil Pressure Gage
6. Interphone Control Panel
7. Engine Cylinder And Anti-Icing Temperature Indicator
8. Manifold Pressure Gage
9. Engine Oil Temperature Gage
10. Oxygen Flow Indicator
11. Torquemeter Indicator
12. Carburetor Air Temperature Indicator
13. Oxygen Pressure Gage
14. Engine Cylinder And Anti-Icing Temperature Selector Switch
15. Fuel Flow Indicator

DETAIL A

Figure 1-4. (Sheet 2 of 6 Sheets) Flight Engineer's Station



DETAIL B

16. Fuel Quantity Gages
17. Fwd Cabin Altimeter
18. Aft Cabin Altimeter
19. Cabin Airflow Indicator
20. Duct Air Temperature Indicator (Forward Cabin Pressure)
21. Fwd Cabin Temperature Indicator
22. Synchronizing Lamps
23. Battery Switch
24. Exciter Control Relay Switch
25. External Power Supply Switch
26. Frequency Meter
27. Frequency Control Knob
28. Space For Fourth Alternator Controls
29. Voltmeter
30. Bus Tie Breaker Control
31. Alternator Breaker Switch
32. Alternator Breaker Indicator Lamp
33. Bus Tie Breaker Indicator Lamp
34. Kilowatt-Kilovar Meter
35. Voltage And Frequency Selector Switch
36. Voltage Control Knob
37. Kilowatt–Kilovar Selector
38. Instruction Panel
39. Phase Sequence Lamps
40. Phase Sequence Lamps Test Switch
41. Fire Warning Lamps
42. Fire Warning Lamps Test Switches
43. Engine Selector Switches
44. Discharge Selector Switch
45. Engine Oil Shut-Off Valve Control Panel
46. Engine Fan Control Panel
47. Carburetor Air Filter Switch
48. Fluorescent Light Switch
49. Engine Supercharger Switch Panel
50. Engine Primer Panel
51. Engine Oil Dilution Switch Panel
52. Engine Starter Switch Panel
53. Master And Individual Ignition Controls

Figure 1-4. (Sheet 3 of 6 Sheets) Flight Engineer's Station

54. Engine Temperature Circuit Breaker
55. Carburetor Air Temperature Circuit Breakers
56. Engine Oil Temperature Circuit Breakers
57. Cabin Heating Duct Temperature Circuit Breaker
58. Interphone Circuit Breaker
59 Caution Placard
60. Fuel Tank Level Indicator Circuit Breakers
61. Bus Tie Breaker Control Circuit Breaker
62. Engine Superchargers Circuit Breakers
63. Fuel Flow Meters Circuit Breakers
64. Engine Throttle Circuit Breakers
65. Oil Dilution Circuit Breaker
66. Engine Primer Circuit Breaker
67. Engine Starter Circuit Breaker
68. Ignition Circuit Breaker
69. Brake Pump Circuit Breaker
70. Wing Anti-Ice Circuit Breaker
71. Tail Anti-Ice And Cabin Heat Circuit Breaker
72. Ventilation Fans Circuit Breaker
73. Engine Oil Shut-Off Valves Circuit Breakers
74. Fire Detection Circuit Breaker
75. Fire Extinguishing Circuit Breaker
76. Engine Fan Circuit Breaker
77. Fuel Panel Indicator Lamps Circuit Breaker
78. Cabin Heat Control Circuit Breaker
79. Wing Shut-Off Valves Circuit Breaker
80. Tank Valve Circuit Breaker
81. Booster Pump Switch
82. Tank Valve Switch
83. Fuel Valve Indicator Lamps
84. Cross-Feed Valve Switch
85. Engine Fuel Valve Switch
86. Engine Valve Circuit Breaker
87. Cross-Feed Valve Circuit Breaker
88. Cabin And Tail Air Modulating Valve Indicator Lamp
89. Cabin And Tail Air Modulating Valve Control Switch

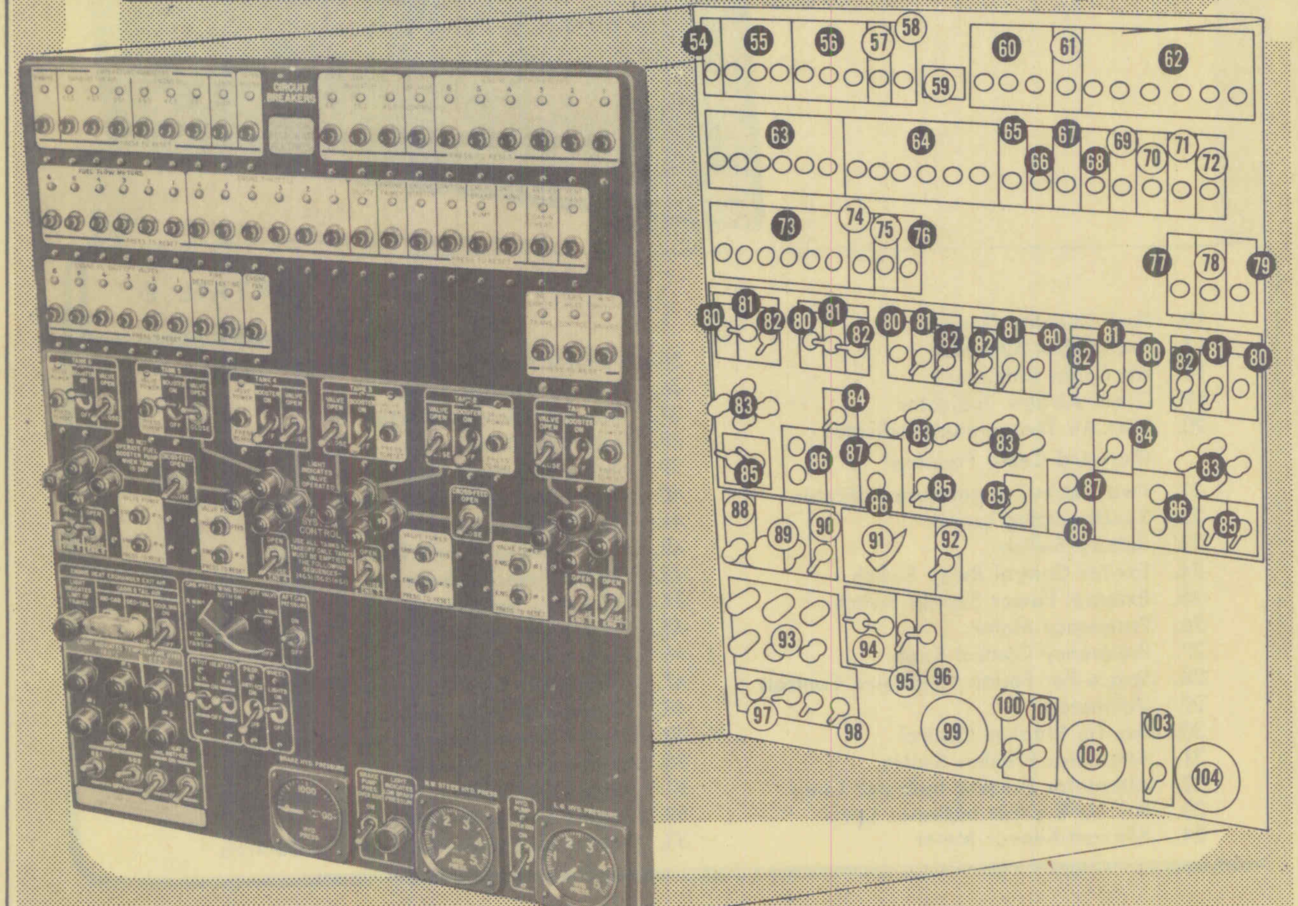
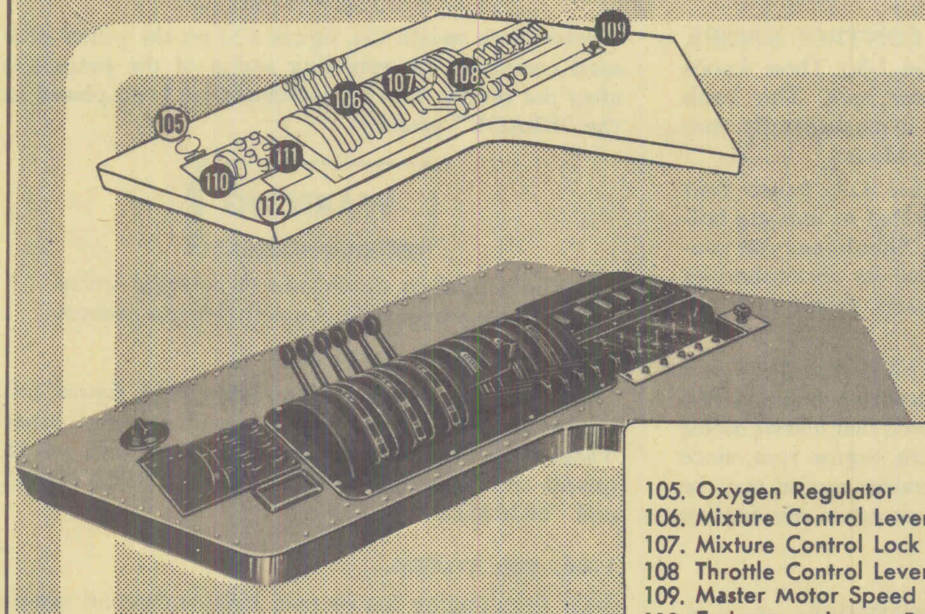


Figure 1-4. (Sheet 4 of 6 Sheets) Flight Engineer's Station

90. Cooling Air Control Switch
91. Cabin Pressure Control Switch
92. Aft Cabin Pressure Switch
93. Cabin Heat And Anti-Icing Air Maximum Temperature Warning Lamps
94. Pitot Heater Control Switches
95. Propeller Anti-Ice Control Switch
96. Wheel Lights Control Switch
97. Wing Anti-Icing Control Switches
98. Cabin Heat And Tail Anti-Icing Control Switches
99. Brake Hydraulic Pressure Gage
100. Brake Pump Pressure Override Switch
101. Brake Low Pressure Warning Lamp
102. Nose Wheel Steering Hydraulic Pressure Gage
103. Hydraulic Pump Override Switch
104. Landing Gear Hydraulic Pressure Gage

DETAIL C



DETAIL D

105. Oxygen Regulator
106. Mixture Control Levers
107. Mixture Control Lock Lever
108 Throttle Control Levers
109. Master Motor Speed Control Knob
110. Turbosupercharger Boost Selector Lever
111. Turbosupercharger Calibration Potentiometer Knobs
112. Ash Tray

Figure 1-4. (Sheet 5 of 6 Sheets) Flight Engineer's Station

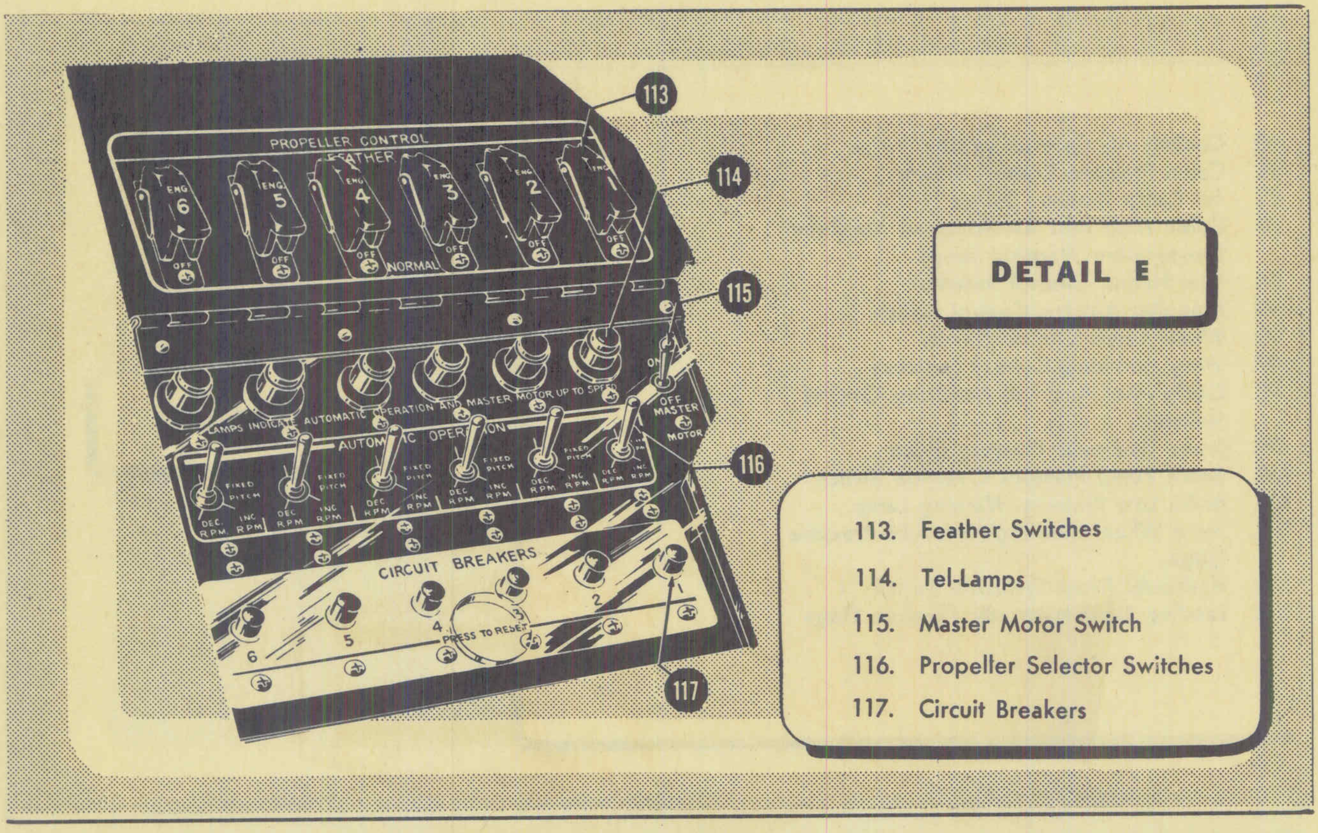


Figure 1-4. (Sheet 6 of 6 Sheets) Flight Engineer's Station

1-36. MASTER MOTOR SPEED CONTROL KNOBS. (See 109, figure 1-4 and 53, figure 1-3.) These knobs are used to control master motor rpm. The knob located at the engineer's station is mechanically connected to the one on the pilots' pedestal.

1-37. INDICATOR LIGHTS. (See 114, figure 1-4.) Six push-to-test tel-lamps are provided to indicate failure of the synchronization system. Should any one contactor experience a power failure, its corresponding tel-lamp will go out. If the master motor fails, all lamps will go out.

1-38. PROPELLER TACHOMETER. (See 18, figure 1-3 and 3, figure 1-4.) This tachometer will indicate master motor rpm. It should be noted that master motor rpm will not always coincide with engine rpm, since during ground operations the master motor may be operating at any selected rpm even when the engines are not running.

1-39. REVERSE CONTROLS.

1-40. REVERSE SELECTOR SWITCHES. (See 45, figure 1-3.) Three propeller reverse control switches located on the pilots' pedestal, with their positions labeled "READY" and "SAFE," select the symmetrical pairs of propellers to be reversed. Propellers are returned from reverse by placing the switches in the "SAFE" position.

1-41. REVERSE PITCH SWITCH. A push-button reverse pitch switch (54, figure 1-3) on the pilots' pedestal completes the reversing action of the propellers after the reverse selector switches have been placed in the "READY" position.

WARNING

The propellers should not be reversed unless the nose wheel is in contact with the ground.

1-42. FEATHER CONTROLS.

1-43. There are six feather switches (113, figure 1-4) located on the flight engineer's propeller control panel. These two-position switches are covered with switch guards and have their positions labeled "FEATHER" and "NORMAL."

1-44. OIL SYSTEM.

1-45. Each engine has its own independent oil system incorporating a 200-gallon tank. Oil conforming to Specification No. AN-O-8 is required. Gages for oil temperature (9, figure 1-4) and pressure (5, figure 1-4) are furnished the engineer.

1-46. OIL SYSTEM CONTROLS.

1-47. OIL SHUT-OFF VALVE SWITCHES. Six oil shut-off switches (45, figure 1-4) equipped with guards are installed on the engineer's control panel. Oil shut-off valves are accessible from the wing crawlways and may be operated manually. (See paragraph 3-35.)

1-48. OIL COOLING. Oil temperature control is fully automatic and employs two different configurations. (See figure 1-5.) During ground operation, air is drawn through the cooler by the engine-driven fan. During flight, ram air independent of the fan passes through the cooler. The change-over is accomplished through use of a switch actuated by movement of a main gear oleo strut.

1-49. OIL DILUTION. Six spring-loaded oil dilution switches (51, figure 1-4) are located on the engineer's control panel.

1-50. FUEL SYSTEM.

1-51. The fuel system is conventional in design, incorporating a tank, an engine-driven pump, and an electrically driven booster pump for each engine. The three tanks and three engines per wing are interconnected; however, the fuel system in the left wing is independent of that in the right wing, making it

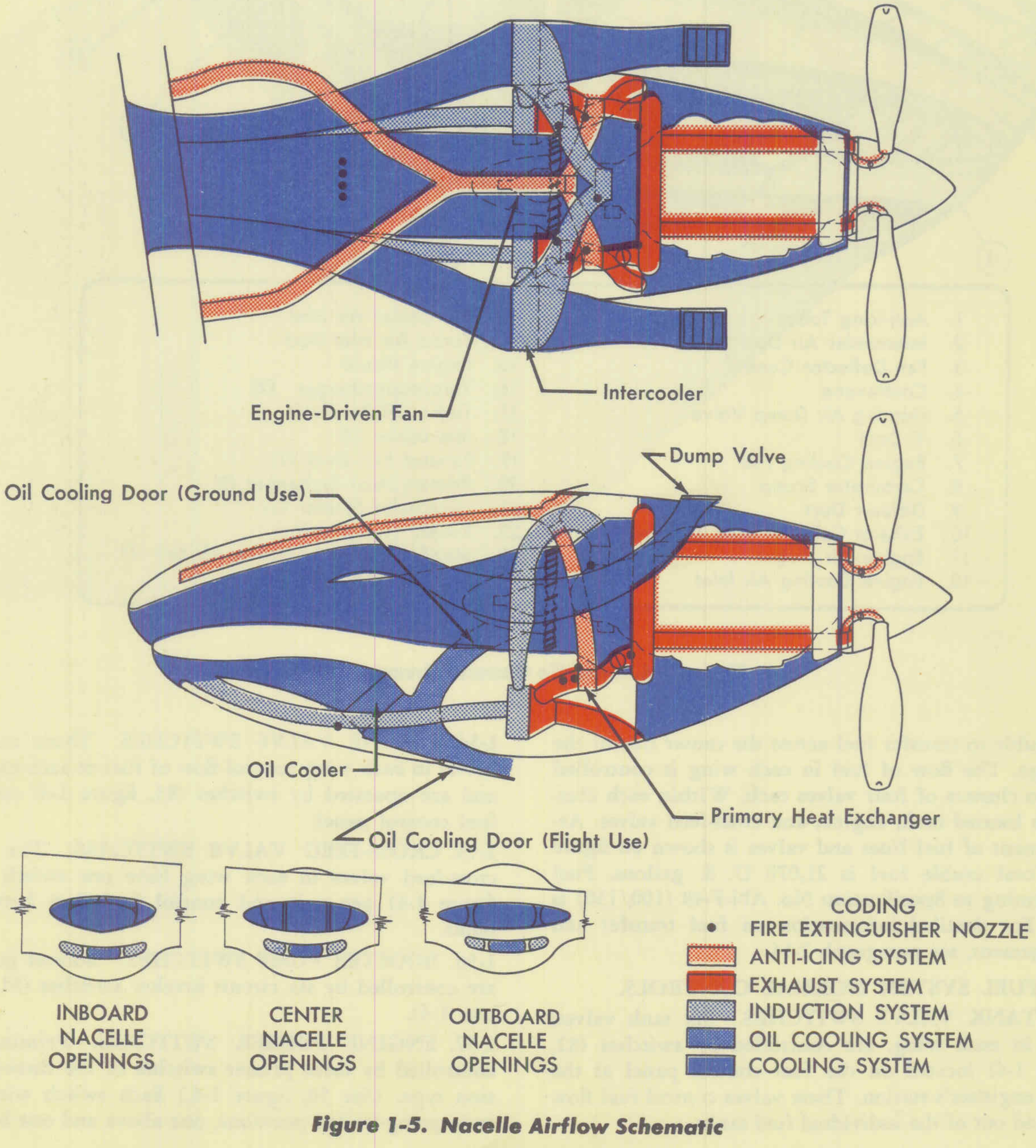
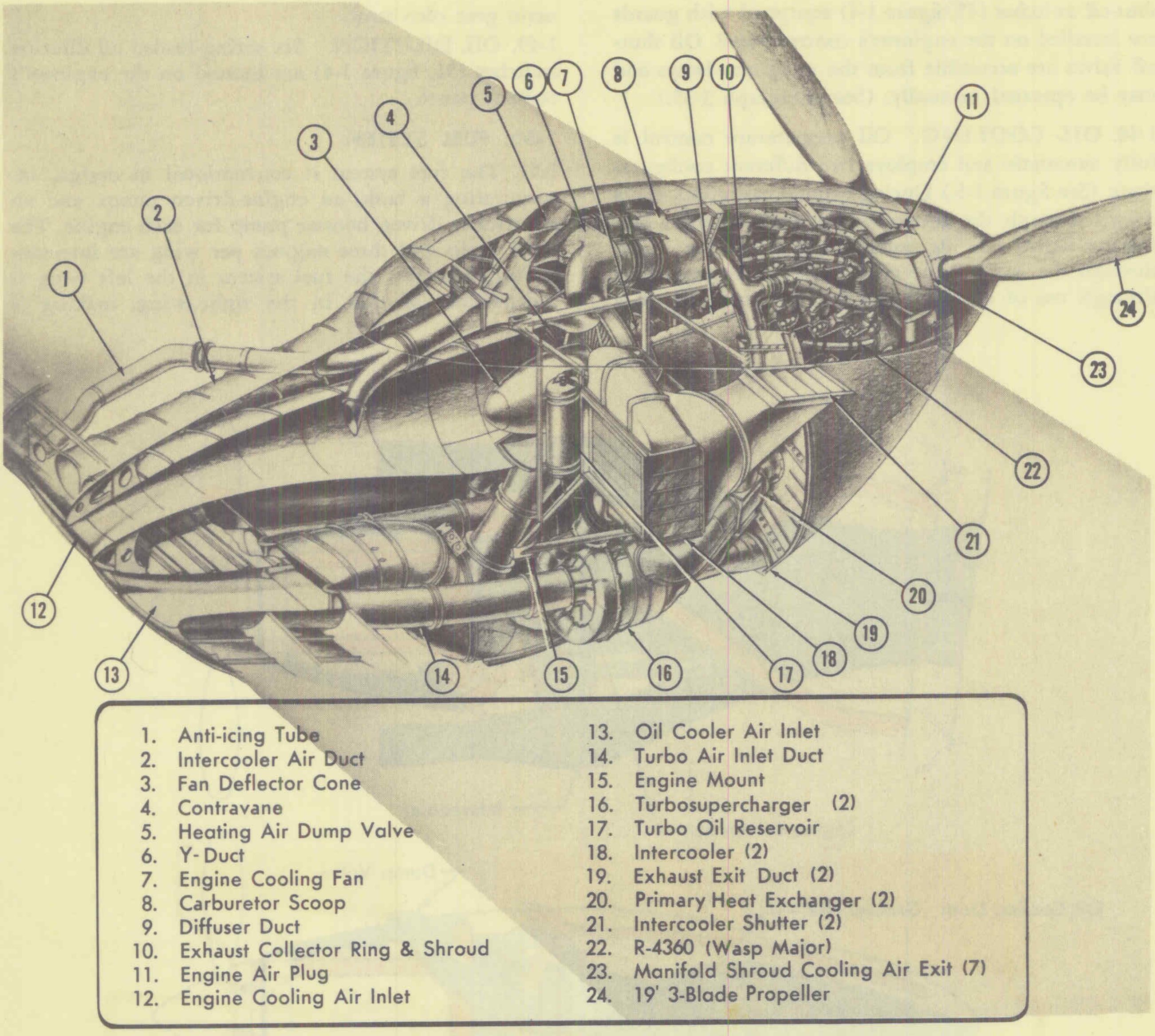


Figure 1-5. Nacelle Airflow Schematic



1. Anti-icing Tube
2. Intercooler Air Duct
3. Fan Deflector Cone
4. Contravane
5. Heating Air Dump Valve
6. Y-Duct
7. Engine Cooling Fan
8. Carburetor Scoop
9. Diffuser Duct
10. Exhaust Collector Ring & Shroud
11. Engine Air Plug
12. Engine Cooling Air Inlet
13. Oil Cooler Air Inlet
14. Turbo Air Inlet Duct
15. Engine Mount
16. Turbosupercharger (2)
17. Turbo Oil Reservoir
18. Intercooler (2)
19. Exhaust Exit Duct (2)
20. Primary Heat Exchanger (2)
21. Intercooler Shutter (2)
22. R-4360 (Wasp Major)
23. Manifold Shroud Cooling Air Exit (7)
24. 19' 3-Blade Propeller

Figure 1-6. Nacelle General Arrangement

impossible to transfer fuel across the center line of the fuselage. The flow of fuel in each wing is controlled by two clusters of four valves each. Within each cluster are located tank, engine, and cross-feed valves. Arrangement of fuel lines and valves is shown on figure 1-7. Total usable fuel is 21,070 U. S. gallons. Fuel conforming to Specification No. AN-F-48 (100/130) is used. For detailed information on fuel transfer and management, see paragraph 2-14.

1-52. FUEL SYSTEM NORMAL CONTROLS.

1-53. TANK VALVE SWITCHES. Six tank valves, three in each wing, are controlled by switches (82, figure 1-4) located on the fuel control panel at the flight engineer's station. These valves control fuel flow into and out of the individual fuel tanks.

1-54. ENGINE VALVE SWITCHES. Three engine valves in each wing control flow of fuel to each engine and are operated by switches (85, figure 1-4) on the fuel control panel.

1-55. CROSS-FEED VALVE SWITCHES. The two cross-feed valves in each wing have one switch (84, figure 1-4) per pair and control fuel flow between tanks.

1-56. BOOSTER PUMP SWITCHES. Booster pumps are controlled by six circuit breaker switches (81, figure 1-4).

1-57. ENGINE PRIMER SWITCHES. Priming is controlled by three primer switches of the three-position type. (See 50, figure 1-4.) Each switch with its two spring-loaded positions, one above and one below the "OFF" position, serves the two engines indicated.

1-58. FUEL INDICATORS.

1-59. FUEL FLOW INDICATORS. A flow meter transmitter located between the booster and the engine-driven pumps in each nacelle is connected to an indicator (15, figure 1-4) on the engineer's instrument panel.

1-60. FUEL PRESSURE GAGES. These three dual gages (1, figure 1-4) are located on the engineer's instrument panel.

1-61. FUEL QUANTITY GAGES. Liquidometers in the fuel tanks have direct-reading transmitters (figure 3-7) which are visible from the crawlway; they are located on the rear spar. Remote-reading dual indicators (16, figure 1-4) are located on the engineer's control panel.

1-62. FUEL VALVE INDICATOR LAMPS. A schematic diagram of the fuel system is reproduced on the

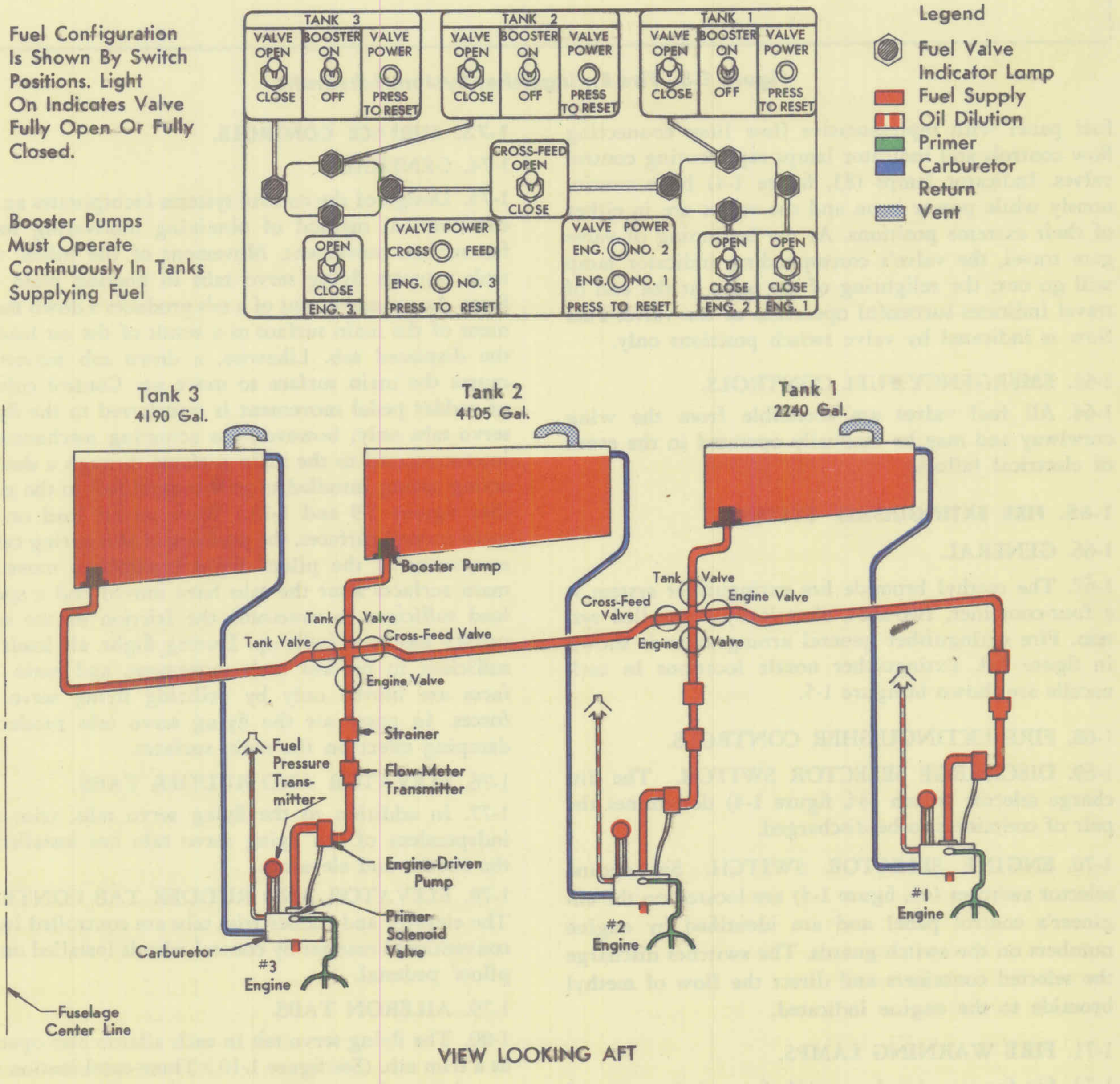


Figure 1-7. Fuel System Schematic

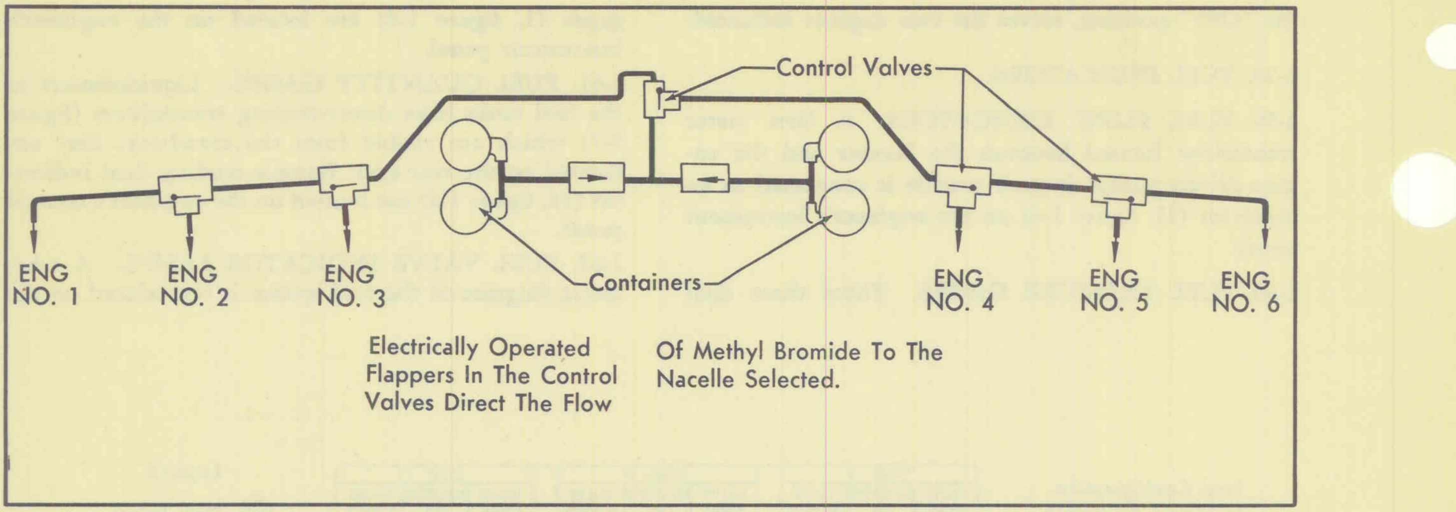


Figure 1-8. Fire Extinguisher System Schematic

fuel panel with representative flow lines connecting flow controls and indicator lamps representing control valves. Indicator lamps (83, figure 1-4) burn continuously while power is on and the valves are in either of their extreme positions. At the beginning of valve gate travel, the valve's corresponding indicator lamp will go out; the relighting of the lamp at the end of travel indicates successful operation of the valve. Fuel flow is indicated by valve switch positions only.

1-63. EMERGENCY FUEL CONTROLS.

1-64. All fuel valves are accessible from the wing crawlway and may be manually operated in the event of electrical failure.

1-65. FIRE EXTINGUISHER SYSTEM.

1-66. GENERAL.

1-67. The methyl bromide fire extinguisher system is a four-container, two-shot, electrically controlled system. Fire extinguisher general arrangement is shown in figure 1-8. Extinguisher nozzle locations in each nacelle are shown in figure 1-5.

1-68. FIRE EXTINGUISHER CONTROLS.

1-69. DISCHARGE SELECTOR SWITCH. The discharge selector switch (44, figure 1-4) determines the pair of containers to be discharged.

1-70. ENGINE SELECTOR SWITCH. Six engine selector switches (43, figure 1-4) are located on the engineer's control panel and are identified by engine numbers on the switch guards. The switches discharge the selected containers and direct the flow of methyl bromide to the engine indicated.

1-71. FIRE WARNING LAMPS.

1-72. Six fire warning lamps (41, figure 1-4) equipped with test switches (42, figure 1-4) provide visual indication of a nacelle fire.

1-73. SURFACE CONTROLS.

1-74. GENERAL.

1-75. Design of the control systems incorporates an unconventional method of obtaining motivating forces for surface movement. Movement of the pilots' controls actuates flying servo tabs in floating main surfaces. An up movement of a tab produces a down movement of the main surface as a result of the air load on the displaced tab. Likewise, a down tab movement causes the main surface to move up. Control column or rudder pedal movement is transferred to the flying servo tabs only; however, the actuating mechanism is interconnected to the main surfaces through a double-acting spring installed to give control feel to the pilot. (See figures 1-9 and 1-10.) With no air load on the main control surfaces, the presence of this spring causes movement of the pilots' flight controls to move the main surfaces after the tabs have moved and a spring load sufficient to overcome the friction of the main surface has been built up. During flight, air loads are sufficient to prevent such movement, and main surfaces are moved only by utilizing flying servo tab forces. In gusty air the flying servo tabs produce a damping effect on the main surfaces.

1-76. ELEVATOR AND RUDDER TABS.

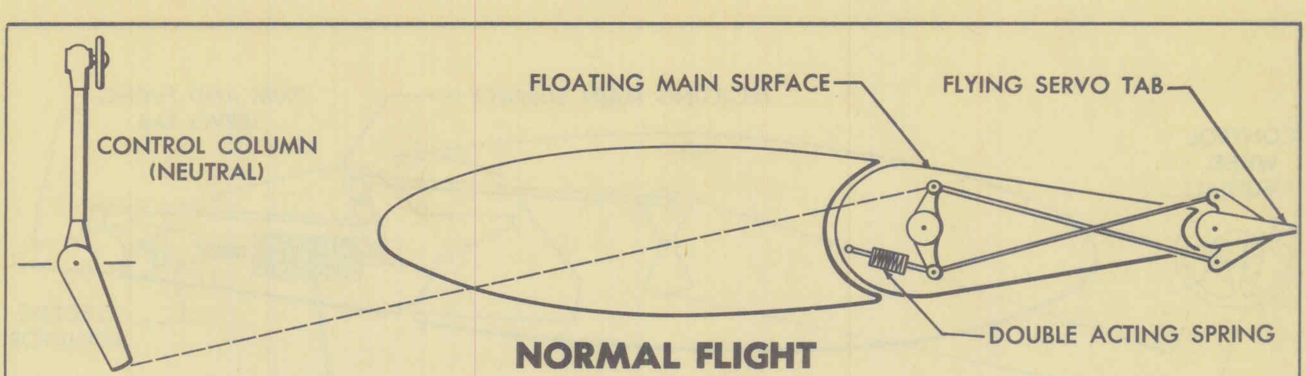
1-77. In addition to the flying servo tabs, trim tabs independent of the flying servo tabs are installed in the rudder and elevators.

1-78. ELEVATOR AND RUDDER TAB CONTROL. The elevator and rudder trim tabs are controlled in the conventional manner by control wheels installed on the pilots' pedestal.

1-79. AILERON TABS.

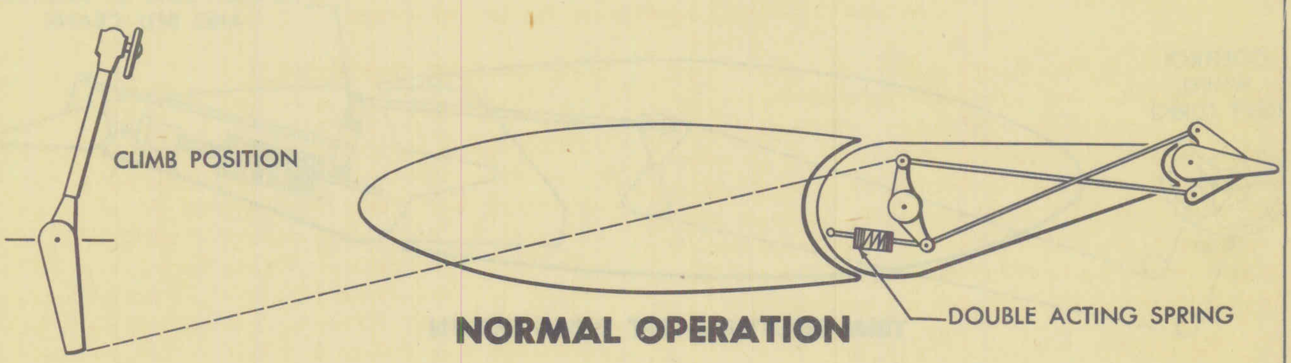
1-80. The flying servo tab in each aileron also operates as a trim tab. (See figure 1-10.) These combination tabs are driven by electric motors during the trimming operation.

1-81. AILERON TRIM TAB CONTROL SWITCH.



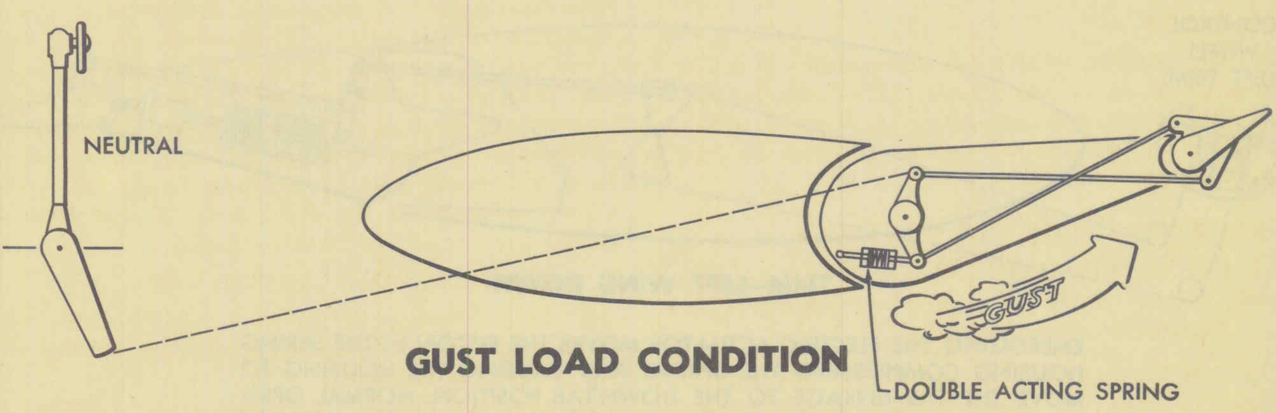
NORMAL FLIGHT

WHEN THE CONTROL COLUMN IS IN NEUTRAL THE FLOATING MAIN CONTROL SURFACE AND THE FLYING SERVO TAB ARE IN NEUTRAL.



NORMAL OPERATION

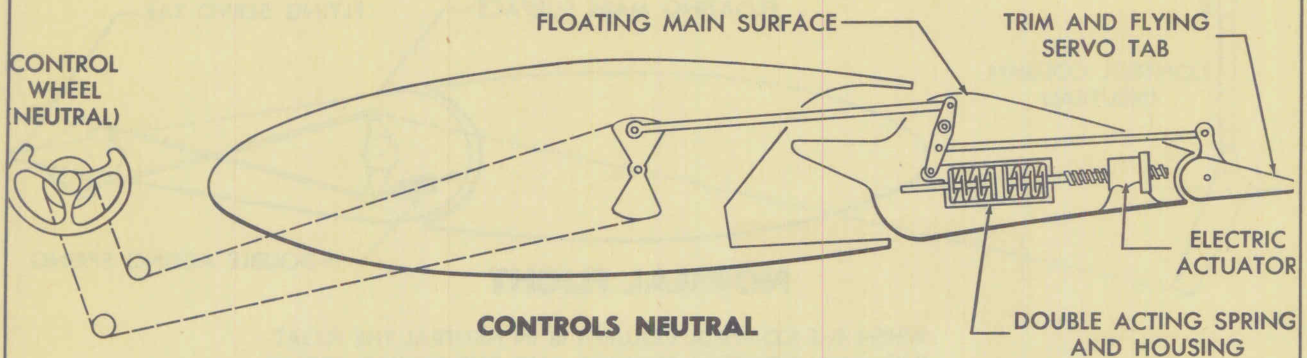
WHEN THE CONTROL COLUMN IS MOVED TO THE CLIMB POSITION IT MOVES THE FLYING SERVO TAB DOWN. AIR LOAD ON THE TAB MOVES THE FLOATING MAIN CONTROL SURFACE UP.



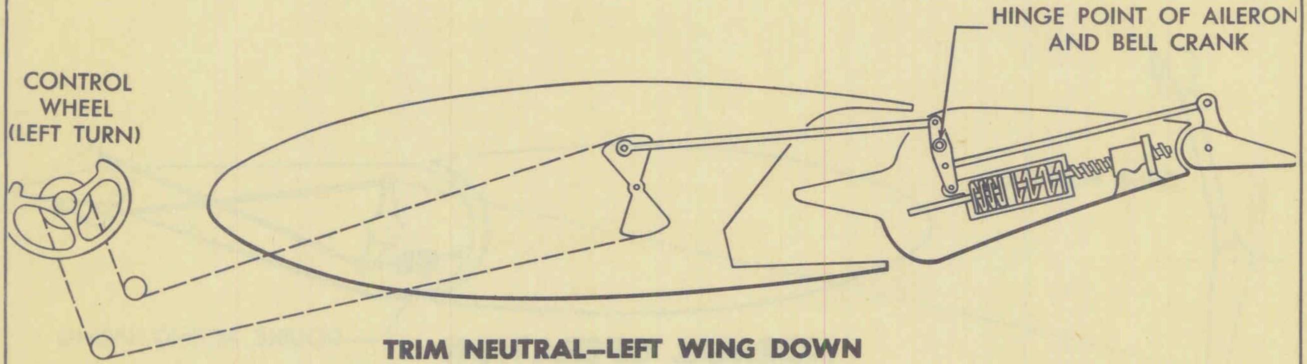
GUST LOAD CONDITION

WHEN THE CONTROL COLUMN IS HELD IN NEUTRAL AND A GUST LOAD MOVES THE MAIN CONTROL SURFACE, THE FLYING SERVO TAB MOVES AGAINST A SPRING LOAD IN THE SAME DIRECTION AS THE FLOATING MAIN SURFACE. AIR LOAD ON THE TAB CAUSES THE MAIN CONTROL SURFACE TO RETURN TO NEUTRAL.

Figure 1-9. Rudder and Elevator Operation

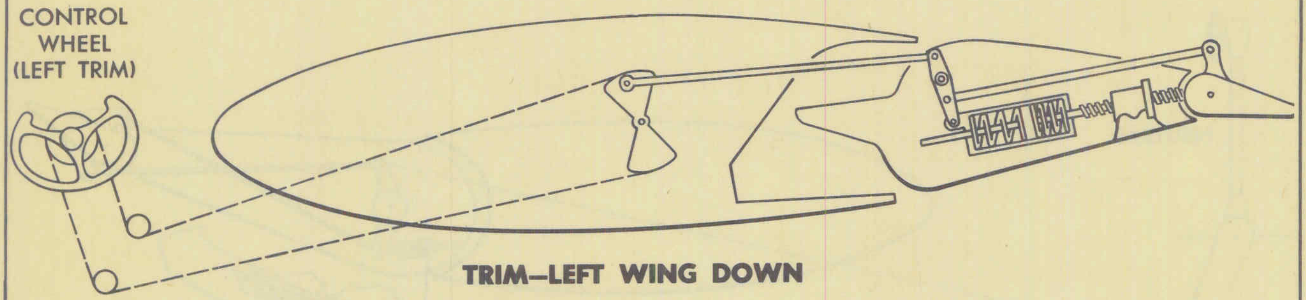


CONTROLS NEUTRAL



TRIM NEUTRAL—LEFT WING DOWN

TURNING THE CONTROL WHEEL TO THE LEFT CAUSES THE LEFT WING AILERON TAB TO MOVE DOWN COMPRESSING THE SPRING WHICH PROVIDES "FEEL" TO THE PILOT AT THE CONTROLS. AIR LOAD ON THE TAB PRODUCES AN UP MOVEMENT OF THE AILERON.



TRIM—LEFT WING DOWN

ENERGIZING THE ELECTRIC ACTUATOR MOVES THE PISTON IN THE SPRING HOUSING COMPRESSING THE SPRING AND CAUSING THE HOUSING TO MOVE THE TAB LINKAGE TO THE DOWN TAB POSITION. NORMAL OPERATION OF THE CONTROL WHEEL MOVES THE TAB TO ANY DESIRED FLIGHT CONTROL POSITION OVERRIDING THE SET TRIM. UPON RELEASE OF THE CONTROL WHEEL THE SURFACE WILL RETURN TO THE PREVIOUSLY SET TRIM POSITION.

SHOWING SINGLE TAB FOR BOTH TRIM AND FLYING SERVO.

Figure 1-10. Aileron Trim and Flying Servo Tab Operation

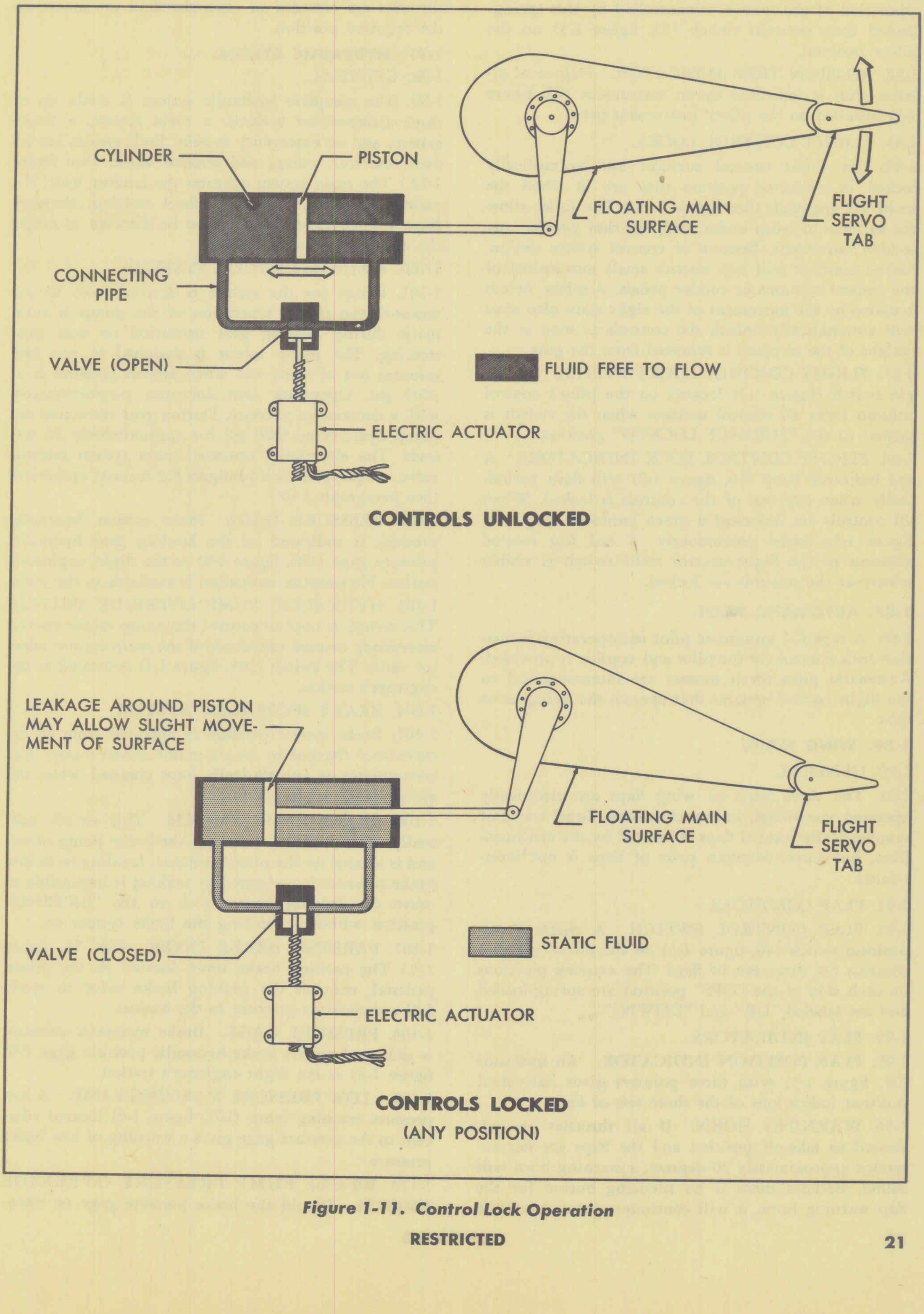


Figure 1-11. Control Lock Operation

Operation of the motors is controlled by this spring-loaded three-position switch (55, figure 1-3) on the pilots' pedestal.

1-82. AILERON TRIM INDICATOR. Degree of aileron trim is indicated by an instrument (25, figure 1-3) installed on the pilots' instrument panel.

1-83. FLIGHT CONTROL LOCKS.

1-84. The flight control surfaces are hydraulically locked in whatever position they are in when the locks are engaged. (See figure 1-11.) The locks allow the surfaces to creep under load, but they prevent any sudden movement. Because of control system design, locked controls will not restrict small movements of the control columns or rudder pedals. A safety switch actuated by the movement of the right main oleo strut will automatically unlock the controls as soon as the weight of the airplane is removed from the gear.

1-85. FLIGHT CONTROL LOCKS SWITCH. A toggle switch (figure 1-3) located on the pilot's control column locks all control surfaces when the switch is moved to the "SURFACE LOCKED" position.

1-86. FLIGHT CONTROL LOCK INDICATORS. A red indicator lamp (16, figure 1-3) will flash periodically when any one of the controls is locked. When all controls are unlocked a green indicator lamp (16, figure 1-3) burns continuously. A red flag located adjacent to the flight control locks switch is visible whenever the controls are locked.

1-87. AUTOMATIC PILOT.

1-88. A type C-1 automatic pilot incorporating formation stick control for the pilot and copilot is provided. Automatic pilot servo motors are interconnected to the flight control systems that operate the flying servo tabs.

1-89. WING FLAPS.

1-90. GENERAL.

1-91. The three pairs of wing flaps are electrically operated, controlled, and synchronized. Equal travel of symmetrically located flaps is insured by the synchronizers, but travel between pairs of flaps is not interrelated.

1-92. FLAP CONTROLS.

1-93. FLAP CONTROL SWITCH. A single three-position switch (46, figure 1-3) on the pilots' pedestal controls the three sets of flaps. The extreme positions on each side of the "OFF" position are spring-loaded and are labeled "UP" and "DOWN."

1-94. FLAP INDICATORS.

1-95. FLAP POSITION INDICATOR. An indicator (27, figure 1-3) with three pointers gives individual position indications of the three sets of flaps.

1-96. WARNING HORN. If all throttles are advanced to take-off position and the flaps are not extended approximately 20 degrees, a warning horn will sound. Because there is no silencing button for the flap warning horn, it will continue to blow until the throttles are retarded or until the flaps are moved to the required position.

1-97. HYDRAULIC SYSTEM.

1-98. GENERAL.

1-99. The complete hydraulic system is made up of three independent systems: a main system, a brake system, and an emergency system. Each system has its own reservoir, pump, and selector valve. (See figure 1-12.) The main system operates the landing gear, the main gear doors, and nose wheel steering. Pressure from the emergency system can be directed to either the main or the brake system.

1-100. MAIN HYDRAULIC SYSTEM.

1-101. Power for the system is derived from an a-c motor-driven pump. Operation of the pump is automatic during landing gear operation or nose gear steering. The pump motor is designed to run two minutes out of every ten when system pressure is at 3000 psi. Operating time increases proportionately with a decrease in pressure. During gear retraction the pump operates at 3000 psi for approximately 50 seconds. The electrically operated main system selector valve is equipped with plungers for manual operation. (See paragraph 3-40.)

1-102. PRESSURE GAGE. Main system hydraulic pressure is indicated on the landing gear hydraulic pressure gage (104, figure 1-4) at the flight engineer's station. No pressure indication is available to the pilot.

1-103. HYDRAULIC PUMP OVERRIDE SWITCH. This switch is used to control the pump motor during emergency manual operation of the main system selector valve. The switch (103, figure 1-4) is located at the engineer's station.

1-104. BRAKE HYDRAULIC SYSTEM.

1-105. Brake system pressure is obtained from an accumulator charged by an a-c motor-driven pump. The accumulator is automatically kept charged when the system is placed in operation.

1-106. BRAKE PUMP SWITCH. This switch normally controls the operation of the brake pump motor and is located on the pilots' pedestal. Landing with low brake pressure is prevented by making it impossible to move the landing gear switch to the "EXTEND" position without switching the brake system on.

1-107. PARKING BRAKE LEVER. (See 51, figure 1-3.) The parking brake lever, located on the pilots' pedestal, controls the parking brake valve to apply full accumulator pressure to the brakes.

1-108. PRESSURE GAGE. Brake hydraulic pressure is indicated on the brake hydraulic pressure gage (99, figure 1-4) at the flight engineer's station.

1-109. LOW PRESSURE WARNING LAMP. A low pressure warning lamp (101, figure 1-4) located adjacent to the pressure gage gives a warning of low brake pressure.

1-110. BRAKE PUMP PRESSURE OVERRIDE SWITCH. Should the brake pressure gage or warn-

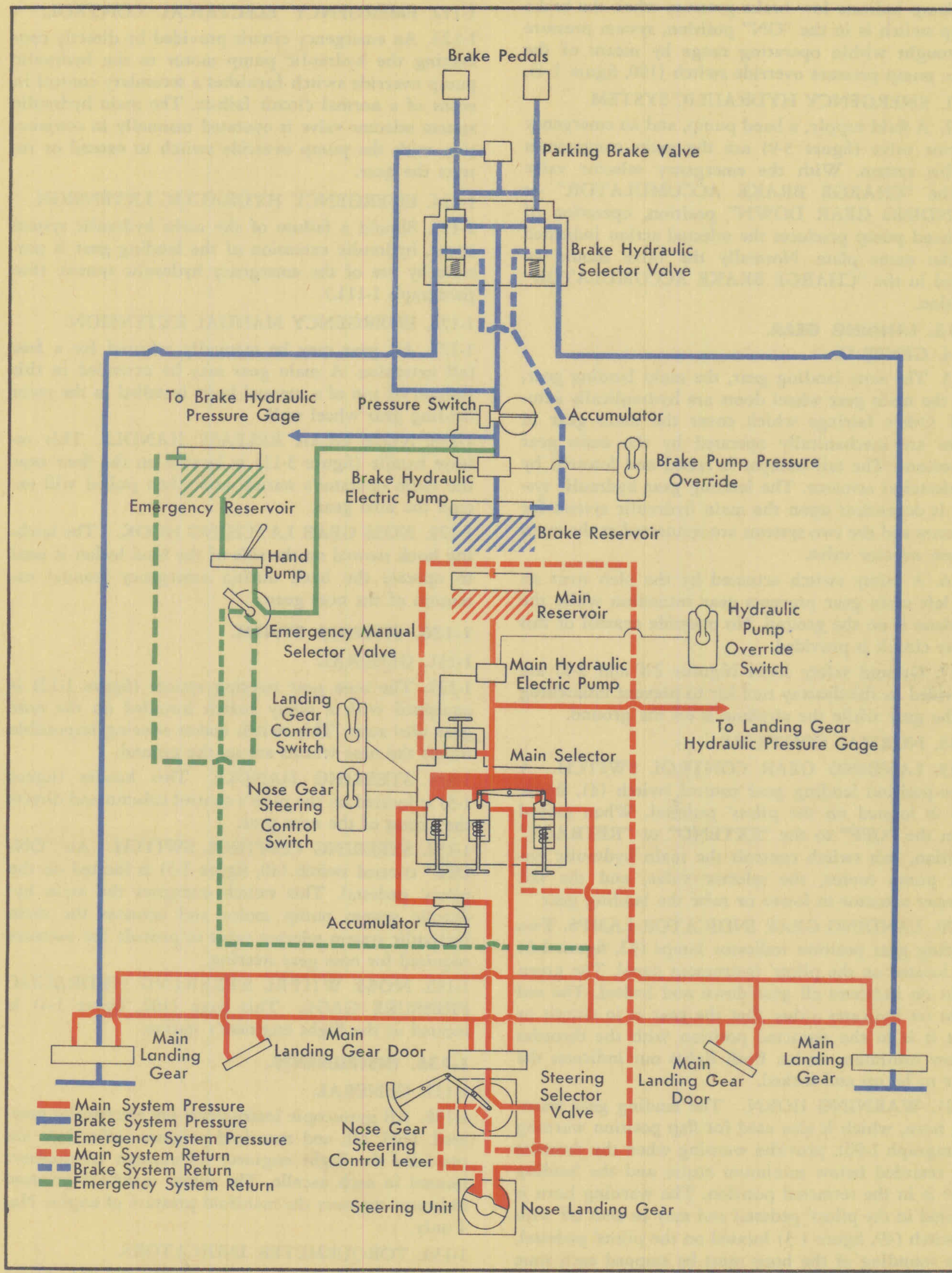


Figure 1-12. Hydraulic System Schematic

ing lamp indicate low brake pressure when the brake pump switch is in the "ON" position, system pressure is brought within operating range by means of the brake pump pressure override switch (100, figure 1-4).

1-111. EMERGENCY HYDRAULIC SYSTEM.

1-112. A fluid supply, a hand pump, and an emergency selector valve (figure 3-9) are the main components of this system. With the emergency selector valve in the "CHARGE BRAKE ACCUMULATOR" or "LANDING GEAR DOWN" position, operation of the hand pump produces the selected action indicated on the name plate. Normally the valve should be placed in the "CHARGE BRAKE ACCUMULATOR" position.

1-113. LANDING GEAR.

1-114. GENERAL.

1-115. The nose landing gear, the main landing gear, and the main gear wheel doors are hydraulically actuated. Other fairings which cover the main gear in flight are mechanically operated by the main gear movement. The tail bumper is raised and lowered by an electrical actuator. The landing gear hydraulic system is dependent upon the main hydraulic system for pressure and the two systems are connected at the main system selector valve.

1-116. A safety switch actuated by the oleo strut on the left main gear prevents gear retraction while the airplane is on the ground. No override control of this safety circuit is provided.

1-117. Ground safety locks (figures 2-4 and 2-5) are provided in the flyaway tool kit to prevent unlatching of the gear while the airplane is on the ground.

1-118. NORMAL CONTROLS.

1-119. LANDING GEAR CONTROL SWITCH. A three-position landing gear control switch (41, figure 1-3) is located on the pilots' pedestal. When moved from the "OFF" to the "EXTEND" or "RETRACT" position, this switch controls the main hydraulic system pump motor, the selector valve, and the tail bumper actuator to lower or raise the landing gear.

1-120. LANDING GEAR INDICATOR LAMPS. Two landing gear position indicator lamps (32, figure 1-3) are located on the pilots' instrument panel. The green light on indicates all gear down and locked. The red light on indicates either that the gear is in transit or that it is in the retracted position with the throttles below minimum cruise. Both lights out indicates the gear to be up and locked.

1-121. WARNING HORN. The landing gear warning horn, which is also used for flap position warning (paragraph 1-96), provides warning when the throttles are retarded below minimum cruise and the landing gear is in the retracted position. The warning horn is located in the pilots' pedestal and may be shut off with a switch (49, figure 1-3) located on the pilots' pedestal. The sounding of the horn must be stopped each time a single throttle lever is retarded below minimum cruise.

1-122. EMERGENCY ELECTRICAL CONTROL.

1-123. An emergency circuit provided by directly connecting the hydraulic pump motor to the hydraulic pump override switch furnishes a secondary control in event of a normal circuit failure. The main hydraulic system selector valve is operated manually in conjunction with the pump override switch to extend or retract the gear.

1-124. EMERGENCY HYDRAULIC EXTENSION.

1-125. Should a failure of the main hydraulic system occur, hydraulic extension of the landing gear is possible by use of the emergency hydraulic system. (See paragraph 1-111.)

1-126. EMERGENCY MANUAL EXTENSION.

1-127. All gear may be manually released for a free fall extension. A main gear may be extended in this fashion by use of a manual hoist installed in the main landing gear wheel well.

1-128. NOSE GEAR RELEASE HANDLE. This release handle (figure 3-11) is located on the floor near the radio operator's station and when pulled will extend the nose gear.

1-129. NOSE GEAR LATCHING HOOK. The latching hook stowed on the side of the food locker is used to operate the latch during emergency manual extension of the nose gear.

1-130. STEERING SYSTEM.

1-131. GENERAL.

1-132. The nose gear steering system (figure 1-12) is equipped with a safety switch installed on the nose gear oleo strut. This switch makes steering impossible unless the nose wheels are on the ground.

1-133. STEERING HANDLE. This handle (figure 1-3) is located on the pilot's control column and directs the action of the nose gear.

1-134. STEERING CONTROL SWITCH. An "ON-OFF" control switch (40, figure 1-3) is located on the pilots' pedestal. This switch energizes the main hydraulic system pump motor and actuates the main hydraulic system selector valve to provide the pressure required for nose gear steering.

1-135. NOSE WHEEL STEERING HYDRAULIC PRESSURE GAGE. This gage (102, figure 1-4) is located at the flight engineer's station.

1-136. INSTRUMENTS.

1-137. GENERAL.

1-138. All gyroscopic instruments are electrically powered. Fuel, oil, and manifold pressure indications are provided the flight engineer by autosyn transmitters located in each nacelle. The pilots' manifold pressure indicator registers the manifold pressure of engine No. 4 only.

1-139. TORQUEMETER INDICATORS.

1-140. Three dual torquemeter indicators (11, figure 1-4) are located at the flight engineer's station.

1-141. AIRSPEED SYSTEM.

1-142. GENERAL. The airspeed system is conventional. It consists of pitot heads located on each lower side of the forward portion of the fuselage and a static pressure port on each side of the fuselage just forward of bomb bay No. 1.

1-143. AIRSPEED INDICATORS. Four airspeed indicators are installed in the airplane, one at the pilot's, copilot's, flight engineer's, and navigator's stations.

1-144. ALTERNATE STATIC PRESSURE SWITCH. Operation of this switch selects the alternate source of static pressure which is located in the bomb bay. The switch (10, figure 1-3) is located on the pilot's and copilot's instrument panel.

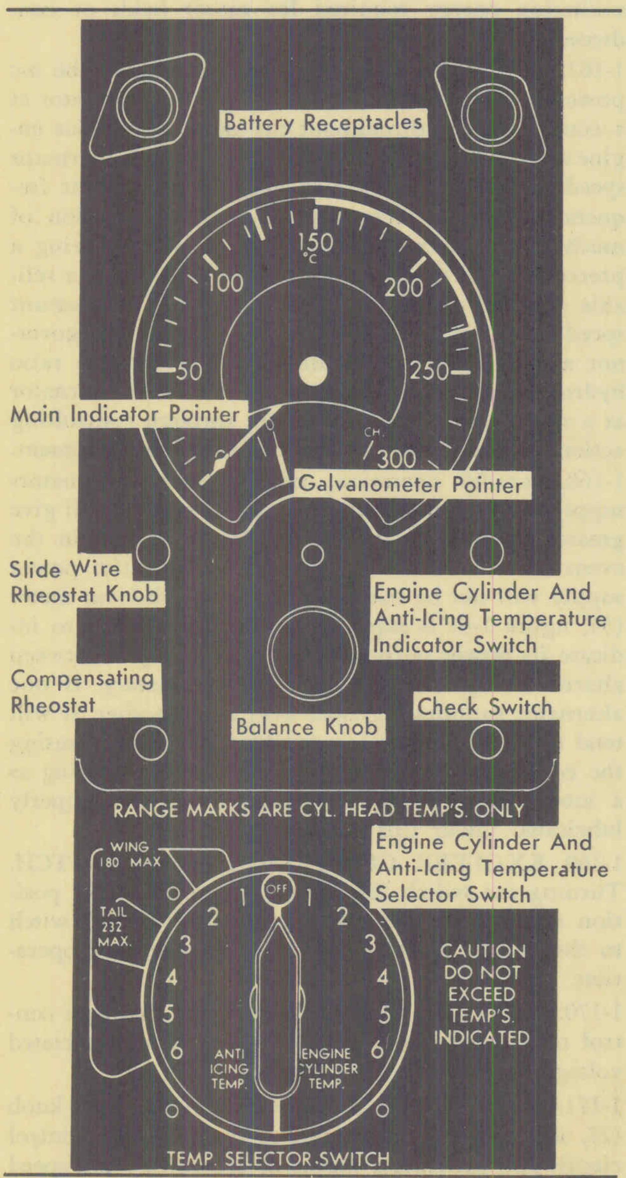


Figure 1-13. Engine Cylinder and Anti-icing Temperature Indicator

1-145. ENGINE CYLINDER AND ANTI-ICING TEMPERATURE INDICATOR.

1-146. GENERAL. A single potentiometer-type temperature indicating gage (7, figure 1-4) is used to indicate cylinder head and anti-icing air temperatures.

1-147. ENGINE CYLINDER AND ANTI-ICING TEMPERATURE SELECTOR SWITCH. This switch (14, figure 1-4) is used to select the particular engine or anti-icing air duct temperature to be read.

1-148. ENGINE CYLINDER AND ANTI-ICING TEMPERATURE INDICATOR SWITCH. (See figure 1-13.) This switch puts the indicator in operation.

1-149. CHECK SWITCH. The check switch places the galvanometer in the check circuit.

1-150. COMPENSATING RHEOSTAT KNOB. This rheostat marked "COMP. RHEO." adjusts compensating current when the check switch is in the "CH" position.

1-151. BALANCE KNOB. The balance knob is used to zero the galvanometer pointer when the check switch is in the "ON" position.

1-152. SLIDE WIRE RHEOSTAT KNOB. This rheostat knob marked "SLW. RHEO." is turned clockwise when the galvanometer cannot be zeroed with the balance knob. Normally it is kept as far counterclockwise as possible while still maintaining full scale balancing with the balance knob.

1-153. GALVANOMETER POINTER. When the check switch is placed in the "CH" position, the galvanometer pointer functions as a milliammeter and measures the necessary amount of compensating current required to obtain an accurate temperature indication on the potentiometer. When the check switch is in the "ON" position, the galvanometer mechanism is in series with the thermocouple circuit and serves as a galvanometer.

1-154. MAIN INDICATOR POINTER. The main indicator pointer acts as a direct-reading temperature gage.

1-155. ELECTRICAL.

1-156. GENERAL.

1-157. A three-phase, high-frequency, a-c system is employed because it permits a considerable weight saving in required wire gages, actuators, and generators. It also permits greater ease of maintenance as a result of the simplified design. Alternating current and direct current are supplied the airplane through a primary and a secondary power distribution network. The primary network is a three-phase, 400-cycle, alternating-current power system (figure 1-14) supplied by three engine-driven alternators; the secondary network is a direct-current power system (figure 1-15) supplied by transformer-rectifier units fed from the alternating-current system. The alternating-current system supplies power to the electronic-controlled turrets, heavy-duty motors, high-speed actuators, lighting circuits, various flight control equipment, and radio and radar units requiring 400-cycle a-c power. The direct-current system supplies power to the bomb release equipment, various flight control equipment, and radio and radar units requiring direct current. It also energizes relays for controlling alternating-current equipment.

1-158. ALTERNATING SYSTEM.

1-159. GENERAL.

1-160. The a-c power supply consists of three 40-kva, 208/115-volt, 3-phase, neutral-grounded, 400-cycle alternators. One is installed on engines No. 3, 4, and 5; provisions for a fourth alternator are made on engine No. 2. Each alternator feeds into the main power panels (figure 1-14) in the fuselage, from where the power is distributed to the various loads in the airplane. All a-c system controls and indicators are installed on the a-c control panel which is located at the flight engineer's station.

1-161. EXTERNAL POWER CONTROLS AND INDICATORS.

1-162. GENERAL. When the airplane is on the ground, electric power is obtained from a portable power cart on which is mounted an alternator driven by a gasoline engine and a battery. During normal operation the cart is connected to the airplane through a six-prong external power receptacle located at the under side of the fuselage below the wing. It supplies 200-volt, 3-phase, 400-cycle, a-c power, part of which energizes the airplane's transformer-rectifier units and furnishes 27-volt direct current. When the external power cart is connected to the airplane, it is necessary that the three-phase power supplied have the same phase sequence as the alternators in the airplane. The direction of rotation of a three-phase electric motor is entirely dependent upon the phase sequence of its power supply. If two of the three power lines to a motor are interchanged, resulting in reversed phase sequence, the direction of motor rotation reverses. Therefore, if the power leads from the cart are interchanged so that the phase sequence of the power output is incorrect, motors on the airplane will run in the wrong direction when energized from the external power cart. To prevent this error, a method of assuring proper phase sequence has been provided.

CAUTION

Fuel booster pump motors will be damaged when operated in reverse.

1-163. EXTERNAL POWER SUPPLY SWITCH. This two-position on-off switch (25, figure 1-4) when placed in the "ON" position completes the circuit from the external power cart to the airplane.

1-164. PHASE SEQUENCE LAMPS. Two lamps are provided to indicate phase sequence. If the phase sequence of the cart is correct, the lamp marked "CORRECT 1, 2, 3" will light. If it is incorrect, then the other lamp marked "INCORRECT 3, 2, 1" will light. A conventional push-to-test switch (40, figure 1-4) is provided to check the operation of the phase sequence lights.

1-165. ALTERNATOR CONTROLS AND INDICATORS.

1-166. GENERAL. Operation of any alternator is possible only when the alternator field is excited by d-c current supplied by a generator built into the alternator. This d-c current flow is controlled by the three-position, spring-loaded, on-off exciter control relay switch (24, figure 1-4). Voltage output of the alternator is controlled by regulating the voltage of the exciter field. The real load output of the alternator is measured in kilowatts. The reactive power output is measured in kilovars. The reactive power supplies excitation energy required for motor fields or condensers.

1-167. One of the most important devices in the a-c power system is the unit used to drive the alternator at a constant speed throughout the range of various engine speeds. Alternator frequency varies with alternator speed; therefore in order to generate a constant frequency, which is necessary for correct operation of much of the electrical equipment as well as being a prerequisite to parallel operation of alternators, a reliable constant speed source is required. The constant speed drive used is a mechanical-hydro-electric governor and drive unit. The drive unit, a variable ratio hydraulic transmission, delivers power to the alternator at a speed which is held constant through controlling action applied to the drive by the governor equipment.

1-168. Parallel operation, two or more alternators supplying a common bus, is desirable, since it will give greater stability to the electrical system; and in the event one alternator is inoperative, the entire power supply will not be cut off. One kilowatt-kilovar meter (34, figure 1-4) is supplied for each alternator to indicate its power output. Equal power output between alternators operating in parallel is necessary. If one alternator supplies a greater load than another, it will tend to run the other as a synchronous motor, causing the constant speed drive of the alternator running as a motor to overheat, since it will not be properly lubricated under this condition.

1-169. EXCITER CONTROL RELAY SWITCH. Turning the switch (24, figure 1-4) to the "ON" position starts alternator operation. Turning the switch to the "OFF" position discontinues alternator operation.

1-170. VOLTAGE CONTROL KNOB. Voltage control of each alternator is controlled by its associated voltage control knob (36, figure 1-4).

1-171. FREQUENCY CONTROL KNOB. This knob (27, figure 1-4) is connected to the governor control circuit and provides a means of controlling the speed of the constant speed drive. Controlling the speed at which the alternator is driven directly controls the frequency of its output.

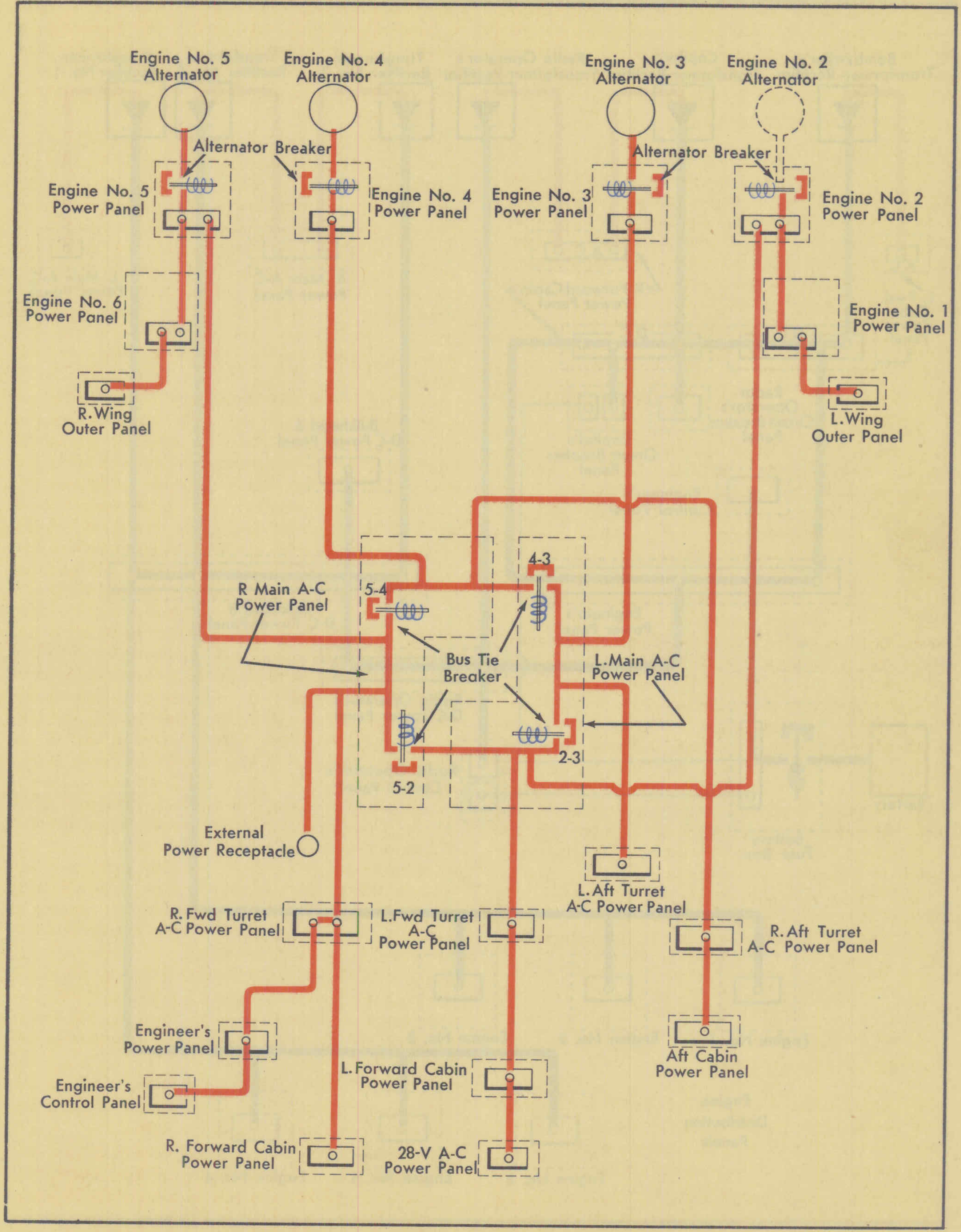


Figure 1-14. A-C Electrical Power Distribution

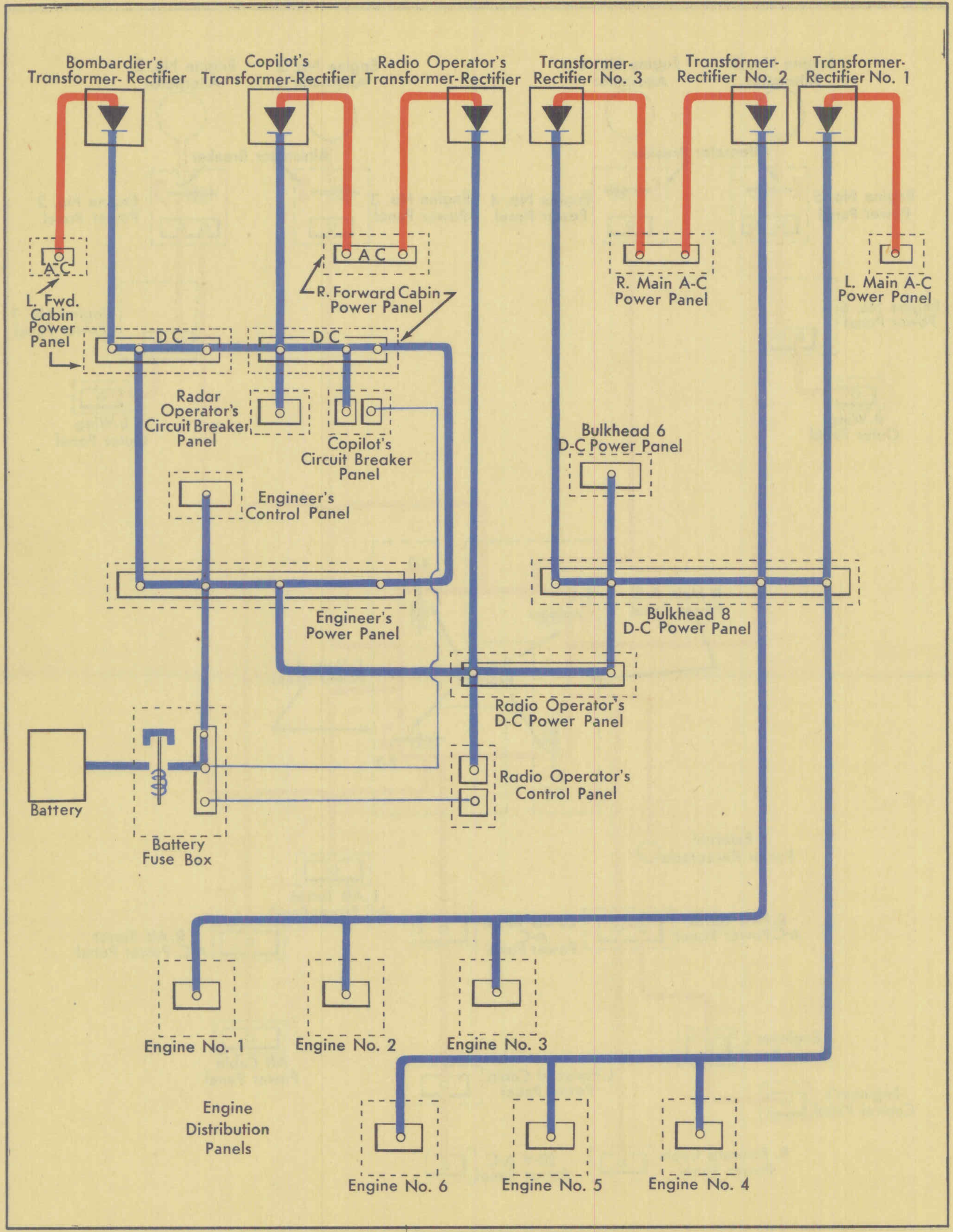


Figure 1-15. D-C Electrical Power Distribution

1-172. VOLTAGE AND FREQUENCY SELECTOR SWITCH. This switch (35, figure 1-4) is used to select individual alternators so their voltage output and frequency may be read on the single indicator provided for each. The frequency meter, like the voltmeter, is used in conjunction with the voltage and frequency selector switch to indicate individual alternator output.

1-173. ALTERNATOR BREAKER SWITCH. Each alternator is connected to the power distribution network by an alternator breaker. A three-position switch (31, figure 1-4) spring-loaded in the "OPEN" and "CLOSED" positions controls the breaker. Individual alternator breaker indicator lamps (32, figure 1-4) are located adjacent to each alternator breaker switch. These red lamps glow when the breaker is in the open position.

1-174. KILOWATT AND KILOVAR SELECTOR SWITCHES. A bank of four kilowatt-kilovar selector switches (37, figure 1-4) is used to determine the power output of the alternators. These switches are used to select the desired reading by placing them in either the "KWATTS" or "KVARS" position. Indicators (34, figure 1-4) are provided for use with the kilowatt-kilovar selector switches. During parallel operation the division of real load is indicated by these meters when the selector switches are in the "KWATTS" position. When the switches are in the "KVARS" position the meters register the reactive power measured in vars being put out by each alternator.

1-175. BUS CONTROLS AND INDICATORS. When in parallel operation the individual alternators are all interconnected to a common bus. This bus is divisible by means of tie breakers which may be controlled by the two-position bus tie breaker control switches (30, figure 1-4). The switches have guards which identify the bus segments they interconnect. The arrangement of the main a-c power bus and the individual bus tie breakers is illustrated on figure 1-14. A red indicator lamp (33, figure 1-4) is located adjacent to each bus tie breaker switch and glows when the bus tie breaker is in the open position.

1-176. SYNCHRONIZER LAMPS. The synchronization controls and indicators are provided to equalize the output and frequency of each alternator so they may be operated in parallel to mutually supply the a-c power requirements. Two lamps (22, figure 1-4) on the engineer's panel are used to synchronize alternators. These lamps are so connected that by means of the voltage and frequency selector switch, each lamp is placed between one phase of the power bus and the corresponding phase of the alternator to be paralleled with the bus. Therefore the lamps will light when a difference exists between the voltage of the power bus and the voltage of the alternator. If the alternator voltage does not have the same frequency as the power bus voltage, the lamps will flicker. During the period that both lamps are dark, there is no difference in voltage between the power bus and the alternator, indicating that the polarities are the same and that it is safe to close the alternator breaker.

1-177. DIRECT-CURRENT SYSTEM.

1-178. GENERAL. The d-c power system consists of six transformer-rectifier units designed to operate on 400-cycle, 200/115-volt, 3-phase alternating current, and a 24-volt, 17 ampere-hour storage battery. No instruments or equipment is required to control the d-c system. The units are connected through fuses to the a-c system and operate in parallel to deliver dc when there is power on the a-c bus. The total load of the system is automatically shared by the units.

1-179. BATTERY SWITCH. The battery is connected to the d-c system through a relay which is controlled by a switch (23, figure 1-4) on the engineer's panel. Power for the relay is taken from the battery. During normal operation of the bus the relay is closed, permitting the battery to be charged by the transformer-rectifier units.

1-180. OPERATIONAL EQUIPMENT.

1-181. Information concerning the operation of the following equipment and systems is given in section IV.

a. Oxygen Equipment

b. Communication, Navigation, and Radar Equipment

c. Pressurizing, Heating, and Ventilating Systems

d. Anti-icing Systems.

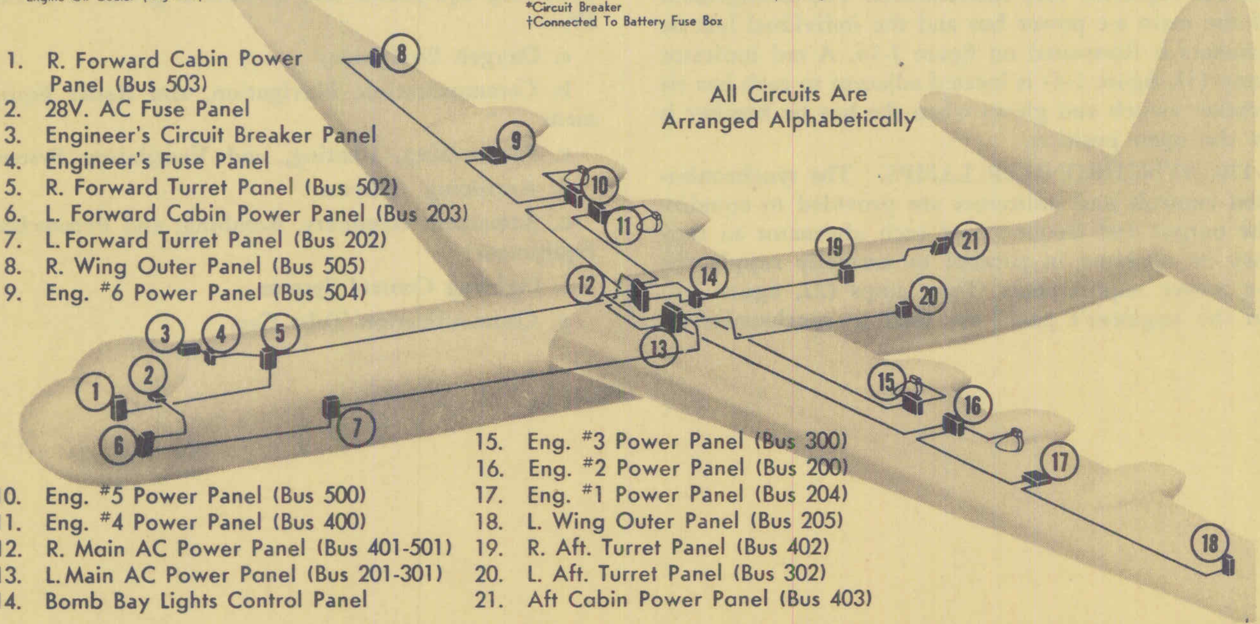
e. Armament (Gunnery, Bombing, and Pyrotechnic Equipment)

f. Lighting Control System

g. Communication Tube Cart

Circuit	Fuse or Cir.Bkr. Size	Panel
Aft Cabin Lights	*10	14
Aileron Lock Motor, Right	10	12 (Bus 501)
Aileron Lock Motor, Left	10	12 (Bus 501)
Aileron Trim Tab Booster, Right	10	8
Aileron Trim Tab Booster, Left	10	18
Automatic Gun Laying, APG-3	30	12 (Bus 401)
Automatic Gun Laying Pressurization, APG-3	10	21
Autosyn Transformer (Eng. #1)	10	17
Autosyn Transformer (Eng. #2)	10	16
Autosyn Transformer (Eng. #3)	10	15
Autosyn Transformer (Eng. #4)	10	11
Autosyn Transformer (Eng. #5)	10	10
Autosyn Transformer (Eng. #6)	10	9
Bomb Bay #1 and #2 Dome Lights	*15	14
Bomb Bay #3 and #4 Dome Lights	*15	14
Bomb Bay #1 Door Motor	10	7
Bomb Bay #2 Door Motor, Right	10	5
Bomb Bay #2 Door Motor, Left	10	7
Bomb Bay #3 Door Motor, Right	10	12 (Bus 501)
Bomb Bay #3 Door Motor, Left	10	13 (Bus 201)
Bomb Bay #4 Door Motor	10	20
Bomb Bay Lighting Transformer	20	12 (Bus 401)
Bomb Sight & AutoPilot Servo Cover Heaters	30	2
Bombardier's Lights	30	2
Brake Pump Motor	20	12 (Bus 401)
Camera Door Motor	10	20
Carburetor Air Filter (Eng. #4, #5, #6)	10	11
Carburetor Air Filter (Eng. #1, #2, #3)	10	15
Cockpit Lights, Radar Operator's and Nose Gunner's	30	2
Cooler Air Valve Motor	10	11
Copilot's Panel (Exterior Lights)	3-20's	2
Drift Meter	10	6
Engine Air Plug Motor (Eng. #1)	10	17
Engine Air Plug Motor (Eng. #2)	10	16
Engine Air Plug Motor (Eng. #3)	10	15
Engine Air Plug Motor (Eng. #4)	10	11
Engine Air Plug Motor (Eng. #5)	10	10
Engine Air Plug Motor (Eng. #6)	10	9
Engine Fan Speed Control Motor	* 5	3
Engine Oil Cooler (Eng. #1)	10	17
Engine Oil Cooler (Eng. #2)	10	16
Engine Oil Cooler (Eng. #3)	10	15
Engine Oil Cooler (Eng. #4)	10	11
Engine Oil Cooler (Eng. #5)	10	10
Engine Oil Cooler (Eng. #6)	10	9
Engine Starter (Eng. #1)	60	17
Engine Starter (Eng. #2)	60	16
Engine Starter (Eng. #3)	60	15
Engine Starter (Eng. #4)	60	11
Engine Starter (Eng. #5)	60	10
Engine Starter (Eng. #6)	60	9
Engineer's Lights	10	2
External Power Receptacle	4-60's	12 (Bus 501)
Flap Motor, Outboard (R. Wing)	20	9
Flap Motor, Center (R. Wing)	20	10
Flap Motor, Inboard (R. Wing)	20	11
Flap Motor, Inboard (L. Wing)	20	15
Flap Motor, Center (L. Wing)	20	16
Flap Motor, Outboard (L. Wing)	20	17
Flux Gate Compass Amplifier	10	6
Fuel Booster Pump Motor	10	10
Fuel Booster Pump Motor (2)	10	11
Fuel Booster Pump Motor (2)	10	15
Fuel Booster Pump Motor	10	16
Gyro Instrument Transformer, Copilot's	10	1
Gyro Instrument Transformer, Pilot's	10	6
Heat Exchanger Left & Turbo Selector Valve Motors	* 6-5's	3
Hydro-Pump Motor	2-60's	12 (Bus 501)
Intercooler Flap Motor Right (Eng. #!)	10	17
Intercooler Flap Motor Left (Eng. #1)	10	17
Intercooler Flap Motor Right (Eng. #2)	10	16
Intercooler Flap Motor Left (Eng. #2)	10	16
Intercooler Flap Motor Right (Eng. #3)	10	15
Intercooler Flap Motor Left (Eng. #3)	10	15
Intercooler Flap Motor Right (Eng. #4)	10	11
Intercooler Flap Motor Left (Eng. #4)	10	11
Intercooler Flap Motor Right (Eng. #5)	10	10
Intercooler Flap Motor Left (Eng. #5)	10	10
Intercooler Flap Motor Right (Eng. #6)	10	9
Intercooler Flap Motor Left (Eng. #6)	10	9
Landing Lights, Right	30	2
Landing Lights, Left	30	2
Lighting Transformer, Forward Cabin	20	6
Loran Set, AN/APN-9	10	6
Pitot Static Tube Heater, Right	* 5	3
Pitot Static Tube Heater, Left	* 5	3
Propeller Anti-Ice (Eng. #4, #5, #6)	10	11
Propeller Anti-Ice (Eng. #1, #2, #3)	10	15
Radar Set, AN/APQ-23A	20	6
Radio Compass, AN/ARN-7	10	6
Radio Operator's Lights	30	2
Rudder and Elevator Lock Motor	10	12 (Bus 501)
Secondary Heat Exchanger Bypass Valve Motor	* 5	3
Tail Anti-Ice Valve (Eng. #3)	10	15
Tail Anti-Ice Valve (Eng. #4)	10	11
Tail Skid	10	21
Throttle Booster Motor (Eng. #1)	10	17
Throttle Booster Motor (Eng. #2)	10	16
Throttle Booster Motor (Eng. #3)	10	15
Throttle Booster Motor (Eng. #4)	10	11
Throttle Booster Motor (Eng. #5)	10	10
Throttle Booster Motor (Eng. #6)	10	9
Transformer-Rectifier A. C. to D. C. Copilot	20	1
Transformer-Rectifier A. C. to D. C Radio Operator	20	1
Transformer-Rectifier A. C. to D. C. Bombardier	20	6
Transformer-Rectifier A. C. to D. C #2	20	12 (Bus 401)
Transformer-Rectifier A. C. to D. C. #3	20	12 (Bus 501)
Transformer-Rectifier A. C. to D. C. #1	20	13 (Bus 301)
Turbo Regulator Amplifiers	6-10's	4
Turbo Regulator Calibration Pots	20	4
Turret, Lower Aft R. H.	50	19
Turret, Lower Aft L. H.	50	20
Turret, Nose	40	1
Turret, Tail	40	21
Turret, Upper Aft Right	50	19
Turret, Upper Aft Left	50	20
Turret, Upper Forward Right	50	5
Turret, Upper Forward Left	50	7
Vent Fan, Aft Cabin	10	19
Vent Fan, Forward Cabin	10	5
Voltage Synchronizing Leads To Engineer's Panel	10	12 (Bus 401)
Voltage Synchronizing Lead To Engineer's Panel	10	12 (Bus 501)
Voltage Synchronizing Leads To Engineer's Panel	10	13 (Bus 201)
Voltage Synchronizing Leads To Engineer's Panel	10	13 (Bus 301)
Windshield Wiper, Bombardier's	10	6
Windshield Wiper, Pilot's	10	1
Wing Anti-Ice Valve (Eng. #1)	10	17
Wing Anti-Ice Valve (Eng. #2)	10	16
Wing Anti-Ice Valve (Eng. #5)	10	10
Wing Anti-Ice Valve (Eng. #6)	10	9
Wing Shut-Off Valve Motor	* 5	3

*Circuit Breaker
†Connected To Battery Fuse Box



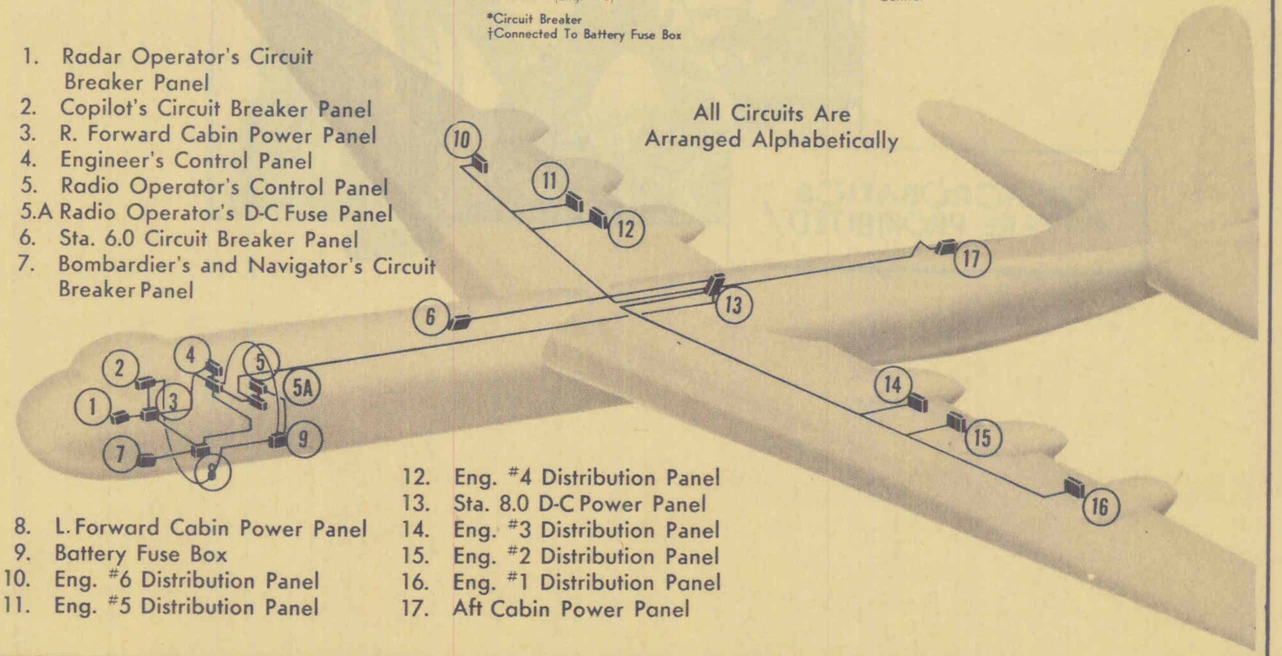
All Circuits Are Arranged Alphabetically

1. R. Forward Cabin Power Panel (Bus 503)
2. 28V. AC Fuse Panel
3. Engineer's Circuit Breaker Panel
4. Engineer's Fuse Panel
5. R. Forward Turret Panel (Bus 502)
6. L. Forward Cabin Power Panel (Bus 203)
7. L. Forward Turret Panel (Bus 202)
8. R. Wing Outer Panel (Bus 505)
9. Eng. #6 Power Panel (Bus 504)
10. Eng. #5 Power Panel (Bus 500)
11. Eng. #4 Power Panel (Bus 400)
12. R. Main AC Power Panel (Bus 401-501)
13. L. Main AC Power Panel (Bus 201-301)
14. Bomb Bay Lights Control Panel
15. Eng. #3 Power Panel (Bus 300)
16. Eng. #2 Power Panel (Bus 200)
17. Eng. #1 Power Panel (Bus 204)
18. L. Wing Outer Panel (Bus 205)
19. R. Aft. Turret Panel (Bus 402)
20. L. Aft. Turret Panel (Bus 302)
21. Aft Cabin Power Panel (Bus 403)

Figure 1-16. (Sheet 1 of 2 Sheets) Fuse Location Diagram

Circuit	Fuse or Cir.Bkr. Size	Panel
Aileron Trim Tab Control	* 5	2
Alarm Bell	* 5 †	2
Alternator Governor (Eng. #5)	10	11
Alternator Governor (Eng. #4)	10	12
Alternator Governor (Eng. #3)	10	14
Alternator Governor (Eng. #2)	10	15
AN/APQ-23A	20	3
Automatic Gun Laying APG-3	*10	5
Automatic Pilot Control	*10	2
Blind Approach, AN/ARN-5	*10	1
Bomb Arming Control	* 5	7
Bomb Arming Bomb Bay #3	*20	13
Bomb Arming Bomb Bay #4	*25	13
Bomb Arming Bomb Bay #2	*20	6
Bomb Arming Bomb Bay #1	*25	6
Bomb Bay #1 and #4 Door Control	* 5	7
Bomb Bay #2 Door Control	* 5	7
Bomb Bay #3 Door Control	* 5	7
Bomb Bay Door Control	* 5	2
Bomb Bay Lights Control	* 5	5
Bomb Bay Lights Control	* 5	13
Bomb Bay Lights Control	* 5	17
Bomb Glide Control	* 5	7
Bomb Rack Selector RS-2 Relay Bomb Bays #1 & #4	* 5	13
Bomb Rack Selector RS-2 Relay Bomb Bay #2	* 5	6
Bomb Rack Selector RS-2 Relay Bomb Bay #3	* 5	13
Bomb Release, Normal	*10	7
Bomb Salvo (2) Bomb Bays #1 & #2	*20	6
Bomb Salvo (2) Bomb Bays #3 & #4	*20	13
Bomb Salvo Release Pilot	*10	2
Bomb Salvo Release Bombardier	*10	7
Bomb Salvo Release Radio Operator	*10	5
Bomb Sight Stabilizer	* 5	7
Bomb Station Indicator Lights	3-20's	8
Brake Pump Control	* 5	2
Bus-Tie Breaker Control, A C	* 5	4
Cabin Heat Control	* 5	4
Cabin Heat Inlet Temperature	* 5	4
Cabin Pressure Control	* 5	4
Cabin Pressure Warning	5	17
Camera Control K-24	*25	13
Carburetor Air Filter Control	* 5	4
Carburetor Air Temperature	* 3-5's	4
Command Set AN/ARC-3	20	5A
Control Surface Lock	* 5	2
Detonator, SCR-695	*10 †	5
Emergency Hydro-Pump Control	* 5	4
Emergency Brake Pump Control	* 5	4
Engine Air Plug Control (Eng. #6)	10	10
Engine Air Plug Control (Eng. #5)	10	11
Engine Air Plug Control (Eng. #4)	10	12
Engine Air Plug Control (Eng. #3)	10	14
Engine Air Plug Control (Eng. #2)	10	15
Engine Air Plug Control (Eng. #1)	10	16
Engine Primer Control	* 5	4
Engine Starter Control	* 5	4
Engine Temperature	* 5	4
Engine Throttle Control	* 6-5's	4
Fire Detection	* 5	4
Fire Extinguisher System	*15	4
Flap Position Transmitter	* 5	13
Flux Gate Compass Caging	* 5	7
Fuel Booster Pump Control	* 6-5's	4
Fuel Mixture Control	* 6-5's	4
Fuel Transfer System	*14-5's	4
Identification Set SCR-695	*10	5
Ignition System	*20	4
Indicator, Copilot's Bank and Turn	* 5	2
Indicator, Flap Position	* 5	2
Indicator, Fuel Level	* 3-5's	4
Indicator, Pilot's Bank and Turn	* 5	2
Induction Vibration Booster (Eng. #6)		10
Induction Vibration Booster (Eng. #5)		11
Induction Vibration Booster (Eng. #4)		12
Induction Vibrator Booster (Eng. #3)		14
Induction Vibrator Booster (Eng. #2)		15
Induction Vibration Booster (Eng. #1)		16
Intercooler Control (Eng. #6)	10	10
Intercooler Control (Eng. #5)	10	11
Intercooler Control (Eng. #4)	10	12
Intercooler Control (Eng. #3)	10	14
Intercooler Control (Eng. #2)	10	15
Intercooler Control	10	16
Interphone, AN/AIC-2A	* 2-5's	2
Interphone	* 5	4
Interphone	* 5	5
Intervalometer Heater	* 5	7
Landing Flap Control	* 3-5's	2
Landing Gear Control	* 5	2
Landing Gear Warning	* 5	2
Landing Lights Position Control	* 5	2
Liaison Set Dynamotor	3-20's	5A
Liaison Set AN/ARC-8	* 5	5
Marker Beacon	* 5	5
Nose Steering Control	* 5	2
Oil Dilute	* 5	4
Oil Shut-Off Valves	* 6-5's	4
Oil Temperature	* 3-5's	4
Propeller Anti-Icing Control	* 5	4
Propeller Pitch Control	* 6-15's	4
Propeller Synchronizer Master	*10	4
Radar Camera Control	*10	1
Radio Compass AN/ARN-7	* 5	7
Radar Pressurization	* 5	1
Test Power Terminal (Eng. #6)	10	10
Test Power Terminal (Eng. #5)	10	11
Test Power Terminal (Eng. #4)	10	12
Test Power Terminal (Eng. #3)	10	14
Text Power Terminal (Eng. #2)	10	15
Test Power Terminal (Eng. #1)	10	16
Trim Tab Position Transmitter L. Aileron	10	10
Trim Tab Position Transmitter R. Aileron	10	16
Turbo Regulator (Eng. #6)	10	10
Turbo Regulator (Eng. #5)	10	11
Turbo Regulator (Eng. #4)	10	12
Turbo Regulator (Eng. #3)	10	14
Turbo Regulator (Eng. #2)	10	15
Turbo Regulator (Eng. #1)	10	16
Wheel Well Lights, Landing Gear	* 5	4
Windshield Wiper Control Pilot	* 5	2
Windshield Wiper Control Bombardier	* 5	7
Wing Anti-Icing Control	* 5	4

*Circuit Breaker
†Connected To Battery Fuse Box



1. Radar Operator's Circuit Breaker Panel
2. Copilot's Circuit Breaker Panel
3. R. Forward Cabin Power Panel
4. Engineer's Control Panel
5. Radio Operator's Control Panel
5.A Radio Operator's D-C Fuse Panel
6. Sta. 6.0 Circuit Breaker Panel
7. Bombardier's and Navigator's Circuit Breaker Panel
8. L. Forward Cabin Power Panel
9. Battery Fuse Box
10. Eng. #6 Distribution Panel
11. Eng. #5 Distribution Panel
12. Eng. #4 Distribution Panel
13. Sta. 8.0 D-C Power Panel
14. Eng. #3 Distribution Panel
15. Eng. #2 Distribution Panel
16. Eng. #1 Distribution Panel
17. Aft Cabin Power Panel

All Circuits Are Arranged Alphabetically

Figure 1-16. (Sheet 2 of 2 Sheets) Fuse Location Diagram

all ACROBATICS ARE PROHIBITED!

NORMAL OPERATING INSTRUCTIONS

SECTION II

2-1. BEFORE ENTERING AIRPLANE.

2-2. FLIGHT LIMITATIONS AND RESTRICTIONS.

2-3. All acrobatics are prohibited. Airplane limitations are as follows:

a. Flap Extension	Maximum IAS 188 mph
b. Landing Gear Extension	Maximum IAS 212 mph
c. Landing Light Extension	Maximum IAS 212 mph
d. Full Aileron Deflection	Maximum IAS 188 mph

e. Maximum bank while turning is 60 degrees at a gross weight of 278,000 pounds.

f. Maximum Diving Speeds

ALTITUDE-FEET	*IAS-MPH*
Sea Level	295
5,000	287
10,000	279
15,000	270
20,000	259
25,000	248
30,000	235
35,000	217

g. Maximum weight for landing is 268,000 pounds.

WARNING

When landing at the maximum weight, bomb bays No. 1 and No. 4 must be empty.

h. High ratio ("HIGH RPM" position) of the engine-driven fan must not be used below 15,000 feet altitude. (See paragraph 2-38.)

Note

These limitations and restrictions are subject to change; consult the latest service directives and orders.

2-4. TAKE-OFF GROSS WEIGHT AND BALANCE.

2-5. Check to see that airplane weight and balance form F is complete. For loading information refer to *Handbook of Weight and Balance Data,* AN 01-1B-40. A load adjuster is stowed in the pilot's data case in the flight compartment.

Note

For optimum ground handling and steering characteristics at low gross weights, the cg location should be approximately 30 per cent MAC.

2-6. INSPECTION—EXTERIOR OF AIRPLANE.

2-7. The following items on the exterior of the airplane will be inspected.

a. Fuel and Oil Caps—In Place and Secure
b. Pitot Head Covers—Removed
c. Landing Gear and Bomb Door Locks—Removed
d. Tires and Oleo Struts—Properly Inflated
e. Wheels—Chocked
f. Nose Gear Scissors—Connected

WARNING

Failure to have the nose gear scissors connected will render the nose wheel steering mechanism inoperative.

2-8. HOW TO GAIN ENTRANCE.

2-9. The crew may enter the airplane through the forward entrance (27, figure 1-1) located in the nose wheel well, or through the aft entrance (48, figure 1-1) located on the under side of the fuselage below the aft upper gunner's blister.

2-10. ON ENTERING THE AIRPLANE.

2-11. On entering the airplane the pilot and flight engineer will make the following preflight checks:

PILOTS

a. Seat	Adjust
b. Rudder Pedals	Adjust
c. Oyxgen Equipment and Pressure	Check
d. Gyros (6 and 7, figure 1-3)	Uncaged
e. Alternate Static Pressure Switch (10, figure 1-3)	"AIRSPEED TUBE STATIC PRESSURE"
f. Circuit Breakers	On
g. Emergency Ignition Switch (33, figure 1-3)	Pushed In

ENGINEER

a. All Circuit Breakers	On
b. Master and Individual Ignition Switches (53, figure 1-4)	"OFF"
c. Battery Switch (23, figure 1-4)	"ON"

CAUTION

The battery switch must be on to supply power for grounding the magnetos.

d. Fuel Quantity Gages (16, figure 1-4)	Check
e. Oxygen Equipment and Pressure (13, figure 1-4)	Check
f. Seat	Adjust
g. Master Motor Switch (115, figure 1-4)	"ON"

PILOTS

h. Landing Gear Control Switch (41, figure 1-3)	"EXTEND"
i. Flap Control Switch (46, figure 1-3)	"UP"
j. Propeller Reverse Selector Switches (45, figure 1-3)	"SAFE"
k. Altimeter (22, figure 1-3)	Set
l. Parking Brake Lever (51, figure 1-3)	"ON"

WARNING

Rapid successive application of the parking brake will cause the brake gage line fuse to shut off the flow of fluid to the valve, rendering the brake inoperative.

ENGINEER

h. Master Motor Speed Control Knob (109, figure 1-4)	2700 rpm
i. Feather Switch Guards (113, figure 1-4)	Down
j. Propeller Selector Switches (116, figure 1-4)	"AUTO"
k. Engine Supercharger Switches (49, figure 1-4)	"BOTH"
l. Fire Extinguisher Engine Selector Switch Guards (43, figure 1-4)	Down
m. Oil Shut-off Valve Switch Guards (45, figure 1-4)	Down
n. Fan Speed Control Switches (46, figure 1-4)	"LOW RPM"
o. Hydraulic Pump Override Switch (103, figure 1-4)	"OFF"
p. Brake Pump Pressure Override Switch (100, figure 1-4)	"OFF"
q. Cabin Heat and Tail Anti-ice Switches (98, figure 1-4)	"OFF"
r. Wing Anti-ice Control Switches (97, figure 1-4)	"OFF"
s. Cabin Pressure Wing Shut-off Valve Switch (91, figure 1-4)	"OFF"
t. Aft Cabin Pressure Control Switch (92, figure 1-4)	"ON"
u. Cooling Air Control Switch (90, figure 1-4)	"OFF"
v. Pitot Heater Control Switches (94, figure 1-4)	"OFF"
w. Propeller Anti-ice Control Switch (95, figure 1-4)	"OFF"
x. Fuel Control Switches (81, 82, 84, and 85, figure 1-4)	Off
y. All Alternator Breaker Switches	"OPEN"
z. External Power Supply Switch (25, figure 1-4)	"OFF"
aa. Plug in External Power	
ab. Correct A-C Phase Sequence Lamp (39, figure 1-4)	Lighted

PILOTS

m. Warning Light Operation — Check

n. Interphone Equipment (See figure 1-3, sheet 4 of 4 sheets.) — Check

o. Radio Equipment — Check

p. Flight Controls — Unlock

CAUTION

Head the airplane into the wind before unlocking the control surfaces.

Note

If the red indicator lamp (16, figure 1-3) does not go out, the controls are not completely unlocked.

q. Flight Controls for Freedom of Movement — Check

r. Flight Controls — Relock

2-12. SPECIAL CHECK FOR NIGHT FLIGHTS.

2-13. When a night flight is anticipated, check the following equipment:

a. Landing Lights
b. Position Lights
c. Formation Lights
d. Compartment Lights
e. Wing Interior Lights
f. Instrument Panel Lights
g. Flares
h. Pyrotechnic Pistol
i. Blackout Curtains
j. Flashlight

ENGINEER

Note

If the incorrect a-c phase sequence lamp is lighted, reverse any two phase leads on the external power cart terminal strip.

CAUTION

The correct a-c phase sequence lamp must light before the external power supply switch is turned on, to eleminiate possibility of motor damage.

ac. External Power Supply Switch — "ON"

ad. All Bus Tie Breaker Switches (30, figure 1-4) — "CLOSE"

ae. Hydraulic Pressure Gages — Check

af. Interphone Equipment (6, figure 1-4) — Check

ag. All Warning Lamps — Check

ah. Turbosupercharger Calibration Potentiometer Knobs (111, figure 1-4) — Indexed

ai. Eng. Cyl. and Anti-icing Temp. Ind. Switch (figure 1-13) — "ON"

aj. Check Switch — "CH" Position

ak. Compensating Rheostat — Adjust Until Galvanometer Needle Indicates "CH"

al. Check Switch — "ON" Position

am. Report to the pilot when the check list is complete and engines are ready to start.

2-14. FUEL SYSTEM MANAGEMENT.

2-15. The various configurations for normal operation are given below: (See figure 2-1.)

CAUTION

Booster pumps must be operated continuously in tanks supplying fuel.

a. STARTING ENGINES, WARM-UP, TAKE-OFF, AND CLIMB. All tank, cross-feed, and engine valves "OPEN."

b. NORMAL CRUISE. Use all the fuel in the inboard tanks first, center tanks second, and outboard tanks last. (See figure 2-1 for switch positions.) When the fuel supply in a single tank feeding three engines is reduced to approximately 200 gallons, fuel from a full tank is brought into the system under booster pump pressure. As soon as the fuel gage of the emptying tank reads zero, the tank valve of the empty tank is closed and its booster pump is turned off.

c. LANDING. For normal landing conditions outboard tank valves and cross-feed valves are "OPEN," center and inboard tank valves are "CLOSED," and all engine valves are "OPEN." If fuel is available in all tanks, use the take-off configuration.

2-16. STARTING ENGINES.

2-17. When starting engines, a ground observer (a member of the flight crew or the ground crew) must be in constant communication with the flight engineer. As each of the engines is turned over, any observation of abnormal operation must be reported to the flight engineer immediately. To facilitate warm-up of the alternators and controls, the recommended engine starting sequence is 4, 5, 6, 3, 2, and 1.

PILOTS

ENGINEER

a. Direct all propellers be pulled through six blades.

CAUTION

Use no more than two men per blade. The engines must be turned carefully while checking for hydraulic locks.

b. Turbosupercharger Boost Selector Lever (110, figure 1-4)	"O" Position
c. Mixture Control Levers (106, figure 1-4)	"IDLE CUT-OFF"
d. Throttle Levers (108, figure 1-4)	1/4 to 1/2 Open
e. Engine Cylinder and Anti-icing Temperature Selector Switch (14, figure 1-4)	Engine No. 4
f. Balance Knob	Rotate right or left to obtain zero reading on galvanometer.

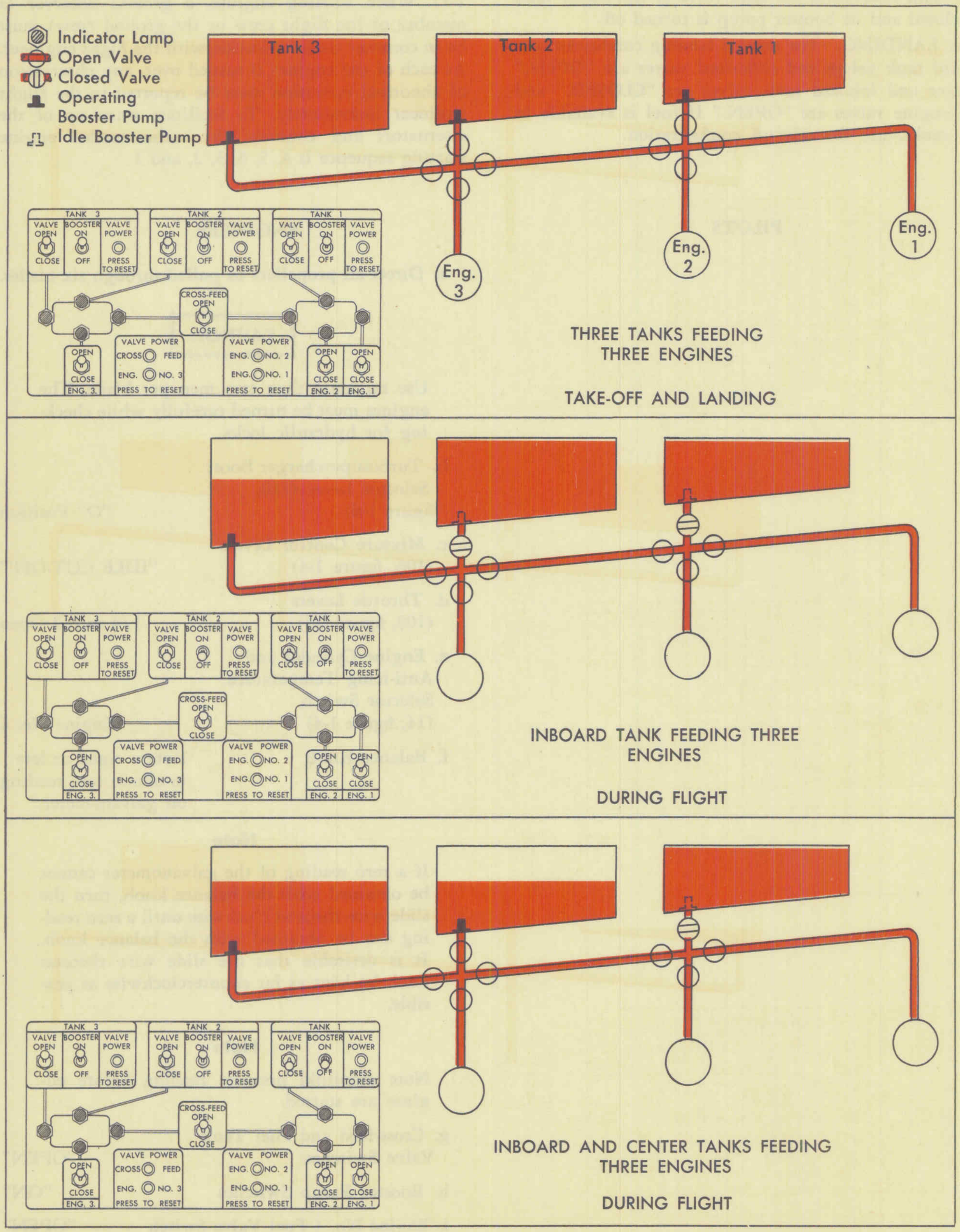
Note

If a zero reading of the galvanometer cannot be obtained with the balance knob, turn the slide wire rheostat clockwise until a zero reading can be obtained with the balance knob. It is desirable that the slide wire rheostat knob be kept as far counterclockwise as possible.

Note

Note manifold pressure reading before engines are started.

g. Cross-feed and Fuel Tank Valve Switches	"OPEN"
h. Booster Pump Switches	"ON"
i. Engine No. 4 Fuel Valve Switch	"OPEN"
j. Engine No. 4 Fuel Pressure (1, figure 1-4)	Note



THREE TANKS FEEDING THREE ENGINES

TAKE-OFF AND LANDING

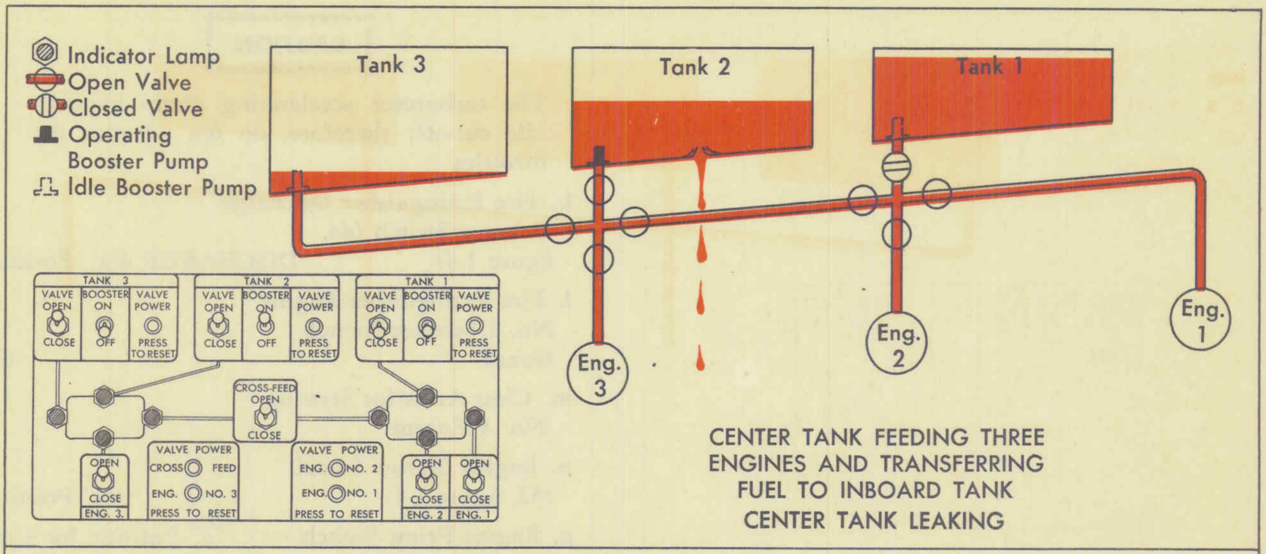
INBOARD TANK FEEDING THREE ENGINES

DURING FLIGHT

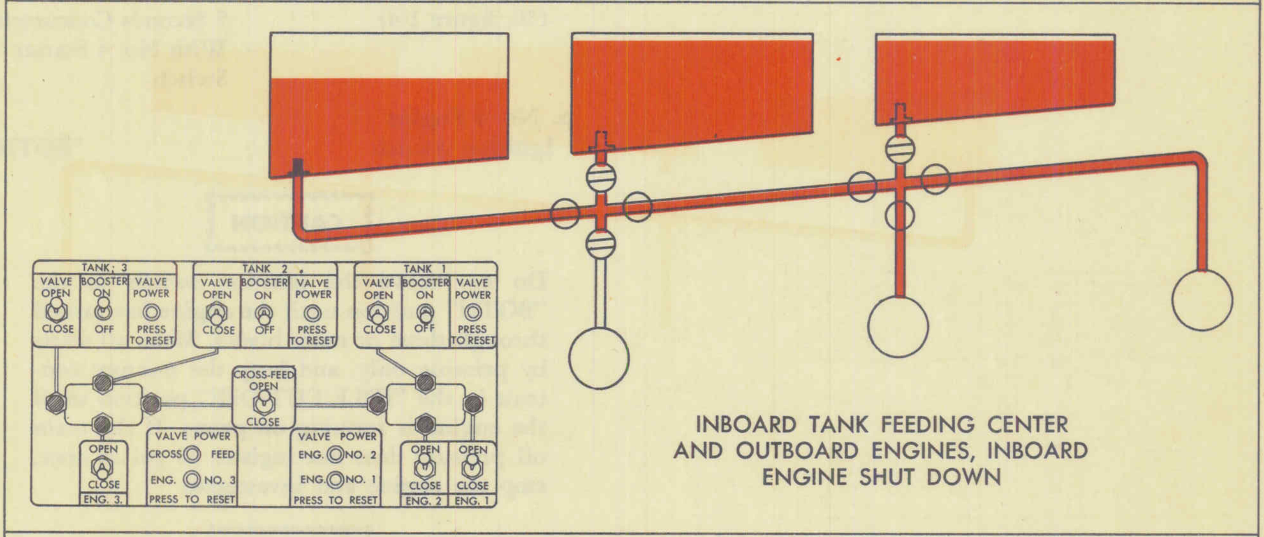
INBOARD AND CENTER TANKS FEEDING THREE ENGINES

DURING FLIGHT

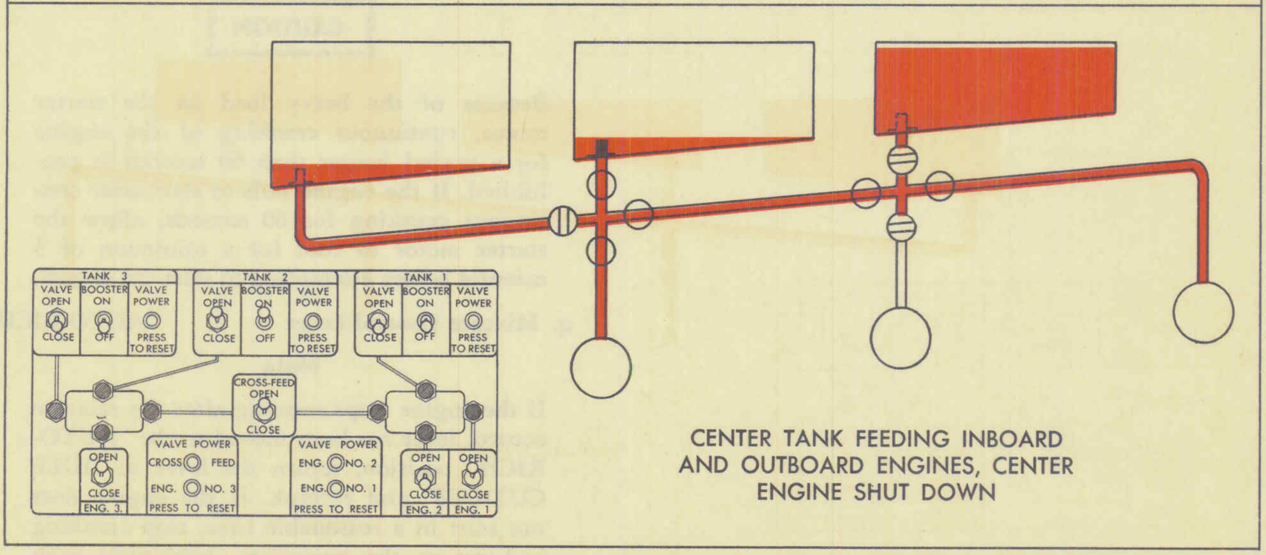
Figure 2-1. (Sheet 1 of 2 Sheets) Courses of Fuel Flow



CENTER TANK FEEDING THREE ENGINES AND TRANSFERRING FUEL TO INBOARD TANK CENTER TANK LEAKING



INBOARD TANK FEEDING CENTER AND OUTBOARD ENGINES, INBOARD ENGINE SHUT DOWN



CENTER TANK FEEDING INBOARD AND OUTBOARD ENGINES, CENTER ENGINE SHUT DOWN

Figure 2-1. (Sheet 2 of 2 Sheets) Courses of Fuel Flow

PILOTS

ENGINEER

CAUTION

The carburetor accelerating pump bypasses idle cut-off; therefore, do not advance the throttles.

k. Fire Extinguisher Discharge Selector Switch (44, figure 1-4) — "DISCHARGE #1" Position

l. Fire Extinguisher Engine No. 4 Selector Switch Guard — Up

m. Clear Areas for Starting No. 4 Engine

n. Engine Starter Switch (52, figure 1-4) — "4" Position

o. Engine Prime Switch (50, figure 1-4) — "4" Position for 3 to 5 Seconds Concurrent With No. 4 Starter Switch

p. No. 4 Engine Ignition Switch — "BOTH"

CAUTION

Do not move the ignition switch to the "BOTH" position until the engine has turned through three or more blades. Make all starts by priming only, and keep the mixture controls in the "IDLE CUT-OFF" position until the engine is running on prime. If the main oil pressure does not register 50 psi at once, stop the engine and investigate.

CAUTION

Because of the heavy load on the starter motor, continuous cranking of the engine for a period longer than 60 seconds is prohibited. If the engine fails to start after continuous cranking for 60 seconds, allow the starter motor to cool for a minimum of 3 minutes before attempting to start the engine.

q. Mixture Control Lever — "AUTO-RICH"

Note

If the engine stops running after the mixture control lever has been moved to the "AUTO-RICH" position, return the lever to "IDLE CUT-OFF" and recrank. If the engine does not start in a reasonable time, stop cranking and repeat the procedure, beginning with priming.

r. Throttle Levers — Set to obtain 1000 rpm

PILOTS

ENGINEER

Note

Do not set throttles for 1000 rpm until oil smoke clears out.

s. Repeat the above procedure for starting engines No. 5, 6, 3, 2, and 1.

Note

See paragraph 3-1 for instructions on combating engine fires.

2-18. ENGINE WARM-UP.

2-19. The following procedure will be used to warm up the engines.

CAUTION

Do not exceed 1000 rpm until the oil temperature reaches 40°C. Make all ground operations with the mixture controls in the "AUTO-RICH" position.

PILOTS

ENGINEER

a. Make the ignition safety check at 1000 rpm as follows: Switch the No. 4 ignition from "BOTH" to "L" and then to the detent position between "L" and "R"; then switch from the detent position to "R" and back to the detent position. Finally switch the ignition from the detent position to "OFF" momentarily, and back to "BOTH."

Note

A slight drop-off of engine rpm on each single magneto position and complete cutting out of the engine at the "OFF" position indicate proper connection of the ignition leads.

b. Engine No. 4 Throttle Lever	Set to Obtain 1000 rpm
c. Voltage and Frequency Selector Switch (35, figure 1-4)	"4" Position
d. No. 4 Exciter Control Relay Switch (24, figure 1-4)	"ON"
e. No. 4 Voltage Control Knob (36, figure 1-4)	Adjust to 205 Volts (29, figure 1-4)
f. No. 4 Frequency Control Knob (27, figure 1-4)	Adjust to 410 Cycles (26, figure 1-4)
g. External Power Supply Switch	"OFF"
h. No. 4 Alternator Breaker Switch (31, figure 1-4)	"CLOSE"
i. External Power Supply	Unplug
j. No. 3 and No. 5 Exciter Control Relay Switches	"ON"

PILOTS

ENGINEER

Note

Placing the exciter control relay switches in the "ON" position allows the alternators time to warm up.

2-20. ENGINE GROUND TEST.

2-21. In order to reduce engine ground test time, the following procedure calls for engine checks to be made in symmetrical pairs where possible.

PILOTS

a. Propeller Tachometer (18, figure 1-3) Check for 2700 rpm

ENGINEER

a. Engine Oil Temperature Gage (9, figure 1-4) 40°C

CAUTION

Do not attempt to accomplish any ground test until oil temperature is 40 degrees C.

b. Voltage and Frequency Selector Switch Engine Being Tested

c. Engine Cylinder and Anti-icing Temperature Selector Switch Engine Being Tested

d. Throttle Levers, One Symmetrical Pair of Engines Set to Obtain 1600 rpm

e. Propeller Selector Switch "DEC. RPM"

Note

Hold the selector switch in the above position until the engine speed drops to 1400 rpm.

f. Propeller Selector Switch "INC. RPM"

Note

Hold the selector switch in the increase position until the engine speed increases to 1500 rpm.

g. Propeller Selector Switch "AUTO"

Note

Engine speed should return to 1600 rpm.

h. Master Motor Speed Control Knob Decrease

Note

Turn the master motor speed control knob in the decrease direction until the propeller tachometer reads 1400 rpm.

i. Engine Tachometer (4, figure 1-4) 1400 rpm

j. Master Motor Speed Control Knob Increase

Note

Turn the master motor speed control knob in the increase direction until the propeller tachometer reads 2700 rpm.

PILOTS

b. After engineer has completed propeller check on each symmetrical pair of engines at 1600 rpm, propeller reverse selector switch (45, figure 1-3) "READY"

c. Propeller Reverse Pitch Switch (54, figure 1-3) Push

d. Propeller Reverse Selector Switch "SAFE"

Note

When the engineer runs up the No. 4 engine, check the manifold pressure gage (17, figure 1-3) against the flight engineer's No. 4 manifold pressure gage.

ENGINEER

k. Engine Tachometer 1600 rpm

l. Observe tachometer and report erratic action.

Note

The increase in engine rpm will be very small as the propeller passes through flat pitch into reverse, since the pitch change action is very fast.

m. Propeller Feather Switch "FEATHER"

CAUTION

Do not leave the propeller feather control switch in "FEATHER" position longer than 1/4 of a second.

n. Propeller Feather Switch "NORMAL"

CAUTION

Never allow the propeller to feather fully when engine power is on.

o. Throttle Increase Power

Note

Make the following checks with the turbosupercharger boost selector lever remaining at "0" position.

Note

Increase the engine rpm in symmetrical pairs until the manifold pressure is equal to the field barometric pressure, or is the same pressure as was indicated on the manifold pressure gages before starting the engines.

p. Ignition Switch "L"

Note

On single magneto operation normal engine rpm drop-off is 60 to 80 rpm. Maximum permissible engine rpm drop-off is 100 rpm.

q. Ignition Switch To Detent Between "L" and "R"

PILOTS

ENGINEER

Note

Engine will come back to speed since the detent position is the same as "BOTH" position.

r. Ignition Switch	Detent Position to "R"
s. Ignition Switch	"R" to "BOTH"
t. Throttle Levers	Full Open—Compare rpm and M.P. Indication
u. Turbosupercharger Boost Selector Lever	"7" Position

Note

Adjust turbosupercharger calibration potentiometer knobs to obtain 52.0 inches M. P.

v. Throttle Levers, All Engines	1000 rpm
w. Voltage and Frequency Selector Switch	"5" Position
x. No. 5 Alternator Voltage Control Knob	Adjust to 205 Volts
y. No. 5 Frequency Control Knob (27, figure 1-4)	Adjust

Note

Adjust frequency control knob until the synchronizing lamps (22, figure 1-4) are dark.

z. No. 5 Alternator Breaker Switch	"CLOSE"

Note

When the alternator breaker closes, the alternator breaker indicator lamp (32, figure 1-4) will go out.

aa. Repeat steps w, x, y, and z for No. 3 alternator.

ab. Kilowatt-kilovar Selector Switches (37, figure 1-4)	"KWATT" Position

Note

Equalize the readings between all alternators by use of the frequency control knobs.

ac. Kilowatt-kilovar Selector Switch	"KVAR" Position

Note

Equalize the readings between all alternators by use of the voltage control knobs.

ad. Repeat steps ab and ac until complete equalization of the alternators is assured.

ae. Report to the pilot that the engines are OK.

2-22. TAXIING INSTRUCTIONS.

2-23. This airplane is taxied like any other large tricycle-gear airplane that is equipped with a steerable nose gear. Directional control while taxiing is accomplished hydraulically through use of the steering handle with all engines set at the same rpm; however, differential-braking and differential-throttle steering may be easily accomplished in lieu of hydraulic steering.

2-24. All flight controls must remain locked while taxiing.

2-25. The airplane must be in motion before executing turns; use the largest turning radius possible in order to minimize tire wear and landing gear stresses. Make alternate right and left turns, when practical, to equalize nose wheel tire wear. For minimum turning radius refer to figure 2-2. A runway width of 300 feet is adequate for executing normal turns. Stop the airplane with the nose wheel in line with the fuselage center line to reduce nose gear stresses during engine run-up and at the restart of taxiing.

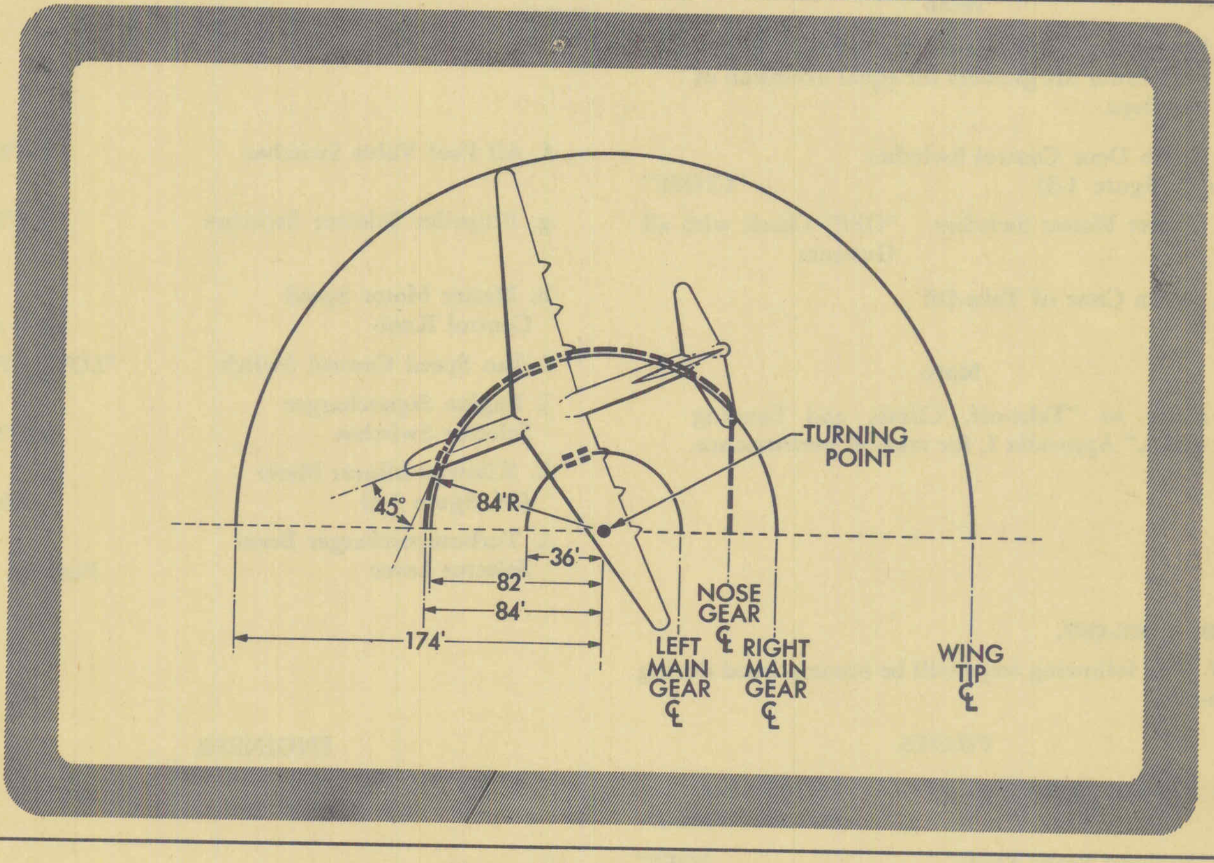


Figure 2-2. Turning Radius

PILOTS		ENGINEER
a. Steering Control Switch (40, figure 1-3)	"ON"	
b. Parking Brake Lever	"OFF"	
c. Taxi into the take-off position.		

2-26. BEFORE TAKE-OFF.

2-27. Make the following checks before take-off:

PILOTS		ENGINEER	
a. Parking Brake Lever	"ON"	a. Engines	Check and Report to Pilot 1000 rpm
b. Autopilot (39, figure 1-3)	"OFF"	b. Brake System Hydraulic Pressure	Check and Report to Pilot

PILOTS

c. Flight Controls	Unlocked

Note

Check control movement in coordination with a visual check made by the aft lower gunner.

d. Trim Tabs (50, 52, and 55, figure 1-3)	Set as Required
e. Flaps	Extend

Note

Extend flaps 20 degrees for take-off. Check with lower aft gunners for equal extension of the flaps.

f. Bomb Door Control Switches (35, figure 1-3)	"CLOSE"
g. Turret Master Switches	"OFF"- Check with all Gunners
h. Warn Crew of Take-Off	

Note

Refer to "Take-off, Climb, and Landing Chart," Appendix I, for take-off performance.

ENGINEER

c. Steering System Hydraulic Pressure	Check and Report to Pilot
d. Mixture Control Levers	"AUTO-RICH"
e. All Booster Pump Switches	"ON"
f. All Fuel Valve Switches	"OPEN"
g. Propeller Selector Switches	"AUTO"
h. Master Motor Speed Control Knob	2700 rpm
i. Fan Speed Control Switch	"LOW RPM"
j. Engine Supercharger Selector Switches	"BOTH"
k. Kilowatt-kilovar Meter (34, figure 1-4)	Check
l. Turbosupercharger Boost Selector Lever	Position "7"

2-28. TAKE-OFF.

2-29. The following steps will be accomplished during take-off:

PILOTS

a. Throttle Levers	Set 30 Inches Manifold Pressure
b. Parking Brake Lever	"OFF"
c. Throttle Levers	Advance to Take-off Manifold Pressure

Note

Use nose wheel steering until airplane reaches a speed of 60 mph IAS when the rudder becomes effective.

d. Airplane Attitude	Nose High

Note

Hold the airplane in a nose-high attitude until airborne.

e. Landing Gear Control Switch	"RETRACT"

ENGINEER

PILOTS

Note

When the landing gear is completely retracted, return the control switch to the "OFF" position.

f. Brake Pump Switch "OFF"

g. Flap Control Switch Retract Flaps 10 Degrees

WARNING

Do not retract the flaps 10 degrees until a speed of 150 mph IAS has been attained.

h. Flap Control Switch Retract Flaps 10 Degrees

WARNING

Do not fully retract the flaps until a speed of 165 mph IAS has been attained.

i. Climbing Speed—Refer to "Take-off, Climb, and Landing Chart," Appendix I.

ENGINEER

2-30. ENGINE FAILURE DURING TAKE-OFF. (Refer to paragraph 3-10.)

2-31. CLIMB.

2-32. The following operations will be performed during climb:

PILOTS

a. Climbing Air Speeds—Refer to "Take-off, Climb, and Landing Chart," Appendix I.

ENGINEER

a. Engine Cylinder and Anti-icing Temperature Indicator Periodic Checks

b. Fan Speed Control Switch Refer to the flight operation instruction charts, Appendix I.

2-33. DURING FLIGHT.

2-34. Refer to the flight operation instruction charts, Appendix I, for information concerning effects of changes in gross weight, external resistance, and engine operation data.

2-35. STABILITY AND CONTROL.

2-36. Stability and control for any given trim condition is normal.

2-37. Extension and retraction of the landing gear induces a mild change in longitudinal trim of the airplane. The sweepback of the wing on this airplane causes the flap movement to exercise a great effect on the longitudinal stability. The resultant effect of the flap movement can be reduced by operating the flaps in increments of 10 degrees.

2-38. TURBOSUPERCHARGER CONTROL.

2-39. At high altitudes turbo operation is limited by a closed waste gate, maximum permissible turbo speed, and in some cases by compression surge. The appropriate turbo operation is indicated for each flight condition in the charts of Appendix I. Dual operation of the turbo is preferable when possible, because it imposes less back pressure on the engine than does single turbo operation.

2-40. COOLING FAN CONTROL.

2-41. Use the low ratio ("LOW RPM" position) of the fan drive when possible, because the high ratio ("HIGH RPM" position) absorbs more of the engine power. Adequate engine cooling should be obtained with low ratio under standard temperature conditions. High ratio fan drive should only be required at very high altitudes with normal rated power.

WARNING

Because of structural limitations of the fan, high ratio must not be used below 15,000 feet altitude. Between 15,000 and 20,000 feet the high ratio may be used when engine speeds are below 2200 rpm. Either drive ratio may be used above 20,000 feet.

2-42. ENGINE CYLINDER AND ANTI-ICING TEMPERATURE INDICATOR.

2-43. If during a long period of operation a galvanometer reading of zero cannot be obtained with the slide wire rheostat in the full clockwise position, the flashlight batteries in the upper corners of the potentiometer panel should be replaced.

CAUTION

Before replacing batteries turn the slide wire rheostat knob fully counterclockwise.

2-44. ALTERNATOR CONTROL.

2-45. Equality of kilowatt and kilovar output between each alternator operating in parallel must be maintained. Should any alternator indicate excessive kilovar or kilowatt output, it will overheat.

WARNING

Continued overheating of an alternator, as indicated by unbalanced kilovar or kilowatt output, will damage the alternator.

2-46. Maintain kilowatt output by adjusting the frequency control knob. The voltage control knob should be used to equalize kilovar output between alternators.

2-47. WARNING HORN.

2-48. During ascent the warning horn will sound intermittently at two different altitudes. The first sounding will indicate the airplane to be at a pressure altitude of 10,250 feet and the cabin pressurization system must be activated or oxygen used. The second sounding of the horn at 40,500 feet indicates the cabin air pressure to be in excess of 8000 feet and oxygen must be used above this height.

2-49. STALLS.

2-50. The following stalling speed chart is indicated air speed and does not contain corrections for position and instrument error.

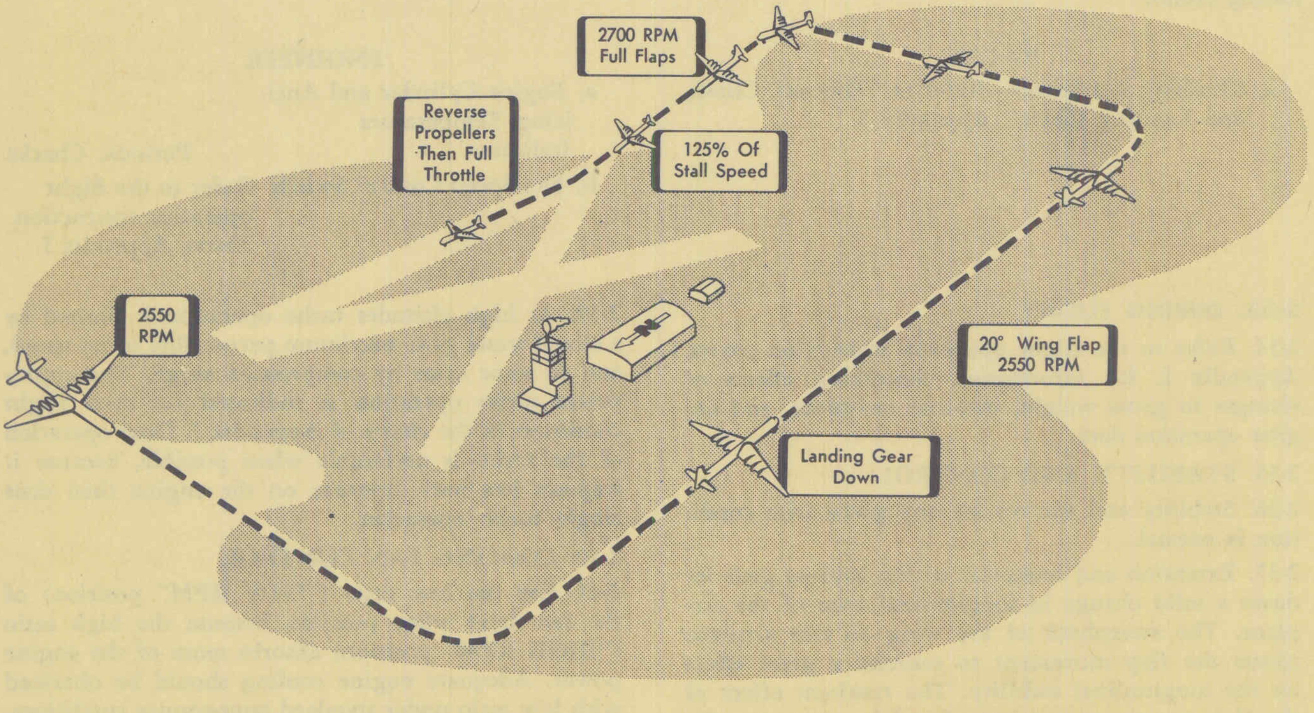


Figure 2-3. Traffic Pattern

STALLING SPEEDS (POWER OFF AND GEAR DOWN)

GROSS WEIGHT	FLAP POSITION	IAS
140,000 Pounds	30 Degrees	75.5
200,000 Pounds	30 Degrees	90.2
278,000 Pounds	30 Degrees	106.2
325,000 Pounds	30 Degrees	115.0
140,000 Pounds	20 Degrees	79
200,000 Pounds	20 Degrees	94
278,000 Pounds	20 Degrees	111
325,000 Pounds	20 Degrees	120
140,000 Pounds	0 Degrees	89
200,000 Pounds	0 Degrees	106
278,000 Pounds	0 Degrees	125
325,000 Pounds	0 Degrees	135

2-51. The airplane is not normally intended to be subjected to stalled flight. Tail shake stall warnings are mild with wing flaps retracted and moderate with wing flaps fully extended. Nose-down pitch at stall is mild with wing flaps retracted and moderate with wing flaps fully extended. A mild tendency to roll at stall is present concurrent with the nose-down pitch. Technique required for entry and recovery from the stall is orthodox. Power-on stall information will be furnished when available.

2-52. SPINS.

2-53. Spins are prohibited. In event of a spin, use conventional methods of recovery.

2-54. DIVING CHARACTERISTICS.

2-55. The airplane is capable of performing normal dives up to air speeds within the allowable limits (paragraph 2-2, step f) for all allowable cg locations. Because of the high stability of the airplane, dives and dive recoveries are normal and are executed with elevator control forces periodically trimmed out as required.

2-56. APPROACH.

2-57. NORMAL TRAFFIC PATTERN BANK.

2-58. In executing steep turns, because of the high stability of the airplane, considerable longitudinal retrimming will be found necessary during the entry and exit periods of the turns in maintaining constant air speed and nominal elevator control forces.

2-59. The following checks and control settings will be made during the approach:

PILOTS

a. Traffic Pattern	See figure 2-3.
b. Landing Gross Weight and Balance	Check
c. Command Set	"ON"
d. Interphone Control Panel Selector Switch	"MIXED SIGNALS & COMMAND"
e. Landing Gear Control Switch	"EXTEND"

WARNING

Do not lower the landing gear at speeds in excess of 212 mph IAS.

f. Flap Control Switch	Extend Flaps to 20 Degrees

WARNING

Do not extend the flaps at speeds in excess of 188 mph IAS.

ENGINEER

a. Electrical System	Check
b. Hydraulic Pressures	Check and Advise Pilot
c. Fuel System Controls	Engine Valve Switches "OPEN"; Cross-feed Valve Switches "OPEN"; Tank Valve Switch "OPEN" (All Tanks Containing Fuel)
d. Booster Pump Switches	"ON" in Tanks Being Used
e. Fan Speed Control Switches	"LOW RPM"
f. Mixture Control Levers	"AUTO-RICH"

PILOTS | ENGINEER

g. Propeller Reverse Selector Switches "SAFE"

h. Turbosupercharger Boost Selector Lever "7" Position

i. Master Motor Speed Control Knob Set for 2550 rpm

j. Throttle Lever Settings As required to maintain 125 per cent of power-off stalling speeds.

k. Trim Tabs As Required

2-60. FINAL APPROACH.

2-61. Make the following settings for final approach:

PILOTS | ENGINEER

a. Master Motor Speed Control Knob Set for 2700 rpm

b. Flap Control Switch Extend Flaps to 30 Degrees

Note

Lift with a 30-degree flap setting is sufficient to allow a very steep landing approach with power off; however, the normal approach procedure is made with power on, to prevent overcooling of the engines, and with a nominally steep glide path.

2-62. LANDING.

2-63. NORMAL LANDING.

2-64. Establish the same nose-high attitude for landing that was used for take-off. During the landing flare, it is recommended that the engines be throttled. After the airplane touches the ground, allow it to rock forward until the nose wheel contacts the runway before applying the brakes or pushing the propeller reverse pitch switch.

a. Propeller Reverse Selector Switches "READY"

CAUTION

To guard against inadvertent pitch reversal, do not move propeller reverse selector switches to "READY" prior to ground contact.

b. Propeller Reverse Pitch Switch Press

Note

Use the nose wheel steering for directional control during reverse pitch landings. When reverse pitch is used, buffeting of controls may occur at approximately 50 mph IAS. Pushing the control column forward and locking the controls prior to this speed is recommended.

2-65. As the airplane nears the stopping point, decrease

power to avoid rolling backward and causing tail damage to the airplane. Move the propeller reverse selector switches to "SAFE." After stopping the airplane, retract the flaps.

2-66. MINIMUM RUN LANDING.

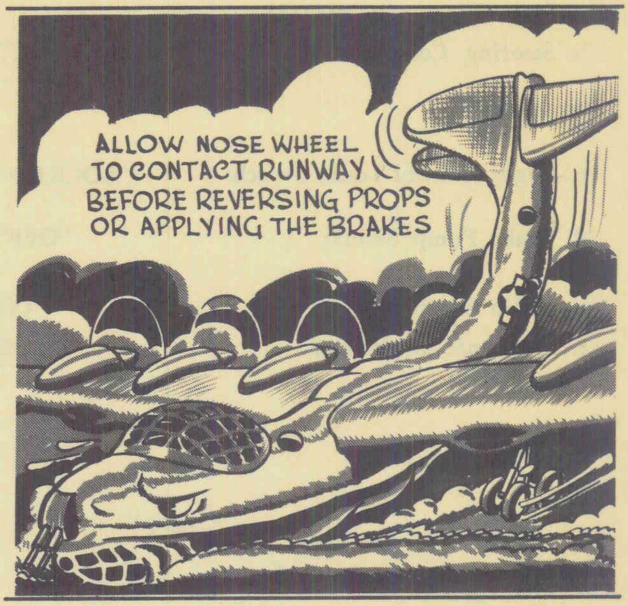
2-67. Use the same procedure as used in normal landings, but instead of applying the brakes or reversing the propellers separately, apply them simultaneously.

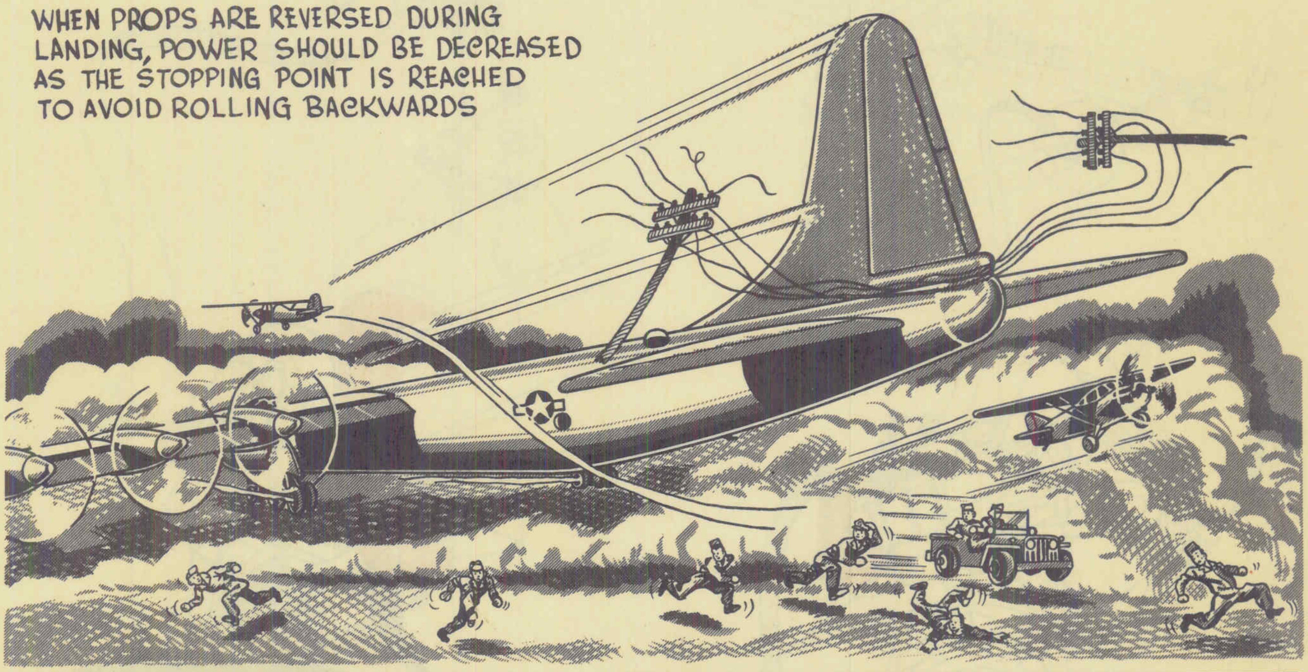
2-68. CROSS-WIND LANDINGS.

2-69. Correction for drift while landing in light-to-moderate cross-winds should be made by the sideslip or wing-low methods, which allow continuous alignment of the airplane with the runway center line.

2-70. WAVE-OFF.

2-71. In the event of a wave-off, increase power to full take-off power, retract the landing gear, and simultaneously retract the flaps to 20 degrees. Maintaining the same air speed as used during the initial approach, complete the retraction of the flaps in the normal manner.





2-72. EMERGENCY LANDINGS. (Refer to section III.)

2-73. STOPPING ENGINES.

2-74. Perform the following when stopping the engines:

PILOTS		ENGINEER	
a. Parking Brake Lever	"ON"	a. Brake Hydraulic Pressure Gage	Check

PILOTS

b. Steering Control Switch	"OFF"
c. Flight Control Locks Switch	"LOCKED"
d. Brake Pump Switch	"OFF"
e. Radio Equipment	Off
f. Electronic Equipment	Off

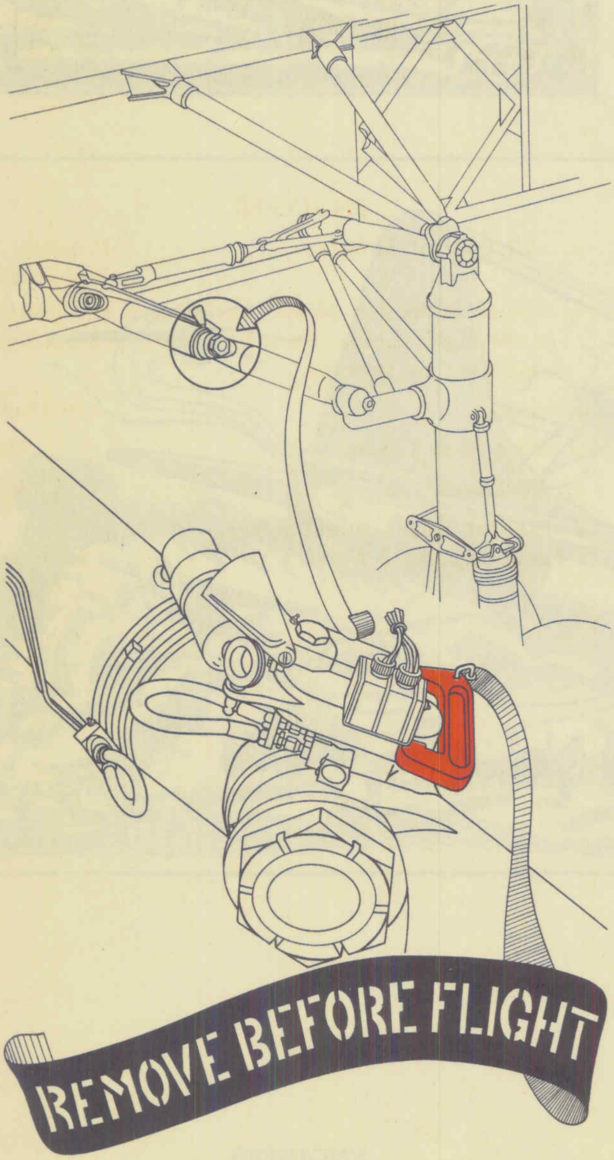


Figure 2-4. Installation of Main Landing Gear Safety Lock

ENGINEER

b. Throttle Levers	Idle until cylinder head temperatures reach 170° C or less
c. Dilute oil, if necessary, according to paragraph 5-15.	
d. Master Motor Speed Control Knob	2700 rpm
e. Master Motor Switch	"OFF"
f. Advance throttle levers to approximately 1100 rpm to clear cylinders	
g. Booster Pump Switches	"OFF"
h. Fuel Shut-off Valve Switches	"CLOSE"
i. Cross-feed Valve Switches	"OPEN"
j. Alternator Breaker Switches	"OPEN"
k. Exciter Control Relay Switches	"OFF"

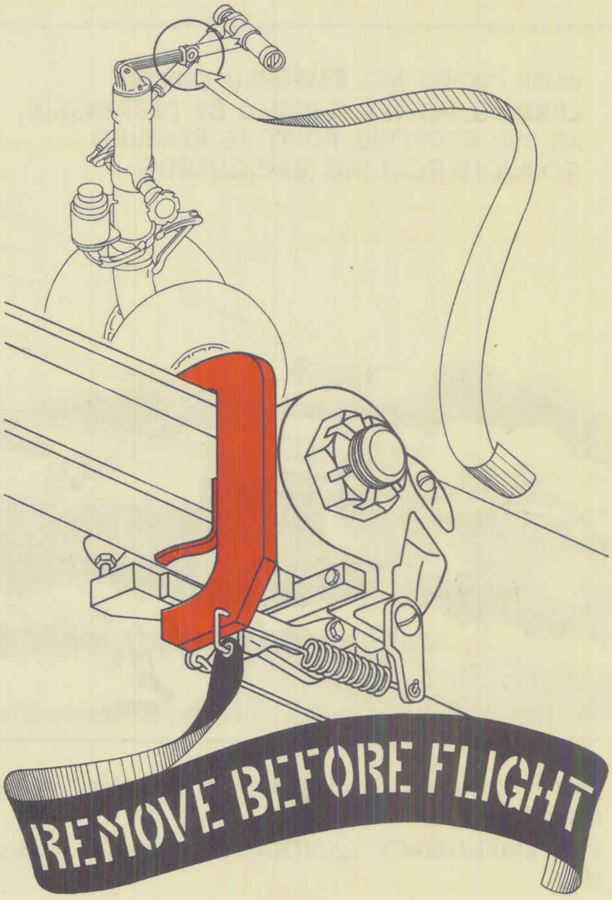


Figure 2-5. Installation of Nose Landing Gear Safety Lock

PILOTS

ENGINEER

CAUTION

Before stopping an engine equipped with an alternator, trip the corresponding alternator breaker and turn the exciter control relay switch off.

l. Mixture Control Levers "IDLE CUT OFF"

CAUTION

Do not open the throttles after moving the mixture control to "IDLE CUT-OFF," since fuel will bypass the cut-off.

m. Individual Ignition Switches "OFF"
n. Master Ignition Switch "OFF"
o. Battery Switch "OFF"

2-75. BEFORE LEAVING THE AIRPLANE.

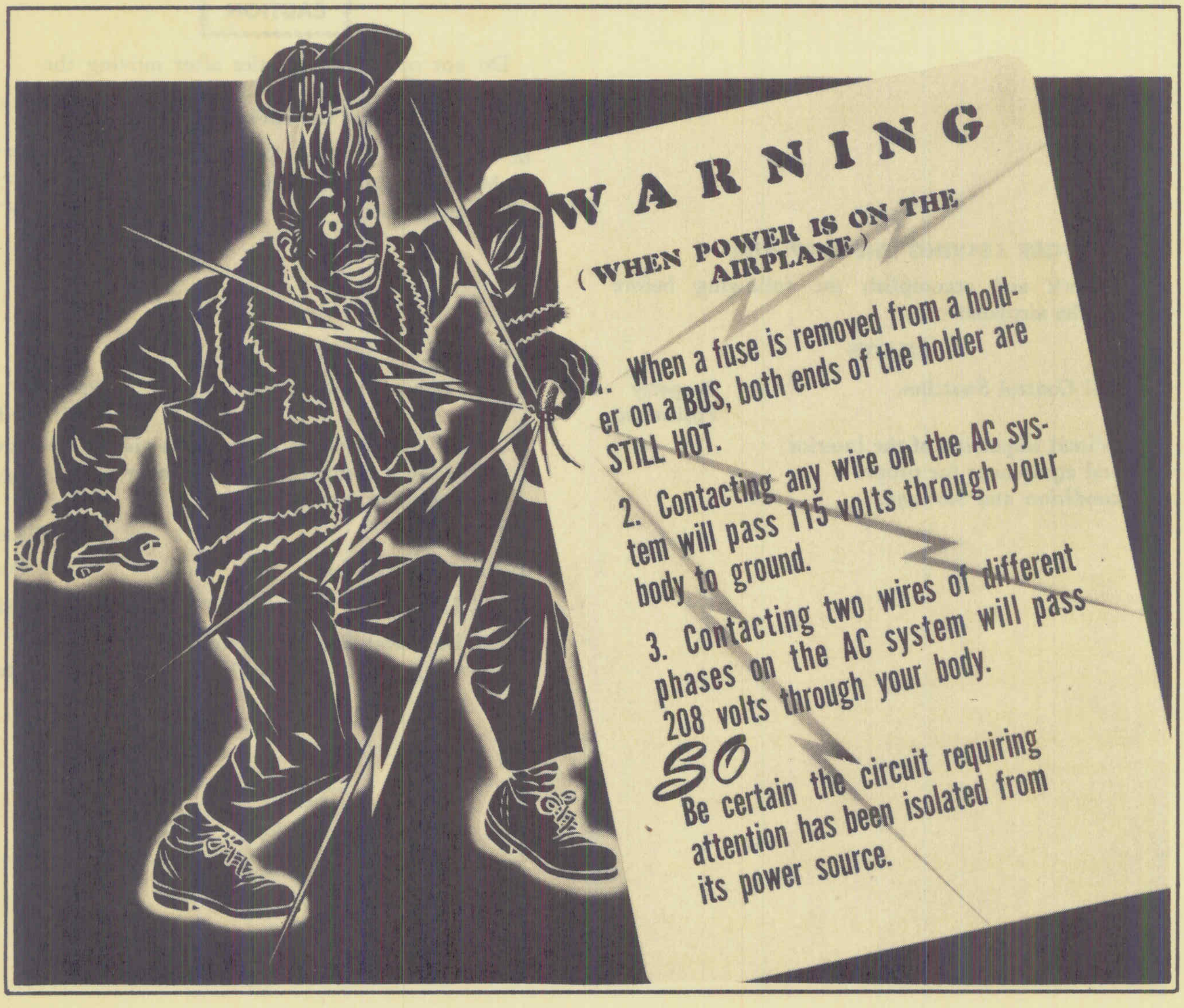
2-76. Check and accomplish the following before leaving the airplane:

PILOTS

a. All Control Switches Properly Positioned
b. Visual inspection of the interior and equipment for proper condition and stowage.

ENGINEER

a. All Control Switches Properly Positioned
b. Visual inspection of all controls and equipment in the flight compartment for proper positioning, condition, or stowage.
c. Chocks In Place
d. Pitot Mast Covers On
e. All Doors Closed
f. Landing Gear Ground Safety Locks (figures 2-4 and 2-5) In Place



WARNING

(WHEN POWER IS ON THE AIRPLANE)

1. When a fuse is removed from a holder on a BUS, both ends of the holder are STILL HOT.

2. Contacting any wire on the AC system will pass 115 volts through your body to ground.

3. Contacting two wires of different phases on the AC system will pass 208 volts through your body.

SO

Be certain the circuit requiring attention has been isolated from its power source.

EMERGENCY OPERATING INSTRUCTIONS

SECTION III

3-1. FIRES.

3-2. ENGINE FIRE ON THE GROUND.

3-3. Pilot shall advise his crew, signal to ground crew equipped with the portable equipment, and notify the control tower. Flight engineer shall position his controls as follows:

a. Mixture Control Levers—"IDLE CUT-OFF."

b. Throttle Levers—"CLOSE."

c. Fire Extinguisher Discharge Selector Switch (44, figure 1-4)—"DISCHARGE #1."

d. Engine Selector Switch (43, figure 1-4)—When the engine has almost stopped, hold the switch "ON" for at least five seconds.

e. Engine Fuel Valve Switch (85, figure 1-4)—"CLOSE."

f. Engine Oil Shut-off Valve Switch (45, figure 1-4)—"CLOSE."

g. Ignition Switch (53, figure 1-4)—"OFF."

h. Alternator Breaker (31, figure 1-4)—"OPEN," if engine on fire is equipped with an alternator.

i. Fire Extinguisher Discharge Selector Switch—"DISCHARGE #2," and repeat step d if first discharge is not adequate.

WARNING

Avoid any contact with methyl bromide—personnel should be upwind from concentrated vapors.

3-4. ENGINE FIRE IN FLIGHT.

3-5. In the event of engine fire the pilot shall warn and advise all members of the crew. The flight engineer shall position controls of the affected engine as follows:

a. Engine Fuel Valve Switch—"CLOSE."

WARNING

Do not, without forethought, close other fuel valves or shut off fuel booster pumps, since other engines may be dependent on their position or operation.

b. Engine Oil Shut-off Valve Switch—"CLOSE."

c. Propeller Feather Switch (113, figure 1-4)—"FEATHER."

d. Mixture Control Lever—"IDLE CUT-OFF," simultaneously with feather.

e. Fire Extinguisher Discharge Selector Switch—"DISCHARGE #1."

f. Engine Selector Switch—On correct engine number; hold on for at least five seconds.

Note

If fire fails to go out after the first discharge, place the discharge switch in the "DISCHARGE #2" position and repeat step f.

g. Ignition Switch—"OFF."

h. Alternator Breaker—"OPEN."

i. Cabin Pressure Wing Shut-off Valve Switch (91, figure 1-4)—Turn off pressure from wing which has engine fire and use the pressure from the other wing if it is needed.

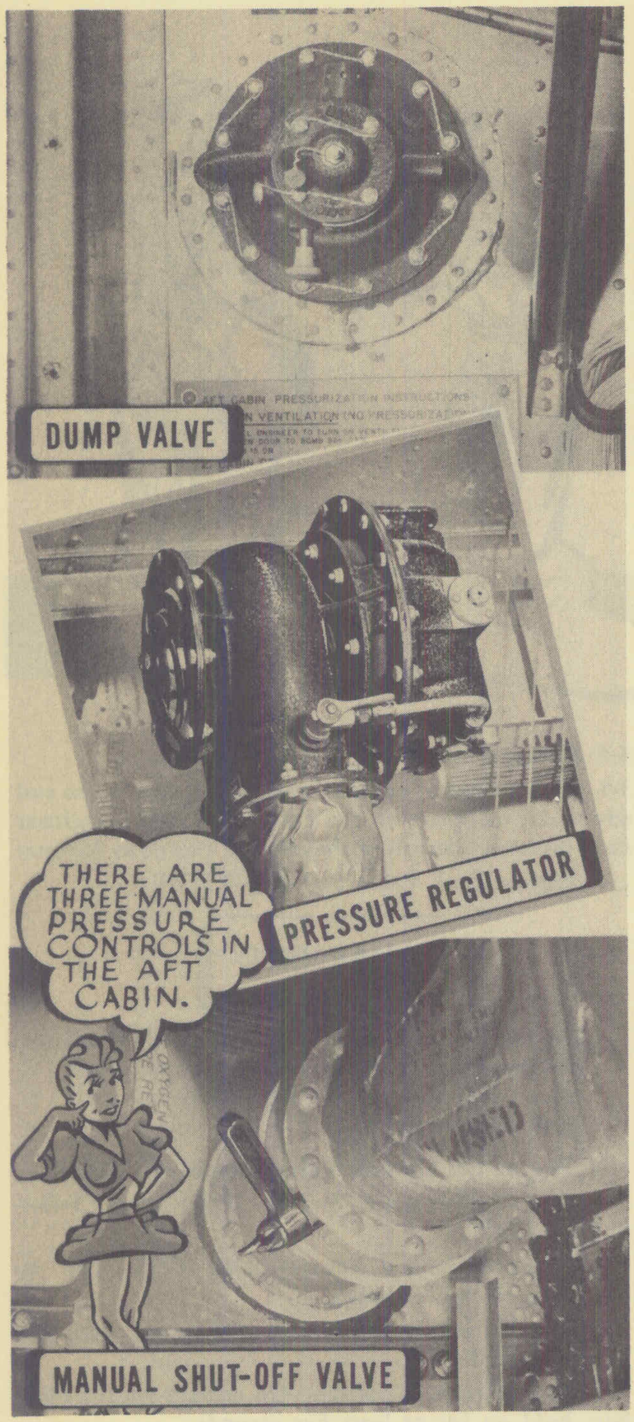


Figure 3-1. Aft Cabin Manual Pressurization Controls (On Forward Wall of Aft Cabin)

j. Cabin Heat and Tail Anti-icing Control Switch (98, figure 1-4)—"OFF," if fire is in engine No. 3 or 4.

k. If fire is in engine No. 1, 2, 5, or 6, appropriate Anti-icing Control Switches (97, figure 1-4)—"OFF."

l. Cooling Air Control Switch (90, figure 1-4)—"OFF," if fire is in engine No. 4.

3-6. FUSELAGE FIRES.

3-7. Reduce drafts by shutting off the pressurized or ventilating air. Isolate the fire by use of valves and doors. Know locations and limitations of fire extinguishers.

a. Crew—Close doors or other openings.

b. Locate cause of fire.

c. Crew—If electrical, isolate the circuit.

d. Crew—If caused by fluid leak, stop the flow.

Note

If the ventilating fans are operating, they must be turned off by placing the Cabin Pressure Wing Shut-off Valve Switch in the "OFF" position.

e. Engineer—Cabin Pressure Wing Shut-off Valve Switch—"OFF," if necessary.

f. Engineer—Aft Cabin Pressure Control Switch (92, figure 1-4)—"OFF," if necessary.

g. Crew—Aft Cabin Manual Pressure Shut-off Valve (figure 3-1)—"OFF," if necessary.

h. Crew—Oxygen masks—As required.

i. Crew—Hand fire extinguishers. (See figure 3-2.)

WARNING

Do not increase ventilation until flames are extinguished. Use oxygen masks for protection against fumes.

j. Crew—Open dump valves, doors, or blisters as required, AFTER fire is out.

3-8. WING FIRES.

3-9. A wing fire involving fuel or oil tank leaks, etc., may be difficult to identify because the smoke or flame will probably emerge from the engine-nacelle. A wing fire will therefore probably be reported as an engine fire by scanners in the rear cabin and should be fought as such until all methyl bromide is exhausted. The engineer will turn off the anti-icing and cooling systems and will stop the flow of cabin pressure air from the wing on fire by positioning the cabin pressure wing shut-off valve switch. Use pressure from the other wing. After the fire is out, allow a reasonable length of time for fumes to disappear before investigating the damage via the wing crawlway.

3-10. ENGINE FAILURE.

3-11. ENGINE SHUTDOWN.

3-12. The flight engineer shall position controls of the affected engine as follows:

a. Throttle Lever—"CLOSE."

b. Propeller Feather Switch—"FEATHER."

c. Mixture Control Lever—"IDLE CUT-OFF," simultaneously with feather.

d. Engine Fuel Valve Switch—"CLOSE."

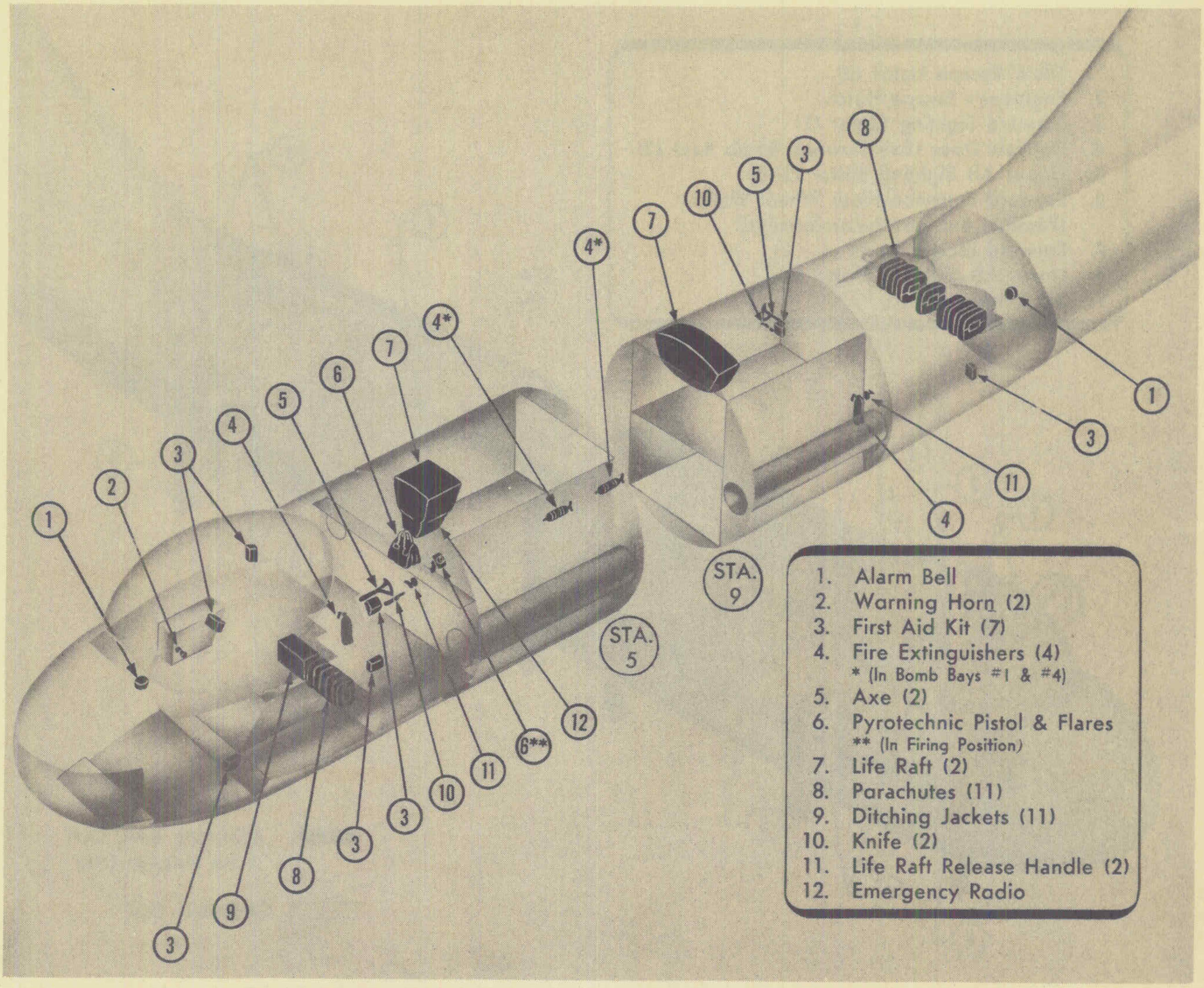


Figure 3-2. Miscellaneous Emergency Equipment

WARNING

Do not, without forethought, close other fuel valves or shut off fuel booster pumps, since other engines may be dependent on their position or operation.

e. Engine Oil Shut-off Valve Control Switch—"CLOSE."

f. Ignition Switch—"OFF."

g. Alternator Breaker Switch—"OPEN."

3-13. OPERATION (PARTIAL POWER FAILURE).

3-14. Refer to "Flight Operation Instruction Chart," Appendix I, for cruising data with one or more engines inoperative. When landing with two or more inoperative engines, know the landing gross weight and cg location and maintain 125 per cent of power-off stalling speed in the landing approach pattern. Initiate final approach higher and use a steeper flight path than is normally employed during early final approach. Use 20-degree flaps until the possibility of undershooting has been eliminated; then use full flaps. Because of the high power output that will be required from the live engines to overcome landing gear drag, maintain landing gear in the up position as long as practical prior to entering final approach. Utilize the rudder trim tab as required for directional trim during the entire landing approach maneuver, and if conditions permit, fully throttle the live engines and simultaneously restore rudder surface and trim deflections to approximately neutral just prior to the landing flare. In the event of wave-off, retract the landing gear and flaps as rapidly as conditions allow, using rudder trim as required. Landing gear and flaps may be retracted simultaneously.

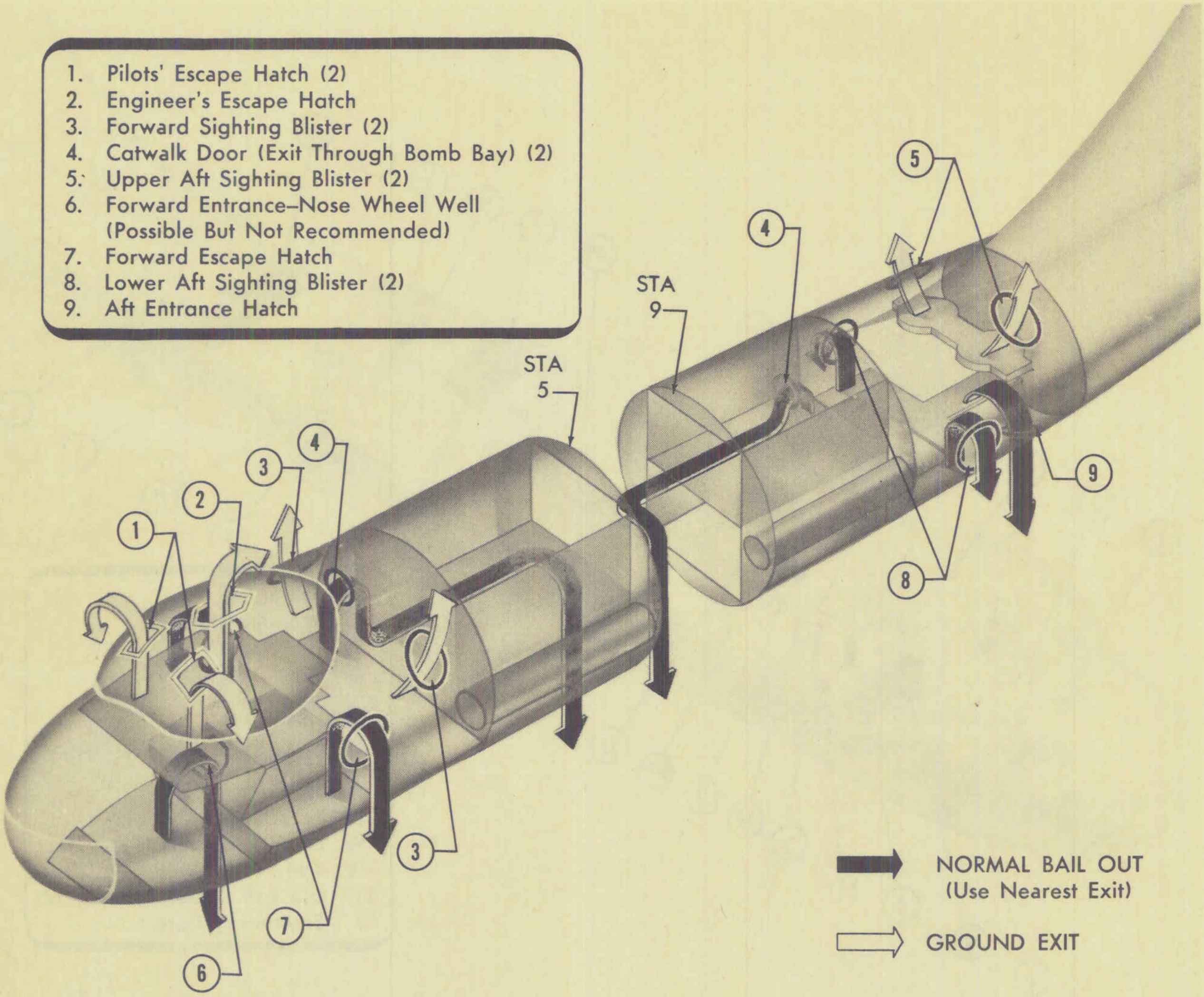


Figure 3-3. Bail-out Exits

3-15. PROPELLER FAILURES.

3-16. PROPELLER UNFEATHERING DURING FLIGHT.

a. Engine Oil Shut-off Valve Control Switch—"OPEN."

b. Engine Fuel Valve Switch—"OPEN."

c. Propeller Selector Switch (116, figure 1-4)—"FIXED PITCH."

d. Propeller Feather Switch—Guard down.

e. Propeller Selector Switch—"INCREASE RPM," until engine turns over 800 to 900 rpm; then return to "FIXED PITCH."

f. Ignition Switch—"ON."

g. Throttle Lever—Advance as required for engine start.

h. Mixture Control Lever—"AUTO-RICH."

Note

Torquemeter indicator (11, figure 1-4) will indicate a successful engine start.

i. Propeller Selector Switch—"INCREASE RPM," until 1000 rpm; then return to "FIXED PITCH."

j. Throttle Lever—Advance until M.P. is approximately 25 inches.

k. Propeller Selector Switch—As required to maintain 1000 rpm during throttle advance.

CAUTION

Warm up the engine at 1000 rpm and 25 inches M.P. until engine oil temperature is 40°C.

l. Exciter Control Relay Switch (24, figure 1-4)—"ON," while engine is warming up.

Figure 3-4. Forward Cabin Dump Valve (Under Radio Operator's Step)

m. Propeller Selector Switch—"INCREASE RPM," until rpm nearly matches rpm of other engines.

n. Propeller Selector Switch—"AUTO."

o. Throttle Lever—Advance as required for power setting.

p. Alternator—Parallel on bus.

3-17. PROPELLER SYNCHRONIZER FAILURE.

WARNING

In the event of a runaway propeller, reduce rpm by placing the propeller selector switch in the "DEC. RPM" position. The fast pitch change rate of 45 degrees per second to the feather position prohibits the use of the feather switch for this operation.

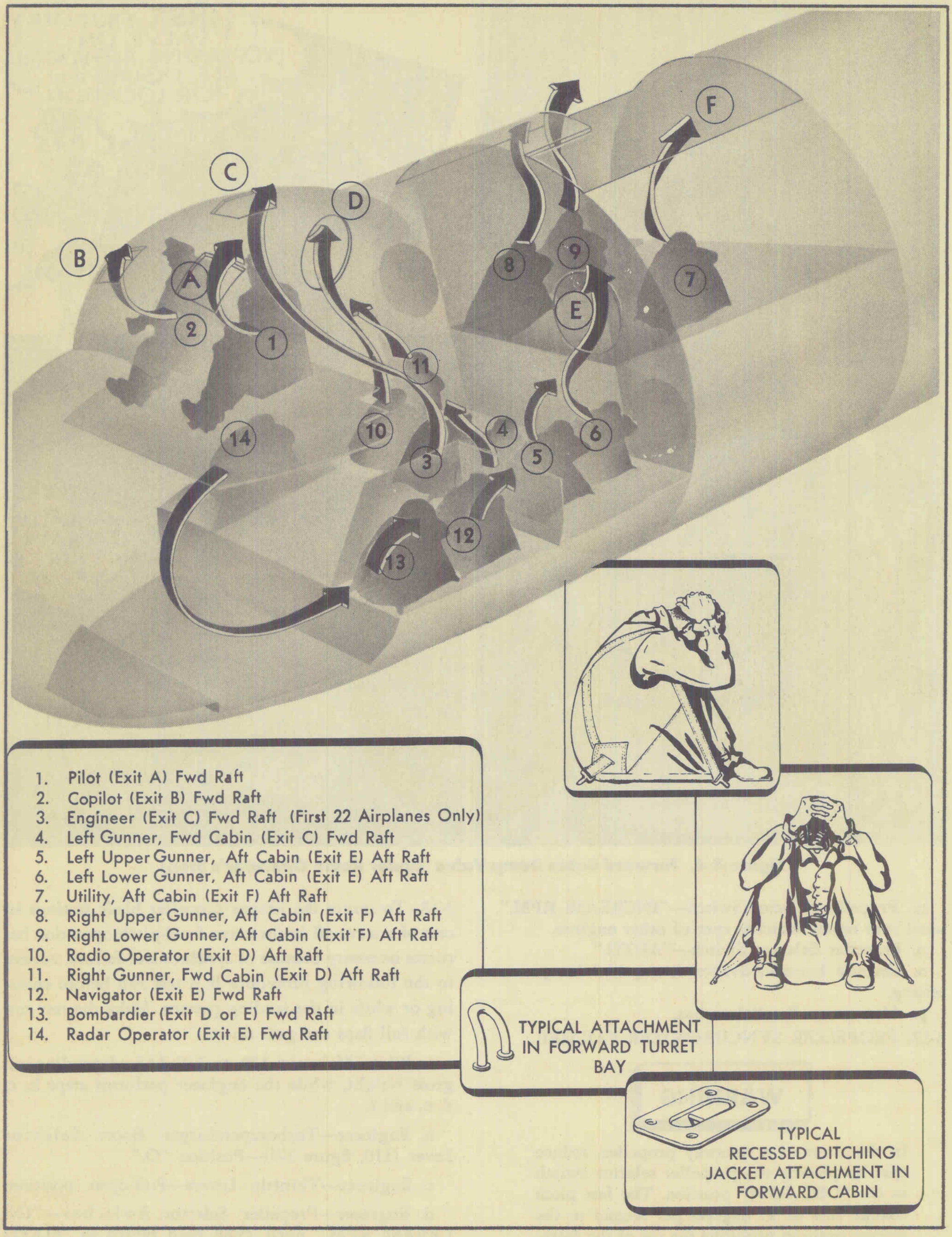
3-18. To insure the proper propeller blade settings in case of a wave-off in the event fixed-pitch operation becomes necessary because of synchronizer failure, adhere to the following procedure in a test run before entering or while in the landing pattern. Make the test run with full flaps and gear down.

a. Pilot—Maintain 120 to 140 IAS, depending on gross weight, while the engineer performs steps b, c, d, e, and f.

b. Engineer—Turbosupercharger Boost Selector Lever (110, figure 1-4)—Position "O."

c. Engineer—Throttle Levers—Full-open position.

d. Engineer—Propeller Selector Switches—"INCREASE RPM," until 2500; then return to "FIXED PITCH."



1. Pilot (Exit A) Fwd Raft
2. Copilot (Exit B) Fwd Raft
3. Engineer (Exit C) Fwd Raft (First 22 Airplanes Only)
4. Left Gunner, Fwd Cabin (Exit C) Fwd Raft
5. Left Upper Gunner, Aft Cabin (Exit E) Aft Raft
6. Left Lower Gunner, Aft Cabin (Exit E) Aft Raft
7. Utility, Aft Cabin (Exit F) Aft Raft
8. Right Upper Gunner, Aft Cabin (Exit F) Aft Raft
9. Right Lower Gunner, Aft Cabin (Exit F) Aft Raft
10. Radio Operator (Exit D) Aft Raft
11. Right Gunner, Fwd Cabin (Exit D) Aft Raft
12. Navigator (Exit E) Fwd Raft
13. Bombardier (Exit D or E) Fwd Raft
14. Radar Operator (Exit E) Fwd Raft

Figure 3-5. Crash Landing and Ditching Positions and Exits

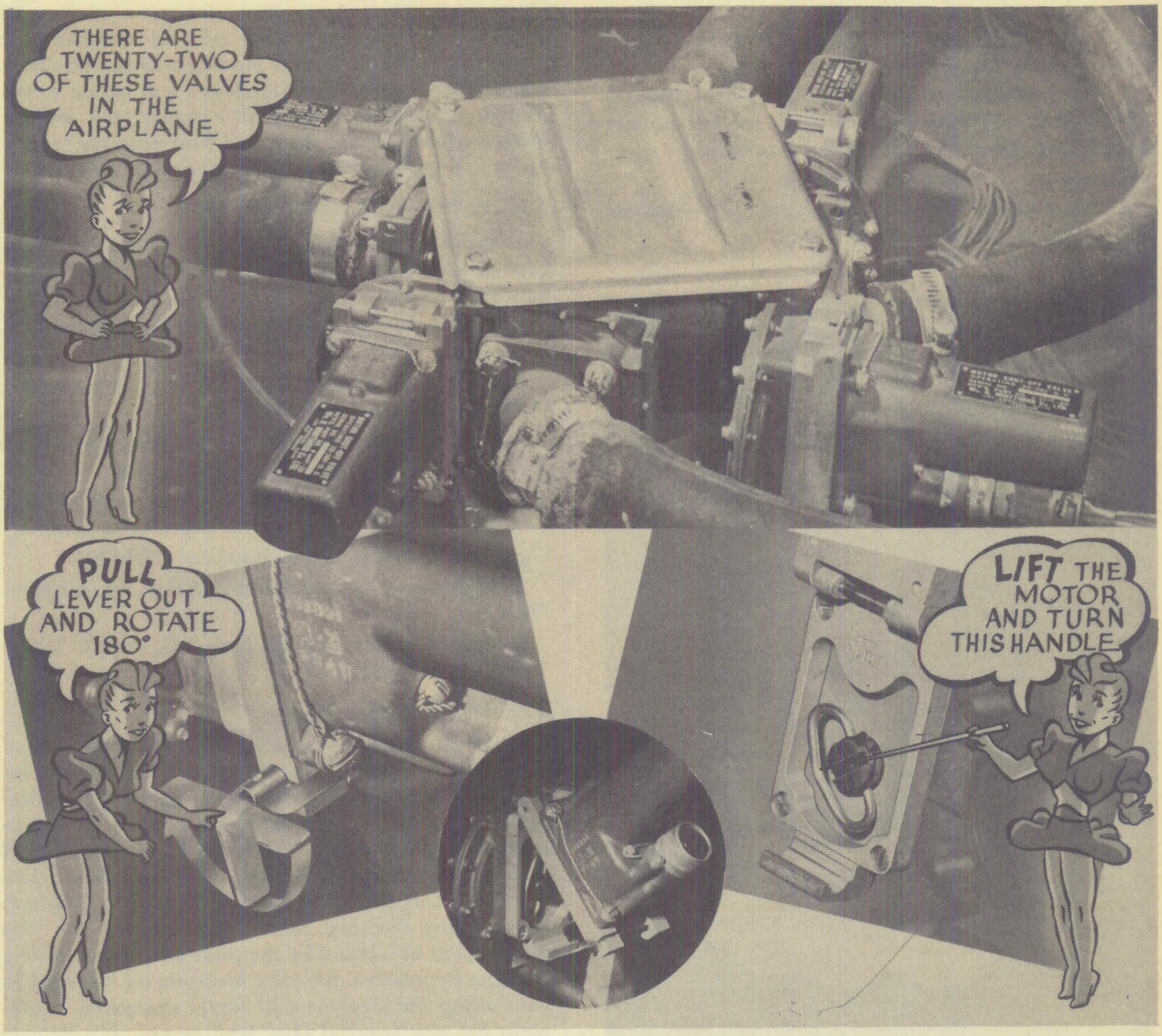


Figure 3-6. Fuel and Oil Shut-off Valve Manual Controls (On Wing Crawlways Between Engines)

e. Engineer—Turbo boost as required to obtain 53 inches M.P.

f. Engineer—Propeller Selector Switches—"INCREASE RPM" or "DECREASE RPM," until 2700, after the above setting.

g. Pilot and Engineer—Use the *throttles only* to control power during landing and in the early stage of the wave-off.

3-19. BAIL-OUT.

(See figure 3-3 for emergency exits.)

3-20. All bail-out should be made so the crew will land in the same vicinity, if over uninhabited territory. If over water, and surface vessels are below, the airplane should be headed so that crew members will drift onto the course of the vessel. In either event, two bail-out runs should be made if required to place men close together. A particular crew member should be responsible for bail-out of men in the aft compartment. Procedure will vary according to conditions. Steps given below apply to a rapid bail-out at high altitude. If circumstances requiring bail-out allow, descend to at least 10,000 feet and minimize forward speed.

a. Pilot—Alarm Bell Switch (26, figure 1-3)—Operate. Give instructions over the interphone.

b. Radio Operator—Transmit course, altitude, ground speed, and estimated position of bail-out as received from the navigator.

c. Crew—Oxygen Masks—On or ready; check bail-out bottles and survival kits.

d. Crew Member — Communication Tube — Open forward door; inspect for personnel.

e. Crew Member—Pressure Dump Valves (figures 3-1 and 3-4)—Operate forward valve for two-minute dump; operate both valves for faster release.

f. Crew—Exit Openings—Remove.

g. Pilot—Salvo Switch (34, figure 1-3)—Actuate to open bomb doors and salvo.

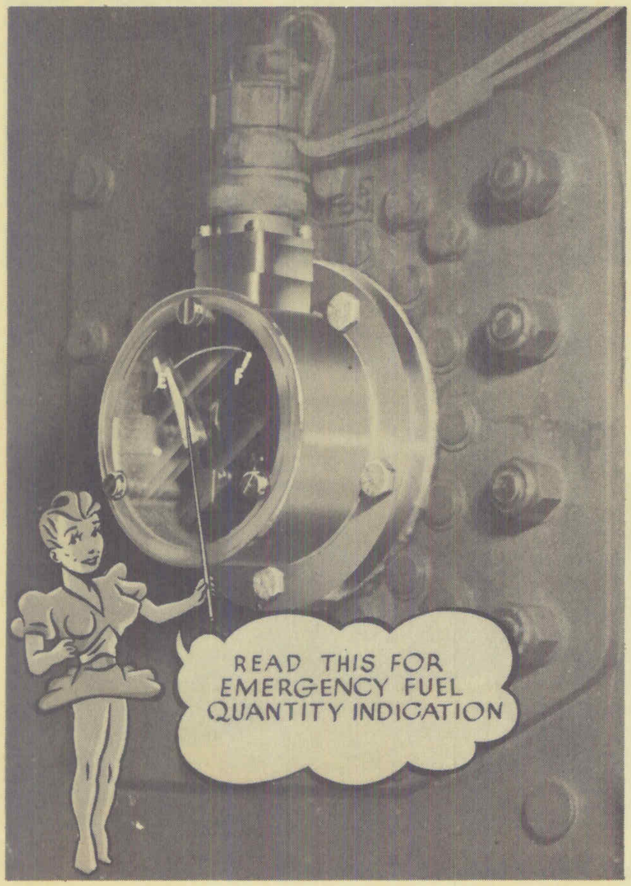


Figure 3-7. Direct-reading Fuel Quantity Gage (On Rear Spar Adjacent to Wing Crawlway)

3-21. FORCED LANDINGS.

3-22. ON THE GROUND.

3-23. BEFORE APPROACH. Pilot will advise crew of decision to crash-land the airplane. Jettison all loose equipment, including small unnecessary items that may fly loose on impact and cause injury. Remove and stow hatches that cover escape exits to be used after landing.

a. Pilot—Open left top hatch.

b. Copilot—Open right top hatch.

c. Left forward gunner—Open top hatch.

d. Lower left aft gunner—Open left hatch.

e. Right forward gunner—Open right hatch.

Upon instructions from the pilot, crew shall take positions as shown on figure 3-5. All members not actively engaged during the landing will put on ditching jackets. If possible the engineer will obtain a fuel configuration in each wing of a single tank feeding three engines. Use full flaps and land with the wheels up on any type of terrain except a known airfield.

3-24. APPROACH AND CONTACT.

a. Radio Operator—Transmit course, altitude, ground speed, and position of landing if over uninhabited territory.

b. Engineer—Turbosupercharger Boost Selector Lever—Position "O."

c. Engineer — Engine Fuel Valve Switches — "CLOSE," after informed of step f.

d. Pilot—Maintain and hold a very flat approach.

e. Pilot—Warn crew just before impact.

f. Pilot—Emergency Ignition Switch (33, figure 1-3) —"OFF," before impact. Inform engineer of action.

g. Engineer—Alternator Breakers—"OPEN."

h. Engineer — Exciter Control Relay Switches — "OFF."

i. Engineer—Battery Switch (23, figure 1-4)— "OFF," on impact.

3-25. DITCHING.

3-26. Ditching drills should be performed before overwater flights until all personnel are thoroughly acquainted with the procedure and the specific operations for which they are responsible. Make an equipment check before each overwater flight. Kits should be complete and crew life vests in good condition. The use of ditching jackets and positions taken by a normal crew during ditching are shown on figure 3-5. The crew should be advised by the pilot as soon as ditching becomes imperative. All crew members not engaged in controlling the airplane will secure emergency equipment for easy removal after landing and will jettison all loose items of unnecessary equipment that may fly loose on impact. Forward upper turrets must be extended and guns pointed aft to provide emergency exits.

3-27. Engineer should estimate remaining endurance and inform navigator. Navigator will in turn inform the radio operator of position, course, altitude, speed, and probable position of ditching, and will advise the pilot of wind speed and direction. Radio operator should transmit information received from the navigator, along with distress signals. Pilot will advise the crew to get into ditching jackets after jettisoning is complete.

3-28. The pilot will ditch before fuel is entirely exhausted, because power is required. The pilot will also perform the following:

a. Bomb Salvo Switch—"ON."

b. Bomb Salvo Switch—"OFF," after complete salvo.

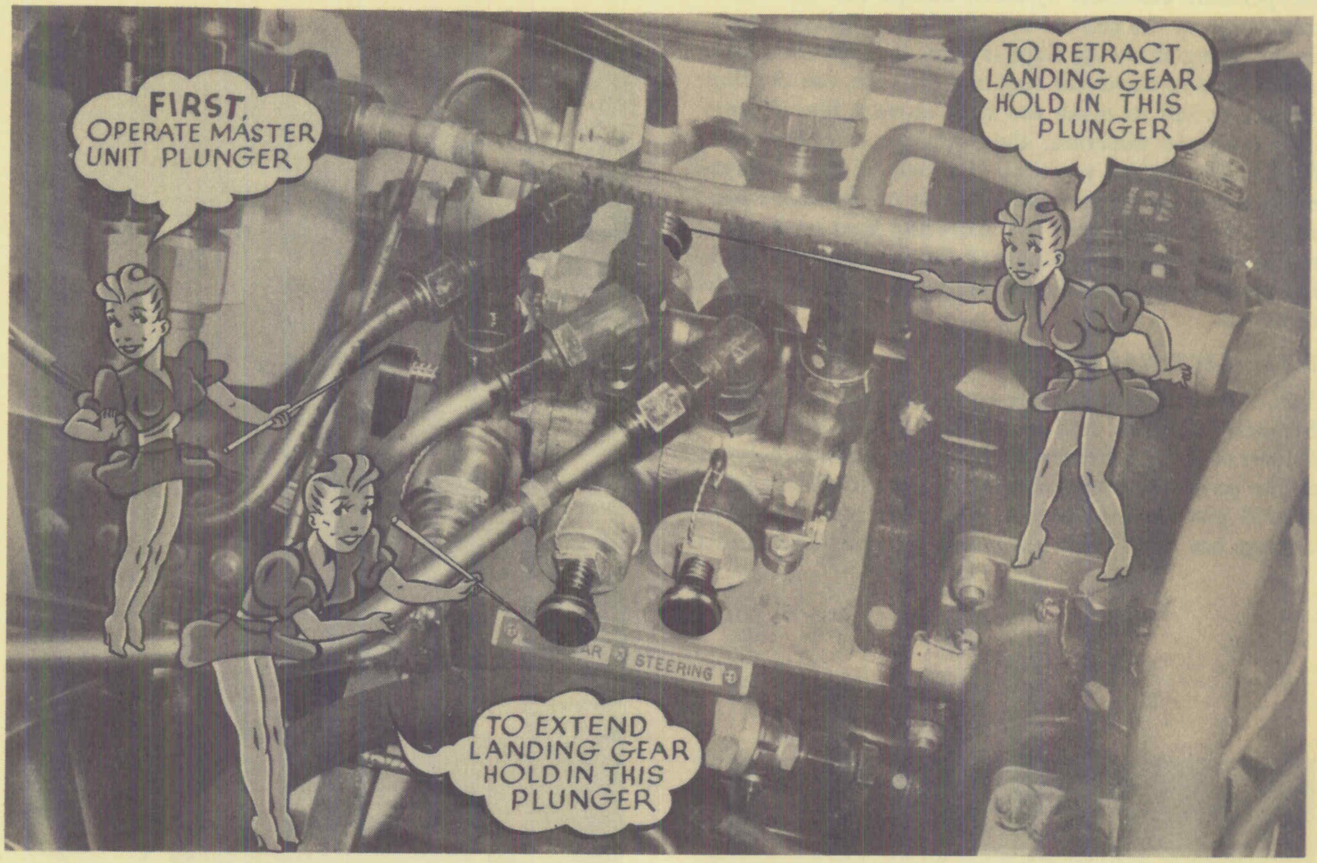


Figure 3-8. Main Selector Valve Manual Controls (In Right Rear of No. 2 Bomb Bay)

c. Bomb Bay Door Switches (35, figure 1-3)—"CLOSED."

d. Flap Control Switch (46, figure 1-3)—"DOWN," until flaps are at 15 degrees.

e. Fuselage Attitude—Approximately 9 degrees above horizontal.

f. Notify crew just before contact.

3-29. Leave the landing gear in the up position during ditching and use the lowest possible air speed without sacrificing control. Head the airplane parallel to uniform waves or swells. Aim the touchdown along the swell crest or just after the crest has passed. If the sea is irregular and confused, make the heading into the wind.

3-30. ON CONTACT.

a. Pilot—Open left top hatch.

b. Copilot—Open right top hatch.

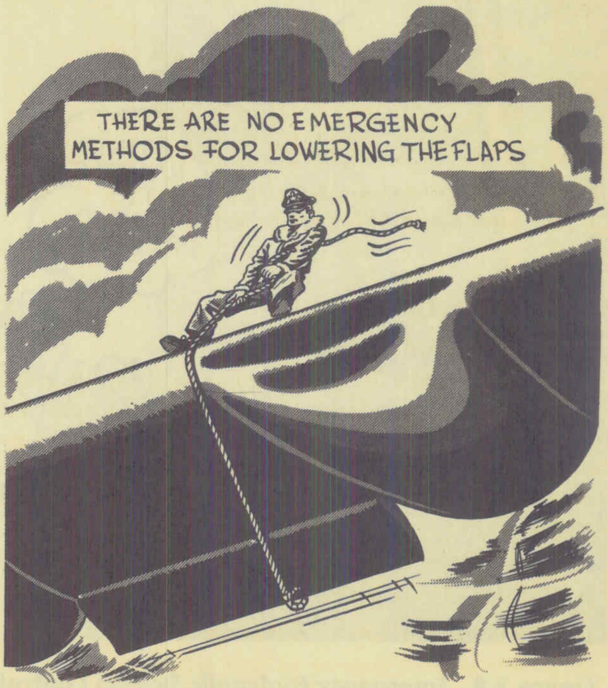
c. Left forward gunner—Open top hatch.

d. Lower left aft gunner—Open left hatch.

e. Right forward gunner—Open right hatch.

3-31. WING FLAPS.

3-32. Since the three sets of flaps are operated by three



independent electrical systems, except for the interconnection at the control switch, no emergency system for lowering the wing flaps is provided. Should a pair of flaps fail to travel the required distance, use the flap control switch to make the flaps move a few degrees in the reverse direction; then attempt to operate the flaps to the desired position. If a pair of flaps fails to move to the down position after use of the above procedure, extend the other two pairs and land in the normal manner. Any single pair of flaps reduces the landing speed approximately six miles per hour when fully extended.

3-33. ELECTRICAL SYSTEM.

3-34. The electrical system employs fuses and circuit breakers to clear faults automatically. Multi-circuit feeders of four or three wires per phase are incorporated in the power distribution system. A multi-circuit feeder will provide continued service after one of its conductors has been broken, causing an open circuit. To

Figure 3-9. Emergency Hydraulic System Controls (On Radio Operator's Floor)

Figure 3-10. Manual Extension of Main Landing Gear (Accessible from Wing Crawlway)

furnish the necessary protection against faults or shorts occurring on a feeder section, fuses are located on each end of the conductors. Should a conductor break and the two loose ends cause a short circuit, the fuses at each end will clear, isolating the fault and permitting continued operation of the feeder section through the remaining conductors. Three alternators are installed on the airplane. Any one of the three alternators will supply sufficient electrical power for routine operations. With the exception of the flap actuating system, all major systems motivated by electrical power are provided with an alternate means of operation.

3-35. MANUAL OPERATION OF FUEL AND OIL SHUT-OFF VALVES.

3-36. In the event of electrical failure or unit malfunction, the fuel selector valves and the oil shut-off valves may be manually operated. (See figure 3-6.) Valves are accessible through the wing crawlways.

3-37. ALTERNATE FUEL QUANTITY INDICATION.

3-38. In the event of a malfunction of the fuel quantity gages at the flight engineer's station, fuel quantity may be read from the wing crawlway on direct reading gages (figure 3-7) located on the spar.

3-39. EMERGENCY LANDING GEAR OPERATION.

CAUTION

> The main system hydraulic pump operation is limited to two minutes out of every ten at 3000 psi; therefore, if the landing gear does not respond to action of the pilots' landing gear control switch after a reasonable length of time, return the switch to the "OFF" position.

3-40. MANUAL OPERATION OF MAIN SELECTOR VALVE.

a. Engineer—Hydraulic Pump Override Switch (103, figure 1-4)—"ON."

b. Crew—Main selector valve master unit plunger—Push in and lock-turn. (See figure 3-8.)

c. Crew—Main selector "EXTEND" or "RETRACT" plunger—Hold in desired plunger until action is completed; then release.

d. Crew—Main selector valve master unit plunger—Unlock and release.

e. Engineer—Hydraulic Pump Override Switch—"OFF."

Note

> It may be possible to extend the tail bumper by use of the landing gear control switch even though the main and nose gears do not extend.

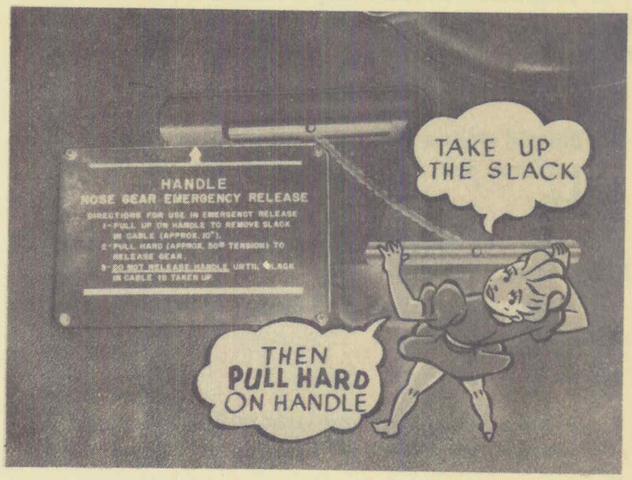


Figure 3-11. Nose Gear Emergency Release Handle (On Radio Operator's Floor)

3-41. EMERGENCY HYDRAULIC SYSTEM LANDING GEAR EXTENSION. (See figure 3-9.)

a. Emergency Selector Valve—"EXTEND LANDING GEAR."

b. Hand Pump—Operate until landing gear is fully extended and locked.

c. Emergency Selector Valve—"CHARGE BRAKE ACCUMULATOR."

3-42. MANUAL EXTENSION OF MAIN LANDING GEAR.

3-43. Gain access to the landing gears along the wing crawlway and operate the emergency controls as shown on figure 3-10.

3-44. MANUAL EXTENSION OF NOSE LANDING GEAR. (See figure 3-11.)

a. Release Handle—Pull up approximately 10 inches to remove cable slack.

b. Release Handle—Pull hard, approximately 50 pounds tension, to unlock nose landing gear; do not release handle until cable slack is taken up.

3-45. MANUAL LATCHING OF NOSE LANDING GEAR. (See figure 3-12.)

a. Latching Hook—Use to break inspection window on the forward cabin floor.

b. Latching Hook—Lower through broken window and insert in the hollow pivot bolt.

c. Latching Hook—Pull up until latch is locked.

3-46. EMERGENCY BRAKE PRESSURE.

3-47. If the brake low pressure warning lamp (101, figure 1-4) is lighted and a pressure gage (99, figure 1-4) check indicates low brake pressure, proceed as follows:

a. Pilot—Brake Pump Switch (41, figure 1-3)—"ON."

b. Engineer—Brake Pump Pressure Override Switch (100, figure 1-4)—"ON"; hold until pressure is within range.

Note

Should steps a and b fail to produce pressure, perform the following as shown on figure 3-9.

c. Crew — Emergency Selector Valve — "CHARGE BRAKE ACCUMULATOR."

d. Crew—Hand pump—Operate until pressure is within normal range.

Note

A fully charged accumulator will supply brake pressure for three full brake applications.

3-48. EMERGENCY CABIN PRESSURE CONTROL.

(See figures 3-1 and 3-4.)

3-49. Should a pressure regulator fail, shut off the unit and let the other regulator control the pressure air exit for both cabins. If a single regulator proves insufficient, the engineer assists the single regulator by manual operation of the pressure dump valve.

3-50. In case of aft cabin shut-off valve failure, shut off the pressure by closing the manual shut-off valve on the forward pressure bulkhead of the aft cabin.

3-51. HEAT AND ANTI-ICING OVERHEATING.

3-52. If an indicator lamp (93, figure 1-4) lights, place the engine cylinder and anti-icing temperature selector switch (14, figure 1-4) on the number of the engine involved and read the duct temperature on the indicator (7, figure 1-4). Should the temperature exceed 180°C in nacelles No. 1, 2, 5, and 6, or 230°C in nacelles No. 3 and 4, reduce the temperature. The method used to reduce this temperature depends upon circumstances. Three possible ways of diminishing the temperature are listed as follows:

a. Pilot—If climbing, increase air speed without increasing power.

b. Flight Engineer—Wing Anti-icing Control Switch (97, figure 1-4)—"OFF"; use switch controlling the nacelle involved.

c. Flight Engineer—Reduce the power of the engine in the nacelle indicated.

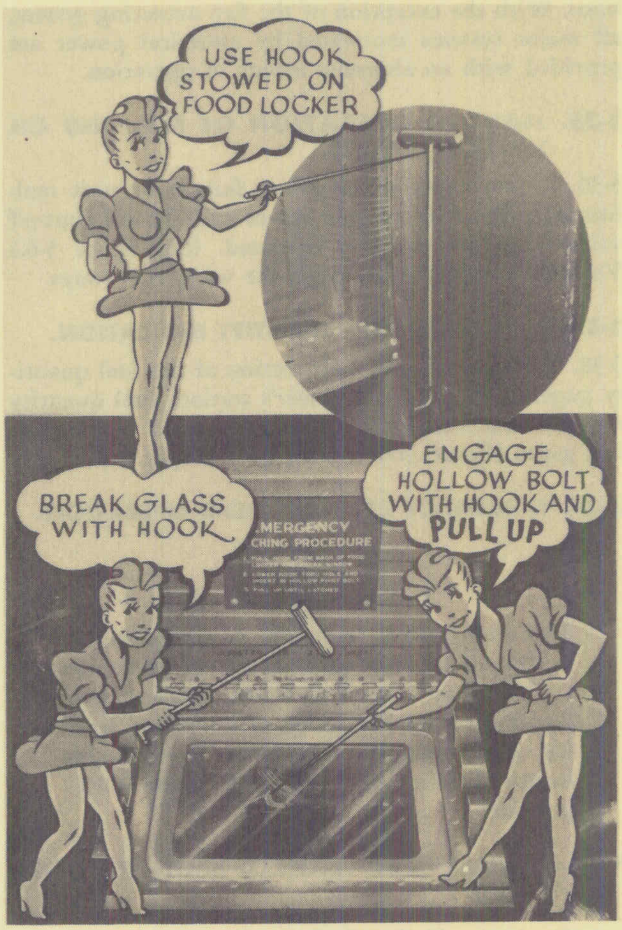


Figure 3-12. Nose Gear Emergency Latching Hook (On Radio Operator's Floor)

OPERATIONAL EQUIPMENT

SECTION IV

4-1. OXYGEN EQUIPMENT.

4-2. GENERAL.

4-3. Because the cabins of the airplane are pressurized, use of oxygen will not be necessary while flying at high altitudes under normal conditions. However, provisions are made for supplying personnel with oxygen in cases of emergency. The low-pressure oxygen system has sufficient capacity to provide oxygen for 15 men for approximately 14 hours at 25,000 feet. Portable oxygen units (8, figure 1-1) and recharger hoses are installed for use in case of emergency or when crew members find it necessary to move about in nonpressurized parts of the airplane.

4-4. The table given below shows the duration in man-hours of the oxygen supply when the regulators are set at "NORMAL."

MAN-HOUR OXYGEN CONSUMPTION TABLE

	Thousands of Feet Altitude						
Crew	0	5	10	15	20	25	30
11	28.5	27.4	35.7	27.4	22.5	19.5	20.5
15	20.8	20.1	26.2	20.1	16.5	14.3	15

4-5. OXYGEN PANELS.

4-6. Fifteen oxygen equipment panels are installed in the airplane; one is located at each station in the forward cabin, one at each sighting station in the aft cabin, and one on the forward wall of the aft cabin to be used by personnel on the bunks. Each panel consists of a type A-14 pressure-breather regulator with hose assembly, a type A-3 flow indicator, and a type K-1 pressure gage.

4-7. PRESSURE-BREATHER REGULATORS.

4-8. With a pressure-breather regulator the safe flying ceiling is raised to 43,000 feet, and even higher for brief periods of time. With it there is a greater safety factor; the extra pressure compensates for possible small leaks in the mask fit and insures a 100 per cent supply of oxygen. Pressure-breathing is made possible by rotating the pressure breathing dial clockwise from the "NORMAL" setting. Thus, by leaving the diluter handle in the "NORMAL OXYGEN" position and turning the dial, the user may obtain oxygen under pressure.

4-9. NORMAL OPERATING INSTRUCTIONS—TYPE A-14 REGULATOR. Use the regulator with either a regular demand mask or a pressure breathing mask (type A-13A or A-15). With a regular demand mask emergency flow can be obtained by turning the pressure dial on the regulator, but pressure breathing is impossible.

a. Below 30,000 feet set the diluter handle to "NORMAL OXYGEN" and the dial to "NORMAL."

Note

Avoid pressure breathing below 30,000 feet; it wastes oxygen.

b. From 30,000 to 40,000 feet leave the diluter handle in the "NORMAL OXYGEN" position and turn the dial to "SAFETY." This setting supplies oxygen to the mask at a pressure slightly greater than ambient air pressure.

c. At 40,000 feet and above leave the lever on "NORMAL OXYGEN" and set the dial in the position corresponding to the altitude.

WARNING

If at 40,000 feet and ascending, turn the dial to the anticipated altitude.

4-10. SPECIAL OPERATING INSTRUCTIONS. When 100 per cent oxygen is to be used during an entire extended flight above 35,000 feet as protection against bends, turn the diluter handle to "100% OXYGEN." If the pressure is inadvertently used below 30,000 feet and the diluter lever is in the "NORMAL OXYGEN" position, the regulator diaphragm may chatter slightly. This is not harmful, but if it occurs, stop the chatter by turning the diluter lever to "100% OXYGEN."

CAUTION

Before leaving the airplane, be sure the regulator dial is on "NORMAL OXYGEN."

4-11. PORTABLE OXYGEN EQUIPMENT.

4-12. Five portable units consisting of an A-6 cylinder and an A-15 auto-mix regulator are installed in the airplane. Three are in the forward cabin and two are in the aft cabin.

4-13. COMMUNICATION, NAVIGATION, AND RADAR EQUIPMENT.

4-14. GENERAL.

4-15. The communication and associated electronic equipment consists of radio and interphone equipment to provide airplane-to-airplane communication, airplane-to-ground communication, and intraplane communication between crew members; navigation sets for guidance and blind landing; and radar sets for identification, long range navigation, high altitude bombing, and tail turret control. Equipment is provided on each wing and on the rudder and elevators to discharge static electricity.

4-16. A functional breakdown of the installed equipment of the airplane is listed as follows:

TYPE	DESIGNATION	USE	PRIMARY OPERATOR	RANGE	ILLUSTRATION
COMMUNICATION EQUIPMENT					
Interphone	AN/AIC-2A	Crew communication	Crew		All crew stations
Filter	RC-210	To separate voice and range signals	Pilot and Copilot		(Figure 1-3, detail C)
Command Radio	AN/ARC-3	Plane-to-plane or plane-to-ground communication	Pilot and Copilot	30 Miles at 1000 feet	(57, figure 1-3)
Liaison Radio	AN/ARC-8	Code or voice transmission and reception	Radio Operator	5000 Miles at high frequency	(10 and 12, figure 4-1 and 59, figure 1-3)
Dinghy Transmitter	AN/CRT-3	Emergency use from life raft		250 Miles at sea; 40 miles on an inland lake	(12, figure 3-2)
NAVIGATION EQUIPMENT					
Blind Approach Equipment	AN/ARN-5A and RC-103-A	Lateral and vertical path indicator during blind landings	Pilot and Copilot	Local	(61, figure 1-3)
Radio Compass	AN/ARN-7	Reception of code or voice signals, direction bearing, and homing	Pilot, Copilot, and Navigator	200 Miles	(58, figure 1-3 and 17, figure 4-2)
Marker Beacon Set	RC-193	To obtain fix on navigation beam		Local	

TYPE	DESIGNATION	USE	PRIMARY OPERATOR	RANGE	ILLUSTRATION
RADAR EQUIPMENT					
Identification Set	SCR-695-B	Identification	Radio Operator	20 Miles at 200 feet	(18, figure 4-1)
Loran Set	AN/APN-9	Long range navigation	Navigator	750 Miles	(25, figure 4-2)
Radar Set	AN/APQ-23A	High altitude bombing and navigation aid	Radar Operator	100 Miles	(Figure 4-3)
Automatic Gun Laying	APG-3	To control the tail turret	Radio Operator	(See paragraph 4-91.)	(Figure 4-1)

A FEATURE OF THE INTERPHONE SYSTEM IS THE PROVISIONS FOR THE PILOT OR COPILOT, OR BOTH, TO MIX COMMAND RADIO, RADIO COMPASS, INTERPHONE, MARKER BEACON AND LOCALIZER AUDIO SIGNALS INTO ONE OUTPUT.

4-17. INTERPHONE SYSTEM AN/AIC-2A.

4-18. The interphone system provides interphone communication between 25 stations. A feature incorporated in this interphone system that is not found in conventional systems is the private interphone circuit. This circuit employs a private interphone amplifier and normally interconnects stations for the pilot, copilot, bombardier, navigator, and radar operator. Thus a private communication channel is available for close coordination between these five stations, while the remainder of the crew may still use the normal system. In an emergency the private interphone channel may be connected to the remainder of the stations, thereby providing a complete auxiliary interphone channel. This connection is made by placing a special interphone switch (60, figure 1-3) on the pilots' pedestal to "EMERGENCY." An additional feature of the interphone system is the provisions for either the pilot or copilot, or both, to mix command radio, radio compass, interphone, marker beacon, and localizer audio signals into one output. This is accomplished from the interphone control panels (figure 1-3, detail C) located on the fairings adjacent to the pilot's and copilot's seat. This facility affords close coordination for take-off or landing operation. The remainder of the crew stations are each equipped with an interphone control panel as shown in 19, figure 4-1. Except for the above features, the basic interphone system is conventional.

4-19. To start the interphone amplifier, turn on the airplane's main power supply. Make certain the "ON-OFF" switch on the amplifier is in the "ON" position.

Note

> Normally this switch will be safety wired in the "ON" position.

4-20. MIXED SIGNALS AND COMMAND. This facility is afforded the pilot and copilot only. Operate as follows:

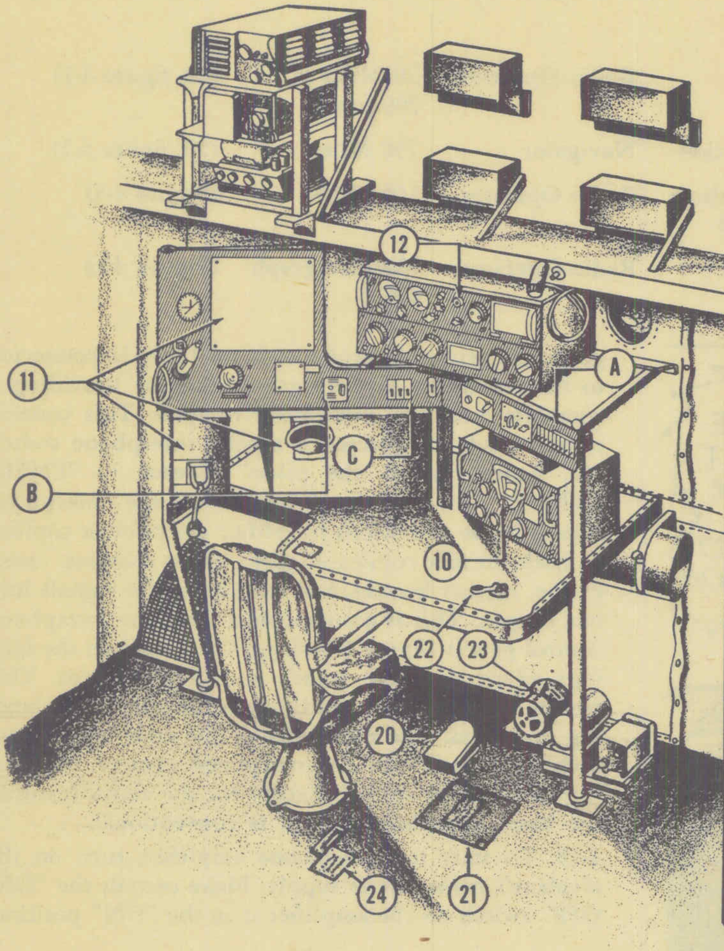
a. Place the selector switch on the interphone control panel in the "MIXED SIGNALS & COMMAND" position. The command radio signals or voice will be received in the headset, provided the set is in operation.

b. Adjust the volume control for the desired output level.

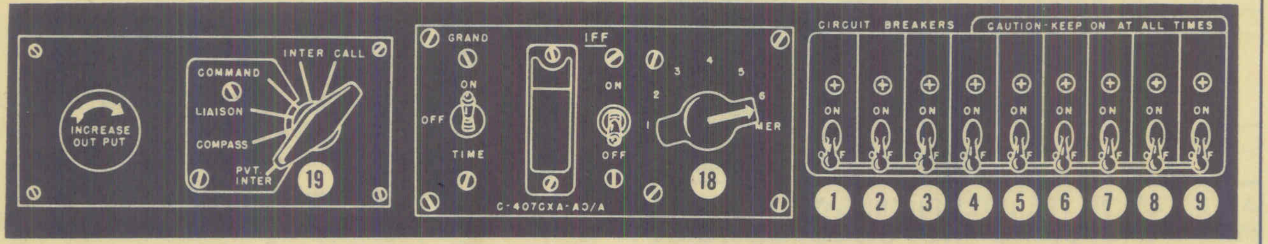
c. To transmit on the command radio set, close the microphone switch and speak into the microphone. The "VOICE-CW-MCW" switch on the transmitter must be in the "VOICE" position.

Note

> The remainder of the crew may use the command radio set by placing their respective selector switches in the "COMMAND" position; steps b and c preceding are applicable. The following steps apply to the pilot and copilot only.



1. COCKPIT LIGHT CIRCUIT BREAKER
2. BOMB SALVO CIRCUIT BREAKER
3. TURRET LIGHTS CIRCUIT BREAKER
4. MARKER BEACON CIRCUIT BREAKER (BC-193)
5. COMMAND SET CIRCUIT BREAKER (AN/ARC-3)
6. IDENTIFICATION RECEIVER CIRCUIT BREAKER (SCR-695)
7. IDENTIFICATION DETONATOR CIRCUIT BREAKER (SCR-695)
8. LIAISON RECEIVER CIRCUIT BREAKER (AN/ARC-8)
9. INTERPHONE CIRCUIT BREAKER (AN/AIC-2A)
10. LIAISON RADIO RECEIVER (AN/ARR-11)
11. TAIL TURRET CONTROLS (APG-3)
12. LIAISON RADIO TRANSMITTER (AN/ART-13A)
13. BOMB SALVO SWITCH
14. TURRET LIGHTS CONTROL
15. SUB FLIGHT DECK LIGHT
16. DOME LIGHT CONTROL
17. LIAISON MONITOR CONTROL
18. IDENTIFICATION CONTROL
19. INTERPHONE
20. MICROPHONE SWITCH
21. NOSE GEAR INSPECTION WINDOW
22. SIGNAL KEY
23. PRESSURE REGULATOR
24. EMERGENCY NOSE GEAR RELEASE



DETAIL A

DETAIL B

DETAIL C

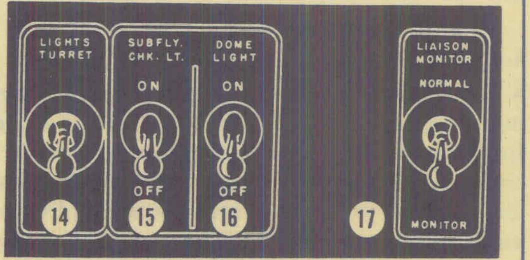


Figure 4-1. Radio Operator's Station

d. By placing any one or all four of the toggle switches marked "INTER-COMP-MARKER-LOCALIZER" in the on position, signals or voice will be received in conjunction with the command radio signals. The "INTER" switch is for the interphone channel and the "COMP" switch is for the radio compass channel. The "MARKER" switch is for the marker beacon and is the only control switch for this channel. The "LOCALIZER" switch is the only control switch for the localizer channel.

Note

These four channels are only operative when their respective switch is in the on position and the selector switch is set at "MIXED SIGNALS & COMMAND."

4-21. PRIVATE INTERPHONE. To use the private interphone facility, the pilot or copilot must first place the special interphone switch located on the pilots' pedestal in the "PRIVATE" position and then proceed as follows:

a. Move and hold the selector switch in the spring-loaded "CALL" position.

b. Close the microphone switch and speak into the microphone, directing the particular crew members desired on the private interphone channel to place their selector switch in the "PVT INTER" position.

c. Release the selector switch, place it in the "PVT INTER" position, and continue the conversation on the private interphone channel.

4-22. Since the private interphone system is independent of the basic interphone system and incorporates its own amplifier, it may be used as an auxiliary interphone channel in the event the basic system becomes inoperative. This operation is accomplished as follows:

a. The pilot or copilot must place the special interphone switch located on the pilots' pedestal in the "EMERGENCY" position.

b. All crew members must then place their respective selector switches in the "PVT INTER" position.

4-23. COMMAND RADIO AN/ARC-3.

4-24. Operation of this equipment is accomplished from the control panel (57, figure 1-3) on the pilots' pedestal. Operate as follows:

a. Place the selector switch on the interphone control panel to "MIXED SIGNALS & COMMAND."

b. Place the "ON-OFF" switch on the command set control unit to the "ON" position and turn the channel selector switch to any one of the positions designated "A" through "H" on the control unit. This action applies power to the unit, which then automatically tunes itself to the channel selected.

4-25. LIAISON RADIO SET AN/ARC-8.

4-26. Control of transmitting equipment is accomplished from the radio operator's table. (See figure 4-1.) The equipment is started by placing the "LOCAL-REMOTE" switch to the "LOCAL" position and setting the emission switch to "VOICE." A remote control panel (59, figure 1-3) is located on the pilots' pedestal for use by the pilot or copilot. Control of this panel is attained when the radio operator places the "LOCAL-REMOTE" switch to "REMOTE." A green light on the pilots' remote control panel will indicate that the transmitter is ready for remote control.

4-27. BLIND APPROACH EQUIPMENT AN/ARN-5A AND RC-103-A.

4-28. A control panel (61, figure 1-3) installed on the pilots' pedestal is provided to control this equipment. Visual indication of the signals received by both receiving sets is transposed onto the indicator (3, figure 1-3) located on the pilots' instrument panel. About 20 minutes before approaching the runway, turn the "ON-OFF" switch on the control panel to the "ON" position and allow the receiver to warm up.

4-29. RADIO COMPASS AN/ARN-7.

4-30. This equipment is used by the pilot and navigator; each has a control panel and an indicator. The pilots' control panel (58, figure 1-3) is located on the pilots' pedestal; his indicator (30, figure 1-3) is installed on the pilots' instrument panel. The navigator's control panel and indicator (17 and 22, figure 4-2) are located on the bombardier-navigator's panel. To start the equipment, momentarily hold the function switch on the control panel in the spring-loaded "CONT" position and then move the function switch to the "COMP" or "ANT" position.

4-31. MARKER BEACON SET RC-193-B.

4-32. Operation of this equipment is automatic when the airplane's d-c power is on. As the airplane passes within radio range of one of the transmitters, the receiver picks up signals, causing an amber indicator light (15, figure 1-3) on the pilots' instrument panel to flash in synchronism with the transmitter keying of the instrument landing markers.

4-33. IDENTIFICATION SET SCR-695-B.

4-34. The IFF control panel (18, figure 4-1) is located on the radio operator's instrument panel. Control and operation of the destructor unit is accomplished by the "DESTROY" switch on the control panel or by an automatic gravity switch. Operation of the identification set is performed from the control panel at the radio operator's station.

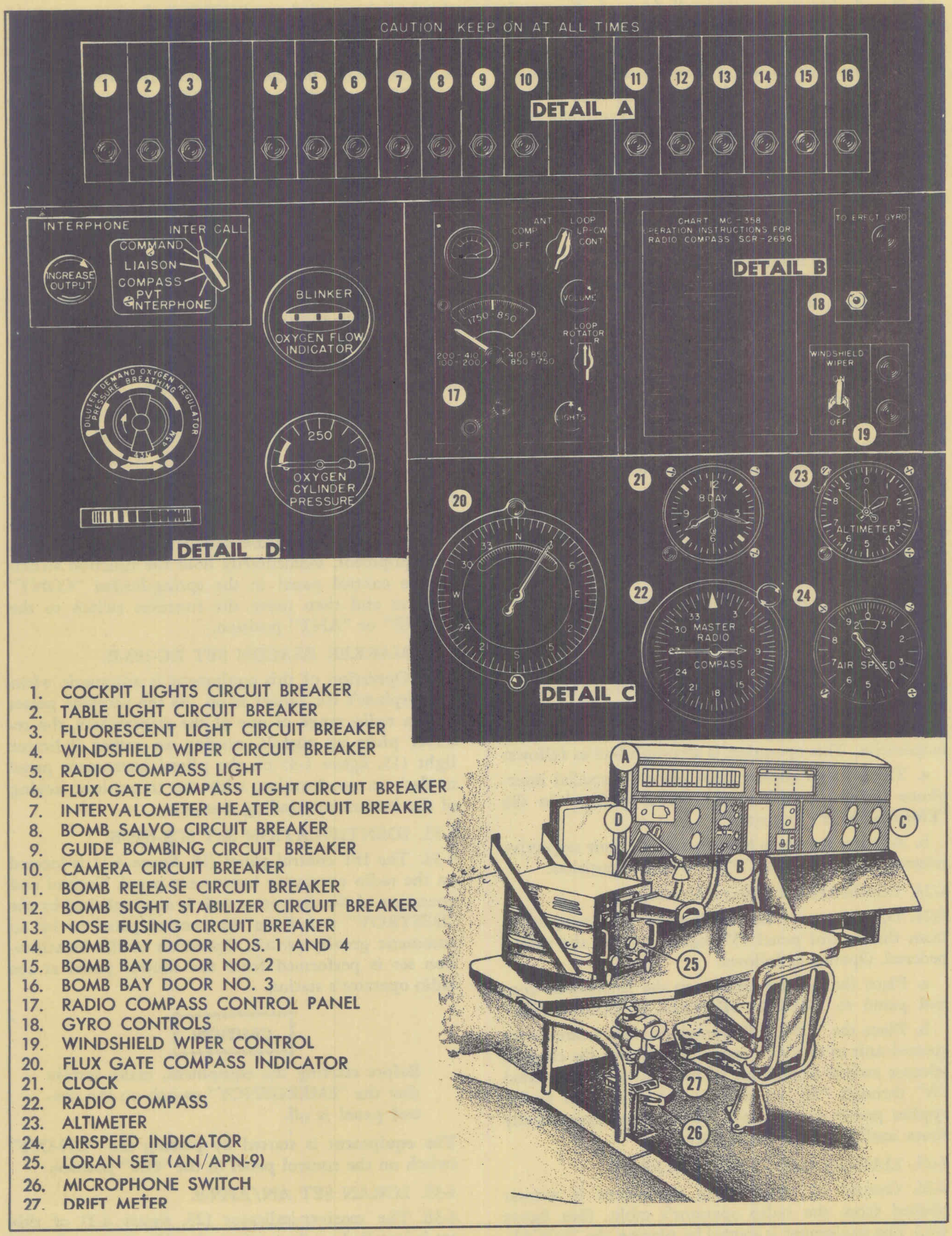
CAUTION

Before starting the equipment, make certain that the "EMERGENCY" switch on the control panel is off.

The equipment is started by placing the "ON-OFF" switch on the control panel in the "ON" position.

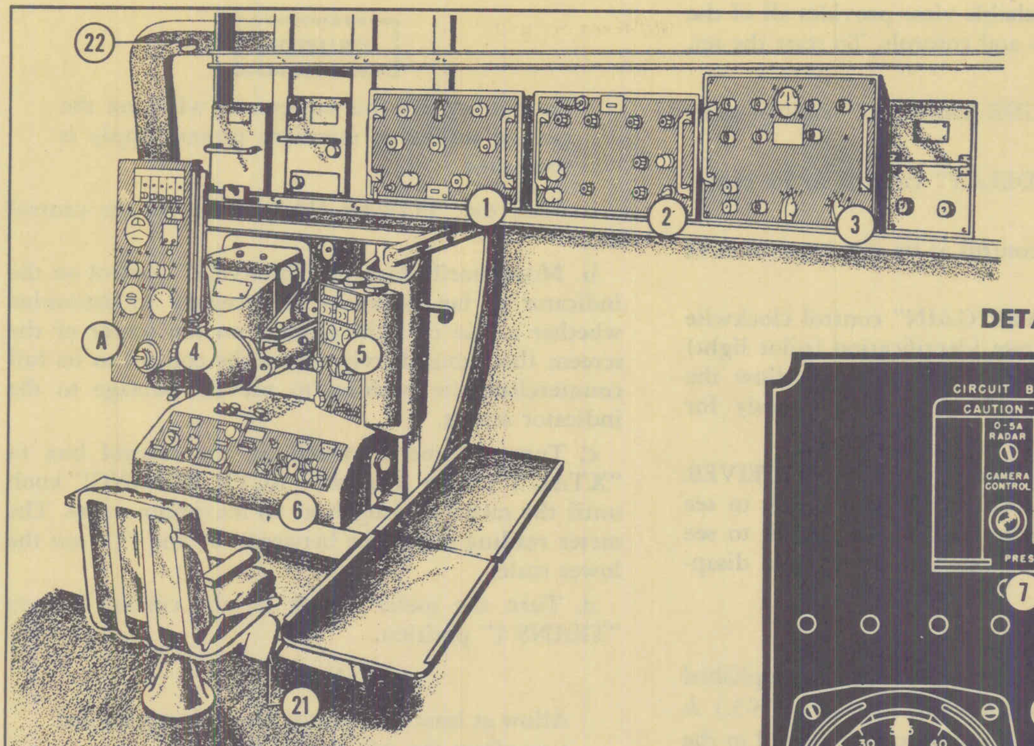
4-35. LORAN SET AN/APN-9.

4-36. The receiver-indicator (25, figure 4-2) of this set is installed on the navigator's table. A control panel incorporated on the front of the receiver-indicator in

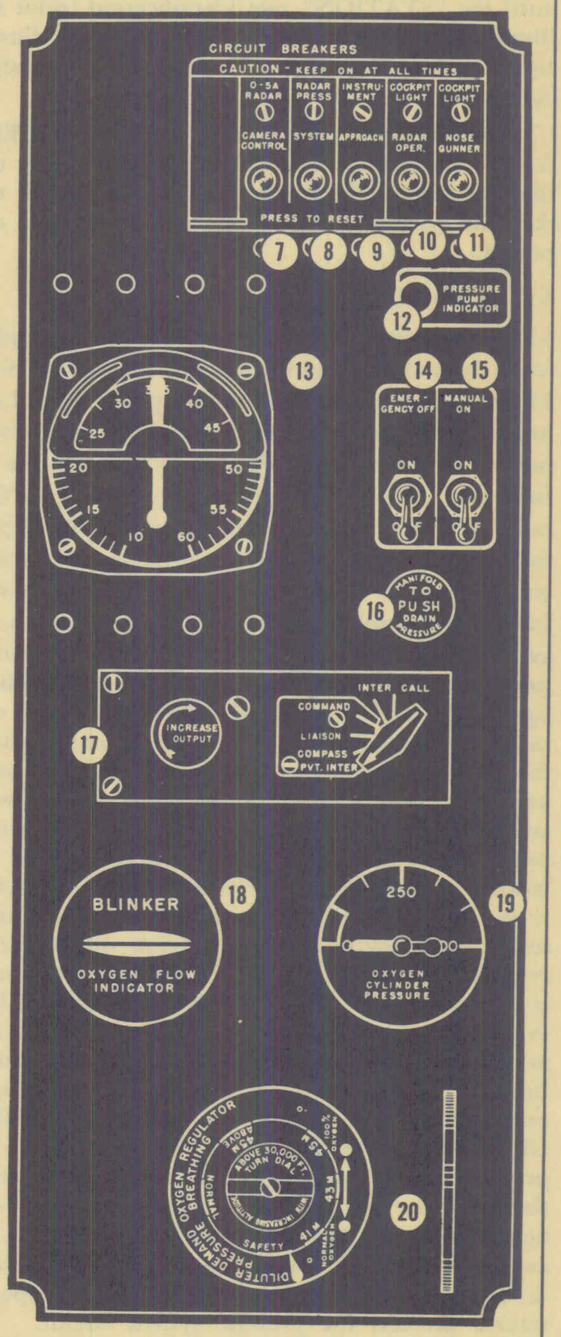


1. COCKPIT LIGHTS CIRCUIT BREAKER
2. TABLE LIGHT CIRCUIT BREAKER
3. FLUORESCENT LIGHT CIRCUIT BREAKER
4. WINDSHIELD WIPER CIRCUIT BREAKER
5. RADIO COMPASS LIGHT
6. FLUX GATE COMPASS LIGHT CIRCUIT BREAKER
7. INTERVALOMETER HEATER CIRCUIT BREAKER
8. BOMB SALVO CIRCUIT BREAKER
9. GUIDE BOMBING CIRCUIT BREAKER
10. CAMERA CIRCUIT BREAKER
11. BOMB RELEASE CIRCUIT BREAKER
12. BOMB SIGHT STABILIZER CIRCUIT BREAKER
13. NOSE FUSING CIRCUIT BREAKER
14. BOMB BAY DOOR NOS. 1 AND 4
15. BOMB BAY DOOR NO. 2
16. BOMB BAY DOOR NO. 3
17. RADIO COMPASS CONTROL PANEL
18. GYRO CONTROLS
19. WINDSHIELD WIPER CONTROL
20. FLUX GATE COMPASS INDICATOR
21. CLOCK
22. RADIO COMPASS
23. ALTIMETER
24. AIRSPEED INDICATOR
25. LORAN SET (AN/APN-9)
26. MICROPHONE SWITCH
27. DRIFT METER

Figure 4-2. Navigator's Station



DETAIL A



1. SYNCHRONIZER (SN-7C/APQ-13)
2. RANGE UNIT (CP-6/APQ-13)
3. AMPLIFIER (AM-77/APQ-23A)
4. INDICATOR ID-41A/APQ-13)
5. CONTROL BOX (C-71B/APQ-13)
6. COMPUTER (CP-16/APQ-23A)
7. RADAR CAMERA CONTROL CIRCUIT BREAKER (O-5A)
8. RADAR PRESSURIZING SYSTEM CIRCUIT BREAKER
9. INSTRUMENT APPROACH CIRCUIT BREAKER
10. COCKPIT LIGHT RADAR OPERATOR CIRCUIT BREAKER
11. COCKPIT LIGHT NOSE GUNNER CIRCUIT BREAKER
12. RADAR PRESSURE PUMP INDICATOR
13. RADAR PRESSURE GAGE
14. RADAR PRESSURE "EMERGENCY OFF" SWITCH
15. RADAR PRESSURE "MANUAL ON" SWITCH
16. RADAR PRESSURE DRAIN VALVE
17. INTERPHONE CONTOL PANEL
18. OXYGEN FLOW INDICATOR
19. OXYGEN CYLINDER PRESSURE
20. OXYGEN REGULATOR
21. MICROPHONE SWITCH
22. RESTRICTOR DAMPER

Figure 4-3. Radar Operator's Station

conjunction with a detachable visor provides all of the manual control switches and controls. To start the set, proceed as follows:

a. Set the "AMPLITUDE BALANCE" control at its center position.

b. Turn the "FINE DELAY" control to its center position of rotation.

c. Set the "DRIFT" control at its center position of rotation.

d. Turn the "RECEIVER GAIN" control clockwise until the "STATION" rate identification (pilot light) illuminates. Wait at least five minutes to allow the equipment to warm up. The set is now ready for operation.

e. To stop the equipment, turn the "RECEIVER GAIN" control to "POWER OFF" and check to see that the pilot light is illuminated. Also check to see that the pattern on the indicator screen has disappeared.

4-37. RADAR SET AN/APQ-23A.

4-38. Operation of this equipment is accomplished from the radar operator's station. (See figure 4-3.) A 24-volt, d-c, motor-driven pressure pump located in the lower section of the forward turret bay provides pressurized air for the radio frequency unit and the radio frequency line (wave guide) of the AN/APQ-23A radar set. The system is automatic when the airplane's main power supply is on; however, two switches (14 and 15, figure 4-3) are provided at the radar operator's station to control the system in the event of an emergency. The system incorporates the control switches, a pressure gage (13, figure 4-3), an indicator light (12, figure 4-3), and a drain valve (16, figure 4-3) at the radar operator's station; an air inlet extending through the forward cabin pressure bulkhead; a dehydrator unit; the pressure pump; an absolute pressure switch; and the necessary tubing. With this equipment the pump draws cabin air through the dehydrator to remove all moisture; it then pressurizes the air before it is routed to the units. Automatic operation of the pressure pump results from the action of the pressure switch. The indicator lamp at the radar operator's station lights when the pump is in operation. In the event the pressure begins to exceed its specified limits, as indicated on the pressure gage, and the indicator light indicates that the pump is still operating, the pump should be stopped by placing the "EMERGENCY OFF" switch in the "OFF" position. If the pressure begins to drop to a critically low point and the indicator light indicates that the pump is not in operation, hold the spring-loaded "MANUAL ON" switch in the "ON" position until the pressure is back to normal. A circuit breaker at the radar operator's station protects the pressure system circuit.

4-39. To start the AN/APQ-23A set, proceed as follows:

CAUTION

Do not operate this equipment while on the ground unless an auxiliary power supply is connected.

a. Press the "POWER ON" button on the control box.

b. Momentarily turn the "BRIGHT" control on the indicator as far clockwise as necessary to determine whether a line of light appears on the center of the screen; then immediately return the control to its full counterclockwise position to prevent damage to the indicator screen.

c. Turn the meter switch on the control box to "XTAL 1"; then turn the "RCVR TUNING" knob until the meter reading is at its maximum value. The meter reading should be between "6" and "11" on the lower scale.

d. Turn the meter switch on the control box to "TRANS 1" position.

Note

Allow at least one minute between steps a and e to allow the tubes to warm up.

e. Press the "TRANS ON" button on the control box. The meter should indicate between 6 and 8 milliamperes on the lower scale within 10 seconds.

f. Turn the "RANGE NAUT MILES" switch on the control box to all its positions, with the "AFC-BEACON" switch on first "AFC-OFF" and then on "BEAC-ON." The meter should read between 7 and 9 milliamperes for all of these conditions.

4-40. To stop the equipment proceed as follows:

a. Press the "TRANS OFF" button on the control box.

b. Press the "POWER OFF" button on the control box.

c. Turn the "BRIGHT" control on the indicator to its full counterclockwise position.

d. Set all controls to their initial preoperation settings.

4-41. PRESSURIZATION AND VENTILATION SYSTEM.

(See figure 4-4.)

4-42. GENERAL.

4-43. The forward and the aft cabins and the interconnecting communication tube are pressurized by a controllable system that utilizes air from the right turbosupercharger in each nacelle. Ventilating fans, one for each cabin, are provided in the pressure ducts to force air from the bomb bays into the cabins. The fans are used to ventilate the cabins when atmospheric conditions are such that cabin pressurization and heating are not required. When the pressure system is turned on, the ventilating fans are automatically turned

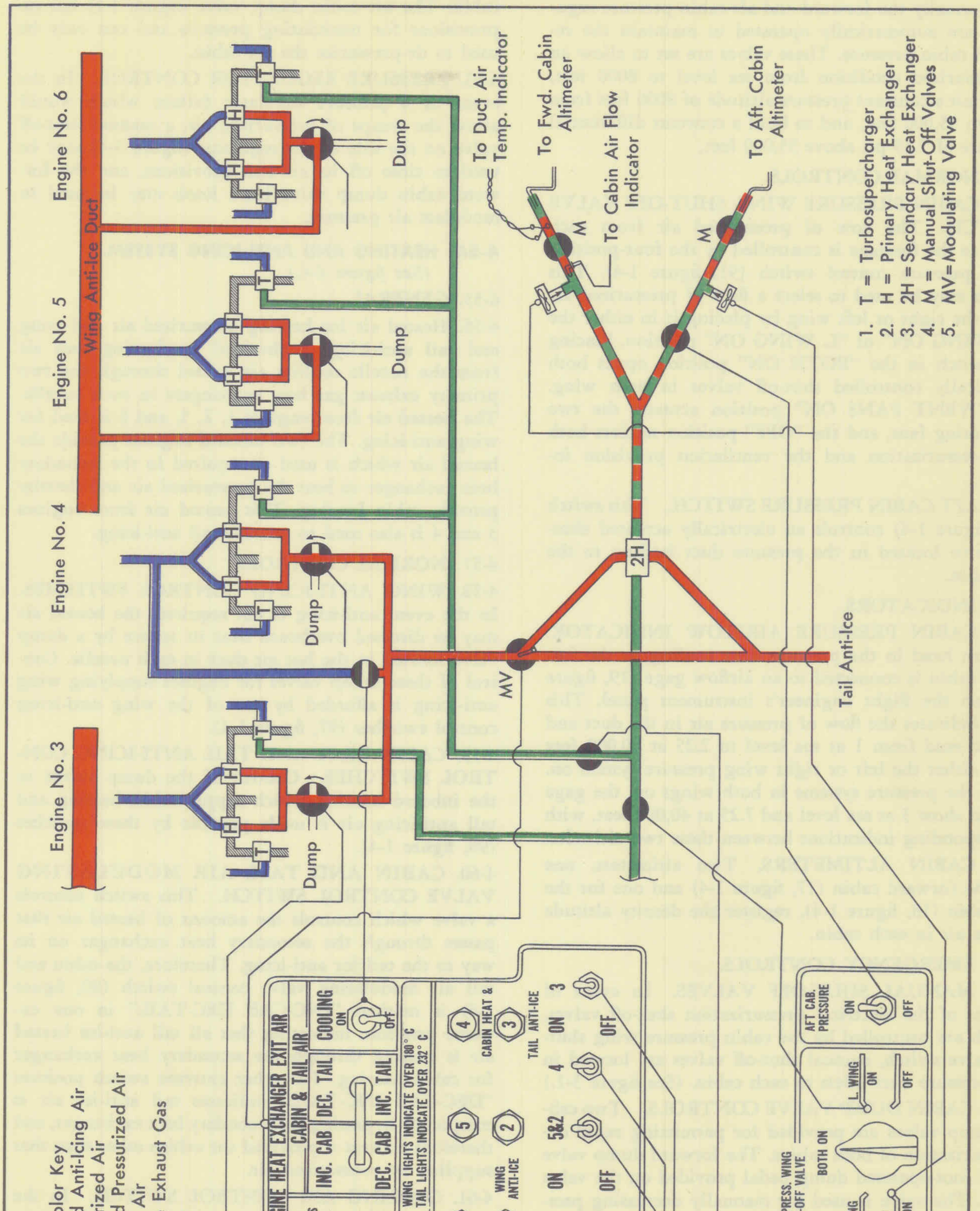


Figure 4-4. Pressurizing, Heating, and Ventilating Systems

off. Normally the forward and aft cabin pressure regulators are automatically operated to maintain the required cabin pressure. These valves are set to allow an unpressurized condition from sea level to 8000 feet, to permit a constant pressure altitude of 8000 feet from 8000 to 35,000 feet, and to hold a constant differential pressure of 7.45 psi above 35,000 feet.

4-44. NORMAL CONTROLS.

4-45. CABIN PRESSURE WING SHUT-OFF VALVE SWITCH. The flow of pressurized air from each wing to the fuselage is controlled by the four-position cabin pressure control switch (91, figure 1-4). This switch may be used to select a flow of pressurized air from the right or left wing by placing it in either the "R. WING ON" or "L. WING ON" position. Placing the switch in the "BOTH ON" position opens both electrically controlled shut-off valves in each wing. The "VENT FANS ON" position actuates the two ventilating fans, and the "OFF" position renders both the pressurization and the ventilation provision inactive.

4-46. AFT CABIN PRESSURE SWITCH. This switch (92, figure 1-4) controls an electrically actuated shut-off valve located in the pressure duct leading to the aft cabin.

4-47. INDICATORS.

4-48. CABIN PRESSURE AIRFLOW INDICATOR. A pitot head in the pressure duct leading to the forward cabin is connected to an airflow gage (19, figure 1-4) on the flight engineer's instrument panel. This gage indicates the flow of pressure air in the duct and should read from 1 at sea level to 2.25 at 40,000 feet with either the left or right wing pressure system on. With the pressure systems in both wings on, the gage should show 3 at sea level and 7.25 at 40,000 feet, with corresponding indications between these two altitudes.

4-49. CABIN ALTIMETERS. Two altimeters, one for the forward cabin (17, figure 1-4) and one for the aft cabin (18, figure 1-4), register the density altitude of the air in each cabin.

4-50. EMERGENCY CONTROLS.

4-51. MANUAL SHUT-OFF VALVES. In event of failure of the electrical pressurization shut-off valves, which are controlled by the cabin pressure wing shut-off valve switch, manual shut-off valves are located in the pressure duct inlets to each cabin. (See figure 3-1.)

4-52. CABIN DUMP VALVE CONTROLS. Two cabin dump valves are provided for permitting rapid de-pressurization of both cabins. The forward dump valve has a foot-operated dump pedal provided on the valve body. The valve is used for manually decreasing pressure within the cabin for combat and for quickly equalizing pressure between the atmosphere and the cabin in an emergency. Quick release of the pressurized air is obtained by depressing the quick-release pedal on the valve body. The dump valve hand knob (figure 3-4) which is located on the engineer's floor may be used to manually modulate the pressure in the forward cabin. The aft cabin dump valve (figure 3-1) has no provisions for modulating pressure and can only be used to de-pressurize the aft cabin.

4-53. PRESSURE REGULATOR CONTROL. In the event of a pressure regulator failure which would allow the escape of pressurized air, a manual shut-off valve on the side of the regulator (figure 3-4) may be used to close off its air exit provisions, and the forward cabin dump valve hand knob may be used to modulate air pressure.

4-54. HEATING AND ANTI-ICING SYSTEM.

(See figure 4-4.)

4-55. GENERAL.

4-56. Heated air for heating pressurized air and wing and tail anti-icing is obtained by ducting ram air from the nacelle cooling air tunnel through the two primary exhaust gas heat exchangers in each nacelle. The heated air from engines 1, 2, 5, and 6 is used for wing anti-icing. The two inboard engines provide the heated air which is used as required in the secondary heat exchanger to heat the pressurized air and thereby provide cabin heating. This heated air from engines 3 and 4 is also used to provide tail anti-icing.

4-57. NORMAL CONTROLS.

4-58. WING ANTI-ICING CONTROL SWITCHES. In the event anti-icing is not required, the heated air may be directed overboard near its source by a dump valve located in the hot air duct in each nacelle. Control of these dump valves for engines supplying wing anti-icing is afforded by use of the wing anti-icing control switches (97, figure 1-4).

4-59. CABIN HEAT AND TAIL ANTI-ICING CONTROL SWITCHES. Control of the dump valves in the inboard nacelles which supply cabin heating and tail anti-icing air is made possible by these switches (98, figure 1-4).

4-60. CABIN AND TAIL AIR MODULATING VALVE CONTROL SWITCH. This switch controls a valve which controls the amount of heated air that passes through the secondary heat exchanger on its way to the tail for anti-icing. Therefore, the cabin and tail air modulating valve control switch (89, figure 1-4) is marked "INC-CAB DEC-TAIL" in one extreme position, indicating that all tail anti-ice heated air is passing through the secondary heat exchanger for cabin heating. The other extreme switch position "DEC-CAB INC-TAIL" indicates tail anti-ice air is completely bypassing the secondary heat exchanger, and therefore no heat is provided the cabins other than that supplied by pressurized air.

4-61. COOLING AIR CONTROL SWITCH. In the event the pressurization system alone supplies more heat than is desirable, the secondary heat exchanger may be used to cool the pressurized air. This is accomplished by placing the cooling air control switch (90, figure 1-4) in the "ON" position and directing cooling air from the No. 4 nacelle around the tubes of the secondary heat exchanger. The degree of cooling may be controlled by use of the cabin and tail air modulating valve control switch. The cabin heat and tail anti-icing control switches must be off.

4-62. INDICATORS.

4-63. CABIN HEAT AND ANTI-ICING AIR MAXIMUM TEMPERATURE WARNING LAMPS. A thermoswitch installed in the heating duct just downstream of each nacelle hot air dump valve is connected to a correspondingly identified warning lamp (93, figure 1-4). The lamps glow when the thermoswitch is subjected to a temperature in excess of 232°C for tail air and 180°C for wing air.

4-64. ENGINE CYLINDER AND ANTI-ICING TEMPERATURE INDICATOR. Installed in the heating duct adjacent to the thermoswitch is a thermocouple which is connected to the temperature indicator (7, figure 1-4). (See paragraph 1-145.)

4-65. CABIN AND TAIL AIR MODULATING VALVE INDICATOR LAMP. This lamp (88, figure 1-4) glows when the valve has reached either of its extreme travel limits.

4-66. PITOT-STATIC HEATERS.

4-67. Pitot heat is controlled by two "ON-OFF" switches (94, figure 1-4) located on the flight engineer's control panel.

4-68. PROPELLER ANTI-ICING.

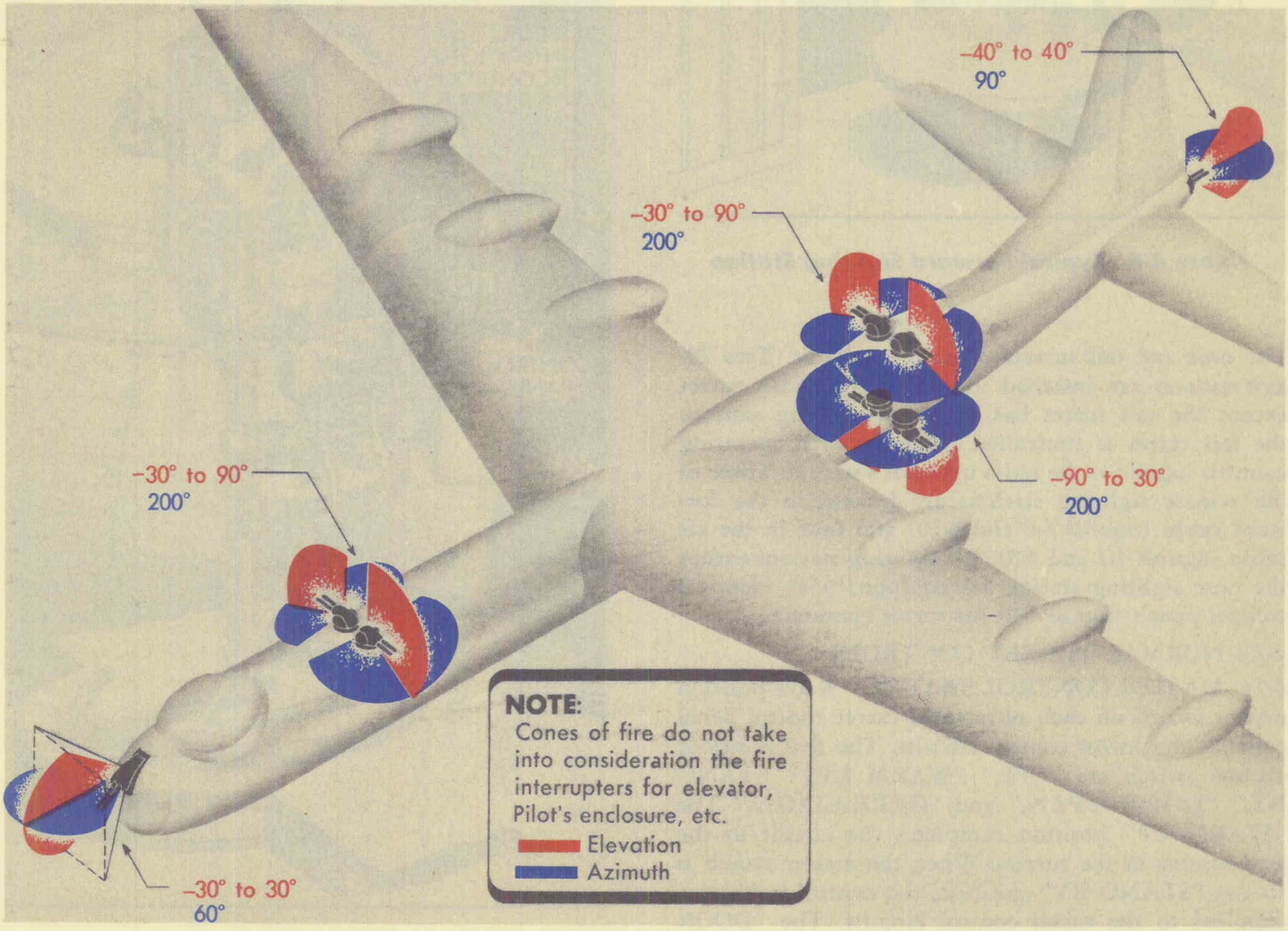
4-69. Anti-icing of the propeller blades is accomplished by conducting heated air from the shrouds surrounding the exhaust manifolds through the hollow steel blades. A single propeller anti-ice "ON-OFF" switch (95, figure 1-4) controls two electrically actuated valves in each engine. The valves are located in the exhaust cooling air exit ducts at the spinner fairings. They may be positioned for anti-icing or for dumping the air overboard.

4-70. GUNNERY EQUIPMENT.

(See figure 4-5.)

4-71. GENERAL.

4-72. The airplane is equipped with eight remote-controlled gun turrets, six of which are retractable. Two are located on the forward top side of the fuselage, two on the aft top side, and two on the aft bottom side.



NOTE:
Cones of fire do not take into consideration the fire interrupters for elevator, Pilot's enclosure, etc.

Figure 4-5. Fields of Fire

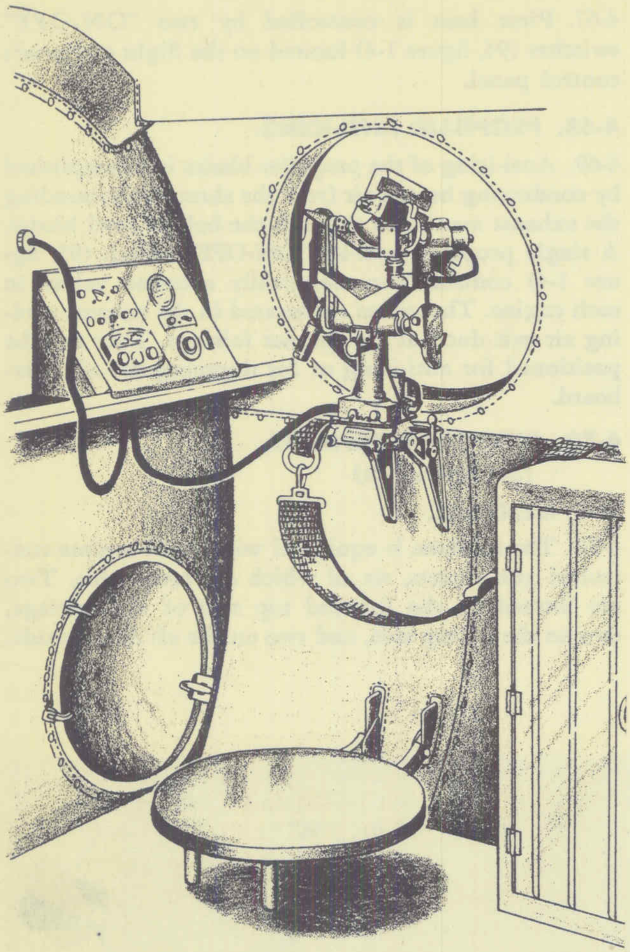


Figure 4-6. Typical Forward Sighting Station

The nose and tail turrets are nonretractable. Two 20-mm cannon are installed in each turret. Each turret except the tail turret has a remote sighting station; the tail turret is controlled by radar with operating controls located at the radio operator's station. Three of the remote sighting stations are located in the forward cabin (figures 4-6 and 4-10) and four in the aft cabin (figures 4-7 and 4-8). All sighting stations except the nose sighting station are equipped with identical control panels (figure 4-9) for turret operation.

4-73. NORMAL TURRET CONTROLS.

4-74. MASTER CONTROL SWITCH. A five-position master switch on each retractable turret control panel controls the turret control circuits. The five positions on the switch are "OFF," "WARM UP," "STAND BY," "DOOR OPEN," and "OPERATION." The "WARM UP" position completes the circuit to the gun heaters in the turrets. When the master switch is in the "STAND BY" position, d-c control voltage is supplied to the turret control circuits. The "DOOR OPEN" position completes the circuit to the turret door motor, opening the turret doors. Placing the master switch in the "OPERATION" position extends the turret.

4-75. SAFE-FIRE SWITCH. Moving the safe-fire switch from the "SAFE" position to "FIRE" sets up the gun charging circuit.

4-76. HANDSET CONTROL KNOBS. The handset unit in each control panel is equipped with knobs to incorporate corrections in the computer on the gun sights for air speed, altitude, and temperature variations.

4-77. INDICATORS.

4-78. TURRET-OUT LAMP. This indicator lamp glows when the turret is fully extended and ready for operation.

4-79. DOOR-CLOSED LAMP. When the turret is retracted and the doors are closed, this indicator lamp will be lighted with the master switch in any position other than off. The lamp will go out when the turret doors are completely open.

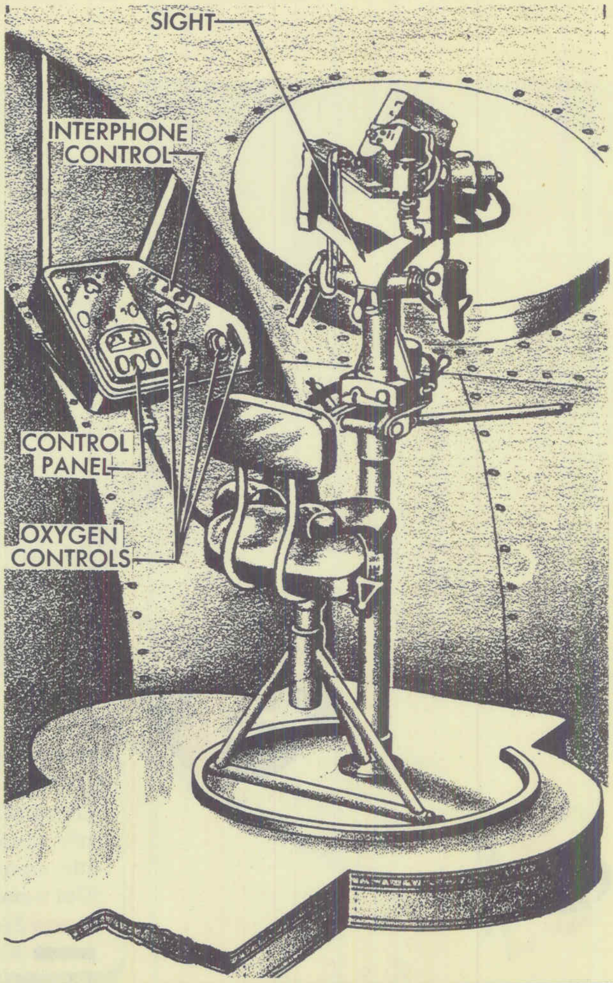


Figure 4-7. Typical Upper Aft Sighting Station

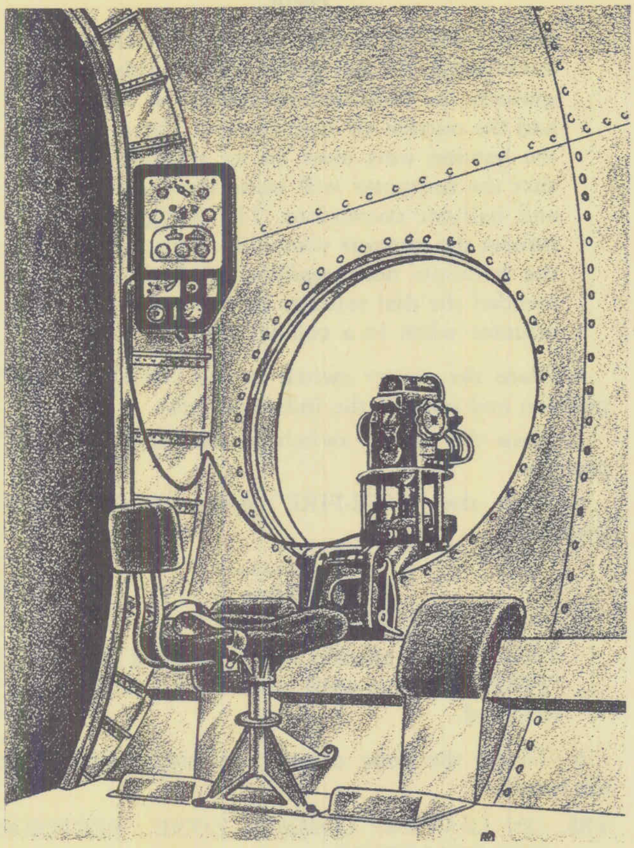


Figure 4-8. Typical Lower Aft Sighting Station

4-80. AMMUNITION INDICATORS. These dials on the control panel indicate reserve ammunition for each gun.

4-81. HANDSET INDICATORS. These dials are used as a visual indication of air speed, altitude, and temperature corrections for the gun sight computers.

4-82. EMERGENCY CONTROLS.

4-83. HAND CRANK. In case of an emergency the turrets can be extended or retracted manually by use of a hand crank stowed in the proximity of each turret. The rotor shaft on the turret's extend-and-retract motor extends beyond the housing and has a fitting for the crank. The turrets may also be turned in azimuth by releasing the brake on the azimuth drive located under the turret base plate near the center of azimuth rotation. The clutch shaft protrudes below the azimuth drive housing and has a fitting for the crank. With the brake released and the crank in position, the turret may be rotated with a 40-pound load on the crank handle.

4-84. OPERATION.

4-85. Operation of the retractable turrets from the sighting stations is accomplished in the following manner:

4-86. BEFORE POWER IS ON THE AIRPLANE. CHECK:

a. Master Selector Switch—"OFF"

b. Circuit Breaker Push Buttons—Pressed

c. Ammunition Reserve Indicators—Set

d. "SAFE-FIRE" Switch—"SAFE"

e. Gun Sight—Locked

4-87. BEFORE ENTERING COMBAT ZONE. PERFORM THE FOLLOWING:

a. Make certain that the "SAFE-FIRE" switch is in the "SAFE" position.

b. Move the master switch to the "WARM UP" position to supply power to the gun heaters for a sufficient period for warm up.

c. Move the master switch to the "STAND BY" position to apply power to the turret control circuits.

d. Allow 50 to 60 seconds for the tubes and equipment to reach their normal operating temperature. During this time set up the airspeed-altitude handset unit on the control panel according to the information furnished by the navigator.

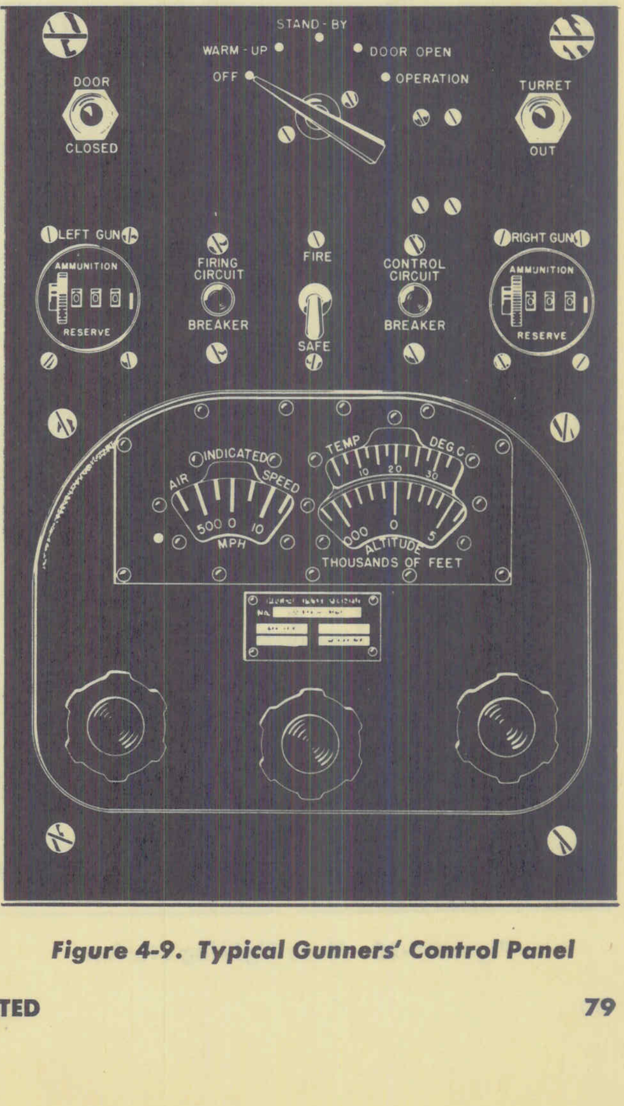


Figure 4-9. Typical Gunners' Control Panel

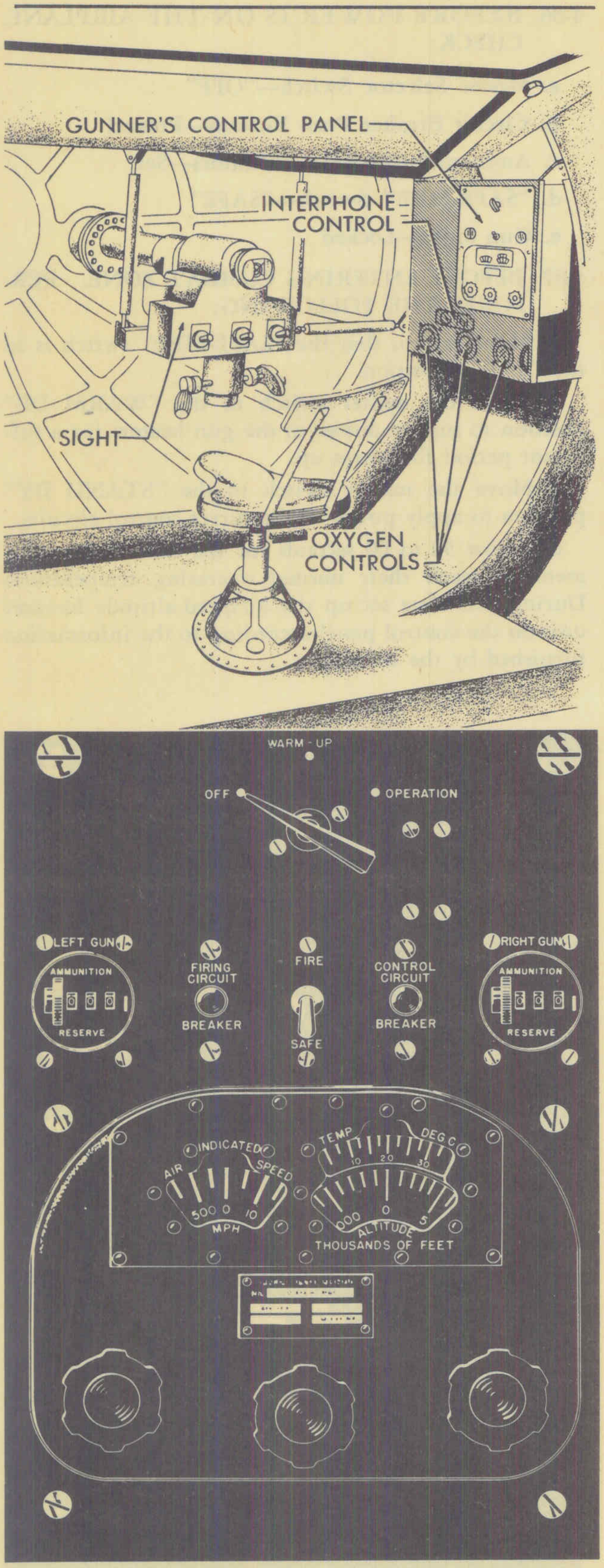


Figure 4-10. Nose Sighting Station

Note

Before entering a zone in which turret use is anticipated, the navigator will furnish to all gunners the indicated air speed, the altitude, and the outside air temperature. The dials on the handset unit must be set accordingly so that the computer will make the proper lead and ballistic corrections. The navigator will inform the gunners when dial adjustments on the handsets need readjusting. It is recommended the dial settings be checked every 10 minutes when in a combat zone.

e. Place the master switch in the "DOOR OPEN" position and observe the indicator light.

f. Place the master switch in the "OPERATION" position.

g. Place the "SAFE-FIRE" switch in the "FIRE" position.

CAUTION

This switch should not be placed in the "FIRE" position until immediate use is anticipated.

h. To fire the guns, depress the trigger buttons on the handles.

4-88. ON LEAVING COMBAT ZONE. PERFORM THE FOLLOWING:

a. Place the "SAFE-FIRE" switch in the "SAFE" position.

b. Place the master switch in the "STAND BY" position.

c. Observe the indicator lamps when the turret is stowed and the doors are closed. Place the master switch in the "OFF" position.

4-89. NOSE TURRET.

4-90. The nose turret operation and control is identical to the retractable turrets, except that the control panel does not have the master switch positions marked "STAND BY" and "DOOR OPEN" with corresponding lights.

4-91. TAIL TURRET.

4-92. For reasons of security classification, no information on control and operation of the tail turret is given in this publication.

4-93. BOMBING EQUIPMENT.

4-94. GENERAL.

4-95. The airplane incorporates four bomb bays designed to carry varied bomb loads and various sized bombs. Structurally rigid bomb bay doors mounted on rollers move on tracks around the fuselage contour. All doors are operated by electric motors and a cable arrangement. Thirty-two removable bomb racks of 11 different types are furnished with each airplane, allowing a number of bomb loading conditions. Design of

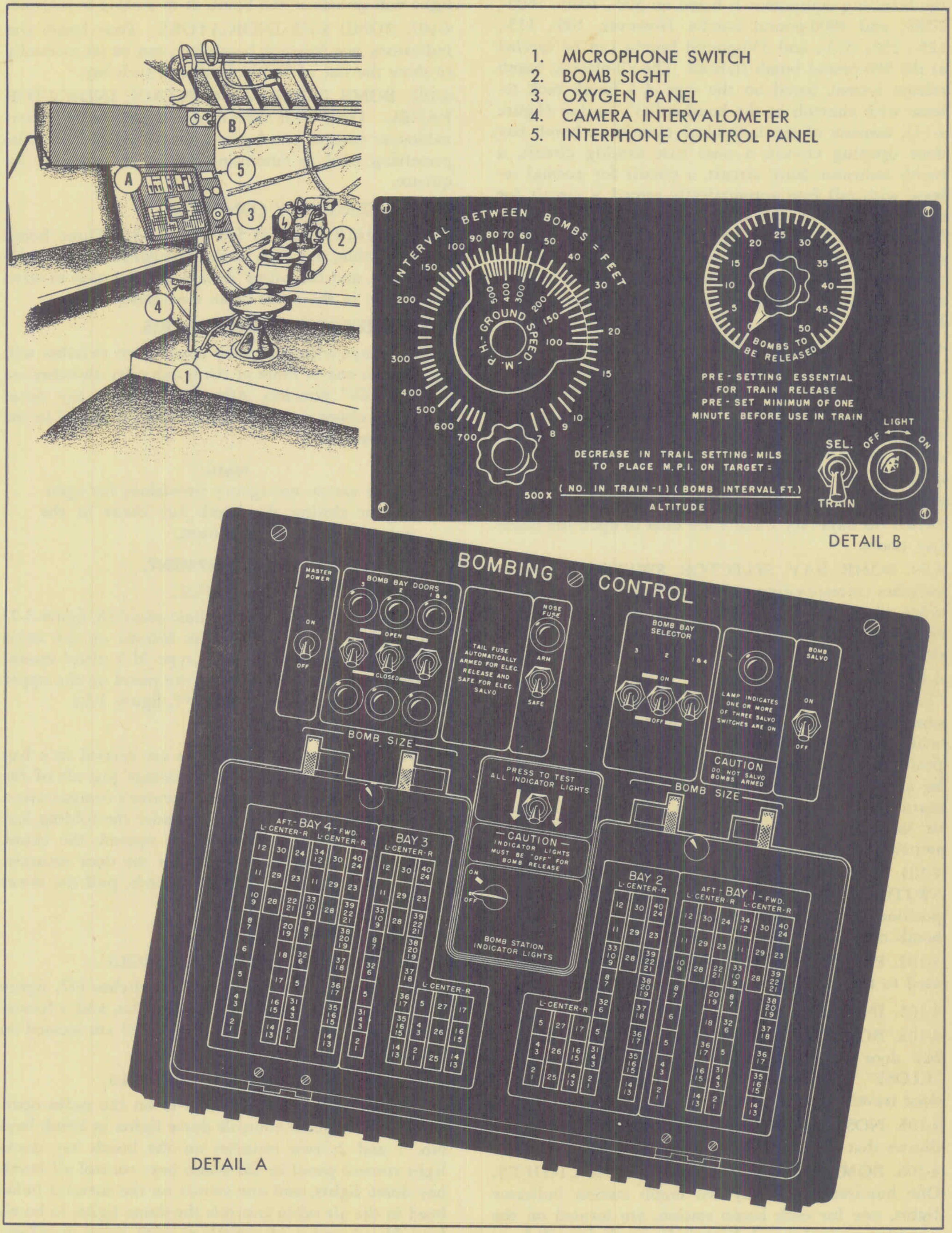


Figure 4-11. Bombardier's Station

the bombing equipment is based on 500-, 1000-, 1600-, 2000-, and 4000-pound bombs. However, 100-, 115-, 125-, 250-, 325-, and 350-pound bombs can be carried at the 500-pound bomb stations. The all-electric bomb release system, based on the type A-4 bomb rack release with controls at the bombardier's station (figure 4-11), consists of six individual circuits: a bomb bay door opening circuit, a nose fuse arming circuit, a bomb indicator lamp circuit, a circuit for normal release with tail fuse automatically armed, a circuit for salvo release with tail fuse automatically safe, and a bomb release formation signal light circuit. Retention of the arming wires for nose fusing is attained by means of the type A-2 bomb arming controls. One arming control is supplied for the nose fuse of each bomb.

4-96. NORMAL CONTROLS.

4-97. MASTER POWER SWITCH. The master power switch with its two positions marked "ON" and "OFF" controls the electric power to the bombing control panel as well as completes the circuit to the formation signal lights in the tail of the airplane.

4-98. BOMB BAY DOOR SWITCHES. Three switches, one each for bays No. 2 and 3, and a single switch for bays No. 1 and 4 are used to open the bomb bay doors.

4-99. BOMB BAY SELECTOR SWITCHES. Three switches corresponding to the bomb bay door switches, when placed in the "ON" position, set up the release circuit to the racks from which bombs are to be dropped.

4-100. NOSE FUSE SWITCH. This switch marked "SAFE" and "ARM" is provided for the arming of the nose fuses. All bombs can be armed simultaneously with this switch. When the switch is in the "SAFE" position during normal release, only the tail fuses will be armed. During salvo the tail fuse will be automatically safe and the nose fuse will be either armed or safe, depending on the position in which this switch is placed.

4-101. BOMB STATION INDICATOR LIGHT SWITCH. When this switch is placed in the "ON" position, each indicator light will burn as long as its bomb rack release unit is cocked.

4-102. PRESS-TO-TEST SWITCH. This switch is used to test the bomb station indicator lights.

4-103. INDICATORS.

4-104. BOMB BAY DOOR LAMPS. The six bomb bay door lamps, three for "OPEN" and three for "CLOSE" positions, give visual indication of bomb door travel.

4-105. NOSE FUSE LIGHT. This light, when on, indicates that the bomb nose fuses are armed.

4-106. BOMB STATION INDICATOR LIGHTS. One hundred and thirty-two bomb station indicator lights, one for each bomb station, are located on the bombing control panel. Each indicator light will burn as long as its bomb rack release unit is cocked. Each light will go out as the bomb at its station is released.

4-107. BOMB SIZE INDICATORS. Four bomb size indicators, one for each bomb bay, can be set manually to show the size of bombs loaded in each bay.

4-108. BOMB INTERVAL CONTROL INDICATOR PANEL. Dials with their control knobs on the intervalometer control panel give a visual indication of the presetting used to determine the bomb dropping sequence.

4-109. EMERGENCY CONTROLS.

4-110. BOMB SALVO SWITCHES. Three bomb salvo switches, one each at the bombardier's, the radio operator's, and the pilots' station may be used to salvo the bombs in the event of an emergency.

4-111. EMERGENCY INDICATORS.

4-112. Lamps adjacent to the bomb salvo switches will light when one or more of the bomb salvo switches are in the "ON" position. After salvo, bomb bay doors cannot be closed until the salvo switch is placed in the "OFF" position.

Note

There are no emergency provisions for opening or closing the bomb bay doors in the event of an electrical failure.

4-113. PYROTECHNIC EQUIPMENT.

4-114. PYROTECHNIC PISTOL.

4-115. A type AN-M8 pyrotechnic pistol (6, figure 3-2) is stowed in a type A-2 holder located on the radio operator's equipment shelf. A type M-1 pistol mount is installed in the proximity of the pistol on the upper left side of the fuselage. (See 6**, figure 3-2.)

4-116. DRIFT FLARES.

4-117. Day and night drift flares are carried in a bag stowed on the left side of the fuselage just aft of the forward bulkhead in the radio operator's compartment. A drift signal chute is installed under the folding leaf of the radar operator's table. To operate the chute, load a flare in the chute and close the door securely. After waiting approximately 5 seconds, pull the lower red handle to release the flare.

4-118. LIGHTING CONTROLS.

4-119. EXTERIOR LIGHT CONTROLS.

4-120. Two landing light control switches (42, figure 1-3), two position light control switches, and a formation light control switch (43, figure 1-3) are located on the pilots' pedestal.

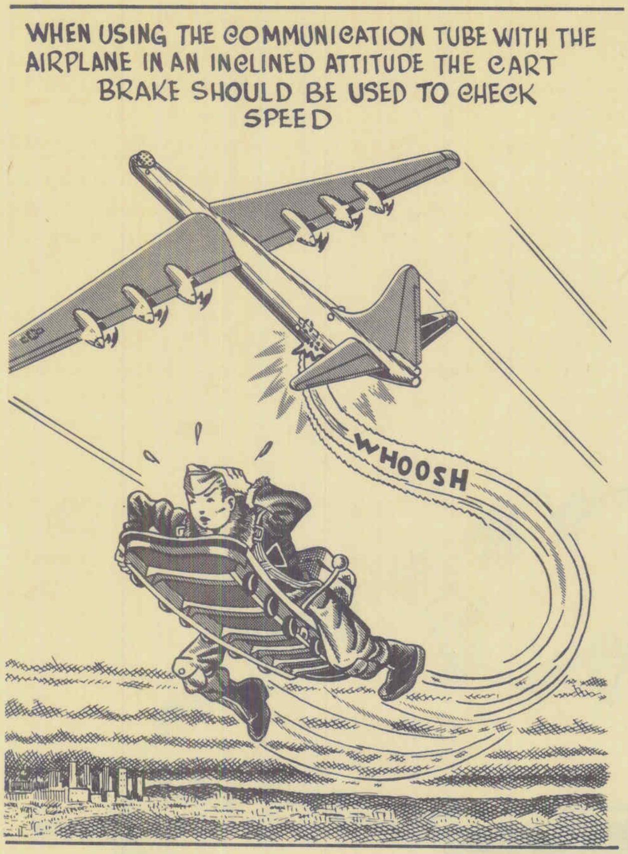
4-121. INTERIOR LIGHT CONTROLS.

4-122. One switch (16, figure 4-1) on the radio operator's control panel controls dome lights in bomb bays No. 1 and 2; two switches on the bomb bay dome light control panel in the bomb bays control all bomb bay dome lights; and one switch on the forward bulkhead in the aft cabin controls the dome lights in bomb bays No. 3 and 4. A switch at each wing crawlway entrance controls the wing crawlway lights. Dome lights and cockpit lights in the fore and aft cabins are controlled by rheostats, circuit breakers, and switches located adjacent to the light. Wheel compartment lights for inspection of wheel latches are controlled by a wheel light control switch (96, figure 1-4) at the flight engineer's station.

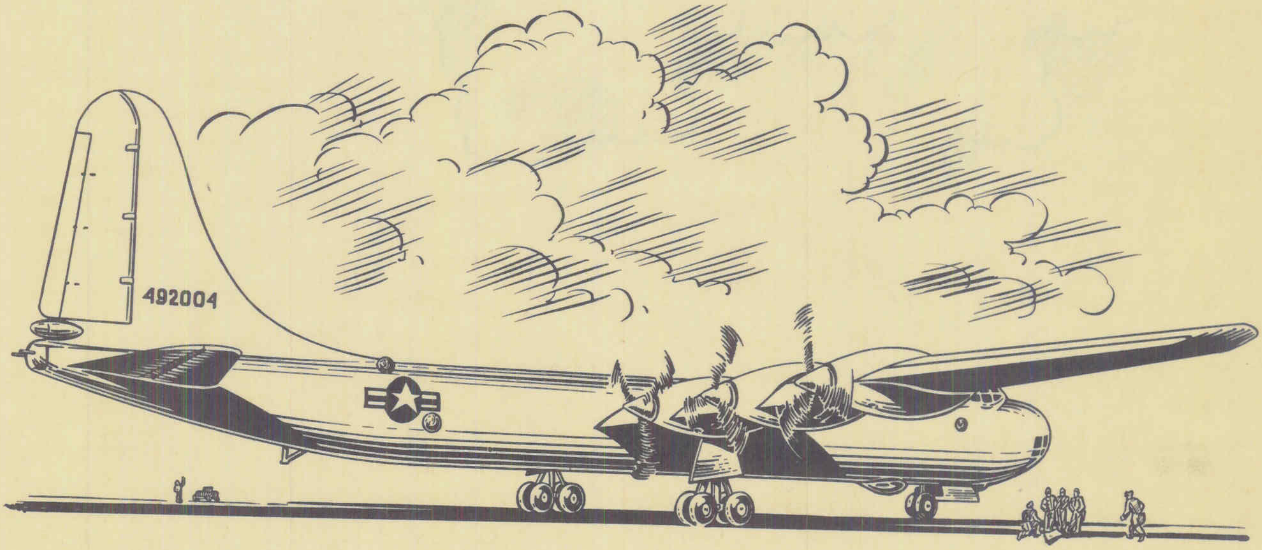
4-123. COMMUNICATION TUBE CART.

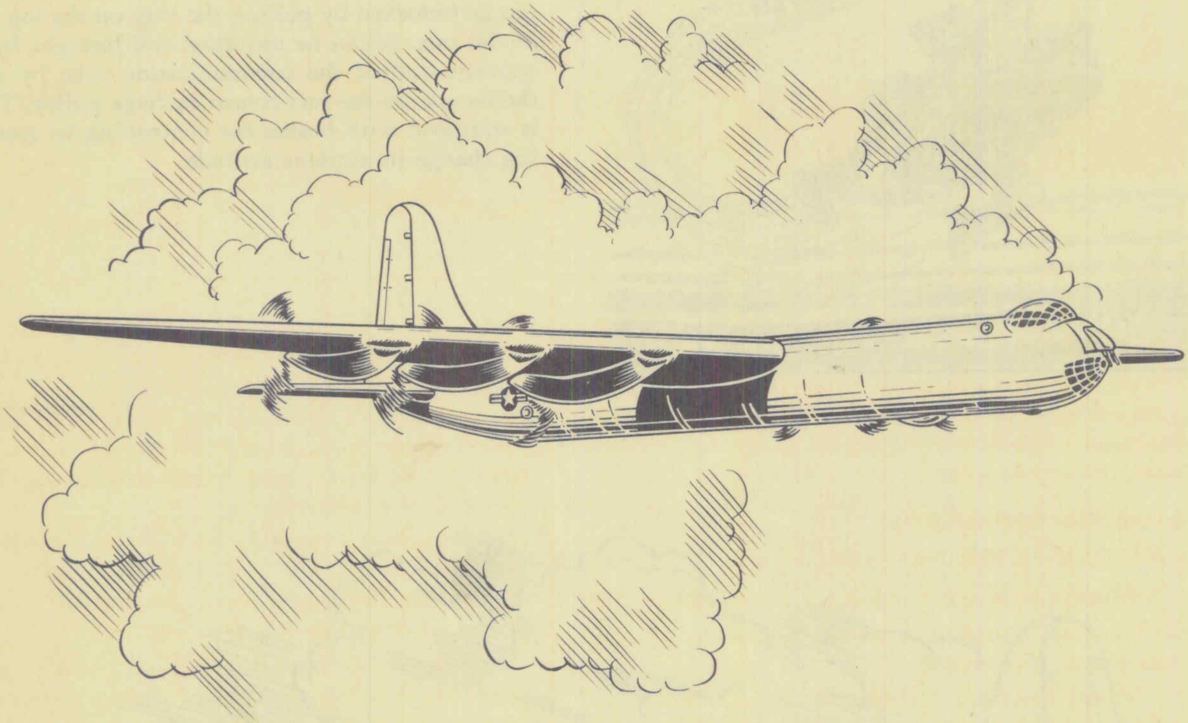
(See 38, figure 1-1.)

4-124. The communication tube cart provides transportation through the communication tube which connects the pressurized compartments. Rollers on the cart are mounted on a track laid in the tube. The user lies face up on the cart and pulls himself through by means of an overhanging rope. The cart is automatically locked in place when it reaches its end of travel. It can be unlocked by pulling the ring on the top surface of the cart. It can be unlocked and brought from the opposite end of the communication tube by turning the handle on the cart return carriage pulley. The cart is equipped with brakes for controlling its speed during change in airplane attitude.



WHEN USING THE COMMUNICATION TUBE WITH THE AIRPLANE IN AN INCLINED ATTITUDE THE CART BRAKE SHOULD BE USED TO CHECK SPEED





EXTREME WEATHER OPERATION

SECTION V

5-1. GENERAL.

5-2. The following operating instructions are written as a supplement to the instructions in section II and should be complied with when extreme weather conditions are encountered.

5-3. ARCTIC OPERATION.

5-4. BEFORE ENTERING AIRPLANE.

a. Preheat engines if temperatures are below -18° C (0°F), even though oil dilution was accomplished at shutdown. (See figure 5-1.)

b. Preheat engines if temperatures are below 2°C (35°F) if oil dilution was not accomplished.

c. Apply external heating ducts to the air intake ducts at the wing leading edge. Heater ducts may be routed to the engine cylinders and accessories by removing the nacelle cowling.

d. Check Y-drains for oil flow. If oil does not flow, apply external heat to the Y-drain and oil tank sump.

e. Check turbo oil system drains for free flow.

f. Check fuel drains for free flow.

g. Check all fuel and oil vent lines for freedom from frozen condensate.

h. Put the electric heating covers for the three servos and the vertical flight gyro in operation one hour prior to take-off when the ambient air temperature is below -12°C (10°F).

i. Supply heat to the forward and aft cabins to heat flight instruments, radios, dynamotor inverters, and radar and other equipment within the airplane.

j. Heat the battery if it has been allowed to get cold. (See paragraph 5-27.)

k. Remove ice, frost, snow, and dirt from the landing gear struts, actuating cylinders, wheels, and brakes. Wipe shock struts with a hydraulic-fluid-soaked cloth after they are cleaned.

l. Check the tires and shock struts for proper inflation.

m. Check engine stiffness periodically to determine when sufficient heat has been applied.

n. Remove wing, gun, pilots' enclosure, nose compartment, blister, and pitot covers; ground heater ducts; and immersion heaters just before entering the airplane.

o. Turn each engine over at least twelve blades, using only two men to a blade. If two men cannot move the propeller, the engine is not warm enough to start or a liquid lock exists.

5-5. ON ENTERING AIRPLANE.

a. Start the flux gate compass gyro motor by depressing and holding for one minute the cold start switch on the flux gate compass amplifier, if temperatures are below -35°C (-31°F). Allow at least five minutes for the gyro to attain maximum operating speed before taking any readings.

b. Operate all movable surfaces three or four times to check ease of operation.

c. Check functioning of instruments that can be checked without engine operation.

d. Check operation of the pitot heaters.

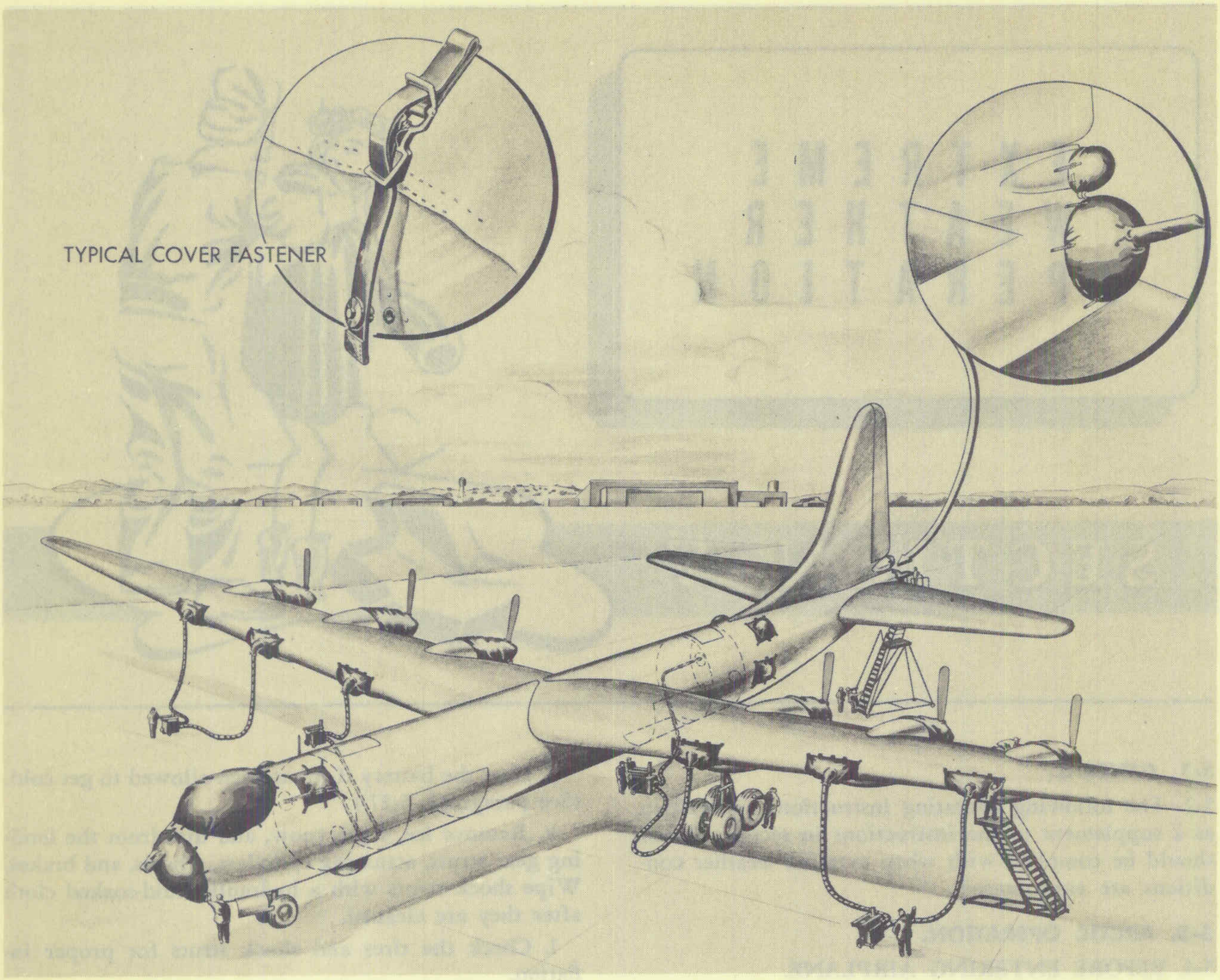


Figure 5-1. Ground Heating

Note

Obtain electric power from an external source.

5-6. STARTING ENGINES.

a. Prime engines 30 seconds just prior to cranking.

b. Use the normal starting procedure prescribed in section II.

Note

If engines have not been sufficiently pre-warmed, unsuccessful attempts at starting may cause ice formation on the spark plug points. Spark plugs must be removed and cleaned to eliminate the ice.

c. Shut off the engines if there is no oil pressure after 30 seconds running, or if the oil pressure drops after a few minutes ground operation. Check for blown lines or oil coolers and recheck for congealed oil or ice at the Y-drain or oil tank sump drain.

Note

Oil may be diluted slightly if pressure is too high for a prolonged period.

5-7. ENGINE WARM-UP.

a. Use oil dilution to reduce viscosity of the oil if time does not permit normal engine warm-up.

CAUTION

Dilute oil with care, because engine failure can result from over-dilution.

b. Parallel alternators after the voltage regulators are at operating temperatures.

c. Operate the brake pedals.

d. Operate the windshield wipers.

e. Operate wing flaps through one cycle.

f. Check wing and empennage anti-icing and cabin heat control.

g. Check all instruments for proper operation.

h. Ground run the engines approximately 45 minutes if normal oil dilution was used at engine shutdown.

Note

> An emergency take-off may be executed with diluted oil in the system as soon as oil pressures are normal and oil temperatures show a slight rise.

i. Turn on pitot heaters and the wing, empennage, and propeller anti-icing systems if icing is evident.

Note

> Comparatively mild icing zones will exist when there is visible moisture in the air at temperatures approaching or below freezing. Most severe icing conditions will exist between freezing and -8°C (18°F).

5-8. TAKE-OFF.

a. Place the cabin heating system in operation so windshield defrosting can be accomplished during take-off if necessary and the flight instruments will not cool to give erroneous indications.

b. Turn on pitot heaters and wing and empennage anti-icing systems if precipitation is encountered or if icing conditions are anticipated immediately after take-off.

Note

> Flight indicators are not very reliable at temperatures below -43°C (-45°F). For this reason cabin heating is necessary during warm-up and take-off under such conditions, and all flight instruments must be cross-checked.

5-9. DURING FLIGHT.

5-10. Cross-check all flight instruments and be alert for any erroneous indications.

5-11. APPROACH.

a. Be sure to maintain a power setting sufficient to prevent cooling of engines and loss of power on landing approach, because temperature inversions (ground temperatures lower than altitude temperatures) are characteristic in cold weather.

b. Use a long, low approach for landing at temperatures below -48°C (-54°F). Such an approach will require the use of more engine power than is normally used for the landing approach, resulting in cylinder head temperatures which are above the critically low value.

5-12. LANDING.

5-13. Use brakes with caution when landing on snow or ice.

5-14. STOPPING ENGINES.

5-15. OIL DILUTION. To accomplish satisfactory starting of the engine it is imperative that each engine oil system be diluted in accordance with the following procedure:

a. Stop the engines and allow the oil to cool to 30°C (86°F) before starting oil dilution if the engine oil temperatures exceed 40°C (104°F).

b. If oil tank servicing is required, dilute the oil one-half the required time, immediately fill the oil tanks, and then complete the dilution process.

c. Idle engines at 1200 rpm and hold the oil dilution switches (51, figure 1-4) on as long as required for proper oil dilution at the lowest expected outside air temperature. See the following chart:

Outside Air Temperature	*Dilution Time*
4° to 1°C (40° to 34°F)	1 Minute
1° to -5°C (34° to 23°F)	2 Minutes
-5° to -12°C (23° to 10°F)	3 Minutes
-12° to -20°C (10° to -4°F)	4 Minutes
-20° to -27°C (-4° to -17°F)	5 Minutes
-27°C (-17°F) and Lower	6 to 10 Minutes

Note

> Operation of the dilution system is indicated by a substantial fuel pressure drop. If this pressure drop is not obtained, investigate, paying particular attention to dilution solenoids which may be stuck, dilution lines which may be plugged, and restrictor fittings which may be reversed.

d. Do not permit the engine oil pressures to fall below 15 psi. If necessary, stop the engine, wait about 5 minutes, and continue dilution.

e. Do not allow oil temperatures to rise above 50°C (122°F) during the oil dilution period. Stop the dilution procedure until the oil temperature drops. It may be necessary to dilute the oil during two or more periods.

f. Release the dilution switch ONLY after the engine stops. This is important, because only diluted oil must be circulated through the engine oil system.

5-16. If engines are ground-run after oil dilution is accomplished, further dilution must follow. Also, if an engine is operated for forty-five minutes with oil temperature above 50°C (122°F), fuel added for dilution will boil off and the oil will return to its normal viscosity, making re-dilution necessary. If a short ground run is made after oil dilution has been accomplished, additional dilution must be accomplished. The dilution time may be obtained by multiplying the time period of the chart by the ratio of the ground-run time to 60 minutes. For examplc, if the ground run is of 30 minutes duration, the additional time will be half of the chart value. However, the dilution period should never be less than 30 seconds.

5-17. OIL DILUTION PRECAUTIONS. Observe the following precautions during engine operation following oil dilution:

a. A high percentage of oil dilution will not harm engine bearings if oil pressures remain normal.

b. When take-off is made before engines have been run long enough to evaporate fuel from the oil system, it is possible that scavenging difficulties may arise during or shortly after take-off and that diluted oil may be discharged through the engine breather lines at a dangerous rate. These difficulties will not normally occur, however, if the dilution procedure outlined above is followed carefully. If scavenging difficulties do arise and oil is discharged through the breather lines, make a landing immediately. It is possible to lose a dangerous amount of oil, and engine failure may occur. Replenish the oil supply with warm undiluted oil.

c. If engines suddenly show a loss of oil pressure or throw oil out of the breather lines after the airplane has been in flight for some time, the oil dilution valve may be stuck open. Operate the oil dilution switch a few times. Operation of the switch will usually correct this condition. Check the oil dilution valve after landing.

5-18. BEFORE LEAVING AIRPLANE.

5-19. DRAINING THE OIL SYSTEM. With ground heaters, proper oil dilution, and immersion heaters, oil draining should never be necessary. However, in an emergency when draining of the oil is required, proceed as follows:

a. Idle the engines until the oil temperatures stabilize at 40°C (104°F).

b. Use the normal procedure for stopping the engines.

c. Install the engine covers.

d. Drain the oil into clean containers.

e. If possible, store the oil in a warm place. If the oil cannot be kept warm, heat it to approximately 75°C (167°F) before it is returned to the tank.

f. Use the normal starting procedure as soon as the heated oil is returned to the tanks.

5-20. PARKING.

5-21. When parking, head the airplane into the wind and set the brakes. Do not set the brakes until they have cooled, however; they might freeze in the on position.

5-22. PROTECTIVE COVERS. When oil dilution is completed, install air intake ducts, turret, nose compartment, blister, pilots' enclosure, and pitot mast covers.

5-23. OIL IMMERSION HEATERS. If full oil dilution was accomplished, the use of oil immersion heaters should not be necessary unless temperatures are below -20°C (-4°F), and ground facilities are not available. Under these circumstances, an immersion heater should be installed in each oil tank immediately after shutdown and should be operated from two to four hours at intervals of the same length.

Note

> Immersion heaters must not be placed in congealed oil. Congealed oil will carbonize around the heater and render it ineffective.

5-24. FUEL TANKS. If fuel tanks are kept filled, condensation in fuel lines will be minimized. Check all drain points and vent line openings for condensation, which will freeze if not drained. After filling tanks, drain at the booster pumps to remove any water.

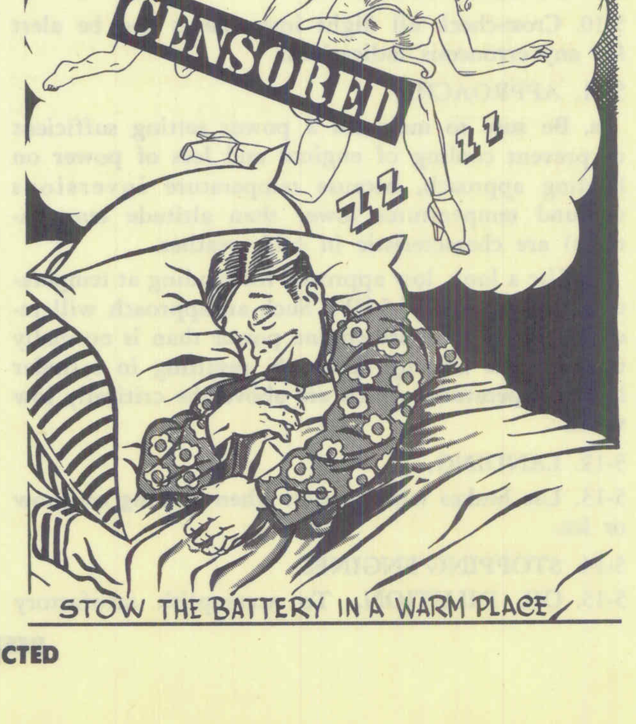
5-25. TURBOSUPERCHARGER OIL. Consult the following chart to determine the proper oil for use in the turbo oil system.

Ground Temperatures	*Oil*
Above -9.4°C (15°F)	Specification No. AN-0-8, Grade 1065
-9.4°C (15°F) and Below	Specification No. AN-VV-0-366

5-26. CONSTANT SPEED DRIVE OIL. The recommended oil is as follows:

Ground Temperatures	*Oil*
Above -23.3°C (-10°F)	Specification No. AN-0-3, Medium
Below -23.3°C (-10°F)	Specification No. AN-0-3, Light

5-27. BATTERY. At freezing temperatures and below, remove the battery and stow it in a heated room



STOW THE BATTERY IN A WARM PLACE

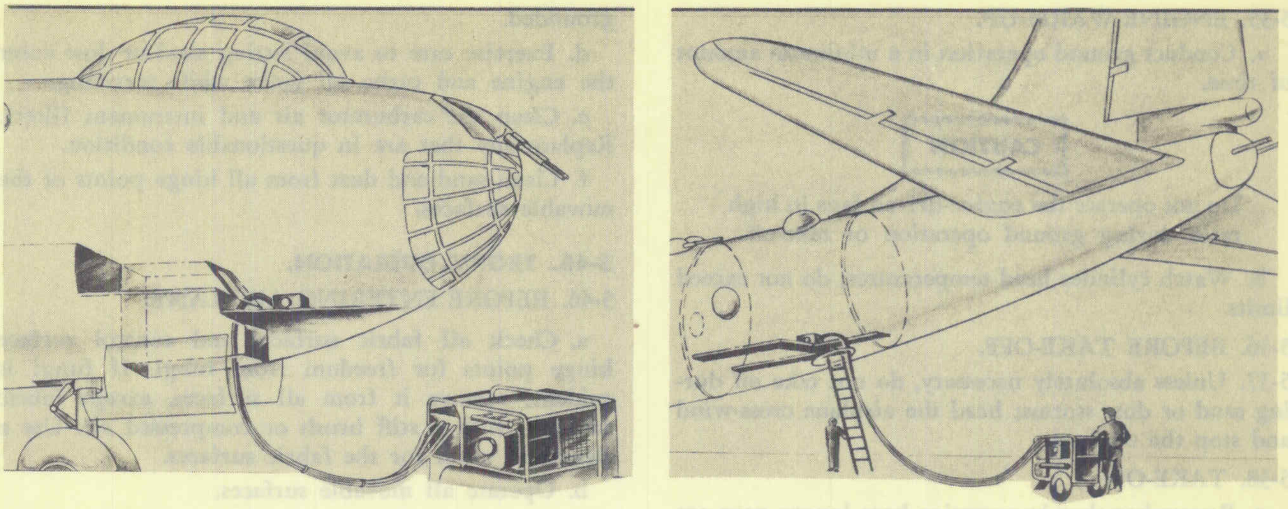


Figure 5-2. Ground Cooling

if possible. The battery should be kept warm at all times. Batteries give best performance at 27°C (81°F) and the performance of even a new, fully charged battery decreases as the temperature decreases.

5-28. WING SURFACES. Always protect wing surfaces from possible collection of snow and ice. In the event ice does form or snow collects, remove it before take-off. Snow can be removed by brushing with brooms. Ice may be removed by use of portable heaters and alcohol, or by vibrating a rope across the wing surface. It must be removed carefully to prevent scratching or marring the wing surfaces.

5-29. DESERT OPERATION.

5-30. BEFORE ENTERING AIRPLANE.

a. Cool the forward and aft cabins by the use of two type A-1 portable coolers. The 15-foot refrigerant lines, which attach the evaporator assembly to each cooler, make it possible to carry the evaporator into the aft cabin through the entrance hatch on the left side of the fuselage. Route the lines through the nose wheel well entrance to cool the forward cabin. (See figure 5-2.)

b. Turn on cabin ventilating fans as soon as the external power supply is connected.

c. Install carburetor air filters and connect the wiring to the electrical actuator of each filter door.

d. Check operation of the filter doors.

e. Operate all movable surfaces and inspect for freedom of dust at the hinge points.

f. Use a cloth moistened with hydraulic fluid to wipe the nose and both main gear shock struts free of dust and sand.

g. Check tires for proper inflation.

h. Wipe instrument panels with a lint-free cloth to remove any dust or sand.

i. Operate all instruments that can be checked without engine operation by using an external source of power.

j. Remove ground cooling ducts and engine and airplane covers.

5-31. ON ENTERING AIRPLANE.

5-32. Turn on the ventilating fans.

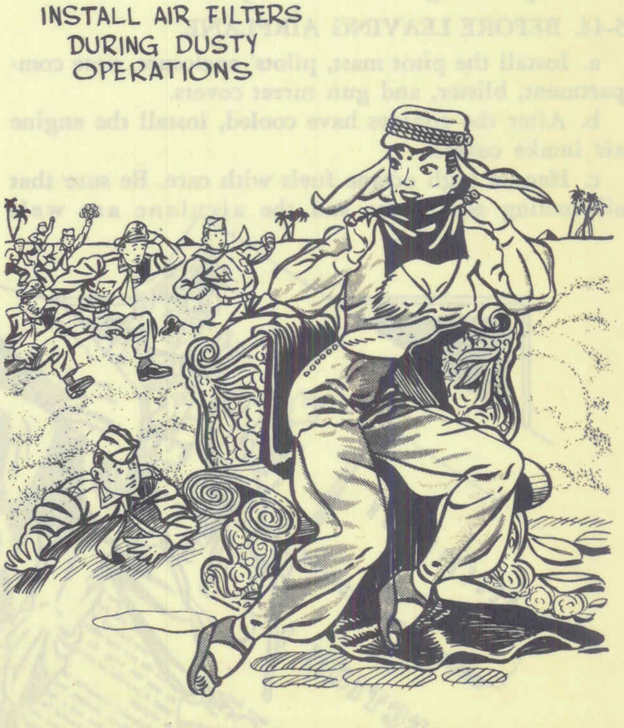
5-33. STARTING ENGINES.

5-34. Use the normal starting procedure.

a. Do not over-prime the engines.

b. Operate engine-driven fans only in low ratio.

c. Turn on the carburetor air filters.



5-35. ENGINE WARM-UP.

a. Conduct ground operation in a minimum amount of time.

CAUTION

Do not operate the engine-driven fans in high ratio during ground operation or take-off.

b. Watch cylinder head temperatures; do not exceed limits.

5-36. BEFORE TAKE-OFF.

5-37. Unless absolutely necessary, do not take off during sand or dust storms; head the airplane cross-wind and stop the engines.

5-38. TAKE-OFF.

a. Remember that in excessive heat longer runs are required for take-off than in ordinary temperatures.

b. Maximum cylinder head temperature for take-off must be within limits.

5-39. DURING FLIGHT.

5-40. If change from hot to cold atmosphere is likely to be abrupt, have the heated covers on the autopilot stabilizers turned on to help prevent condensation.

5-41. LANDING.

5-42. Remember, the airplane will sink faster in excessive heat than in moderate temperatures.

5-43. STOPPING ENGINES.

a. Park the airplane into the wind.

b. Open the bomb bay doors if the sand is not blowing.

c. Stop the engines as soon as possible.

5-44. BEFORE LEAVING AIRPLANE.

a. Install the pitot mast, pilots' enclosure, nose compartment, blister, and gun turret covers.

b. After the engines have cooled, install the engine air intake covers.

c. Handle high octane fuels with care. Be sure that all fueling equipment and the airplane are well grounded.

d. Exercise care to avoid letting sand or dust enter the engine and turbo oil tanks while servicing.

e. Clean the carburetor air and instrument filters. Replace any that are in questionable condition.

f. Clean sand and dust from all hinge points of the movable surfaces.

5-45. TROPIC OPERATION.

5-46. BEFORE ENTERING AIRPLANE.

a. Check all fabric surfaces and control surface hinge points for freedom from fungi. If fungi is evident, remove it from all surfaces, except fabric surfaces, with a stiff brush or compressed air. Use a clean soft cloth for the fabric surfaces.

b. Operate all movable surfaces.

c. If necessary, warm electrical instruments with an external source of heat until all moisture is eliminated.

d. Inspect the oleo struts and tires for cleanliness and proper inflation.

5-47. STARTING ENGINES.

5-48. Use the normal starting procedure, taking care not to exceed limiting cylinder head temperatures during engine warm-up.

5-49. STOPPING ENGINES.

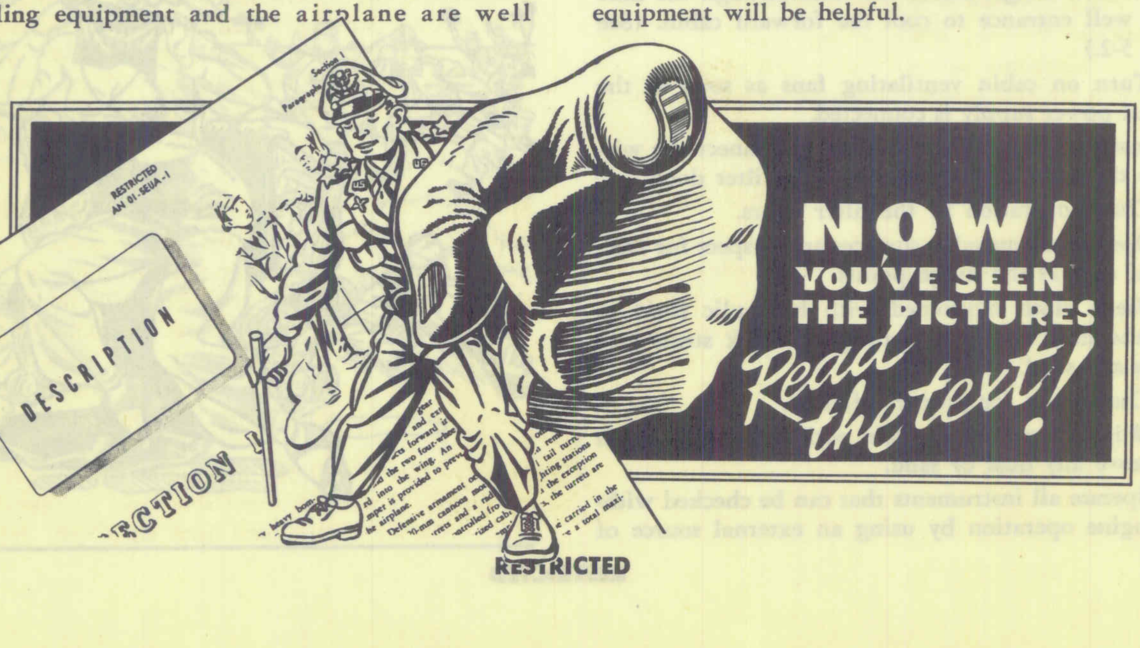
5-50. Stop the engines as soon as possible.

5-51. BEFORE LEAVING AIRPLANE.

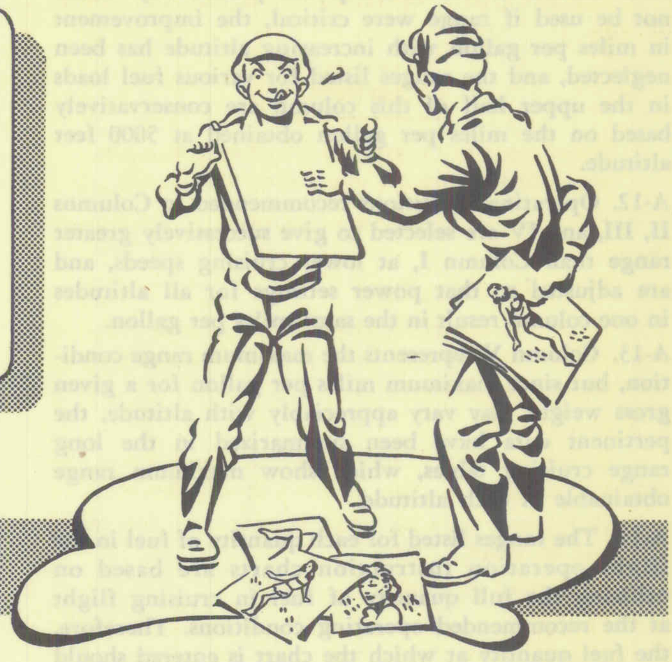
a. Install nose compartment, pilots' enclosure, gun turret, pitot mast, and blister covers.

b. As soon as the engines have cooled, install the engine and the air duct covers. The covers will keep out moisture, thus preventing corrosion and growth of fungi.

c. If possible, keep delicate instruments, such as communication equipment, etc., warmer than ambient temperature by approximately 6°C (10°F). If heating cannot be accomplished, circulation of air over the equipment will be helpful.



OPERATING CHARTS



APPENDIX I

A-1. GENERAL.

A-2. The charts in this section present estimated performance to facilitate flight planning and efficient operation of B-36 airplanes. They will be replaced by charts based on actual flight test data when the necessary flight testing has been completed.

A-3. The data included are for operation in NACA standard atmospheric conditions. Although the B-36 is equipped with two-speed engine cooling fans to insure proper cooling under extreme conditions, the chart performance is based on the "LOW RPM" fan setting. This setting should provide satisfactory cooling in NACA standard air, and it results in less engine power being diverted from the propellers.

A-4. Engine cooling, intercooling, and oil cooling losses are taken into account in the performance; but the cooling air exit settings to maintain required cooling air flow are not included in the charts, since the airplane is equipped with automatic cooling controls.

A-5. TAKE-OFF, CLIMB, AND LANDING CHART.

A-6. Take-off ground run distances and total distances to clear a 50-foot obstacle from a hard surface runway are tabulated for three gross weights, three altitudes, and three head wind velocities. Take-off performance may be estimated for other conditions of gross weight, altitude, and head wind by interpolation. No data are presented for sod or softer surfaces, since the B-36 will be operated from heavy duty runways only. The charted distances are 125 per cent of the minimum distances obtainable using high performance take-off procedure.

A-7. Climb data are shown for three gross weights and several altitudes so that best climb speed, rate of climb, time to climb, and fuel used may be interpolated for intermediate conditions of gross weight and altitude. Reduction in gross weight during climb may be determined by multiplying gallons of fuel consumed by 6.21, which figure assumes that the fuel weighs 6 pounds per gallon and that oil consumption is 3.5 per cent of the fuel consumption by weight. The chart values of fuel used include an allowance for warm-up and take-off.

A-8. Landing distance to clear 50 feet, landing ground run, and best approach speed are listed for two gross weights and three altitudes, with zero wind and a dry hard surface runway. Landing for intermediate gross weights and altitudes may be estimated by interpolation. The tabulated distances are 125 per cent of the minimum high performance distances obtainable without utilizing the reverse pitch feature of the propellers.

A-9. FLIGHT OPERATION INSTRUCTION CHARTS.

A-10. These charts indicate the relations between range, speed, and operating conditions for various altitudes, gross weights, and fuel loads in level cruising flight with no wind. Charts are included for six-engine and three-engine operation, showing range and cruising speeds for operating conditions from maximum continuous power to power for maximum range.

A-11. In Column I, for maximum continuous power operation, it will be noted that true air speed varies with altitude, while fuel flow does not, indicating that miles per gallon varies with altitude. However, since maximum continuous power presumably would not be used if range were critical, the improvement in miles per gallon with increasing altitude has been neglected, and the ranges listed for various fuel loads in the upper half of this column are conservatively based on the miles per gallon obtained at 5000 feet altitude.

A-12. Operating conditions recommended in Columns II, III, and IV are selected to give successively greater range than Column I, at lower cruising speeds, and are adjusted so that power settings for all altitudes in one column result in the same miles per gallon.

A-13. Column V represents the maximum range condition, but since maximum miles per gallon for a given gross weight may vary appreciably with altitude, the pertinent data have been summarized in the long range cruising tables, which show maximum range obtainable at each altitude.

A-14. The ranges listed for each quantity of fuel in the flight operation instruction charts are based on utilizing the full quantity of fuel in cruising flight at the recommended operating conditions. Therefore, the fuel quantity at which the chart is entered should be the figure in the fuel column which is equal to, or slightly less than, the fuel initially loaded in the airplane, minus all allowances. The fuel allowance for warm-up, take-off, and climb may be obtained from the "Take-off, Climb, and Landing Chart." Allowances for wind, navigational errors, combat, formation flying, and other contingencies should be based on local policy. The amount of residual (trapped) fuel is very small for the B-36 and will vary among the airplanes. However, if range is critical, an allowance of 100 gallons for residual fuel should be ample.

A-15. It will be noted that the long range cruising tables do not take into account directly variations in fuel loading at each gross weight. The charted ranges are based on consumption of fuel and oil equal to the difference between the maximum and minimum gross weights of each weight bracket. For fuel quantities less than this, the miles per gallon may be determined by proportion, as explained in Example A below. The above remarks on fuel allowances apply also to the long range cruising tables.

A-16. When gross weight diminishes below the limit specified for the chart being used, it is important that the new operating conditions be selected from the same column in the next chart, because the charted ranges are based on operation in the same column throughout. The charted power settings are based on the maximum gross weight for each chart and consequently will result in slightly higher speeds than tabulated when the gross weight is less than the maximum for the chart. However, the slight improvement in miles per gallon resulting from this has been neglected in calculating ranges.

A-17. EXAMPLES.

A-18. To clarify and illustrate the preceding statements, the following examples have been included. For purposes of illustration, it is assumed that the airplane weight less fuel, oil, and bombs is 150,000 pounds (referred to herein as the basic weight) and that fuel and oil are loaded in the ratio of 18:1 by volume (14.4:1 by weight).

A-19. EXAMPLE A.

A-20. It is desired to fly a B-36 over water from one air field to another field 3500 nautical miles away. Local policy prescribes a fuel reserve of at least three hours.

A-21. Since the flight is over water, terrain is not a determining factor, and 5000 feet is selected as the cruising altitude from consideration of prevailing winds.

A-22. Examination of the "Long Range Cruising Table" for six engines indicates 375 gph fuel flow at 5000 feet for the gross weight band bracketing 150,000 pounds. For three hours reserve, the fuel allowance required is 3 x 375, or 1125 gallons.

A-23. By a systematic inspection of the flight operation instruction charts, the following combinations of weight, operating column, and cruising fuel supply which will provide the required range are found:

	Chart Weight Limits Pounds	Column	Cruising Fuel Gallons	Range Nautical Miles
(1)	330-320,000	II	24,000	3520
(2)	320-300,000	II	24,000	3595
(3)	300-280,000	II	23,000	3570
(4)	300-280,000	III	19,000	3610
(5)	280-260,000	III	18,000	3575
(6)	280-260,000	IV	16,000	3760
(7)	260-240,000	III	17,000	3555
(8)	260-240,000	IV	15,000	3755
(9)	240-220,000	III	16,000	3520
(10)	240-220,000	IV	14,000	3730
(11)	220-200,000	IV	13,000	3670

A-24. Each chart is applicable only when the initial cruising gross weight is within the chart limits. The initial cruising gross weight is determined by adding reserve fuel, cruising fuel, and oil to the basic weight of 150,000 pounds. For gasoline at six pounds per gallon and oil loaded equal to 1/14.4 of the fuel by weight, the weight of fuel and oil is 6.42 pounds per gallon of fuel. By checking the initial cruising gross weight in this manner, it is found that all the above combinations are eliminated, with the exception of numbers (2), (5), (6), and (8).

A-25. These numbers are retabulated below, together with cruising speeds and gross weights. Gross weight at the end of the flight is found by subtracting the fuel used in cruising and the oil consumed, which is 3.5 per cent by weight of the fuel consumed. The reduction in gross weight during cruise is thus 6.21 x gallons of fuel used.

	Initial Cruising G. W. Pounds	Cruising Fuel Gallons	Final Cruising G. W. Pounds	Initial Cruising Speed MPH	Final Cruising Speed MPH	Average Cruising Speed MPH	Cruising Time Hours
(2)	311,100	24,000	162,000	235	246	241	17.2
(5)	273,000	18,000	161,000	219	236	228	18.1
(6)	260,000	16,000	160,000	213	214	214	20.2
(8)	253,500	15,000	160,000	218	214	216	20.0

A-26. Of the four possible loadings found above, the first would probably not be desired, because it would require auxiliary fuel tanks in the bomb bay and would result in only two or three hours' saving in duration of the flight. It would also require a rather long take-off distance.

A-27. If a gross weight and fuel load lighter than any of the foregoing is desired, the maximum range conditions of the "Long Range Cruising Table" may be used. The preceding calculations indicate an initial cruising gross weight in the neighborhood of 230,000 pounds for this condition. Therefore, the range is checked for the bracketing gross weights of 240,000 and 220,000 pounds:

Initial Cruising G. W.	Pounds	240,000	220,000
Basic Weight	Pounds	150,000	150,000
Weight of Fuel and Oil	Pounds	90,000	70,000
Gallons of Fuel, (#Fuel+Oil)/6.42	Gallons	14,030	10,900
Reserve Fuel	Gallons	1,125	1,125
Cruising Fuel	Gallons	12,905	9,775
Fuel Plus Oil Consumed in Cruise (Gallons Fuel x 6.21)	Pounds	80,200	60,700
Final Cruising G. W.	Pounds	159,800	159,300

A-28. Summing up increments of range between the weight limits found above, the following ranges are obtained:

Gross Weight Pounds	Range Nautical Miles	Range Nautical Miles
240,000		
	892	
220,000		
	962	962
200,000		
	1031	1031
180,000		
	1132	1132
160,000		
	12	
159,800		
		43
159,300		
	4029	3168

A-29. The increments of range between 160,000 pounds and the final cruising gross weight are obtained by proportion. For example, since the chart indicates that consumption of 20,000 pounds of fuel and oil (160,000-140,000) will add 1233 nautical miles, consumption of 700 pounds (160,000-159,300) will add 1233 x 700/20,000 or 43 nautical miles. The gross weight and fuel load required for 3500 nautical miles with the specified reserve are found by interpolation to be 227,700 pounds initial cruising weight and 11,000 gallons of cruising fuel. The average cruising speed is found to be 176 statute mph, resulting in a cruising time of 22.9 hours.

A-30. From a comparison of the conditions studied, condition (8) is selected, since it requires only three hours more than the minimum time and permits a moderate gross weight and fuel load. From the "Take-off, Climb, and Landing Chart," the fuel for warm-up, take-off, and climb to 5000 feet is found by interpolation to be 580 gallons. A summary of the loading and operating conditions is as follows:

Basic Gross Weight		Pounds	150,000
Fuel @ 6 Pounds Per Gallon, Including		Pounds	100,230
Warm-Up, Take-Off, and Climb	580 Gallons		
Cruise	15,000 Gallons		
Reserve	1,125 Gallons		
Total	16,705 Gallons		
Oil @ 1/14.4 x Fuel Weight (Oil Weight 7.5 lbs/gal)		Pounds	6,960
Take-off Gross Weight		Pounds	257,190
Take-off Ground Run @ SL, No Wind		Feet	4,360
Take-Off Over 50-Foot Obstacle @ SL, No Wind		Feet	5,750
Time to Climb to 5000 Feet		Minutes	6.5
Best Climb Speed		CAS mph	149
Initial Cruising Conditions (Column IV)*			
RPM			2,100
M. P.		in. hg	35.0
Mixture			AL
TAS		mph	218

*NOTE: Each time the gross weight is reduced to the minimum chart value, it is essential that power be re-set according to values shown in the same column on the next chart, because ranges are based on this type of operation.

A-31. The preceding example was based on zero wind. If the average wind velocity component in the direction of flight is known, it should be taken into account by calculating the air miles to be flown through the wind and using this distance rather than the ground distance in entering the charts. Air miles are calculated as ground distance times true air speed divided by ground speed.

A-32. EXAMPLE B.

A-33. To illustrate planning of a typical bombing mission, it is assumed that 10,000 pounds of bombs are to be dropped on an objective 2000 statute miles away. Intervening terrain requires an altitude of at least 5,000 feet (assume the cruising altitude to be 10,000 feet), and bombs are to be dropped from 25,000 feet. It is desired to reach 25,000 feet approximately 30 minutes before dropping bombs, maintaining normal rated power during this time, and for an additional 30 minutes after bombs are dropped. Two hours of reserve fuel is required.

A-34. Reserve fuel may be determined by examination of the "Long Range Cruising Table" for six engines, which indicates 400 gph fuel consumption at 10,000 feet for the gross weight band bracketing the basic weight of 150,000 pounds. Two hours reserve fuel will require 2 x 400, or 800 gallons.

A-35. There are probably several combinations of initial gross weight and cruising speeds which will provide the desired range. As a first approximation, 278,000 pounds design gross weight will be checked, since it is desirable not to exceed design gross weight unless necessary. With 150,000 pounds basic weight and 10,000 pounds of bombs, the weight of fuel and oil will be 278,000—160,000, or 118,000 pounds. For gasoline at six pounds per gallon and oil/fuel loaded in the ratio of 1/14.4 by weight, the fuel carried is 118,000/6.42, or 18,400 gallons.

A-36. At the take-off gross weight selected, the fuel for warm-up, take-off, and climb to 10,000 feet is determined to be 889 gallons, from the "Take-off, Climb, and Landing Chart."

A-37. The fuel required for the specified one hour of rated power operation while approaching and leaving the objective can also be determined at this time; it is found from Column I of the six-engine "Flight Operation Instruction Chart" to be 2065 gallons.

A-38. Therefore, the fuel available for cruise and climb to a point 30 minutes before the objective and for return cruise from a point 30 minutes after the objective is calculated as 18,400—800—889—2065, or 14,646 gallons.

A-39. To estimate the fuel used in climbing from 10,000 to 25,000 feet, the gross weight at the beginning of the climb is approximated by assuming that half of 14,646 gallons, or 7323 gallons, is consumed during the 10,000-foot cruise. With oil consumption equal to 3.5 per cent of the fuel consumption by weight, gross weight is reduced 6.21 x (889+7123), or 51,000 pounds, to 227,000 pounds.

A-40. For conservatism, the above gross weight is rounded off to 230,000 pounds, and the fuel for climb from 10,000 to 25,000 feet is interpolated from the "Take-off, Climb, and Landing Chart" as 670 gallons. The approximate fuel available for cruise, excluding the rated power operation, is 14,646—670, or 13,976 gallons.

A-41. Neglecting the distance covered during climb, the range required with 13,976 gallons is 4000 miles, less the distance covered during the hour at rated power approaching and leaving the objective. From Column I of the "Flight Operation Instruction Chart," the true air speed with normal rated power at 25,000 feet and 230,000 pounds gross weight is 311 mph, indicating that one hour at rated power will account for 311 miles of the range. The problem is thus reduced to selecting cruising conditions which will allow approximately 3689 miles (4000—311) with 13,976 gallons of fuel.

A-42. Inspection of the "Flight Operation Instruction Chart" indicates that operation in Columns IV or V should be satisfactory for the loading assumed and that operation in Column III would probably leave less than the required reserve. Column IV operation is checked first, as follows:

			Notes
(1) Take-off Gross Wt.	Pounds	278,000	
(a) Including Fuel	Gallons	18,400	
(b) Including Bombs	Pounds	10,000	
(2) Fuel for Take-Off and Climb to 10,000 Feet	Gallons	889	(a)
(3) Gross Weight at 10,000 Feet, (1)—[6.21 x (2)]	Pounds	272,500	(b)
(4) Fuel for 1845 Miles, Column IV	Gallons	8,000	(c)
(5) Gross Weight at 1845 Miles, (3)—[6.21 x (4)]	Pounds	222,800	(b)
(6) Fuel for Climb to 25,000 Feet at (5)	Gallons	634	(a)
(7) Gross Weight at 25,000 Feet, (5)—[6.21 x (6)]	Pounds	218,850	(b)
(8) True Speed with NRP at (7), Column I	mph	311	(c)
(9) Distance in 30 Minutes at (8), .5 x (8)	Miles	155	
(10) Fuel Consumption with NRP, Column I	gph	2,065	(c)
(11) Fuel Used in 30 Minutes at (10), .5 x (10)	Gallons	1,033	
(12) Gross Weight at Target, (7)—[6.21 x (11)]	Pounds	212,450	(b)
(13) Gross Weight, Bombs Dropped, (12)—[(1) (b)]	Pounds	202,450	
(14) True Speed With NRP at (13), Col. I	mph	317	(c)
(15) Distance in 30 Minutes at (14), .5 x (14)	Miles	158	
(16) Gross Weight at (15), (13)—[6.21 x (11)]	Pounds	196,050	(b)
(17) Remaining Distance to Base, 2000—(15)	Miles	1,842	
(18) Fuel for 1842 Miles, Column IV	Gallons	6,000	(c)
(19) Reserve, (1) (a)—(2)—(4)—(6)—[2 x (11)]—(18)	Gallons	812	

A-43. The duration of the flight may be calculated as follows:

(20) Time for Take-Off and Climb to 10,000 Feet	Hours	0.26	(a)
(21) TAS at Beginning of 10,000-Foot Cruise, Column IV	mph	220	(c)
(22) TAS at End of 10,000-Foot Cruise, Column IV	mph	234	(c)
(23) Average TAS in 10,000-Foot Cruise	mph	227	
(24) Distance During 10,000-Foot Cruise	Miles	1,845	
(25) Time in 10,000-Foot Cruise, (24)/(23)	Hours	8.13	
(26) Time in Climb from 10,000 to 25,000 Feet	Hours	0.30	(a)
(27) Time of NRP Cruise	Hours	1.00	
(28) TAS at Beginning of 25,000-Foot Cruise, Column IV	mph	279	(c)
(29) TAS at End of 25,000-Foot Cruise, Column IV	mph	281	(c)
(30) Average TAS in 25,000-Foot Cruise	mph	280	
(31) Distance During 25,000-Foot Cruise	Miles	1,842	
(32) Time in 25,000-Foot Cruise, (31)/(30)	Hours	6.58	
(33) Total Duration, (20) +(25)+(26)+(27) +(32)	Hours	16.27	

NOTES: (a) "Take-off, Climb, and Landing Chart"

(b) Fuel weighs 6 pounds per gallon; oil consumption is 3.5 per cent fuel consumption by weight.

(c) "Flight Operation Instruction Chart" for six engines.

A-44. The preceding check indicates that operation according to Column IV of the flight operation instruction charts would satisfy the requirements set up for the mission. The calculated reserve of 812 gallons is actually slightly conservative, since the distance covered during the climbs of items (2) and (6) was neglected, and the charted fuel quantities of items (4) and (18) provided slightly more range than required.

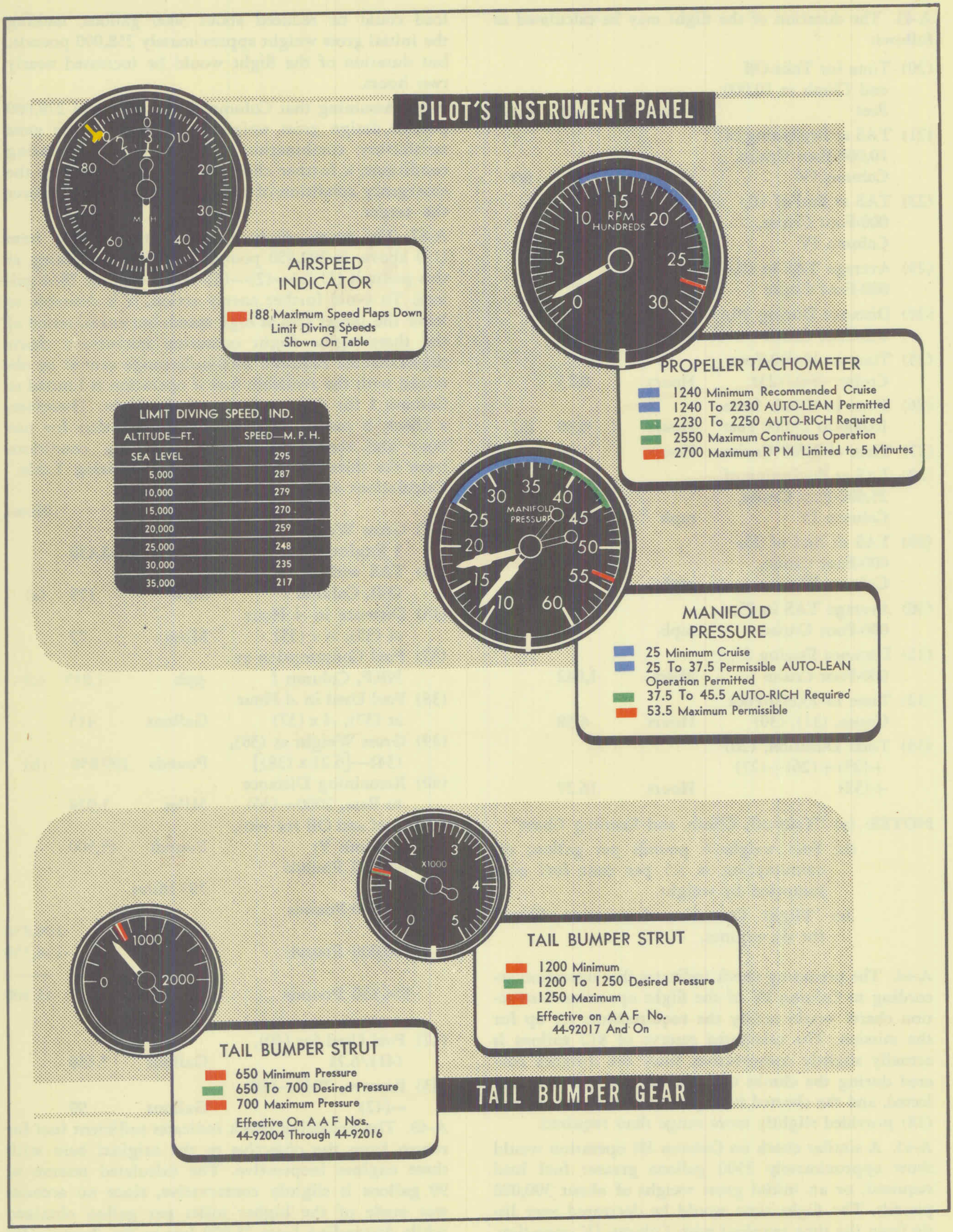
A-45. A similar check on Column III operation would show approximately 3500 gallons greater fuel load required, or an initial gross weight of about 300,000 pounds. The flight time would be decreased very little from the time required with Column IV operation. If Column V operating conditions were used, the fuel load could be reduced about 3000 gallons, making the initial gross weight approximately 258,000 pounds; but duration of the flight would be increased nearly two hours.

A-46. Assuming that Column IV cruising and 278,000 pounds design gross weight are selected as the most satisfactory combination of loading and operating conditions, a further check is made to investigate the emergency condition of having three engines fail over the target.

A-47. The gross weight after dropping bombs, item (13) above, is 202,450 pounds. The fuel remaining at this point is (1) (a)—(2)—(4)—(6)—(11), or 7844 gallons. To avoid further enemy action, it is desirable to leave the target area at high speed, but examination of the three-engine flight operation instruction charts shows that the required 2000-mile range cannot be obtained with the available fuel if operation is limited to Column I for the remainder of the flight. Therefore, a check is made using Column I operation for one hour and then switching to operating conditions from the three-engine "Long Range Cruising Table." Calculations are for 5,000 feet altitude:

			Notes
(34) Gross Weight, 3 Engines Out	Pounds	202,450	
(35) TAS with NRP at (34), Column I	mph	179	(c)
(36) Distance in .4 Hour at (35), .4 x (35)	Miles	72	
(37) Fuel Consumption at NRP, Column I	gph	1,035	(c)
(38) Fuel Used in .4 Hour at (37), .4 x (37)	Gallons	415	
(39) Gross Weight at (38), (34)—[6.21 x (38)]	Pounds	199,850	(b)
(40) Remaining Distance to Base, 2000—(36)	Miles	1,928	
(41) Fuel and Oil for (40), Column V:	Pounds	45,500	
199,850 Pounds			
	705 Miles		
180,000 Pounds			
	855 Miles		199,850
160,000 Pounds			—154,350
	368 Miles		
154,350 Pounds			45,500
	1,928 Miles		
(42) Fuel Used for (40), (41)/6.21	Gallons	7,330	
(43) Reserve, 7844—(38) —(42)	Gallons	99	

A-48. The preceding check indicates sufficient fuel for return from the objective to the original base with three engines inoperative. The calculated reserve of 99 gallons is slightly conservative, since no account was made of the higher miles per gallon obtained while descending from 25,000 feet to the three-engine cruising altitude of 5000 feet.



AIRSPEED INDICATOR

🟥 188 Maximum Speed Flaps Down
Limit Diving Speeds
Shown On Table

LIMIT DIVING SPEED, IND.	
ALTITUDE—FT.	SPEED—M. P. H.
SEA LEVEL	295
5,000	287
10,000	279
15,000	270
20,000	259
25,000	248
30,000	235
35,000	217

PROPELLER TACHOMETER

🟦 1240 Minimum Recommended Cruise
🟦 1240 To 2230 AUTO-LEAN Permitted
🟩 2230 To 2250 AUTO-RICH Required
🟩 2550 Maximum Continuous Operation
🟥 2700 Maximum R P M Limited to 5 Minutes

MANIFOLD PRESSURE

🟦 25 Minimum Cruise
🟦 25 To 37.5 Permissible AUTO-LEAN Operation Permitted
🟩 37.5 To 45.5 AUTO-RICH Required
🟥 53.5 Maximum Permissible

TAIL BUMPER STRUT

🟥 1200 Minimum
🟩 1200 To 1250 Desired Pressure
🟥 1250 Maximum

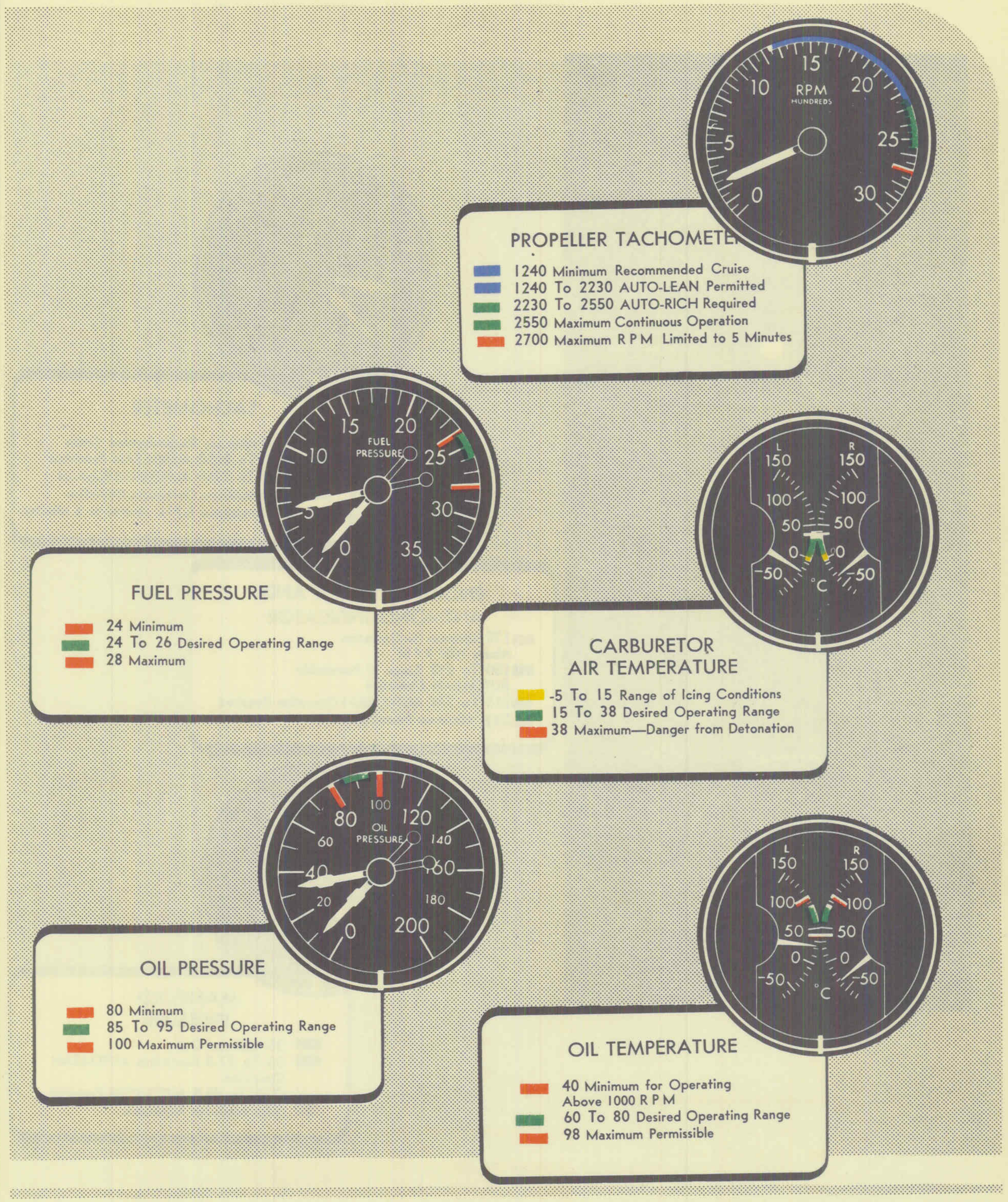
Effective on A A F No.
44-92017 And On

TAIL BUMPER STRUT

🟥 650 Minimum Pressure
🟩 650 To 700 Desired Pressure
🟥 700 Maximum Pressure

Effective On A A F Nos.
44-92004 Through 44-92016

Figure A-1. (Sheet 1 of 4 Sheets) Instrument Limitation Markings



PROPELLER TACHOMETER

🟦 1240 Minimum Recommended Cruise
🟦 1240 To 2230 AUTO-LEAN Permitted
🟩 2230 To 2550 AUTO-RICH Required
🟩 2550 Maximum Continuous Operation
🟥 2700 Maximum R P M Limited to 5 Minutes

FUEL PRESSURE

🟥 24 Minimum
🟩 24 To 26 Desired Operating Range
🟥 28 Maximum

CARBURETOR AIR TEMPERATURE

🟨 -5 To 15 Range of Icing Conditions
🟩 15 To 38 Desired Operating Range
🟥 38 Maximum—Danger from Detonation

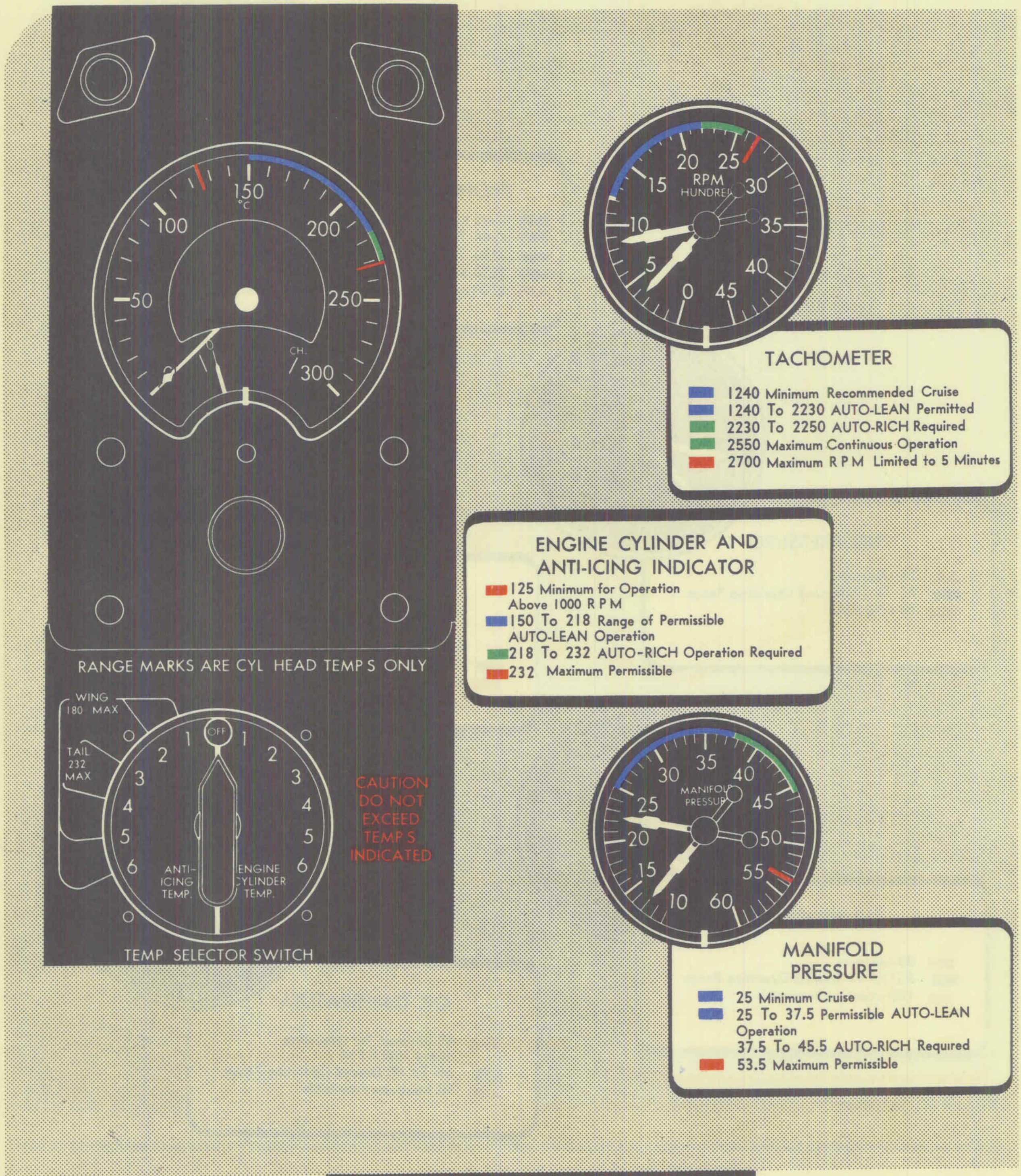
OIL PRESSURE

🟥 80 Minimum
🟩 85 To 95 Desired Operating Range
🟥 100 Maximum Permissible

OIL TEMPERATURE

🟥 40 Minimum for Operating Above 1000 R P M
🟩 60 To 80 Desired Operating Range
🟥 98 Maximum Permissible

Figure A-1. (Sheet 2 of 4 Sheets) Instrument Limitation Markings



TACHOMETER

🟦 1240 Minimum Recommended Cruise
🟦 1240 To 2230 AUTO-LEAN Permitted
🟩 2230 To 2250 AUTO-RICH Required
🟩 2550 Maximum Continuous Operation
🟥 2700 Maximum R P M Limited to 5 Minutes

ENGINE CYLINDER AND ANTI-ICING INDICATOR

🟥 125 Minimum for Operation Above 1000 R P M
🟦 150 To 218 Range of Permissible AUTO-LEAN Operation
🟩 218 To 232 AUTO-RICH Operation Required
🟥 232 Maximum Permissible

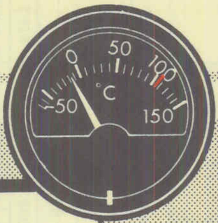
MANIFOLD PRESSURE

🟦 25 Minimum Cruise
🟦 25 To 37.5 Permissible AUTO-LEAN Operation
37.5 To 45.5 AUTO-RICH Required
🟥 53.5 Maximum Permissible

ENGINEER'S INSTRUMENT PANEL

Figure A-1. (Sheet 3 of 4 Sheets) Instrument Limitation Markings

ENGINEER'S INSTRUMENT PANEL

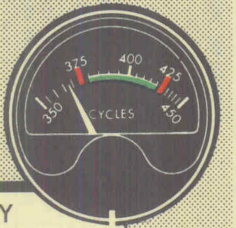


DUCT AIR TEMPERATURE (Forward Cabin Pressure)

🟥 105 Maximum Permissible

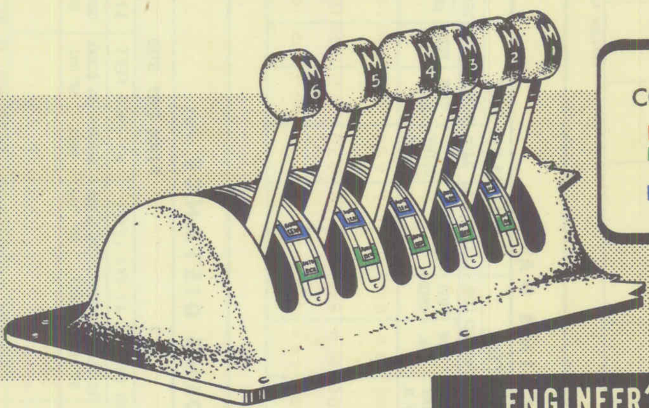
VOLT METER

🟥 190 Minimum Permissible
🟩 190 To 210 Desired Operating Range
🟥 210 Maximum Permissible



FREQUENCY METER

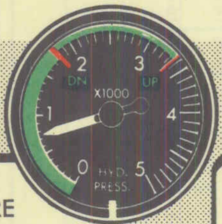
🟥 375 Minimum Permissible
🟩 380 To 420 Desired Operating Range
🟥 425 Maximum Permissible



MIXTURE CONTROL QUADRANT

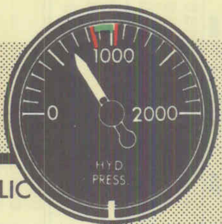
🟥 IDLE CUT-OFF
🟩 AUTO-RICH Required Above 2230 R P M
🟦 AUTO-LEAN Permitted Below 2230 R P M

ENGINEER'S TABLE



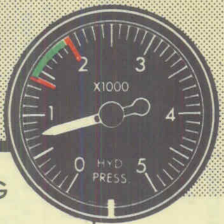
LANDING GEAR HYDRAULIC PRESSURE

🟩 0 To 1800 Safe Operating Pressure During Gear Extension
🟩 0 To 3350 Safe Operating Pressure During Gear Retraction
🟥 1800 Maximum Permissible Operating Pressure During Gear Extension
🟥 3350 Maximum Permissible Operating Pressure During Gear Retraction



BRAKE HYDRAULIC PRESSURE

🟥 850 Minimum Permissible Pressure
🟩 850 To 1025 Desired Operating Pressure
🟥 1025 Maximum Permissible Pressure



NOSE WHEEL STEERING HYDRAULIC PRESSURE

🟥 1400 Minimum Pressure for Operation
🟩 1400 To 2000 Desired Operating Pressure
🟥 2000 Maximum Permissible Operating Pressure

ENGINEER'S INSRUMENT PANEL

Figure A-1. (Sheet 4 of 4 Sheets) Instrument Limitation Markings

AAFMC-527
4-1-44

AIRCRAFT MODEL
B-36A

TAKE-OFF, CLIMB & LANDING CHART

ENGINE MODEL
P&W R-4360-25

TAKE-OFF DISTANCE FEET

GROSS WEIGHT LB.	HEAD WIND		HARD SURFACE RUNWAY						SOD-TURF RUNWAY						SOFT SURFACE RUNWAY					
			AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
	M.P.H.	KTS.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.
220,000	0	0	2730	3630	3130	4120	3630	4670												
	29	25	1630	2280	1880	2580	2190	2980												
	58	50	690	1110	860	1290	1040	1540												
278,000	0	0	5270	6940	6000	7910	7020	9120												
	29	25	3250	4590	3850	5340	4590	6250												
	58	50	1710	2630	2140	3050	2630	3800												
320,000	0	0	8100	11060	9370	12720														
	29	25	5440	7700	6370	9000														
	58	50	3060	4690	3740	5670														

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 75°F + 10%; 100°F + 20%; 125°F + 30%; 150°F + 40%

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

OPTIMUM TAKE-OFF WITH 2700 RPM, 53.5 IN.HG. & 20 DEG.FLAP IS 80% OF CHART VALUES

CLIMB DATA

GROSS WEIGHT LB.	AT SEA LEVEL				AT 5000 FEET					AT 10,000 FEET					AT 15,000 FEET					AT 20,000 FEET					AT 30,000 FEET				
	BEST I.A.S.		RATE OF CLIMB F.P.M.	GAL. OF FUEL USED	BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL	
	MPH	KTS			MPH	KTS		TIME MIN.	FUEL USED	MPH	KTS		TIME MIN.	FUEL USED	MPH	KTS		TIME MIN.	FUEL USED	MPH	KTS		TIME MIN.	FUEL USED	MPH	KTS		TIME MIN.	FUEL USED
220,000	141	122	1080	345	141	122	1060	4.5	505	141	122	1030	9.5	670	141	122	980	14.5	840	141	122	895	19.5	1025	141	122	600	33.0	1480
278,000	154	134	645	345	154	134	635	7.5	610	154	134	600	16.0	890	154	134	530	24.5	1200	154	134	435	35.0	1545	154	134	140	60.5	2430
320,000	163	142	420	345	163	142	410	12.0	755	163	142	365	24.5	1335	163	142	290	40.0	1715	163	142	180	61.0	2445					

POWER PLANT SETTINGS: (DETAILS ON FIG. SECTION III):

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

FUEL USED (U.S. GAL.) INCLUDES WARM-UP & TAKE-OFF ALLOWANCE

LANDING DISTANCE FEET

GROSS WEIGHT LB.	BEST IAS APPROACH				HARD DRY SURFACE						FIRM DRY SOD						WET OR SLIPPERY					
	POWER OFF		POWER ON		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
	MPH	KTS	MPH	KTS	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.
160,000	101	88			1880	3350	2050	3600	2250	3880												
268,000	131	114			3150	5165	3440	5580	3770	6060												

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

OPTIMUM LANDING WITH 30 %FLAPS IS 80%. OF CHART VALUES

NOTE: TO DETERMINE FUEL CONSUMPTION IN BRITISH IMPERIAL GALLONS, MULTIPLY BY 10, THEN DIVIDE BY 12

SPECIAL NOTES:

(1) USE DUAL TURBOSUPERCHARGER OPERATION FOR TAKE OFF & CLIMB.

(2) USE "LOW RPM" COOLING FAN SETTING FOR TAKE OFF & CLIMB.

LEGEND

I.A.S. : INDICATED AIRSPEED
M.P.H. : MILES PER HOUR
KTS. : KNOTS
F.P.M. : FEET PER MINUTE

Figure A-2. Take-off, Climb, and Landing Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL
B-36 A

ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 160,000 TO 140,000 POUNDS

EXTERNAL LOAD ITEMS
THREE PROPELLERS FEATHERED

NUMBER OF ENGINES OPERATING: 3

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)
WAR EMERG.								
MILITARY POWER	2700	53.5	—	A.R.	5 MIN	232 °C	1345	

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.)(NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIR SPEED (T.A.S.) A APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).(1) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)								
725	630	3755	920	800	1125	975	1375	1195	3755		
580	505	3000	740	640	905	785	1100	955	3000	SEE LONG RANGE CRUISING TABLE	
390	340	2000	495	430	605	525	730	635	2000		
200	175	1000	245	215	300	260	365	320	1000		

MAXIMUM CONTINUOUS						PRESS	(246 STAT. (214 NAUT.) MI./GAL.)						(300 STAT. (260 NAUT.) MI./GAL.)						(366 STAT. (318 NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
			APPROX.							APPROX.						APPROX.						APPROX.							APPROX.		
R.P.M.	M.P. INCHES	MIXTURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIXTURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIXTURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.
						40000																			40000						
						35000																			35000	SEE LONG RANGE CRUISING TABLE					
						30000																			30000						
2550	44.5	A.R.	1035	227	197	25000	2450	40.5	A.R.	890	219	190													25000						
2550	44.5	A.R.	1035	224	194	20000	2450	40.0	A.R.	855	211	183													20000						
2550	45.0	A.R.	1035	216	188	15000	2400	39.0	A.R.	815	201	174	2200	34.5	A.R.	605	181	157							15000						
2550	45.0	A.R.	1035	208	181	10000	2400	38.5	A.R.	775	191	166	2150	34.0	A.R.	575	172	149	2100	35.0	A.L.	435	165	143	10000						
2550	45.5	A.R.	1035	199	173	5000	2400	38.0	A.R.	740	182	158	2100	33.5	A.R.	550	164	142	2100	35.5	A.L.	435	160	139	5000						
						S.L.																			S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQUIRED.
(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.
(3) USE "LOW RPM" ENGINE COOLING FAN SETTING.

EXAMPLE

AT 157,000 LB. GROSS WEIGHT WITH 2000 GAL. OF FUEL
(AFTER DEDUCTING TOTAL ALLOWANCES OF 200 GAL.)
TO FLY 495 STAT. AIRMILES AT 5000 FT. ALTITUDE
MAINTAIN 2400 RPM AND 38.0 IN. MANIFOLD PRESSURE
WITH MIXTURE SET: A.R.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL

F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY, DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 1 of 14 Sheets) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL
B-36 A

ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 180,000 TO 160,000 POUNDS

EXTERNAL LOAD ITEMS
THREE PROPELLERS FEATHERED

NUMBER OF ENGINES OPERATING: 3

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)
WAR EMERG.								
MILITARY POWER	2700	53.5	—	A.R.	5 MIN	232 °C	1345	

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUF NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND)(1). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)								
1325	1150	6930	1620	1405	1920	1665			6930		
1150	995	6000	1390	1205	1640	1425			6000	SEE LONG RANGE CRUISING TABLE	
950	825	5000	1150	995	1340	1165			5000		
755	655	4000	900	780	1045	905			4000		
565	490	3000	650	565	750	650			3000		
375	325	2000	440	380	500	435			2000		
190	165	1000	220	190	250	215			1000		

MAXIMUM CONTINUOUS						PRESS	(.218 STAT. (.189 NAUT.) MI./GAL.)						(.249 STAT. (.216 NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
			APPROX.			ALT.				APPROX.						APPROX.						APPROX.			ALT.				APPROX.		
R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	FEET	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	FEET	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.
						40000																			40000						
						35000																			35000						
						30000																			30000						
2550	44.5	A.R.	1035	212	184	25000																			25000	SEE LONG RANGE CRUISING TABLE					
2550	44.5	A.R.	1035	214	186	20000	2500	42.5	A.R.	955	208	181													20000						
2550	45.0	A.R.	1035	209	181	15000	2500	42.0	A.R.	920	200	174	2400	37.0	A.R.	735	183	159							15000						
2550	45.0	A.R.	1035	202	175	10000	2450	40.5	A.R.	860	189	164	2350	36.5	A.R.	705	176	153							10000						
2550	45.5	A.R.	1035	194	168	5000	2450	40.0	A.R.	820	180	156	2350	36.0	A.R.	675	168	146							5000						
						S.L.																			S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.
(3) USE "LOW RPM" COOLING FAN SETTING.

EXAMPLE

AT 172,000 LB. GROSS WEIGHT WITH 2000 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 100 GAL.) TO FLY 440 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2450 RPM AND 40.0 IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R. WHEN GROSS WEIGHT REACHES THE LOW LIMIT OF WEIGHT BAND REFER TO COLUMN II AT 5000 FT. ON CHART FOR PROPER WEIGHT TO OBTAIN NEW POWER SETTING.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL

F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 2 of 14 Sheets) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL
B-36 A

ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 200,000 TO 180,000 POUNDS

EXTERNAL LOAD ITEMS
THREE PROPELLERS FEATHERED

NUMBER OF ENGINES OPERATING: 3

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)
WAR EMERG.								
MILITARY POWER	2700	53.5	—	A.R.	5 MIN	232 °C	1345	

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM. MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.)(NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIR SPEED (T.A.S.) A APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).(1) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING(1)								
1910	1655	10105	2265	1965					10105		
1695	1470	9000	1995	1730					9000	SEE LONG RANGE CRUISING TABLE	
1500	1300	8000	1750	1520					8000		
1310	1135	7000	1500	1305					7000		
1120	970	6000	1270	1100					6000		
935	810	5000	1055	915					5000		
745	645	4000	835	725					4000		
555	480	3000	615	535					3000		
370	320	2000	415	360					2000		
190	165	1000	210	180					1000		

MAXIMUM CONTINUOUS						PRESS	(.204 STAT. (.177 NAUT.) MI./GAL.)					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000						
						35000						
						30000						
						25000						
2550	44.5	A.R.	1035	196	170	20000						
2550	45.0	A.R.	1035	198	172	15000						
2550	45.0	A.R.	1035	194	168	10000	2450	40.5	A.R.	860	177	154
2550	45.5	A.R.	1035	187	162	5000	2450	41.0	A.R.	855	174	151
						S.L.						

(STAT. (NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
												40000						
												35000						
												30000						
												25000	SEE LONG RANGE CRUISING TABLE					
												20000						
												15000						
												10000						
												5000						
												S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQUIRED.
(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.
(3) USE "LOW RPM" ENGINE COOLING FAN SETTING.

EXAMPLE

AT 195,000 LB. GROSS WEIGHT WITH 7000 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 200 GAL.) TO FLY 1500 STAT. AIRMILES AT 10,000 FT. ALTITUDE MAINTAIN 2450 RPM AND 40.5 IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R. WHEN GROSS WEIGHT REACHES THE LOW LIMIT OF WEIGHT BAND REFER TO COLUMN II AT 10,000 FT. ON CHART FOR PROPER WEIGHT TO OBTAIN NEW POWER SETTING.

LEGEND

ALT.	PRESSURE ALTITUDE	F.R.	FULL RICH
M.P.	MANIFOLD PRESSURE	A.R.	AUTO-RICH
GPH	U.S. GAL. PER HOUR	A.L.	AUTO-LEAN
TAS	TRUE AIRSPEED	C.L.	CRUISING LEAN
KTS.	KNOTS	M.L.	MANUAL LEAN
S.L.	SEA LEVEL	F.T.	FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY. DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 3 of 14 Sheets) Flight Operation Instruction Chart

AAFMC-52B
4-1-44

AIRCRAFT MODEL
B-36A

ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 220,000 TO 200,000 POUNDS

EXTERNAL LOAD ITEMS
THREE PROPELLERS FEATHERED

NUMBER OF ENGINES OPERATING: 3

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.							
MILITARY POWER	2700	53.5	—	A.R.	5 MIN	232 °C	1345

FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING (1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). (1) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)								
2405	2090	13000							13000		
2215	1920	12000							12000		
2020	1750	11000							11000		
1820	1580	10000							10000	SEE LONG RANGE CRUISING TABLE	
1630	1415	9000							9000		
1440	1250	8000							8000		
1255	1090	7000							7000		
1070	950	6000							6000		
890	770	5000							5000		
705	610	4000							4000		
520	450	3000							3000		
350	305	2000							2000		
175	150	1000							1000		

MAXIMUM CONTINUOUS						PRESS	(STAT. (NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT.	APPROX. T.A.S.		ALT.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT.	APPROX. T.A.S.		R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT.	APPROX. T.A.S.		R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT.	APPROX. T.A.S.		ALT.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT.	APPROX. T.A.S.	
			G.PH.	MPH.	KTS.	FEET				G.PH.	MPH.	KTS.				G.PH.	MPH.	KTS.				G.PH.	MPH.	KTS.	FEET				G.PH.	MPH.	KTS.
						40000																			40000						
						35000																			35000						
						30000																			30000						
						25000																			25000	SEE LONG RANGE CRUISING TABLE					
						20000																			20000						
						15000																			15000						
2550	45.0	A.R.	1035	183	159	10000																			10000						
2550	45.0	A.R.	1035	179	155	5000																			5000						
						S.L.																			S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.
(3) USE "LOW RPM" COOLING FAN SETTING

EXAMPLE

AT 205,000 LB. GROSS WEIGHT WITH 4000 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 400 GAL.) TO FLY 705 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2550 RPM AND 45.5 IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R. WHEN GROSS WEIGHT REACHES THE LOW LIMIT OF WEIGHT BAND REFER TO COLUMN I AT 5000 FT. ON CHART FOR PROPER WEIGHT TO OBTAIN NEW POWER SETTING.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL

F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 4 of 14 Sheets) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL
B-36A

ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 160,000 TO 140,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: 6

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.							
MILITARY POWER	2700	53.5	—	A.R.	5 MIN	232 °C	2695

FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUF NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).(1) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)								
500	435	3755	785	680	1060	920	1355	1175	3755		
405	350	3000	630	545	855	740	1080	940	3000	SEE LONG RANGE CRUISING TABLE	
265	230	2000	420	365	575	500	725	.630	2000		
140	120	1000	215	185	300	260	375	325	1000		

MAXIMUM CONTINUOUS						PRESS	(.208 STAT. (.181 NAUT.) MI./GAL.)						(.286 STAT. (.248 NAUT.) MI./GAL.)						(.362 STAT. (.314 NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			ALT.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			ALT.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.		
			TOT.	T.A.S.		FEET				TOT.	T.A.S.					TOT.	T.A.S.					TOT.	T.A.S.		FEET				TOT.	T.A.S.	
			G.P.H.	M.P.H.	KTS.					G.P.H.	M.P.H.	KTS.				G.P.H.	M.P.H.	KTS.				G.P.H.	M.P.H.	KTS.					G.P.H.	M.P.H.	KTS.
						40000																			40000						
2550	45.0	A.R.	2065	353	306	35000	2400	38.0	A.R.	1615	342	297	2100	32.5	A.R.	1140	327	284	2100	35.0	A.L.	875	317	275	35000						
2550	44.5	A.R.	2065	342	296	30000	2400	37.5	A.R.	1555	329	286	2100	32.0	A.R.	1095	312	270	1900	37.5	A.L.	805	301	261	30000						
2550	44.5	A.R.	2065	329	286	25000	2400	36.5	A.R.	1495	315	274	2100	34.5	A.L.	875	292	254	1850	37.5	A.L.	790	285	248	25000	SEE LONG RANGE CRUISING TABLE					
2550	44.5	A.R.	2065	315	274	20000	2400	36.0	A.R.	1435	299	260	2100	34.5	A.L.	875	278	241	1750	35.0	A.L.	720	263	228	20000						
2550	45.0	A.R.	2065	301	261	15000	2350	35.5	A.R.	1345	280	243	2100	35.0	A.L.	875	264	229	1650	35.0	A.L.	680	245	213	15000						
2550	45.0	A.R.	2065	290	252	10000	2250	35.0	A.R.	1265	263	228	2100	35.0	A.L.	875	252	218	1500	35.0	A.L.	625	227	197	10000						
2550	45.5	A.R.	2065	277	240	5000	2150	34.5	A.R.	1170	246	214	1900	37.5	A.L.	805	235	204	1400	34.5	A.L.	580	210	182	5000						
						S.L.																			S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.
(3) USE "LOW RPM" ENGINE COOLING FAN SETTING.

EXAMPLE

AT 155,000 LB. GROSS WEIGHT WITH 3,000 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 2000 GAL.) TO FLY 405 STAT. AIRMILES AT 35,000 FT. ALTITUDE MAINTAIN 2550 RPM AND 45.0 IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R. WHEN GROSS WEIGHT REACHES THE LOW LIMIT OF WEIGHT BAND REFER TO COLUMN I AT 35,000 FT. ON CHART FOR PROPER WEIGHT TO OBTAIN NEW POWER SETTING.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 5 of 14 Sheets) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL
B-36 A

ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 180,000 TO 160,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: 6

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)
WAR EMERG.								
MILITARY POWER	2700	53.5	—	A.R.	5 MIN	232 °C	2695	

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM. MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIR SPEED (T.A.S.) A APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).(1) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)								
930	805	6930	1420	1230	1920	1665	2425	2105	6930		
795	690	6000	1225	1065	1660	1440	2080	1805	6000		
670	580	5000	1015	880	1370	1190	1720	1495	5000		
535	465	4000	815	705	1090	945	1360	1180	4000	SEE LONG	RANGE
405	350	3000	605	525	815	705	1010	875	3000		
265	230	2000	405	350	550	475	675	585	2000	CRUISING	TABLE
140	120	1000	205	180	280	245	340	295	1000		

MAXIMUM CONTINUOUS						PRESS	(200 STAT. (174 NAUT.) MI./GAL.)						(268 STAT. (233 NAUT.) MI./GAL.)						(336 STAT. (291 NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
			APPROX.			ALT.				APPROX.						APPROX.						APPROX.			ALT.				APPROX.		
R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	FEET	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	FEET	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.
						40000																			40000						
2550	45.0	A.R.	2065	346	300	35000	2450	39.0	A.R.	1660	335	292	2200	33.0	A.R.	1190	320	278	2100	35.0	A.L.	875	307	266	35000						
2550	44.5	A.R.	2065	339	294	30000	2400	38.0	A.R.	1610	325	282	2150	32.5	A.R.	1150	310	269	2100	34.0	A.L.	875	299	260	30000						
2550	44.5	A.R.	2065	326	283	25000	2400	37.5	A.R.	1565	313	272	2100	32.0	A.R.	1085	291	252	2100	32.5	A.L.	835	281	244	25000	SEE LONG RANGE					
2550	44.5	A.R.	2065	312	271	20000	2400	37.0	A.R.	1485	297	258	2100	34.5	A.L.	875	273	237	1900	36.5	A.L.	795	266	231	20000						
2550	45.0	A.R.	2065	300	260	15000	2350	36.0	A.R.	1400	280	243	2100	35.0	A.L.	875	260	226	1750	36.5	A.L.	735	248	215	15000	CRUISING TABLE					
2550	45.0	A.R.	2065	288	250	10000	2300	35.5	A.R.	1305	262	227	2100	35.0	A.L.	875	248	215	1650	36.0	A.L.	685	231	200	10000						
2550	45.5	A.R.	2065	278	241	5000	2200	35.0	A.R.	1220	246	214	2100	35.5	A.L.	875	236	205	1550	35.5	A.L.	635	214	186	5000						
						S.L.																			S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQUIRED.

(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.

(3) USE "LOW RPM" ENGINE COOLING FAN SETTING.

EXAMPLE

AT 165,000 LB. GROSS WEIGHT WITH 4000 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 2500 GAL.) TO FLY 1360 STAT. AIRMILES AT 35,000 FT. ALTITUDE MAINTAIN 2100 RPM AND 35.0 IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R. WHEN GROSS WEIGHT REACHES THE LOW LIMIT OF WEIGHT BAND REFER TO COLUMN IV, AT 35,000 FT. ON CHART FOR PROPER WEIGHT TO OBTAIN NEW POWER SETTING.

LEGEND

ALT. :	PRESSURE ALTITUDE	F.R. :	FULL RICH
M.P. :	MANIFOLD PRESSURE	A.R. :	AUTO-RICH
GPH :	U.S. GAL. PER HOUR	A.L. :	AUTO-LEAN
TAS :	TRUE AIRSPEED	C.L. :	CRUISING LEAN
KTS. :	KNOTS	M.L. :	MANUAL LEAN
S.L. :	SEA LEVEL	F.T. :	FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 6 of 14 Sheets) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL
B-36A

ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 200,000 TO 180,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

·NUMBER OF ENGINES OPERATING: 6

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.							
MILITARY POWER	2700	53.5		A. R.	5 MIN	232°	2695

FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM. MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIR SPEED (T.A.S.) A APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).(1) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S. GAL.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S. GAL.	RANGE IN AIRMILES	
STAUTE	NAUTICAL		STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL		STATUTE	NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING(1)								
1340	1165	10105	2030	1760	2690	2360	3400	2955	10105		
1190	1035	9000	1800	1560	2385	2090	3005	2605	9000	SEE LONG RANGE CRUISING TABLE	
1065	925	8000	1585	1375	2110	1840	2645	2295	8000		
930	805	7000	1380	1200	1830	1595	2280	1980	7000		
795	690	6000	1175	1020	1560	1350	1930	1675	6000		
670	580	5000	980	850	1285	1115	1590	1380	5000		
535	465	4000	775	670	1015	880	1250	1085	4000		
405	350	3000	575	500	755	655	930	805	3000		
265	230	2000	385	335	505	440	625	540	2000		
140	120	1000	195	170	260	225	310	270	1000		

MAXIMUM CONTINUOUS						PRESS ALT. FEET	(.191 STAT. (.166 NAUT.) MI./GAL.)						(250 STAT. (217 NAUT.) MI./GAL.)						(308 STAT. (267 NAUT.) MI./GAL.)						PRESS ALT. FEET	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.		R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.		R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000																			40000						
2550	45.0	A.R.	2065	339	294	35000	2450	39.5	A. R.	1705	328	285	2250	33.5	A. R.	1255	312	271	2100	35.0	A. L.	875	292	254	35000						
2550	44.5	A.R.	2065	333	289	30000	2450	39.0	A. R.	1665	321	279	2200	33.0	A. R.	1225	305	264	2100	34.0	A. L.	875	289	251	30000						
2550	44.5	A.R.	2065	332	280	25000	2400	38.5	A. R.	1610	310	269	2150	33.0	A. R.	1160	289	251	2100	34.5	A. L.	875	279	242	25000	SEE LONG RANGE CRUISING TABLE					
2550	44.5	A.R.	2065	310	269	20000	2400	38.0	A. R.	1550	297	258	2100	32.0	A. R.	1090	272	236	2100	34.5	A. L.	870	267	232	20000						
2550	45.0	A.R.	2065	298	258	15000	2400	37.0	A. R.	1460	279	242	2100	35.0	A. L.	875	256	222	1900	37.0	A. L.	805	250	217	15000						
2550	45.0	A.R.	2065	286	248	10000	2350	36.0	A.R.	1365	262	227	2100	35.0	A. L.	875	245	213	1800	37.0	A. L.	760	235	204	10000						
2550	45.5	A.R.	2065	274	238	5000	2300	35.5	A.R.	1275	246	214	2100	35.5	A. L.	875	234	203	1700	37.0	A. L.	715	220	191	5000						
						S. L.																			S. L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQUIRED.
(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.
(3) USE "LOW RPM" ENGINE COOLING FAN SETTING.

EXAMPLE

AT 192,000 LB. GROSS WEIGHT WITH 8,000 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 000 GAL.) TO FLY 1585 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2300 RPM AND 35.5 IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R. WHEN GROSS WEIGHT REACHES THE LOW LIMIT OF WEIGHT BAND REFER TO COLUMN II AT 5,000 FT. ON CHART FOR PROPER WEIGHT TO OBTAIN NEW POWER SETTING.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL

F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 7 of 14 Sheets) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL
B-36A
ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 220,000 TO 200,000 POUNDS

EXTERNAL LOAD ITEMS
NONE
NUMBER OF ENGINES OPERATING: 6

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)
WAR EMERG.								
MILITARY POWER	2700	53.5	—	A.R.	5 MIN	232 °C	2695	

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM. MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIR SPEED (T.A.S.) A APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).[1] TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]								
1730	1500	13000	2560	2220	3390	2940	4225	3670	13000		
1600	1385	12000	2345	2035	3100	2690	3860	3350	12000		
1460	1265	11000	2140	1855	2805	2435	3500	3045	11000		
1325	1150	10000	1925	1670	2515	2180	3140	2725	10000		
1190	1035	9000	1720	1495	2240	1945	2795	2425	9000	SEE LONG	RANGE
1055	915	8000	1520	1320	1980	1715	2455	2130	8000		
920	800	7000	1325	1150	1720	1490	2120	1840	7000		
790	685	6000	1125	975	1460	1265	1790	1555	6000	CRUISING	TABLE
665	575	5000	935	810	1215	1055	1490	1295	5000		
530	460	4000	745	645	965	835	1175	1020	4000		
400	345	3000	560	485	720	625	870	755	3000		
265	230	2000	370	320	485	420	580	505	2000		
140	120	1000	185	160	250	215	290	250	1000		

MAXIMUM CONTINUOUS						PRESS	(184 STAT. (160 NAUT.) MI./GAL.)						(238 STAT. (206 NAUT.) MI./GAL.)						(292 STAT. (253 NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
			APPROX.			ALT.				APPROX.						APPROX.						APPROX.			ALT.				APPROX.		
			TOT.	T.A.S.						TOT.	T.A.S.					TOT.	T.A.S.					TOT.	T.A.S.						TOT.	T.A.S.	
R.P.M.	M.P. INCHES	MIX-TURE	G.P.H.	M.P.H.	KTS.	FEET	R.P.M.	M.P. INCHES	MIX-TURE	G.P.H.	M.P.H.	KTS.	R.P.M.	M.P. INCHES	MIX-TURE	G.P.H.	M.P.H.	KTS.	R.P.M.	M.P. INCHES	MIX-TURE	G.P.H.	M.P.H.	KTS.	FEET	R.P.M.	M.P. INCHES	MIX-TURE	G.P.H.	M.P.H.	KTS.
						40000																			40000						
2550	45.0	A.R.	2065	329	286	35000	2450	39.5	A.R.	1730	318	276	2250	33.5	A.R.	1260	298	259							35000						
2550	44.5	A.R.	2065	325	282	30000	2450	39.5	A.R.	1690	315	274	2250	33.5	A.R.	1260	298	259	2100	34.0	A.L.	875	276	239	30000						
2550	44.5	A.R.	2065	317	275	25000	2450	39.0	A.R.	1645	305	265	2200	33.0	A.R.	1195	284	246	2100	34.5	A.L.	875	270	234	25000	SEE LONG RANGE					
2550	44.5	A.R.	2065	306	266	20000	2400	38.5	A.R.	1580	293	252	2100	32.5	A.R.	1130	268	232	2100	34.5	A.L.	875	261	226	20000						
2550	45.0	A.R.	2065	295	256	15000	2400	37.5	A.R.	1505	278	241	2100	32.5	A.R.	1075	254	220	2100	33.5	A.L.	840	245	212	15000	CRUISING TABLE					
2550	45.0	A.R.	2065	284	246	10000	2350	36.5	A.R.	1415	262	227	2100	35.0	A.L.	875	241	209	1900	37.5	A.L.	805	234	203	10000						
2550	45.5	A.R.	2065	272	236	5000	2300	36.0	A.R.	1315	245	212	2100	35.5	A.L.	875	230	200	1800	37.5	A.L.	750	220	191	5000						
						S.L.																			S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQUIRED.

(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.

(3) USE "LOW RPM" ENGINE COOLING FAN SETTING.

EXAMPLE

AT 215,000 LB. GROSS WEIGHT WITH 12,000 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 2000 GAL.) TO FLY 3860 STAT. AIRMILES AT 15,000 FT. ALTITUDE MAINTAIN 2100 RPM AND 33.5 IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R. WHEN GROSS WEIGHT REACHES THE LOW LIMIT OF WEIGHT BAND REFER TO COLUMN IV AT 15,000 FT. ON CHART FOR PROPER WEIGHT TO OBTAIN NEW POWER SETTING.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY. DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 8 of 14 Sheets) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL
B-36 A

ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 240,000 TO 220,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: 6

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)
WAR EMERG.								
MILITARY POWER	2700	53.5		A.R.	5 MIN	232°C	2695	

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM. MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING. REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.)(NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIR SPEED (T.A.S.) A APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).(1) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
				SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING(1)							
2115	1835	16,000	3080	2675	4055	3520	5015	4355	16,000	SEE LONG RANGE CRUISING TABLE	
1975	1715	15,000	2875	2495	3765	3270	4655	4045	15,000		
1845	1600	14,000	2665	2315	3480	3020	4300	3730	14,000		
1710	1485	13,000	2460	2135	3200	2775	3940	3420	13,000		
1580	1370	12,000	2255	1955	2920	2535	3600	3125	12,000		
1450	1255	11,000	2055	1785	2645	2295	3260	2830	11,000		
1315	1140	10,000	1850	1605	2385	2070	2925	2540	10,000		
1180	1025	9,000	1655	1435	2125	1845	2610	2265	9,000		
1050	910	8,000	1465	1270	1880	1630	2300	1995	8,000		
915	795	7,000	1275	1105	1625	1410	1995	1730	7,000		
790	685	6,000	1090	945	1380	1200	1690	1465	6,000		
655	570	5,000	905	785	1150	1000	1395	1210	5,000		
525	455	4,000	720	625	915	795	1110	960	4,000		
390	340	3,000	535	465	680	590	820	710	3,000		
265	230	2,000	360	310	455	395	555	480	2,000		

MAXIMUM CONTINUOUS						PRESS ALT. FEET	(.177 STAT. (.154 NAUT.) MI./GAL.)						(.224 STAT. (.195 NAUT.) MI./GAL.)						(.272 STAT. (.236 NAUT.) MI./GAL.)						PRESS ALT. FEET	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	KTS.		R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	KTS.		R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	KTS.
						40000																			40000						
2550	45.0	A.R.	2065	316	274	35000																			35000						
2550	44.5	A.R.	2065	318	276	30000	2450	39.5	A.R.	1730	306	266	2300	33.5	A.R.	1275	286	248							30000						
2550	44.5	A.R.	2065	311	270	25000	2450	39.5	A.R.	1690	301	261	2250	33.5	A.R.	1240	278	242							25000	SEE LONG RANGE CRUISING TABLE					
2550	44.5	A.R.	2065	302	262	20000	2450	39.0	A.R.	1620	289	251	2150	33.0	A.R.	1165	263	228	2100	34.5	A.L.	875	252	219	20000						
2550	45.0	A.R.	2065	292	253	15000	2400	38.0	A.R.	1540	275	239	2100	33.0	A.R.	1115	252	219	2100	35.0	A.L.	875	244	212	15000						
2550	45.0	A.R.	2065	281	244	10000	2400	37.5	A.R.	1465	262	228	2100	35.0	A.L.	875	235	204	2100	33.5	A.L.	875	228	198	10000						
2550	45.5	A.R.	2065	270	234	5000	2350	36.5	A.R.	1360	244	212	2100	35.5	A.L.	875	225	195	1900	37.5	A.L.	875	220	191	5000						
						S.L.																			S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQUIRED.
(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.
(3) USE "LOW RPM" ENGINE COOLING FAN SETTING.

EXAMPLE

AT 227,000 LB. GROSS WEIGHT WITH 9000 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 2500 GAL.) TO FLY 2125 STAT. AIRMILES AT 30,000 FT. ALTITUDE MAINTAIN 2300 RPM AND 33.5 IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R. WHEN GROSS WEIGHT REACHES THE LOW LIMIT OF WEIGHT BAND REFER TO COLUMN III AT 30,000 FT. CN CHART FOR PROPER WEIGHT TO OBTAIN NEW POWER SETTING.

LEGEND

ALT.	PRESSURE ALTITUDE	F.R.	FULL RICH
M.P.	MANIFOLD PRESSURE	A.R.	AUTO-RICH
GPH	U.S. GAL. PER HOUR	A.L.	AUTO-LEAN
TAS	TRUE AIRSPEED	C.L.	CRUISING LEAN
KTS.	KNOTS	M.L.	MANUAL LEAN
S.L.	SEA LEVEL	F.T.	FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY. DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 9 of 14 Sheets) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL
B-36 A

ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 260,000 TO 240,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: 6

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)
WAR EMERG.								
MILITARY POWER	2700	53.5	—	A.R.	5 MIN	232 °C	2695	

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM. MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIR SPEED (T.A.S.) A APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND)[1] TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
				SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)							
2500	2165	19000	3570	3100	4655	4045	5740	4980	19000		
2360	2050	18000	3360	2920	4365	3795	5380	4670	18000		
2230	1935	17000	3160	2740	4095	3555	5025	4360	17000		
2095	1820	16000	2955	2565	3815	3310	4660	4050	16000		
1965	1705	15000	2755	2390	3545	3075	4325	3755	15000		
1830	1590	14000	2555	2215	3270	2840	3995	3465	14000		
1700	1475	13000	2355	2045	3005	2610	3660	3175	13000	SEE LONG	RANGE
1570	1360	12000	2160	1875	2745	2385	3345	2905	12000	CRUISING	TABLE
1435	1245	11000	1970	1710	2490	2160	3035	2635	11000		
1300	1130	10000	1775	1540	2235	1940	2730	2370	10000		
1170	1015	9000	1590	1380	1985	1725	2430	2110	9000		
1040	900	8000	1405	1220	1760	1525	2135	1855	8000		
910	790	7000	1220	1060	1530	1325	1850	1605	7000		
780	675	6000	1045	905	1310	1135	1570	1360	6000		
650	565	5000	865	750	1085	940	1295	1125	5000		

MAXIMUM CONTINUOUS						PRESS	(.169 STAT. (.147 NAUT.) MI./GAL.)						(.210 STAT. (.182 NAUT.) MI./GAL.)						(.251 STAT. (.218 NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000																			40000						
2550	45.0	A.R.	2065	295	256	35000																			35000						
2550	44.5	A.R.	2065	308	267	30000	2450	40.0	A.R.	1730	296	257													30000						
2550	44.5	A.R.	2065	305	264	25000	2450	39.5	A.R.	1720	294	255	2300	34.0	A.R.	1295	271	235							25000						
2550	44.5	A.R.	2065	296	257	20000	2450	40.0	A.R.	1665	285	248	2250	34.0	A.R.	1250	261	227							20000	SEE LONG RANGE CRUISING TABLE					
2550	45.0	A.R.	2065	288	250	15000	2400	39.0	A.R.	1600	273	237	2200	34.0	A.R.	1190	249	216	2100	35.0	A.L.	875	235	204	15000						
2550	45.0	A.R.	2065	278	241	10000	2400	38.0	A.R.	1515	259	225	2100	33.5	A.R.	1115	235	204	2100	35.0	A.L.	875	228	198	10000						
2550	45.5	A.R.	2065	267	232	5000	2350	37.0	A.R.	1415	243	211	2100	33.0	A.R.	1055	222	193	2100	35.0	A.L.	860	218	189	5000						
						S.L.																			S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQUIRED.
(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.
(3) USE "LOW RPM" ENGINE COOLING FAN SETTING.

EXAMPLE

AT 248,000 LB. GROSS WEIGHT WITH 8000 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 3000 GAL.) TO FLY 1405 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2450 RPM AND 40.0 IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R. WHEN GROSS WEIGHT REACHES THE LOW LIMIT OF WEIGHT BAND REFER TO COLUMN II AT 20,000 FT. ON CHART FOR PROPER WEIGHT TO OBTAIN NEW POWER SETTING.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL

F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY. DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 10 of 14 Sheets) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL
B-36 A

ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 280,000 TO 260,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: 6

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)
WAR EMERG.								
MILITARY POWER	2700	53.5		A.R.	5 MIN	232°C	2695	

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM. MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIR SPEED (T.A.S.) A APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).(1) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
		22575(4)		SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING(1)							
2605	2260	20000	3635	3155	4660	4050	5680	4935	20000		
2470	2145	19000	3425	2975	4390	3805	5335	4630	19000		
2330	2025	18000	3235	2805	4110	3575	4990	4335	18000		
2205	1915	17000	3030	2630	3845	3340	4665	4050	17000		
2075	1800	16000	2835	2460	3580	3105	4330	3760	16000		
1940	1685	15000	2640	2295	3335	2895	4025	3495	15000		
1810	1570	14000	2455	2130	3080	2675	3720	3230	14000	SEE LONG	RANGE
1675	1455	13000	2265	1965	2830	2455	3415	2965	13000	CRUISING	TABLE
1540	1340	12000	2080	1805	2590	2250	3115	2705	12000		
1410	1225	11000	1895	1645	2350	2040	2830	2455	11000		
1285	1115	10000	1710	1480	2105	1830	2535	2200	10000		
1150	1000	9000	1525	1325	1880	1630	2260	1960	9000		
1020	885	8000	1350	1170	1660	1440	1985	1725	8000		
895	775	7000	1170	1015	1440	1250	1720	1490	7000		
765	665	6000	995	865	1225	1065	1455	1265	6000		

MAXIMUM CONTINUOUS						PRESS	(.162 STAT. (.141 NAUT.) MI./GAL.)						(.197 STAT. (.171 NAUT.) MI./GAL.)						(.232 STAT. (.202 NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000																			40000						
						35000																			35000						
2550	44.5	A.R.	2065	293	254	30000																			30000						
2550	44.5	A.R.	2065	296	257	25000	2450	40.5	A.R.	1760	261	226													25000	SEE LONG RANGE					
2550	44.5	A.R.	2065	290	252	20000	2450	40.0	A.R.	1715	280	243	2250	34.0	A.R.	1265	250	217							20000	CRUISING TABLE					
2550	45.0	A.R.	2065	283	246	15000	2450	40.0	A.R.	1670	270	234	2250	34.5	A.R.	1240	244	212							15000						
2550	45.0	A.R.	2065	276	240	10000	2400	39.0	A.R.	1565	256	222	2150	34.0	A.R.	1160	230	200	2100	35.0	A.L.	875	220	191	10000						
2550	45.5	A.R.	2065	264	229	5000	2400	38.0	A.R.	1480	241	209	2100	34.0	A.R.	1110	219	190	2100	35.5	A.L.	875	213	185	5000						
						S.L.																			S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQUIRED.
(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.
(3) USE "LOW RPM" ENGINE COOLING FAN SETTING.
(4) WITH FULL WING TANKS AND 1459 GALLONS IN THE BOMB BAY TANKS.

EXAMPLE

AT 262,500 LB. GROSS WEIGHT WITH 14,000 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 2000 GAL.) TO FLY 3720 STAT. AIRMILES AT 10,000 FT. ALTITUDE MAINTAIN 2100 RPM AND 35.0 IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R. WHEN GROSS WEIGHT REACHES THE LOW LIMIT OF WEIGHT BAND REFER TO COLUMN IV AT 10,000 FT. ON CHART FOR PROPER WEIGHT TO OBTAIN NEW POWER SETTING.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL

F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 11 of 14 Sheets) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL
B-36A
ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 300,000 TO 280,000 POUNDS

EXTERNAL LOAD ITEMS
NONE
NUMBER OF ENGINES OPERATING. 6

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)
WAR EMERG.								
MILITARY POWER	2700	53.5	—	A.R.	5 MIN	232 °C	2695	

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM. MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.)(NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIR SPEED (T.A.S.) A APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).(1) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
		25650(4)									
2980	2585	23000	4115	3570	5240	4550			23000		
2850	2470	22000	3905	3390	4960	4305			22000		
2715	2355	21000	3700	3215	4690	4070			21000		
2580	2240	20000	3500	3040	4415	3835			20000	SEE LONG RANGE	
2450	2125	19000	3305	2870	4160	3610			19000		
2315	2010	18000	3110	2700	3905	3390			18000		
2185	1895	17000	2920	2535	3660	3175			17000		
2050	1780	16000	2735	2375	3410	2960			16000	CRUISING TABLE	
1920	1665	15000	2550	2215	3175	2755			15000		
1790	1550	14000	2365	2055	2940	2550			14000		
1660	1440	13000	2185	1895	2700	2345			13000		
1525	1325	12000	2005	1740	2470	2145			12000		
1400	1215	11000	1825	1585	2245	1950			11000		
1265	1100	10000	1650	1430	2020	1755			10000		
1140	990	9000	1475	1280	1800	1565			9000		

MAXIMUM CONTINUOUS						PRESS	(.161 STAT. (.140 NAUT.) MI./GAL.)						(.197 STAT. (.171 NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000																			40000						
						35000																			35000						
2550	44.5	A.R.	2065	253	220	30000																			30000						
2550	44.5	A.R.	2065	285	248	25000																			25000	SEE LONG RANGE					
2550	44.5	A.R.	2065	283	246	20000	2450	39.0	A.R.	1660	268	232													20000	CRUISING TABLE					
2550	45.0	A.R.	2065	278	241	15000	2400	39.0	A.R.	1585	259	225													15000						
2550	45.0	A.R.	2065	270	234	10000	2400	38.0	A.R.	1535	248	215	2100	33.0	A.R.	1075	212	184							10000						
2550	45.5	A.R.	2065	261	226	5000	2400	37.5	A.R.	1445	234	203	2100	33.0	A.R.	1050	207	180							5000						
						S.L.																			S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQUIRED.
(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.
(3) USE "LOW RPM" ENGINE COOLING FAN SETTING.
(4) WITH FULL WING TANKS AND 4534 GALLONS IN THE BOMB BAY TANKS.

EXAMPLE

AT 286,000 LB. GROSS WEIGHT WITH 16,000 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 1200 GAL.) TO FLY 3410 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 211 RPM AND 33.0 IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R. WHEN GROSS WEIGHT REACHES THE LOW LIMIT OF WEIGHT BAND REFER TO COLUMN III AT 5,000 FT. ON CHART FOR PROPER WEIGHT TO OBTAIN NEW POWER SETTING.

LEGEND

ALT.	PRESSURE ALTITUDE	F.R.	FULL RICH
M.P.	MANIFOLD PRESSURE	A.R.	AUTO-RICH
GPH	U.S. GAL. PER HOUR	A.L.	AUTO-LEAN
TAS	TRUE AIRSPEED	C.L.	CRUISING LEAN
KTS.	KNOTS	M.L.	MANUAL LEAN
S.L.	SEA LEVEL	F.T.	FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 12 of 14 Sheets) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL
B-36A

ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 320,000 TO 300,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: 6

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)
WAR EMERG.								
MILITARY POWER	2700	53.5	—	A.R.	5 MIN	232 °C	2695	

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM. MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.)(NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIR SPEED (T.A.S.) A APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).(1) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
				SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING(1)							
		28425 (4)							28425 (4)	SEE LONG RANGE CRUISING TABLE	
3210	2785	25000	4340	3765					25000		
3075	2670	24000	4140	3595					24000		
2945	2555	23000	3945	3425					23000		
2810	2440	22000	3750	3255					22000		
2690	2325	21000	3560	3090					21000		
2550	2210	20000	3365	2920					20000		
2415	2095	19000	3180	2760					19000		
2285	1980	18000	2990	2595					18000		
2155	1870	17000	2805	2435					17000		
2025	1755	16000	2630	2280					16000		
1895	1645	15000	2450	2125					15000		
1760	1525	14000	2270	1970					14000		
1630	1415	13000	2090	1815					13000		
1505	1305	12000	1925	1670					12000		
1370	1190	11000	1750	1520					11000		

MAXIMUM CONTINUOUS						PRESS	(.150 STAT. (.130 NAUT.) MI./GAL.)					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			ALT.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.		
			TOT.	T.A.S.						TOT.	T.A.S.	
			G.P.H.	M.P.H.	KTS.	FEET				G.P.H.	M.P.H.	KTS.
						40000						
						35000						
						30000						
2550	44.5	A.R.	2065	267	232	25000						
2550	44.5	A.R.	2065	274	238	20000						
2550	45.0	A.R.	2065	272	236	15000						
2550	45.0	A.R.	2065	264	229	10000	2450	39.5	A.R.	1630	247	214
2550	45.5	A.R.	2065	257	223	5000	2400	39.0	A.R.	1560	235	204
						S.L.						

PRESS	(STAT. (NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
ALT.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			ALT.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.		
				TOT.	T.A.S.					TOT.	T.A.S.						TOT.	T.A.S.	
FEET				G.P.H.	M.P.H.	KTS.				G.P.H.	M.P.H.	KTS.	FEET				G.P.H.	M.P.H.	KTS.
40000													40000	SEE LONG RANGE CRUISING TABLE					
35000													35000						
30000													30000						
25000													25000						
20000													20000						
15000													15000						
10000													10000						
5000													5000						
S.L.													S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQUIRED.
(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.
(3) USE "LOW RPM" ENGINE COOLING FAN SETTING.
(4) WITH FULL WING TANKS AND 7309 GALLONS IN THE BOMB BAY TANKS.

EXAMPLE

AT 308,400 LB. GROSS WEIGHT WITH 23,000 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 1500. GAL.) TO FLY 3945 STAT. AIRMILES AT 10,000 FT. ALTITUDE MAINTAIN 2450 RPM AND 39.5 IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R. WHEN GROSS WEIGHT REACHES THE LOW LIMIT OF WEIGHT BAND REFER TO COLUMN II AT 10,000 FT. ON CHART FOR PROPER WEIGHT TO OBTAIN NEW POWER SETTING.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL

F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY. DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 13 of 14 Sheets) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL
B-36A

ENGINE(S): R-4360-25

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 330,000 TO 320,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: 6

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)
WAR EMERG.								
MILITARY POWER	2700	53.5		A.R.	5 MIN	232 °C	2695	

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM. MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIR SPEED (T.A.S.) A APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).[1] TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
		(4) 30010	SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING [1]						(4) 30010		
3450	2995	27000	4655	4040					27000		
3320	2880	26000	4455	3865					26000		
3190	2740	25000	4255	3690					25000	SEE LONG RANGE CRUISING TABLE	
3060	2655	24000	4055	3520					24000		
2925	2540	23000	3860	3350					23000		
2800	2430	22000	3670	3185					22000		
2660	2310	21000	3475	3015					21000		
2530	2195	20000	3290	2855					20000		
2395	2080	19000	3110	2700					19000		
2265	1965	18000	2925	2540					18000		
2135	1855	17000	2750	2385					17000		
2010	1745	16000	2570	2230					16000		
1885	1635	15000	2385	2070					15000		
1765	1525	14000	2225	1930					14000		

MAXIMUM CONTINUOUS						PRESS	(146 STAT. (125 NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000																			40000						
						35000																			35000						
						30000																			30000						
						25000																			25000	SEE LONG RANGE CRUISING TABLE					
2550	44.5	A.R.	2065	268	233	20000																			20000						
2550	45.0	A.R.	2065	269	234	15000																			15000						
2550	45.0	A.R.	2065	263	228	10000																			10000						
2550	45.5	A.R.	2065	254	220	5000	2400	39.5	A.R.	1605	234	203													5000						
						S.L.																			S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQUIRED.
(2) USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM'S OVER 1900.
(3) USE "LOW RPM" ENGINE COOLING FAN SETTING.
(4) WITH FULL WING TANKS AND 8894 GALLONS IN THE BOMB BAY TANKS.

EXAMPLE

AT 322,600 LB. GROSS WEIGHT WITH 22,000 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 2000 GAL.) TO FLY 3670 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2400 RPM AND 39.5 IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R. WHEN GROSS WEIGHT REACHES THE LOW LIMIT OF WEIGHT BAND REFER TO COLUMN II AT 5,000 FT. ON CHART FOR PROPER WEIGHT TO OBTAIN NEW POWER SETTING.

LEGEND

ALT. :	PRESSURE ALTITUDE	F.R. :	FULL RICH
M.P. :	MANIFOLD PRESSURE	A.R. :	AUTO-RICH
GPH :	U.S. GAL. PER HOUR	A.L. :	AUTO-LEAN
TAS :	TRUE AIRSPEED	C.L. :	CRUISING LEAN
KTS. :	KNOTS	M.L. :	MANUAL LEAN
S.L. :	SEA LEVEL	F.T. :	FULL THROTTLE

DATA AS OF 3/15/47 BASED ON: CALCULATED DATA

RED FIGURES ARE PRELIMINARY, DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-3. (Sheet 14 of 14 Sheets) Flight Operation Instruction Chart

LONG RANGE CRUISING TABLE

AIRPLANES: B-36 A
ENGINES: R-4360-25

6 ENGINES OPERATING
ZERO WIND

NACA STANDARD CONDITIONS

DATA AS OF 3-15-47
BASED ON CALCULATED DATA

THIS CHART SUMMARIZES THE RECOMMENDED LONG RANGE OPERATING CONDITIONS AND PREDICTS THE RANGE FOR THE CHANGE IN WEIGHT SHOWN.

CONDITIONS
NO ALLOWANCES INCLUDED
FLYING ALONE
40° C C.A.T.

GROSS WEIGHT 330,000-320,000								PRESSURE ALTITUDE FEET	GROSS WEIGHT 320,000-300,000							
CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS.	ST. AIR MILES	NAUT. AIR MILES		CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS	ST. AIR MILES	NAUT. AIR MILES
								25,000								
								20,000	193	2500	42.0	AR	1875	1.7	455	395
196	2440	39.4	AR	1670	1.0	239	207	15,000	193	2400	37.8	AR	1525	2.1	516	448
196	2380	36.8	AR	1445	1.1	255	221	10,000	193	2320	35.4	AR	1340	2.4	541	470
196	2300	35.6	AR	1285	1.2	265	230	5,000	193	2200	34.8	AR	1200	2.7	561	488

GROSS WEIGHT 300,000-280,000								PRESSURE ALTITUDE FEET	GROSS WEIGHT 280,000-260,000							
CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS.	ST. AIR MILES	NAUT. AIR MILES		CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS.	ST. AIR MILES	NAUT. AIR MILES
187	2520	42.8	AR	1970	1.6	458	397	25,000	181	2380	36.2	AR	1470	2.2	592	514
187	2380	36.6	AR	1490	2.2	556	482	20,000	181	2240	34.0	AR	1240	2.6	644	559
187	2280	34.8	AR	1295	2.5	588	510	15,000	181	2100	32.4	AR	1080	3.0	681	592
187	2120	33.6	AR	1135	2.8	620	533	10,000	181	1900	37.5	AL	805	4.0	845	733
187	2100	35.4	AL	865	3.7	752	653	5,000	181	1740	37.2	AL	730	4.4	862	748

GROSS WEIGHT 260,000-240,000								PRESSURE ALTITUDE FEET	GROSS WEIGHT 240,000-220,000							
CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS.	ST. AIR MILES	NAUT. AIR MILES		CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS.	ST. AIR MILES	NAUT. AIR MILES
								35,000	168	2440	38.6	AR	1690	1.9	573	497
174	2400	36.8	AR	1525	2.1	603	523	30,000	168	2120	32.2	AR	1135	2.8	778	676
176	2240	33.8	AR	1220	2.6	695	603	25,000	172	2100	34.4	AL	875	3.7	946	822
176	2100	34.6	AL	880	3.7	880	764	20,000	172	1820	36.0	AL	765	4.2	991	860
176	1860	37.2	AL	780	4.1	912	791	15,000	172	1660	35.4	AL	695	4.6	1008	875
176	1700	36.2	AL	705	4.6	932	809	10,000	172	1540	34.8	AL	635	5.1	1019	885
176	1580	35.8	AL	645	5.0	942	818	5,000	172	1420	34.6	AL	580	5.6	1028	892

SEE FOLLOWING PAGE FOR SPECIAL NOTES.

Figure A-4. (Sheet 1 of 2 Sheets) Long Range Cruising Table—6 Engine

LONG RANGE CRUISING TABLE

6 ENGINES OPERATING
ZERO WIND

AIRPLANES: B-36 A
ENGINES: R-4360-25

NACA STANDARD CONDITIONS

DATA AS OF 3-15-47
BASED ON CALCULATED DATA

THIS CHART SUMMARIZES THE RECOMMENDED LONG RANGE OPERATING CONDITIONS AND PREDICTS THE RANGE FOR THE CHANGE IN WEIGHT SHOWN.

CONDITIONS
NO ALLOWANCES INCLUDED
FLYING ALONE
40°C C.A.T.

GROSS WEIGHT 220,000-200,000								PRESSURE ALTITUDE FEET	GROSS WEIGHT 200,000-180,000							
CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS.	ST. AIR MILES	NAUT. AIR MILES		CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS.	ST. AIR MILES	NAUT. AIR MILES
162	2120	32.6	AR	1130	2.8	829	720	35,000	160	2100	32.8	AL	830	3.9	1108	961
162	1900	37.5	AL	800	4.0	1063	923	30,000	160	1700	35.6	AL	710	4.6	1185	1028
169	1800	36.2	AL	755	4.3	1076	935	25,000	164	1600	34.4	AL	665	4.9	1193	1035
169	1620	34.2	AL	675	4.8	1099	954	20,000	164	1460	33.4	AL	600	5.4	1212	1053
169	1400	34.0	AL	615	5.2	1114	967	15,000	164	1400	32.4	AL	550	5.9	1217	1055
169	1400	33.8	AL	565	5.7	1115	968	10,000	164	1400	30.6	AL	510	6.3	1203	1047
169	1400	32.0	AL	525	6.1	1109	962	5,000	164	1400	29.2	AL	480	6.7	1188	1031

GROSS WEIGHT 180,000-160,000								PRESSURE ALTITUDE FEET	GROSS WEIGHT 160,000-140,000							
CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS.	ST. AIR MILES	NAUT. AIR MILES		CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS.	ST. AIR MILES	NAUT. AIR MILES
156	1940	30.4	AL	720	4.5	1253	1087	35,000	150	1500	34.2	AL	610	5.3	1420	1232
156	1520	34.0	AL	625	5.1	1313	1139	30,000	150	1400	31.6	AL	540	5.9	1453	1262
160	1440	33.4	AL	585	5.5	1310	1137	25,000	154	1400	29.0	AL	510	6.3	1448	1257
160	1400	30.8	AL	535	6.0	1317	1142	20,000	154	1400	26.6	AL	470	6.8	1442	1251
160	1400	29.0	AL	495	6.5	1310	1137	15,000	154	1400	25.6	AL	435	7.4	1432	1243
160	1400	27.4	AL	460	7.0	1300	1128	10,000	154	1240	27.2	AL	400	8.0	1436	1246
160	1240	29.8	AL	425	7.6	1305	1132	5,000	154	1240	26.0	AL	375	8.6	1421	1233

NOTES:

1. VALUES SHOWN ARE BASED ON HEAVY WEIGHT IN EACH WEIGHT BAND.
2. HOURS REPRESENT FLIGHT DURATION FOR WEIGHT BAND SHOWN.
3. AS WEIGHT DECREASES, HOLD AIR SPEEDS SHOWN BY REDUCING POWER ACCORDING TO POWER SCHEDULE, FIG.IA-10. IT SHOULD NOT BE NECESSARY TO RESET POWER MORE OFTEN THAN EVERY TWO OR THREE HOURS.
4. USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM OVER 1900.
5. USE "LOW RPM" ENGINE COOLING FAN SETTING.
6. THE DATA SHOWN ABOVE WERE OBTAINED FROM TYPE A-1-6 CURVES, WHICH ARE CORRECTED FOR AUTOMATIC COOLING CONTROL.

Figure A-4. (Sheet 2 of 2 Sheets) Long Range Cruising Table—6 Engine

LONG RANGE CRUISING TABLE

AIRPLANES: B-36A
ENGINES: R-4360-25

3 ENGINES OPERATING
3 PROPELLERS FEATHERED
ZERO WIND

NACA STANDARD CONDITIONS

DATA AS OF 3-15-47
BASED ON CALCULATED DATA

THIS CHART SUMMARIZES THE RECOMMENDED LONG RANGE OPERATING CONDITIONS AND PREDICTS THE RANGE FOR THE CHANGE IN WEIGHT SHOWN.

CONDITIONS
NO ALLOWANCES INCLUDED
FLYING ALONE
40°C C.A.T.

GROSS WEIGHT 220,000-200,000								PRESSURE ALTITUDE FEET	GROSS WEIGHT 200,000-180,000							
CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS.	ST. AIR MILES	NAUT. AIR MILES		CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS.	ST. AIR MILES	NAUT. AIR MILES
								25,000								
								20,000								
								15,000	153	2520	43.2	AR	984	3.3	633	549
								10,000	153	2460	40.8	AR	877	3.4	654	567
160	2520	43.6	AR	977	3.3	568	493	5,000	153	2400	38.0	AR	747	4.3	711	617

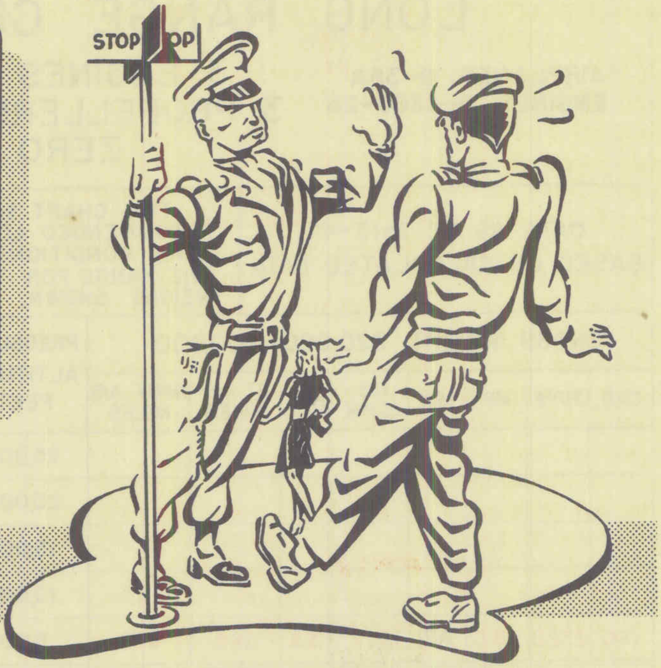
GROSS WEIGHT 180,000-160,000								PRESSURE ALTITUDE FEET	GROSS WEIGHT 160,000-140,000							
CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS.	ST. AIR MILES	NAUT. AIR MILES		CAS	RPM	MP	MIX.	U.S. G.P.H.	HRS.	ST. AIR MILES	NAUT. AIR MILES
								25,000	137	2380	35.8	AR	725	4.4	901	782
145	2460	39.8	AR	869	3.7	736	639	20,000	137	2260	34.0	AR	630	5.1	959	832
145	2380	37.0	AR	733	4.4	804	697	15,000	137	2100	32.6	AR	545	5.9	1018	884
145	2300	35.2	AR	652	4.9	837	726	10,000	137	1900	37.4	AL	400	8.0	1280	1111
145	2160	34.4	AR	590	5.5	855	742	5,000	137	1760	37.2	AL	364	8.8	1302	1130

NOTES:

1. VALUES SHOWN ARE BASED ON HEAVY WEIGHT IN EACH WEIGHT BAND.
2. HOURS REPRESENT FLIGHT DURATION FOR WEIGHT BAND SHOWN.
3. AS WEIGHT DECREASES, HOLD AIR SPEEDS SHOWN BY REDUCING POWER ACCORDING TO POWER SCHEDULE, FIG. I A-10. IT SHOULD NOT BE NECESSARY TO RESET POWER MORE OFTEN THAN EVERY TWO OR THREE HOURS.
4. USE DUAL TURBOSUPERCHARGER OPERATION WITH ENGINE RPM OVER 1900.
5. USE "LOW RPM" ENGINE COOLING FAN SETTING.
6. THE DATA SHOWN ABOVE WERE OBTAINED FROM TYPE A-1-3 CURVES, WHICH ARE CORRECTED FOR AUTOMATIC COOLING CONTROL.

Figure A-5. Long Range Cruising Table—3 Engine

CRUISE CONTROL DATA



APPENDIX IA

A-1A. GENERAL.

A-2A. The performance charts in this section, since they are presented in graphical form, permit more precise cruise control than the charts of Appendix I and offer more versatility in the planning of complex missions. They are based on calculated data and will be replaced with charts based on flight test data when the necessary flight testing has been completed.

A-3A. All charted performance and power settings are for NACA standard atmosphere and "LOW RPM" engine cooling fan setting. The "HIGH RPM" fan setting should not be used unless abnormally high ambient air temperatures make cylinder cooling critical, because high fan rpm diverts more engine power from the propellers. Normal cooling losses are taken into account in the performance, but cooling air exit settings are not specified, since cooling is automatically controlled in the B-36 airplane.

A-4A. POWER PLANT CHARTS.

A-5A. BMEP POWER SCHEDULE (TYPE M-1 CURVE).

A-6A. This chart summarizes recommended power settings for R-4360-25 engines from 28 to 100 per cent of normal rated power. This lower portion of the main chart indicates engine rpm, which is based on 150 bmep or propeller load, except where limited by propeller governing, propeller vibration, or turbosupercharger characteristics. Propeller governing establishes the minimum rpm of 1240. The cross-hatched areas show the power regions where rpm must be increased to avoid excessive propeller vibrations. The dashed line indicates the deviation from optimum rpm which is necessary because of turbo limits when operating at 35,000 feet.

A-7A. The upper part of the main chart shows curves of manifold pressure required to maintain power at the charted rpm with 40°C carburetor air temperature. Due to conservatism in calculating back pressure effects, the charted manifold pressures are probably higher than will be required under normal operating conditions.

A-8A. The sloping lines on the right side of the chart provide corrections to manifold pressure for varying carburetor air temperature. The method of correction is illustrated by the chart example.

A-9A. FUEL FLOW CHARTS (TYPE M-2 CURVES).

A-10A. These charts indicate six-engine fuel flow for a wide range of power settings and include corrections for carburetor air temperature and altitude. The M-2R chart is for operation with auto-rich mixture control setting, and the M-2L chart is for auto-lean.

A-11A. This type of chart is useful mainly for checking fuel flow when odd power settings are being used, for example, during formation flying. When the recommended power settings of the "BMEP Power Schedule" are being used, it is not necessary to consult the fuel flow charts, since range problems can be solved by means of the flight operating charts, paragraph A-13A.

A-12A. To obtain partial engine fuel flows from the type M-2 curves, determine the six-engine fuel flow as indicated by the chart example, divide this figure by six, and multiply by the number of engines operating.

A-13A. FLIGHT OPERATING CHARTS.

A-14A. NAUTICAL MILES PER GALLON CHARTS (TYPE A-1 CURVES).

A-15A. These curves show the nautical miles per gallon and air speed that may be expected for various gross weights and altitudes when recommended operating conditions from the "BMEP Power Schedule" are used. Charts for six-engine operation (A-1-6) and three-engine operation (A-1-3) are included. Miles per gallon and airspeeds for five-engine or four-engine operation may be obtained by interpolation.

A-16A. The type A-1 curves are the basis of the charts for long range operation, paragraphs A-19A and A-21A; and since the latter are more conveniently used for long range problems, the A-1 curves are primarily useful for other types of cruising, such as constant speed or constant power.

A-17A. Recommended long range cruising speeds are marked with an X on the A-1 curves. The manifold pressures to be used with the charted rpm are obtained from the "BMEP Power Schedule."

A-18A. Uses of the nautical miles per gallon charts in cruise control are illustrated in the examples of paragraph A-26A.

A-19A. LONG RANGE SUMMARY CURVES (TYPE A-2 CURVES).

A-20A. Type A-2 curves summarize the recommended operating conditions for long range. The power settings shown are based on the "BMEP Power Schedule" (M-1), and the cruising speeds on the nautical miles per gallon curves (A-1). Types A-2-6 (six-engine) and A-2-3 (three-engine) are included.

A-21A. LONG RANGE PREDICTION CURVES (TYPE A-3 CURVES).

A-22A. These curves are used to predict air miles and cruising time when the flight is made under long range cruising conditions, but they are applicable only when the recommended air speeds and power settings of the type A-2 charts are maintained.

A-23A. Charts are presented for six-engine operation (A-3-6) and three-engine operation (A-3-3), showing distances and times for a wide range of gross weights and altitudes. An illustrative example of their use is included in paragraph A-26A.

A-24A. CLIMB CONTROL CHART (TYPE A-6 CURVE).

A-25A. This chart is used for predicting the time and fuel for climb and the horizontal distance covered during climb with six engines at normal rated power. Application of the charted data is illustrated in the same problems of paragraph A-26A.

A-26A. EXAMPLES.

A-27A. To clarify the preceding statements, the following examples are given. For purposes of illustration, it is assumed that the airplane weight, less fuel, oil, and bombs, is 150,000 pounds. Fuel and oil are loaded in the ratio of 18:1 by volume (14.4:1 by weight); fuel weighs six pounds per gallon. Oil consumption is 3.5 per cent of the fuel consumption by weight.

A-28A. EXAMPLE A.

A-29A. It is desired to ferry a B-36 over water to another base 3500 nautical miles away. How much fuel and time will be required for the flight, and how much extra equipment can be carried if the initial gross weight is limited to 278,000 pounds? Three hours reserve fuel is required, and the flight is to be made at 5,000 feet altitude.

A-30A. The fuel for warm-up, take-off, and climb to 5,000 feet is read from the "Climb Control Chart" (A-6) as 344 plus 250, or 594 gallons, and time to climb is eight minutes.

A-31A. The initial cruising gross weight at 5,000 feet is 278,000—6.21 x 594, or 274,300 pounds. Entering the "Long Range Prediction Curves" (A-3-6) at this gross weight, a reference figure of 1600 is read from the range scale. The required range is added to this figure, giving 1600 plus 3500, or 5100 nautical miles. The final cruising gross weight is found, opposite 5100 miles, to be 194,000 pounds. Fuel and oil consumed in cruising is thus 274,300—194,000, or 80,300 pounds. The cruising fuel is 8,300/6.21, or 12,900 gallons.

A-32A. Entering the time curve at the initial and final cruising gross weights, reference figures of 9.0 and 30.5 respectively are obtained. The difference, 21.5 hours, represents the cruising time required.

A-33A. To determine the reserve fuel, the flight time is extended three hours to 33.5. The gross weight opposite this point is 186,000 pounds. The fuel and oil consumed in three hours would thus be 194,000—186,000, or 8,000 pounds. Three hours reserve fuel would be 8,000/6.21, or 1290 gallons.

A-34A. The total fuel load is 594 plus 12,900 plus 1290, or 14,784 gallons, and the total weight of fuel and oil is 6.42 x 14,784, or 94,800 pounds. The weight available for fuel, oil, and cargo is 278,000—150,000, or 128,000 pounds. Therefore, 128,000—94,800, or approximately 33,000 pounds of extra equipment may be carried. The total flight time is 8 minutes (climb) plus 21.5 hours (cruise), or nearly 22 hours.

A-35A. The above example assumes zero wind. Wind velocity, if known, should be taken into account by calculating air miles to be flown through the wind and using this distance rather than ground distance in determining fuel requirements. Air miles are calculated as ground distance times true air speed divided by ground speed.

A-36A. Since the fuel load was calculated on the basis of long range cruising, it is essential that the operating conditions of the "Long Range Summary Curves" (A-2-6) be followed. The predicted range and time (A-3-6) are based on resetting power each time the gross weight is reduced to an integral multiple of 20,000 pounds, corresponding to intervals of time varying from five to seven hours for this particular flight. However, slightly better range can be obtained by resetting power at intervals of two or three hours.

A-37A. EXAMPLE B.

A-38A. With the same gross weight, range, and hours of reserve fuel as in Example A, how much fuel and time will be required, and how much extra equipment can be carried if the flight is made at constant power, corresponding to maximum power in auto-lean mixture?

A-39A. Fuel for warm-up, take-off, and climb and time to climb to 5,000 feet are the same as in example A—594 gallons and eight minutes, respectively. The initial cruising gross weight is therefore also the same, 274,300 pounds.

A-40A. Entering the six-engine "Nautical Miles Per Gallon" (A-1-6) curves for 5,000 feet, the maximum power in auto-lean is found to be 2100 rpm. The fuel and time required for 3500 nautical miles may be determined as follows:

Gross Weight Pounds	Average Mi/Gal	Gallons* Fuel	Range Nautical Miles	Avg. True Speed mph	Time** Hours
274,300					
	.215	2,300	495	218	2.6
260,000					
	.220	3,220	709	223	3.7
240,000					
	.225	3,220	725	228	3.7
220,000					
	.230	3,220	741	232	3.7
200,000					
	.234	3,220	754	235	3.7
180,000					
	.235	320	* 76	237	.4
178,000		15,500	3,500		17.8

*Gallons fuel=change in gross weight/6.21.

**Time=1.152 x nautical miles/statute mph.

A-41A. The reserve fuel is determined in the same way as in Example A. Entering the A-3-6 time curve at the final cruising gross weight of 178,000 pounds, a reference figure of 36 is found. Adding three hours to this gives a second reference figure of 39, opposite which the gross weight is seen to be 170,000 pounds. The fuel and oil consumed in three hours under long range conditions would therefore be 178,000—170,000 or 8,000 pounds, and the reserve fuel would be 8,000/6.21, or 1,290 gallons.

A-42A. The total fuel load is 594 plus 15,500 plus 1,290, or 17,384 gallons, and the total weight of fuel and oil loading is 6.42 x 17,384, or 111,500 pounds. Subtracting this from the weight available for fuel, oil, and cargo leaves 128,000—111,500, or 16,500 pounds, which may be carried in the form of extra equipment or other pay load. The total flight time is approximately 18 hours.

A-43A. Power settings for this type of flight are obtained from the'BMEP Power Schedule" (M-1).

TYPE A-2-6 CURVE

LONG RANGE SUMMARY CURVES

6 ENGINE

N.A.C.A. STANDARD CONDITIONS

CORRECTED FOR COOLING DRAG WITH AUTOMATIC COOLING CONTROL

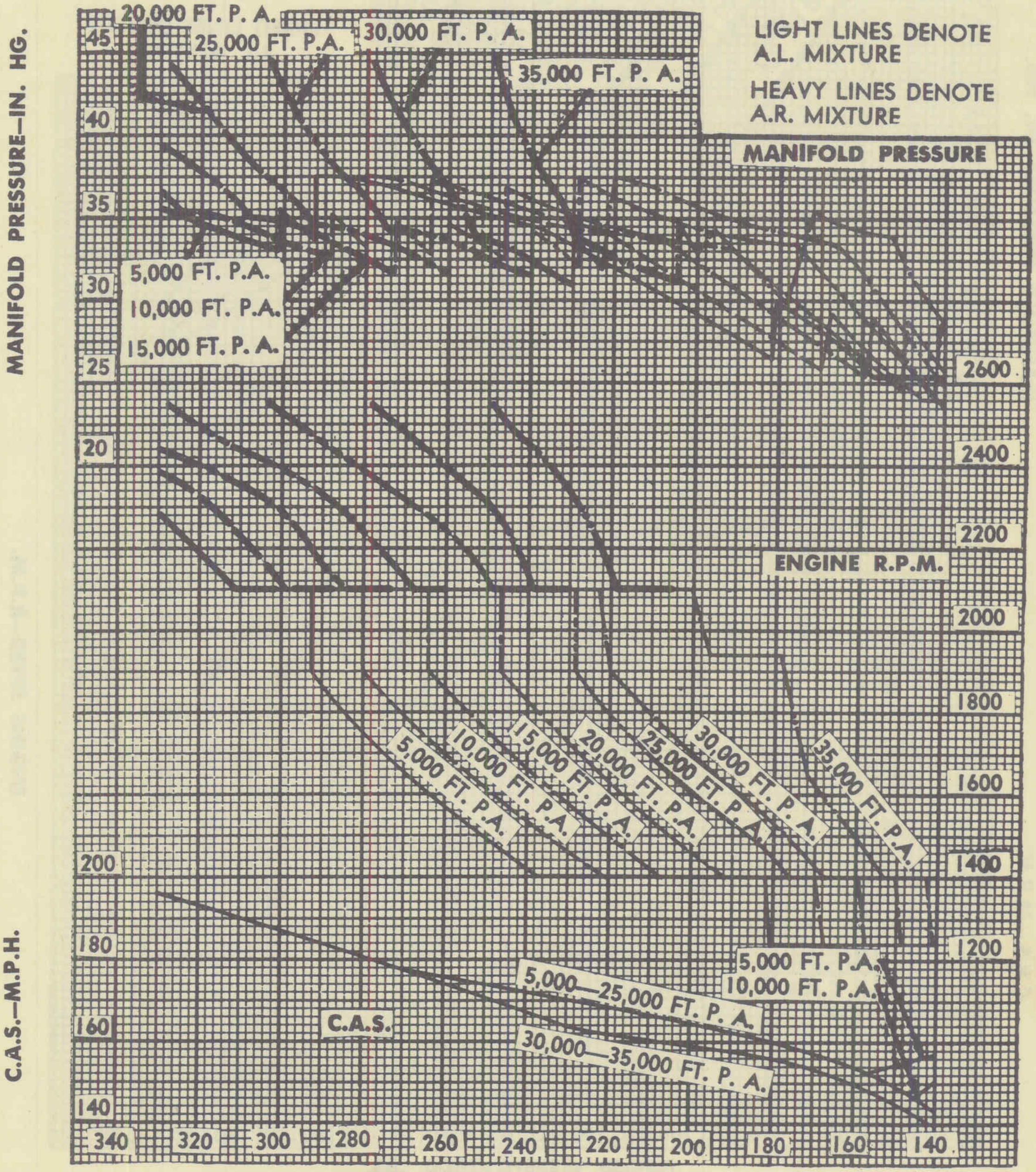


Figure A-1A. Long Range Summary Curves—6 Engine

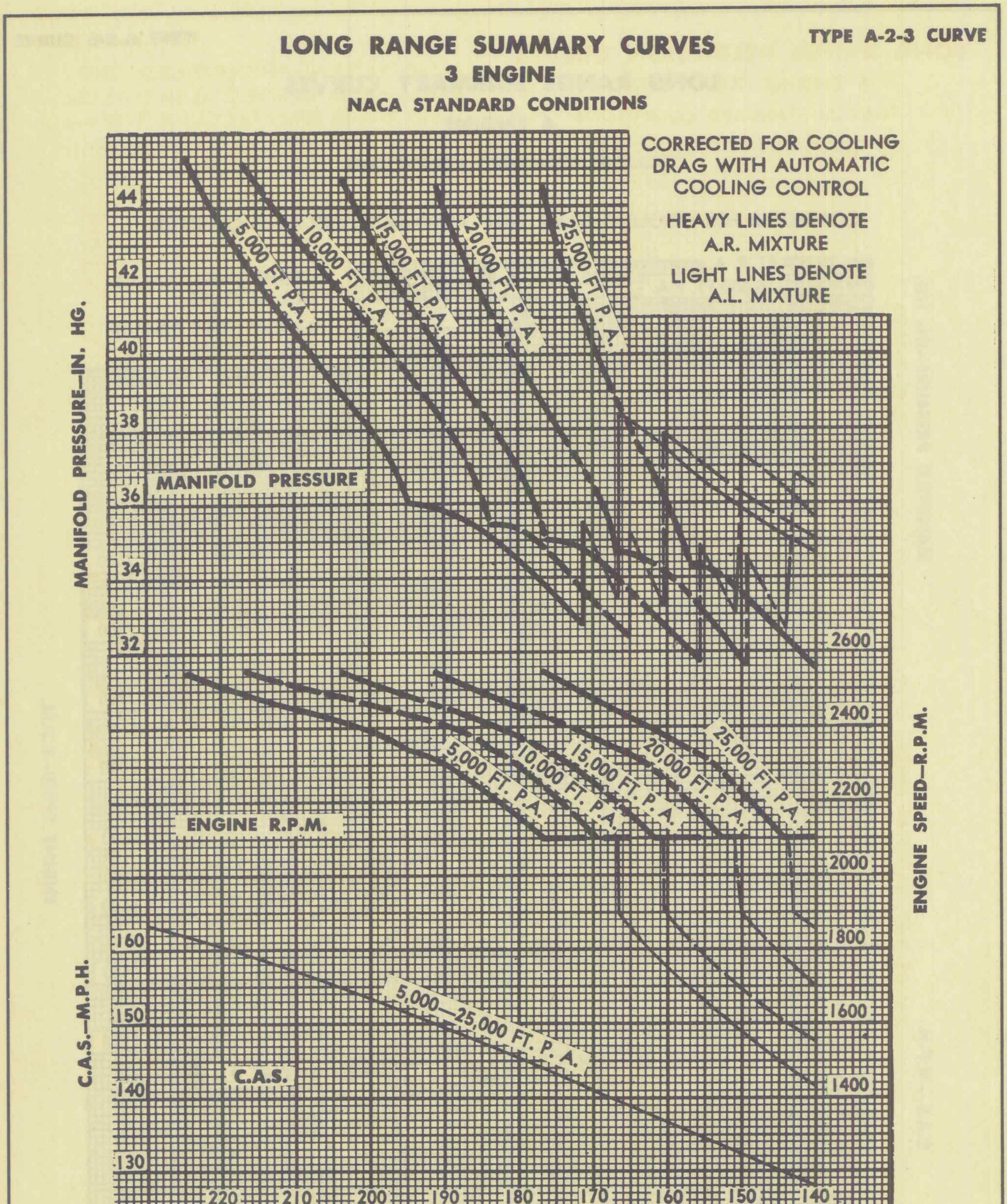


Figure A-2A. Long Range Summary Curves—3 Engine

LONG RANGE PREDICTION CURVES

6 ENGINE ZERO WIND

N.A.C.A. STANDARD CONDITIONS

TYPE A-3-6 CURVE

BASED ON FLYING RECOMMENDED LONG RANGE CRUISING SPEEDS AS SHOWN ON LONG RANGE SUMMARY CURVE (TYPE A-2-6).

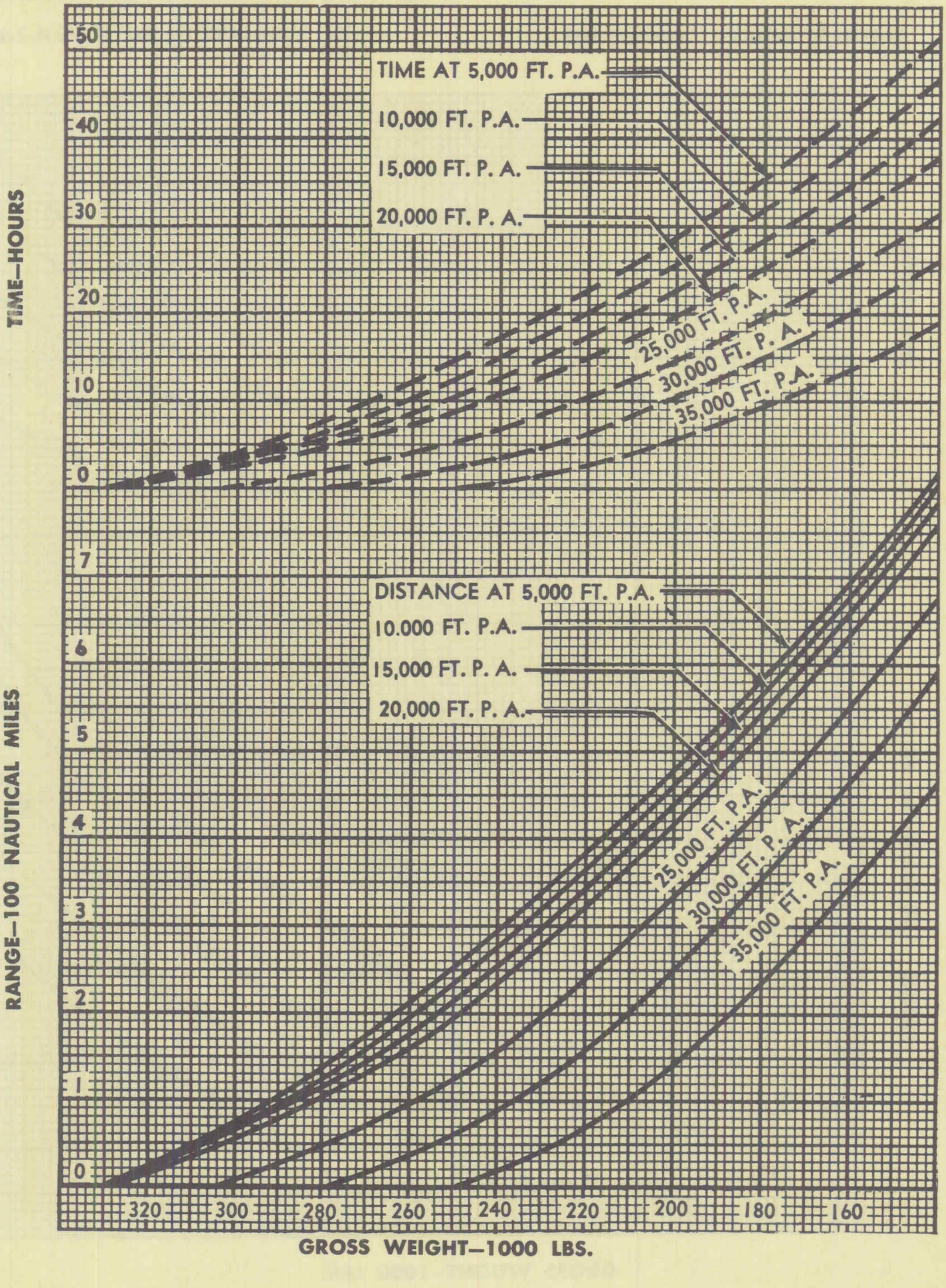


Figure A-3A. Long Range Prediction Curves—6 Engine

TYPE A-3-3 CURVE

LONG RANGE PREDICTION CURVES

3 ENGINE ZERO WIND

NACA STANDARD CONDITIONS

BASED ON FLYING RECOMMENDED LONG RANGE CRUISING SPEEDS AS SHOWN ON SUMMARY CURVE (TYPE A-2-3).

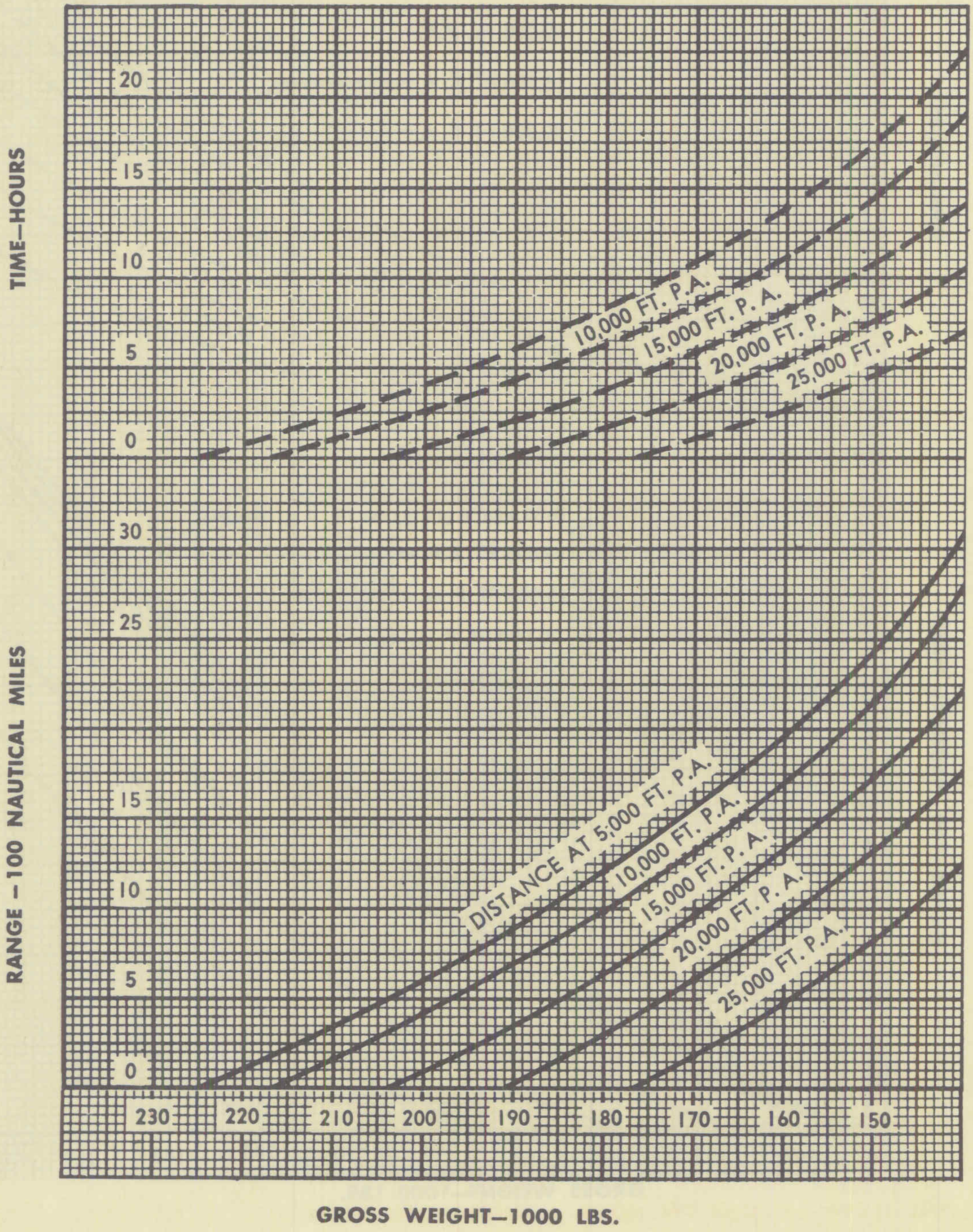
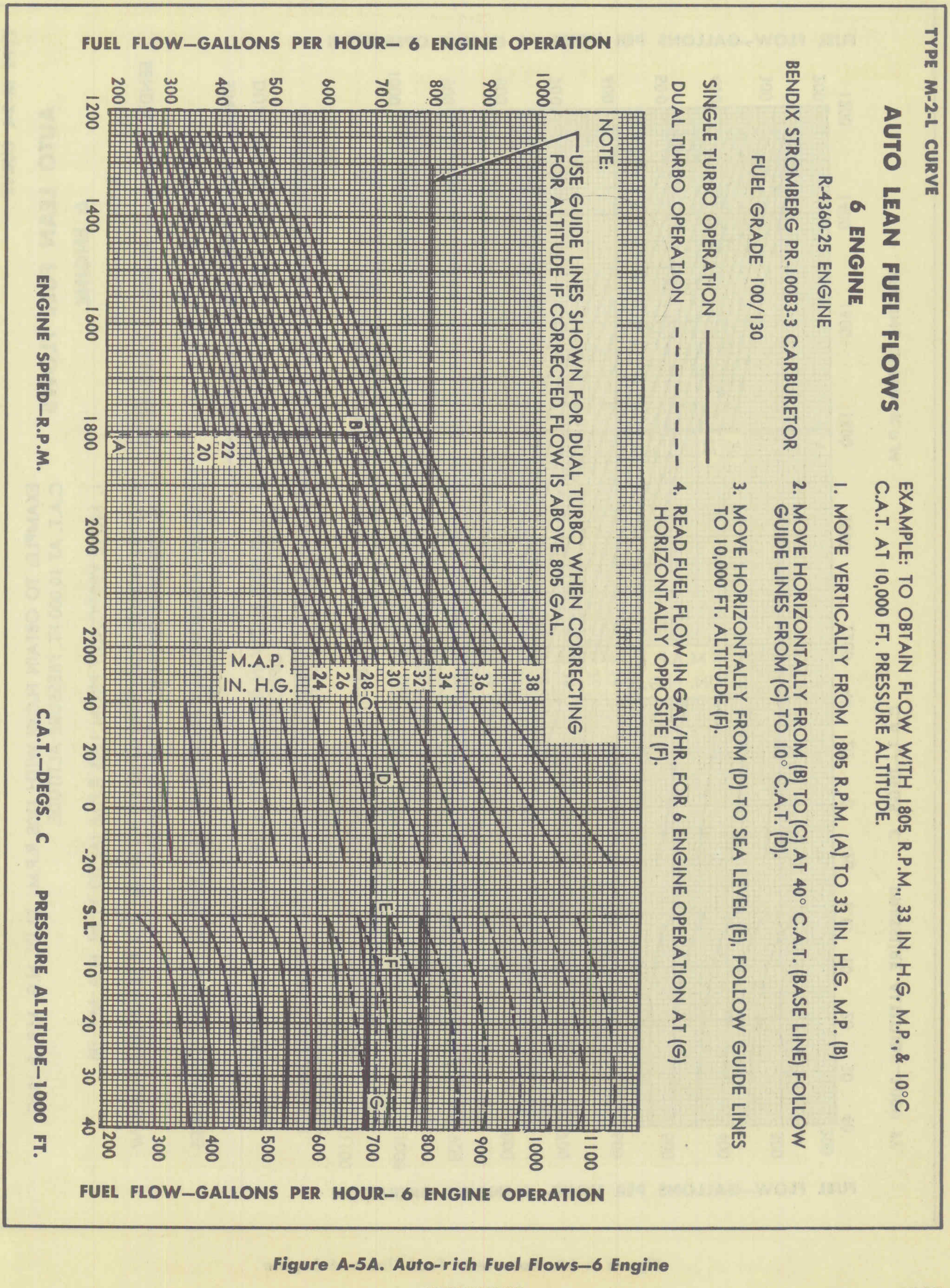


Figure A-4A. Long Range Prediction Curves—3 Engine



TYPE M-2-L CURVE

AUTO LEAN FUEL FLOWS

6 ENGINE

R-4360-25 ENGINE
BENDIX STROMBERG PR-100B3-3 CARBURETOR
FUEL GRADE 100/130

SINGLE TURBO OPERATION ————
DUAL TURBO OPERATION - - - - - - -

EXAMPLE: TO OBTAIN FLOW WITH 1805 R.P.M., 33 IN. H.G. M.P., & 10°C C.A.T. AT 10,000 FT. PRESSURE ALTITUDE.

1. MOVE VERTICALLY FROM 1805 R.P.M. (A) TO 33 IN. H.G. M.P. (B)
2. MOVE HORIZONTALLY FROM (B) TO (C) AT 40° C.A.T. (BASE LINE) FOLLOW GUIDE LINES FROM (C) TO 10° C.A.T. (D).
3. MOVE HORIZONTALLY FROM (D) TO SEA LEVEL (E). FOLLOW GUIDE LINES TO 10,000 FT. ALTITUDE (F).
4. READ FUEL FLOW IN GAL/HR. FOR 6 ENGINE OPERATION AT (G) HORIZONTALLY OPPOSITE (F).

NOTE:
USE GUIDE LINES SHOWN FOR DUAL TURBO WHEN CORRECTING FOR ALTITUDE IF CORRECTED FLOW IS ABOVE 805 GAL.

Figure A-5A. Auto-rich Fuel Flows—6 Engine

TYPE M-2-L CURVE

AUTO LEAN FUEL FLOWS

6 ENGINE

R-4360-25 ENGINE

BENDIX STROMBERG PR-100B3-3 CARBURETOR

FUEL GRADE 100/130

SINGLE TURBO OPERATION ————

DUAL TURBO OPERATION - - - - - - - -

EXAMPLE: TO OBTAIN FLOW WITH 1805 R.P.M., 33 IN. H.G. M.P., & 10°C C.A.T. AT 10,000 FT. PRESSURE ALTITUDE.

1. MOVE VERTICALLY FROM 1805 R.P.M. (A) TO 33 IN. H.G. M.P. (B)
2. MOVE HORIZONTALLY FROM (B) TO (C) AT 40° C.A.T. (BASE LINE) FOLLOW GUIDE LINES FROM (C) TO 10° C.A.T. (D).
3. MOVE HORIZONTALLY FROM (D) TO SEA LEVEL (E), FOLLOW GUIDE LINES TO 10,000 FT. ALTITUDE (F).
4. READ FUEL FLOW IN GAL/HR. FOR 6 ENGINE OPERATION AT (G) HORIZONTALLY OPPOSITE (F).

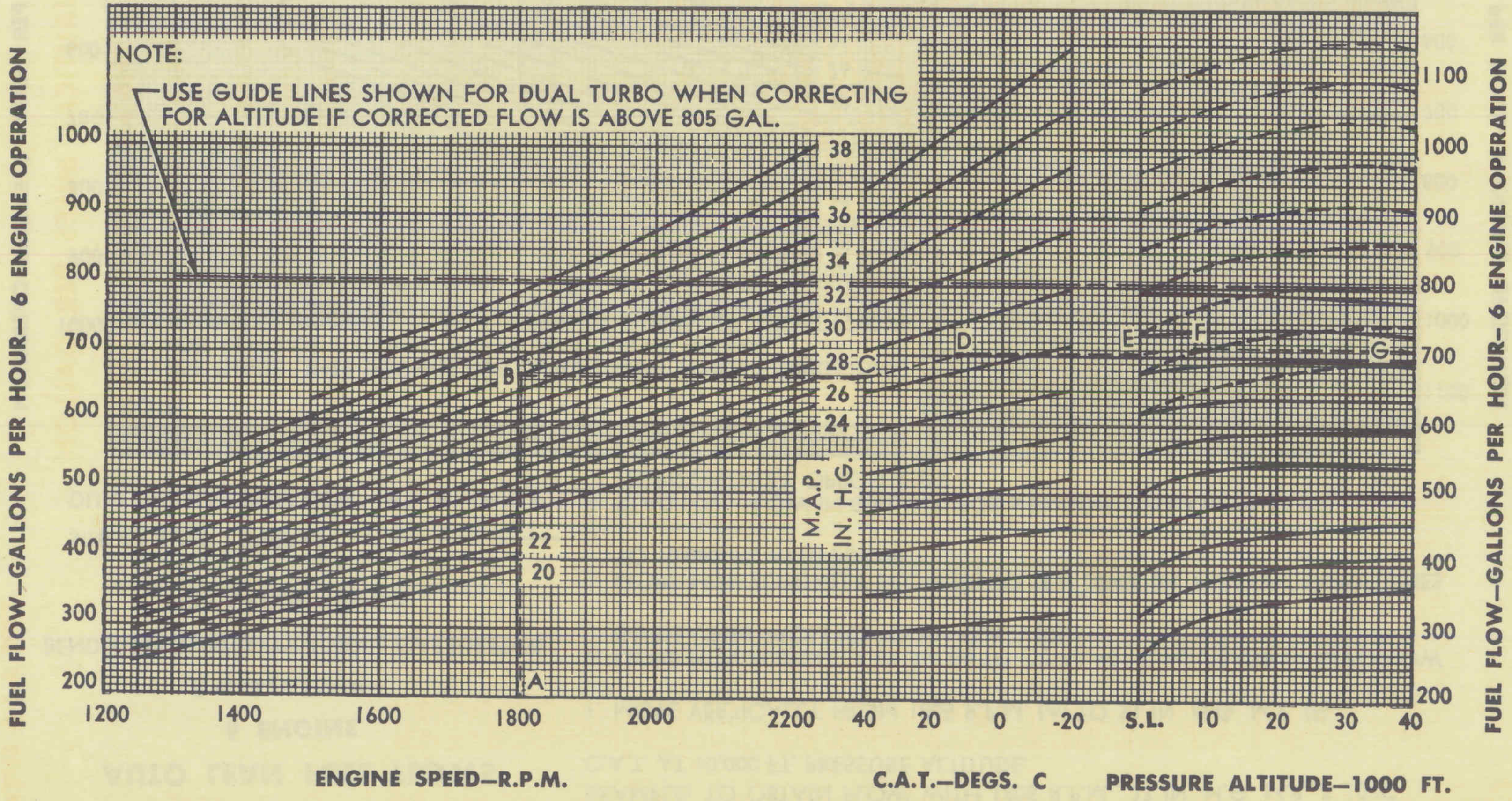


Figure A-6A. Auto-lean Fuel Flows—6 Engine

TYPE A-1-6 CURVE

NAUTICAL MILES PER GALLON

6 ENGINE 5,000 FT. ALTITUDE

NACA STANDARD CONDITIONS

CORRECTED FOR COOLING DRAG WITH AUTOMATIC COOLING CONTROL
"LOW R.P.M." ENGINE COOLING FAN SETTING
X—RECOMMENDED LONG RANGE CRUISING SPEEDS

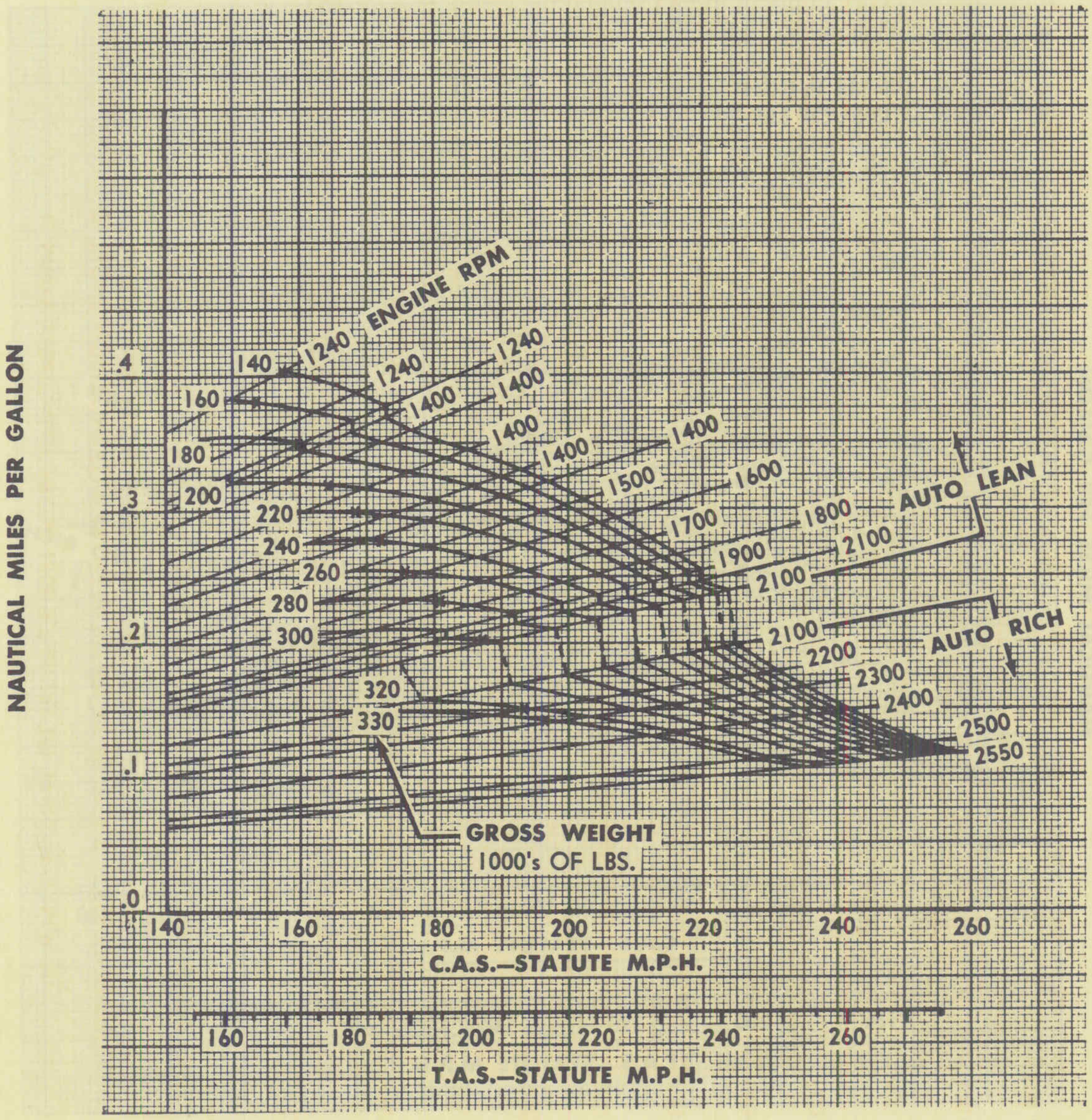


Figure A-7A. (Sheet 1 of 7 Sheets) Nautical Miles Per Gallon Curve—6 Engine

TYPE A-1-6 CURVE

NAUTICAL MILES PER GALLON

6 ENGINE 10,000 FT. ALTITUDE

NACA STANDARD CONDITIONS

CORRECTED FOR COOLING DRAG WITH AUTOMATIC COOLING CONTROL
"LOW R.P.M." ENGINE COOLING FAN SETTING
X—RECOMMENDED LONG RANGE CRUISING SPEEDS

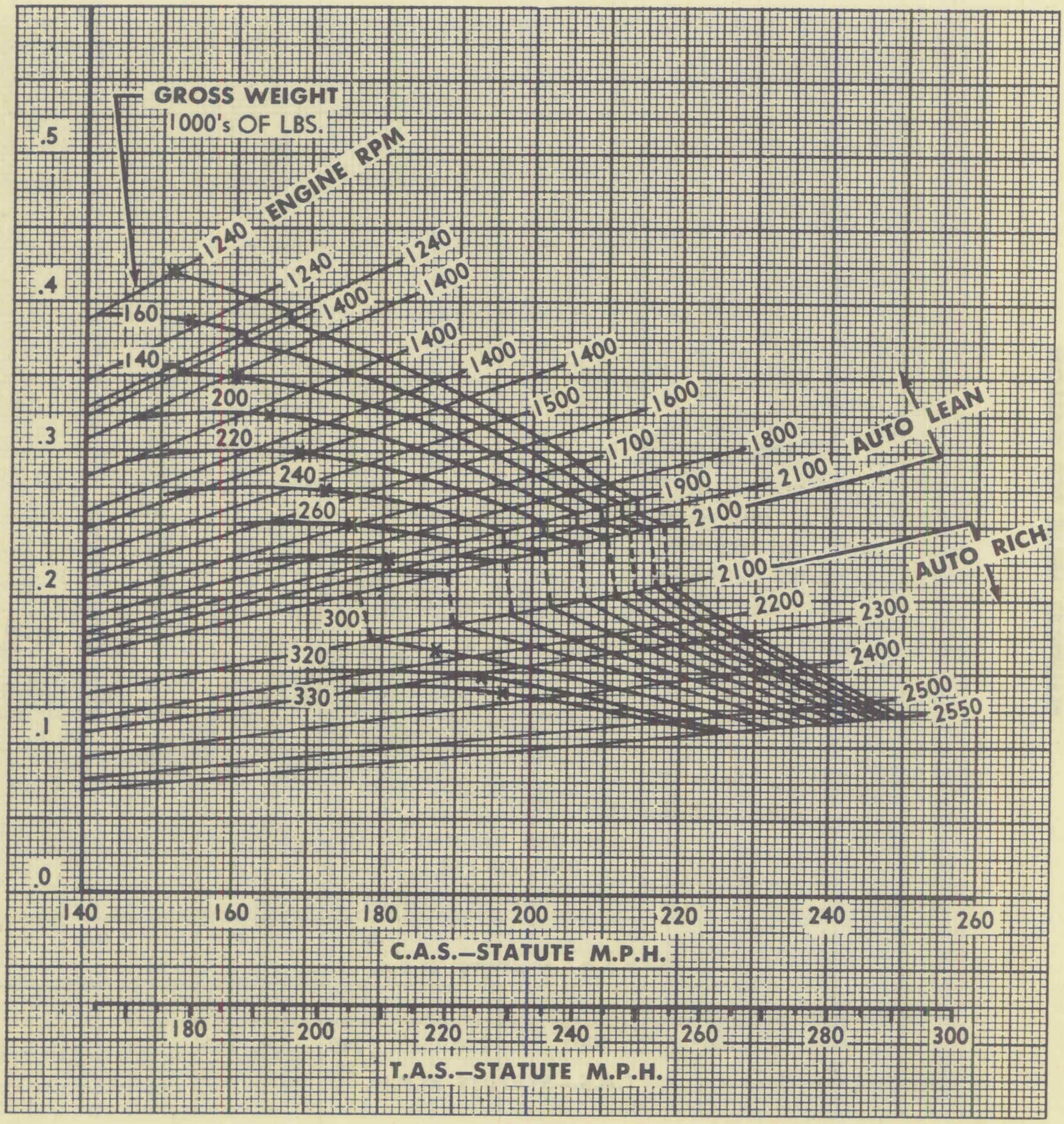


Figure A-7A. (Sheet 2 of 7 Sheets) Nautical Miles Per Gallon Curve—6 Engine

TYPE A-1-6 CURVE

NAUTICAL MILES PER GALLON

6 ENGINE 15,000 FT. ALTITUDE

NACA STANDARD CONDITIONS

CORRECTED FOR COOLING DRAG WITH AUTOMATIC COOLING CONTROL
"LOW R.P.M." ENGINE COOLING FAN SETTING
X—RECOMMENDED LONG RANGE CRUISING SPEEDS

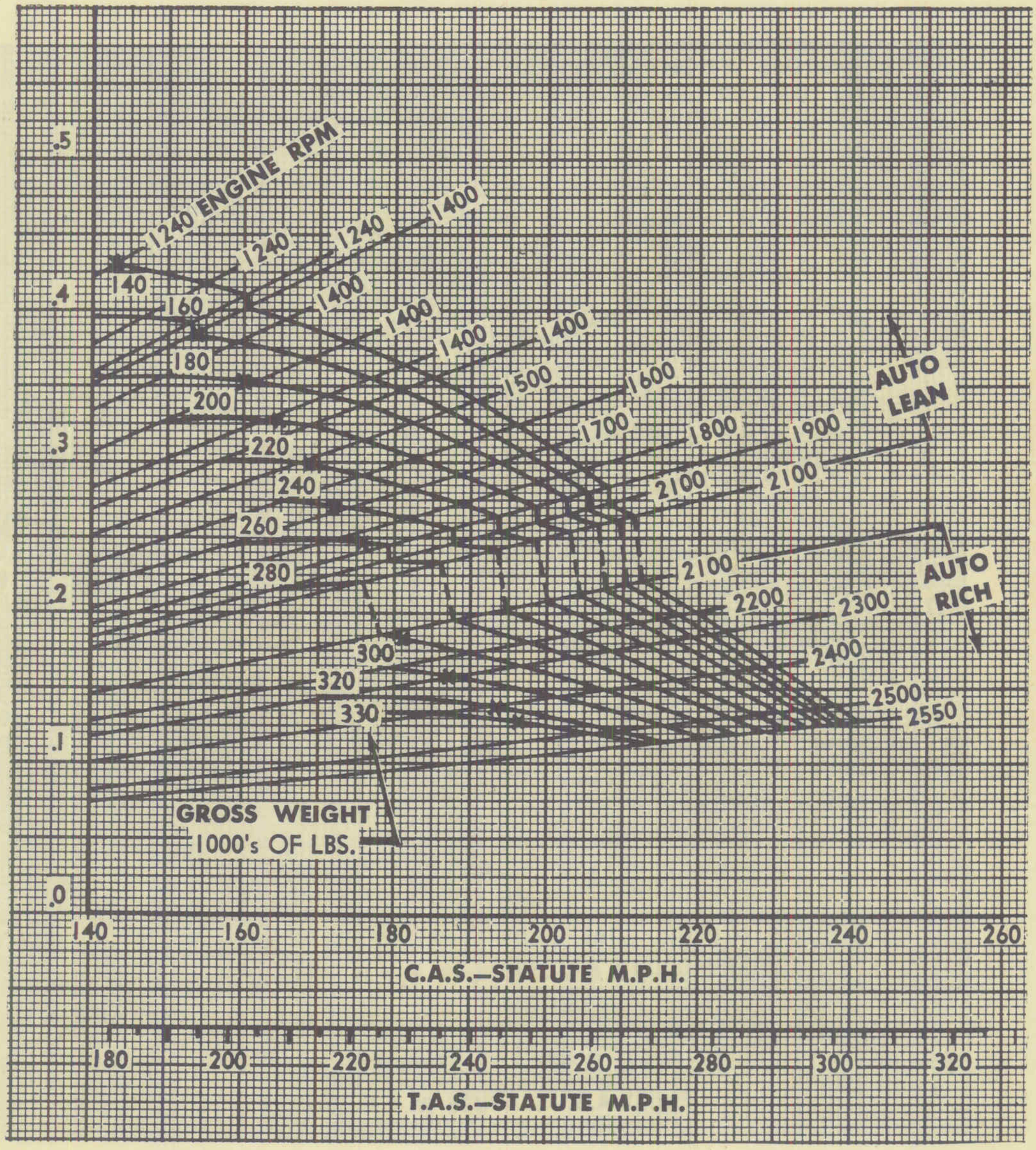


Figure A-7A. (Sheet 3 of 7 Sheets) Nautical Miles Per Gallon Curve—6 Engine

TYPE A-1-6 CURVE

NAUTICAL MILES PER GALLON

6 ENGINE 20,000 FT. ALTITUDE

NACA STANDARD CONDITIONS

CORRECTED FOR COOLING DRAG WITH AUTOMATIC COOLING CONTROL

"LOW R.P.M." ENGINE COOLING FAN SETTING

X—RECOMMENDED LONG RANGE CRUISING SPEEDS

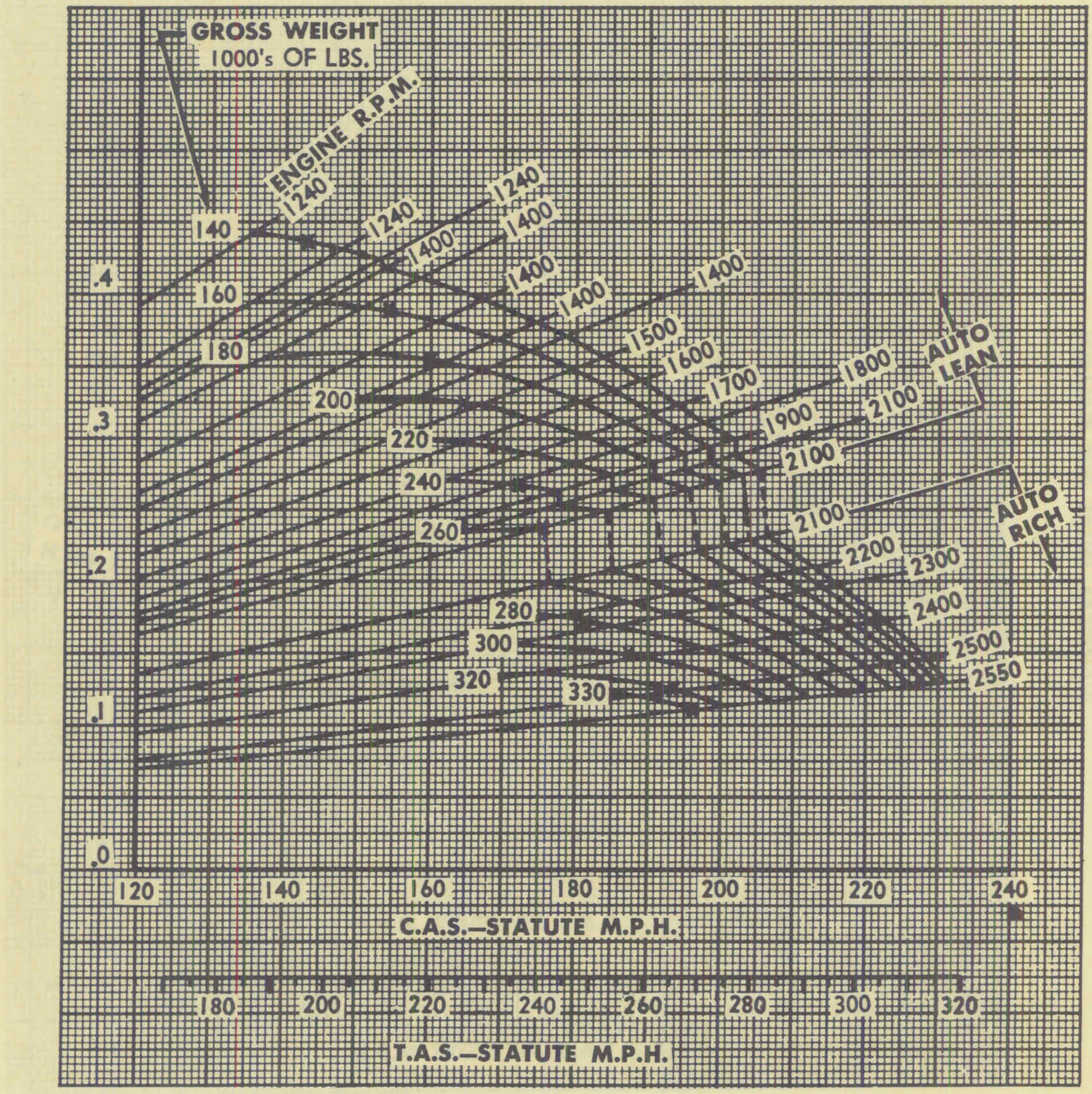


Figure A-7A. (Sheet 4 of 7 Sheets) Nautical Miles Per Gallon Curve—6 Engine

TYPE A-1-6 CURVE

NAUTICAL MILES PER GALLON

6 ENGINE 25,000 FT. ALTITUDE

NACA STANDARD CONDITIONS

CORRECTED FOR COOLING DRAG WITH AUTOMATIC COOLING CONTROL

"LOW R.P.M." ENGINE COOLING FAN SETTING

X—RECOMMENDED LONG RANGE CRUISING SPEEDS

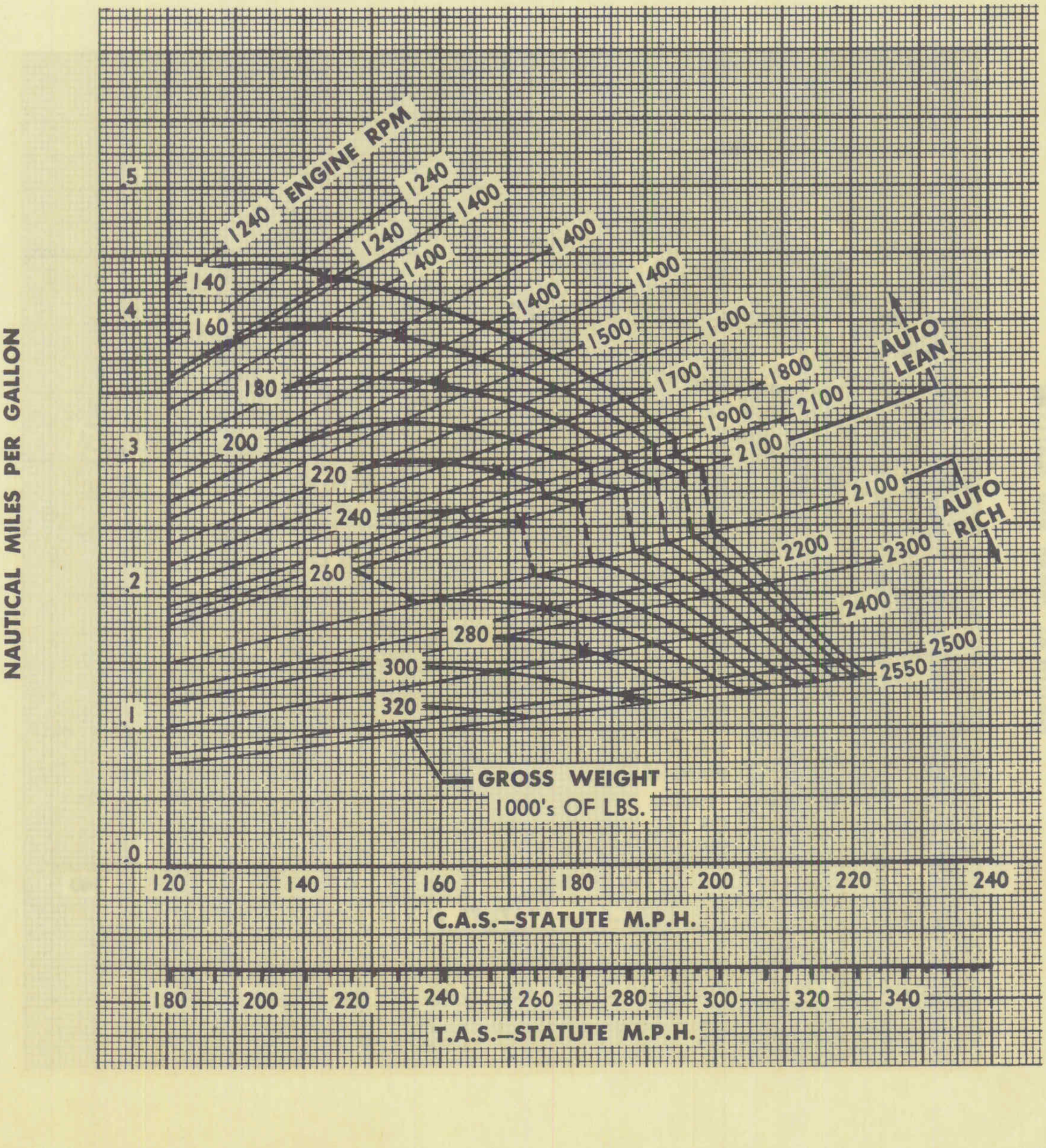


Figure A-7A. (Sheet 5 of 7 Sheets) Nautical Miles Per Gallon Curve—6 Engine

TYPE A-1-6 CURVE

NAUTICAL MILES PER GALLON

6 ENGINE 30,000 FT. ALTITUDE

NACA STANDARD CONDITIONS

CORRECTED FOR COOLING DRAG WITH AUTOMATIC COOLING CONTROL

"LOW R.P.M." ENGINE COOLING FAN SETTING

X—RECOMMENDED LONG RANGE CRUISING SPEEDS

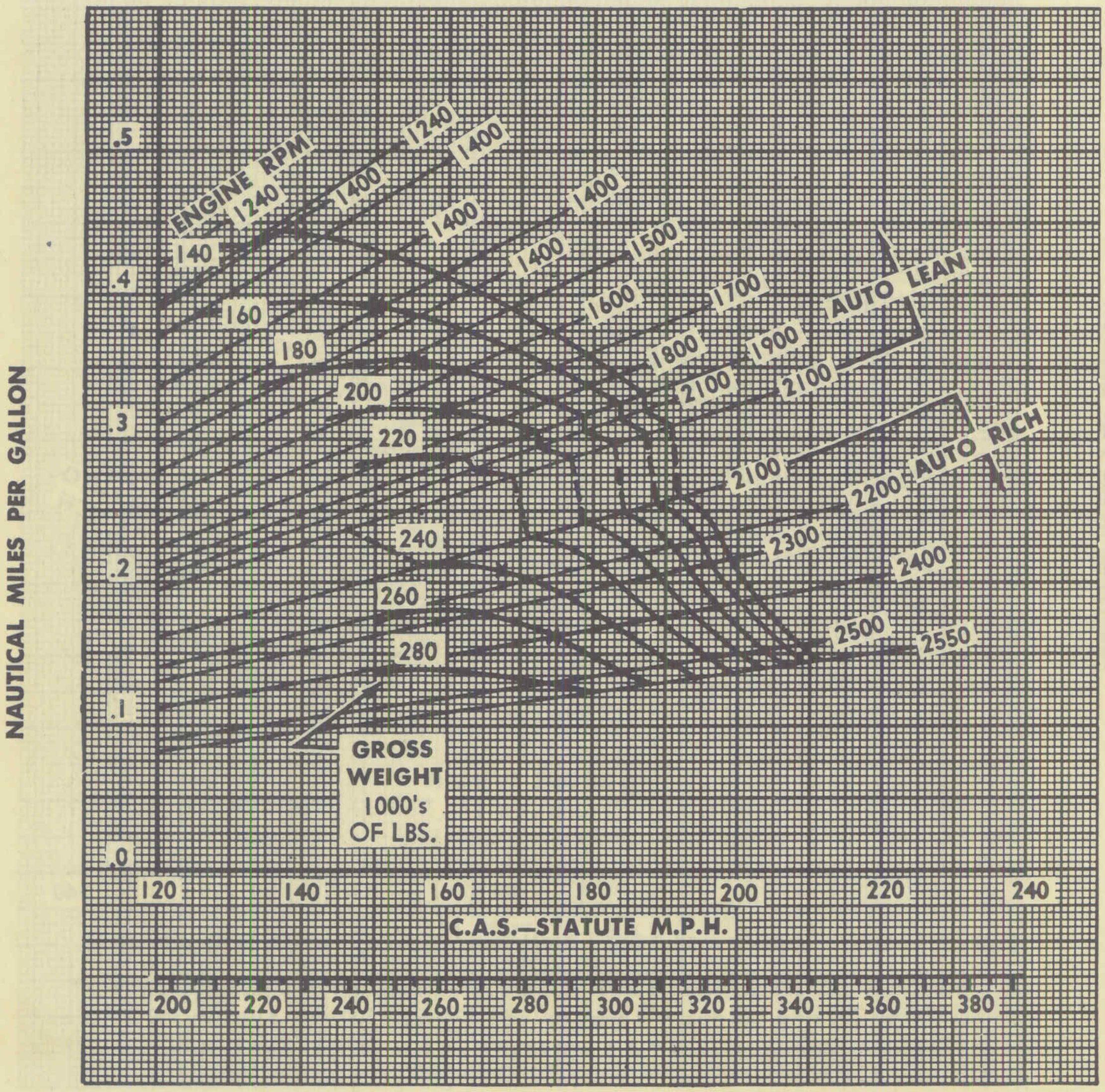


Figure A-7A. (Sheet 6 of 7 Sheets) Nautical Miles Per Gallon Curve—6 Engine

TYPE A-1-6 CURVE

NAUTICAL MILES PER GALLON

6 ENGINE 35,000 FT. ALTITUDE

NACA STANDARD CONDITIONS

CORRECTED FOR COOLING DRAG WITH AUTOMATIC COOLING CONTROL

"LOW R.P.M." ENGINE COOLING FAN SETTING

X—RECOMMENDED LONG RANGE CRUISING SPEEDS

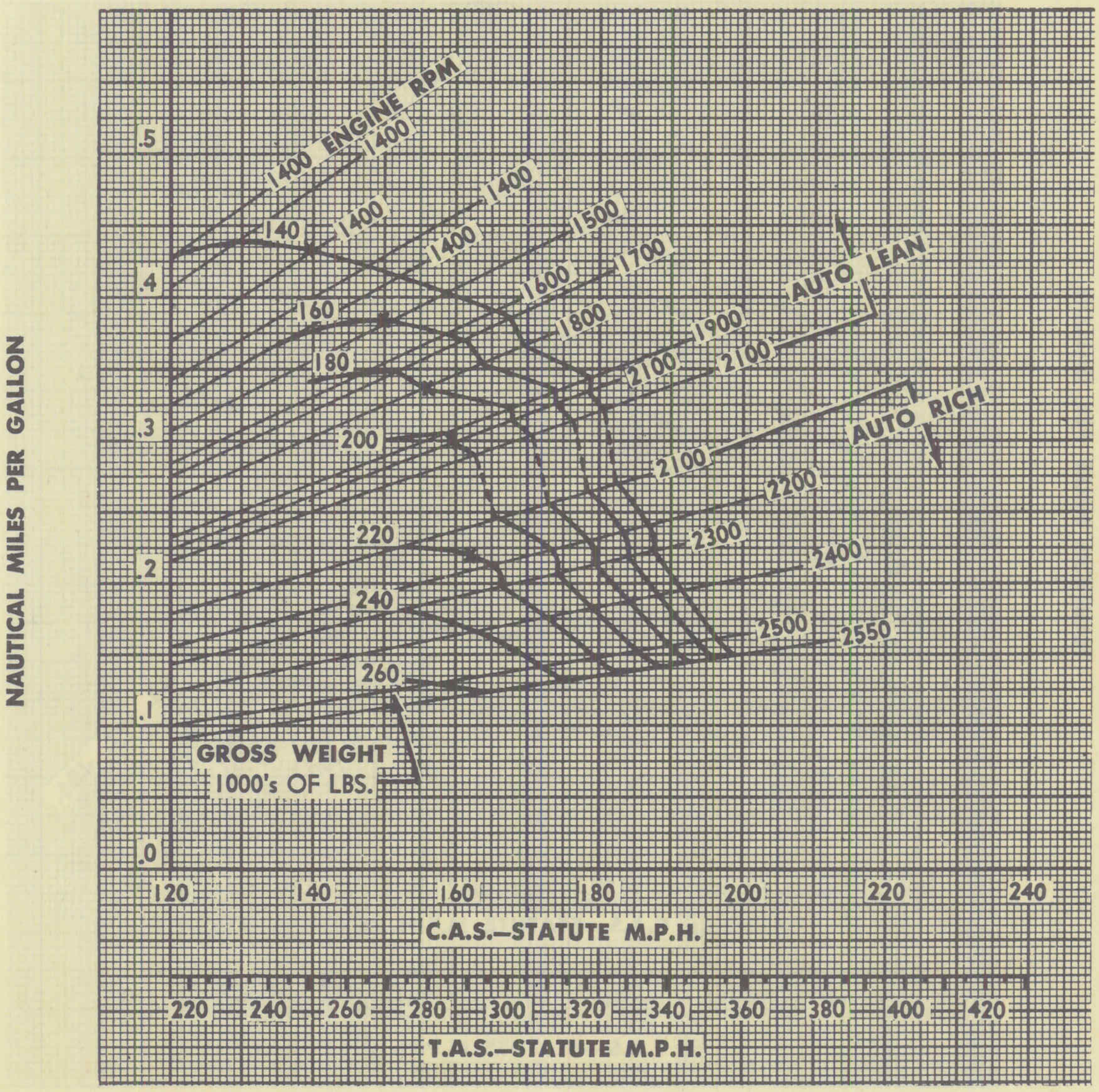


Figure A-7A. (Sheet 7 of 7 Sheets) Nautical Miles Per Gallon Curve—6 Engine

TYPE A-1-3 CURVE

NAUTICAL MILES PER GALLON

3 ENGINE 5.000 FT. ALTITUDE

NACA STANDARD CONDITIONS

CORRECTED FOR COOLING DRAG WITH AUTOMATIC COOLING CONTROL

"LOW R.P.M." ENGINE COOLING FAN SETTING

X—RECOMMENDED LONG RANGE CRUISING SPEEDS

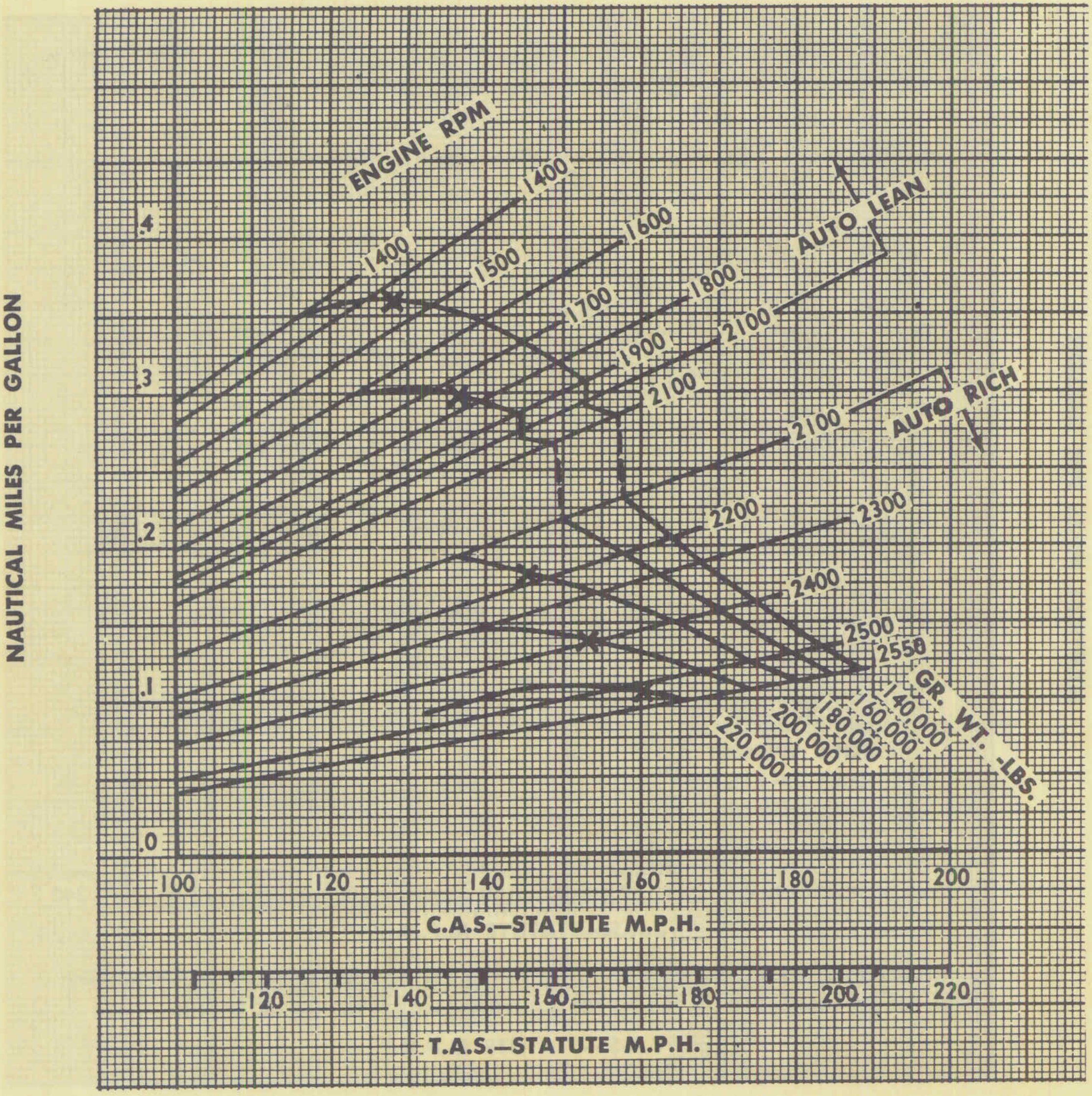


Figure A-8A. (Sheet 1 of 5 Sheets) Nautical Miles Per Gallon Curve—3 Engine

TYPE A-1-3 CURVE

NAUTICAL MILES PER GALLON

3 ENGINE 10,000 FT. ALTITUDE

NACA STANDARD CONDITIONS

CORRECTED FOR COOLING DRAG WITH AUTOMATIC COOLING CONTROL
"LOW R.P.M." ENGINE COOLING FAN SETTING
X—RECOMMENDED LONG RANGE CRUISING SPEEDS

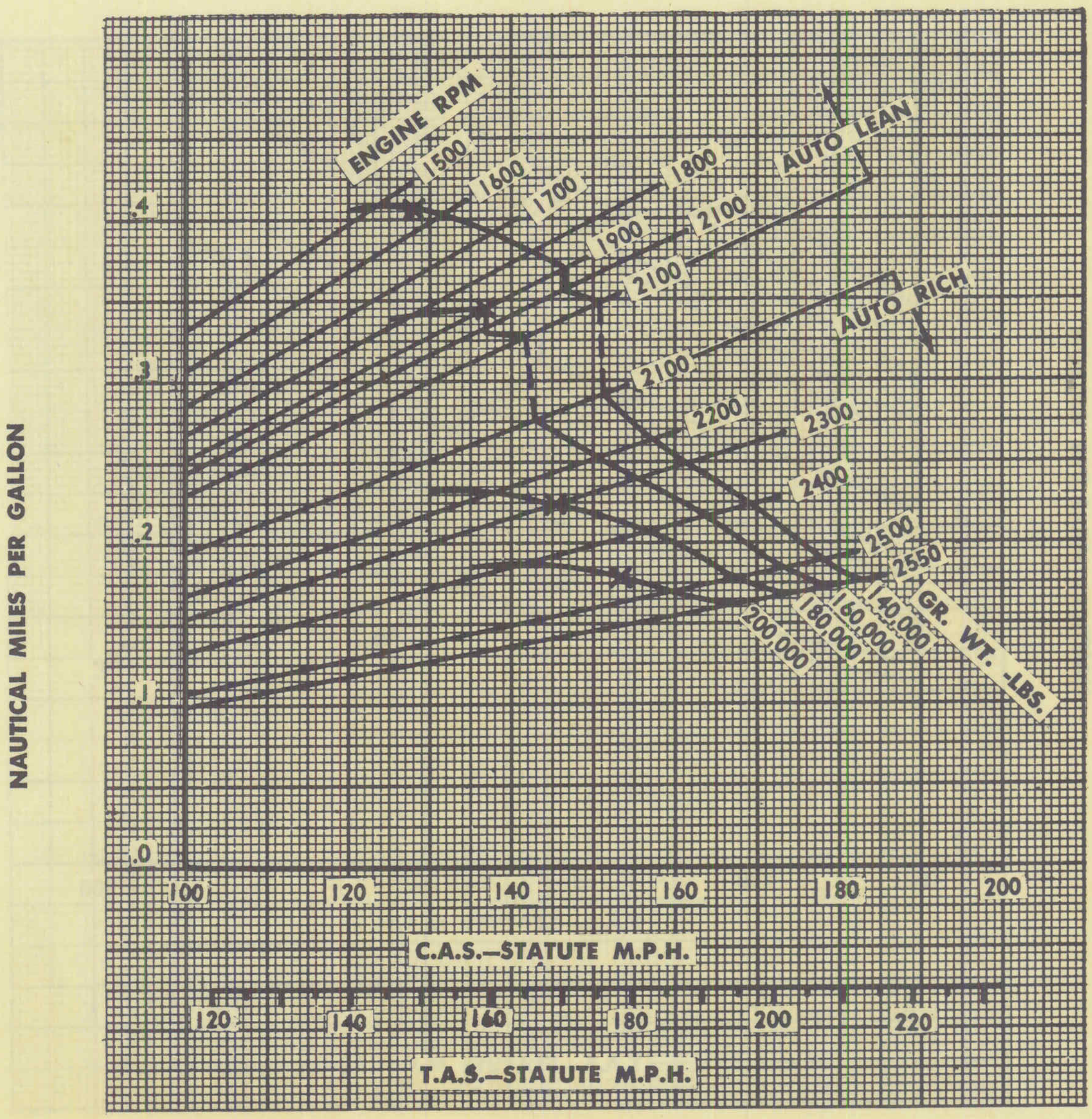


Figure A-8A. (Sheet 2 of 5 Sheets) Nautical Miles Per Gallon Curve—3 Engine

TYPE A-1-3 CURVE

NAUTICAL MILES PER GALLON

3 ENGINE 15,000 FT. ALTITUDE

NACA STANDARD CONDITIONS

CORRECTED FOR COOLING DRAG WITH AUTOMATIC COOLING CONTROL

"LOW R.P.M." ENGINE COOLING FAN SETTING

X—RECOMMENDED LONG RANGE CRUISING SPEEDS

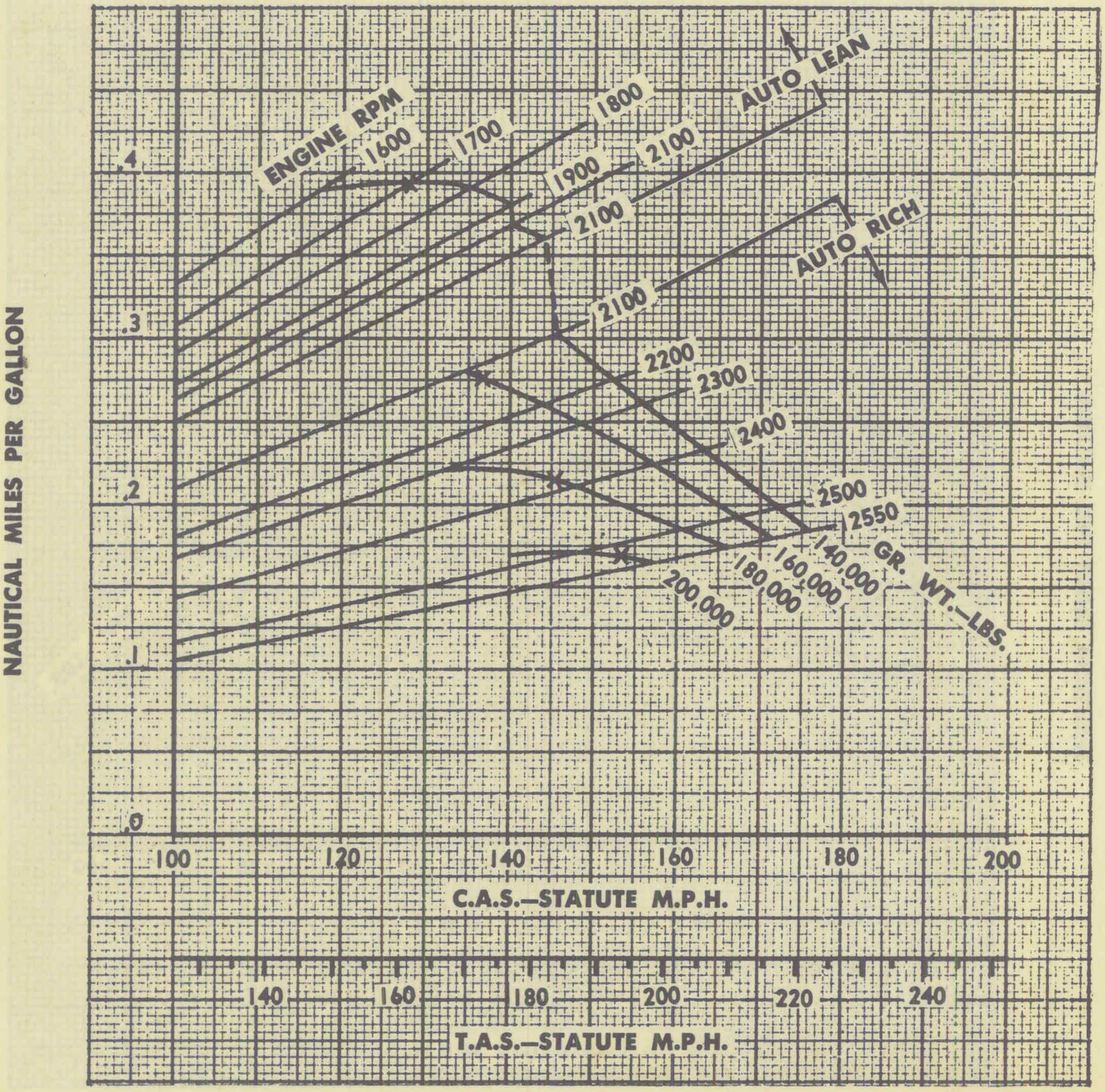


Figure A-8A. (Sheet 3 of 5 Sheets) Nautical Miles Per Gallon Curve—3 Engine

TYPE A-1-3 CURVE

NAUTICAL MILES PER GALLON

3 ENGINE 20,000 FT. ALTITUDE

NACA STANDARD CONDITIONS

CORRECTED FOR COOLING DRAG WITH AUTOMATIC COOLING CONTROL
"LOW R.P.M." ENGINE COOLING FAN SETTING
X—RECOMMENDED LONG RANGE CRUISING SPEEDS

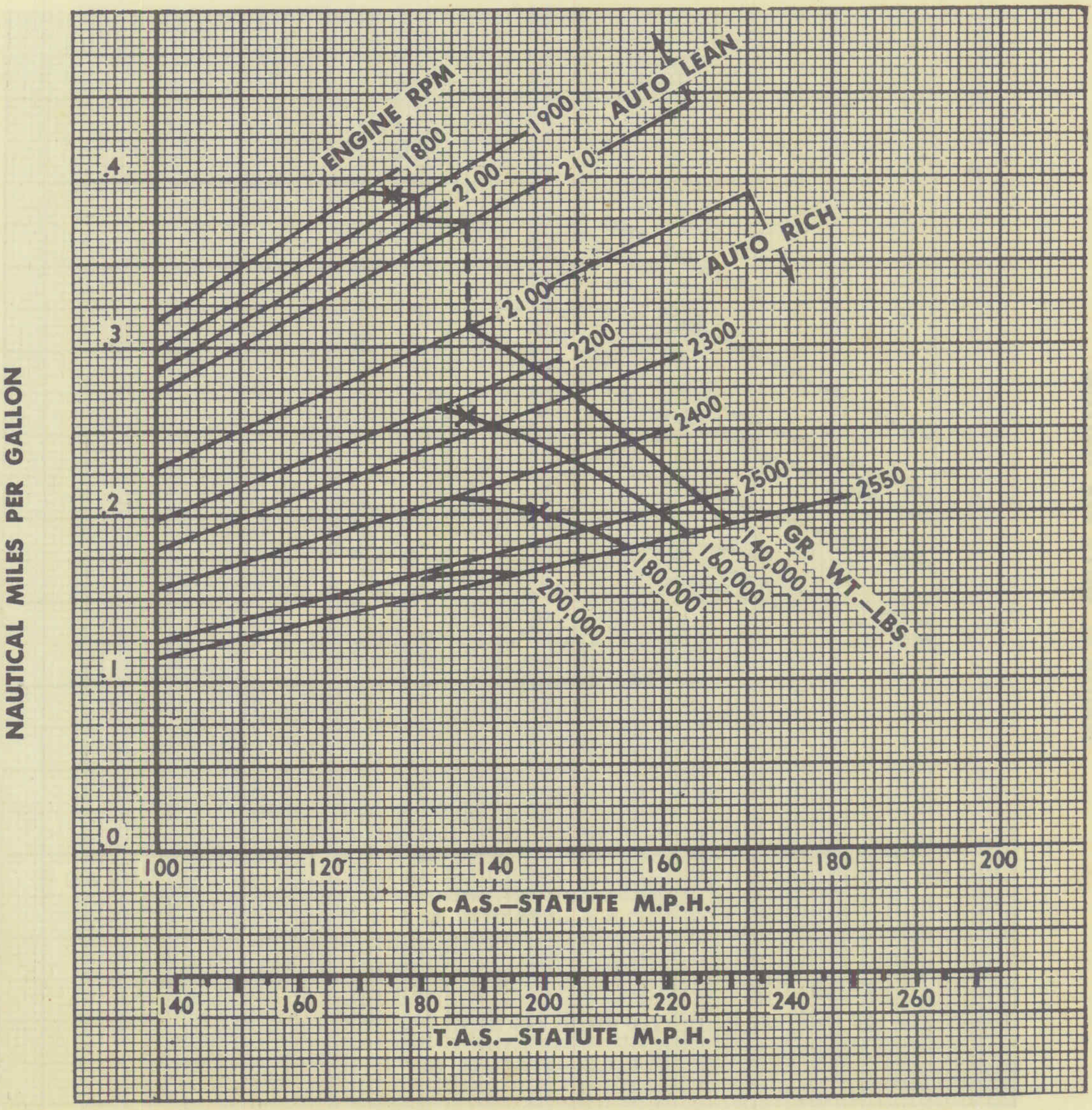


Figure A-8A. (Sheet 4 of 5 Sheets) Nautical Miles Per Gallon Curve—3 Engine

TYPE A-1-3 CURVE

NAUTICAL MILES PER GALLON

3 ENGINE 25,000 FT. ALTITUDE

NACA STANDARD CONDITIONS

CORRECTED FOR COOLING DRAG WITH AUTOMATIC COOLING CONTROL

"LOW R.P.M." ENGINE COOLING FAN SETTING

X—RECOMMENDED LONG RANGE CRUISING SPEEDS

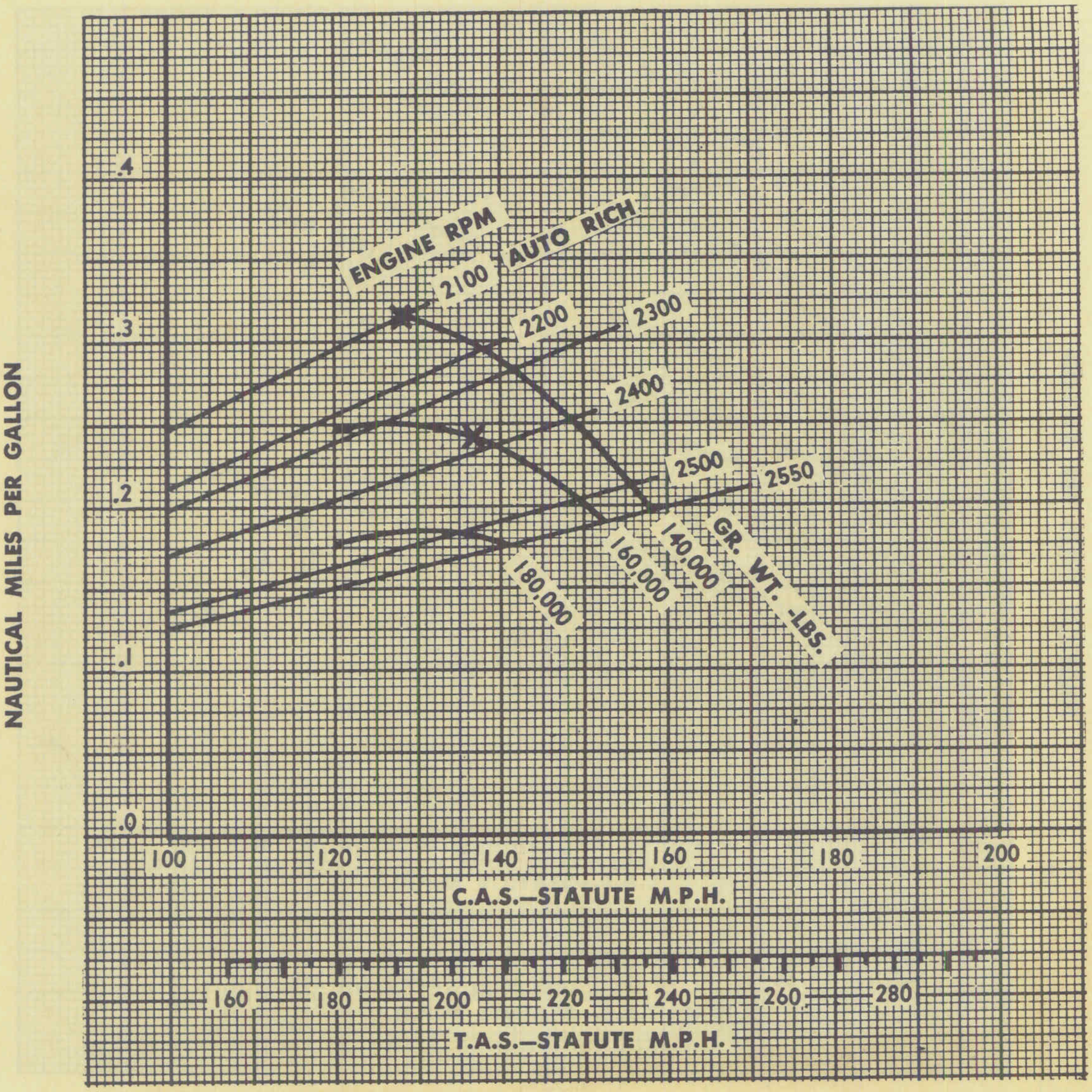


Figure A-8A. (Sheet 5 of 5 Sheets) Nautical Miles Per Gallon Curve—3 Engine

TYPE A-6 CURVE

CLIMB CONTROL CHART

6 ENGINE

NACA STANDARD CONDITIONS

NORMAL RATED POWER

WING FLAPS RETRACTED

"LOW RPM" ENGINE COOLING FAN SETTING

CORRECTED FOR COOLING DRAG WITH
AUTOMATIC COOLING CONTROL

NOTES:

1. CONSULT M-1-6 CHART TO DETERMINE MANIFOLD PRESSURE REQUIRED TO OBTAIN NORMAL RATED POWER
2. ALLOW 344 GALS. OF FUEL FOR WARM-UP AND TAKE-OFF (10 MIN. AT NORMAL RATED POWER).

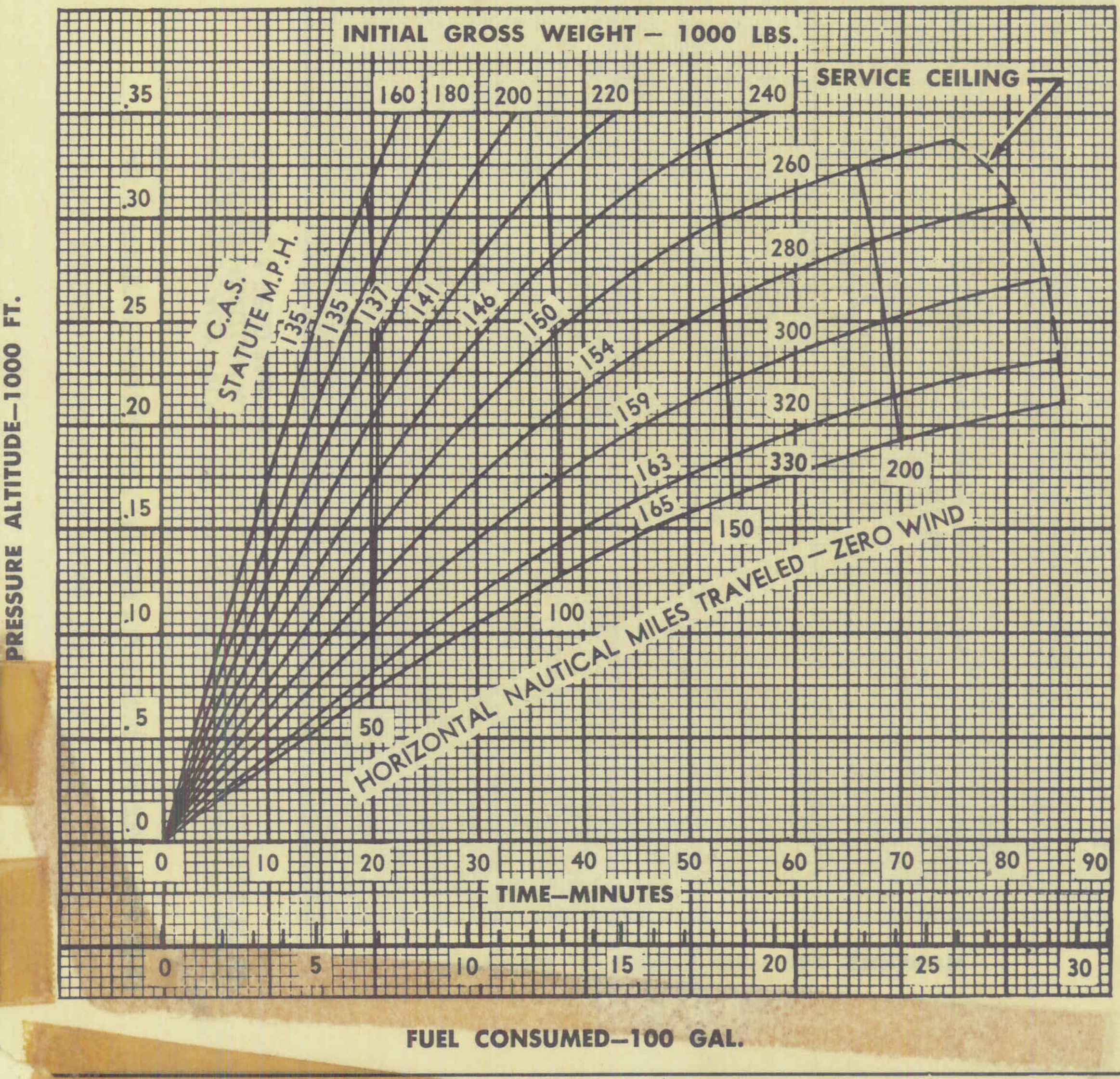


Figure A-8[illegible] Climb Control Chart—6 Engine

B M E P POWER SCHEDULE

R-4360-25 ENGINE

EXAMPLE: TO OBTAIN 1450 BHP AT 20,000′ WITH 20°C.A.T.

1. MOVE VERTICALLY FROM B.H.P. (A) TO R.P.M. CURVE (B) & READ 1760 R.P.M AT (C).
2. MOVE VERTCALLY FROM B.H.P. (A) TO M.P. CURVE FOR 20,000 FT. (D). PROCEED HORIZONTALLY TO BASE LINE (E). FOLLOW GUIDE LINES TO 20° C.A.T. (F), & READ 34.0″ HG AT (G).