The Texan

PILOT'S MANUAL

AT-6C TRAINER PLANES SNJ-4

INCLUDING EARLY MODELS OF AT-6D AND SNJ-5

NORTH AMERICAN AVIATION, INC.

DALLAS INGLEWOOD KANSAS CITY

Joe L. Wages

PILOT'S HANDBOOK OF *Flight Operating Instructions* FOR *The* Texan TRAINER AIRPLANES

AT-6C and AT-6D SNJ-4 and SNJ-5

CONTRACTS

W535 AC-19192 W535 AC-29317 DA W535 AC-8

DA W535 AC-2799

This publication shall not be carried in aircraft on combat missions or when there is a reasonable chance of its falling into the hands of the enemy.

Prepared by the

FIELD SERVICE DEPARTMENT

NORTH AMERICAN AVIATION, INC.

DALLAS

November 15th, 1943

1943

Introduction

REALIZING the urgent need of the industry for a standardized and handy form of airplane manual, North American presents this Pilot's Handbook of Flight Operating Instructions. It has been prepared in accordance with Army-Navy Aeronautical Specification AN-H-7 and AN-H-8 for the AT-6C, AT-6D, SNJ-4 and SNJ-5 advanced training airplanes.

IN COMPILING this manual, simplicity has been the watchword, and in order to prevent any confusion or misunderstanding North American has departed from highly technical terms and technical language and has employed plain, everyday, understandable English to tell its story. This, it is hoped, will make reading the manual interesting as well as instructive.

THE DESCRIPTION section of the manual provides brief and essential details of the airplane and the systems that are utilized under normal flight conditions. The Pilot Operating Instruction section consists of a detailed check-off list for operating the airplane, including a list of flight restrictions. The following section provides the Emergency Instructions and the final Operational Equipment section contains brief details of special or auxiliary equipment which may or may not be used in flight. Flight personnel will find that each section, therefore, is complete within itself—providing all the necessary information for the safe and efficient operation of the airplane.

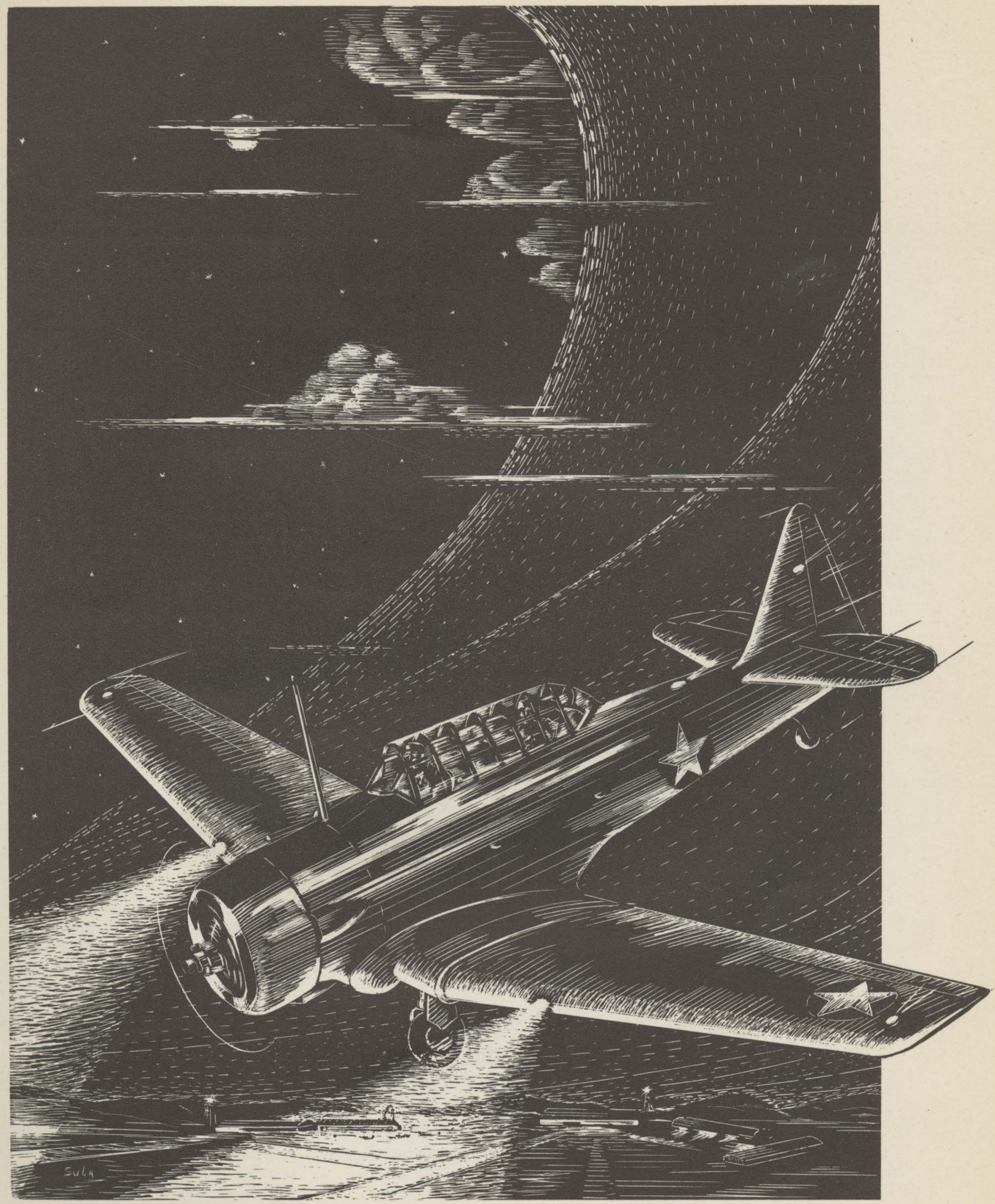
REFERENCES to other publications have been eliminated in this manual and Technical Order references to equipment as well as accessories have been carefully digested and incorporated, as far as possible, into the text itself. However, for more detailed information on the airplane reference should also be made to other North American publications, namely Report No. NA-6006—"Service Manual" and Report No. NA-5614—"Repair Manual."

MATERIAL in this manual covers the operation of all AT-6C and SNJ-4 (Navy) Airplanes. The present AT-6D and SNJ-5 (Navy) Airplanes are also described. As changes occur in production, revisions will be taken care of by North American Field Service Bulletins and North American Service News until the manual is revised for forthcoming airplanes.

HERETOFORE, manuals usually have required references to numerous files not always available to men in remote fields or in the theater of war. It is honestly believed that this manual has sufficient data to provide such information under one cover.

AT least, this has been the sincere aim.

NORTH AMERICAN AVIATION, INC.
Dallas, Texas



Night Landing

Out of the North American trade mark an artist has taken the flying symbol and created "NORT", a square-shootin' Texan with a breezy manner and a serious mind.

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TO THE HOLDER OF THIS BOOK: If at any time contact cannot be made with the local N.A.A. representative, write to the FIELD SERVICE DEPARTMENT, NORTH AMERICAN AVIATION, INC., DALLAS 1, TEXAS, regarding the representative's location.

AT-6C AND SNJ-4 TRAINER AIRPLANES

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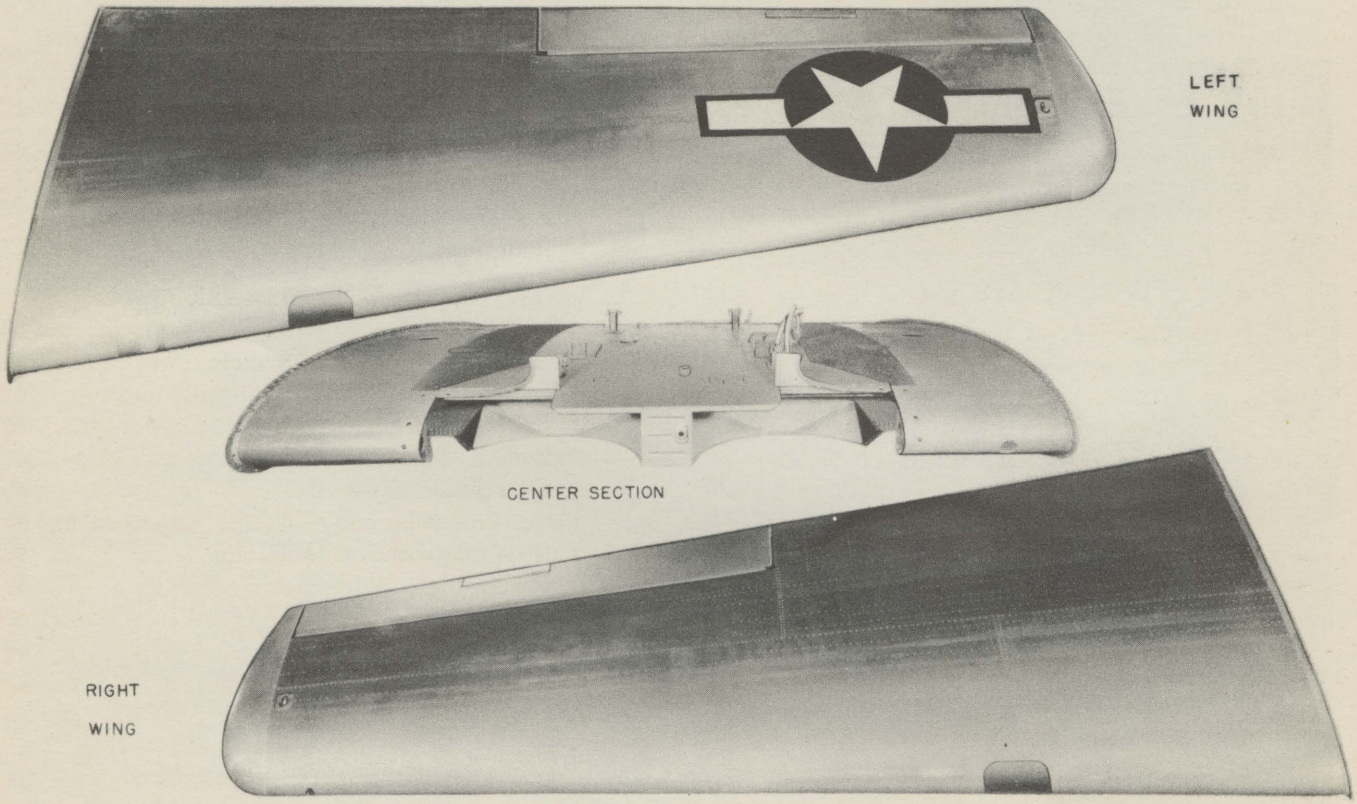


FIG. 1—COMPLETE WING

Section I.
DESCRIPTION

1. GENERAL.

The AT-6C and SNJ-4 (Navy) Airplanes are of identical construction and are two-place, single-engine, low-wing monoplanes designed as advanced trainers with provisions for the installation of bombs and gunnery equipment. Later airplanes of the trainer series are designated as AT-6D and SNJ-5 (Navy) Airplanes and may be readily distinguished from the previous models by the installation of a 24 volt electrical system in place of a 12 volt system. The tactical mission of the airplane, therefore, is to provide a means for the advanced training of student pilots and their transition flying to combat-type airplanes. Each airplane is of all-metal construction except that in some later airplanes wood is employed in various parts of the structure. Airplanes delivered to the United Kingdom are identical to the standard AT-6C and SNJ-4 (Navy) Airplanes except for the following items:

Yellow band, seven feet wide, painted on each wing.

Sutton harness installed in lieu of type B-11 safety belt.

Provisions for ballast weight in rear of fuselage.

Provisions for British radio and interphone equipment and cockpit covers.

Mixture control with standard British movement.

These items and other minor innovations are described in more detail in their proper places throughout this handbook.

2. WING. (See figure 1.)

The tapered wing is of all-metal, stressed skin, full cantilever, low wing design, consisting of a detachable center section and two detachable outer wing panels with removable tips. The center section is of constant chord design and is set at a positive 2° angle of incidence. Each outer panel is twisted 2° forward at the tips. Three split-type landing flap panels are incorporated in the lower surfaces of the wing to facilitate inspection, servicing, replacement, etc. The center section contains two fuel tanks and mounting and housing for retractable landing gear. Navigation lights and landing and passing lights are installed in the outer panels along with provisions for the installation of a fixed machine gun, gun camera and bomb racks. A Frize-type aileron is installed in the trailing edge of each outer panel. Each aileron is of fabric-covered metal frame construction and incorporates a trim or booster tab. The ailerons equipped with trim booster tabs have an angular movement of 15° UP and 15° DOWN. Ailerons equipped with booster tabs, incorporated in earlier airplanes, have 30° UP and 15° DOWN movement utilizing a differential motion of 2 to 1. Booster tabs, installed on earlier airplanes, are adjusted from the ground only, and automatically operate upon movement of the ailerons. A push-pull rod extending from the tab is attached to a hinge bracket mounted on the wing. The attachment is such that the tab achieves its own automatic angular travel when the aileron changes position. Trim tabs are installed on later airplanes and are also adjustable from the ground only. A connecting rod extending from the tab is attached to a hinge fitting on the axis of rotation of the aileron. Unlike the booster tab, the trim tab has no angular travel of its own but remains in a fixed position in relation to the aileron when the latter changes position. Neither of these tabs are adjustable from the cockpit.

3. EMPENNAGE (See figure 2.)

The tail assembly fixed surfaces consist of a vertical and horizontal stabilizer and are of metal construction, with the exception of wood constructed horizontal stabilizers installed on some later airplanes. The tail assembly movable surfaces consist of fabric-covered, metal frame elevators and rudder. Trim tabs are installed on the elevators and rudder, metal tabs having been replaced by wooden tabs on later airplanes. The movable tail surfaces are balanced statically and dynamically, and all surfaces are mounted on sealed-type ball bearing hinge brackets with the exception of wooden trim tabs which utilize Ledaloyl self-lubricating hinge bearings. Navigation lights are installed on both sides of the vertical stabilizer. On later airplanes the rudder travel has been changed from 35° to 30° left and right.

4. FUSELAGE (See figure 3.)

The fuselage structure consists of two sections bolted together just aft of the rear cockpit. The front fuselage section, including an integral over-turning structure, is of welded chrome molydenum steel tube and steel fitting construction. The engine mount is mounted on the front of the forward fuselage struc-

ture at four attaching points. The rear section of the fuselage is of aluminum alloy, semi-monocoque construction, consisting of longerons, bulkheads and stringers covered with aluminum alloy sheet. Some of the airplanes in service are equipped with a rigid wooden fabric-covered, semi-monocoque rear fuselage structure, made to meet the same requirements as their metal counterparts. The removable side panels and access doors are provided to permit necessary inspection and servicing. Space and installation provisions are incorporated in the fuselage for radio and photographic equipment, oxygen system, miscellaneous furnishings and additional facilities for operation of the airplane. A cockpit of the tandem-type is enclosed by a full vision enclosure. A baggage compartment is located in the rear section immediately aft of the rear cockpit. A ventilating and heating system is provided with controls located in the front cockpit. An instrument flying hood for blind flying is provided for installation in either the front or rear cockpit. Quickly detachable panels in the sliding sections of the front and rear cockpit enclosures provide means for emergency escape from the airplane.

5. SURFACE CONTROLS (See figures 16, 17 and 18.)

A complete set of surface controls is installed in each cockpit for operating the flight control surfaces which consist of an aileron in each outer panel, a rudder and an elevator assembly of two interchangeable sections. The rudder and both elevator sections are equipped with trim tabs adjustable from either cockpit. A booster or trim tab is provided on each aileron and is adjusted manually when the airplane is on the ground. A surface control lock is installed for all primary surface controls. The surface controls and the tab controls for the elevator and rudder are interconnected with their respective control surfaces and tab operating mechanism by flexible stainless steel cables. The tail wheel is steered by rudder pedals, its cables reacting to the movement of the rudder cables since both are connected with idler arms in the rear of the fuselage. For wing flaps refer to Main Hydraulic System.

a. CONTROL STICKS.—The hickory control sticks (aluminum alloy tube in earlier airplanes), located in the conventional position in each cockpit, are mounted on an aluminum alloy torque tube horn assembly. Adjustable stops for the ailerons are provided on the torque tube horn assembly to limit the side movement of the sticks. Fore-and-aft movement of the control sticks, controlling the UP and DOWN movement of the elevator, is limited by an adjustable stop on either end of the aileron torque tube. Both sticks are connected by a push-pull rod passing through the aileron torque tube. A trigger-type electrical switch for firing machine guns is provided in the front of the handle on the front control stick while a push-type electrical button switch for releasing the bombs is centered in the top of this handle. The rear cockpit control stick may be removed by pulling aft on the lock plunger button at the base of the stick and may be locked in the stowage position at the left side of the cockpit by the same device.

b. RUDDER PEDALS.—Rudder control is obtained by rudder pedals located in the conventional position in each cockpit. They are connected with the rudder by cables. The front and rear rudder pedal assemblies obtain a common balance through a rudder balance cable which, passing around two pulleys, connects both pedals of the rear assembly. Balance of the rear pedals thus achieved is transmitted to the front pedals by connecting tubes. The tubes attached to the outboard side of the pedals, unite the respective right and left pedals of the front and rear pedal assemblies and provide an attachment means to compensate for the pilot's leg length. This latter function is accomplished by a series of holes. The attachment points begin at either end of the connecting tubes and extend a few inches along their length. By moving the point of attachment, the rudder pedals can be adjusted as desired. The pedals should be adjusted for proper leg length and the pedals checked to ascertain that they are adjusted so the pilot can easily maintain full rudder throw, especially when recovering from a spin. Adjustable stops are provided on either side of the lower rudder hinge support fitting on the vertical stabilizer rear spar to limit rudder movement. Brake control pedals are incorporated in the rudder pedal assemblies.

c. TRIM TAB CONTROLS.—Elevator and rudder trim tabs are controlled by a system of cables and pulleys actuated by control wheels located at the left side of each cockpit. Trim tab conirol cables are connected with the trim tabs by means of a drum and tab operating mechanism located in the leading edge of each of the respective control surfaces. The tab mechanism is connected with the tab by a threaded push-pull rod assembly. Stops are provided on the control wheels in both cockpits. Neutral marks on the control wheel when lined up vertically locate the tabs in a NEUTRAL position. The tabs should be

adjusted as required to obtain directional and longitudinal trim of the airplane. Clockwise or counterclockwise rotation of the outboard wheel controlling the rudder tab compensates for directional instability to the left or right respectively. Clockwise or counterclockwise rotation of the inboard wheel which controls the elevator tabs compensates for an existing tail-heavy or nose-heavy condition respectively.

d. SURFACE CONTROL LOCK (See figure 19.)—The surface control locking mechanism located left and forward of the control stick in the front cockpit locks the entire surface control system. To do this, place the rudder pedals in neutral, push the control stick forward and center it laterally. Pull up and aft on the lock handle assembly and engage the control stick in the lock recess, then engage the handle plunger in the locked position. To release, push forward on the control handle and then push the lock mechanism forward into the stowed position. The lock mechanism should be stowed in the lock down position when not engaged with the control stick.

6. MAIN HYDRAULIC SYSTEM (See figure 20.)

Two individual hydraulic systems are incorporated in the airplane, namely, the main and brake hydraulic systems. The main hydraulic system is provided to operate the UP and DOWN movement of the wing flaps and landing gear. An engine-driven pump draws hydraulic fluid from a reservoir and discharges it under pressure to a selector valve unit. This unit incorporates the landing gear and flap selector valves, also a pressure control valve, pres-

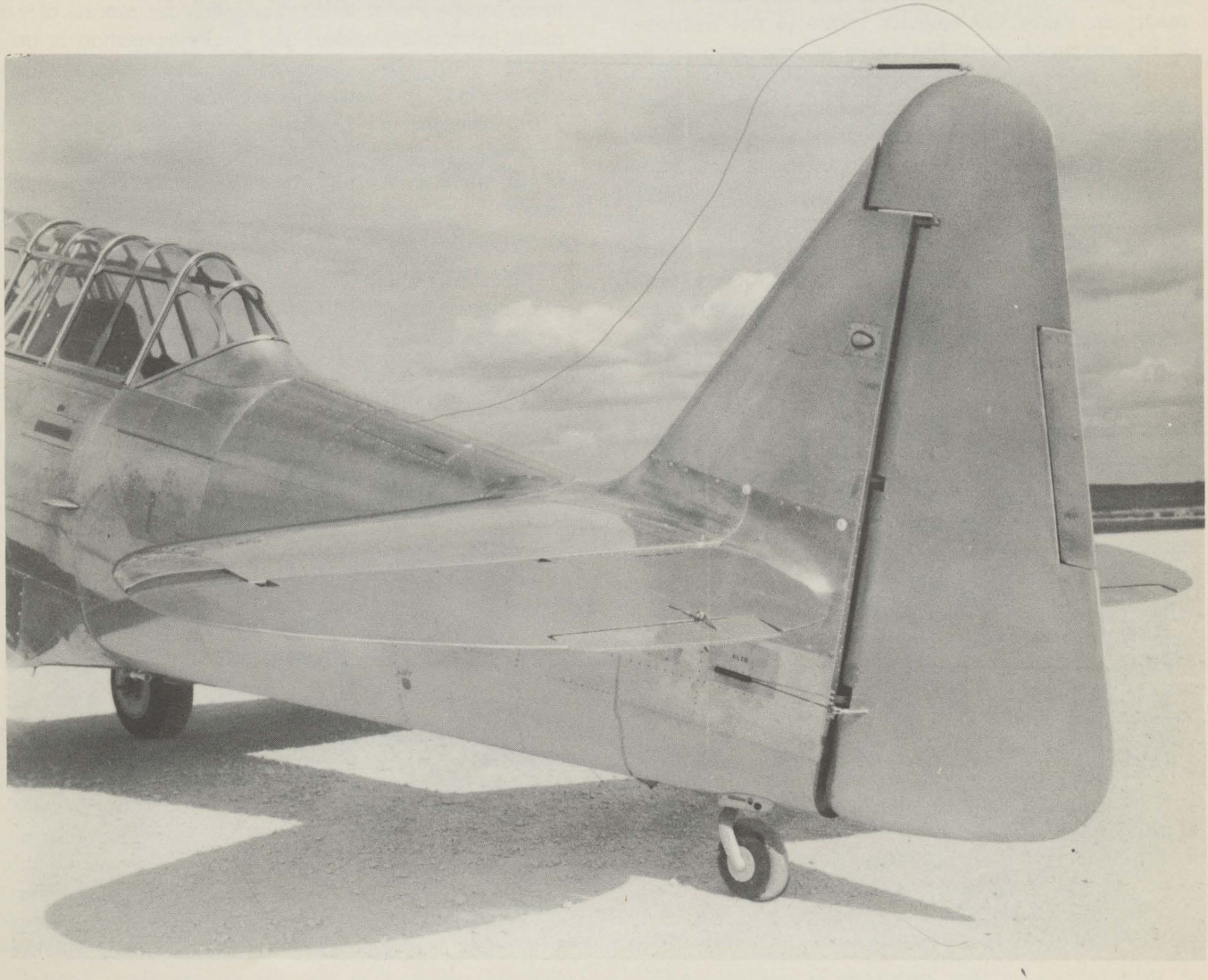


FIG. 2—EMPENNAGE

sure relief valve, a one-way check valve for each of the two selector valves and an emergency hand pump. Pressure is directed by manually depressing a power control lever at the left side of either cockpit, the time that this valve remains engaged being governed by a time-lag valve which has a predetermined setting. Selection for the operation of the landing gear or flaps is provided by means of a control lever at the left side of each cockpit. Thus, fluid under pressure is directed to the selected operating cylinder where force is conveyed to the mechanism, which actuates the flaps or landing gear. The displaced fluid in the cylinder is returned to the reservoir by passing through selector valve and filter. The chosen operation will be complete before the time-lag valve has become disengaged. Following disengagement, hydraulic fluid is then by-passed through the selector valve unit and is returned to the reservoir. Since the selector valve is not designed to be leakproof, a ratchet valve is employed by the selector valve and the flap operating cylinder, which locks fluid pressure in the operating cylinder, thus retaining the flap in the selected position. A thermal expansion valve is incorporated in the ratchet valve to relieve excessive pressure in the flap UP hydraulic lines. The system also employs several check valves for the purpose of maintaining fluid pressure in a given section of the system. An emergency hand pump is installed for the emergency operation of the UP and DOWN movement of the landing gear and flaps. This unit obtains fluid from the emergency supply in the reservoir, and its pressure line is connected to the selector valve unit. Selection of the operation desired is accomplished under conditions similar to normal operation with the exception that it is not necessary to depress the power control lever. A pressure gage is provided to indicate pressure in the system during the various operations. Travel and position of the landing gear or flaps is shown by position indicators located on front cockpit control shelf.

a. LANDING GEAR (See figures 21 and 22.)—The landing gear equipment consists of a main retractable landing gear and a steerable, non-retracting tail wheel. Provisions are made on all three landing gear forks for the installation of skis. Retraction of the main landing gear is accomplished by means of the main hydraulic system, and brake operation is provided by an independent hydraulic system. Positive mechanical UP position lock latches and DOWN position lockpins are provided as well as mechanical position indicators showing the position of each strut at all times. A warning horn will operate when the throttle is closed for landing and the landing gear is not locked in the extended position.

(1) LANDING GEAR CONTROLS.—A landing gear control handle is mounted on the control shelf at

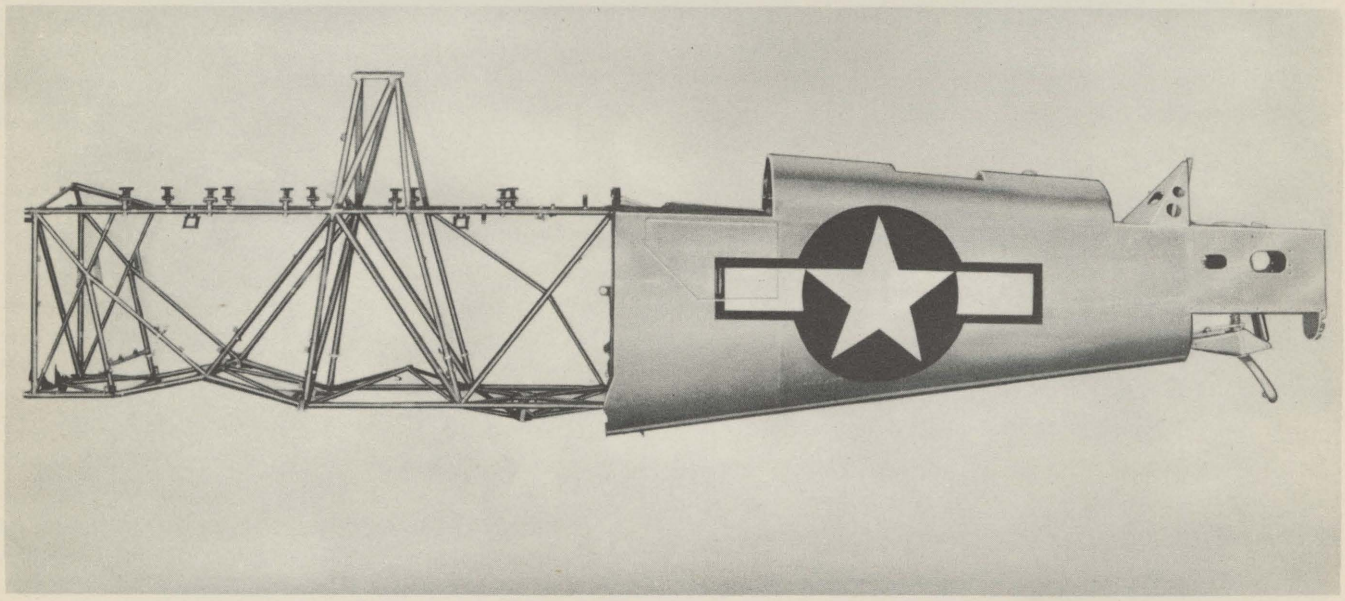


FIG. 3—FUSELAGE

the left side of each cockpit. The handles are interconnected with the hydraulic selector valve and the landing gear lockpins and latches. The downward position of the control handle selects the DOWN position of the landing gear and the upward position of the handle selects the UP position of the landing gear. In order to move the control handle in the front cockpit from the DOWN position to the UP position, it is necessary to pull out on the handle. This precaution is incorporated to prevent unintentional retraction of the gear. The gear can be retracted from the front cockpit only; however, it may be lowered from either cockpit.

CAUTION

Do not attempt to operate landing gear and flaps simultaneously.

b. WING FLAPS.—Three split-type landing flap panels are incorporated in the lower surface of the wing trailing edge between the inboard ends of the ailerons. One flap section is on each outer panel and one is on the center section. Flap panels are attached to the wing by the ball-bearing hinge brackets on the flaps connecting with brackets on the wing. The flaps are moved by actuating rods connected to the flap hat section and the flap push-pull rods. The push-pull rods are connected in turn to the flap actuating cylinder and equalizer arms located beneath the trailing edge of the center section. The center section rods are connected at their outboard ends to the outer panel rods by universal joints. The operating cylinder actuates the rods which move all flaps in unison. All flap panels have a constant chord design.

(1) FLAP CONTROL.—A flap control handle is mounted on the control shelf at the left side of each cockpit. The controls are interconnected with a hydraulic selector valve. The UP position of the flap control handle selects the UP position and the DOWN position selects the DOWN position of the flaps. The center lock position is used when it is desired to stop the flaps at any intermediate position between UP and DOWN.

NOTE

Do not lower flaps above 126 MPH.

7. BRAKE HYDRAULIC SYSTEM (See figure 23.)

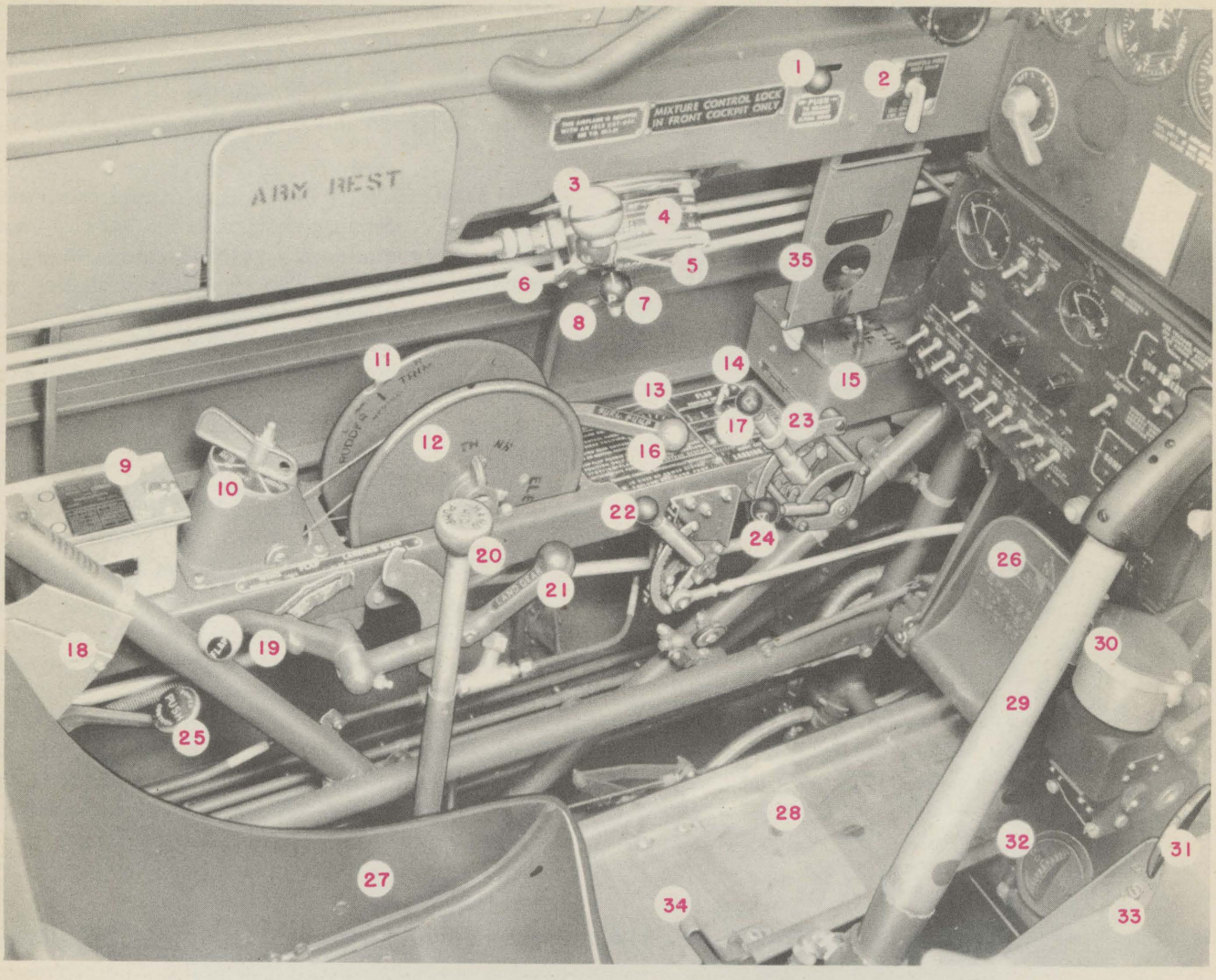
The system consists essentially of a master brake cylinder unit which contains two independent master cylinders and a fluid reservoir common to both cylinders. A brake shoe operating cylinder is located on each landing gear wheel backing plate. The pedals actuate the master brake cylinder by means of a cable, rod and pulley linkage. A separate front cockpit parking brake control handle is interconnected with the master brake cylinder parking brake valve mechanism by means of a cable and pulley linkage.

a. BRAKE CONTROL.—Brake pedals are incorporated in the rudder pedal assemblies. The brakes, of the single-shoe, self-energizing type, are hydraulically controlled and are actuated selectively from either front or rear cockpit. A parking brake control handle is located below the instrument panel in the front cockpit.

(1) PARKING BRAKE CONTROLS.—A parking brake control knob is located on a subpanel below the front instrument panel. To apply the parking brakes, press both brake pedals to their full extent and then pull out on the control knob; release the brake pedals and then release the control knob. The parking brakes may be set from the front cockpit only; however they may be released from either cockpit by depressing the brake pedals.

8. ENGINE (See figures 24 and 25.)

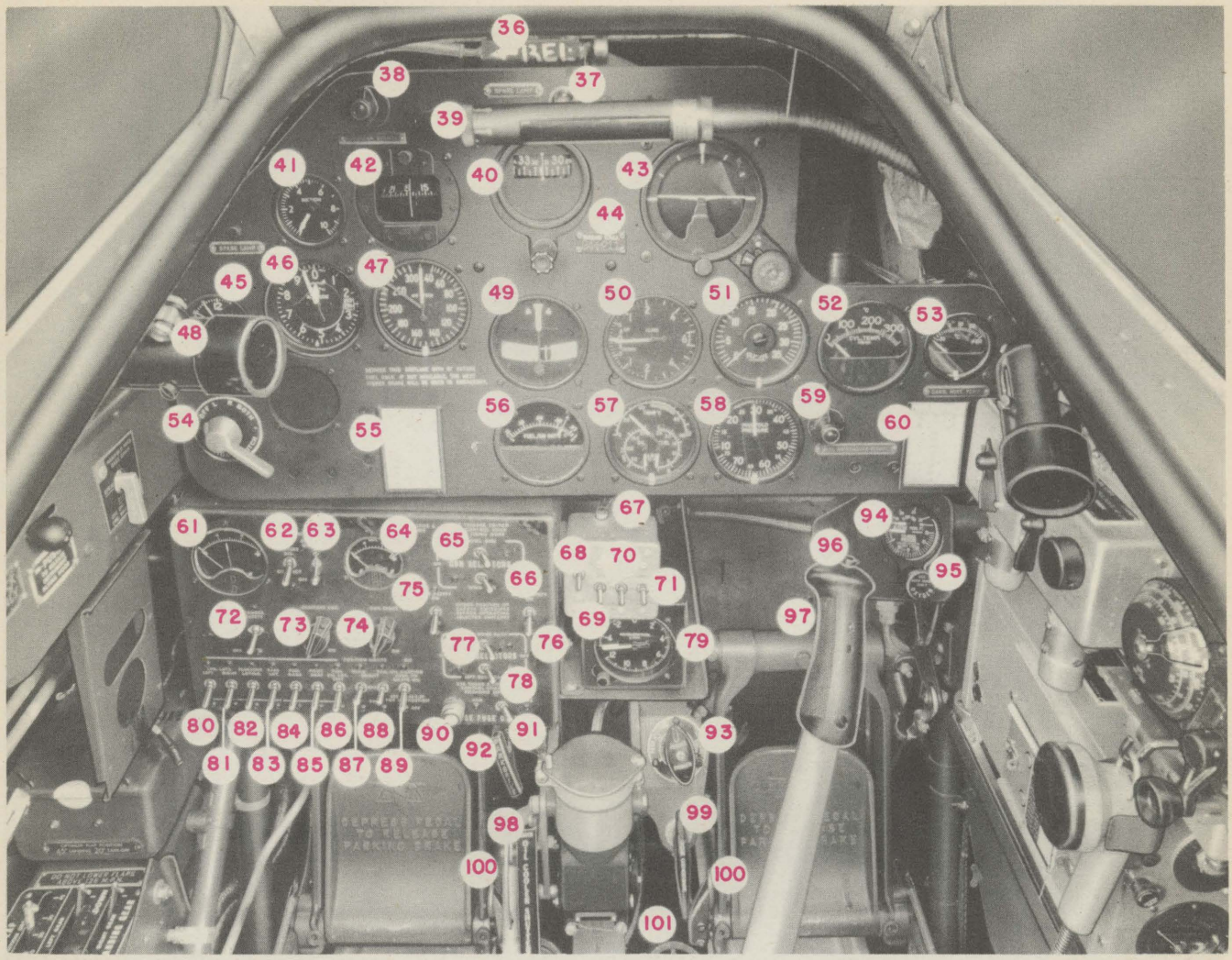
The airplane is powered with a single Pratt & Whitney Model R-1340 AN-1, nine-cylinder, air-



LEGEND

1. Blind Flying Hood Release
2. Manifold Pressure Gage Drain Valve
3. Throttle Control
4. Throat Microphone Switch
5. Mixture Control Lock Release
6. Mixture Control
7. Propeller Control
8. Engine Control Lock
9. Transmitter Coil Set C-184
10. Fuel Selector Valve
11. Rudder Trim Tab Control
12. Elevator Trim Tab Control
13. Hydraulic Pressure Gage
14. Flap Position Indicator
15. Generator Control Box
16. Hand Fuel Pump Handle
17. Landing Gear Position Indicator
18. Flight Report Case
19. Flap Control
20. Hydraulic Hand Pump
21. Landing Gear Control
22. Carburetor Air Temperature Control
23. Bomb Release Control
24. Bomb Arming Control
25. Hydraulic Power Control
26. Left Rudder and Brake Pedal
27. Cockpit Seat
28. Foot Trough
29. Control Stick
30. Gun Sight
31. Gun Charger
32. Cold Air Inlet
33. Starter Pedal
34. Flight Control Lock
35. Gun Camera Film Consumption Indicator Bracket
36. Blind Flying Hood Catch
37. Spare Lamp
38. Camera Signal Light
39. Fluorescent Light
40. Directional Gyro
41. Suction Gage
42. Magnetic Compass

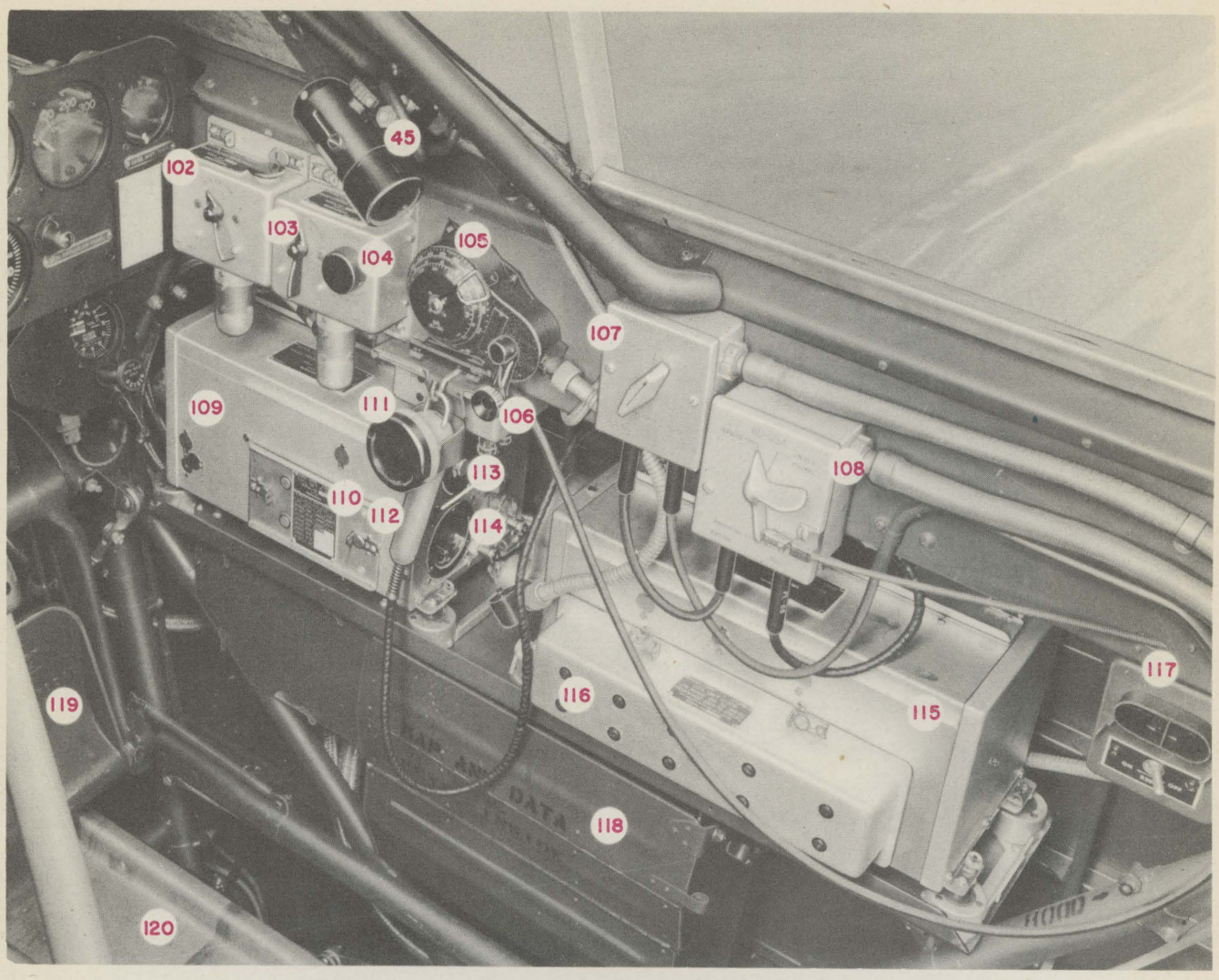
FIG. 4—LEFT SIDE FRONT COCKPIT—12 VOLT AIRPLANE



LEGEND

43. Flight Indicator
44. Radio Call Plate
45. Clock
46. Altimeter
47. Air Speed Indicator
48. Cockpit Light
49. Bank and Turn Control
50. Rate of Climb Indicator
51. Tachometer
52. Cylinder Head Temperature Gage
53. Carburetor Mixture Temperature Gage
54. Ignition Switch
55. Altimeter Correction Chart
56. Fuel—Air Ratio Gage
57. Oil Temperature, Fuel and Oil Pressure Gage
58. Manifold Pressure Gage
59. Fuel Switch-over Signal Light
60. Compass Correction Chart
61. Generator Voltmeter
62. Battery Disconnect Switch
63. Generator Main Line Switch
64. Generator Ammeter
65. Cowl Gun Selector Switch
66. Wing Gun Selector Switch
67. Recognition Light Keying Switch
68. White Recognition Light Switch
69. Red Recognition Light Switch
70. Green Recognition Light Switch
71. Amber Recognition Light Switch
72. Camera Safety Switch
73. Compass Light Rheostat
74. Gun Sight Rheostat
75. Gun Safety Switch
76. Bomb Safety Switch
77. Right Bomb Rack Selector Switch
78. Left Bomb Rack Selector Switch
79. Accelerometer

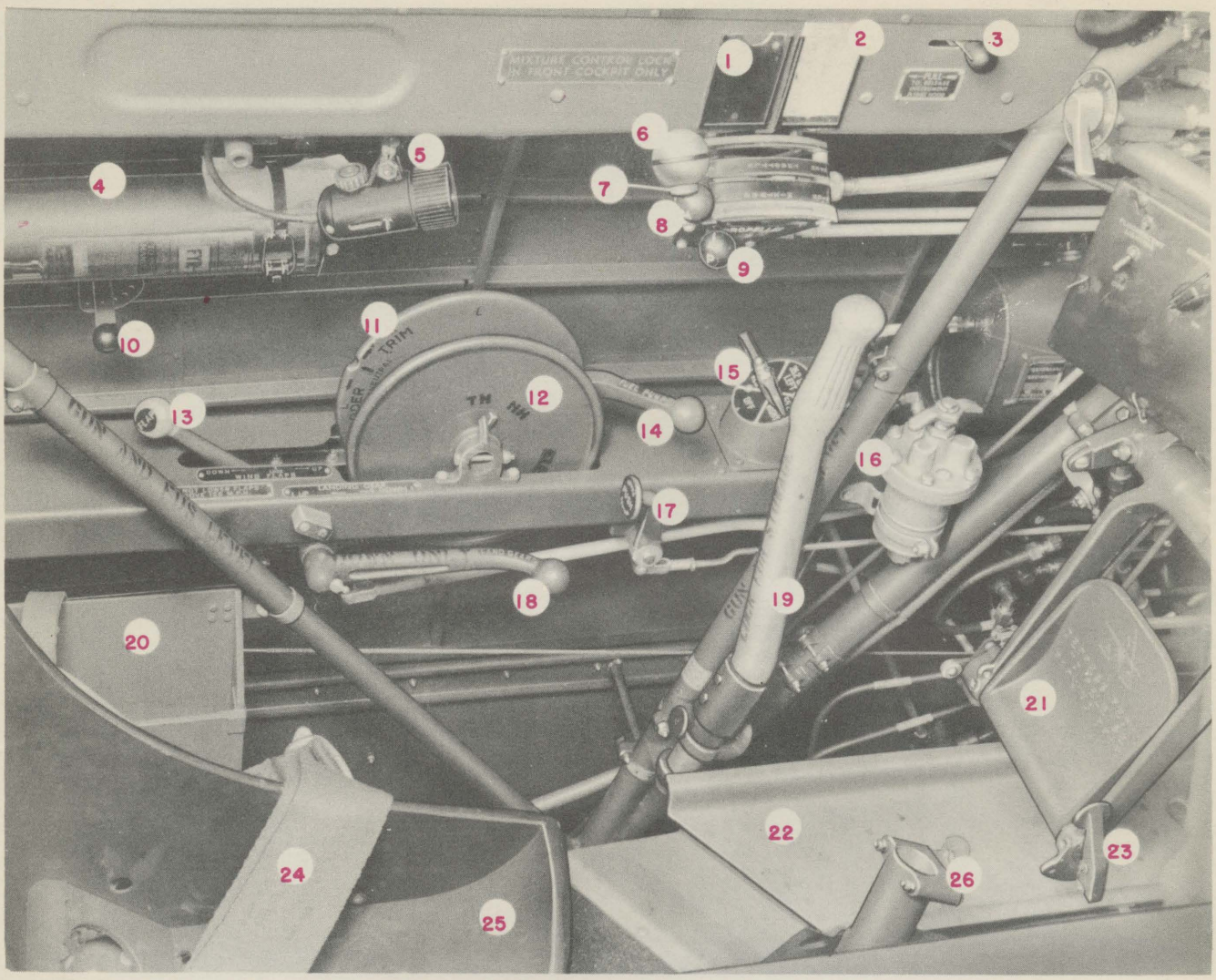
FIG. 5—CENTER FRONT COCKPIT — 12 VOLT AIRPLANE



LEGEND

80. Left Landing Light Switch
81. Right Landing Light Switch
82. Fluorescent Light Switch
83. Passing Light Switch
84. Fuel Gage Light Switch
85. Pitot Heater Switch
86. Fuel Switch-over Signal Light Test Switch
87. Wing Position Light Switch
88. Tail Position Light Switch
89. Oil Dilute Switch
90. Bomb Arming Indicator Light
92. Parking Brake Control
93. Engine Primer
94. Oxygen Pressure and Flow Gage
95. Oxygen Regulator
96. Bomb Release Switch
97. Gun Trigger Switch
98. Oil Cooler Shutter Control
99. Gun Charger Control
100. Pedal Adjusting Latch
101. Hot Air Inlet
102. Transmitter Modulator Switch
103. Radio Receiver Switch
104. Receiver Volume Control
105. Receiver Tuning Dial
106. Receiver Tuning Crank
107. Radio Filter Box
108. Radio and Interphone Selector Switch
109. Radio Transmitter
110. Transmitter Coil Set C-383
111. Microphone
112. Microphone Switch
113. Antenna Current Control
114. Antenna Current Indicator
115. Radio Receiver
116. Receiver Coil Unit C-379
117. British Interphone Switch
118. Map and Data Case
119. Right Rudder and Brake Pedal
120. Right Foot Trough

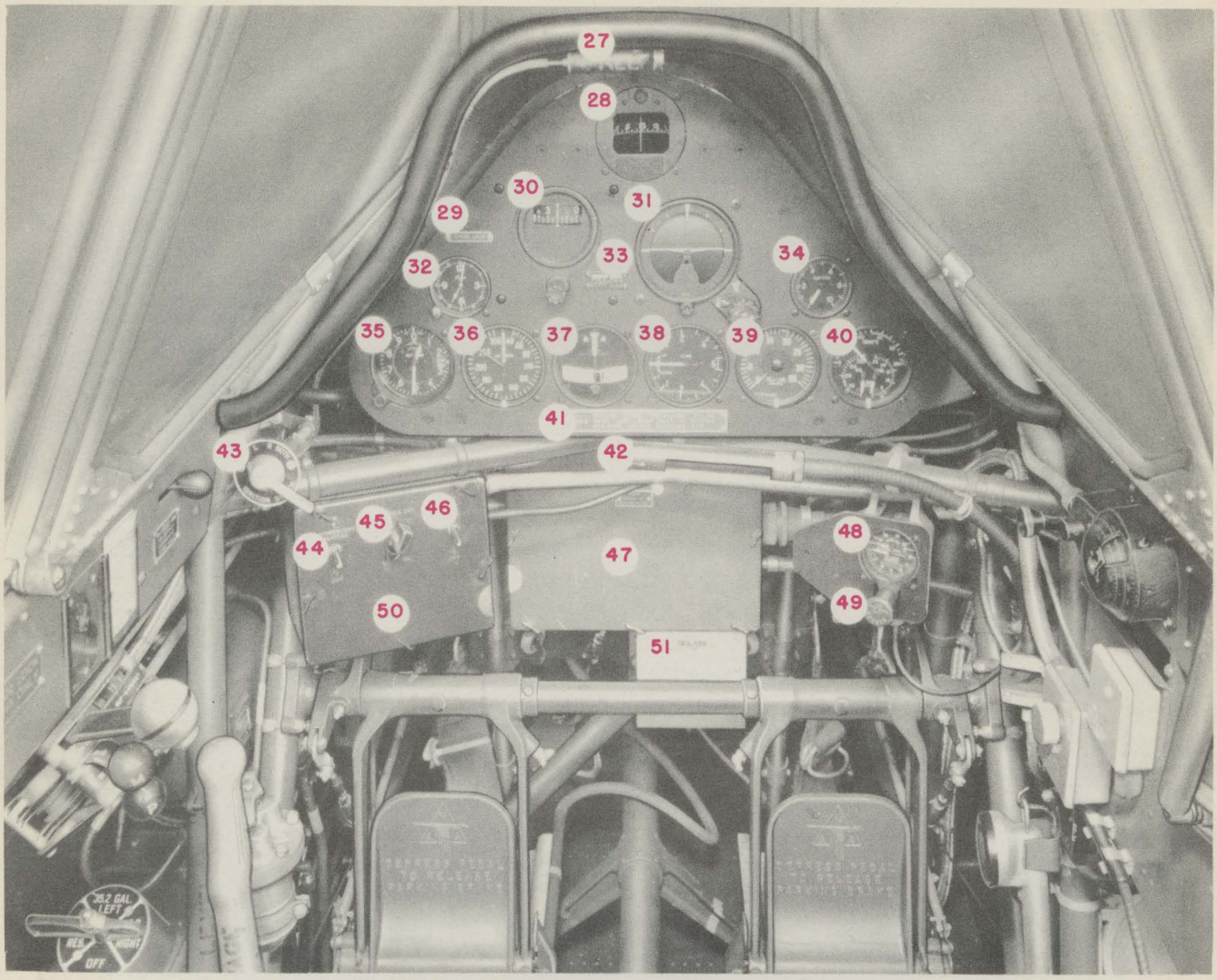
FIG. 6—RIGHT SIDE FRONT COCKPIT—12 VOLT AIRPLANE



LEGEND

1. Altimeter Correction Chart
2. Compass Correction Chart
3. Blind Flying Hood Release
4. Fire Extinguisher
5. Cockpit Light
6. Throttle Control
7. Throat Microphone Switch
8. Mixture Control
9. Propeller Pitch Control
10. Ventilator Door Control
11. Rudder Trim Tab Control
12. Elevator Trim Tab Control
13. Flap Handle
14. Hand Fuel Pump Handle
15. Fuel Selector Valve
16. Hydraulic Filter
17. Hydraulic Power Control
18. Landing Gear Control
19. Control Stick (Stowed)
20. Flight Report Case
21. Left Rudder and Brake Pedal
22. Left Foot Trough
23. Pedal Adjusting Latch
24. Safety Belt
25. Cockpit Seat
26. Control Stick Socket

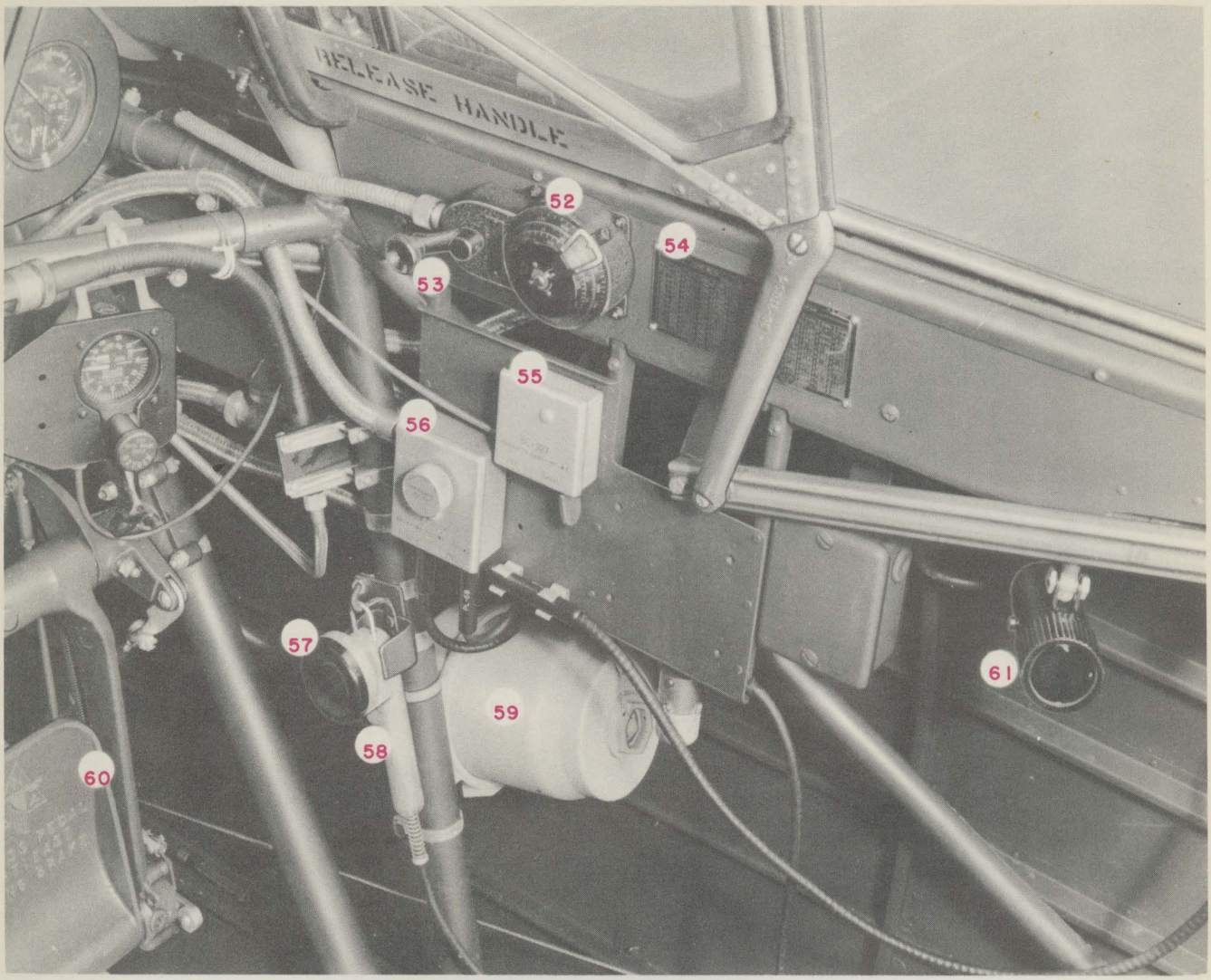
FIG. 7—LEFT SIDE REAR COCKPIT—12 VOLT AIRPLANE



LEGEND

27. Blind Flying Hood Catch
28. Magnetic Compass
29. Spare Lamp
30. Directional Gyro
31. Flight Indicator
32. Clock
33. Radio Call Plate
34. Suction Gage
35. Altimeter
36. Air Speed Indicator
37. Bank and Turn Indicator
38. Rate of Climb Indicator
39. Tachometer
40. Oil Temperature, Fuel and Oil Pressure Gage
41. Warning Instruction Plate
42. Fluorescent Light
43. Ignition Switch
44. Fluorescent Light Switch
45. Compass Light Rheostat
46. Fuel Gage Light Switch
47. Radio and Interphone Fuse Box
48. Oxygen Pressure and Flow Gage
49. Oxygen Regulator
50. Switch Box
51. Interphone Amplifier Switch

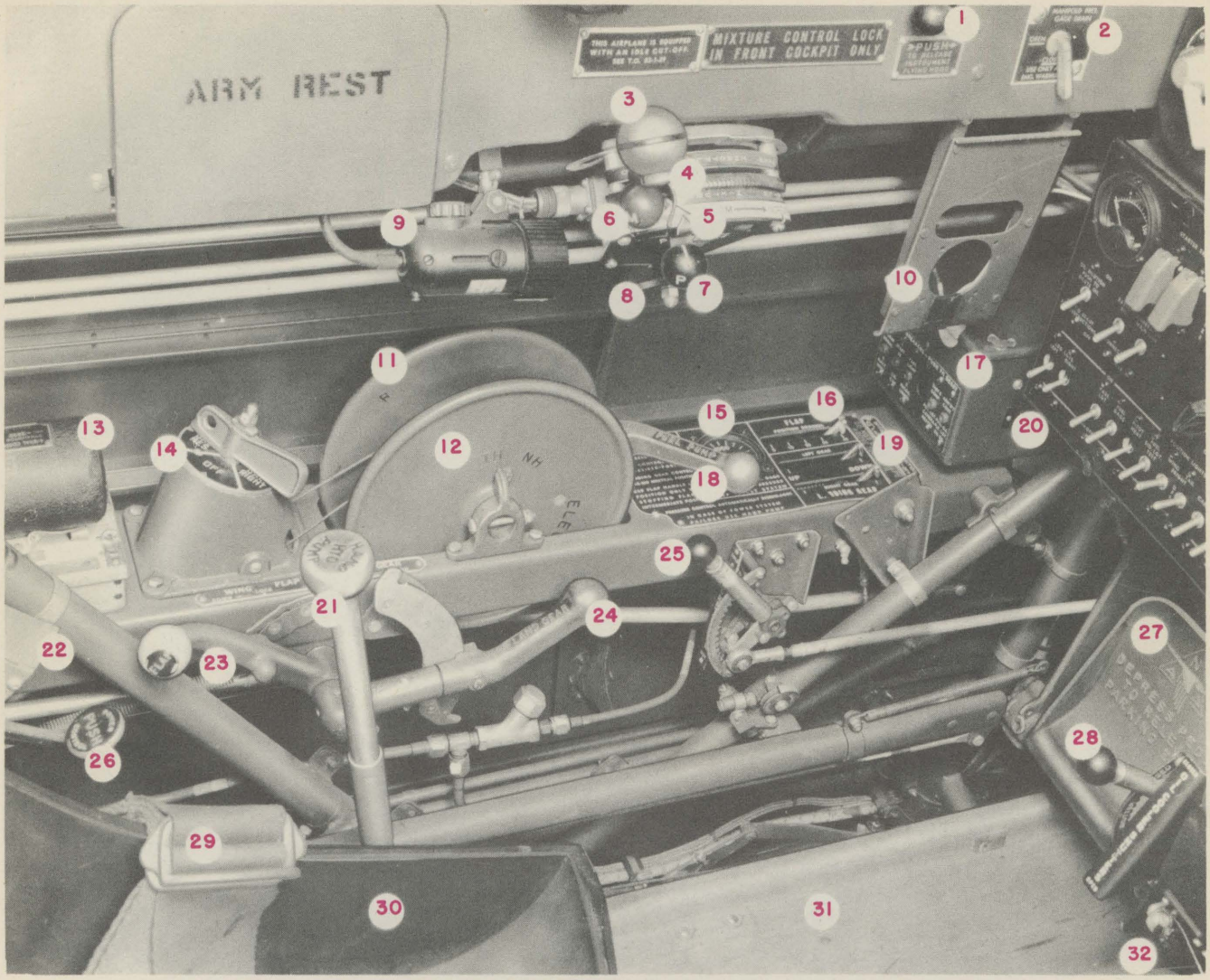
FIG. 8—CENTER REAR COCKPIT—12 VOLT AIRPLANE



LEGEND

52. Receiver Tuning Dial
53. Receiver Tuning Crank
54. Receiver Frequency Chart
55. Radio and Interphone Selector Switch
56. Volume Control
57. Microphone
58. Microphone Switch
59. Vacuum Filter Unit
60. Right Rudder and Brake Pedal
61. Cockpit Light

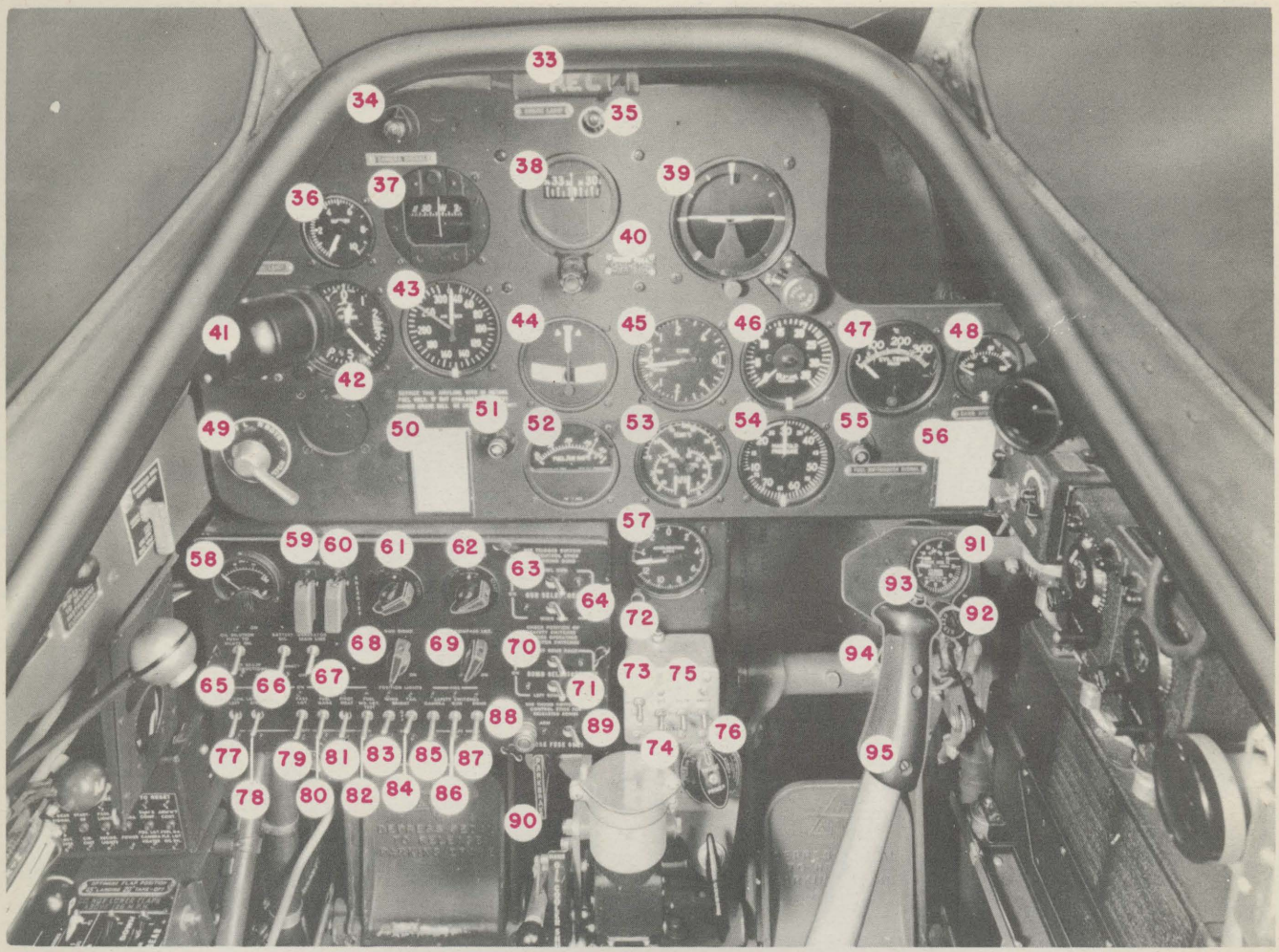
FIG. 9—RIGHT SIDE REAR COCKPIT—12 VOLT AIRPLANE



LEGEND

1. Blind Flying Hood Release
2. Manifold Pressure Gage Drain Valve
3. Throttle Control
4. Throat Microphone Switch
5. Mixture Control Lock Release
6. Mixture Control
7. Propeller Control
8. Engine Control Lock
9. Cockpit Light
10. Gun Camera Film Consumption Indicator Bracket
11. Rudder Trim Tab Control
12. Elevator Trim Tab Control
13. Marker Beacon Receiver Dynamotor
14. Fuel Selector Valve
15. Hydraulic Pressure Gage
16. Flap Position Indicator
17. Circuit Breaker Box
18. Hand Fuel Pump Handle
19. Landing Gear Position Indicator
20. Generator Circuit Breaker
21. Hydraulic Hand Pump
22. Flight Report Case
23. Flap Control
24. Landing Gear Control
25. Carburetor Air Temperature Control
26. Hydraulic Power Control
27. Left Rudder and Brake Pedal
28. Oil Cooler Shutter Control
29. Safety Belt
30. Cockpit Seat
31. Foot Trough
32. Cold Air Outlet
33. Blind Flying Hood Catch
34. Camera Signal Light
35. Spare Lamp
36. Suction Gage
37. Magnetic Compass
38. Directional Gyro

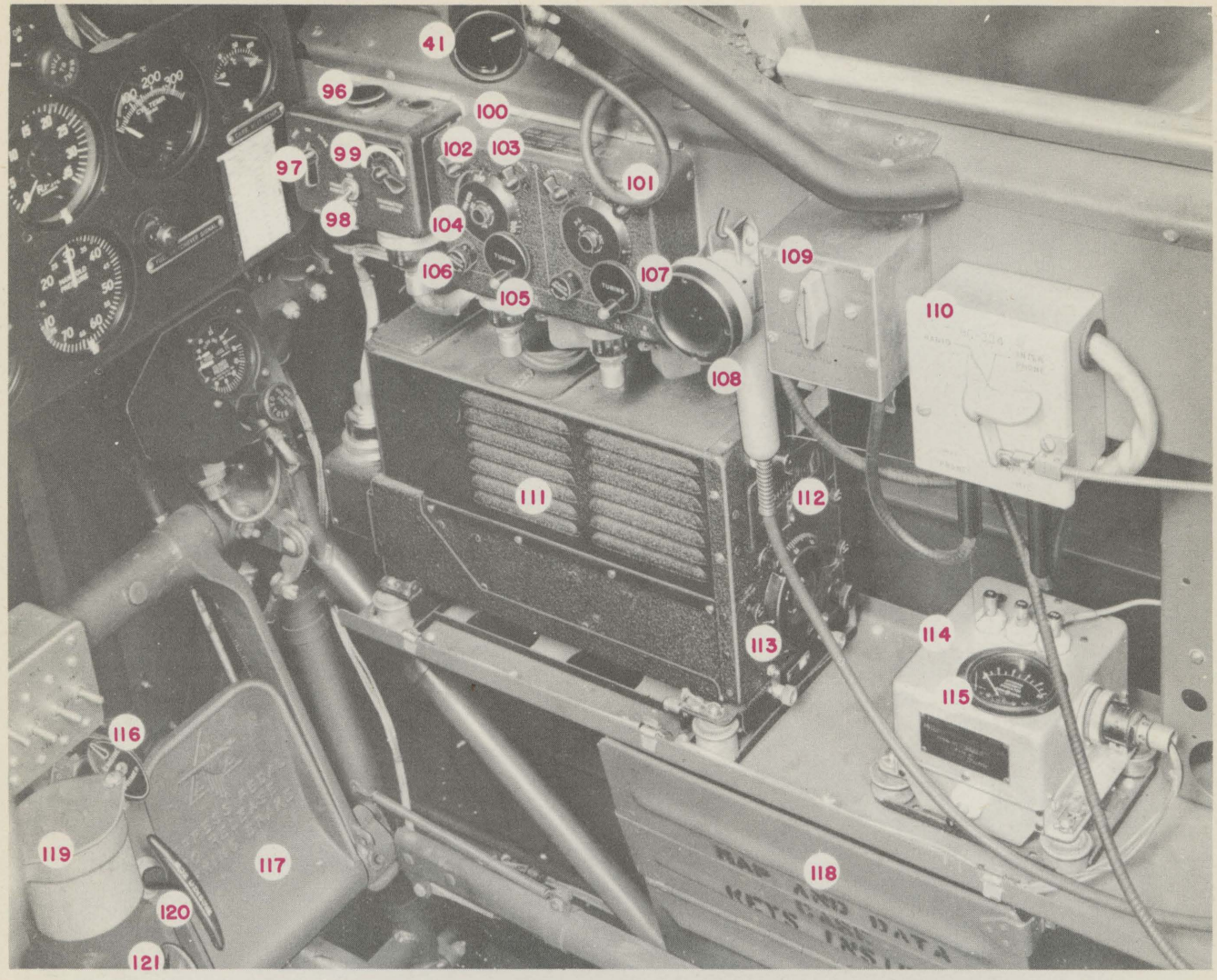
FIG. 10—LEFT SIDE FRONT COCKPIT—24 VOLT AIRPLANE



LEGEND

39. Flight Indicator
40. Radio Call Plate
41. Fluorescent Instrument Light
42. Altimeter
43. Air Speed Indicator
44. Bank and Turn Indicator
45. Rate of Climb Indicator
46. Tachometer
47. Cylinder Head Temperature Gage
48. Carburetor Mixture Temperature Gage
49. Ignition Switch
50. Altimeter Correction Chart
51. Marker Beacon Signal Light
52. Fuel—Air Ratio Gage
53. Oil Temperature, Fuel and Oil Pressure Gage
54. Manifold Pressure Gage
55. Fuel Switch-over Signal Light
56. Compass Correction Chart
57. Accelerometer
58. Generator Ammeter
59. Starter Engage Switch
60. Starter Energize Switch
61. Left Fluorescent Light Rheostat
62. Right Fluorescent Light Rheostat
63. Cowl Gun Selector Switch
64. Wing Gun Selector Switch
65. Oil Dilute Switch
66. Battery Disconnect Switch
67. Generator Main Line Switch
68. Gun Sight Rheostat
69. Compass Light Rheostat
70. Right Bomb Rack Selector Switch
71. Left Bomb Rack Selector Switch
72. Recognition Light Keying Switch
73. White Recognition Light Switch
74. Red Recognition Light Switch
75. Green Recognition Light Switch
76. Amber Recognition Light Switch
77. Left Landing Light Switch
78. Right Landing Light Switch
79. Passing Light Switch

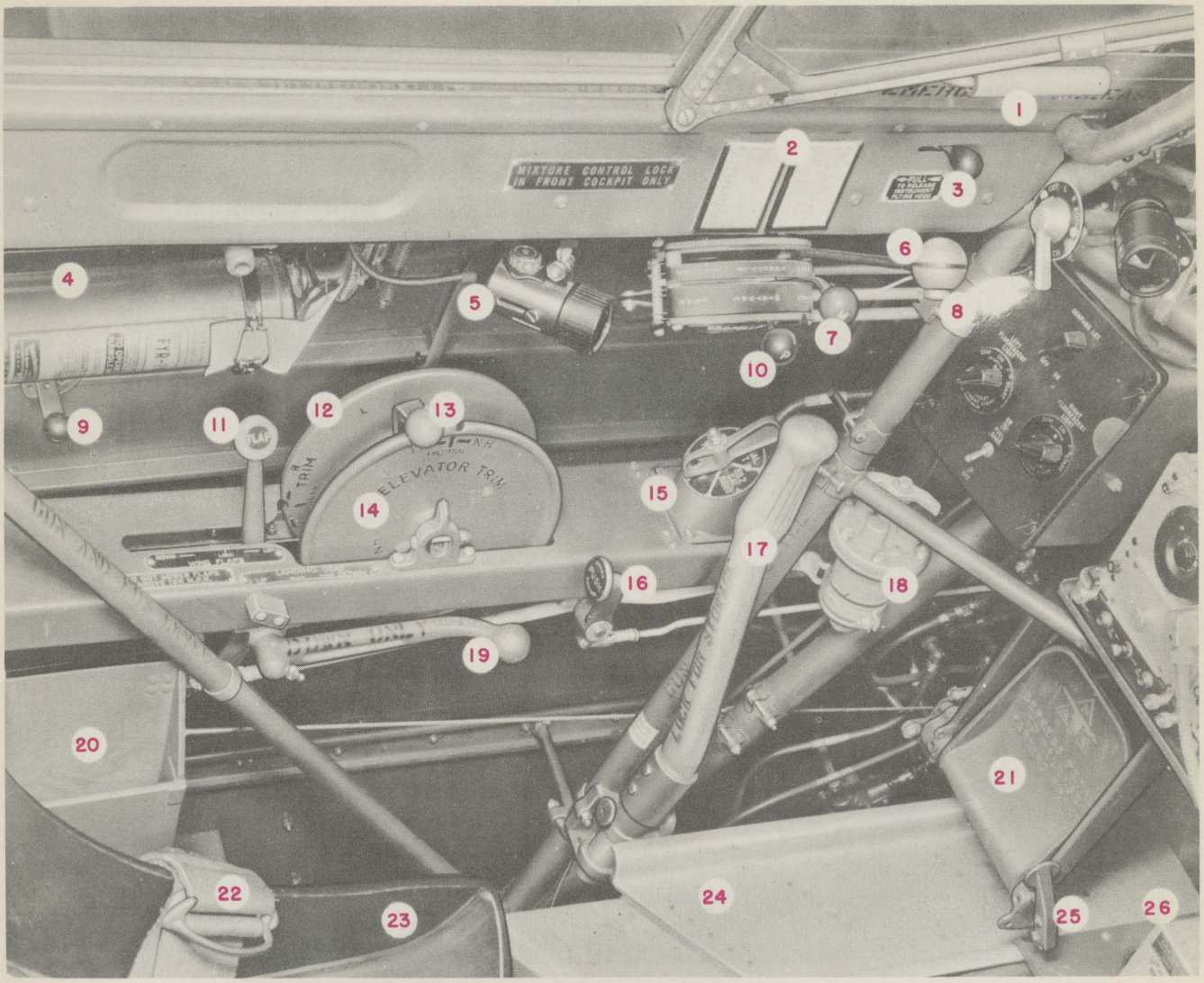
FIG. 11—CENTER FRONT COCKPIT—24 VOLT AIRPLANE



LEGEND

80. Fuel Gage Light Switch
81. Pitot Heater Switch
82. Fuel Switch-over Signal Light Test Switch
83. Wing Position Light Switch
84. Tail Position Light Switch
85. Camera Safety Switch
86. Gun Safety Switch
87. Bomb Safety Switch
88. Bomb Arming Signal Light
89. Bomb Arming Safety Switch
90. Parking Brake Handle
91. Oxygen Pressure and Flow Gage
92. Oxygen Regulator
93. Bomb Release Switch
94. Gun Trigger Switch
95. Control Stick
96. Transmitter Signal Key
97. Transmitter Phone and CW Selector Switch
98. Transmitter Power Switch
99. Transmitter Frequency Selector Switch
100. High Frequency Receiver
101. Low Frequency Receiver
102. Headphone Selector Switch
103. Power Switch
104. Tuning Dial
105. Tuning Crank
106. Volume Control
107. Microphone
108. Microphone Switch
109. Radio Filter Box
110. Radio—Interphone Selector Switch
111. Transmitter
112. Frequency Indicator
113. Tuning Dial
114. Antenna Relay
115. Antenna Current Indicator
116. Engine Primer
117. Right Brake and Rudder Pedal
118. Map and Data Case
119. Gun Sight
120. Gun Charger
121. Pedal Adjustment Latch

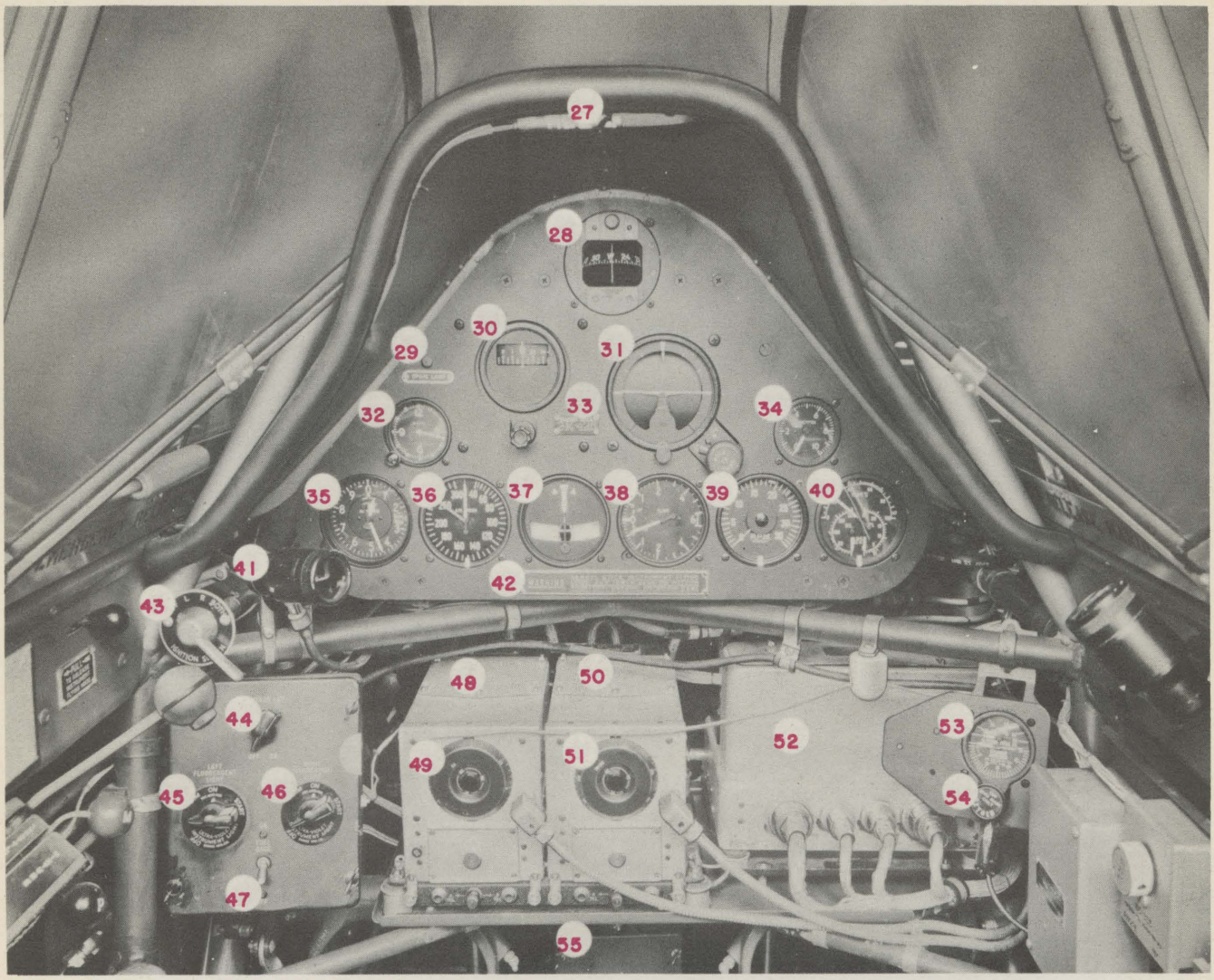
FIG. 12—RIGHT SIDE FRONT COCKPIT—24 VOLT AIRPLANE



LEGEND

1. Gunner's Hood Handle
2. Altimeter and Compass Correction Charts
3. Blind Flying Hood Release
4. Fire Extinguisher
5. Cockpit Light
6. Throttle Control
7. Mixture Control
8. Throat Microphone Switch
9. Ventilator Door Handle
10. Propeller Control
11. Flap Control
12. Rudder Trim Tab Control
13. Hand Fuel Pump Handle
14. Elevator Trim Tab Control
15. Fuel Selector Valve
16. Hydraulic Power Control
17. Control Stick (Stowed Position)
18. Hydraulic Filter
19. Landing Gear Control
20. Flight Report Case
21. Left Rudder and Brake Pedal
22. Safety Belt
23. Cockpit Seat
24. Foot Trough
25. Pedal Adjusting Latch
26. Marker Beacon Receiver

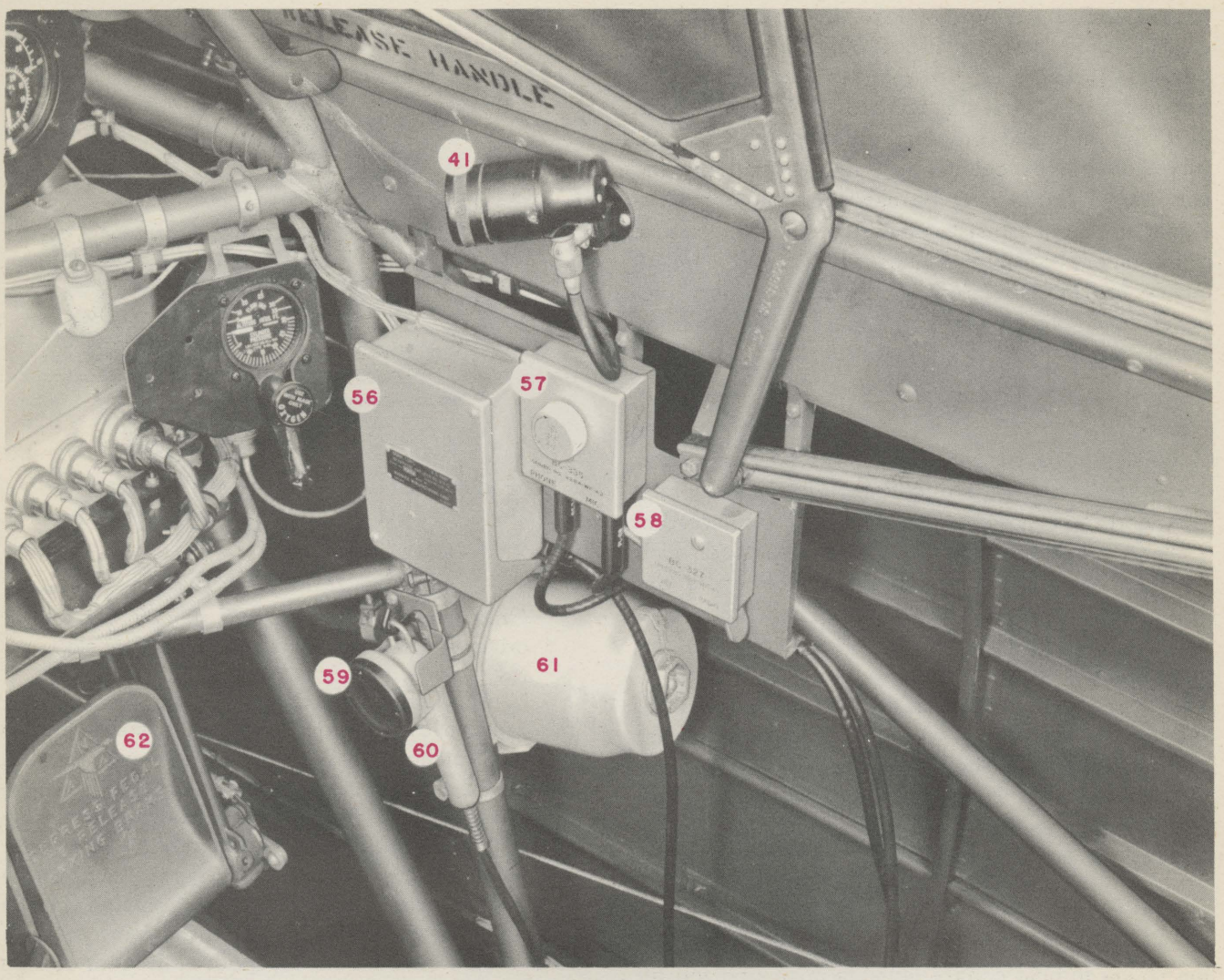
FIG. 13—LEFT SIDE REAR COCKPIT—24 VOLT AIRPLANE



LEGEND

27. Blind Flying Hood Catch
28. Magnetic Compass
29. Spare Lamp
30. Directional Gyro
31. Flight Indicator
32. Clock
33. Radio Call Plate
34. Suction Gage
35. Altimeter
36. Air Speed Indicator
37. Bank and Turn Indicator
38. Rate of Climb Indicator
39. Tachometer
40. Oil Temperature, Fuel and Oil Pressure Gage
41. Fluorescent Light
42. Warning Instruction Plate
43. Ignition Switch
44. Compass Light Rheostat
45. Left Fluorescent Light Rheostat
46. Right Fluorescent Light Rheostat
47. Fuel Gage Light Switch
48. Low Frequency Receiver
49. Low Frequency Receiver Tuning Dial
50. High Frequency Receiver
51. High Frequency Receiver Tuning Dial
52. Transmitter Modulator
53. Oxygen Pressure and Flow Gage
54. Oxygen Regulator
55. Radio Junction Box

FIG. 14—CENTER REAR COCKPIT—24 VOLT AIRPLANE



LEGEND

56. Interphone Amplifier
57. Radio Volume Control
58. Interphone—Radio Switch
59. Microphone
60. Microphone Switch
61. Vacuum Filter Unit
62. Right Rudder and Brake Pedal

FIG. 15—RIGHT SIDE REAR COCKPIT—24 VOLT AIRPLANE

cooled, radial engine. For take-off at sea level the engine rating is 600 BHP at 2250 RPM with 36" Hg manifold pressure for five minutes (maximum.) Normal rating at 5,000 feet is 550 BHP, at 2200 RPM with 32.5" Hg manifold pressure. The engine is to be serviced with 91 octane fuel. If not available the next higher grade may be used in emergency. Engine equipment consists of two Scintilla magnetos, a Stromberg carburetor fitted with an idle cut-off device, a Hamilton Standard constant speed propeller, and other necessary accessories, such as starter, generator and various pumps.

a. ENGINE CONTROLS.—The engine controls are of the steel tube, push-pull type, with bellcranks and rod ends mounted on ball bearings. The throttle, mixture and propeller control levers are all assembled in a single quadrant located on the left side of each cockpit. Front and rear cockpit control levers are interconnected by means of rods. The engine controls are equipped with a friction lock to prevent the controls from creeping after setting. The lock is located in the front cockpit on the face of the quadrant and may be actuated at will by the pilot or occupant in the front cockpit. The controls may be set or tightened by screwing the small disc inward or loosened by screwing outward. The functions and operation of the controls are as follows:

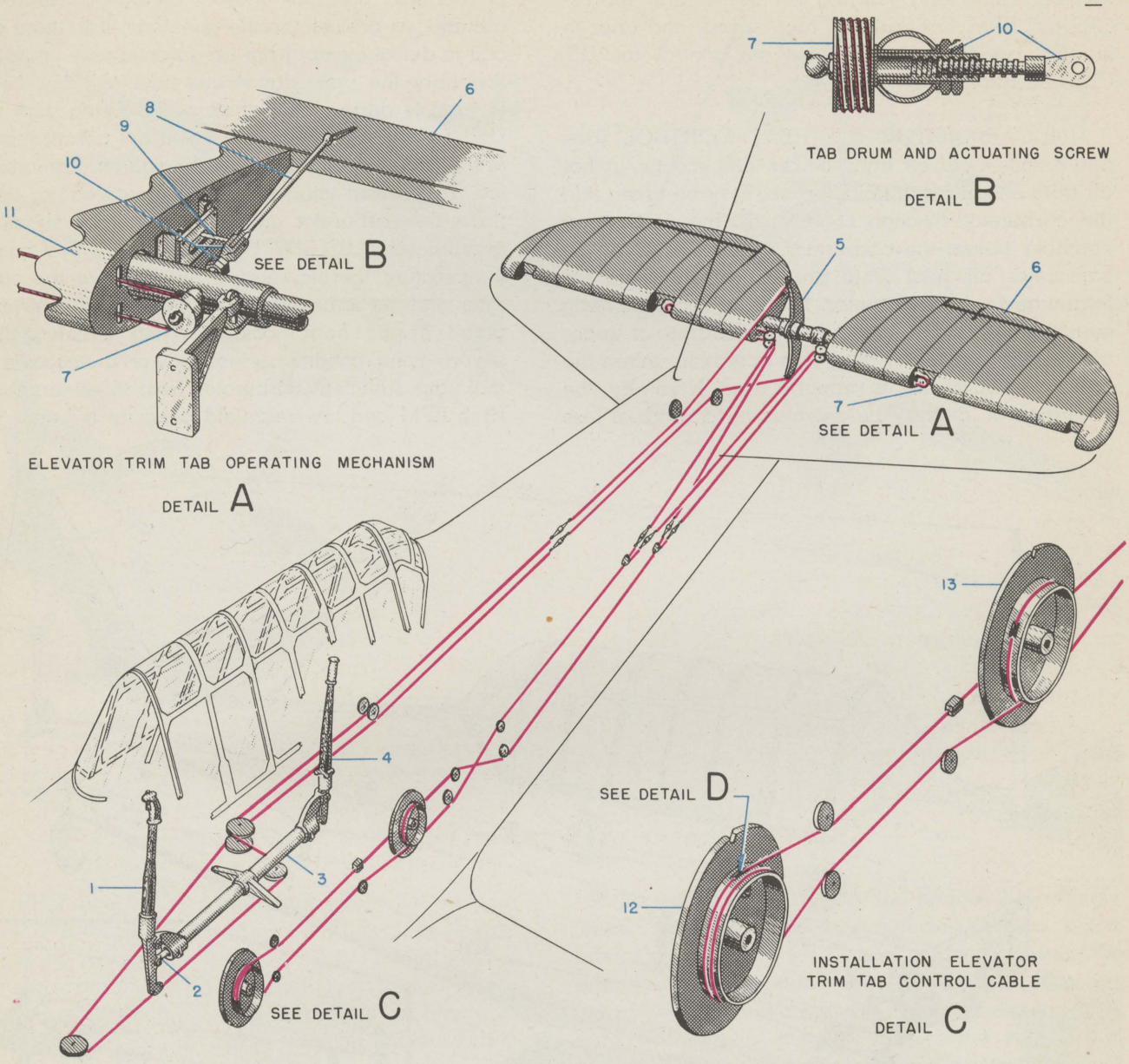
(1) THROTTLE CONTROL.—The forward position of the throttle control lever is open and the aft position is closed as indicated on the quadrant. The throttle in the front cockpit is provided with a joggle-type stop that should be adjusted to limit the travel of the control lever so that 36 inches Hg manifold pressure at 2250 RPM is not exceeded at sea level take-off. The throttle may be advanced beyond the stop for maximum power, however this position is utilized ONLY in case of an emergency and must not be used otherwise. The throttle lever is wired to two toggle switches in the wheel wells that operate the landing gear warning horn. If the throttle is retarded within 7/16-inch of the LEAN position the warning horn will sound indicating the landing gear is not down or locked in its extended position. Located in the knob-type handle on the throttle control lever is a radio button for British throat-type microphones serving the same purpose as the switch on U. S. hand-type microphones.

WARNING

Only in emergency should the throttle be advanced beyond the maximum power stop.

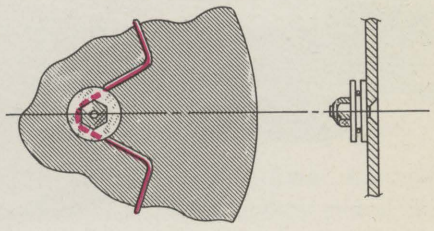
(2) MIXTURE CONTROL.—The front cockpit mixture control lever is equipped with a spring-loaded lock and ratchet. When the control is moved forward toward the rich position, the lock is ineffective; however, in moving the control aft toward the lean position it is necessary to press forward on lock lever attached to the control handle. When this is done the lock is disengaged from the ratchet and allows the control to be pulled back toward the lean position. This feature enables the occupant in the rear cockpit to readily enrich, but prevents him from leaning out the mixture. This is done because the engine instruments are in the front cockpit and cannot be checked visually from the rear cockpit. An idle cut-off device is provided and becomes effective when the mixture control handle is in the extreme rear or LEAN position. On British airplanes the mixture controls operate in reverse, that is, LEAN is in the forward position.

(3) PROPELLER CONTROL.—The propeller control lever is mounted on the engine control quadrant. Control levers are interconnected by a rod and connected to the constant speed governor by means of push-pull rods and bellcranks. As indicated on the quadrant, the forward position of the propeller control lever results in INCREASE RPM and the rearward position results in DECREASE RPM. Between these two positions is the CONSTANT SPEED CONTROL RANGE which permits the governor to automatically adjust the propeller pitch for the desired RPM. For



LEGEND

1. Front Control Stick
2. Control Stick Connecting Tube
3. Control Stick Torque Tube
4. Rear Control Stick
5. Elevator Horn
6. Elevator Trim Tab
7. Trim Tab Drum
8. Trim Tab Push-pull Rod
9. Trim Tab Guide Spacer
10. Trim Tab Actuating Screw
11. Elevator
12. Front Trim Tab Control Wheel
13. Rear Trim Tab Control Wheel

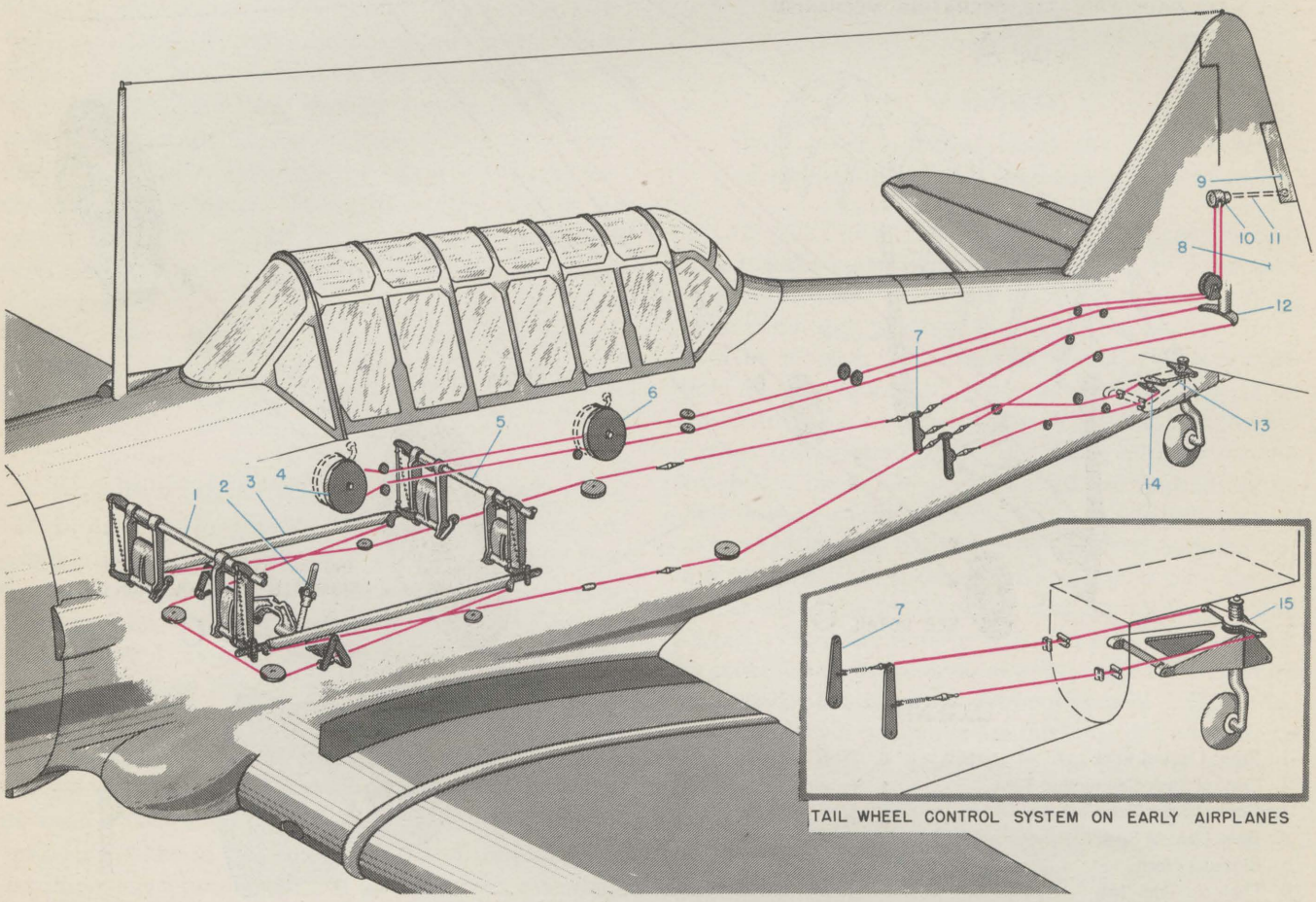


CABLE ATTACHMENT TO CONTROL WHEEL
DETAIL D

FIG. 16—ELEVATOR CONTROL SYSTEM

take-off, climb and landing set the control for INCREASE RPM. For cruising, high speed, and prior to starting and stopping engine, set control for DECREASE RPM.

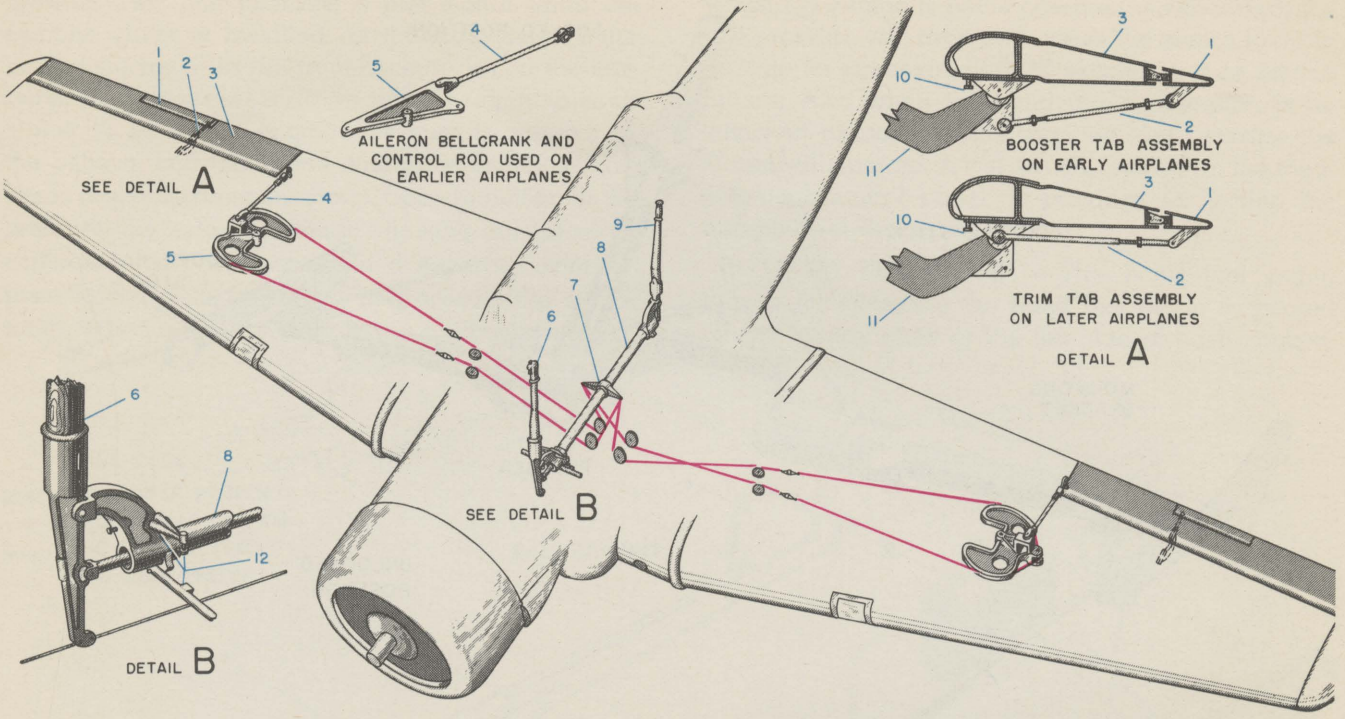
(4) CARBURETOR AIR HEAT CONTROL (See figure 26.)—Cold air from the air inlet scoops, or hot air from exhaust manifold shroud, may be taken into the carburetor through a valve in the air mixing chamber below the carburetor. The function of the carburetor air heat is to prevent or eliminate ice formation in the carburetor. If the right atmospheric conditions exist, ice will form in the carburetor under almost any conditions of engine operation unless the carburetor air heater is properly used. Normally, the formation of ice may be detected by a gradual loss of manifold pressure without change of throttle or altitude. At greater throttle openings, it is more difficult to detect except from irregular engine operation. Probably the most dangerous time of flight for ice to form is during take-off, or while flying very low. Under these conditions, time will not permit the use of the air heater to eliminate the sudden formation of ice. To prevent icing under adverse weather conditions, the carburetor mixture temperature should be maintained at 3°C (37°F) to 5°C (41°F). The mixture temperature thermometer is fitted above the carburetor and the indicator is mounted on the instrument panel in the front oockpit. When cruising under severe icing conditions, use power it necessary to maintain sufficient carburetor heat to eliminate ice. High RPM and low manifold pressure is better than



LEGEND

1. Front Rudder Pedal Assembly
2. Surface Control Lock
3. Rudder Pedal Connecting Tube
4. Front Trim Tab Control Wheel
5. Rear Rudder Pedal Assembly
6. Rear Trim Tab Control Wheel
7. Rudder Cable Idler Arm
8. Rudder
9. Rudder Trim Tab
10. Trim Tab Drum
11. Trim Tab Push-pull Rod
12. Rudder Horn
13. Bellcrank Linking Rod
14. Bellcrank Assembly
15. Post Assembly

FIG. 17—RUDDER CONTROL SYSTEM



LEGEND

1. Aileron Trim/Booster Tab
2. Trim/Booster Tab Connecting/Push-pull Rod
3. Aileron
4. Aileron Quadrant/Bellcrank Control Rod
5. Aileron Quadrant/Bellcrank
6. Front Control Stick
7. Aileron Torque Tube Arm
8. Aileron Torque Tube
9. Rear Control Stick
10. Aileron Hinge Stop
11. Aileron Hinge Bracket
12. Aileron Torque Tube Stop Assembly and Stop Lug

FIG. 18—AILERON CONTROL SYSTEM

low RPM and high manifold pressure. Elimination of ice is determined when manifold pressure has returned to normal for the particular throttle setting. It is important, due to the high manifold pressure allowed for take-off, that the carburetor air heat control be set for COLD before take-off, except when operating in unusually cold or damp weather. This is necessary, due to the resulting air temperature with the control set for HOT which materially reduces the engine power and may cause detonation and its accompanying serious effects. Always enrich the mixture before removing carburetor heat.

(5) ENGINE PRIMER.—The engine primer pump and the operating handle, type 40, manufactured by the Parker Appliance Co., is installed on the subpanel directly below the instrument panel in the front cockpit. The Parker primer is of the displacement plunger type. It is an entirely self-contained unit with no auxiliary valves or other parts. Distribution and shut-off are effected by the single pump handle. In the OFF position, the handle is positively locked against vibration. A special vacuum check prevents suction of fuel into the engine should the primer accidently be left in the ON position. The fuel is pumped by means of the primer pump from the discharge side of the fuel unit to the engine fuel outlet distributor on cylinder No. 1 intake port. From the primer distributing inlet fuel diffuses through jets in the cylinder intake ports of cylinders 8, 9, 1, 2 and 3. To operate push in on handle and rotate counterclockwise allowing the pump to be operated.

(6) STARTER CONTROLS. — Two toggle-type switches located on the pilot's switch panel in the front cockpit provide for electrical control of the starter. The right switch energizes the starter and the left switch causes the starter to engage with the crankshaft. Toggle-type switches replace a foot pedal starting device on all airplanes equipped with the 24 volt electrical system. The starter provides ample torque for engine starting when the flywheel has

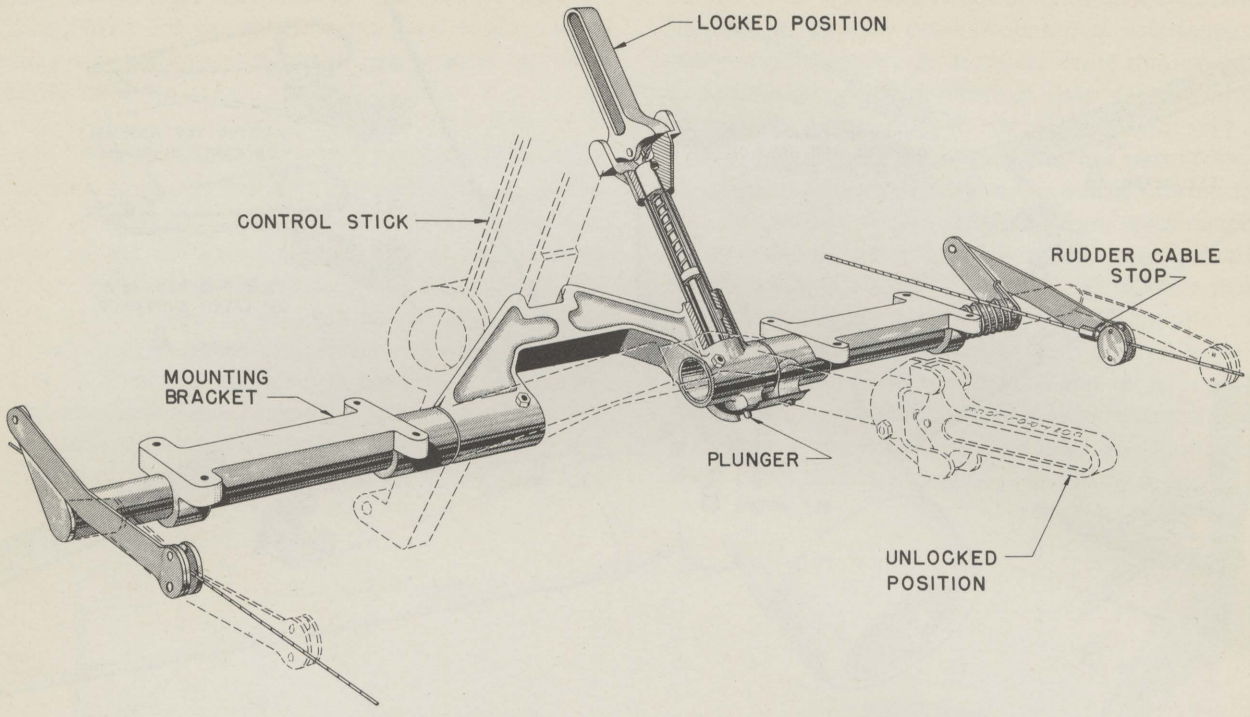


FIG. 19—SURFACE CONTROL LOCK MECHANISM

accelerated to the normal 12,000 RPM either manually or electrically.

CAUTION

On all airplanes equipped with the 24 volt system, always use outside power for cranking engines whenever possible.

(a) HAND CRANKING.—Remove crank from baggage compartment and place in receptacle on left engine cowl, open access door marked STARTER, reach in and lift starter brushes, turn crank until a steady hum is heard and then pull cable which operates starter engaging solenoid.

(7) MANIFOLD PRESSURE GAGE DRAIN.—The manifold pressure gage drain control is located on the cockpit fairing at the forward left side of the front cockpit. The control should be used at engine warm-up in order to blow out moisture that has accumulated in the manifold pressure line. To operate, turn handle 90° in a clockwise direction from the closed position for a period of approximately five seconds.

(8) OIL DILUTION SWITCH.—The oil dilution switch is located on the front cockpit control panel. To dilute the oil operate the engine at 800 RPM and maintain oil temperature 5° to 50°C (4° to 122°F), hold oil dilution switch ON four minutes, stop engine, release oil dilution switch.

(a) For ground temperatures from 5° to -7°C (40° to 20°F), hold oil dilution switch ON four minutes, stop engine, release oil dilution switch.

(b) For temperatures -7° to -30°C (+ 20 to -20°F), dilute for a second four-minute period 15 minutes after first dilution.

(c) For temperatures below -30°C (-20°F) dilute for third four-minute period, 15 minutes after second dilution.

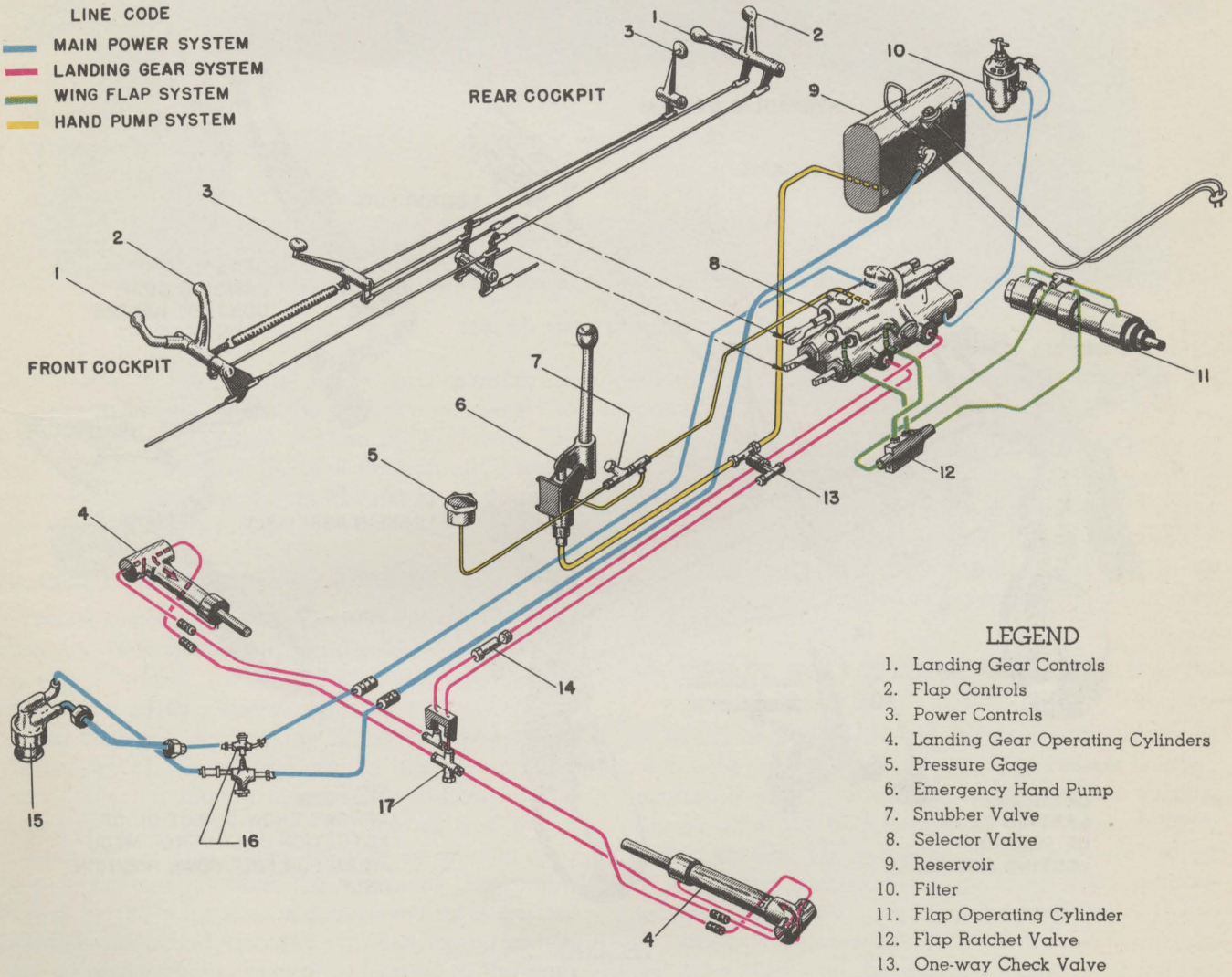
9. FUEL SYSTEM (See figures 27 and 28.)

The fuel system consists essentially of two removable tanks housed within the center section structure, a Type F-10 engine-driven fuel pump on the engine accessory housing, a fuel unit on the forward side of the firewall with a fuel cock at the bottom of the fuel unit and a fuel selector valve. The fuel system is provided with two float-type fuel quantity gages, a fuel pressure signal, a carburetor mixture temperature indicator, engine priming and oil dilution system, and necessary piping, fittings and controls.

a. FUEL SWITCH-OVER SIGNAL.—Signal assembly is installed on the lower left forward side of the

firewall. This unit operates a fuel signal lamp assembly which is installed on the right side of the instrument panel in the front cockpit. When the carburetor fuel pressure is above three lb/sq in. (plus or minus ¼ lb/sq in.) enough pressure is exerted on the bellows and the spring within the signal assembly to maintain an open circuit. Upon reduction of the pressure, the bellows extends allowing the electrical contacts which are located in a separate compartment to complete the circuit and operate the signal lamp. When the fuel supply in the compartment from which the engine is being operated is exhausted, the fuel pressure will drop and cause the signal lamp to operate for approximately 10 seconds before engine failure. Also when the hand pump operation is insufficient to maintain the required fuel pressure the signal will operate. A test switch, located on the main electrical control panel, is provided for testing the operation of the warning light.

b. HAND FUEL PUMP. — The hand fuel pump handle for operating the hand fuel pump is located on the control shelf at the left side of each cockpit,



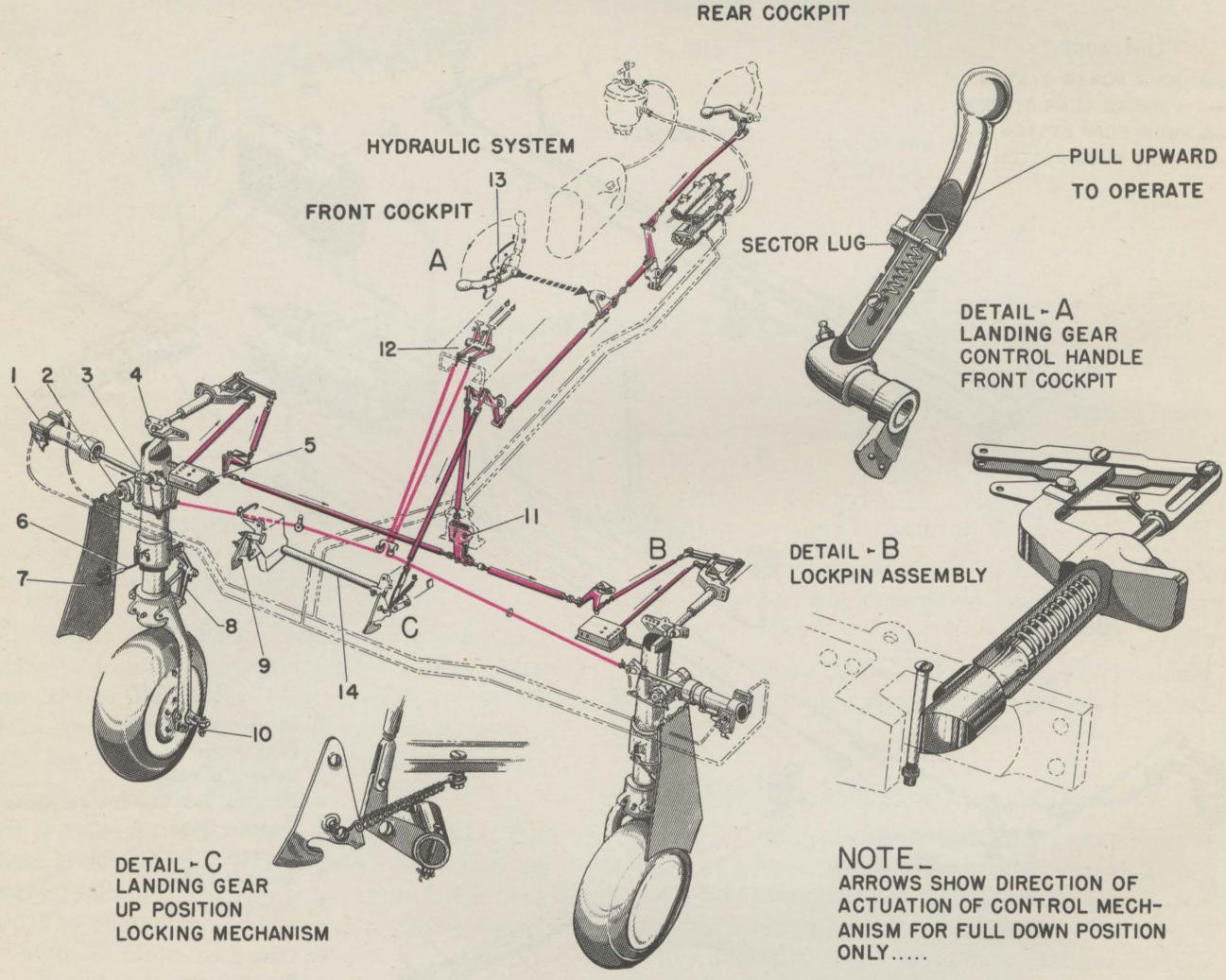
LEGEND

1. Landing Gear Controls
2. Flap Controls
3. Power Controls
4. Landing Gear Operating Cylinders
5. Pressure Gage
6. Emergency Hand Pump
7. Snubber Valve
8. Selector Valve
9. Reservoir
10. Filter
11. Flap Operating Cylinder
12. Flap Ratchet Valve
13. One-way Check Valve
14. Restrictor Valve
15. Engine-driven Pump
16. Test Connections
17. Drain Plug

FIG. 20—MAIN HYDRAULIC SYSTEM

between the rudder and trim tab control wheels. The control levers are interconnected by a rod, and connected to the hand pump arm by means of a push-pull and bellcrank mounted on ball bearings. The function of this hand pump is to obtain fuel pressure when the engine is not running and to be used in the event the engine fuel pump fails to operate. Insufficient operation of the hand fuel pump will be indicated by the fuel pressure warning light.

c. FUEL SELECTOR VALVE. — The fuel selector valve is a cork-seated cock-type G-2A valve with dial-type selectors. The fuel selector valve is located in the center section structure aft of the left fuel tank gage assembly and is connected by means of rod linkage to the dial selectors located on the control shelf. Fuel tank dial selectors are provided in both front and rear cockpits; forward of the trim tab controls in the rear cockpit and aft of trim tab controls in front cockpit. Fuel may be taken from either the RIGHT tank, LEFT tank or the RESERVE supply by turning the dial selector to any one of these three positions as indicated on the dial selector face plate. By turning the selectors the rod linkage revolves a cord-



LEGEND

1. Operating Cylinder
2. Oleo Attaching Fitting
3. Pneudraulic Strut
4. Lock and Hoist Fitting
5. Warning Horn Switch Box
6. Fairing Door Actuating Rod
7. Strut Fairing
8. Torsion Link
9. Locking Mechanism Latch
10. Towing and Jacking Lug
11. Locking Mechanism Bellcrank
12. Position Indicators
13. Control Sector Assembly
14. Lock Torque Shaft

FIG. 21—LANDING GEAR SYSTEM

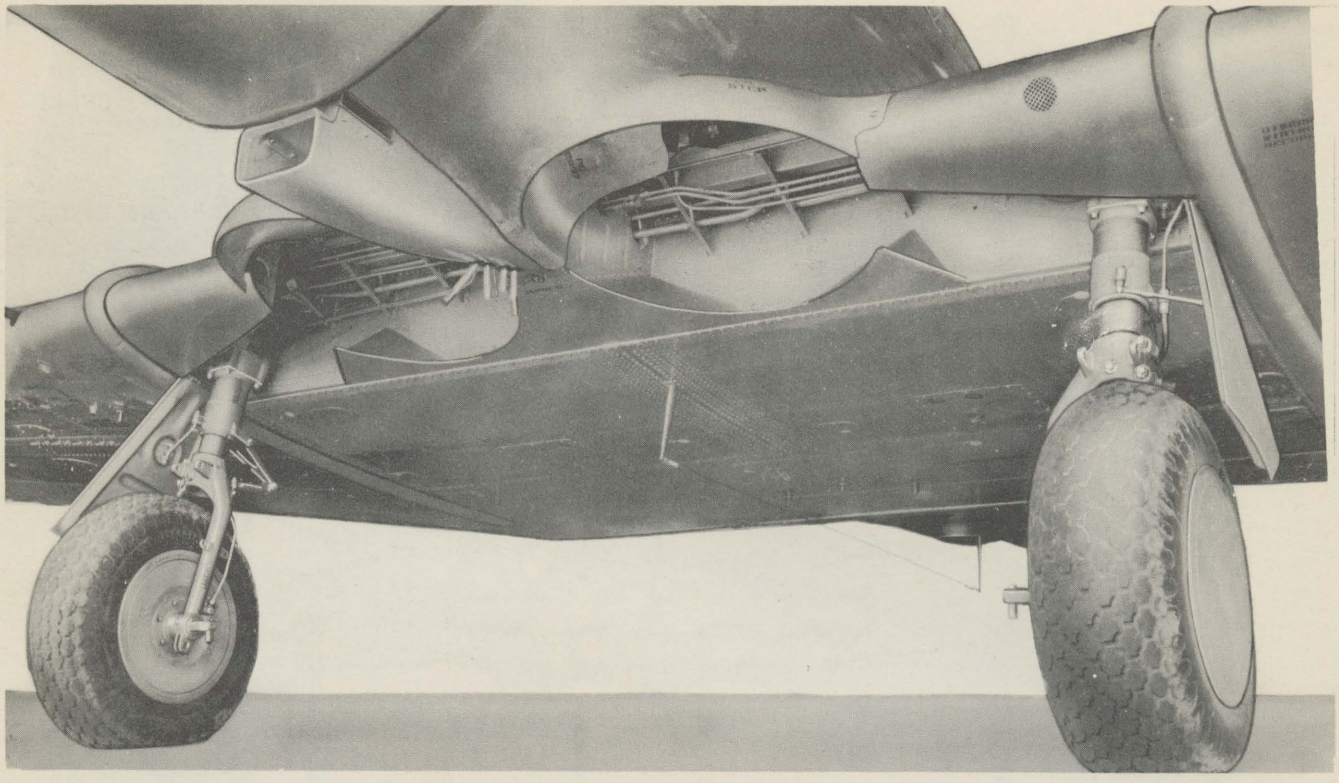


FIG. 22—MAIN LANDING GEAR

seated core in the selector valve, thus aligning an opening in the core with the passage connected to the fuel line from the selected fuel compartment. The fuel will then flow from the tank through the selector valve to the fuel unit. To shut off the flow of fuel to the engine turn the fuel selector to the OFF position.

10. OIL SYSTEM (See figures 29 and 30.)

The oil system consists of an oil tank, an oil cooler equipped with shutters, an engine-driven oil pump, an oil "Y" drain valve, pressure and temperature indicators and the necessary piping to carry the oil to and from the engine. The oil system flows from the bottom of the oil tank to the engine pressure pump. After circulating through the engine, the engine scavenger pump picks up the oil and forces it back to the tank either directly by means of a by-pass valve or through the oil cooler. The return flow of the oil to the tank is determined by a thermostatically controlled viscosity valve at the oil cooler. The oil cooler shutter control is located in the front cockpit to the left of the electric gun sight and is for the purpose of maintaining the oil within the operating limits. When the control handle is in the extreme up position the shutters are CLOSED and when the control lever is in the extreme down position the shutters are OPEN. Oil system lines, including oil pressure lines, are identified with a yellow band.

a. OIL PRESSURE AND TEMPERATURE INDICATOR.—Oil pressure and temperature indicators are included in the engine gage unit mounted on the instrument panel of each cockpit. The oil temperature indicators are actuated by thermometers which are inserted in wells located in the oil system drain cock assembly.

11. TWELVE VOLT ELECTRICAL SYSTEM (See figures 31, 32 and 33.)

AT-6C and SNJ-4 (Navy) Airplanes are equipped with a 12 volt electrical system. The system has two sources of energy: A storage battery and an engine-driven generator both connected to a common distribution system. The common system is energized by 12 volt direct current, but some of the equipment requiring alternating current is supplied by a DC to AC inverter. The distribution system is of the single, hot wire type with the metallic structure of the airplane as the return except in some instances where it is necessary to use a two-wire circuit to prevent compass interference or to obtain a more efficient ground. All circuits (except the bomb release and gun circuits) are fused in the main fuse box. All electrical

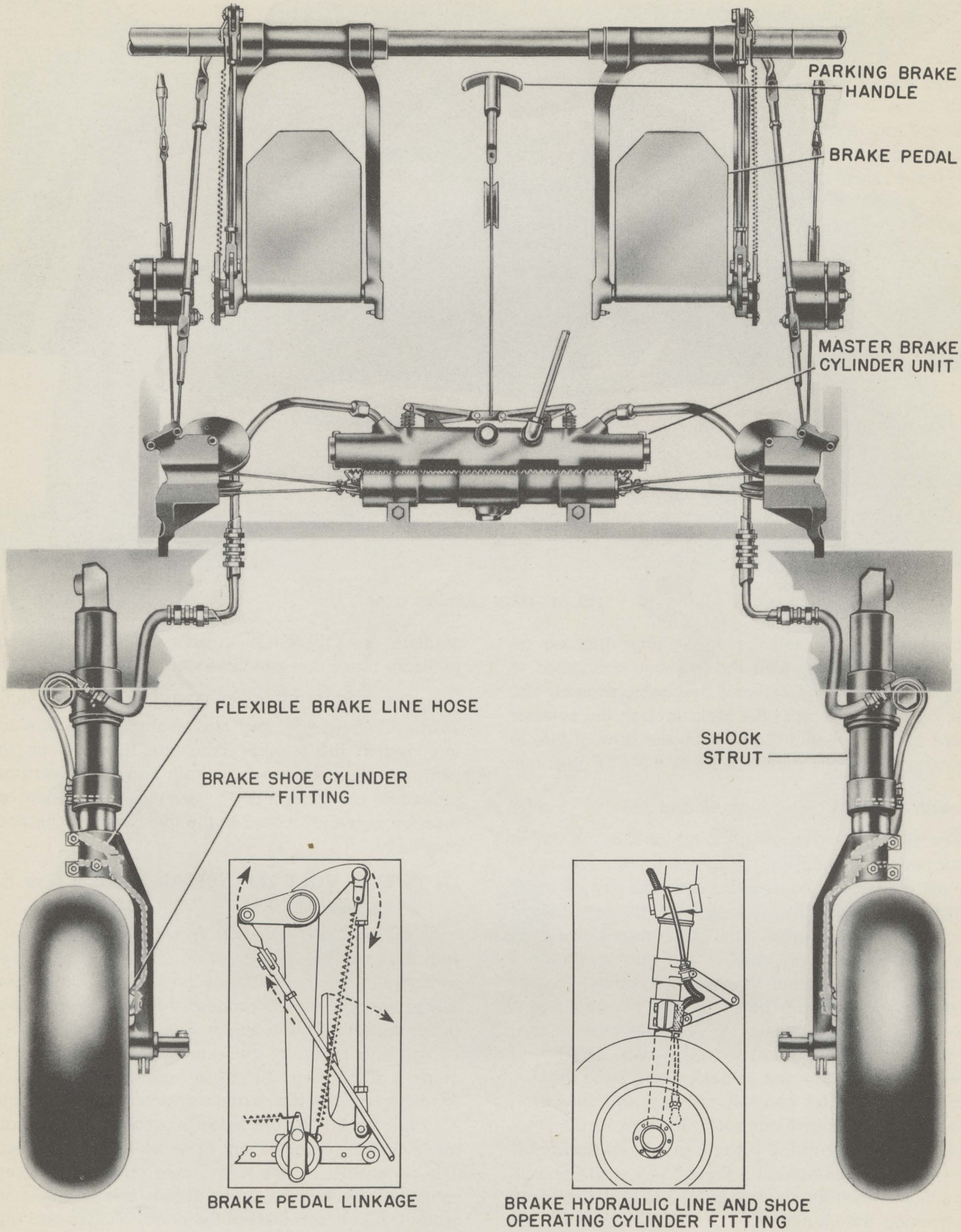


FIG. 23—BRAKE HYDRAULIC SYSTEM

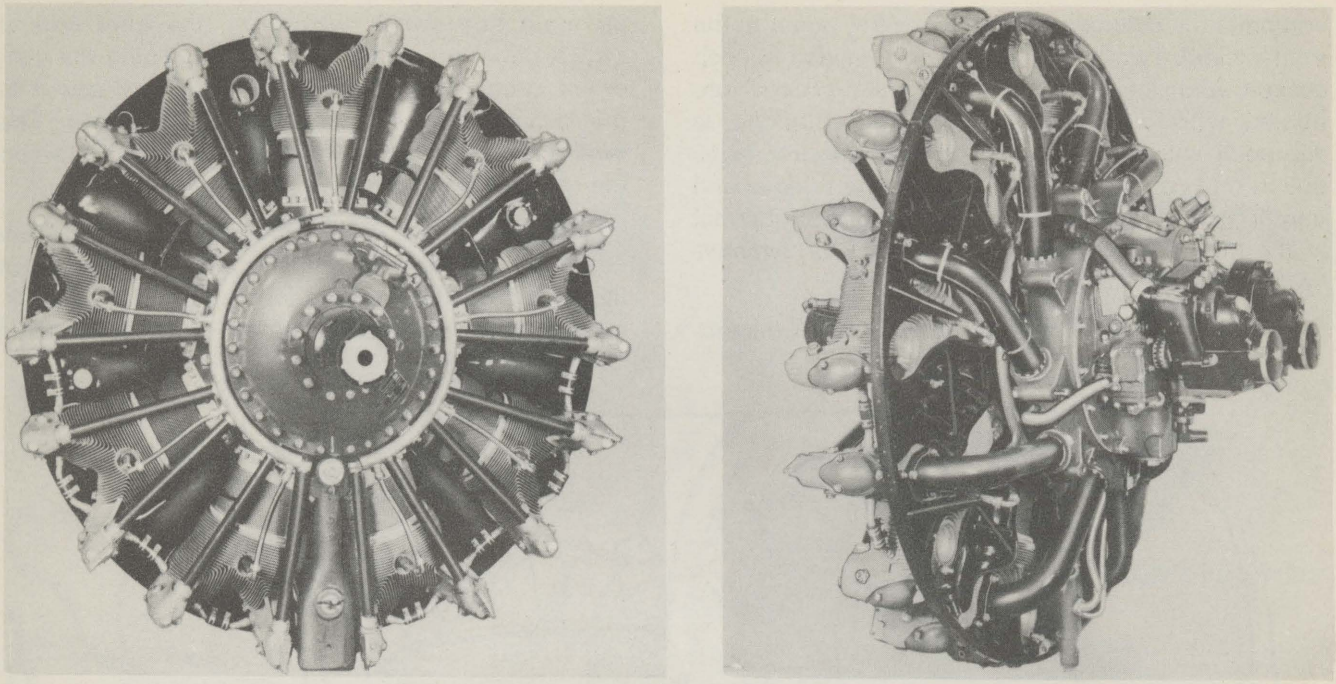


FIG. 24—ENGINE—FRONT AND SIDE VIEWS

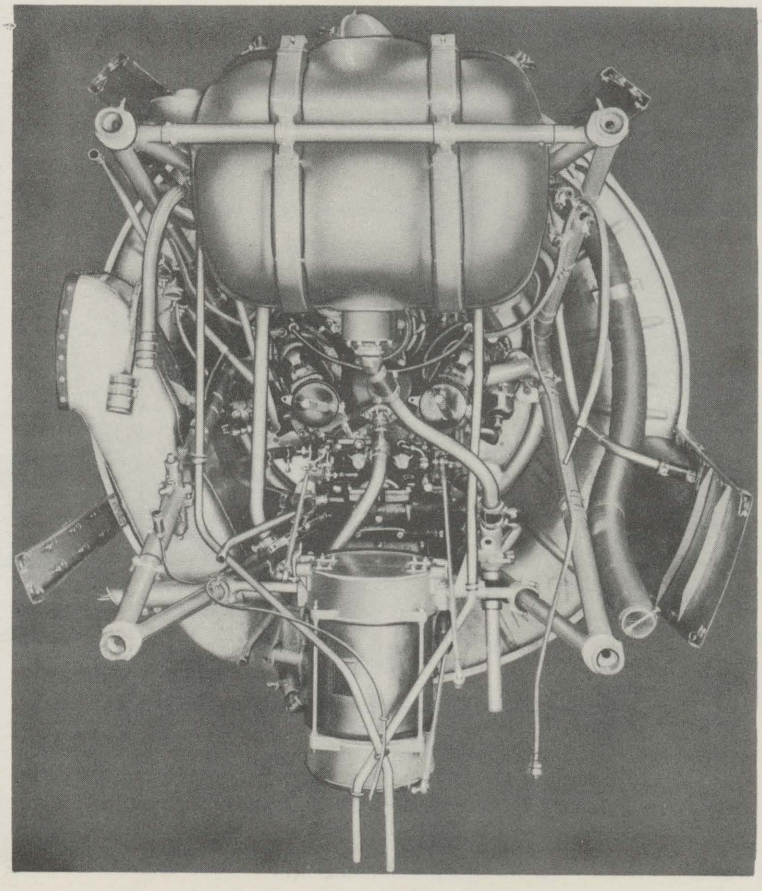
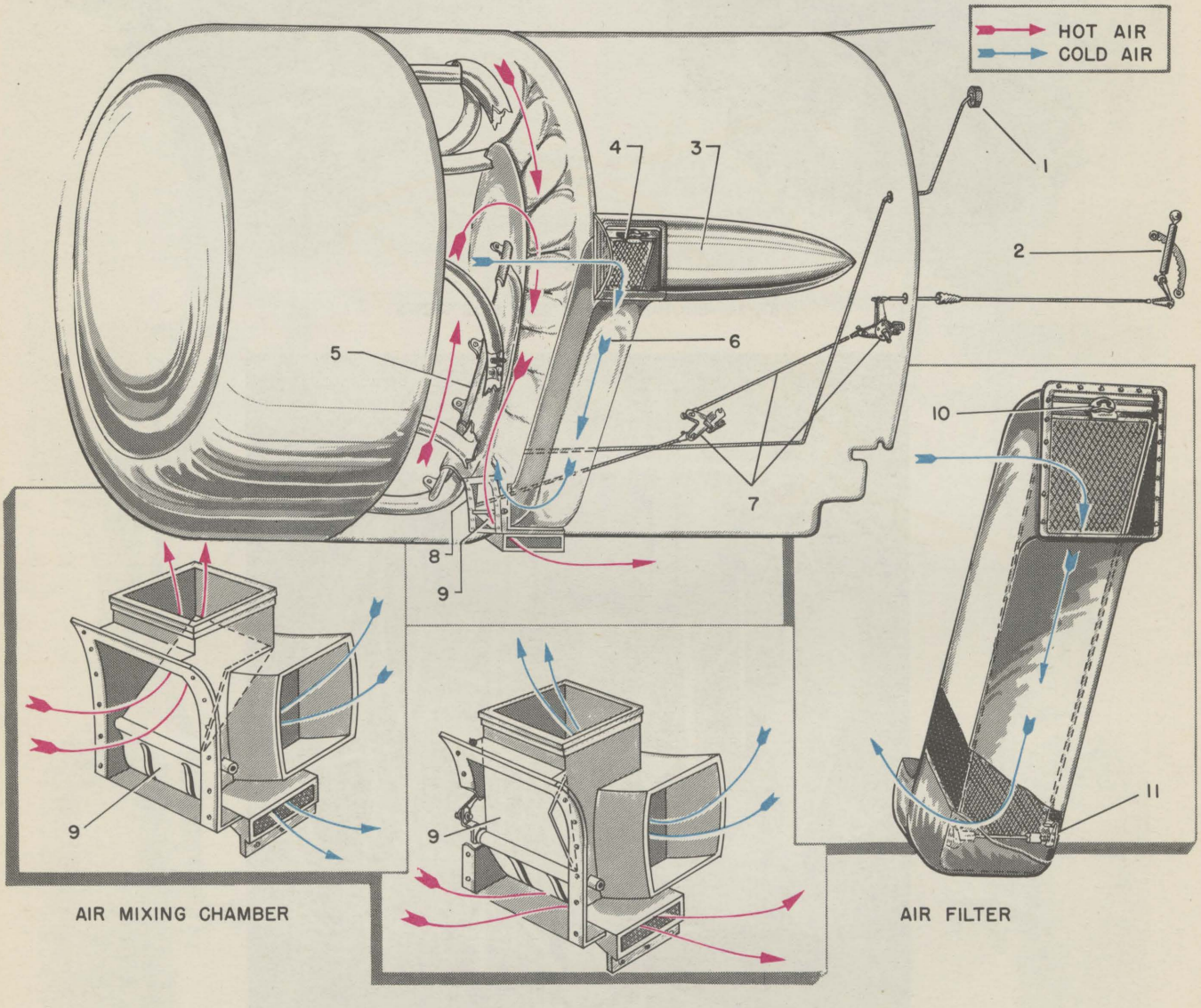


FIG. 25—POWER PLANT REAR VIEW

equipment is controlled from the control panel in the front cockpit. Two cockpit lights are provided in each cockpit and the instruments in each cockpit are lighted with a fluorescent light. The airplane is equipped with conventional landing, passing, navigation and recognition lights. The bomb release and gun firing circuits are fused in the main control panel in the front cockpit, and are controlled by switches on the face of this control panel.

a. GENERATOR MAIN LINE SWITCH.—A generator main line switch located on the front cockpit switch panel provides a means of opening the generator circuit in case the automatic relay cutout in the generator control panel fails to operate. The switch should also be left in the OFF position when the engine is not running.

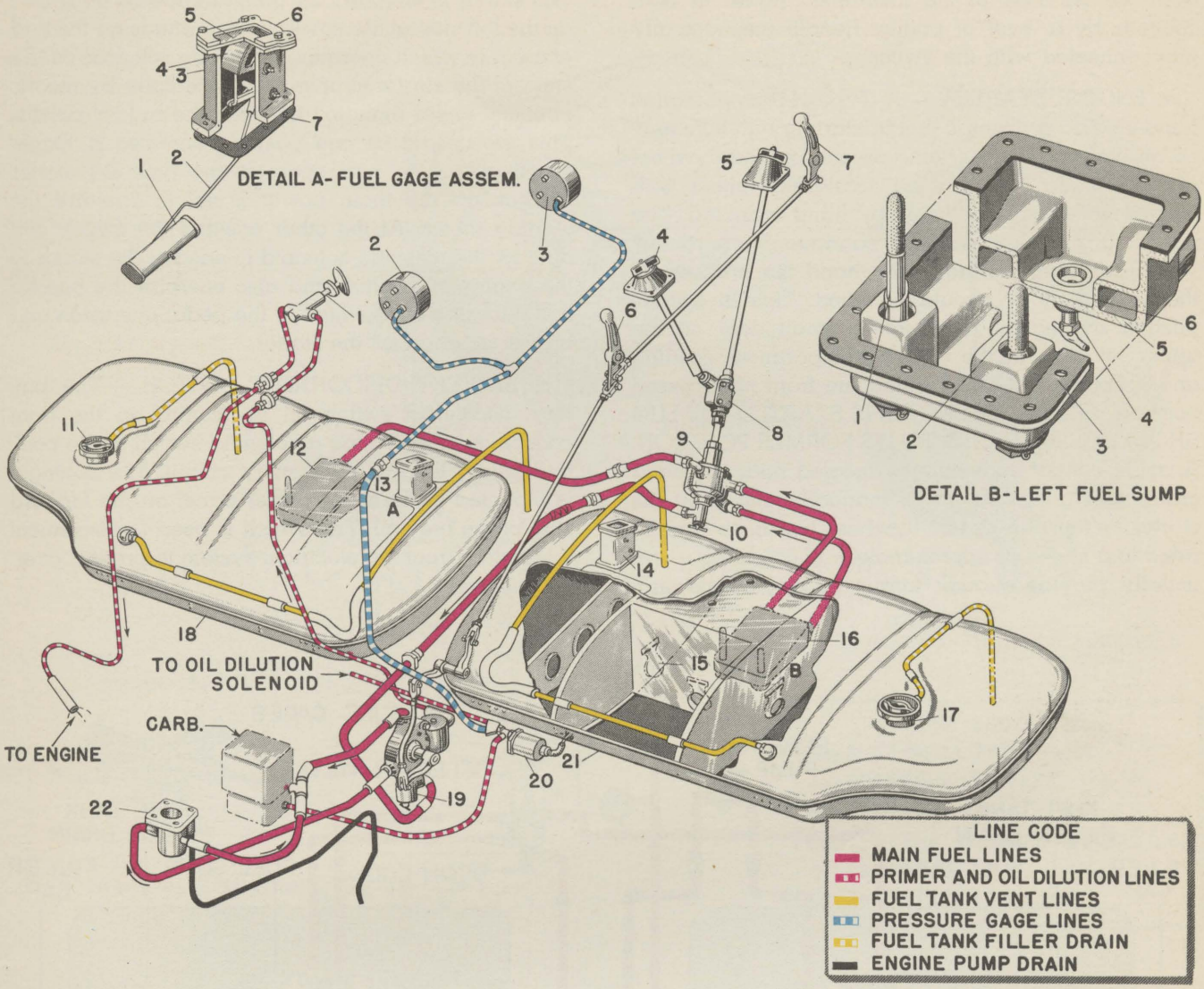
b. IGNITION SWITCH.—A master ignition switch box unit wired directly to the magnetos is located at the left side of the fuselage forward of the front cockpit instrument panel. This master switch is operated



LEGEND

1. Air Temperature Gage
2. Air Control Quadrant
3. Cold Air Scoop
4. Air Scoop Filter Screen
5. Exhaust Manifold Shroud
6. Cold Air Duct
7. Control Linkage and Bellcranks
8. Air Mixing Chamber
9. Air Mixing Chamber Gate
10. Air Filter Fastener
11. Air Filter Bracket

FIG. 26—CARBURETOR AIR INTAKE SYSTEM



LEGEND

1. Primer
2. Engine Front Gage
3. Engine Rear Gage
4. Front Fuel Selector Dial
5. Rear Fuel Selector Dial
6. Front Fuel Pump Handle
7. Rear Fuel Pump Handle
8. Selector Valve Gear
9. Fuel Selector Valve
10. Selector Valve Drain Cock
11. Right Tank Filler Cap
12. Right Fuel Tank Sump
13. Right Fuel Tank Gage Assembly
14. Left Fuel Tank Gage Assembly
15. Flapper Valve
16. Left Fuel Tank Sump
17. Left Tank Filler Cap
18. Right Fuel Tank
19. Fuel Unit
20. Fuel Pressure Signal
21. Left Fuel Tank
22. Engine-driven Pump

DETAIL A—FUEL GAGE ASSEMBLY

1. Float
2. Float Rod Assembly
3. Housing
4. Dial Assembly
5. Plexiglas
6. Retainer Plate
7. Gasket

DETAIL B—LEFT FUEL SUMP

1. Standpipe (Long)
2. Standpipe (Short-Reserve)
3. Gasket
4. Drain Cock
5. Reserve Outlet
6. Outlet

FIG. 27—FUEL SYSTEM

from the left side of the instrument panel in both cockpits by a lever or pointer handle mechanically interconnected with the switch.

c. ENGINE STARTER. — A Type H-5 combination hand-electric concentric inertia starting unit is mounted on the rear of the engine assembly. The flywheel of the starting unit may be accelerated either with the starter electric motor or by hand cranking. The hand crank is stowed in the baggage compartment. When cranking the starter by hand the brushes on the electric motor should be lifted. This is accomplished by reaching through a small door on the upper left side of the engine compartment cowling and dropping the brush lifting lug from its recessed position. AFTER THE ENGINE IS STARTED THE LUG SHOULD BE RETURNED TO ITS FORMER POSITION. A cable control conveniently located near the hand crank provides a means of manually engaging the starter. When the starter flywheel has been accelerated to a speed of approximately 12,000 RPM, it will usually provide enough torque for engine starting. The starter is engaged by pulling outward on a ring on the left side of the cowling. This ring is on the end of a cable which operates a meshing solenoid on the starter. The starter is operated electrically by means of a foot pedal mounted between the rudder pedals. This foot pedal at one position operates a toggle switch which in turn operates the type B-1 starter solenoid in the main power panel to energize the starting motor. At the other position the switch will operate the meshing solenoid to engage the starter to the engine crankshaft and also energize the booster coil. Pressing on the heel of the pedal energizes and on the toe engages the starter.

d. BATTERY DISCONNECT SWITCH. — The battery disconnect switch on the control in the front cockpit is for operating a solenoid switch in the positive power lead of the battery circuit. The solenoid is mounted in the main power panel on the forward side of the firewall. The switch is used to disconnect the battery from the electrical system to prevent over charging.

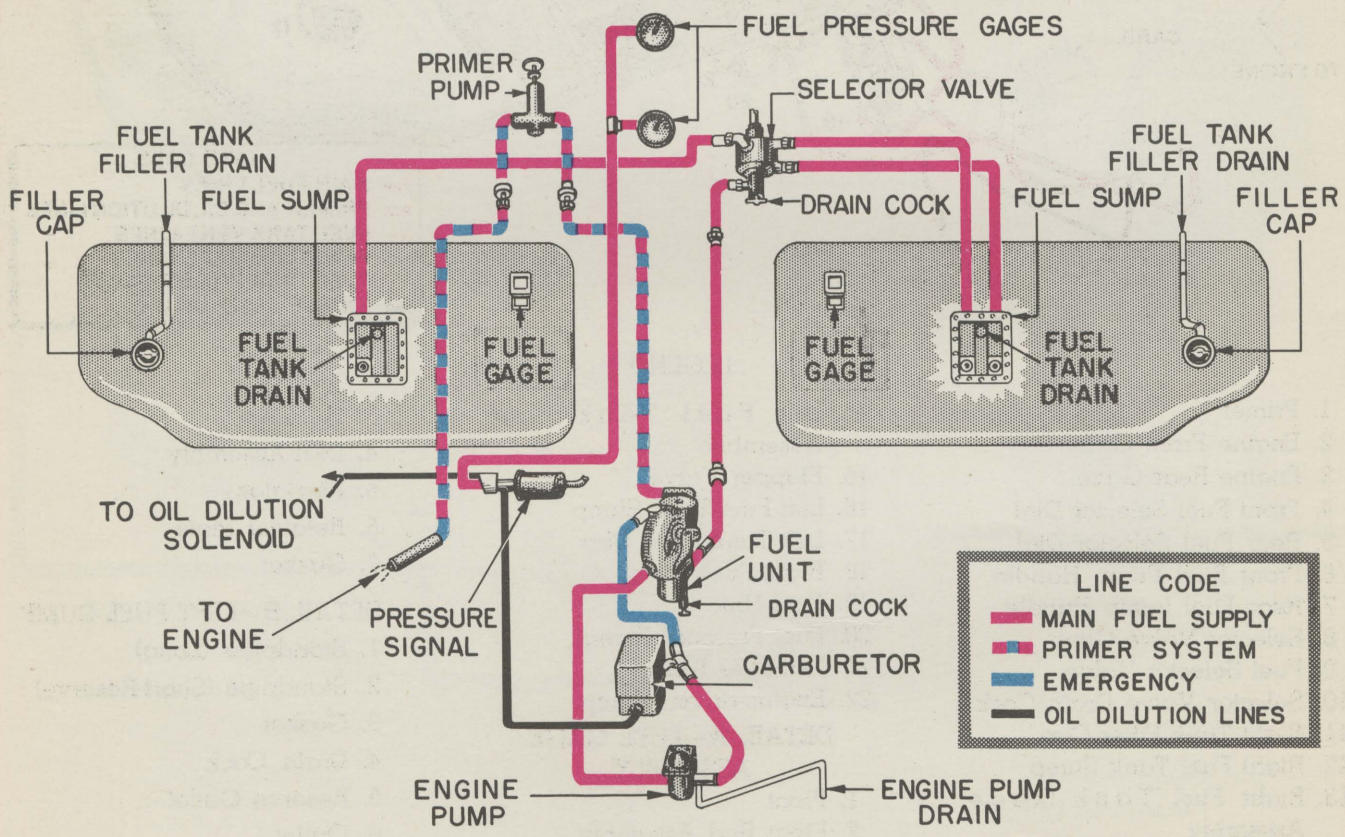
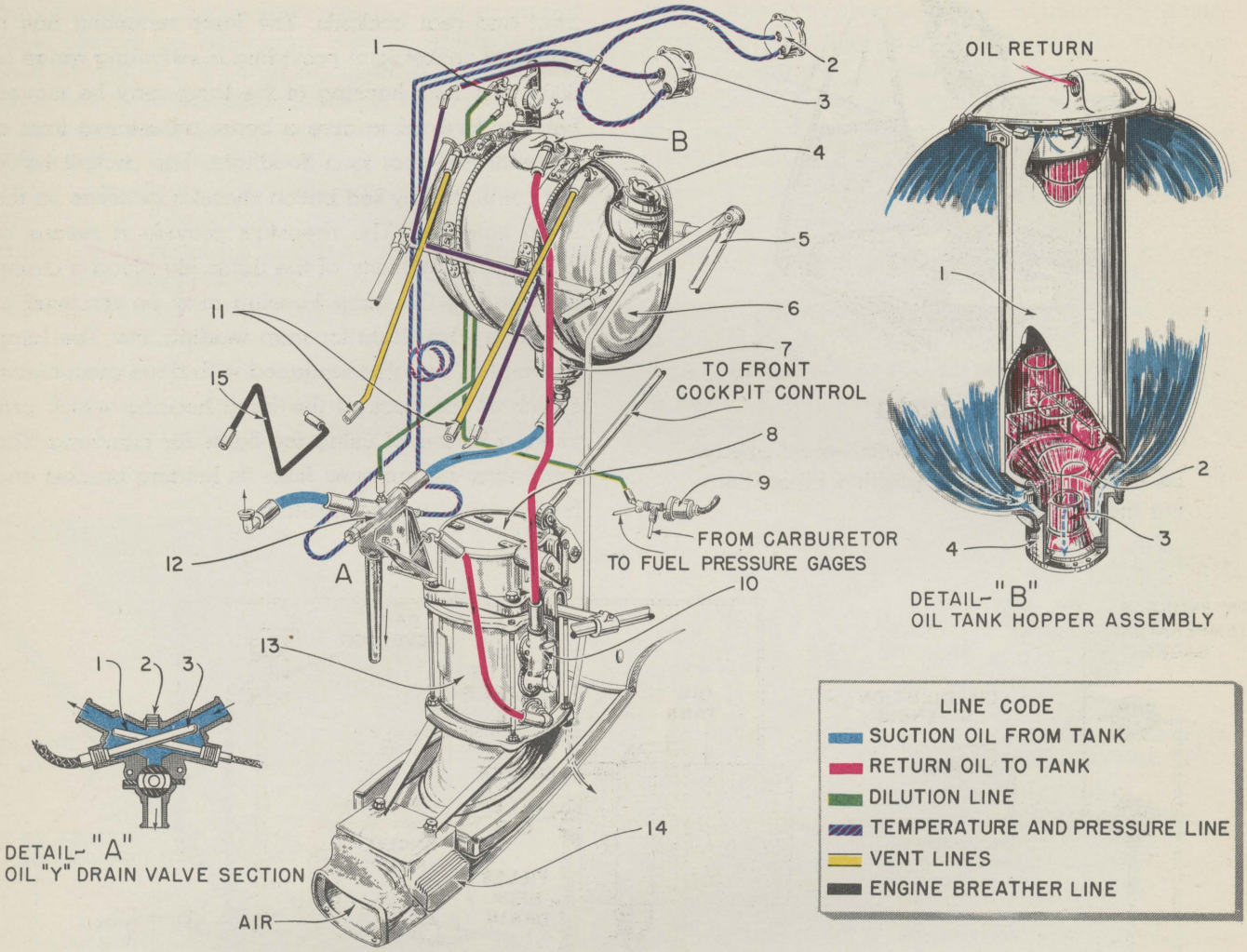


FIG. 28—FUEL SYSTEM FLOW DIAGRAM



LEGEND

1. Oil Dilution Solenoid
2. Rear Engine Gage Unit
3. Front Engine Gage Unit
4. Tank Filler Cap and Adapter
5. Engine Mount Assembly
6. Oil Tank Assembly
7. Oil Tank Sump
8. Oil Cooler Shutter
9. Fuel Pressure Type Signal
10. Thermostat Relief Valve
11. Vent Line Attaching Elbow
12. Oil "Y" Drain Valve
13. Oil Cooler
14. Oil Cooler Duct
15. Engine Breather Line

DETAIL A—Oil "Y" DRAIN VALVE

1. Temperature Capillary Front
2. Fuel Line
3. Temperature Capillary Rear

DETAIL B—HOPPER ASSEMBLY

1. Tank Hopper Assembly
2. Support
3. Sump Standpipe
4. Sump

FIG. 29—OIL SYSTEM

WARNING

The battery disconnect switch must always be thrown to the OFF position before leaving the airplane.

e. COCKPIT LIGHTS (See figure 34.)—Type C-4 cockpit lights are mounted on each side of both the front and rear cockpits. The lamp mounting has a ball and socket joint providing a swiveling range of 360°. The lens housing of the lamp may be moved back or forward to give a beam adjustment from a concentrated spot to a floodlight. The cockpit lights are controlled by red button rheostat switches on the lamp housings. The rheostats provide a means of varying the intensity of the lights. By lifting a clamp the head of the lamp housing may be removed to obtain a white light for map reading, etc. The lamp assemblies are also equipped with a red push-button switch at the back of the lamp housing which provides a means of using the lights for signaling. The lamp may be removed from its holding bracket and held in any desired position.

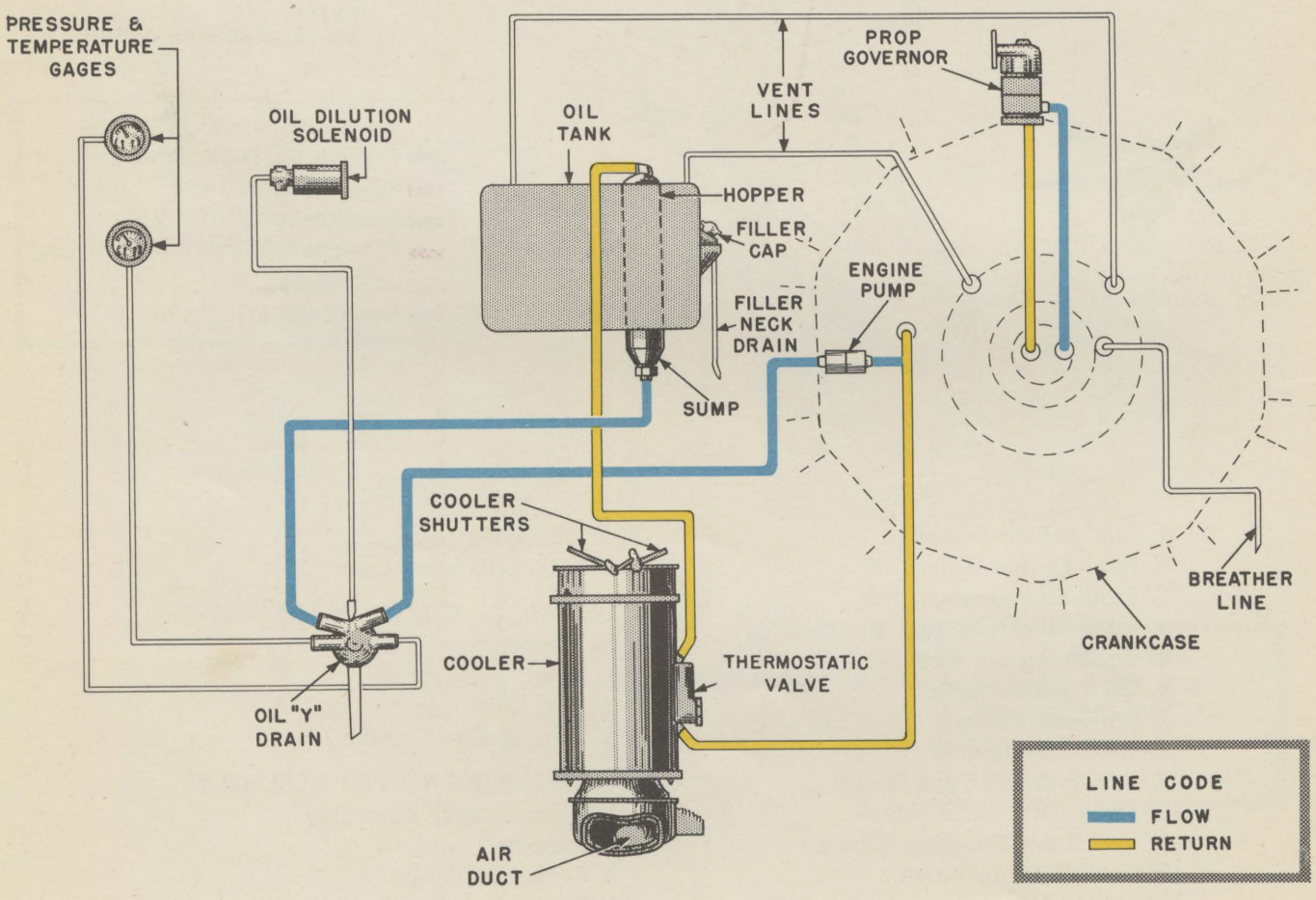


FIG. 30—OIL SYSTEM FLOW DIAGRAM

f. INSTRUMENT LIGHTING.—Fluorescent lighting is provided in both cockpits for all instruments except the compasses. Both the fluorescent and compass lights operate on alternating current which is supplied by a type A-4, DC to AC inverter mounted just below the front instrument panel. A fluorescent light is mounted on a flexible cable at the right side of each cockpit. On earlier airplanes type X220 fluorescent lights are installed. The housings of this type light has an ultra-violet transmitting filter and a visible light aperture. The outer housing of the type X220 lamp can be rotated to give visible or ultra-violet light and a variable shutter may be moved to give full light, approximately two-thirds output or approximately one-third output for either ultra-violet or visible light. Later airplanes are equipped with type X221 fluorescent light assemblies, which will give only ultra-violet light. The movable shutter on this type light may be rotated to vary the amount of light output. The inverter which supplies alternating current for the fluorescent lights and the compass lights is controlled by the switch marked FLUORESCENT LIGHTS on the control panel in both front and rear cockpits. When either switch is thrown to the ON position the fluorescent lights in both cockpits will come on. The three-volt compass lights are integral with the compasses and are individually controlled by rheostat switches on the instrument panel in each cockpit. The compass lights, however, will not operate unless the fluorescent light switch is ON. There is a light mounted on the fuel gage on each side of the front cockpit seat. The control panel in each cockpit has a switch for controlling these lights. Either switch will turn the lights on or off at

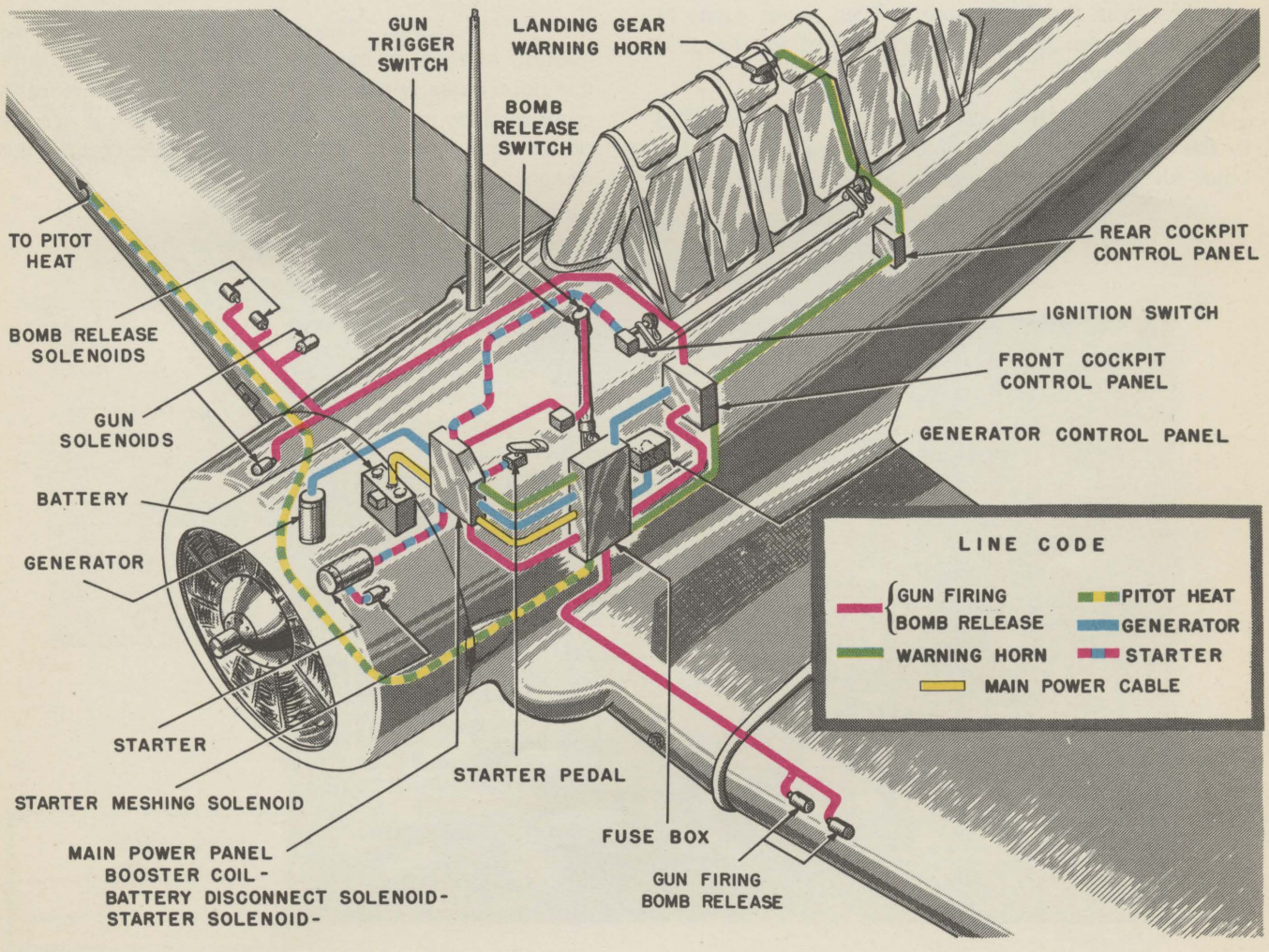


FIG. 31—MAIN POWER SYSTEM—12 VOLT

any time. The fuel gages are visible from both cockpits.

g. NAVIGATION OR POSITION LIGHTS.—Type A-8 navigation lights are installed on both the upper and lower wing surfaces at each wing tip and on both sides of the vertical stabilizer. The lights on the left wing are red, on the right wing green, and on the vertical stabilizer they are white. The navigation lights are controlled by individual switches on the front cockpit control panel marked WING and TAIL, with BRIGHT, DIM and OFF positions.

h. LANDING LIGHTS.—A landing light assembly is installed in the leading edge of each outer wing panel. The landing lights are of the fixed-focus type with the light beams parallel to the ground line when the airplane is in the three point position. The lights are focused 10 degrees outboard from the centerline of the airplane, and are controlled by individual switches from the front cockpit. The cover glass of each lamp conforms to the contour of the leading edge of the wing.

i. PASSING LIGHT.—A passing light is installed in the same bay with the landing light in the left outer wing panel. The cover glass of the passing light is red and the light beam is parellel to the line of flight. The light is controlled from the front cockpit.

j. RECOGNITION LIGHTS. — Later airplanes are equipped with four recognition lights installed on the surface of the fuselage aft of the rear cockpit. Three type E-2 lights, red, green and amber are located under the fuselage and one type E-1 white light is on top of the fuselage. These lights are controlled by individual switches mounted in a switch box on the right side of the main control panel. The switches are wired in series with a push-button switch which acts as a telegraph key to provide a means of using the lights for signaling. The individual switches must be thrown to the UP or KEY position for using the telegraph key. The down position is STEADY and the center position is OFF. With proper switching these lights may be used for signaling in various combinations and sequences.

k. PITOT HEAT.—The pitot mast with its internal heating element is mounted on the leading edge of the right outer wing panel. This heating element is controlled by a switch on the front cockpit control panel and serves to prevent ice from clogging the airspeed orifice of the pitot mast.

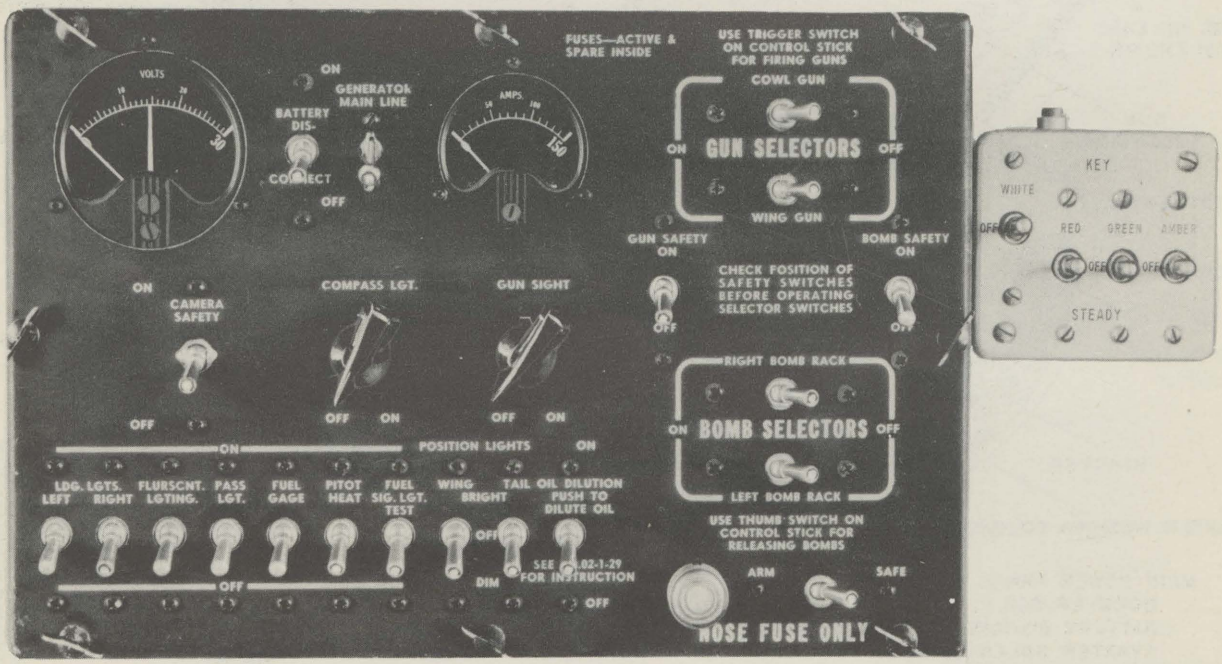


FIG. 32—FRONT COCKPIT CONTROL PANEL—12 VOLT

12. TWENTY-FOUR VOLT ELECTRICAL SYSTEM

(See figures 35, 36 and 37.)

AT-6D and SNJ-5 (Navy) Airplanes are equipped with a 24 volt electrical system. The system has two main sources of energy: A 24 volt storage battery and 24 volt 50-ampere engine-driven generator, both connected to a common distribution system. The distribution system is of the single, hot wire, direct current type, with the metallic structure of the airplane serving as the return except in some instances where it is necessary to use a two-wire circuit to prevent compass interferences or to obtain a more efficient ground. Circuit breakers are employed for the protection of all circuits and are accessible for resetting from the front cockpit only. In place of a foot pedal

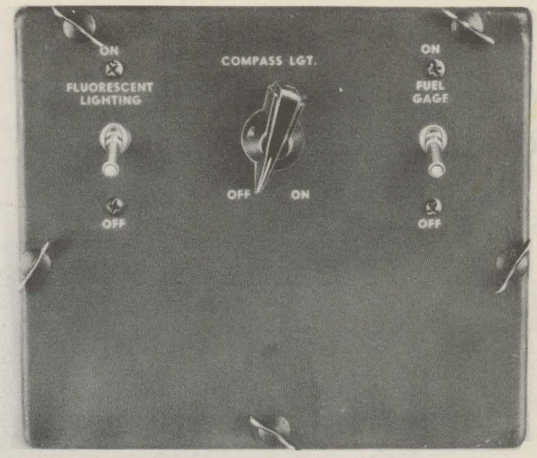


FIG. 33—REAR COCKPIT CONTROL PANEL—12 VOLT

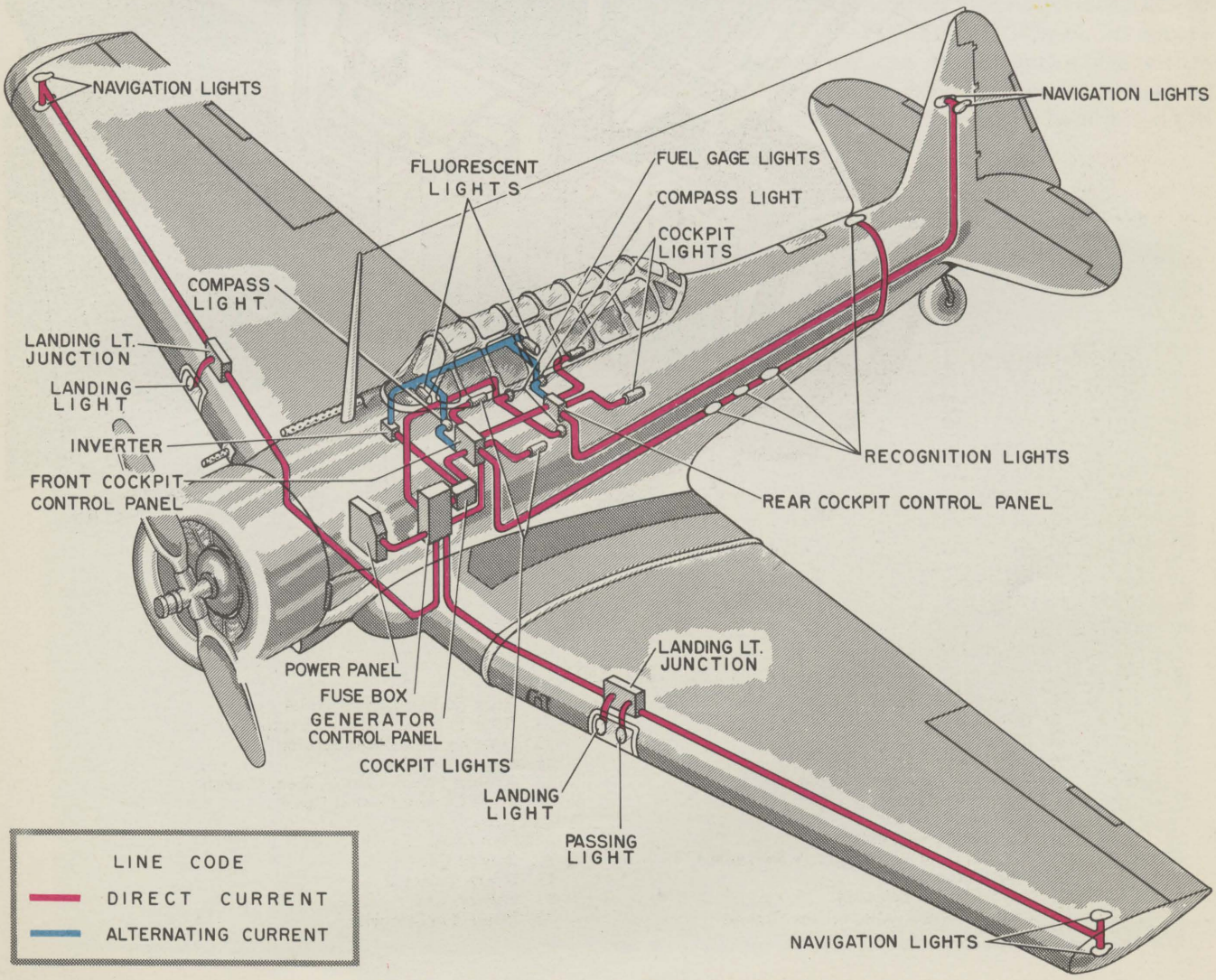
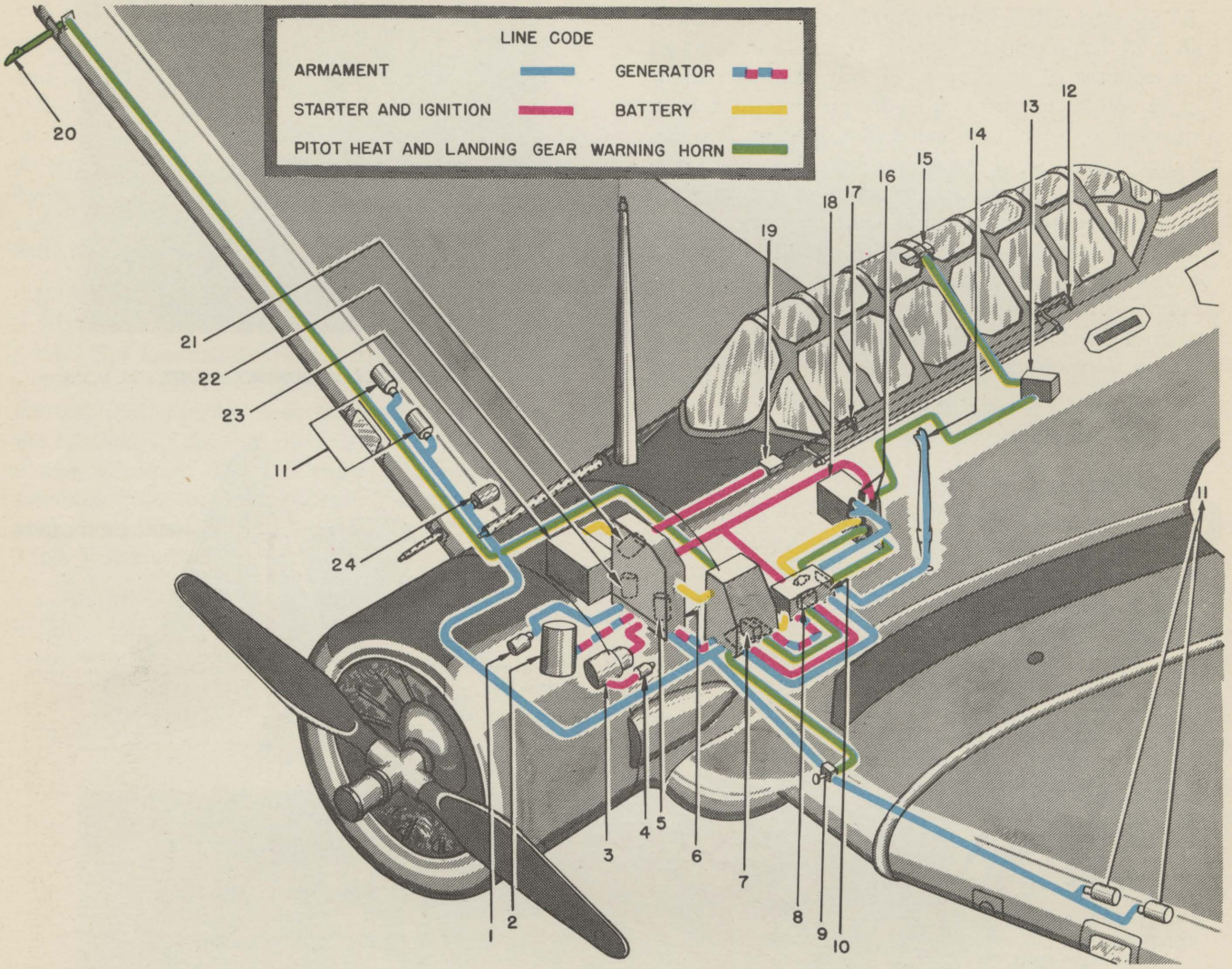


FIG. 34—EXTERIOR AND INTERIOR LIGHT SYSTEM



LEGEND

1. Cowl Gun Solenoid
2. Generator
3. Starter
4. Starter Meshing Solenoid
5. Battery Disconnect Solenoid
6. Main Power Panel
7. Voltage Regulator
8. Reverse Current Relay
9. Landing Gear Warning Horn Switch Box
10. Circuit Breaker
11. Bomb Release Solenoid
12. Ignition Switch Control, Rear Cockpit
13. Rear Cockpit Control Panel
14. Bomb Release and Gun Trigger Switches
15. Landing Gear Warning Horn
16. Starter Switches
17. Ignition Switch Control, Front Cockpit
18. Front Cockpit Control Panel
19. Ignition Switch
20. Pitot Head
21. Booster Coil
22. Starter Solenoid
23. Battery
24. Wing Gun Solenoid

FIG. 35—MAIN POWER SYSTEM—24 VOLT

starter, two toggle switches are installed on the front cockpit control panel. To prevent accidental operation these switches are protected by a guard that must be raised against spring action in order to operate the switch. All electrical equipment is controlled from the main control panel in the front cockpit. A cockpit light and two fluorescent lights are provided in each cockpit. The airplane is equipped with conventional landing, passing, navigation, and recognition lights. Solenoid switches are incorporated in the bomb release and gun firing circuits.

a. GENERATOR MAIN LINE SWITCH.—The generator main line switch on the front cockpit switch panel provides a means of opening the generator circuit in case the automatic relay cutout, in a circuit breaker box at the left side of the front cockpit fails to operate (See figure 38). The switch should be left in the OFF position when the engine is not running.

b. IGNITION SWITCH.—A master ignition switch box unit wired directly to the rear of the magnetos is located at the left side of the fuselage, forward of the front instrument panel. This master switch is operated from the left side of the instrument panel in both cockpits by a lever or pointer handle mechanically interconnected with the switch.

c. ENGINE STARTER.—A type G-5 combination hand-electric concentric inertia starting unit is mounted on the rear of the engine assembly. The flywheel of the starting unit may be accelerated either with the electric motor or by hand cranking. When cranking the starter by hand (the hand crank is stowed in the baggage compartment) the brushes on the electric motor should be lifted from the commutator. This is accomplished by reaching through a small Dzus-fastened door on the upper left side of the engine compartment cowling and dropping the brush-lifting lug from its recessed position. AFTER THE ENGINE IS STARTED THE BRUSH-LIFTING LUG SHOULD BE RETURNED TO ITS FORMER POSITION. To accelerate the starter with the electric motor, the switch under the red guard on the control panel in the front cockpit, marked ENERGIZE, must be held in the ON

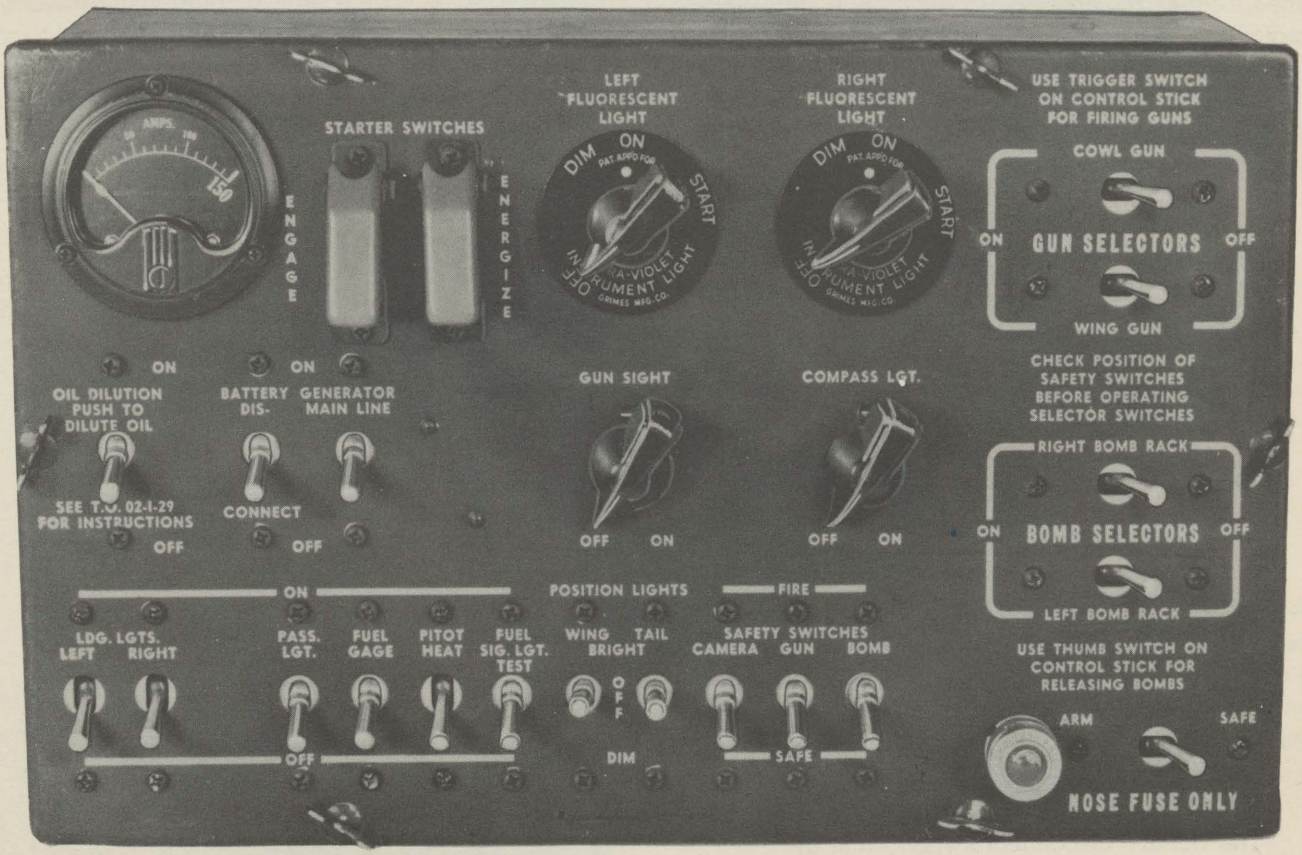


FIG. 36—FRONT COCKPIT CONTROL PANEL—24 VOLT

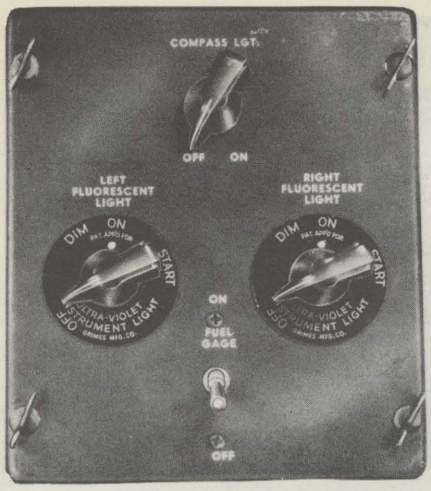


FIG. 37—REAR COCKPIT CONTROL PANEL—24 VOLT

position long enough for the inertia flywheel to gain sufficient speed to turn the engine over several times. When the starter flywheel had been accelerated to a speed of approximately 12,000 RPM it will usually provide enough torque for engine starting. When the starter flywheel has been brought up to speed either by hand cranking or with the electric motor it is made to engage the engine crankshaft by holding the switch (under the red guard), marked ENGAGE, to the ON position. Normally both switches should be held to the ON position until the engine starts.

WARNING

Use an outside battery supply for all FIRST or COLD ENGINE starting and for all electrical and radio testing purposes. Never use the battery installed in the airplane for these purposes as a low or partially discharged battery will cause malfunctioning of some of the electrical equipment resulting in damage and interruption of the electrical power supply.

d. BATTERY DISCONNECT SWITCH.—The type B-4 battery disconnect solenoid switch is mounted in the main power panel and is remotely controlled by a toggle switch on the switch panel in the front cockpit. This switch is used to disconnect the battery from the electrical system to prevent discharging.

WARNING

The battery disconnect switch must always be thrown to the OFF position before leaving the airplane.

e. COCKPIT LIGHTS.—Both the front and rear cockpits are provided with a type C-4 cockpit light mounted at the left side. The lamp mounting is a ball and socket joint providing a swiveling range of 360°. The lamp is provided with an adjustable beam which is controlled by moving the lens housing backward or forward. The beam is continuously adjustable from a concentrated spot to a flood light beam. The intensity of the light is controlled by a rheostat switch on the lamp housing. The head of the lamp housing containing the red lens may be removed to obtain a white light. A push-button switch at the back end of the lamp housing provides a means of instantaneous control of the light so that it may be used for signaling. The lamp may be removed from its holding bracket and held in any desired position.

f. INSTRUMENT LIGHTING.—Fluorescent lighting is provided for the instruments in both cockpits. A type C-5 fluorescent light is mounted on both the right and left side of each cockpit. The lights are mounted with a ball and socket joint providing a swiveling range of 360° and are adjustable to any desired angle. The head of the light housing may be rotated to give visible light or ultra-violet (invisible) light. The fluorescent lights are individually controlled by switches on the instrument panel in each cockpit. The switch must be turned to START and held until the fluorescent tube lights and then may be turned to ON for full light or DIM for subdued light.

g. NAVIGATION OR POSITION LIGHTS.—Type A-8 navigation lights are installed on both the upper and lower surface of each wing tip and on both sides

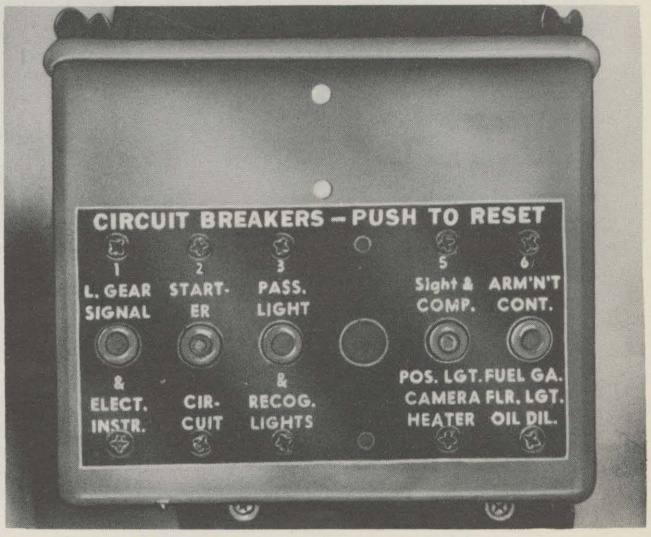


FIG. 38—CIRCUIT BREAKER

of the vertical stabilizer. The lights on the left wing are red, on the right wing green, and on the vertical stabilizer they are white. The navigation or position lights are controlled by individual switches on the front cockpit control panel marked WING and TAIL with BRIGHT, DIM and OFF positions.

h. RECOGNITION LIGHTS.—The recognition lights are installed in the outer surface of the rear fuselage section just aft of the rear cockpit. Three type E-2 lights, red, green and amber are installed on the bottom of the fuselage, and one type E-1 white light is installed on top of the fuselage. These lights are controlled by individual switches that are wired in series with a push-button switch that may be operated as a telegraph key to provide a means of using the lights for signaling in various combinations and sequences. The individual switches must be thrown to the UP or key position for signaling with the push-button switch on top of the box. The DOWN position of the switches is STEADY and the center position is OFF. The recognition light switch box is mounted in the center of the front cockpit directly to the right of the control panel.

WARNING

Do not operate the recognition lights for more than ten seconds when the airplane is on the ground as there must be air circulation to dissipate the heat from the lights.

i. LANDING LIGHTS.—Two type PAR-56 landing lights are installed, one in the leading edge of each outer wing panel. These lights are of the fixed-focus type with the light beams parallel to the ground line when the airplane is in the three-point position. The lights are focused 10 degrees outboard from the centerline of the airplane and are controlled by individual switches on the front cockpit switch panel. The cover glass of each light conforms to the contour of the leading edge of the wing.

WARNING

Do not operate the landing lights for more than ten seconds when the airplane is on the ground and engine is not running.

j. PASSING LIGHT.—A type B-3 passing light is installed in the same bay with the landing light in the left outer wing panel. The cover glass of the passing light is red, and the light beam is parallel to the line of flight at operating speed. The light is controlled from the front cockpit only.

k. PITOT HEAT.—A pitot mast with internal heating element is located on the leading edge of the right wing tip. The heating element is controlled by a toggle switch on the control panel in the front cockpit only and serves to prevent ice from clogging the airspeed orifice of the pitot mast.

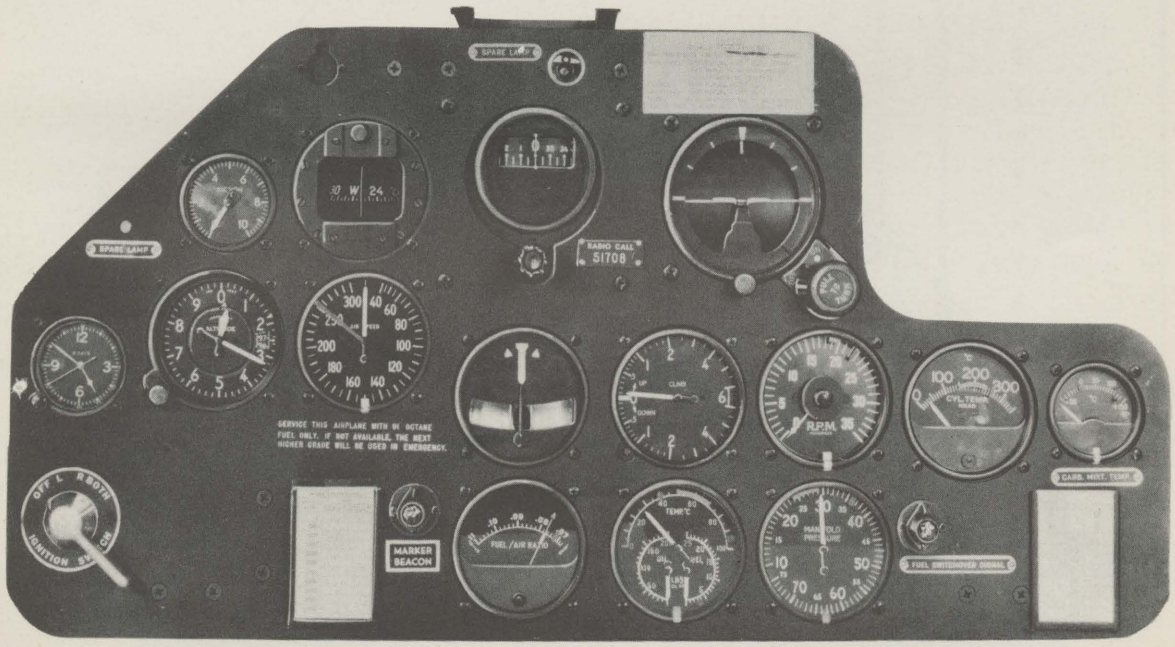


FIG. 39—FRONT COCKPIT INSTRUMENT PANEL

WARNING

The pitot mast heat should never be turned on when the plane is at rest on the ground, except for momentary test, as without air circulation the heating element will be damaged from overheating.

13. INSTRUMENTS (See figures 39, 40 and 41.)

The instrument panels, installed in the conventional position in each cockpit, are mounted on rubber shock absorbers to prevent damage to the instruments from engine vibration, hard landings, etc. Fluorescent lights are provided in each cockpit for lighting the instrument panels. The lights may be adjusted to give either white light or filtered ultraviolet light that will make the luminous markings on the instrument dials glow in the dark. Each compass is individually lighted by a lamp that is integral with the face of the instrument.

a. VACUUM INSTRUMENTS.
- (1) Gyro Horizon
- (2) Bank and Turn Indicator
- (3) Directional Gyro
- (4) Suction Gage

b. PITOT-STATIC INSTRUMENTS.
- (1) Airspeed Indicator
- (2) Rate of Climb Indicator
- (3) Altimeter

c. ENGINE INSTRUMENTS.
- (1) Tachometer
- (2) Cylinder Head Temperature
- (3) Fuel-air Ratio
- (4) Fuel Pressure
- (5) Oil Pressure
- (6) Oil Temperature
- (7) Manifold Pressure

d. MISCELLANEOUS INSTRUMENTS.
- (1) Fuel Gage
- (2) Hydraulic Pressure Gage
- (3) Voltmeter
- (4) Ammeter
- (5) Accelerometer
- (6) Clock
- (7) Compass

14. OTHER EQUIPMENT.

Complete details of operational equipment such as radio, armament, oxygen and photographic equipment are contained in Section IV.

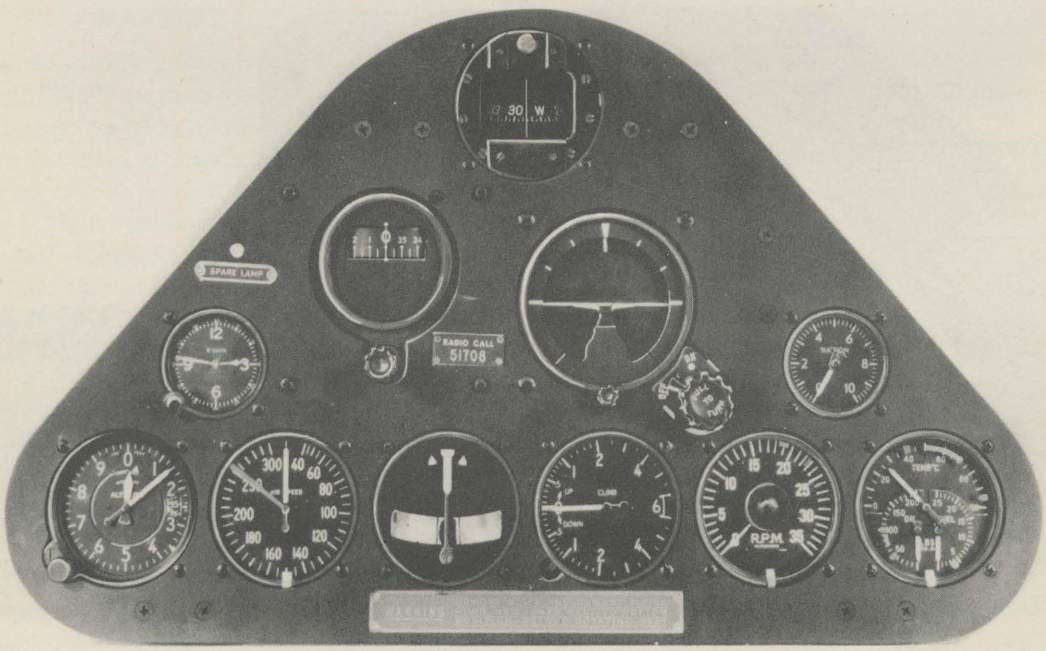
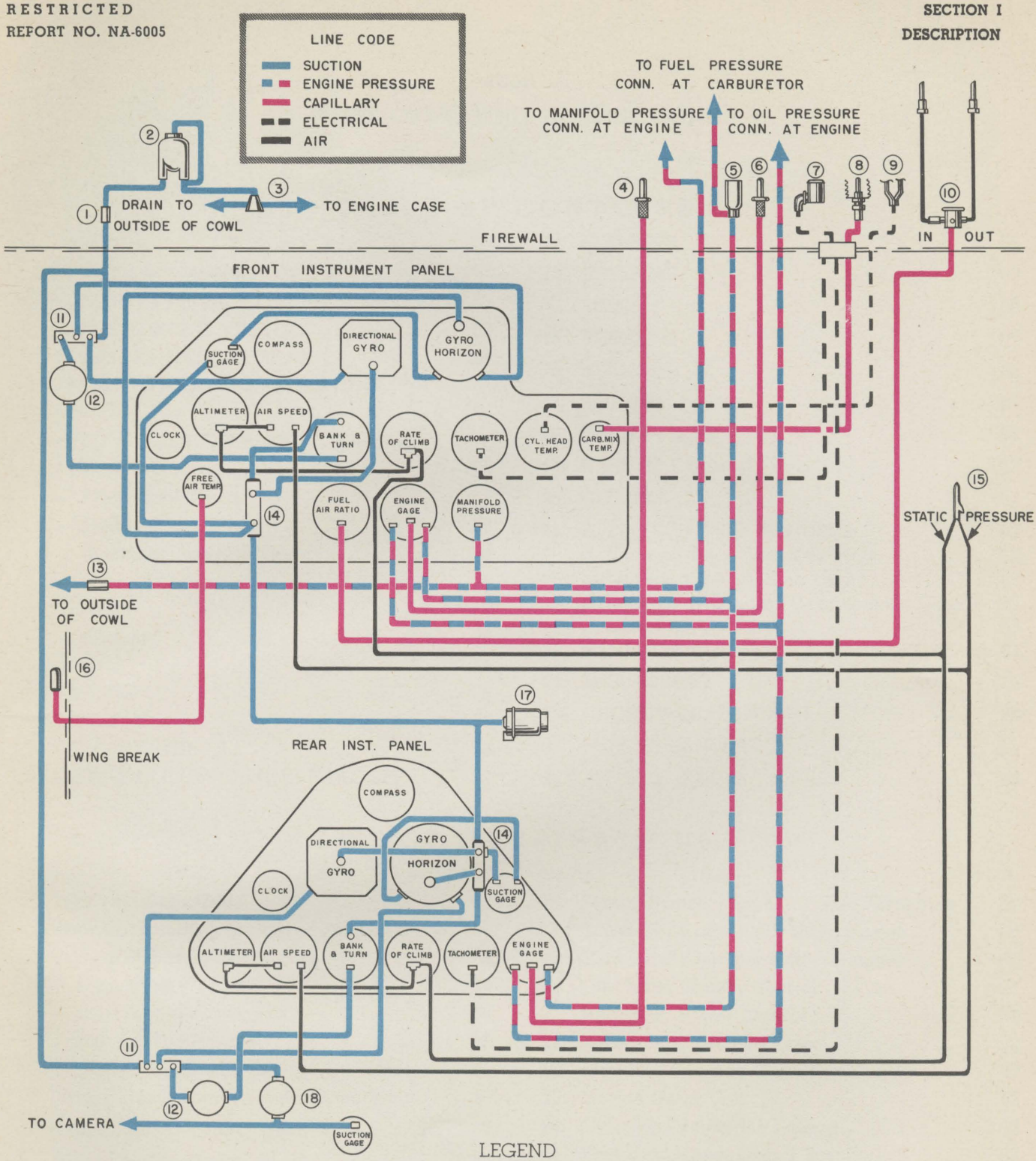


FIG. 40—REAR COCKPIT INSTRUMENT PANEL



LEGEND

1. Vacuum Relief Valve
2. Vacuum Pump
3. Oil Separator
4. Oil Temp. Capillary Rear
5. Fuel Pressure Signal
6. Oil Temp. Capillary Front
7. Tachometer Generator
8. Carb. Mixture Temp. Bulb
9. Thermocouple
10. Exhaust Gas Analyzer
11. Vacuum Distribution Block
12. Vacuum Throttle Valve
13. Manifold Pressure Gage Drain
14. Air Filter Distribution Block
15. Pitot Head
16. Free Air Thermometer Bulb
17. Air Filter
18. Camera Valve

FIG. 41—INSTRUMENT SYSTEM DIAGRAM

Section II.
PILOT OPERATING INSTRUCTIONS

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

Section II.
PILOT OPERATING INSTRUCTIONS

1. GENERAL.

Pertinent to the equipment dealt with in these operating instructions, refer to the handbook of Erection and Maintenance Instructions, T.O. No. 01-60FE-2. For the location of controls mentioned in the following text refer to cockpit illustrations in Section I of this handbook.

NOTE

On all AT-6D and SNJ-5 (Navy) Airplanes, if any electrical equipment does not function, always push the circuit breaker for the circuit in question to ascertain that the circuit breaker is set. Frequently extra pressure must be applied to make sure the circuit breaker is reset.

a. FLYING LIMITATIONS

(1) MANEUVERS PROHIBITED

(a) Outside Loop.

(b) Inverted flight.

(c) Snap rolls in excess of 130 MPH indicated.

(d) Slow rolls at more than 190 MPH indicated.

(e) Spins and stalls when normal gross weight is exceeded.

(2) OTHER LIMITATIONS:

(a) Indicated airspeeds in excess of 251 MPH.

(b) RPM of engine in excess of 2640, which is possible during a dive.

(c) RPM of engine in excess of 2200 with less than 1/3 throttle.

(d) Lowering flaps in excess of 126 MPH indicated airspeed.

(e) Lowering landing gear in excess of 150 MPH indicated airspeed.

(f) Taxiing faster than a walk.

(g) Taking off, landing or performing acrobatics without the fuel selector valve placed to the RESERVE POSITION.

(h) Flying solo from rear cockpit.

2. BEFORE ENTERING THE COCKPIT.

a. Check the load and balance handbooks and charts stowed in the data case to ascertain that the load and balance requirements of the airplane are satisfied. Requirements will vary with the combinations of miscellaneous equipment used on different missions. On later airplanes refer to weight and balance data handbook, Technical Order No. AN 01-1-40. Also refer to weight and balance charts in Appendix II of this handbook.

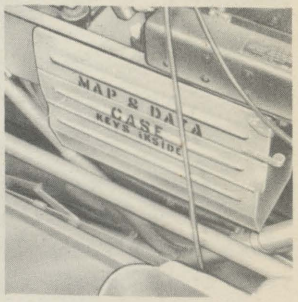


FIG. 1—MAP AND DATA CASE

b. Make sure that the airplane has been serviced and is ready for flight especially as regards fuel, oil, hydraulic fluid and ammunition.

c. If flying solo, make certain that the rear cockpit control stick is stowed and locked in its socket located at the left side of the rear cockpit; also, see that there is no loose equipment such as safety harness and gunner's belt in the cockpit which might foul the controls or otherwise affect the operation of the airplane.

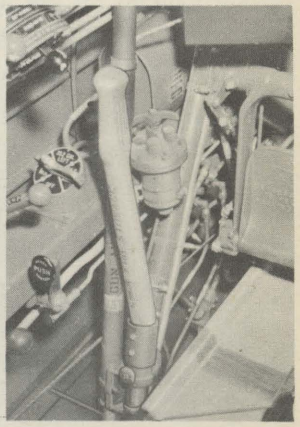


FIG. 2—REAR COCKPIT STICK IN STOWED POSITION

d. To gain entrance at the airplane, lift the desired control lever and push the sliding enclosure. The front cockpit enclosure must be pulled aft and the rear cockpit enclosure must be pushed forward.

3. ON ENTERING THE COCKPIT.

a. If the cockpit lights are required for vision turn the battery disconnect and light switches ON.

b. Check that all the armament switches are OFF or SAFE.

c. Unlock the surface control lock at the base of the control stick by putting the control lever in its extreme forward position.

d. Adjust the rudder pedals for proper leg length so as to obtain full brake control while taxiing and landing and to insure full rudder travel when pulling out of a spin. Adjustment may be made in each cock-

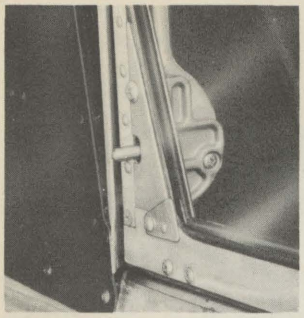


FIG. 3—SLIDING ENCLOSURE LATCH

pit by pressing the lever located on the inboard side of each rudder pedal.

e. Check the surface controls for free and full movement.

f. Apply parking brakes preparatory to running up the engine by depressing both brake pedals to their fullest extent, then pull out on the parking brake control knob located below the electrical control panel and release the brake pedals and then the parking brake control knob. To release brakes, simply depress brake pedals. Chocks should also be used if available.

g. Check the two fuel gages, which are located on the top of each fuel tank at each side of the front cockpit for the presence of fuel. If vision requires it will be necessary to turn ON the fuel gage light switch located on the main electrical control panel. The gages are accurate in level flight position only.

h. Set the altimeter to zero.

i. If intercommunication between occupants of both cockpits is desired, check the interphone system for proper functioning. Specific instruction for operating the radio and interphone equipment are to be found in Section IV.

4. STARTING THE ENGINE.

a. After making certain that the ignition switch is OFF, pull the propeller through three or four turns if the engine has been idle for more than one hour.

b. Ascertain that the parking brakes are on.

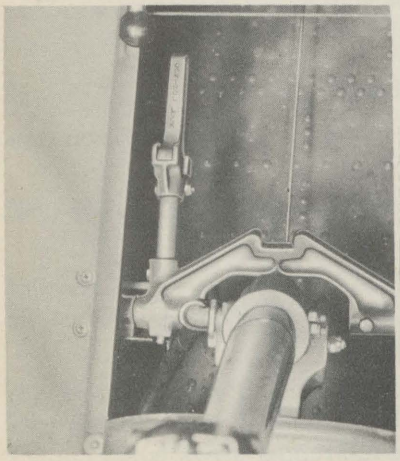


FIG. 4—SURFACE CONTROL LOCK

c. The propeller control should be in full DECREASE RPM.

d. Place the mixture control in full RICH.

e. Place the throttle control lever approximately 1/2-inch open (600-800 RPM.)

f. Place fuel selector on RESERVE tank.

g. Place carburetor air heat control to full COLD.

h. Prime the engine four to six full strokes of the priming pump when cold, two to four strokes when warm and none when hot. Turn priming pump handle counterclockwise to unlock and vice versa when priming has been completed.

NOTE

In extreme cold weather do not prime the engine until it begins to crank. Continue priming until complete firing is obtained.

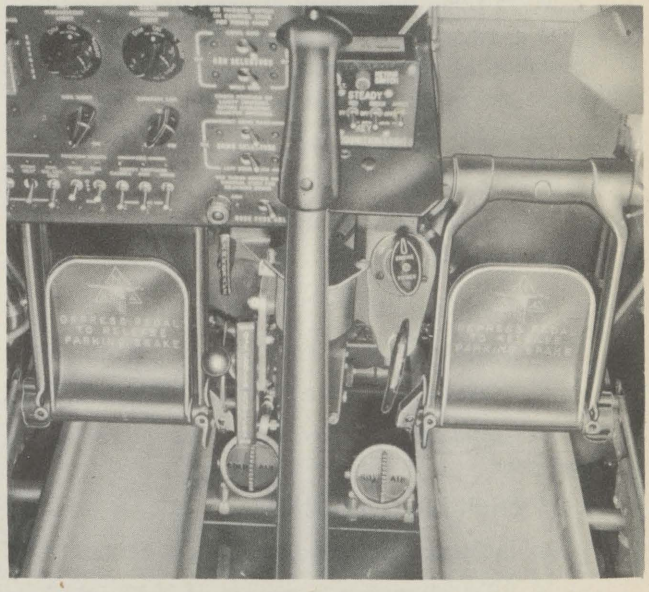


FIG. 5—RUDDER AND BRAKE PEDALS

i. Turn battery and generator main line switches ON.

j. Turn ignition switch to BOTH after checking that all personnel are clear of the propeller.

k. Obtain three to four lb/sq in. fuel pressure by use of hand fuel pump located on left side of the front cockpit.

WARNING

On AT-6D and SNJ-5 (Navy) Airplanes in order to avoid excessive drainage of electrical energy from the airplane's battery, always use outside power for cold starts. If outside power is not available it is advisable to use the hand crank instead of the airplane's battery for all cold starts.

l. On earlier AT-6C and SNJ-4 (Navy) Airplanes, equipped with starter switch pedals, depress the rear of the starter pedal to energize the inertia starter and when the flywheel has reached maximum speed, press the forward end of the pedal to engage the starter to the engine. On later airplanes, AT-6D and SNJ-5, operate the right hand, guard-covered toggle switch on the main box panel marked ENERGIZE to energize the starter and after the flywheel has reached maximum speed, operate the left hand, adjacent switch marked ENGAGE to engage the starter to the engine.

CAUTION

Do not pump the throttle on a cold engine when attempting to start it, as this may cause backfiring with accompanying fire hazard. In case of fire, remove the portable hand-pump type, carbon tetrachloride fire extinguisher from the left fuselage side panel in the rear cockpit.

m. As the engine starts, check the oil pressure. If the oil pressure instrument registers no pressure after 30 seconds of operation, shut down the engine and investigate for trouble.

n. Ascertain that the oil cooler shutters are OPEN.

5. ENGINE WARM-UP.

a. When the oil pressure reaches 70 to 90 lb/sq in. set the propeller control at INCREASE RPM (low-pitch) position and advance the throttle to 1000 RPM for the engine warm-up.

b. Check oil for temperature at 40°C.

c. Check all fuel selector valve positions for proper functioning of valve.

FIG. 6—PARKING BRAKE HANDLE

d. On AT-6C and SNJ-4 (Navy) Airplanes check to determine that the generator cuts in for charging between 1000 and 1200 RPM by checking voltmeter and ammeter. Voltmeter should register between 14.25 and 14.5 volts. Charging rate as indicated by the ammeter depends on the condition of the battery.

e. On AT-6D and SNJ-5 (Navy) Airplanes check to determine the generator cuts in for charging as indicated by the ammeter between 1150 and 1250 RPM. The output of the generator as indicated by the movement of the ammeter needle will vary according to condition of battery, electrical load on airplane, etc.

CAUTION

Minimum idling oil pressure is 15 lb/sq in.

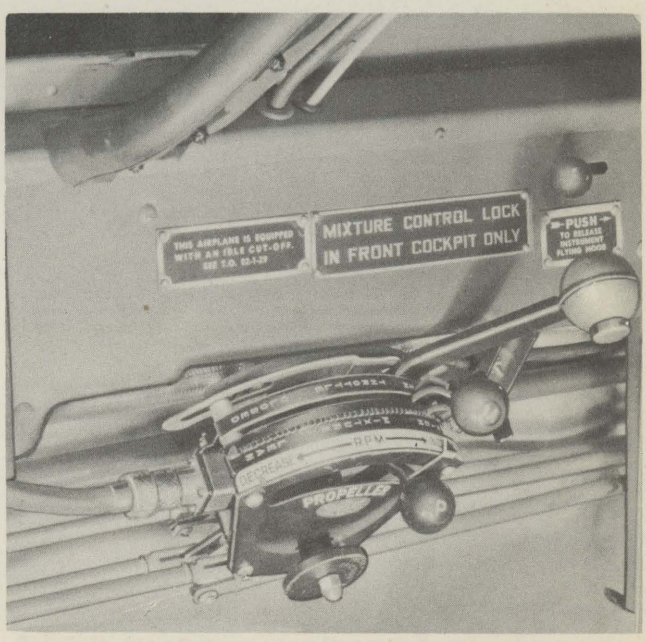


FIG. 7—FRONT COCKPIT ENGINE CONTROL QUADRANT

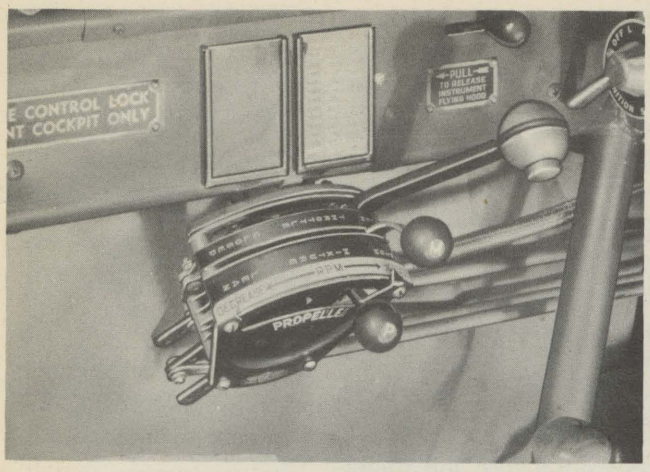


FIG. 8—REAR COCKPIT ENGINE CONTROL QUADRANT

6. ACCESSORIES OPERATION GROUND TEST.

While the engine is warming, test the operation of the wing flaps, first with the emergency hand pump and then with the engine-driven hydraulic pump. The procedure is as follows:

a. EMERGENCY HAND PUMP.—Pull up on the handle of the emergency hand pump, located on the left side of the front cockpit, and rotate the handle clockwise into its locked position. Move the flap control handle, which is located on the left control shelf of each cockpit, to its down position, and operate the hand pump until the wing flaps are fully lowered, as shown by the mechanical flap-position indicator located on the forward end of the control shelf at the left side of the front cockpit. Reverse the operation and return the pump handle to its proper position.

b. ENGINE-DRIVEN PUMP. — Press down on the power (pressure) control lever marked PUSH located aft of the wing flap control handle referred to in the previous paragraph and move the flap control handle as when testing with emergency hand pump. Pressing down on the pressure control lever connects the engine-driven pump to the general hydraulic system, from which an automatic needle valve will disengage it at the end of approximately two minutes. This is the period calculated to be twice that necessary to accomplish combined landing gear and flap operation. When the hydraulic fluid is cold, the period of engagement may be considerably longer without harmful effect.

c. HYDRAULIC PRESSURE GAGE.—Note the reading on the hydraulic pressure gage located on the shelf beside the flap-position indicator at the left side of the front cockpit. This gage indicates the pressure in the general hydraulic system at all times. Normally, after the pressure control lever has been deprssed the gage will show a pressure of 1000 pounds. Initial loads encountered by the system in operating the wing flaps and landing gear should cause the pressure to drop only momentarily. When the pressure control valve becomes disengaged, the pressure will fall to zero.

WARNING

Do not move the landing gear control handle, located beside the flap control handle, while the airplane is on the ground.

d. GYRO HORIZON. — Ascertain that the gyro horizon is caged, and that the engine-driven suction pump is producing between 2½ and 4½-inches of Hg vacuum pressure. Line up the adjustable airplane horizontal line with the center of the caged horizon, and uncage the horizon.

e. RADIO.—Check the radio with the engine running, in accordance with instructions contained in Section IV.

f. IGNITION. — When the oil temperature has reached 40°C (112°F) check the left and right magnetos as follows:

(1) Open the throttle until a reading of 29 inches Hg is obtained on the manifold pressure gage.

(2) Note the loss of RPM when the ignition is switched to one magneto. The maximum allowable drop is 100 RPM. This check should be made in as short a time as practicable and should not exceed 15 seconds.

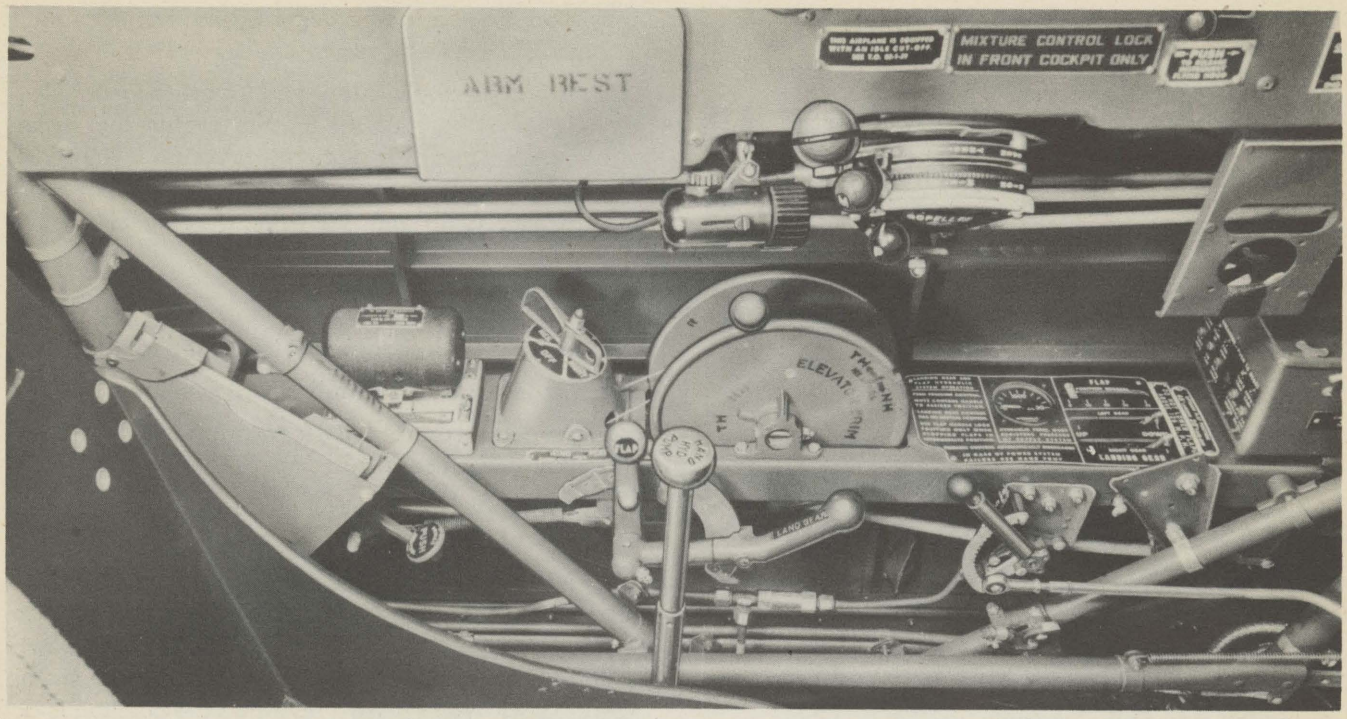


FIG. 9—FRONT COCKPIT CONTROL SHELF

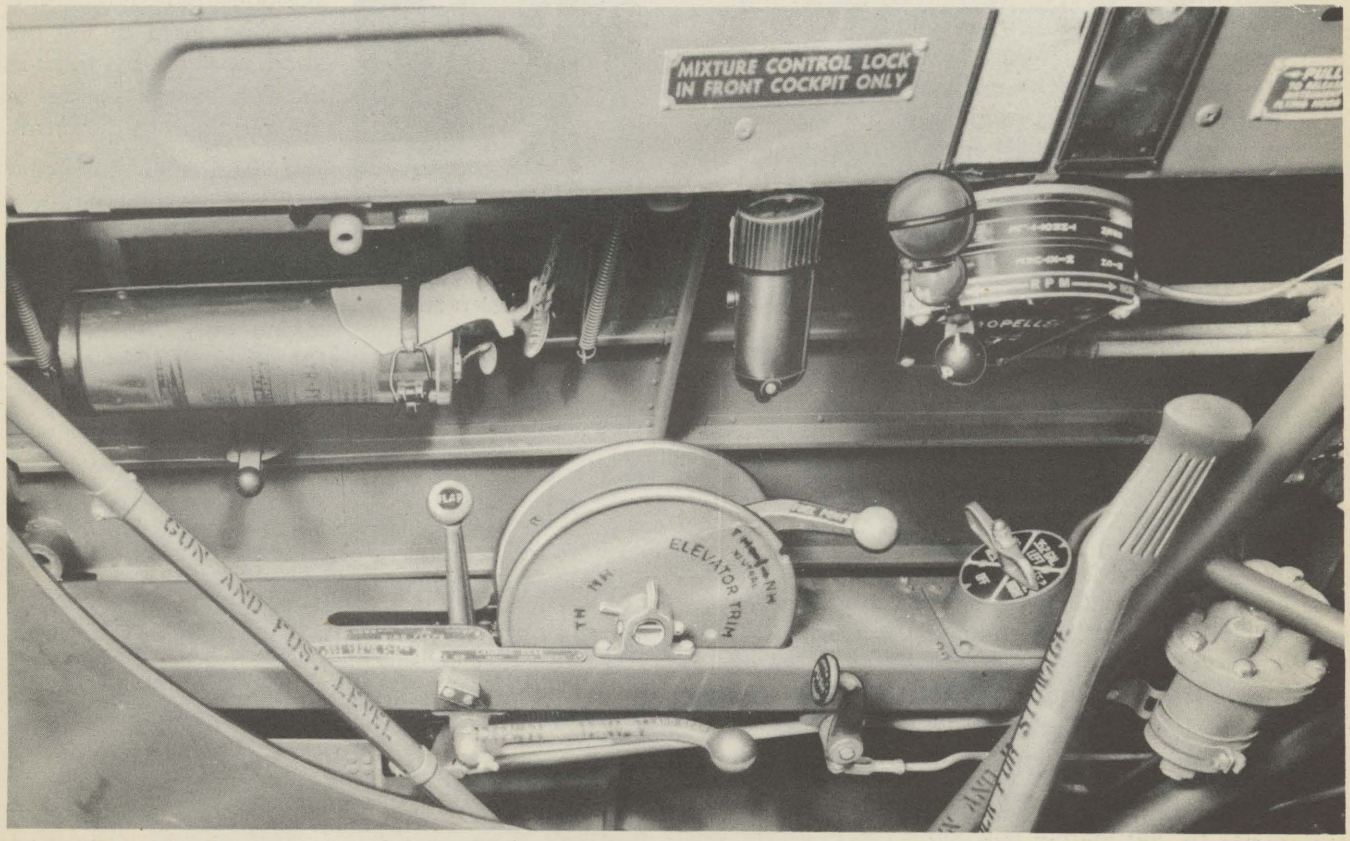


FIG. 10—REAR COCKPIT CONTROL SHELF

7. IDLING.

Gradually decrease the engine RPM to idling (600-800 RPM) and check the following:

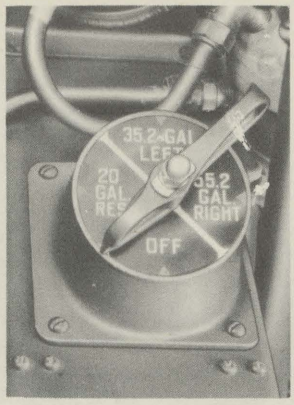


FIG. 11—FUEL SELECTOR CONTROL

a. Observe that the engine oil pressure is at least 15 lb/sq in.

b. Check the fuel switch-over signal for proper functioning by throwing the switch on the main electrical control panel.

c. Open the manifold pressure gage drain momentarily to clear the line (Approx. five seconds.)

d. Check the operation of all surface controls.

e. Set the elevator and rudder trim tabs in the proper take-off position by rotating the control wheels on the left side of the cockpit.

CAUTION

Cylinder head temperature should not exceed 205°C (410°F) during ground operation. The engine should be stopped rather than idled for prolonged periods after the warm-up has been accomplished to prevent fouling of the spark plugs.

f. On AT-6D and SNJ-5 (Navy) Airplanes check all circuit breakers located on left side of front cockpit by pressing the red buttons to ascertain that all of the circuit breakers are set.

8. TAXIING.

a. Use the brakes as little as possible and always taxi cautiously. (Never faster than a walk.)

NOTE

Do not taxi with flaps lowered as damage is likely to result, particularly if in a strong down wind.

(1) Check the cylinder head temperature regularly to see that it stays under 205°C (401°F.)

(2) Steer a zig-zag course to survey the area obstructed by the engine cowling.

(3) On reaching the take-off position on the runway stop the airplane cross-wind so that approaching airplanes can be plainly seen.

(4) If the take-off is delayed for any reason, clear the engine by opening the throttle against the brakes to about 25 inches Hg manifold pressure (1900 RPM.) The engine should not run at idling speed for more than two or three minutes without being cleared in this manner.

9. TAKE-OFF.

If the field is clear, quickly check the following:

a. Mixture control in full RICH position.

b. Propeller control fully forward in the INCREASE RPM (low pitch position.)

c. Carburetor air control in full COLD, except in extreme cold weather conditions.

d. Ascertain that flaps are UP. If high obstacles are to be cleared and only a short run is available, set the flaps at 20° down. Locking the flaps in an intermediate position is accomplished by observing their movement on the flap position indicator and stopping them at the desired position by placing the flap control handle in the middle of its quadrant.

FIG. 12—CARBURETOR AIR HEAT CONTROL

e. Turn into the wind and take-off without delay. Open the throttle with one motion until it is hard against the sea-level stop, taking only two or three seconds to do so. This will give 2250 RPM and 36 inches Hg manifold pressure. The manifold pressure of 36 inches Hg is not to be exceeded.

CAUTION

Do no attempt to pull the airplane off the ground too early. Maintain a constant attitude until it flies itself off.

10. CLEARING THE FIELD.

As soon as the airplane is sufficiently clear of the ground, retract the landing gear, proceeding as follows:

a. Push down on the pressure control lever marked PUSH. This lever energizes the general hydraulic system and should always be depressed before any hydraulic operation.

b. Pull back on the landing gear control handle located beside the flap control handle on the left side of each cockpit.

c. Observe the landing gear position from the mechanical indicator located on the left forward side of the front cockpit, beside the flap position indicators.

FIG. 13—ENGINE PRIMER

d. If the flaps have been partially lowered for the take-off, raise them provided the indicated airspeed is at least 100 MPH and the altitude 300 feet. Raising the flaps is accomplished by depressing the pressure control lever marked PUSH and placing the flap control lever in the UP position.

e. Ease back on the throttle to 32.5 inches Hg manifold pressure and on the propeller control to 2200 RPM.

f. Climb at 117 MPH indicated and check the cylinder and oil temperatures, together with oil pressure.

g. Close the sliding cockpit enclosure the desired amount.

h. Turn the fuel selector valve from RESERVE to LEFT.

i. Adjust the rudder trimming wheel, which is the outer one of the two located on the left side of each cockpit, so that the airplane flies straight ahead, with feet off of the rudder pedals. Clockwise rotation of the wheel turns the airplane to the right.

11. ENGINE FAILURE DURING TAKE-OFF.

If the engine fails immediately after take-off, act quickly as follows:

a. Maintain speed by depressing the nose at once so that airspeed does not drop below 95 MPH.

b. Open the sliding enclosure all the way.

c. Make sure that the landing gear has started to come up. There is not time to take further action, and even if only unlocked and on the way up, the gear will collapse on landing. Do not try to lower it. There is less likelihood of personal injury if the airplane is landed with the landing gear UP.

d. Lower the flaps fully if possible.

e. Land straight ahead, only changing direction sufficiently to miss obstructions.

f. If time permits, switch off the engine to reduce the risk of fire. In any case do so after landing, and also turn the fuel selector valve OFF.

g. After landing, get out of the airplane as quickly as possible and remain outside.

12. CLIMBING.

a. Climb at 2200 RPM and 32.5 inches Hg manifold pressure. At this setting the best climbing speed is 117 MPH indicated airspeed up to approximately 5000 feet, with a three MPH reduction for every 2000

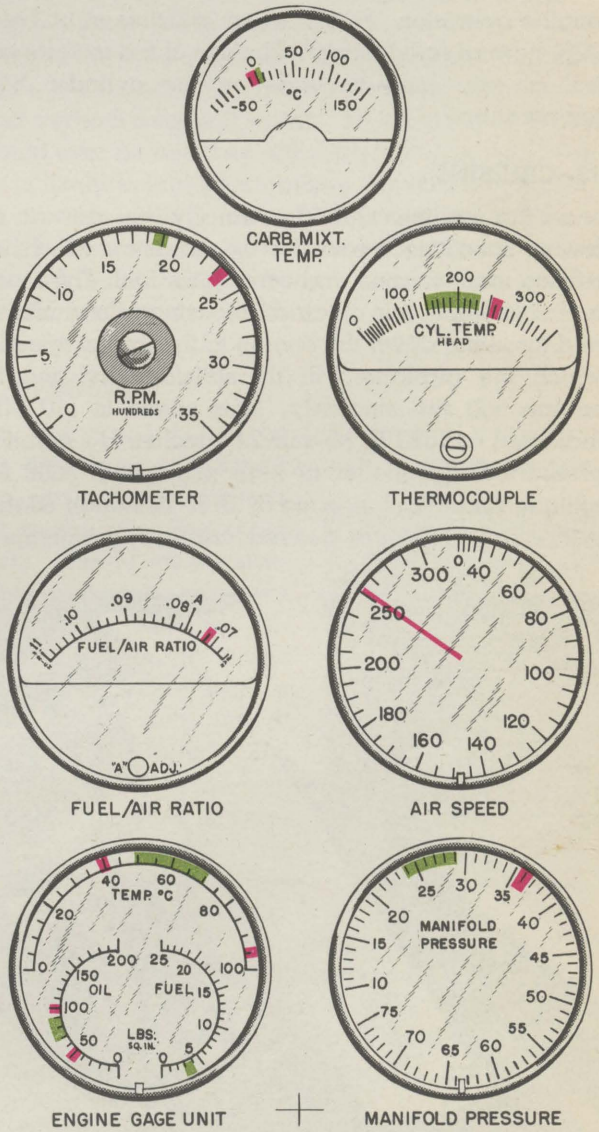


FIG. 14—INSTRUMENT LIMITATION MARKINGS

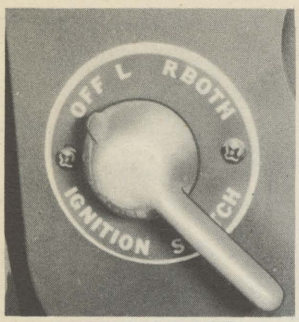


FIG. 15—IGNITION SWITCH CONTROL

feet increase in altitude above 5000 feet. The average rate of climb with a setting of 32.5 inches Hg manifold pressure and 2200 RPM is approximately 1200 feet per minute. During take off, climbing at nearly maximum rate, and high speed level flight below 5000 feet, the mixture control should be kept in the full RICH position. For all operations above 5000 feet, the mixture should be leaned only sufficiently to maintain smooth engine operation, except when cruising at or below 70% normal rated power. The use of the mixture control at any time depends on the cylinder head temperature.

13. CRUISING.

a. The engine should normally be run at the lowest speed necessary for the occasion which will reduce maintenance and economize fuel. The lowest fuel consumption is obtained by using a lean mixture and throttling down the engine to the lowest speed at which the airplane will fly satisfactorily and the engine will run smoothly. This speed is 110 MPH indicated at 1320 RPM and 22.5 inches Hg manifold pressure the propeller in high pitch, with 5000 feet altitude and a fuel-air ratio of .078. Although slightly less economical, the desired cruising conditions of 1850 RPM at 26 inches Hg manifold pressure and an indicated airspeed of approximately 145 MPH are more practicable for ordinary flying conditions. Greater economy will be effected if the airplane is flown at approximately 5000 feet altitude, provided the weather permits. The mixture control should be used to lean the mixture when cruising steadily for any length of time, but care must be taken not to lean the mixture too much as serious damage may result from overheated cylinders.

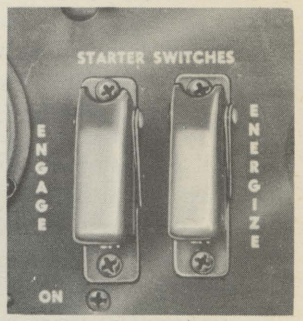


FIG. 17—STARTER SWITCHES —24 VOLT AIRPLANES

b. Adjust the elevator trimming wheel, which is the inner one of the two located on the left side of each cockpit to obtain correct longitudinal flight. Clockwise rotation of the control wheel compensates for an existing tail-heavy condition.

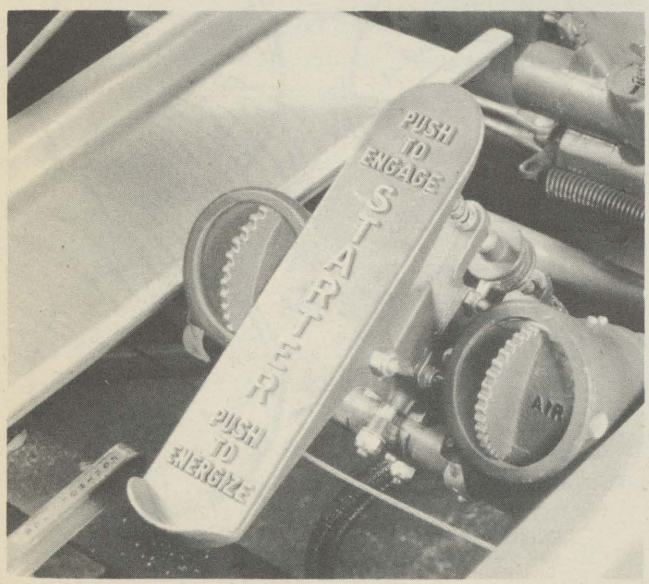


FIG. 16—STARTER SWITCH PEDAL—12 VOLT AIRPLANES

14. TRIM.

a. The effect of flap and landing gear operation on the trim of the airplane in flight is as follows:

(1) Landing gear retracted—no effect.

(2) Landing gear extended—no effect.

(3) Flaps lowered — airplane becomes nose-heavy.

(4) Flaps raised—airplane becomes tail-heavy.

(5) Flaps raised at 80 MPH—airplane sinks approximately 20 feet.

(6) Flaps raised at 75 MPH—airplane sinks approximately 40 feet.

NOTE

The elevator trim tab requires frequent use to compensate for changes of trim owing to variations of throttle settings. The trim tab must not be used for maneuvering, as great stresses are imposed on the airplane when this is done. The elevator trim tab control should be turned counterclockwise to trim the elevator for landing. Do not trim over half way or difficulty will be experienced in preventing the nose from rising if full throttle is needed after a mislanding.

15. SIDESLIPS.

a. Care must be taken while side-slipping that the airspeed does not fall below 90 MPH. Recovery from a side-slip should be effected above 200 feet.

16. STALLING.

a. Though the stall most commonly occurs at low speed, it should be remembered that it may occur at any speed if the control stick can be brought back far enough to put the airplane at stalling incidence. The following is a brief description of the stalling characteristics of this airplane.

(1) With wing flaps and landing gear up, the stalling incidence is reached at about 75 MPH indicated airspeed. When the stalling incidence is reached a wing will drop and if the backward movement of the stick is continued, the airplane will go into a steep spin, later becoming a stall in the recovery.

(2) With wing flaps and landing gear down, the stalling incidence is reached at approximately 65 MPH indicated airspeed. As speed is reduced the right wing usually drops very quickly and unless recovery is affected immediately, the airplane may whip into a half roll and attempt to spin. If recovery is not made at once, an indicated speed of 140 MPH will develop and severe strain will be put on the wing flaps. At the same time care must be taken not to ease the stick back too soon. If this is done at too low a speed, there is a possibility that the airplane will spin in the opposite direction.

(3) A characteristic of this airplane near the stalling speed is that with the wing flaps up, the stalling incidence is reached with the control stick only a short distance back from the normal position,

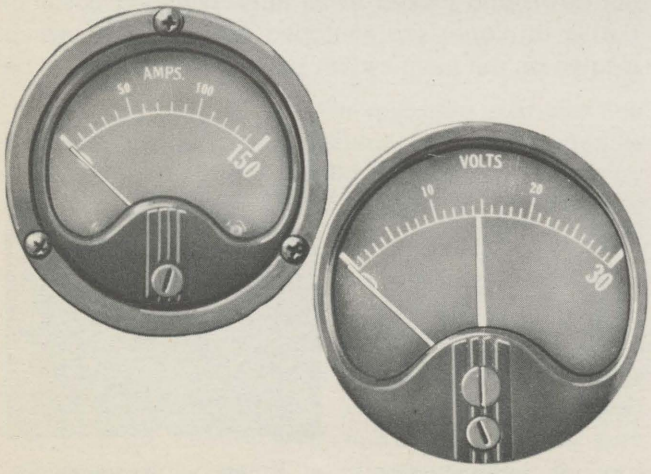


FIG. 18—GENERATOR AMMETER AND VOLTMETER

owing to sensitive elevators. This is not the case, however, with wing flaps down or in flattening out to land, when the stick should be brought right back. It is very easy to check the whip when stalling if the stick is put forward as the ship starts and opposite rudder applied. But if putting the stick forward is delayed until the airplane is on its back, the result may be an inverted spin. If the stick is eased forward only very slightly when the wing drops, it is possible that a very fast whip about an almost vertical axis will result. No warning of a stall should ever be relied on although buffeting and pitching is likely to take place before the stall proper. During practice stall, do not pull the nose up in order to stall but counteract its tendency to sink by easing the stick back gently. When a wing drops, put the stick forward at once and apply opposite rudder.

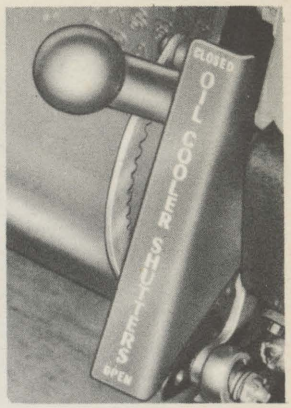


FIG. 19—OIL COOLER SHUTTER CONTROL

17. SPINNING.

a. Spins should not be intentionally made with the wing flaps and landing gear in the down position, since great strain is put on the flaps and other parts. Should an unintentional spin occur, recovery should be effected immediately by the same method as with the flaps and landing gear up. If full opposite rudder is first applied and then the control stick pushed forward firmly, recovery from the spin will be effected after 1½ or two turns. The rudder should be centralized as soon as the airplane is in a straight dive to prevent a spin in the opposite direction. Do not pull the stick back too soon to recover from the resultant dive or stalling incidence may again be reached and another spin follow.

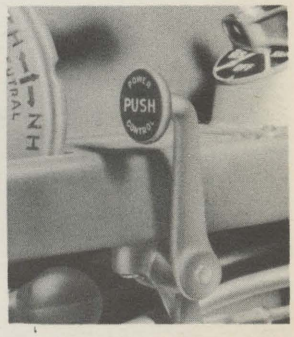


FIG. 20—HYDRAULIC POWER CONTROL

18. DIVING.

a. The maximum allowable diving speed is 251 MPH indicated airspeed during which time the

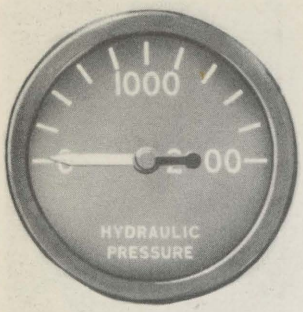


FIG. 21—HYDRAULIC PRESSURE GAGE

engine speed must not exceed 2640 RPM and 20 inches Hg manifold pressure with the throttle open one-third or more. If the throttle is less than one-third open, 2200 RPM is not to be exceeded. When diving, the flaps and landing gear must be up and the propeller put in the DECREASE RPM (high pitch) position. The propeller control must be moved to the high pitch position while the throttle is still open to prevent the propeller blades from remaining set in low pitch during the dive. Elevator tabs must not be used to assist recovery from a dive, except as a last resort, and then only by a very slight and slow movement.

19. RAIN AND POOR VISIBILITY.

a. When visibility is poor due to rain, fog or frost, open the sliding enclosure. The airplane may be equipped with defrosting equipment for the windshield. If frosting occurs, turn on the defrosting system by rotating the cockpit heating valve. In extreme cases where speed has been reduced in order to facilitate navigation or to obviate the danger of suddenly arising ground, the wing flaps should be partially or fully lowered and the propeller should be put in the LOW PITCH position to reduce vibration at low RPM. In such cases the engine temperature must be watched closely.

FIG. 22—MANIFOLD PRESSURE GAGE DRAIN

20. GLIDING.

a. Gliding may be carried out at any safe speed down to the recommended margin of about 25% above stalling speed. With the flaps and landing gear up, the glide is very flat, and at the best gliding speed of about 100 MPH indicated airspeed, long distances can be covered for a comparatively small loss of height. Lowering either the flaps or the landing gear or both greatly steepens the gliding angle of a given speed and the rate of descent is greatly increased. The following tabulation illustrates the characteristics of the various gliding speeds.

INDICATED AIRSPEED	GLIDING ANGLE	FLAPS AND L.G.	POWER
100 MPH	Best	Up	Off
95 MPH	Best	Down	Off
90 MPH	Steep	Down	Off
85 MPH	Best	Down	On
80 MPH	Steep	Down	On
75 MPH	Stall	Up	—
65 MPH	Stall	Down	—

CAUTION

Steep gliding must not be done near the ground.

Should the cylinder head temperature fall below 100°C, the engine should be opened up for a short period. The carburetor air intake heat control must be put in the HOT position if the engine shows signs of becoming unduly cold or if there is a possibility of its icing up.

21. APPROACH AND LANDING.

When the airplane nears the landing field, speed should be reduced to less than 127 MPH indicated airspeed and the propeller should be set in the INCREASE RPM (low pitch) position. The mixture control should be placed in the FULL RICH position and preparations made for lowering the landing gear and wing flaps. Also press the landing gear warning signal circuit breaker to determine that the circuit breaker is set.

a. LANDING GEAR WARNING HORN.—As the throttle is retarded to under 1200 RPM, the warning horn will sound to indicate that the landing gear is not down and locked in its fully extended position. Earlier airplanes are equipped with a toggle switch located on the main switch box panel which may be

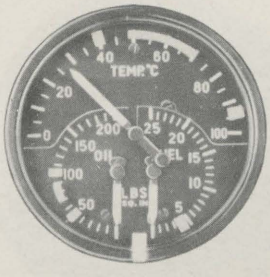


FIG. 23—ENGINE GAGE UNIT

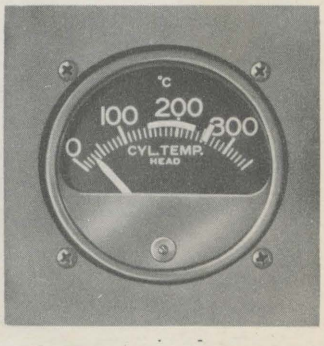


FIG. 24—CYLINDER TEMPERATURE GAGE

thrown to suspend operation of the horn until the throttle is advanced again past 1200 RPM. But when preparing to land the use of this switch should be avoided. Instead the horn should be allowed to sound until the conditions responsible for its operation have been removed; that is, until the landing gear is fully lowered and locked in place. On later airplanes the landing gear warning horn disconnect switch has been removed.

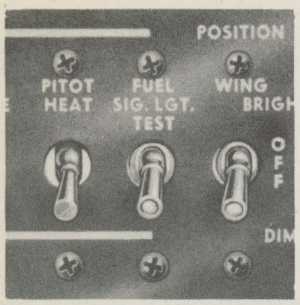


FIG. 25—FUEL SWITCH-OVER SIGNAL TEST SWITCH

b. LOWERING THE LANDING GEAR.—Push down on the pressure control lever marked PUSH to energize the hydraulic system and move the landing gear control handle to the extreme lower DOWN notch in its quadrant. Upon full extension of the landing gear, spring-loaded steel pins will drop behind the extended members and lock them securely in the extended position. When so locked, the warning horn will cease operating and a safe landing condition will thereby be indicated.

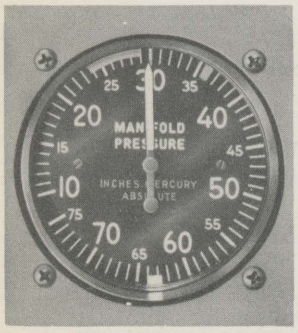


FIG. 26—MANIFOLD PRESSURE GAGE

c. EMERGENCY LANDING GEAR LOCKING CONTROL.—Should the lock pins referred to above fail to automatically lock the landing gear in place, such a condition being indicated by the blowing of the warning horn, they may be forced into the locking position by lifting the landing gear control handle over the stop in the quadrant and pushing it as far downward as it will go. In case of complete failure of the main hydraulic system, the emergency hand pump should be used to obtain hydraulic pressure.

d. LOWERING THE FLAPS.—When the airplane has been brought around into the wind for landing, the flaps should be lowered fully, at an altitude of at least 400 feet, provided the indicated airspeed is between 90 and 95 MPH. To lower the flaps, push the pressure control lever marked PUSH and then move the flap control handle to its most forward position. Check the full movement of the flaps by noting the position of the mechanical flap position indicator arms on the forward end of the control shelf.

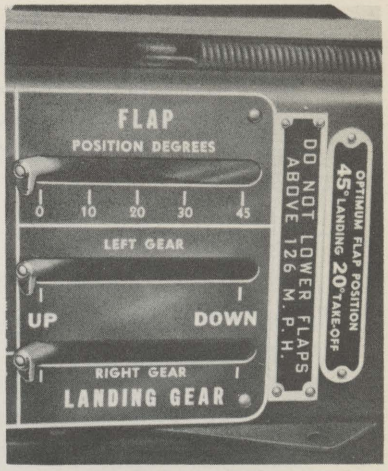


FIG. 27—LANDING GEAR AND FLAP POSITION INDICATORS

e. TURNS WITH FLAPS. — Surface controls, particularly the rudder, are slightly less responsive with the flaps down, therefore turns and side slips, with the flaps fully lowered, must not be made on the final approach lower than 400 feet.

22. MISLANDING.

In the case of an unsuccessful attempt to land, the airplane will climb satisfactorily with flaps and landing gear down. However, on emergency take-off, raise the landing gear as soon as possible, and when 400 feet altitude has been gained, depress the nose, increase the speed to 100 MPH indicated airspeed, and then raise the flaps. DO NOT RAISE FLAPS BELOW 100 MPH.

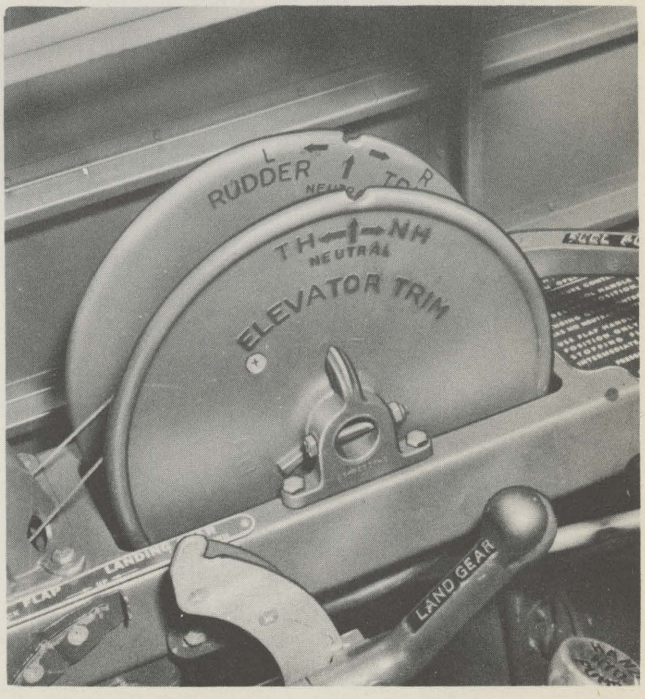


FIG. 28—TRIM TAB CONTROLS

23. CROSS WIND LANDING.

As this airplane has a landing gear of wide tread, cross wind landings may be negotiated safely. Keeping one wing slightly down and into the wind until near the ground will nevertheless partly counteract the drift.

24. FORCED LANDING.

In case of total engine failure during flight, it should be remembered that in this airplane an effective sideslip is difficult because of the large fin area and that "S" turns should be employed only above 2000 or 3000 feet. The lowering of the flaps may be delayed until the last 300 or 400 feet and then may be lowered progressively. But it should also be kept in mind that once lowered they cannot be raised. Maintain speed by depressing the nose at once if necessary so that the airspeed does not drop below 95 MPH.

FIG. 29—GENERATOR CIRCUIT BREAKER

25. AFTER LANDING.

a Raise the flaps.

b. Taxi to the line.

c. Cage the artificial horizon if not already done.

d. Place the mixture control in the FULL RICH position.

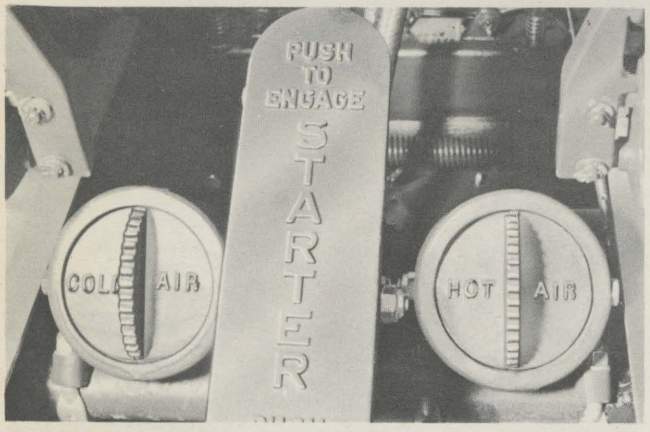


FIG. 30—COCKPIT VENTILATORS

e. Open the throttle to about 1200 RPM and shift the propeller control to the DECREASED RPM (high pitch) position.

f. After the blades have moved into high pitch as noted by the decrease in the engine RPM allow the engine to run approximately one minute at 1200 RPM in order that the oil drained into the engine from the propeller cylinder may be properly scavenged and returned to the oil tank.

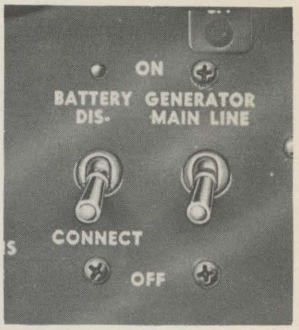


FIG. 31—BATTERY AND GENERATOR MAIN LINE SWITCHES

g. When temperatures below 6°C (41°F) exist or are expected dilute the engine oil as follows:

(1) Operate the engine at 800 RPM.

(2) Maintain oil temperature 5° to 50°C (40° to 122°F).

(3) For ground temperatures from 5° to -7° (40° to 20°F), hold oil dilution switch ON four minutes, stop engine, release oil dilution switch.

(4) For temperatures -7° to -30°C (20° to -20°F) dilute for a second four minute period, 15 minutes after first dilution.

(5) For temperatures below -30°C (-20°F), dilute for a third four minute period, 15 minutes after second dilution.

h. Set the mixture control in the full LEAN position, thus making use of the idle cut-off.

i. After the engine has ceased firing, turn the ignition switch OFF.

j. Turn the fuel selector valve OFF.

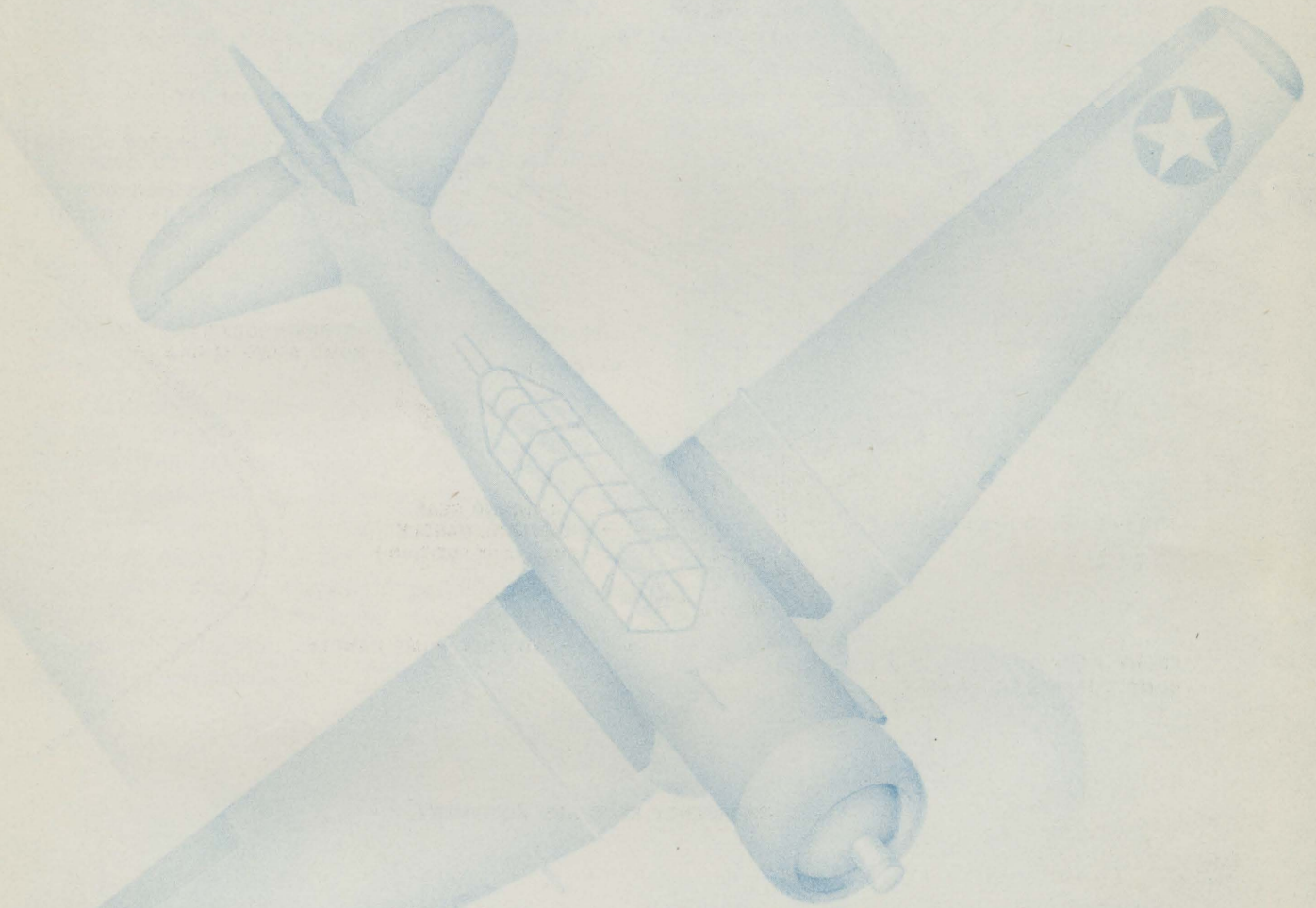
k. Move the throttle to the CLOSED position.

l. Leave the mixture control at full LEAN (idle cut-off) as a precaution against accidental starting.

m. Turn off the battery-disconnect and generator main line switches.

n. Apply parking brakes after the brakes have cooled sufficiently.

Section III.
EMERGENCY OPERATING INSTRUCTIONS



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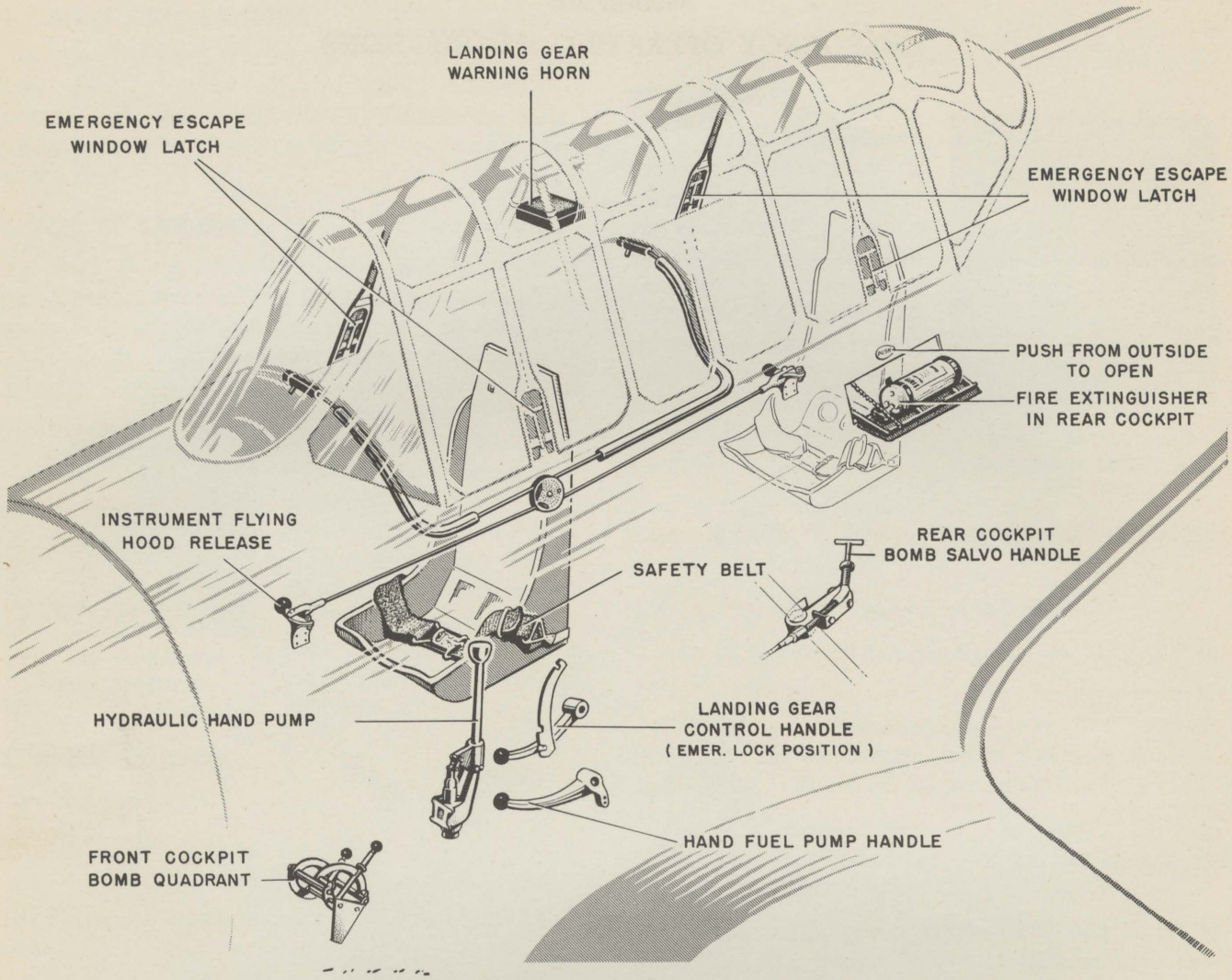

FIG. 1—EMERGENCY EXITS AND EQUIPMENT

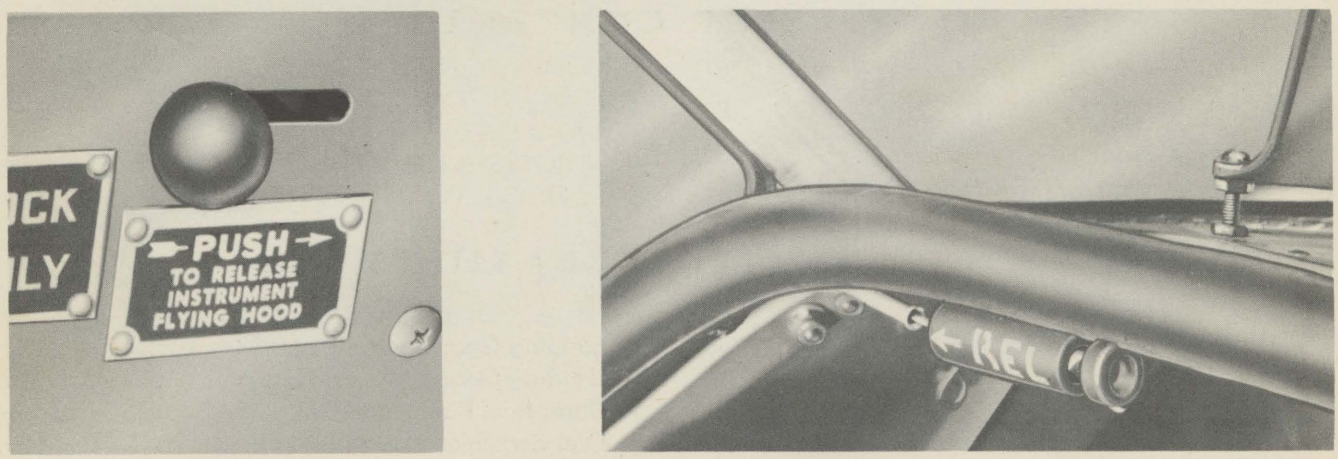

FIG. 2—INSTRUMENT FLYING HOOD RELEASE

Section III.
EMERGENCY OPERATING INSTRUCTIONS

1. EMERGENCY EXITS (See figure 1.)

Four removable glass panels are installed in the cockpit sliding enclosures, one on each side of the front and rear cockpit. Each panel has a latch assembly which consists of a steel frame with top and bottom release plungers and a red spring lever which operates both plungers simultaneously. The lever is safety wired when the removable panel is locked in place. Raising the lever, thus breaking the safety wire disengages both plungers and releases the entire panel from the cockpit enclosure. The panel should be pushed clear, providing an emergency exit for the crew.

2. RELEASE OF THE INSTRUMENT FLYING HOOD (See figure 2.)

The instrument flying hood may be installed in either the front or rear cockpit.

The instrument flying hood may be released by the occupant of either cockpit. To release the hood of the adjoining cockpit, push the control knob located on the forward left side of either cockpit. If the occupant of either cockpit desires to release his hood he must push to the left the lever extending from the latch assembly located, below the top edge of the instrument panel shield.

WARNING

Be sure that the seat is lowered for head clearance before releasing the instrument flying hood.

3. FIRE EXTINGUISHER (See figure 3.)

A hand fire extinguisher containing carbon tetrachloride is installed on the inner side of a special hinged access door located at the left side and accessible to the occupant of the rear cockpit. The extinguisher is also accessible to personnel outside the airplane by pressing the red button located on the left fuselage side panel, which opens the access door. The extinguisher can be quickly removed from its retaining brackets on the access door by releasing the buckle on its retaining strap and pulling it outward.

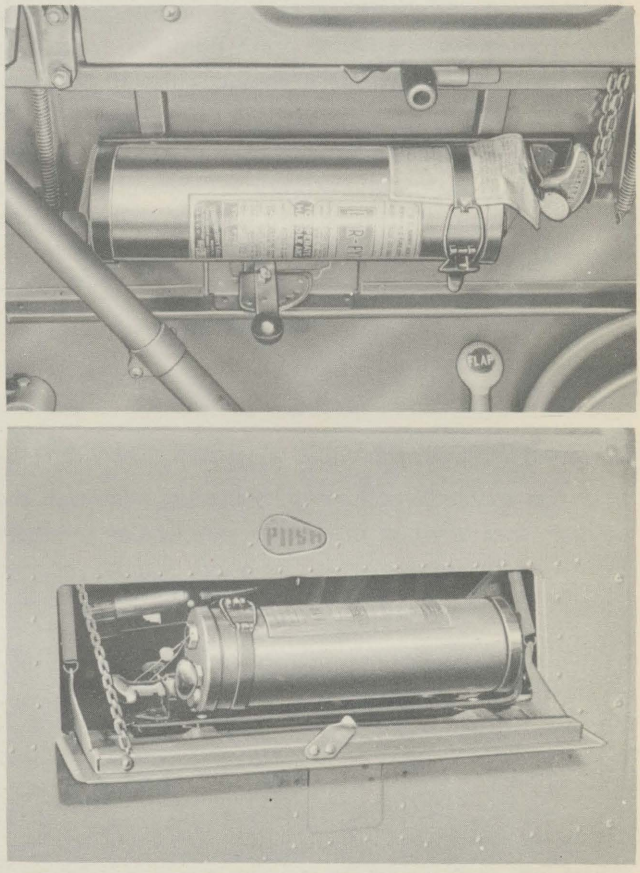

FIG. 3—FIRE EXTINGUISHER

4. EMERGENCY HYDRAULIC HAND PUMP (See figure 4.)

The emergency hydraulic hand pump located below the left front corner of the pilot's seat in the front cockpit has a pump handle of the spring-loaded telescope type. The pump can be operated with the

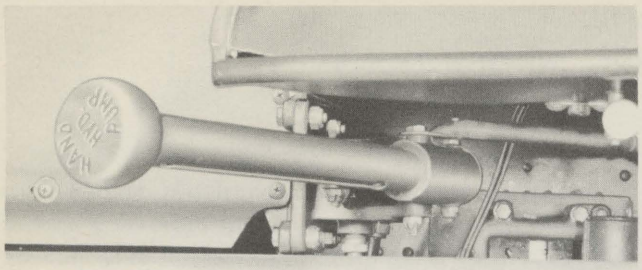

FIG. 4—EMERGENCY HYDRAULIC HAND PUMP

handle in the shortened position but should be operated in the extended position in order to develop full efficiency. The pump is used in the event that the engine-driven hydraulic pump is inoperative and for testing the hydraulic system when the airplane is at rest on the ground. The hand pump is assured of additional fluid because it receives its supply from the reserve supply at the bottom of the reservoir. To operate the landing gear or flaps, place the landing gear or flap control lever in the selected position and start pumping. 1000 lb/sq in. pressure is not to be exceeded in the event the relief valve freezes in the closed position. It will be noted that when the hydraulic hand pump is used it is not necessary to press the hydraulic pressure control.

5. COMPLETE HYDRAULIC FAILURE (See figure 5.)

In the event of complete hydraulic failure in the system, that is when pressure cannot be maintained by either the engine-driven or hand pumps, proceed as follows to lower the landing gear:

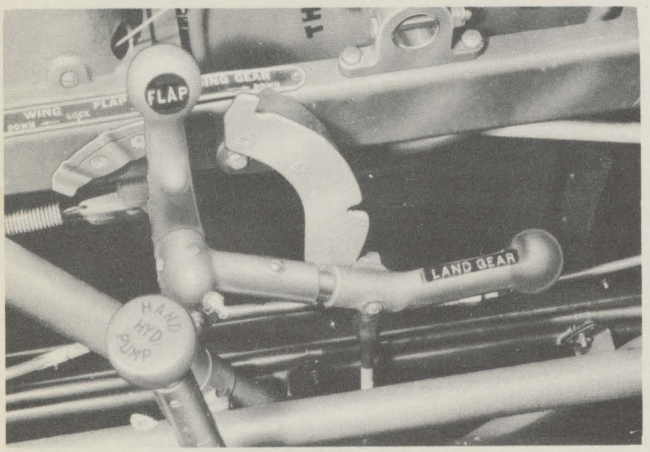

FIG. 5—LANDING GEAR CONTROL EMERGENCY POSITION

(a) Move the landing gear control lever to the DOWN position. This will mechanically release the UP position locks and allow the force of gravity to pull the landing gear to the DOWN position.

(b) Check the landing gear position indicators located on the control shelf to the left of the pilot's seat to ascertain that the landing gear is actually in the full DOWN position. If the landing gear is not in the full DOWN position as shown by the indicators, rock the wings of the airplane until the gear is definitely in the full DOWN position.

(c) Place the landing gear control in the EMERGENCY locking position which mechanically engages the down lockpins. If difficulty is encountered

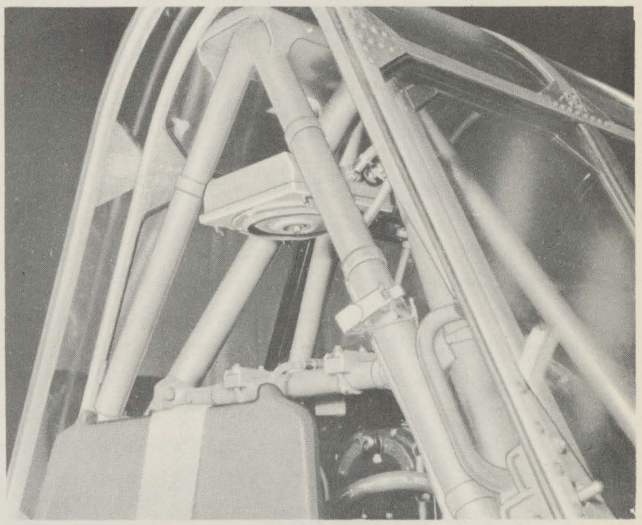

FIG. 6—LANDING GEAR WARNING HORN

in engaging the lockpins, rock the wings again. DO NOT move control to EMERGENCY position until it is determined that landing gear is full DOWN.

(d) Reduce the engine RPM below 1200 to check the landing gear warning horn. (See figure 6.)

6. HAND FUEL PUMP (See figure 7.)

The handle for operating the hand fuel pump is located on the control shelf at the left side of each cockpit, between the rudder and trim tab control wheels. The function of this hand pump is to obtain fuel pressure when the engine is not running and is to be used in the event the engine fuel pump fails to operate. Insufficient operation of the hand pump will be indicated by the fuel pressure warning light. Three to four lb/sq in. pressure should be maintained to supply sufficient fuel to the engine.

7. FUEL SWITCH-OVER SIGNAL (See figure 8.)

A red fuel switch-over signal light is mounted on the right side of the front cockpit instrument panel. When the electric current in the airplane is on, the signal light will flash on if the fuel pressure is below 3 lb/sq in. plus or minus ¼ lb/sq in. If the signal light should flash on during engine operation, especially when in flight, immediately turn the fuel selector valve to the tank containing sufficient fuel to sustain engine operation. The signal light flashes on approximately 10 seconds before engine failure. Check to see that the lamp is in working order by placing the electric switch ON, which is located on the front cockpit electrical control panel. Checking

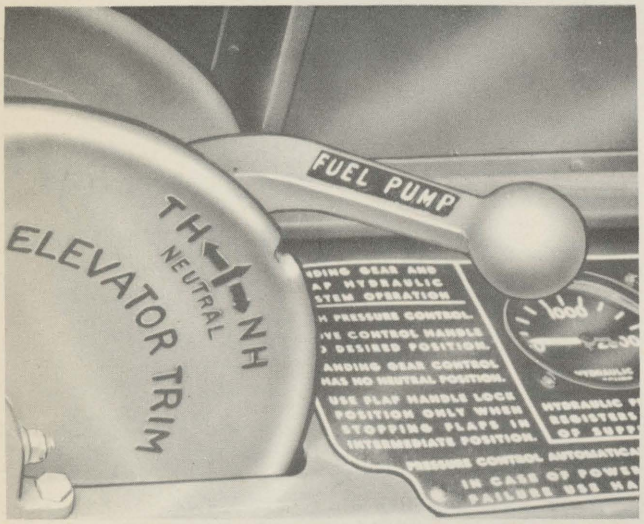

FIG. 7—HAND FUEL PUMP HANDLE

the pressure at which the circuit begins to operate can be accomplished by using the hand fuel pump on the ground with the engine stopped and noting at what pressure on the fuel pressure gage the lamp goes out as the pressure is gradually raised.

8. PYROTECHNICS.

Provisions are made in earlier airplanes for stowing a type M-2 pyrotechnic pistol at the right side of the front cockpit adjacent to the oxygen regulator. Racks alongside are provided for three type M-10 and three type M-11 pyrotechnic signals. The type M-10 are white star parachute signals and the type M-11 are red star parachute signals. On later airplanes all pyrotechnic provisions have been removed.

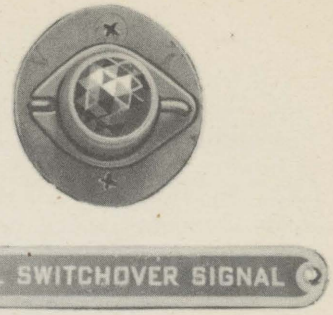

FIG. 8—FUEL SWITCH-OVER SIGNAL LIGHT

9. BOMB SALVO (See figure 9.)

If, in taking off, it becomes urgently necessary to reduce weight in order to clear obstacles on the ground or if a forced landing is anticipated, the bombs should be dropped in SALVO in the unarmed condition. The bomb control quadrant is installed on the left side of the front cockpit on airplanes equipped for bombing and contains the arming and releasing levers. The rear cockpit contains an emergency salvo control which is also located on the left side of the cockpit. To salvo the bombs from the front cockpit, place the release lever in the salvo position. To salvo the bombs from the rear cockpit, pull the emergency salvo control. Before dropping the bombs, ascertain that the bomb safety switch, located in the front cockpit on the electrical control panel, and the bomb arming lever, located on the bomb control quadrant in the front cockpit, are in the SAFE position in order that bombs may be dropped unarmed.

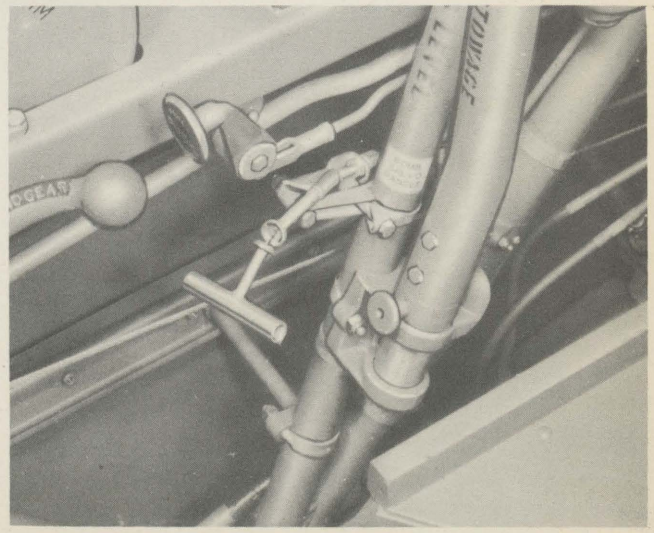

FIG. 9—REAR COCKPIT BOMB SALVO HANDLE

Section IV.
OPERATIONAL EQUIPMENT

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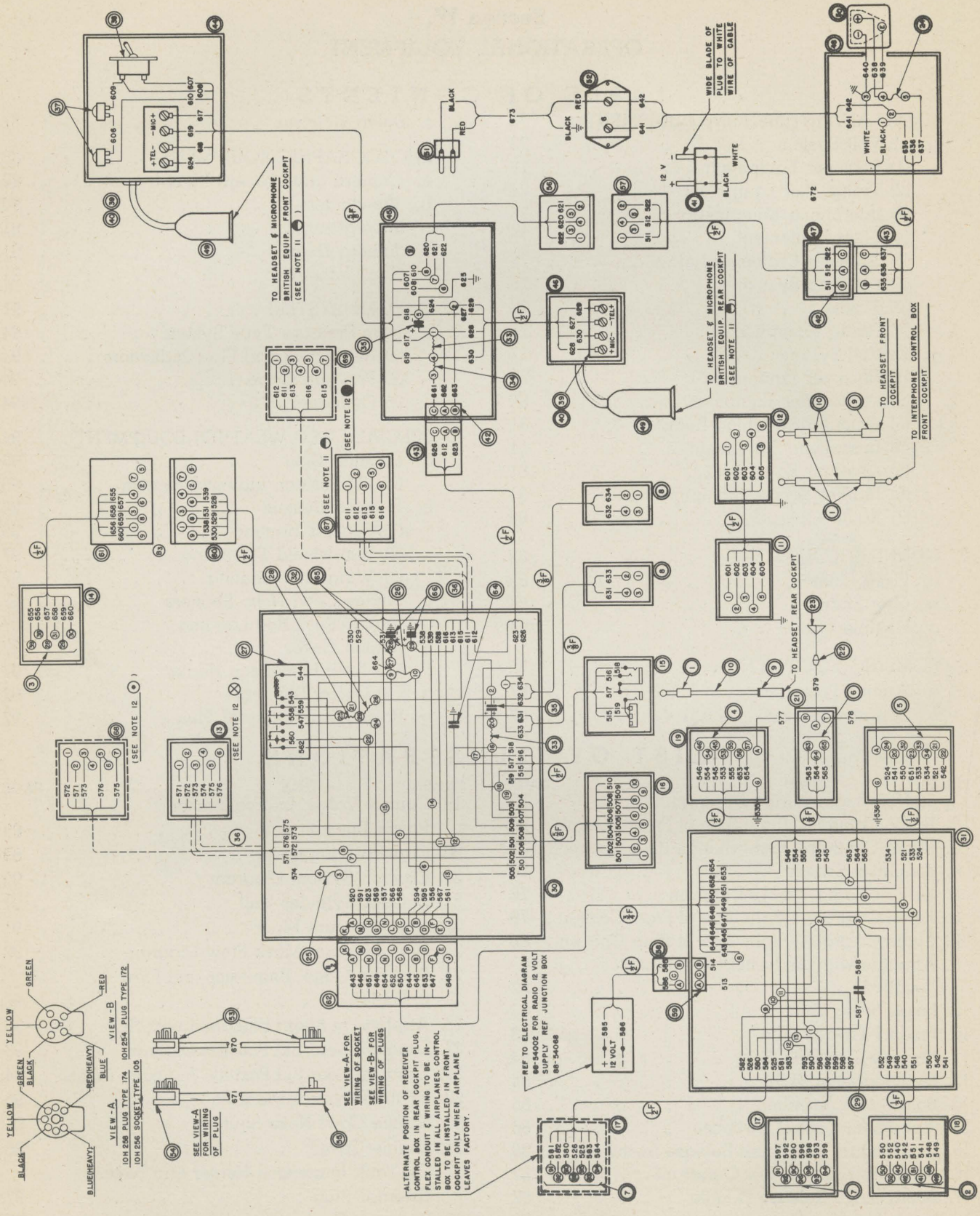


FIG. 1—12 VOLT RADIO WIRING DIAGRAM

Section IV.
OPERATIONAL EQUIPMENT

1. RADIO AND INTERPHONE EQUIPMENT.

a. 12 VOLT SYSTEM (See figure 1.)—The radio and interphone equipment installed on the 12 volt airplane consists of a radio command set SCR-AL-183, necessary antenna equipment, two-place interphone equipment BC-27 and miscellaneous equipment necessary for the operation of the communication system as a whole. The command set is directly controlled from the front cockpit and remotely controlled from the rear cockpit. All controls are installed on the right side of the cockpits and provision is made for installing the receiver control box in either cockpit to provide receiver control from the cockpit in which the instrument flying hood is installed.

(1) RECEIVER EQUIPMENT (See figures 2 and 3.) —Radio receiver BC-AL-229 consists of a set-box including the supply and coupling circuits, tubes, sockets, power terminals and plug-in coil terminals required for the reception of radio signals. The receiver comprises four stages of radio frequency amplification which amplify at the incoming frequency, a detector and one stage of audio frequency amplification. The BC-AL-229 receiver is installed on a shock absorber mounting attached to the radio shelf on the right side of the front cockpit. The tuning unit with dial MC-282 mounted in the front cockpit is connected to the receiver by a tuning shaft. The tuning unit with dial MC-322 mounted in the rear cockpit, is also connected to the receiver by a tuning shaft. A type BC-AL-231 receiver control box is installed directly above the transmitter on the right side of the front cockpit. An additional mounting bracket for the receiver control unit is installed on the radio remote control panel in the rear cockpit. This is to provide for alternate installation when the instrument flying hood is installed in the rear cockpit. A receptacle is provided on each mounting bracket to stow the receiver control box plug when it is not in use. Two coil units are included in the receiver assembly. Coil unit C-379 is mounted on the receiver and coil unit C-377 is stowed over the baggage compartment behind the rear cockpit seat.

LEGEND—12 VOLT RADIO WIRING DIAGRAM

NO.	DESCRIPTION
1	Plug—Head Set Connector Cord
2	Plug—Transmitter Control Box
3	Plug—Dynamotor
4	Plug—Receiver
5	Plug—Transmitter
6	Plug—Antenna Relay
7	Plug—Receiver Control Box
8	Plug—Throttle Quadrants
9	Jack-Head Set Connector Cord
10	Cordage—Head Set Connector
11	Filter Unit
12	Box Assem.—Filter Switch
13	Amplifier—Interphone
14	Dynamotor—Command Set
15	Box Assem.—Interphone Remote
16	Box Assem.—Interphone Master
17	Box Assem.—Receiver Control
18	Box Assem.—Transmitter Control
19	Receiver—Command Set
20	Transmitter—Command Set
21	Relay—Antenna Switching
22	Insulator—Antenna Lead-in
23	Wire—Radio Antenna
24	Fuse—10 Amp. (1 Spare)
25	Fuse—50 Amp. (1 Spare)
26	Fuse—15 Amp. (1 Spare)
27	Relay—Strowger
28	Resistor 30 Ohms 1/2 Watt
29	Capacitor .004 MFD
30	Box Assem.—Command Set Junct.
31	Box Assem.—Command Set Pull
32	Resistor 50,000 Ohms 2 Watt (1R.C.)
33	Resistor 500 Ohms 1 Watt (1R.C.)
34	Resistor 390 Ohms 1 Watt (1R.C.)
35	Condenser 25 MFD 25 Volt
36	Spacer—Interphone Amplifier
37	Switch—Push Button
38	Switch
39	Terminal—Strip
40	Insulator—Terminal Strip
41	Cap—Metal-covered Cord Grip
42	Socket—Box Connector
43	Plug—Connector Straight
44	Box Assem.—R3002 Control
45	Box Assem.—Interphone Junct.
46	Box Assem.—Interphone Rear
47	Box Assem.—R3002 Plug Junct.
48	Box Assem.—R3002 Junct.
49	Socket
50	Socket
51	Socket
52	Switch—Fire Extinguishing
53	Plug
54	Plug
55	Socket
56	Plug
57	Bulkhead Connector
58	Plug
59	Box Connector
60	Plug
61	Bulkhead Connector
62	Plug
63	Box—Connector
64	Condenser 1 MFD 600 Volt
65	Resistor 2 Ohms, 1 Watt (1R.C.)
66	Condenser 250 MFD, 25 Volt
67	Amplifier—Interphone
68	Amplifier—Interphone
69	Amplifier—Interphone

Each coil unit is a combination of two coil sets, with each set tuned for a different frequency band. The frequency band for which the coil set is tuned is marked on the back of the set and a band-change switch on the end of the unit provides for switching from one frequency band to the other. The coil units may be quickly interchanged, as the unit is plugged into the receiver and held in place by snap-slide fasteners.

(2) TRANSMITTER EQUIPMENT. — Radio transmitter BC-AL-230 consists of a set-box including the circuits and tuning elements required for the generation, amplification and modification of radio frequency circuits. The transmitter is mounted forward of the receiver on a shock absorber mounting attached to the radio shelf. The transmitter comprises a radio frequency oscillator, a radio frequency amplifier, a coupling circuit for transferring radio frequency power from the amplifier to the antenna and a modulator stage for amplifying either internal or external modulation currents and modulating the radio frequency amplifier therewith. The control box, BC-AL-232, mounted at the right side of the front cockpit carries a selector switch, a telegraph key, and a jack for use in modulating the transmitter from a microphone or other external source. The selector switch has three positions VOICE, CW and TONE and is for selecting the type of emission from the transmitter. Six interchangeable coil sets are provided for the transmitter. These coil sets must be used only with the transmitter with which they were tuned. The serial number of the transmitter that the coil was tuned with and the frequency band applicable to the coil are marked on the back of each coil.

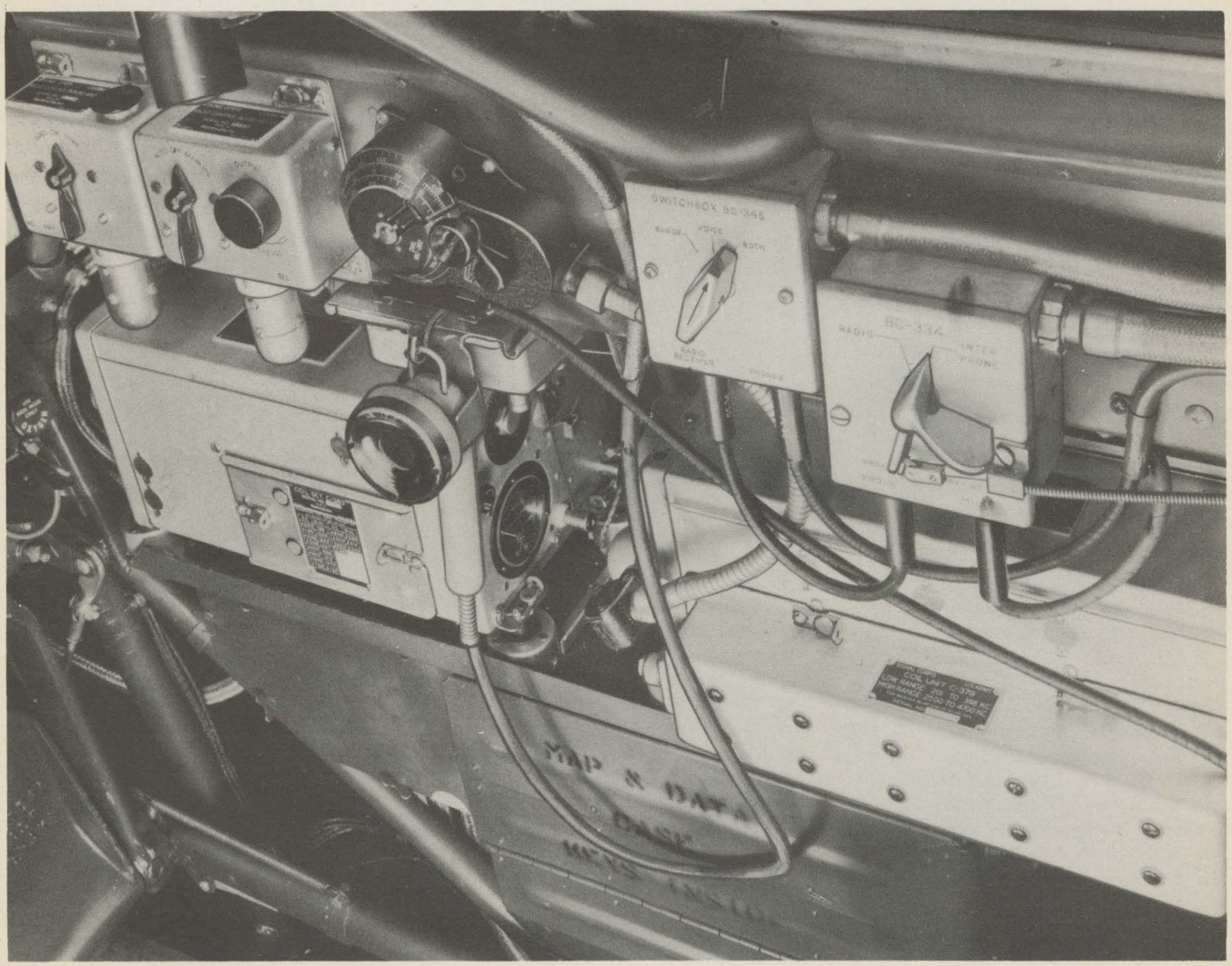


FIG. 2—RADIO CONTROLS—RIGHT SIDE OF FRONT COCKPIT

NOTE

The calibration for each coil set applies only to the transmitter bearing the same serial number as the coil set.

Coil sets are installed in the transmitter by removing a snap-slide fastened door on the side of the transmitter case. Four of the coils when not in use are stowed behind the rear cockpit seat and the other is stowed on the left side of the front cockpit. Power for the transmitting equipment is supplied by a type BD-AL-83 dynamotor mounted on a shock absorber mounting type FT-141 located on a shelf in the aft section of the airplane just forward of the horizontal stabilizer. The dynamotor is of the totally enclosed type having a low voltage commutator and brushes at one end and a high voltage commutator and brushes at the other end. Current is fed to the low voltage commutator and the common field winding from the 12-14.5 volt DC source. Current for the transmitting equipment is drawn from the high voltage commutator at 300 to 375 volts depending upon the value of the applied low voltage.

(3) INTERPHONE EQUIPMENT. — The two-place interphone equipment (RC-27) consists essentially of an amplifier, a master control box, a remote control box, interphone box, microphones, head sets and the necessary tubes, cords, sockets, etc., necessary for the proper functioning of the interphone system as a whole. The two interphone amplifiers, with two VT-65 tubes each, are mounted on the bottom of the command set junction box below the rear cockpit instrument panel. A switch on the front of the amplifier unit provides a means of turning on the interphone dynamotor from the rear cockpit (See figure 4.) The master control box BC-334 mounted on the right side of the front cockpit just above the receiver contains the master control for switching from interphone to radio. Remote control boxes BC-327 and BC-335 are mounted on the right side of the rear cockpit. Control box BC-335 provides a means of limited volume control from the rear cockpit and BC-327 interconnected with master control box BC-334 by flexible shaft provides a means of switching the rear cockpit interphone to either radio or interphone. The T-17 microphones are held in a bracket attached to the right side of each cockpit. Push-to-talk buttons are installed on the handles to the microphones and also on the throttle quadrant arm in each cockpit.

(4) FILTER EQUIPMENT.—A type FL-5-B filter is installed on the right side between the cockpits and BC-345 switch box is installed in the front cockpit between the interphone control box BC-334 and the receiver tuning unit MC-125. The filter unit together with its switch box provides a means of filtering out interference between radio range signals and voice. The switch box has three positions; RANGE for beacon signals only, VOICE with no interference from beacon signals, and BOTH when both voice and bea-

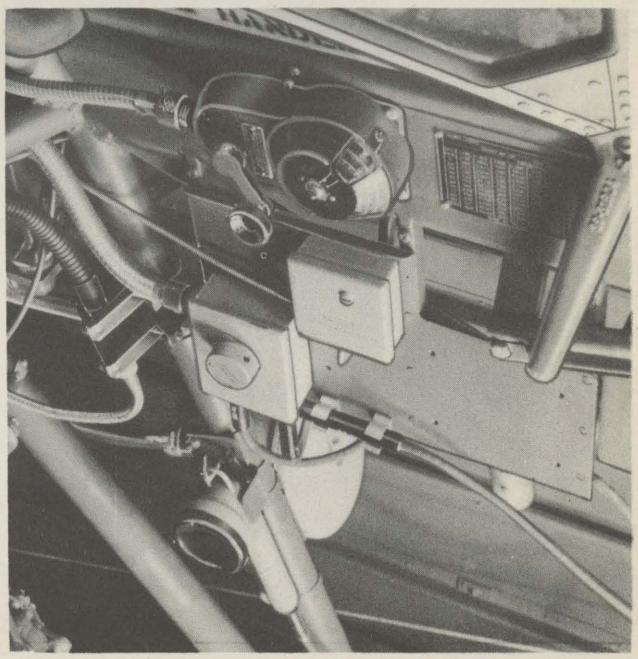


FIG. 3—RADIO CONTROLS—RIGHT SIDE OF REAR COCKPIT

con signals are heard. The BOTH position provides a means of listening to the RANGE beacon signal and at the same time listening for an expected voice message such as the weather report. When the voice message comes in the switch may be thrown to VOICE to make the message audible.

(5) ANTENNA SWITCHING RELAY.—The type BC-AL-198 switching relay is mounted underneath the receiver tuning unit and above the transmitter at the right side of the front cockpit. The antenna switching relay contains a two-position relay, an antenna binding post and two binding post terminals for the receiver and transmitter respectively. It also carries a receptacle for Plug PL-87. The function of the antenna switching relay is to switch the common antenna between the receiver and the transmitter. The

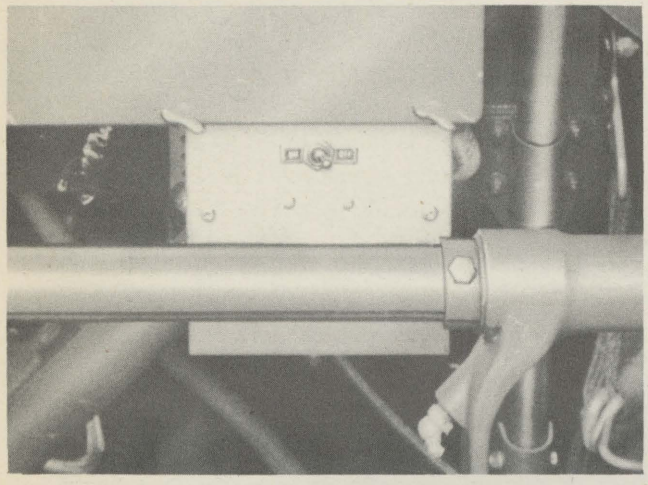


FIG. 4—AMPLIFIER SWITCH

change-over between receiver and transmitter causes the power relay and the BC-198 relay to perform simultaneously the respective functions of switching the dynamotor voltage between the receiver and transmitter and switching the antenna between the receiver and transmitter.

(6) ANTENNA SYSTEM.—The antenna wire type W-106A for the radio equipment, extends from the top of the rudder to the spruce wood antenna mast located forward and to the right of the windshield. The wire enters the right side of the fuselage at the front cockpit.

(7) FUSES.—The radio junction box mounted below the rear cockpit instrument panel contains active and spare fuses for the radio equipment.

(8) RADIO OPERATION.—Start the dynamotor which supplies power to both the radio set and the interphone amplifier by throwing the control switch on receiver control box to either AUTO or MANUAL. The dynamotor may be started from the rear cockpit by means of the switch on the face of the amplifier unit. Put the switch on interphone control box BC-334 to the position marked INTERPHONE. This connects both microphones to the input circuit of the amplifier and both headsets to the output circuit. Interphone communication between the front and rear cockpit is now possible, but as the volume control or interphone box BC-335 is not in the circuit at this position, it will have no effect on the volume level of the system. With the radio set operative as described above, throw the switch on interphone control box BC-334 to RADIO. This will connect the two headsets across the radio receiver output and the two microphones to the transmitter audible input and relay circuits. At this position the radio receiver output may be heard at both headsets, and it should be possible to control the volume over a limited range in the head set at the remote position, by varying the volume control in interphone box BC-335. The volume to both headsets is controlled by means of the radio receiver volume control in the front cockpit only. The maximum volume possible at the BC-335 position is therefore, determined by the receiver volume control setting. Set the switch on the receiver tuning coil to the frequency band from which it is desired to receive signals. Tune in signals by rotating the tuning unit crank and as the receiver is tuned adjust the volume control for suitable signal intensity. The receiver should be tuned with the switch on the control box set at MANUAL but when the incoming signal has been tuned to the desired volume the switch may be set on AUTO for automatic gain control. Set the control knob on the filter switch box at RANGE, VOICE or BOTH as desired. The selector switch on the transmitter control box is for selecting the type of emission from the transmitter. The CW position is the most effective for long range communication or communication through interference. The TONE position is the next most effective, and VOICE is the least effective. For keying, the selector switch must be in either the CW or VOICE positions. Either the push-to-talk switch on the microphone or the throttle quadrant arm must be pressed for voice transmission. Radio set SCR-AL-183 is designed for a voice range of 25 miles but in the absence of atmospheric and local disturbances plane-to-plane ranges as high as 100 miles may be obtained.

SAFETY NOTICE

Operation of this equipment involves the use of high voltages which are dangerous. Do not change tubes or make adjustments inside any unit of equipment with the dynamotor running.

CAUTION

DO NOT operate the radio equipment if the airplane voltage supply is less than 12 volts or more than 15 volts. Never operate the radio equipment when the airplane is on the ground longer than is necessary for an operational check, and never leave the airplane without turning the switch on the receiver control box to the OFF position.

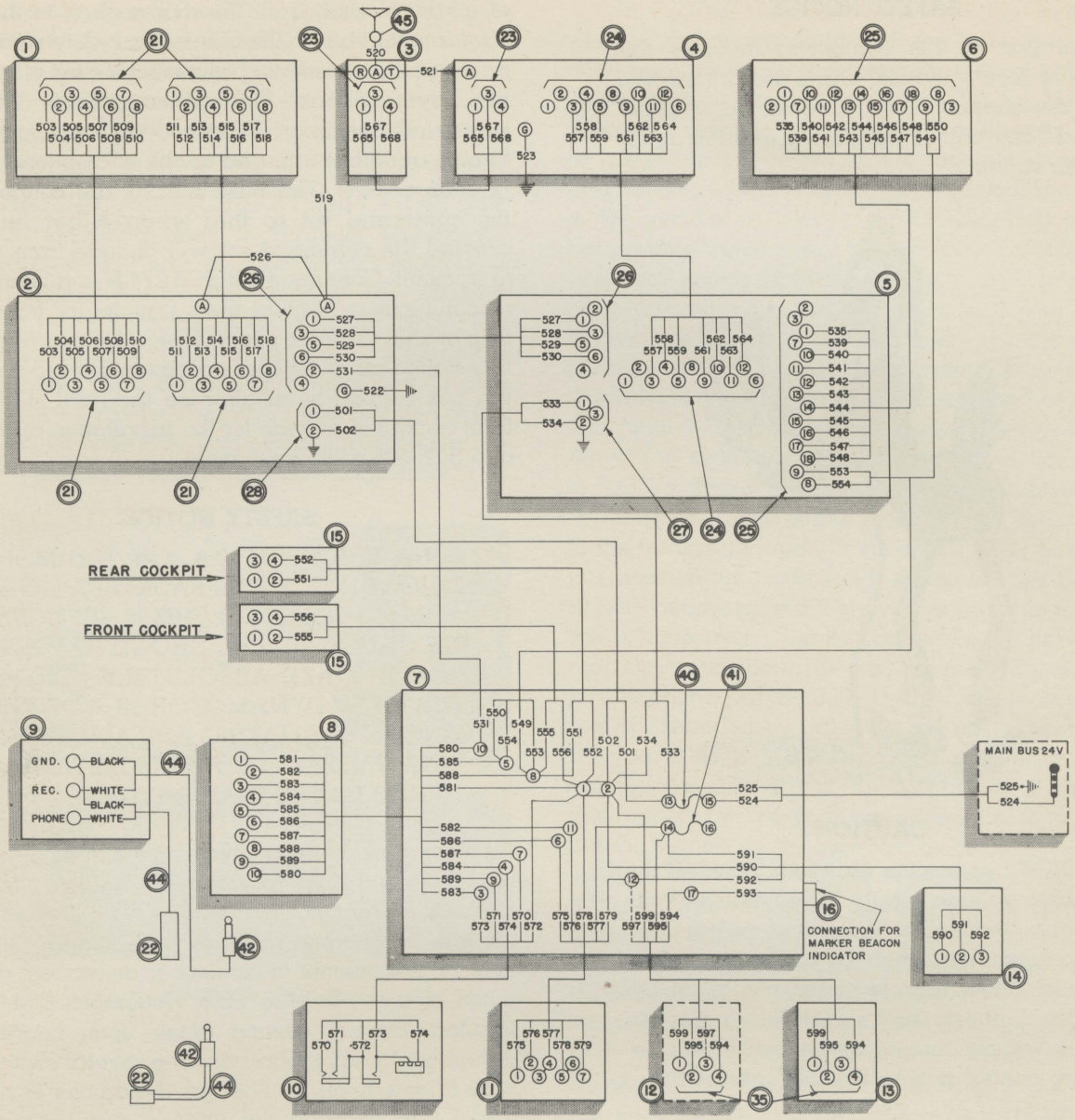
b. 24 VOLT SYSTEM (See figure 5.)—The communication equipment on the 24 volt airplane consists of radio set SCR-274-N, marker beacon equipment RC-43-B, two-place interphone equipment RC-35 and the necessary cordage, flexible shafts, jacks, plugs and miscellaneous equipment necessary for the proper functioning of the communication system as a whole. A single antenna is used for both receiving and transmitting and an antenna relay provides a means of switching the antenna between transmitter and receiver. The command set consists of one transmitter and two receivers with the controls for both transmitter and receivers located on the right side of the front cockpit only. The rear cockpit interphone, however, may be switched to radio by means of a control shaft from the rear cockpit to the interphone control box in the front cockpit. A telegraph key on top of the transmitter provides a means of transmitting keying signals. The command set is controlled by push-button controls (push-to-talk switches) on the throttle quadrant arm and on the microphone handle in each cockpit. The push buttons are connected to the command set so that when either button is pressed the command set will change from receive to transmit. Command set SCR-274-N is a short range communication system used principally for ship to ship or ship to field contact. A receiver mounting shelf is installed aft of the rear cockpit and a receiver control box support is installed on the right side of the front cockpit to provide for the installation of SCR-515 and SCR-535 radio equipment.

SAFETY NOTICE

DYNAMOTOR DM-33-A, ON THE MODULATOR UNIT OF THIS RADIO SET, GENERATES 600 VOLTS, DC. THIS IS SUFFICIENT TO CAUSE SEVERE SHOCK, OR EVEN DEATH. MAKE ABSOLUTELY CERTAIN THAT THE DYNAMOTOR IS NOT RUNNING BEFORE MAKING ANY ADJUSTMENT WHATEVER WITH THE EXCEPTION OF TUNING UP THE TRANSMITTERS.

Opening up the tube covers on the transmitters and modulator unit exposes the high voltage plate connections to the top caps of tubes VT-136. These covers are safety-wired in place at the time of installation. Do not attempt to connect or disconnect a transmitter or a power plug while dynamotor DM-33-A is running. Do not depend alone upon hearing the dynamotor or upon observing the several switch positions to determine whether the dynamotor is running —feel it. In tuning up the antenna circuit of the transmitter, be careful to avoid touching the antenna when the power is on as severe, irritating burns will result. Warn anyone who may be working near the antenna of your intention to turn on the power. Dynamotor DM-32-A, on each of the receivers, generates 250 volts DC. The danger of exposure to this voltage must not be ignored. Make certain that all control switches are OFF before performing any adjustment to the equipment other than antenna alignment.

(1) RECEIVER EQUIPMENT (See figures 6 and 7.) —The two receivers BC-453-A and BC-454-A are located on a shelf just below the rear cockpit instrument panel. a dynamotor for supplying plate voltage for the command receivers is mounted on the rear



LEGEND

NO.	DESCRIPTION	NO.	DESCRIPTION	NO.	DESCRIPTION
1	Radio Control Box (Rec.)	11	Interphone Amplifier	26	Plug
2	Receiver Rack	12	Marker Beacon Receiver	27	Plug
3	Antenna Relay Unit	14	Dynamotor Unit	28	Plug
4	Transmitter Rack	15	Plug-throttle Quadrants	35	Plug
5	Modulator Unit	16	Socket	40	Fuse 30 Amp. (1 Spare)
6	Radio Control Box (Trans.)	21	Plug	41	Fuse 10 Amp. (1 Spare)
7	Radio Equip. Junction Box	22	Jack	42	Plug
8	Interphone Control Box	23	Plug	44	Cordage
9	Filter Box	24	Plug	45	Insulator-Antenna Lead-in
10	Interphone Box (Remote)	25	Plug		

FIG. 5—24 VOLT RADIO WIRING DIAGRAM

of each receiver. A covered fuse box mounted on the rack behind the dynamotors contains active and spare fuses for the dynamotor circuits. Primary power for operating the dynamotors is obtained from the 24-28 volt supply of the airplane. The receivers are designed for satisfactory operation over a range of 22 to 30 volts input. The receivers are remotely controlled from receiver control box BC-496-A mounted in the front cockpit.

(a) RECEIVER CONTROL BOX.—The receiver control box BC-496-A is mounted on the right side of the front cockpit directly above the transmitter on FT-240-A mounting bracket. This control box is divided into two sections, one section has dial MC-212 for receiver BC-453-A (190 to 550 KC), and the other receiver has dial MC-213 for receiver BC-454-A (3 to 6 MC.) The receiver control box in the front cockpit is connected to the receivers in the rear cockpit by tuning shaft MC-215 (59 inches) and tuning shaft MC-215 (61 inches.) These shafts are connected to the receiver at one end and to the control box at the other end by means of a type MC-211-A coupling. The receiver must be equipped with a type FT-211-A adapter when so connected for remote control. The receiver control box contains the following controls for each receiver: a CW-OFF-MCW switch, a tuning knob, a gain-control marked increase output and an A-B switch. Each receiver is independently controlled and each control box contains two head set jacks marked A-TEL and B-TEL. With the interphone instal-

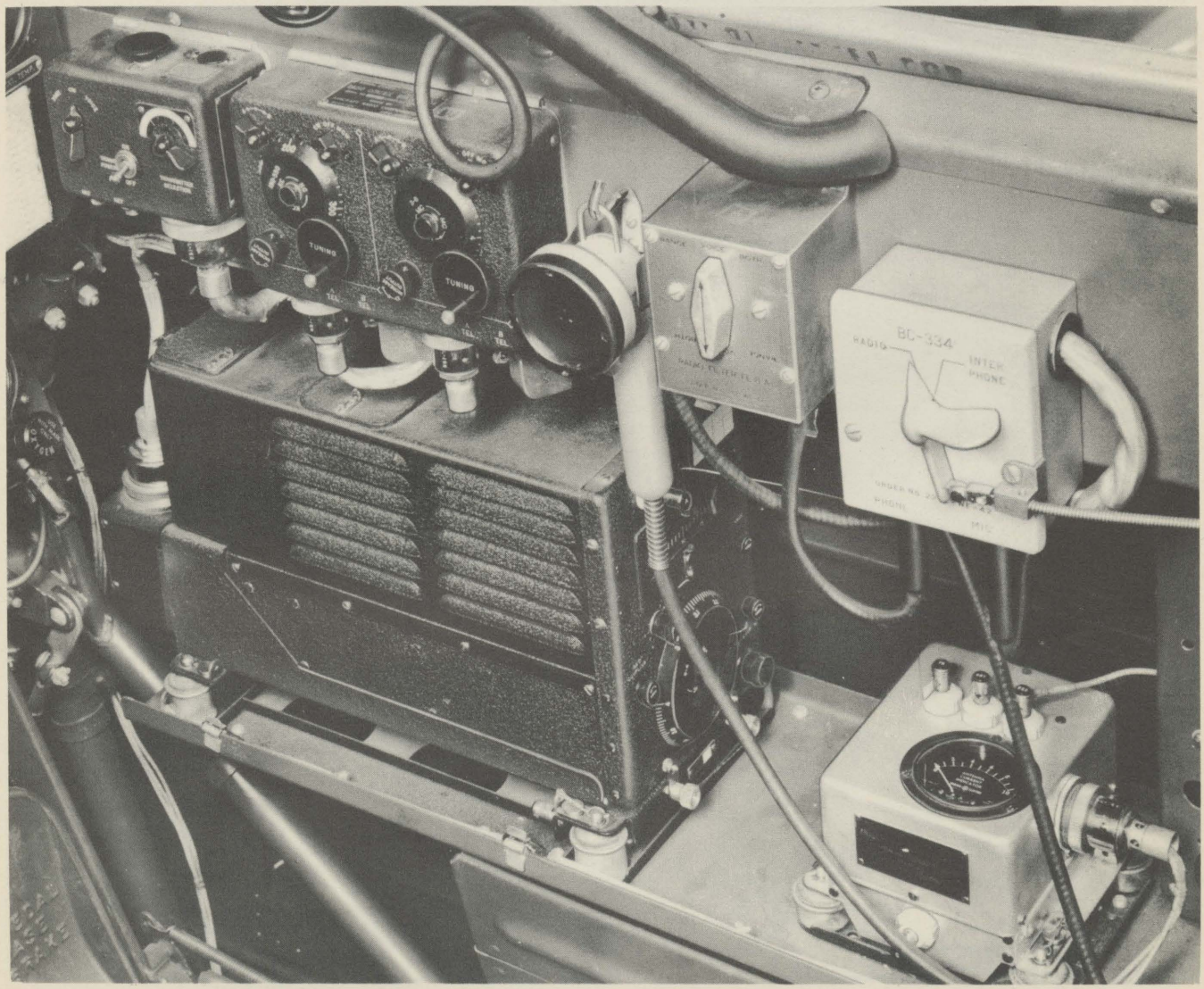


FIG. 6—RADIO CONTROLS—RIGHT SIDE OF FRONT COCKPIT

lation, however, only the jacks in the interphone boxes are normally used, and the A-B switch is operative only at the A position.

(2) TRANSMITTER EQUIPMENT.—The transmitting equipment consists of radio transmitter BC-696-A; dynamotor DM-33-A and modulator unit BC-456-A for supplying the high voltage DC and the modulating power for the transmitter radio control box BC-451-A for control of the transmitter, and antenna relay unit BC-442-A for switching the common antenna between the receivers and transmitter. This equipment also includes the racks, mountings, cords, plugs, etc., necessary for the proper functioning of the transmitting equipment as part of command set SCR-274-N.

(a) TRANSMITTER.—The BC-696-A transmitter covering a range of 3000 KC to 4000 KC is mounted on the radio shelf at the right side of the front cockpit. There are three controls on the front of the transmitter; the FREQUENCY control knob in the lower right corner and the ANT. INDUCTANCE control in the upper right section and the ANT. COUPLING control in the middle left section. The transmitter is also supplied with a special frequency checking circuit which includes a plug-in crystal resonator. This crystal circuit is used for checking the frequency at one point on the dial and not for controlling the frequency.

(b) CONTROL BOX.—The transmitter control box BC-451-A is mounted on the right side of the front cockpit directly above the transmitter. This control box contains all the controls for operating the pretuned transmitter The toggle switch marked TRANS. POWER on the face of this box is for turning ON or OFF the primary power for the transmitting equipment. The three-position switch marked TONE-CW-VOICE controls the circuits which determine the type of emission from the transmitter. Only position No. 1 of the four position transmitter selection switch is used as there is only one transmitter in the radio installation on this airplane. A data plate

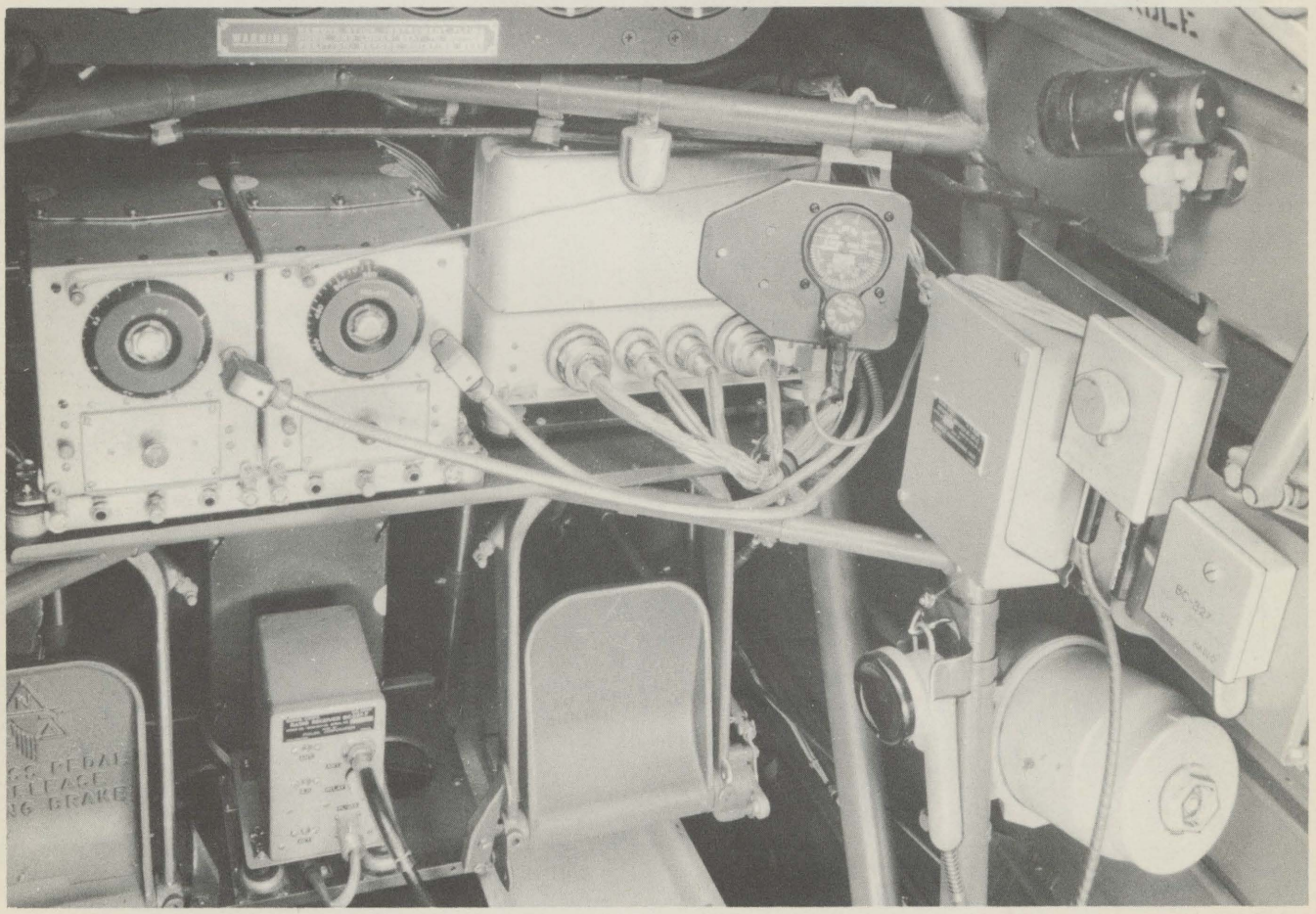


FIG. 7—RADIO CONTROLS—RIGHT SIDE OF REAR COCKPIT

just above the switch is for marking the frequency to which the transmitter is tuned. A telegraph key on top of the box provides for transmitting keying signals when the three-way switch is in TONE or CW positions.

(3) ANTENNA SWITCHING RELAY. — The antenna switching relay unit BC-442-A is mounted just aft of the transmitter, on the radio shelf at the right side of the front cockpit. This antenna relay unit provides a means of switching the common antenna between the receivers and the transmitter. This relay is operated simultaneously with the high-voltage keying relay in modulator unit BC-456-A and will ground the antenna lead to the receivers during transmission.

(4) INTERPHONE EQUIPMENT.—The RC-35 two-place interphone equipment consists of an amplifier, a filter and a dynamotor, with interphone control boxes and microphones in both cockpits. The BC-347 amplifier is installed on the right side of the rear cockpit and the FL-8 filter unit is mounted on the right side of the front cockpit. The function of the interphone amplifier is to amplify the interphone messages so that they may be heard with ease and the function of the filter is to separate voice and range signals. The PE-86-A dynamotor is installed on the hydraulic shelf at the left side of the front cockpit. Interphone control box BC-334 installed on the right side of the front cockpit is connected by control shaft MC-166 to control box BC-327 in the rear cockpit. This provides a means of switching the rear cockpit interphone to radio by remote control. Interphone control box BC-335 is installed on the right side of the rear cockpit to provide a means of radio volume control for the rear cockpit interphone. The T-17 microphones are held in a bracket attached to the right side of each cockpit. Push-to-talk buttons are installed on the handle to the microphones and also on the throttle quadrant arm in each cockpit. The push-to-talk buttons may be used as a key for transmitting code when the control box switch is turned to CW or TONE positions.

(5) ANTENNA EQUIPMENT. — The W-106A antenna wire for both the transmitter and the receivers extends from the top of the rudder to the antenna mast located forward and to the right of the windshield. The antenna wire is brought into the fuselage at the right side of the front cockpit. A spring-type shock connector and an insulator are installed between the antenna wire and the rudder attachment point to maintain an initial wire tension of 15 pounds (plus ½ pound, minus 0.)

CAUTION

Voltages generated in this radio set are dangerous. Read the safety notices on page 77 of this book.

(6) MARKER BEACON EQUIPMENT.—The radio marker beacon equipment consists of a receiver and antenna equipment with high voltage power supplied by the same dynamotor supplying the interphone equipment. The BC-357-B receiver is mounted between the rudder pedals in the rear cockpit on mounting FT-161 attached to the support between the floor boards. The antenna for the marker beacon equipment is mounted on short masts underneath the wing center section of the fuselage, extending fore-and-aft along the center line of the airplane. A marker beacon signal light is installed on the instrument panel in the front cockpit only. The marker beacon receiving equipment will enable the pilot to determine when he is flying over a 75 megacycle marker transmitter. This transmitter may be of the Army instrument landing type or a cone of silence or fan marker found along commercial airways. The receiver will respond to any 75 megacycle signal which is horizontally polarized and modulated at an audio rate. The sensitivity of the receiver increases as the modulation rate increases, up to 3000 cycles. A signal many times greater is required at 60-cycle modulation than at 3000-cycle modulation to give normal output. This receiver was designed because the 60-cycle modulating transmitter used in some of the Army instrument landing systems is too powerful to use with the sensitive receiver required for cone of silence operation. The indicator lamp on the front

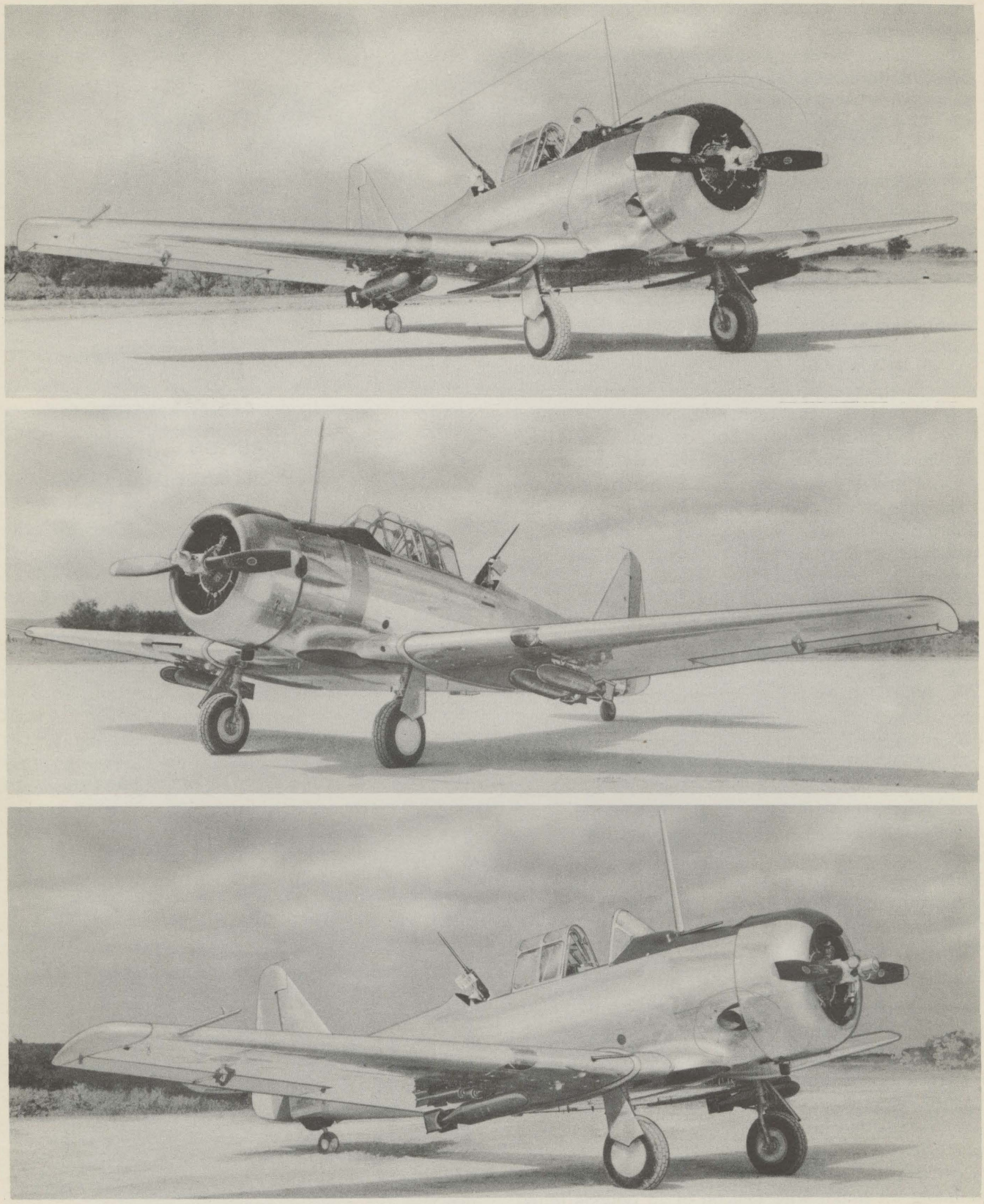


FIG. 8—AIRPLANE WITH ARMAMENT EQUIPMENT INSTALLED

instrument panel in the front cockpit will give the pilot a visual signal in accordance with the output of the receiver. When the receiver is over a keyed transmitter such as a C. A. A. marker, or certain types of Army transmitters, the indicator lamp will identify the transmitter by flashing in definite sequence. The only voltage requirement for marker beacon receiver BC-1033-A installed on later airplanes is the common 24-28 volt supply of the airplane's electric system.

(7) RADIO OPERATION. — With the airplane's battery disconnect switch in the ON position put the receiver dynamotors in operation by throwing the CW-OFF-MCW switches on the receiver control box to either CW or MCW. Tune the receiver having the frequency band desired with the tuning crank and regulate the volume with the gain control knob marked INCREASE OUTPUT. The gain control of one receiver may be used to fade the signals from one in or out with respect to the other. The transmitter is put in operation by throwing the TRANS. POWER toggle switch on the transmitter control box to the ON position, waiting fifteen seconds for the tube filaments to reach operating temperature, and then operating the emission switch to TONE, CW or VOICE as required. The transmitting dynamotor will operate only when the emission selector switch is in the TONE or CW position or if this switch is in the VOICE position the dynamotor will operate when the press-to-talk switch is depressed. For transmitting keying signals the emission switch must be in the TONE or the CW position. The marker beacon equipment is in operation at all times when the battery disconnect switch is in the ON position.

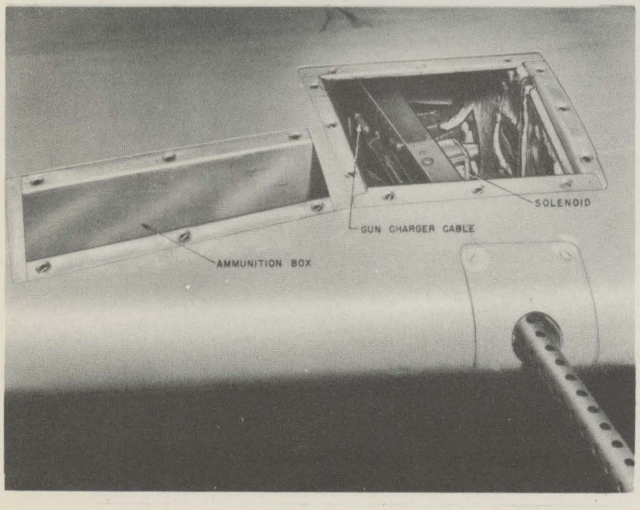


FIG. 9—FIXED WING GUN

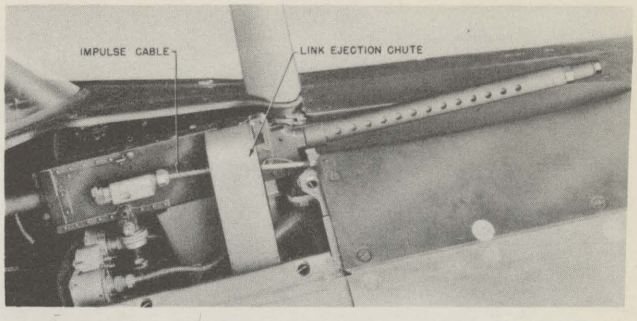


FIG. 10—FIXED FUSELAGE GUN

NOTE

The TRANS. POWER toggle switch may be left on throughout flight; but to reduce battery drain and to increase dynamotor life, the emission selector switch should be left in VOICE unless continued use of TONE or CW is expected. The keying switch must not be used with the emission switch in the VOICE position as the dynamotor would start and stop each time the key is pressed and released.

2. GUNNERY EQUIPMENT (See figure 8.)

The gunnery equipment consists of three model M-2, .30-caliber Browning machine guns; two guns are fixed and one flexible. The fixed guns are located, one on the right side of the fuselage forward of the front cockpit and the other one in the right outer wing panel. The flexible gun is mounted on a track attached to the aft end of the rear cockpit. Provisions are made for manually charging the fixed guns from the cockpit. A type W-7B gun camera may be installed on the leading edge of the left wing and operated by the firing button on the control stick grip. A gun camera film consumption indicator may be installed on bracket provided in the front cockpit. A type N-3B optical gun sight is installed.

a. FIXED GUNS (See figures 9 and 10.)—Provisions are incorporated in the airplane for the installation and operation of two model M-2, .30-caliber Browning fixed machine guns, one at the right upper side of the fuselage forward of the front cockpit firing through the propeller arc and the other in the right outer wing panel leading edge near the center section. Charging the wing gun is effected by a charging cable assembly terminating in a charging control handle located in the pilot's cockpit to the right and below the pilot's electrical control panel. On some earlier airplanes preflight charging was provided for the wing gun

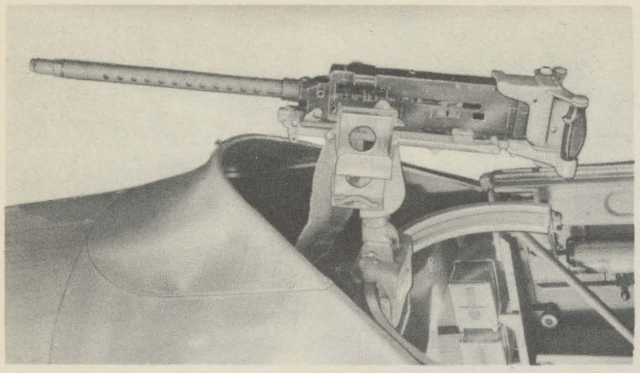


FIG. 11—FLEXIBLE FUSELAGE GUN

which was accomplished by removing the gun bay cover plate and charging the gun directly with charging handle. However this feature has been changed to a remote charging system as used on later airplanes. The fuselage gun is installed in a manner to provide direct charging with charging handle accessible from right side of front cockpit. A safety switch, on the pilot's electrical control panel, controls the electric current to the guns. The guns are selectively controlled by means of gun selector switches also located on the pilot's electrical control panel, and either gun may be selected or both guns may be fired at the same time. A gun firing trigger is provided on the forward side of the control stick grip, which also operates the gun camera when selected. The fuselage gun ammunition box, accommodating 200 rounds of .30-caliber ammunition is located on the inboard side of the gun. A wing gun ammunition box accommodating 200 rounds of .30-caliber ammunition is located on the outboard side of the wing gun. A gun synchronizing unit, type 4-A, is installed to permit firing the fuselage gun through the propeller arc. To operate the fixed guns in the wing and fuselage, adhere to the following procedure:

(1) Charge the fuselage gun by pulling back on the charging handle on the left side of the gun.

(2) Charge the wing gun by pulling back on the charging handle located below the fuselage gun.

(3) Snap the selector and safety switches to the ON position.

(4) Adjust the rheostat on the switch panel for the proper light intensity in the optical gun sight.

(5) Fire the guns by squeezing the trigger on the pilot's control stick grip.

b. GUN SIGHT (See figure 12.) — A bracket, and adjustment stud and a shield are provided directly below the front cockpit instrument panel for installation of a type N-3B optical gun sight. The gun sight consisting essentially of a main housing which contains the lamp and lamp socket, the reticle, mirror assembly and lens assembly, is installed in a manner so the reflected image shall be free of movement. A reflector glass is mounted on a bracket below the windshield on the fuselage, level with the pilot's line of sight. A reticle pattern is projected on the reflector from the lens assembly, with the light intensity being regulated by a rheostat located on the electrical control panel. Normally the N-3B gun sight is properly adjusted by the manufacturer, and it should not be necessary to readjust either reticle or main lens throughout the life of the sight. If the reticle image is not projected on the vertical center line with the reflector, an adjusting knob located on the right side of the sight housing is provided to focus the reticle in the center of the reflector glass.

c. FLEXIBLE GUN (See figure 11.)—Provisions are made in the rear cockpit frame for the installation of a model M-2, .30-caliber, Browning flexible machine gun. The gun is mounted on a gun mount that trains on a track attached to the aft end of the rear cockpit. A truck-locking handle is provided to secure the gun truck to the track. The locking handle must be raised before the gun truck can be moved along the track. The gun is equipped with a gun yoke locking device to secure it in the stowed position. Ammunition boxes

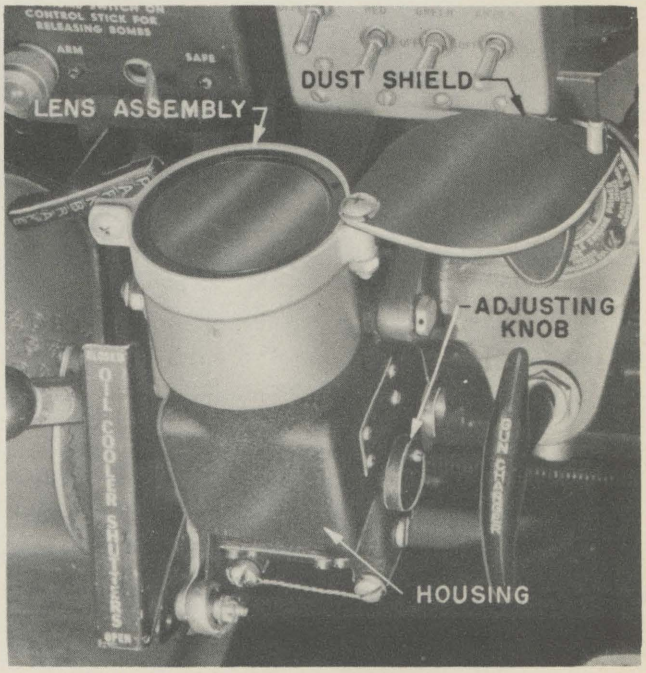


FIG. 12—ELECTRICAL GUN SIGHT

located below the gun, one on the left side and four on the right side of the fuselage, contain 500 rounds of .30-caliber ammunition. The gun is equipped with a type A-1 holder assembly and a type A-5 container assembly. The mount and track will permit the gun to rotate approximately 160 degrees radius. The rear seat may be rotated 180 degrees to the left so that it faces the gun. A foot-operated latch releases the seat from its fore-and-aft positions. A type A-3 gunner's belt with a quick release buckle is attached to the swivel point of the cockpit seat. Releasing or removing the belt can be effected by pulling up on the handle provided on the buckle, thus allowing the shoulder straps and belt to fall free. The gun may be stowed in a special compartment or trough aft of the rear cockpit by centering the gun truck on the track, releasing the yoke and pushing the gun into the trough. The flexible gun is operated manually by the occupant of the rear cockpit. To remove the gun from its stowed position and operate it the following instructions must be adhered to:

(1) Pull outward on the gun yoke locking knob.

(2) Pull up and back on the gun until the locking knob snaps into place.

(3) Raise the truck-locking handle to move the gun truck along the track.

(4) Lower the handle at the desired position.

(5) Pull back on the charging handle and then release it.

(6) To fire the gun press the trigger on the hand grip.

WARNING

Place control stick in the stowed position before attempting to rotate seat.

3. BOMBING EQUIPMENT (See figure 13.)

Complete provisions have been incorporated in the airplane for a flush-type bomb rack and other bombing equipment on the lower surface of each outer wing panel. Bomb equipment kits, supplied by North American Aviation, Inc., provide the necessary bomb racks, shackles, cables and bombing control equipment. The bomb racks in each outer wing panel will carry five M-5, 30-pound fragmentation bombs or five M-41, 20-pound fragmentation bombs, either U. S., or

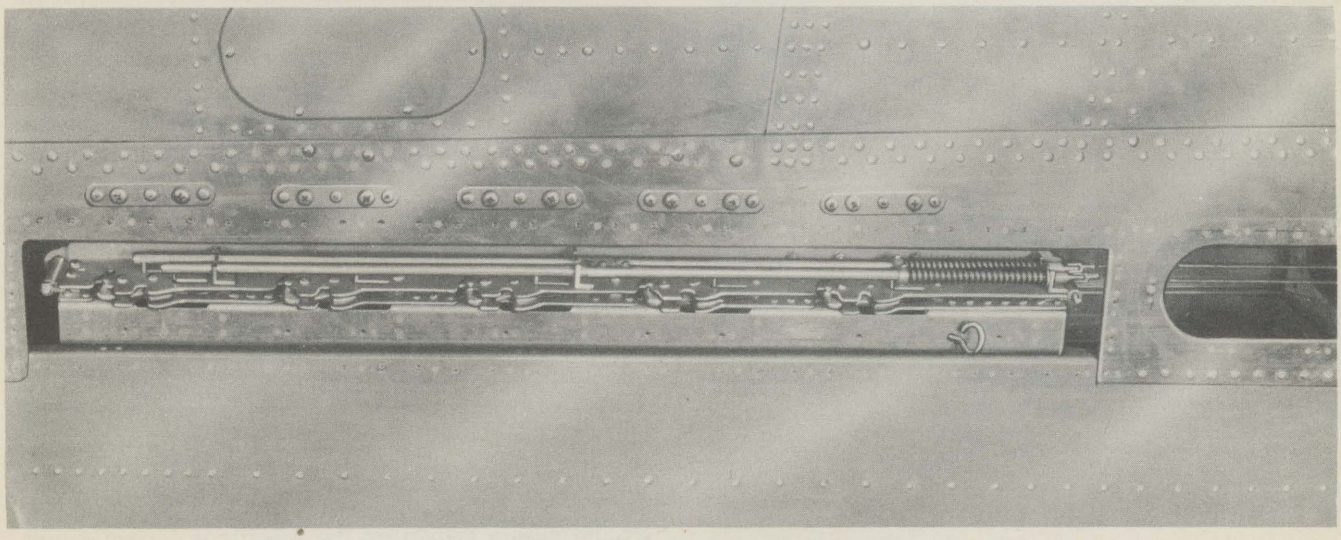


FIG. 13—BOMB RACK INSTALLED

British. Two auxiliary bomb shackles may be added to each of these racks for carrying a total of four Mark 1, 100-pound bombs, either U. S. or British, in place of the smaller bombs. The smaller bombs are armed at the nose only, and the 100-pound bombs are armed at the tail by arming levers on the bomb rack. Four Type B-1 bomb arming units are provided in the wing to nose-arm the 100-pound bombs. Electrical control switches, which consist of: One BOMB SAFETY switch; two BOMB SELECTOR switches; and one NOSE FUSE switch, are grouped on the pilot's electrical control panel in the front cockpit. The BOMB SAFETY switch, when OFF, prevents accidental electrical release of the bombs. The switch must be ON before any electrical release can be accomplished. The BOMB SELECTOR switches provide selection of the rack to be employed. LEFT or RIGHT, or LEFT and RIGHT can be used as desired. The NOSE FUSE switch operates the four Type B-1 bomb arming units to nose-arm the 100-pound bombs. A signal lamp, adjacent to this switch, will glow when the 100-pound bombs are nose-armed. Release of the bombs, as

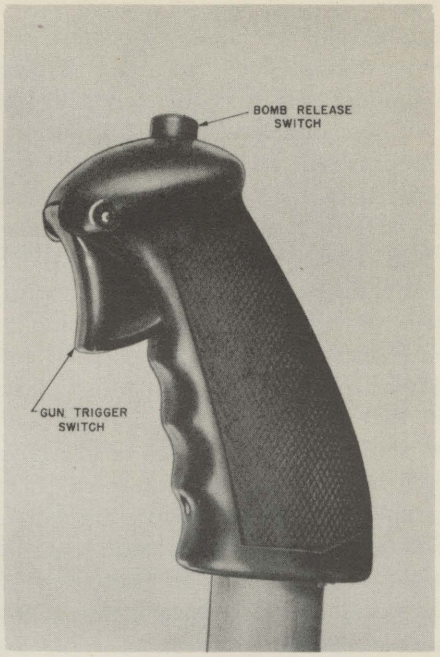


FIG. 15—GUN TRIGGER AND BOMB RELEASE SWITCHES

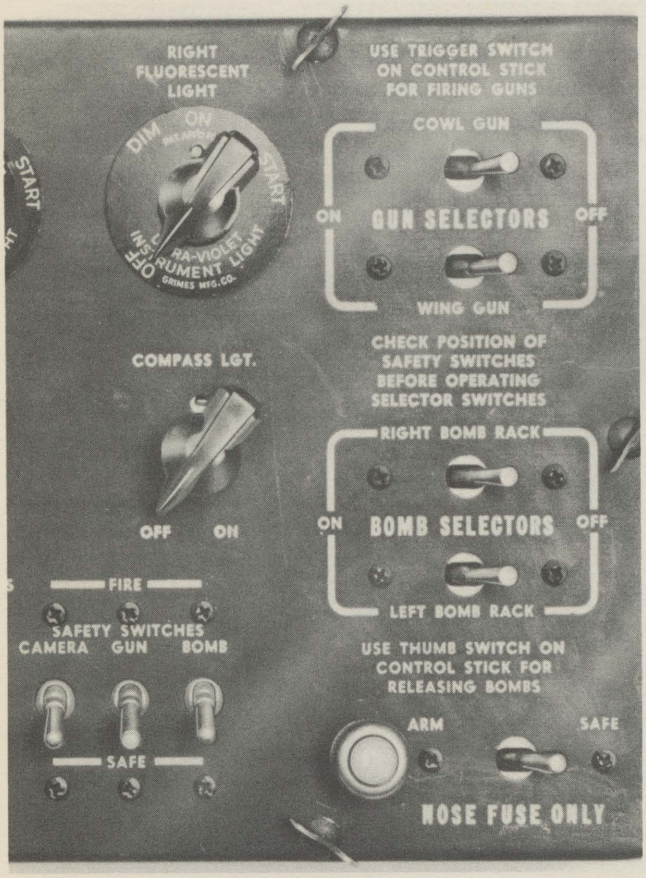


FIG. 14—ARMAMENT CONTROL SWITCHES

selected, is accomplished by the push-button type thumb switch located on the control stick in the front cockpit (See figure 15.) Bombs may be dropped selectively by pushing the control stick release button consecutively. The bombs are released in a definite order, from inboard to outboard and simultaneously on both sides of the airplane when both racks are used together. Bombs may be selected for alternate release from each side of the airplane by moving the left and right BOMB SELECTOR switches to ON and OFF alternately. The BOMB SELECTOR circuits and the NOSE FUSE circuits are protected from current overloads by integral toggle-type circuit breakers. The BOMB SAFETY switch circuits and the firing switch circuits on the control stick are protected from current overloads by the push-button type circuit protector (ARMAMENT CONT.—PUSH-TO-RESET) located just above the pilot's control shelf and to the left of the electrical control panel. Provisions are made for a bomb control quadrant (See figure 16) on the control shelf on the left side of the front cockpit. This quadrant provides an arming and release handle, stamped "A" and "R", respectively. The arming handle, by means of a cable to each of the wing bomb racks, will arm the 20- and 30-pound bombs at the nose, and the 100- pound bombs at the tail. Except for nose-arming the 100-pound bombs which is accomplished by the toggle switch on the electrical control panel, all arming must be done through this arming handle.

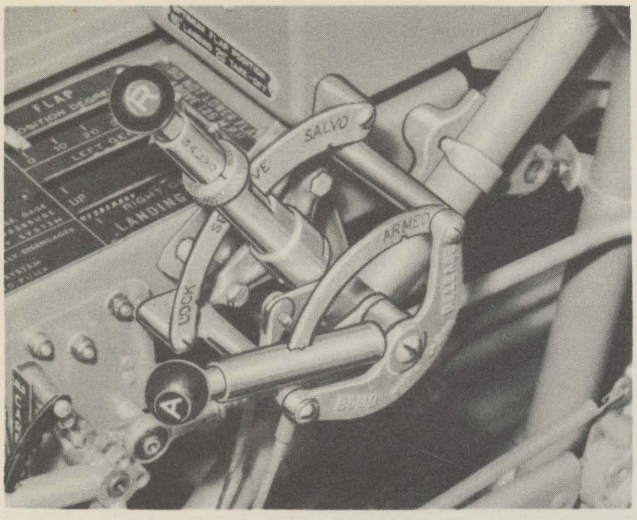


FIG. 16—BOMB RELEASE CONTROL QUADRANT

The release handle, when at LOCK position, locks the entire system and will prevent release, either electrically or manually, of all bombs. The handle must be moved to SELECTIVE position before electrical release can be accomplished. In moving the release handle to SALVO, all bombs are dropped simultaneously, either in the ARMED or SAFE condition according to the setting of the arming handle and the electrical toggle switches on the control panel. Provision is also made for a release handle in the rear cockpit (See figure 17) beneath the control shelf on the left side, which will only SALVO all bombs. This is for use in an emergency and will release bombs either in the SAFE or ARMED condition, according to the position of the arming handle and the electrical toggle switches in the front cockpit. Two types of bomb racks may be installed, however, operation is identical for each.

a. ARMING PROCEDURE.—The 20- and 30-pound bombs, being of the fragmentary type, are armed at the nose only. This is accomplished by moving the bomb arming handle, located on the bomb control quadrant in the front cockpit, to the ARMED position. Bombs, then when released, will drop ARMED. The 100-pound bombs, being of the demolition type, may be armed at the nose or at the tail, or at the nose and tail. Tail arming is accomplished, as above, by moving the arming handle on the bomb control quadrant to the ARMED position. Nose arming is accomplished by moving the NOSE FUSE switch, located on the front cockpit electrical control panel, to the ON position. One or both conditions may be utilized, as desired.

b. SELECTIVE RELEASE (See figure 18.)—To drop bombs selectively, proceed as follows:

(1) Move the bomb release handle, located on the bomb control quadrant in the front cockpit to the SELECTIVE position. The knob on the release handle must be depressed to release the handle for movement.

(2) Select the rack (LEFT or RIGHT, or LEFT and RIGHT) to be used by turning ON one or both of the BOMB SELECTOR switches on the front cockpit electrical control panel.

(3) Place the BOMB SAFETY switch, on the pilot's electrical control panel, in the ON position.

(4) Press the bomb release button on the control stick to release the bomb or bombs. Bombs are released in a definite order, from inboard to outboard and simultaneously on each side of the airplane when both racks are used together. Bombs may be selected for alternate release from each side of the airplane by moving the BOMB SELECTOR switch to ON and OFF alternately.

c. SALVO RELEASE. — If all bombs are to be dropped simultaneously, proceed as follows:

(1) Press down on the knurled salvo safety ring, located half-way down the release handle, and turn it counterclockwise. This will allow the release handle to be moved through the SELECTIVE position to the SALVO position. The locking knob on the release handle must also be depressed to release the handle for movement.

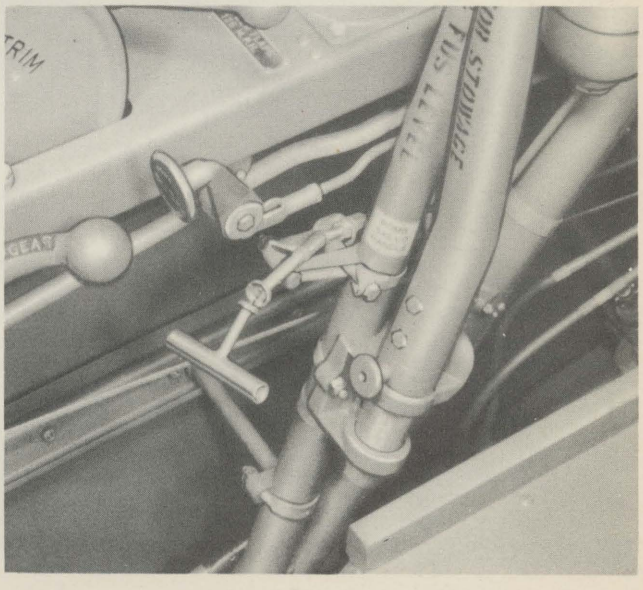


FIG. 17—BOMB SALVO RELEASE HANDLE

(2) All bombs will drop simultaneously, either in the ARMED or SAFE condition according to the setting of the arming handle on the bomb control quadrant and the position of the NOSE FUSE switch on the pilot's electrical control panel, at the time the release is effected.

(3) A release handle in the rear cockpit, beneath the control shelf on the left side, will only SALVO all bombs (figure 17.) This is for use in an emergency and will release bombs either in the SAFE or ARMED condition, as above.

4. PHOTOGRAPHIC EQUIPMENT (See figure 20.)

Provisions are made in all AT-6C and SNJ-4 (Navy) Airplanes for the installation of photographic equipment which includes a K-3B aerial camera, type A-8 camera mount, type A-2 viewfinder, type B-2 intervalometer, camera power junction box, camera vacuum valve and a warning light. Camera support rails for the camera mount are located at the bottom of the fuselage, immediately aft of the cockpit. Two camera doors, located below the baggage compartment, are to be used during camera operation. In the AT-6D and SNJ-5 Airplanes, which do not have provisions for installing photographic equipment, these doors are sealed shut. The vacuum valve and camera junction box are installed on the right side of the fuselage aft of the rear cockpit. A warning light is located on the camera junction box and on the front instrument panel. A bracket for supporting the intervalometer is attached to the right side of the rear fuselage structure, aft of the rear cockpit. Provisions are made to install the viewfinder on the floor of the front fuselage section, immediately aft of the rear cockpit seat. The opening in the fuselage bottom, below the viewfinder is provided with a cover plate which is to be secured in place when the viewfinder is not installed. Provisions are also made for the installation of a type W-7B gun camera in the leading edge of the inboard end of the left outer wing panel.

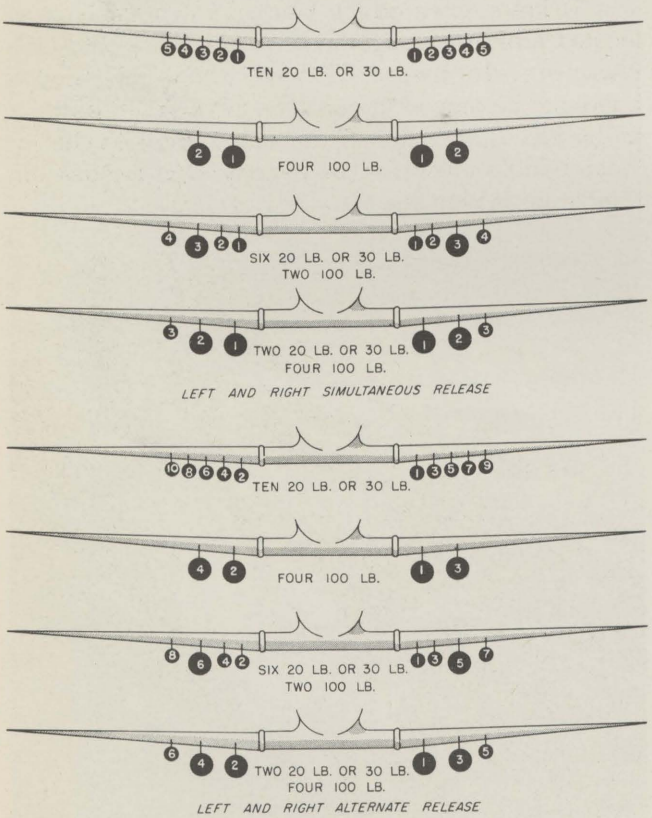


FIG. 18—BOMB LOADING DIAGRAM

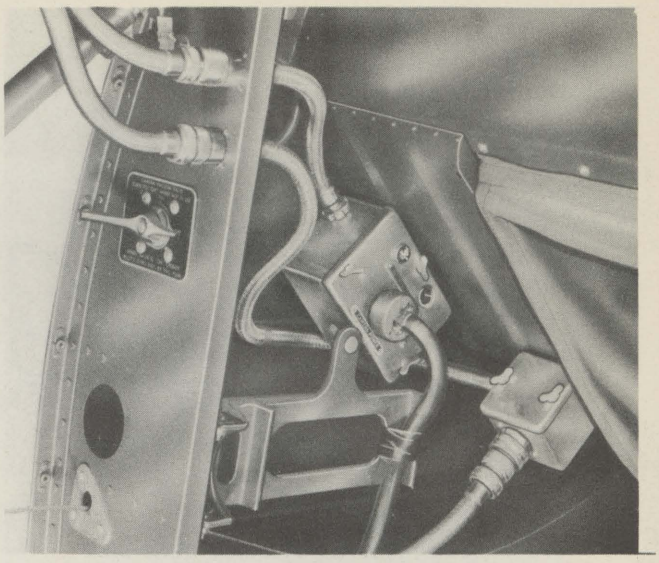


FIG. 19—CONTROL VALVE, INTERVALOMETER, POWER JUNCTION BOX

a. CAMERA AND CAMERA MOUNT.—The K-3B camera is designed for making both oblique and vertical photographs and produces a 7x9 negative. However, in the AT-6C and SNJ-4 (Navy) Airplanes only provisions for vertical photography is made. It may be operated either manually or automatically by simply adding or removing certain camera accessories. When operated automatically the K-3B camera is driven by a motor that derives its power from the storage battery. With the exception of the action of the vacuum system, it then becomes an entirely electrically operated photographic unit, through the electric cable connection of the power supply box to the intervalometer and the camera, and the connection

of the camera and intervalometer. A selector valve in the vacuum system regulates the vacuum action that holds the film to the focal plane contact glass. The intervalometer which governs the automatic operation of the camera provides for exposures from six to seventy-five seconds apart. Electric cables make the connections between the camera, intervalometer, signal lights and electric power. Two signal lights, one on the power junction box and one on the pilot's instrument panel, are connected to the intervalometer and warn the pilot and camera operator to level the airplane and the camera for the next exposure. The shutter retard regulator located on the camera body may be adjusted for speeds of 1/30, 1/50, 1/100 and 1/150th of a second. When the camera is operated manually the winding is done by using the manual wing and the tripping by using the trip lever located on the right side of the camera body. The interval of time between exposures may be timed by using the speed timer. The type A-1A roll film magazine is used

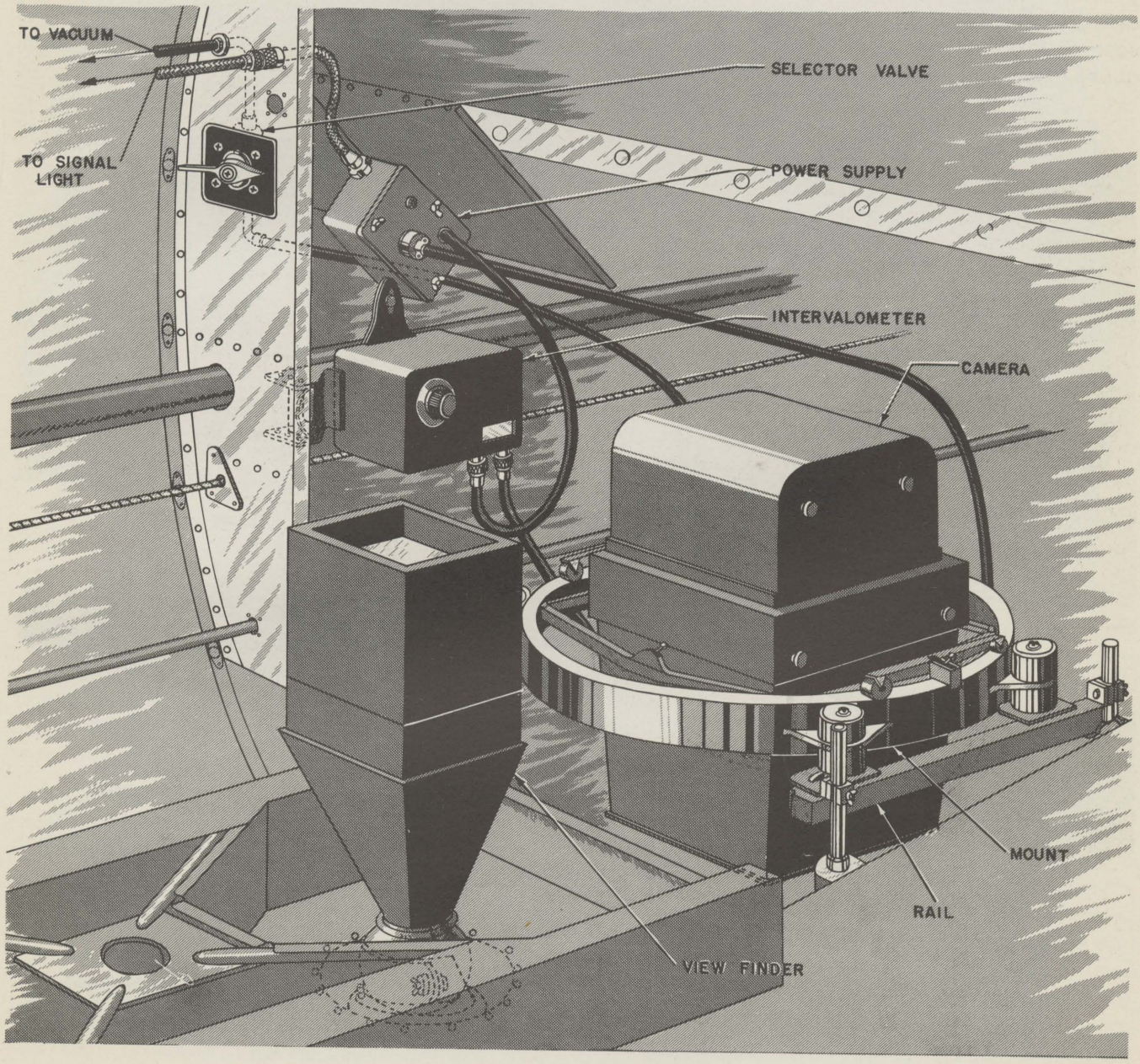


FIG. 20—CAMERA EQUIPMENT

with the K-3B aerial camera. It is detachable and light tight when not attached to the camera. The number of photographs that can be made on a single flight is limited only by the number of fully loaded extra magazines carried. When necessary the type A1-A roll film magazine may re replaced by the type B-1 cut film magazine for use with the 8x10 cut film holders. The lens cone containing the lens and shutter is detachable and interchangeable with lens cones containing lens of other focal length. Provisions are made for the use of either a 12-inch cone or an 8¼-inch cone and no adjustment is necessary after attaching either lens cone, as it will be in focus as soon as it is in place. Only a few minutes are required to move one lens cone and replace it with another. The lens and shutter of each lens cone is a standard unit by itself and can be introduced with other lens and shutter assemblies containing a lens of the same focal length. Trunnions are provided on each lens cone so that the camera can be suspended in a standard camera mount that is supplied for use when taking aerial photographs.

b. VIEWFINDERS.—The type A-2 vertical viewfinder, the purpose of which is to give a clear and distinct view of objects beneath the airplane and to provide accurate means for determining correct exposure intervals, is installed in the floor of the front fuselage immediately aft of the rear cockpit seat, over an opening provided for that purpose.

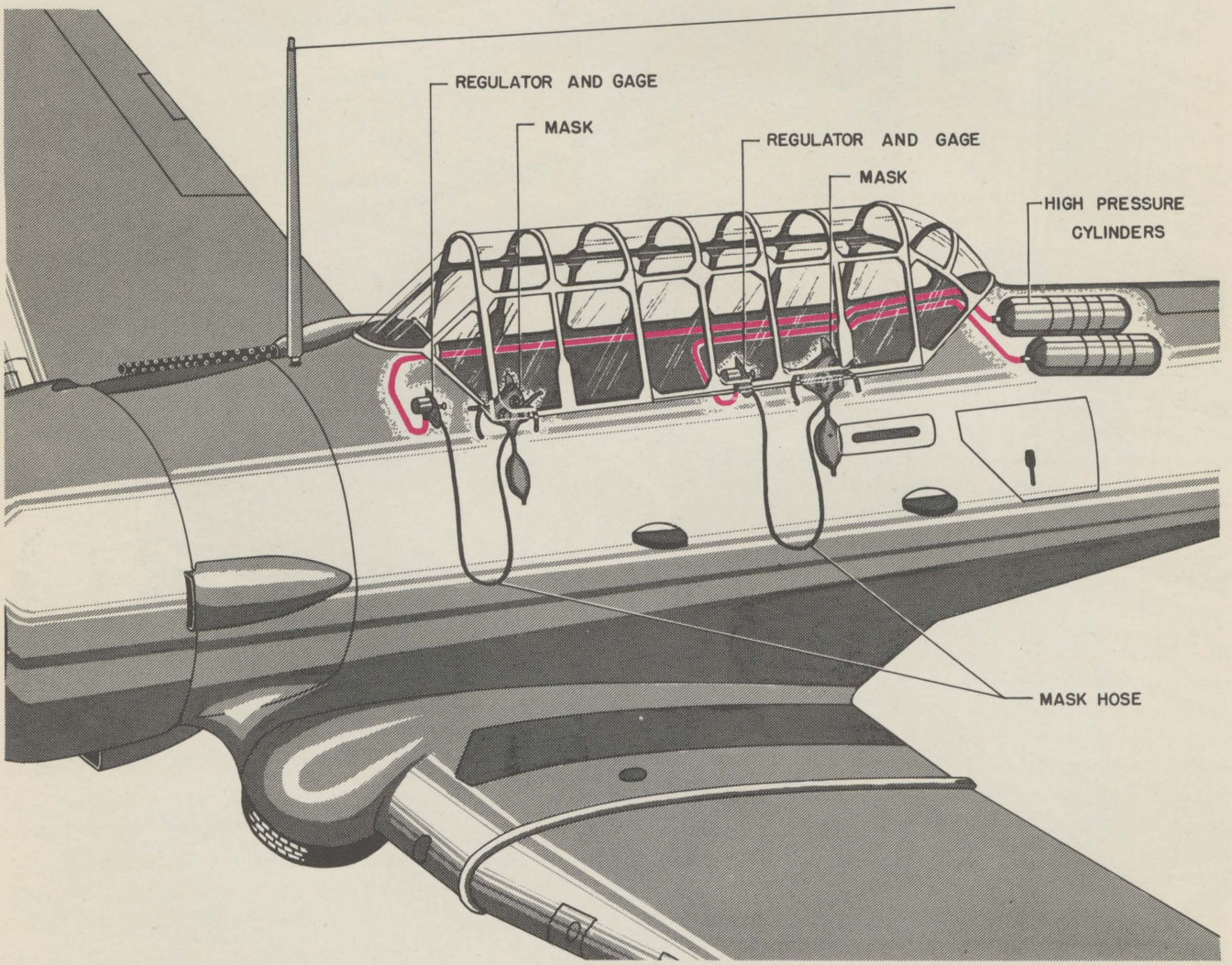


FIG. 21—OXYGEN SYSTEM DIAGRAM

FIG. 22—BAIL-OUT CYLINDER UNIT

FIG. 23—HIGH PRESSURE MASK

c. INTERVALOMETER (See figure 19.)—The type B-2 intervalometer which is an instrument for automatically operating the camera at any predetermined interval and which is electrically operated, is installed by mounting on a bracket secured to the right side of the rear fuselage structure aft of the right forward bulkhead.

d. CAMERA DOORS.—Two camera doors are provided in the bottom of the rear fuselage below the baggage compartment to be used during camera operation. They are attached to longerons at each side of the door opening by full length hinges. To open or close the camera doors push down on the knob-type door handle; then push or pull the handle with a quick firm movement to engage the doors in an open or closed position respectively.

e. GUN CAMERA.—An electrically-operated type W-7B gun camera which is suitable for fixed operation only, may be installed in the inboard end of the outer wing leading edge. A gun camera safety switch is provided on the front cockpit control panel, and when it is in the FIRE position the camera will automatically operate when either or both fixed guns are fired. A solenoid in the camera circuit is built into the rear of the gun camera itself.

5. OXYGEN SYSTEM (See figure 21.)

The use of oxygen in aviation has raised the absolute ceiling physiologically speaking, from 18,000 to 44,000 feet. It has also placed a heavy responsibility on those officers who are responsible for teaching flyers the narrowness of the divide between life and death at extreme altitudes. Physiologically, one can be at his best up to an altitude of 37,000 feet when provided with perfectly functioning oxygen equipment. Loss of one's oxygen at an altitude of 37,000 feet means loss of consciousness within thirty seconds and death not long thereafter. Flyers must be

disciplined in the use of oxygen equipment as carefully as ground personnel are disciplined in the use of gas masks. The airplanes employ a high-pressure type oxygen system and airplanes of later date will incorporate a demand-type oxygen system. If an unusually high altitude flight is anticipated bail-out units may be provided for crew members (See figure 22.) This is a completely self-contained unit providing a supply of oxygen lasting from four to eight minutes and consists of a high pressure cylinder, pressure gage, release valve and "pipe-stem" mouth piece. An auxiliary pocket is provided for securing the bail-out cylinder which can be tied or sewed to the parachute harness, secured in a pocket of the clothing or tied to the crew member's thigh. To use, the valve should be completely opened before leaving the airplane. The oxygen flow will be automatic.

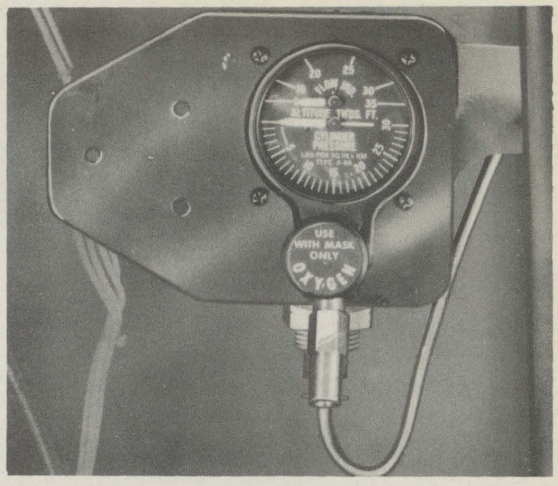


FIG. 25—PRESSURE GAGE, REGULATOR AND FLOW INDICATOR

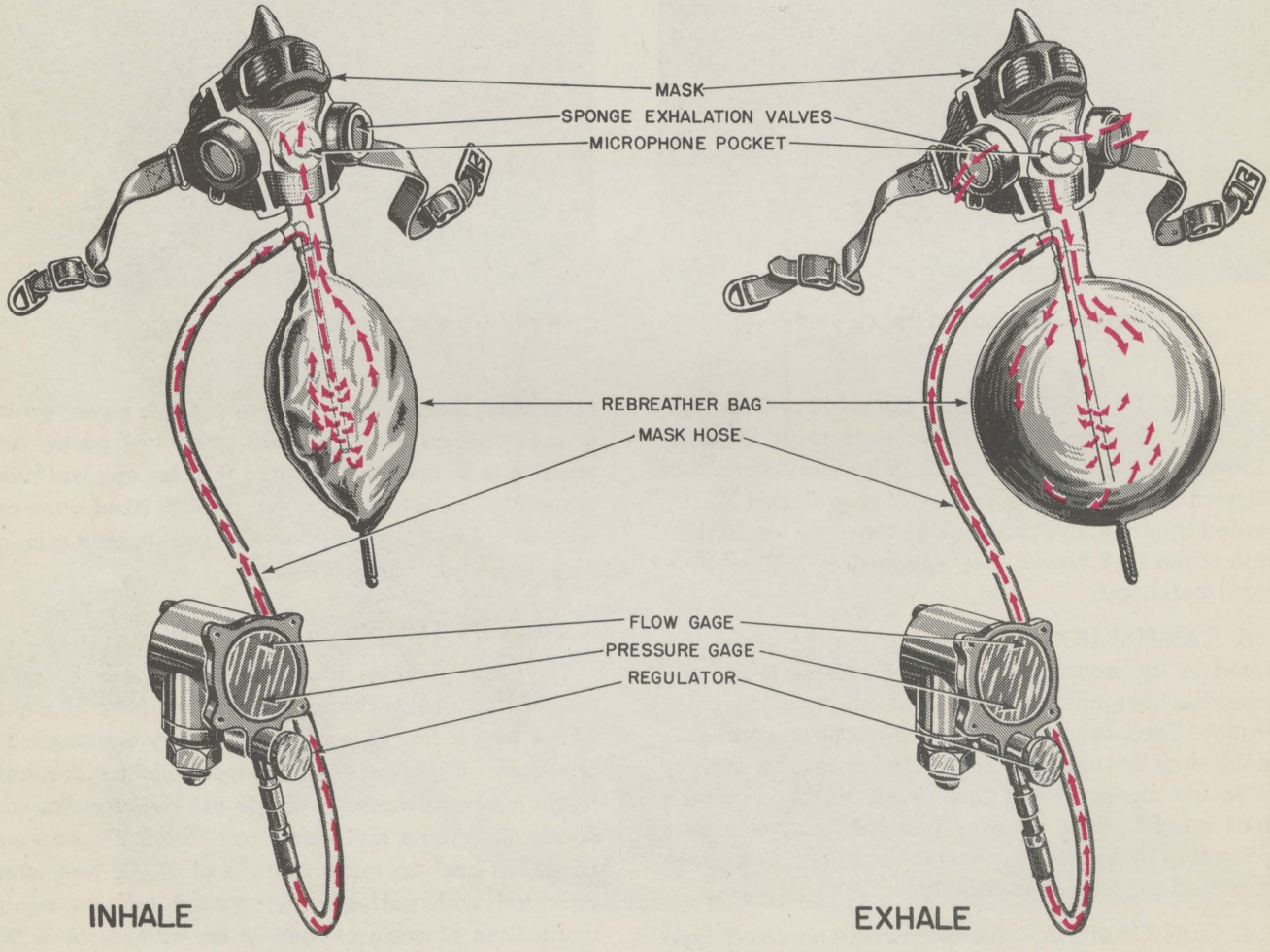


FIG. 24—HIGH PRESSURE MASK FLOW DIAGRAM

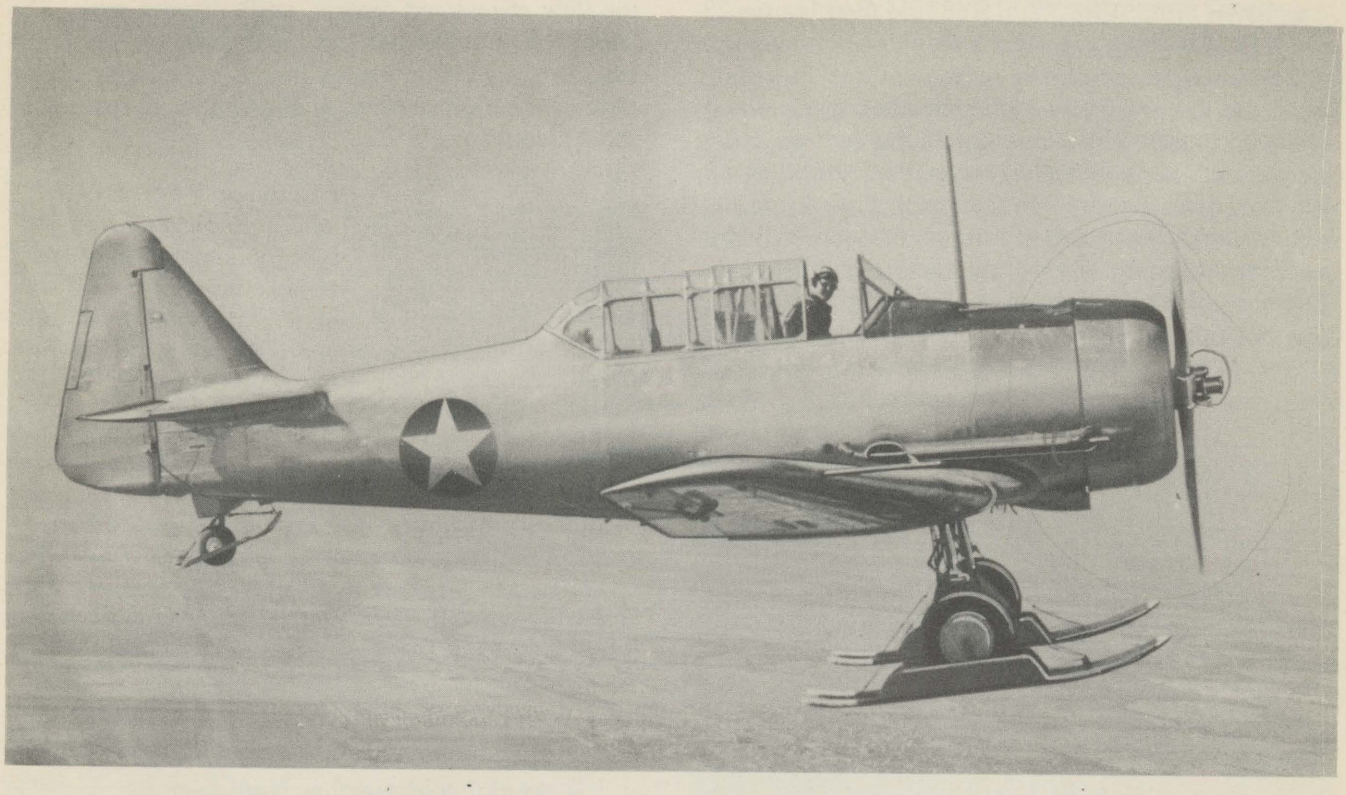


FIG. 26—AIRPLANE IN FLIGHT EQUIPPED WITH SKIS

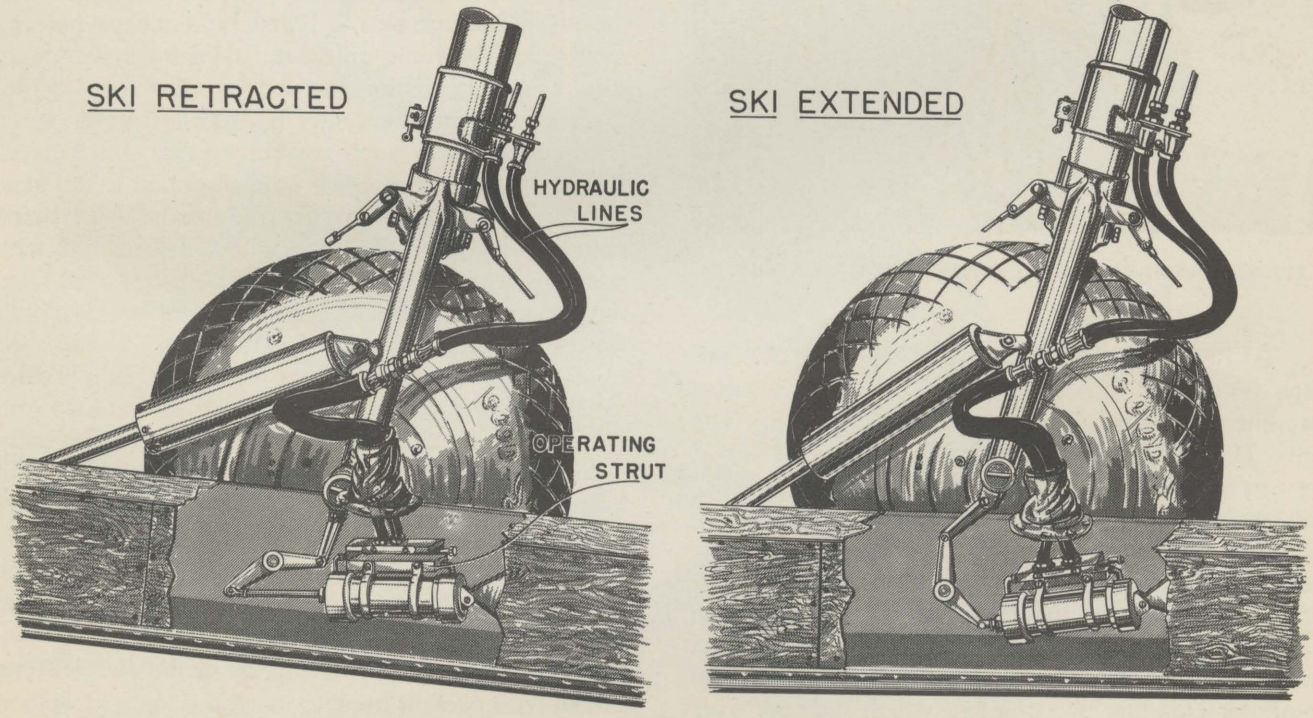


FIG. 27—LANDING GEAR SKI POSITION DIAGRAM

a. HIGH PRESSURE TYPE SYSTEM (See figures 23 and 24.)—The high-pressure type oxygen system incorporates a regulator, pressure gage and flow indicator and the necessary high-pressure copper tubing in each cockpit. Provisions are made for two high-pressure metal cylinders, to be located just aft of the gunner's deck. These cylinders are installed parallel with the center line of the fuselage, the right cylinder furnishing oxygen for the front cockpit and the other cylinder furnishing oxygen for the rear cockpit. Oxygen is released from the cylinders through check valves and into lines extending along the right side of the fuselage to the regulator assemblies.

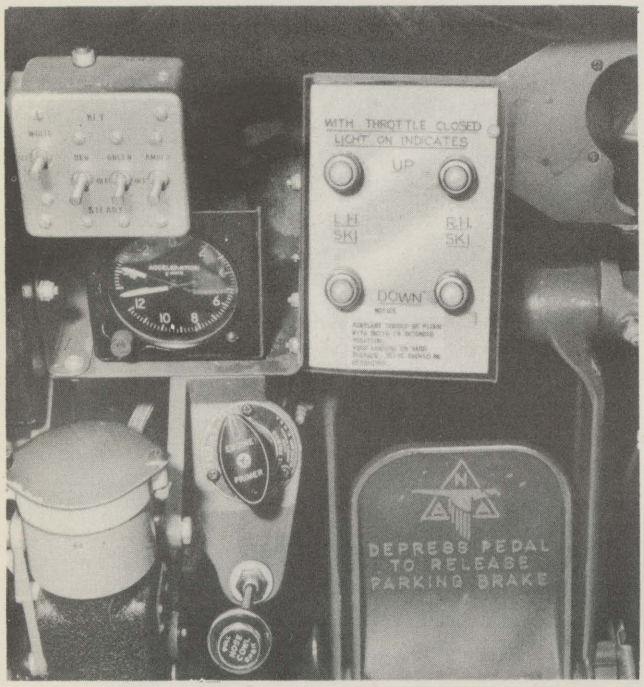


FIG. 28—LANDING GEAR SKI POSITION INDICATOR LIGHTS

(1) REGULATORS AND FLOW INDICATORS (See figure 25.)—Regulators of the type A-8 series are intended to be used with masks of the A-8 series only. The A-8 series regulators have been developed for use in high altitude flying and deliver the proper mixture of air and oxygen to sustain life in the substratosphere. These regulators provide enough oxygen at 30,000 feet for people at rest or for those doing light work, such as the pilot does. But the flow is insufficient for heavy work, such as is required of a gunner engaged in swinging a gun in combat. The regulator contains two pointers which indicate over separate scales on the dial. The pressure condition in the supply cylinder is shown on the lower scale and the flow of metered oxygen on the upper scale. The flow scale is calibrated directly in altitude. That is to say, for a set indication the flow is automatically regulated to supply the required quantity of oxygen at that altitude.

(2) PRESSURE GAGE.—Each pressure gage is of the type A-8 series and is an instrument that indicates the gage pressure of the oxygen in the supply cylinders, its purpose being to show the available oxygen pressure. The dial of the pressure gage is calibrated to show pounds-per-square-inch pressure. Satisfactory operation requires a pressure of from 500 pounds minimum to 3000 pounds maximum.

(3) CYLINDERS.—Oxygen is distributed to each cockpit by means of high-pressure tubing from a system of two high-pressure type B-1 metal cylinders, each of which is supplied with a check valve. The cylinders are located just aft of the gunner's deck allowing one for each member and a total of approximately 4½ hours supply for each at an altitude of 30,000 feet.

6. SPECIAL COLD WEATHER EQUIPMENT.

The special cold weather equipment discussed in the following paragraphs was installed on a group of fourteen airplanes which were intended for service under winter conditions. This equipment consists principally of landing skis, a British-type cockpit heating system and various units which insure the dependable operation of the power plant. On regular production airplanes skis may be installed at the three landing points in such a manner that the conventional wheel gear may be used in option to the skis, depending on service requirements. Auxiliary spindles added to the three wheel axle shafts, with permanent mounting lugs on the fork castings, furnish attachment points for the ski installation. Landing and drag wires, rigged with elastic shock cord, permit a variable angle of attack of all three skis according to the position of the airplane at landing and take-off. The skis are of composite structure, the body being of laminated spruce plywood, tipped with heavy gage metal sheath. Openings through the skis proper allow sufficient protrusion of the wheel traction surface for hard surface landings. This ski installation eliminated the gear retraction feature of the airplane as it was not designed to permit inclusion of the ski equipment into the center section. The British-type cockpit heating system does not replace the standard hot and cold air ventilating system installed on all production airplanes. The two operate

as separate units. Other special equipment includes manually controlled engine cowl nose shutters which help to maintain proper engine temperatures and an engine cover used to facilitate warming of the engine prior to flight. The engine push rods are lagged to protect oil in housings, while an oil tank immersion heater has been installed to prevent congealing of the special type engine oil when the airplane is on the ground. A battery cart external plug permitting the introduction of electrical power from an outside source, has been installed to supplement the functions of the battery when the airplane is on the ground and the engine is to be started. Only two instruments, the oil pressure gage and the bank and turn indicator, require special lubrication.

a. LANDING SKIS (See figure 26.)—The main landing gear skis are retractable approximately five inches. This retraction is accomplished by the same operating lever which normally operates the landing gear. The landing gear is locked in the extended position with the skis installed, and any movement of the retracting lever operates the skis only. The skis are automatically locked in the DOWN position hydraulically with the lever in the landing gear DOWN position and are locked in the UP position with the lever in the landing gear UP position. Raising and lowering of the skis to permit use of either skis or wheels is accomplished hydraulically by diversion of the gear retraction system to the ski actuating system. The tail wheel landing ski is in a stationary

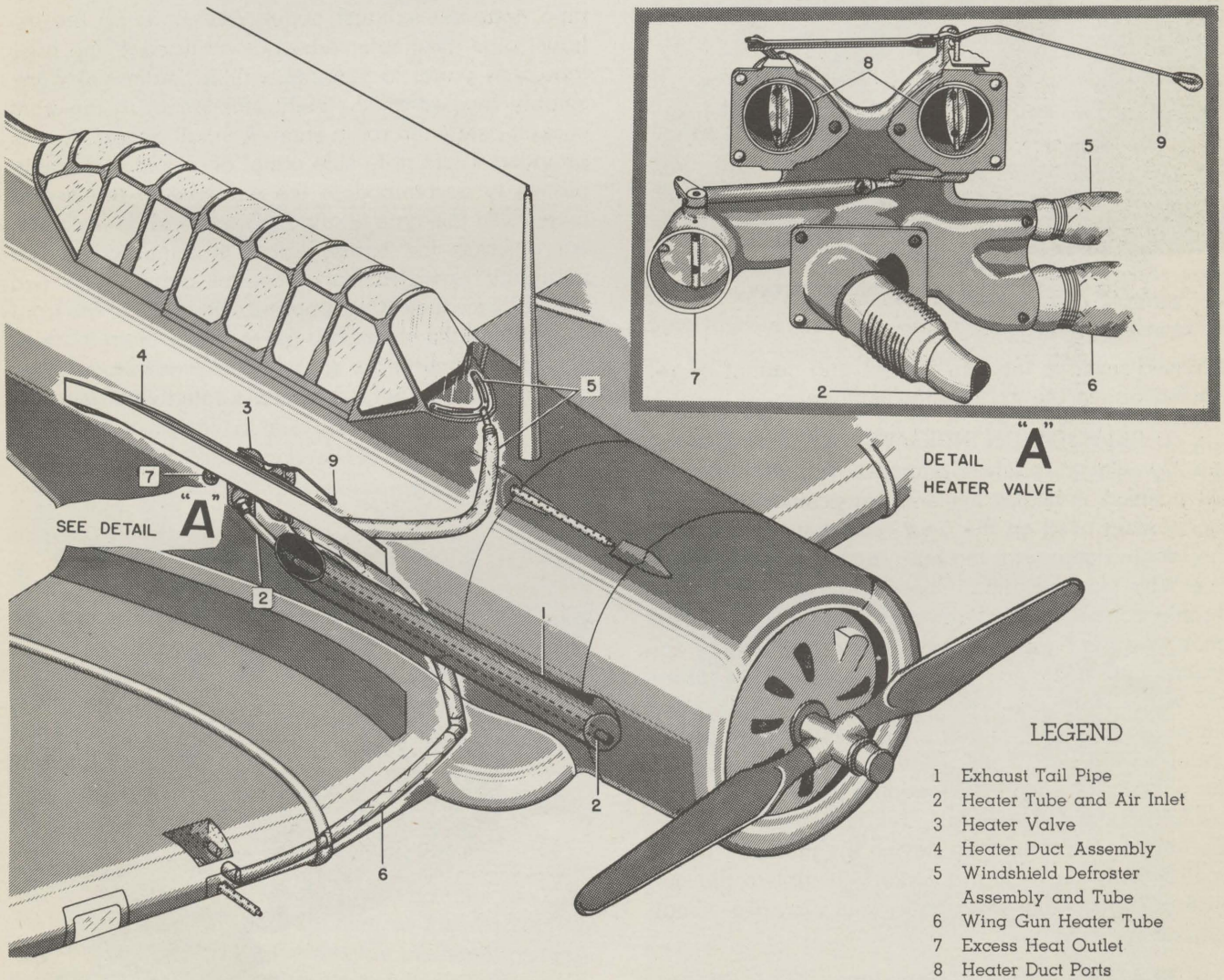


FIG. 29—HEATING SYSTEM DIAGRAM

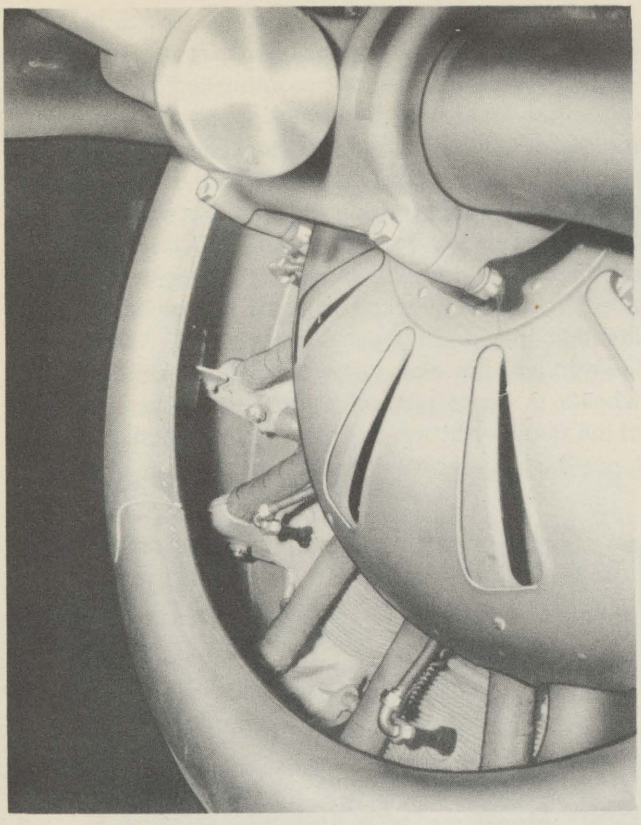


FIG. 30—ENGINE COWL NOSE SHUTTERS

exposed position through the ski and cannot be retracted above the ski landing surface.

(1) SKI POSITION INDICATOR SYSTEM (See figure 27.)—This airplane is equipped with an electrical ski position indicator system, the position indicator mechanism used on the gear retraction system and the landing gear warning horn are rendered inoperative with skis installed. The contact switch on the throttle control which formerly operated the landing gear warning horn is now an integral unit in the operation of the ski position indicator lights (See figure 28.) With the throttle closed to the normal landing position the indicator lights located on the auxiliary panel on the right side of the front cockpit indicate the position of each ski. Indication is made on both the fully extended and fully retracted position. Like the landing gear warning device the indicator lights operate only on a dual contact to complete the operating circuit. This warning system provides visual indications only.

b. HEATING SYSTEM (See figure 29.) — On airplanes provided with special winterization equipment the installation of a British-type cockpit heating system not only sends air to both cockpits but also defrosts the windshield and conducts heat to the wing gun bay to prevent the congealing of oil on machine gun parts.

(1) COCKPIT HEATING. — Heated air is conducted to the front cockpit by means of a heater tube located within and running the full length of an elongated exhaust tail pipe which extends from behind the right side of the engine cowling to a joint just outside the front cockpit. Both the heater tube and the exhaust tail pipe are made of corrosion-resistant steel tubing. The former receives its air from an opening at the front of the exhaust pipe outside the engine cowling. Exhaust gases in the surrounding tail pipe warm the air inside the heater tube, the aft end of which protrudes from the inboard wall of the exhaust pipe near the exhaust outlet. After leaving the exhaust pipe the heater tube passes through the fuselage side panel to connect with a heater valve assembly located on the right side panel in the front cockpit below the radio shelf. A small access door is provided in the right side panel of all production airplanes to accommodate the entrance of the heater tube when this type heating system is to be installed. Air entering the heater valve is admitted by the manually operated valve control handle into two 24ST alclad ducts. One duct supplies heat to the front cockpit and the other does the same for the rear cockpit. The heat outlet for each duct curves inboard. The outboard side of each duct is insulated with asbestos millboard.

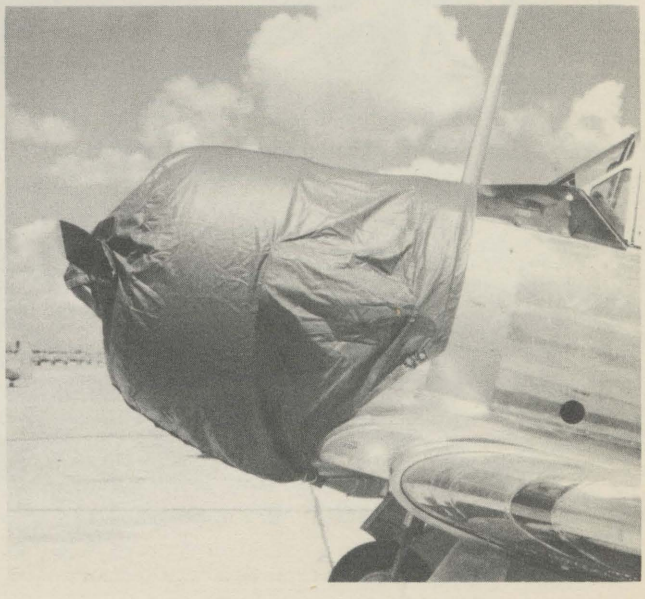


FIG. 31—ENGINE COVER

FIG. 32—OIL TANK IMMERSION HEATER AND BATTERY EXTERNAL PLUG

(2) WINDSHIELD DEFROSTING.—The windshield may be defrosted by means of a flexible aluminum alloy tube which extends from the heater valve at the right side of the front cockpit to a semi-circular nozzle at the base of the windshield. The tube is insulated with skyfelt and sends heat to the windshield by manual operation of the heater valve control handle.

(3) WING GUN HEATING.—Heated air is supplied to the wing machine gun by a flexible aluminum alloy tube which extends from the heater salvo in the front cockpit to the center section and from there to the gun's position in the right outer panel. The tube is insulated with skyfelt and terminates at its connection with a heater duct in the gun bay. Manual operation of the heater valve control handle sends heat through the tube.

c. ENGINE COWL NOSE SHUTTERS (See figure 30.)—Part of the special winterization equipment acting to maintain proper engine temperatures are full closing engine cowl nose shutters so installed as to be manually operated by a flexible push-pull control rod, an Arens control. The control knob is located in the front cockpit below the instrument panel to the right of the gun sight. When the knob is pulled, the shutters open; when it is pushed, the shutters close.

d. ENGINE PUSH ROD LAGGING.—The engine push rods are lagged to prevent the congealing of oil in the housings.

e. ENGINE COVER (See figure 31.) — An engine cover is provided to facilitate the warming of the engine under conditions of extreme cold. A heater tube may be inserted through it to warm the rear engine accessory section.

f. OIL TANK IMMERSION HEATER (See figure 32.) —An oil tank immersion heater is installed in the tank for cold weather operation of the airplane. If the heater is to be used it is put into operation as soon as possible after stopping the engine and is left in operation until the engine is started again.

g. OIL COOLER SHUTTERS.—Oil cooler shutters are installed in the airplane to maintain specified oil temperature for engine operation. The operating temperature is from 40°C. to 75°C. If the temperature drops below 40°C. move the oil cooler shutter control located to the left of the main electrical control panel toward the closed position.

h. BATTERY CART EXTERNAL PLUG.—To conserve the battery of the airplane when starting engine in cold weather, an external power receptacle is installed in the left side of the engine compartment. The receptacle may be reached by opening the door located on the left side of the engine accessory panel. The battery disconnect switch, located on the front cockpit switch box, must be on before the receptacle can be used.

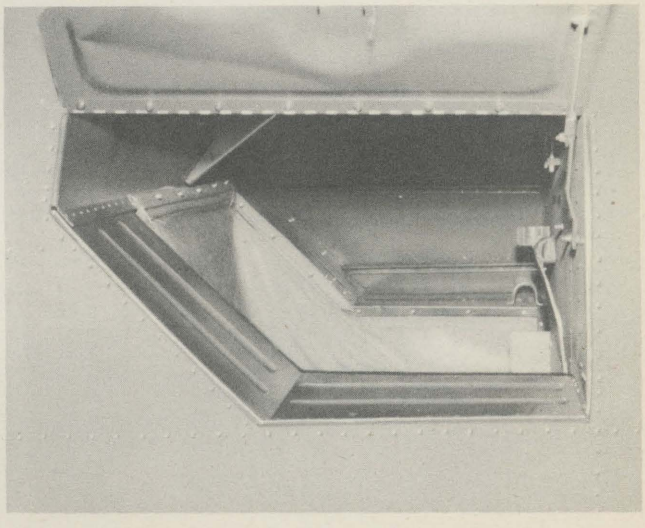


FIG. 33—BAGGAGE COMPARTMENT

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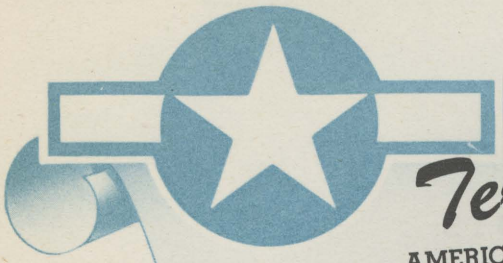
APPENDIX I

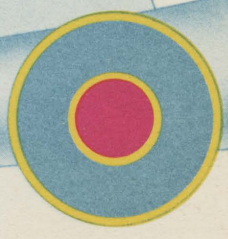
APPENDIX II

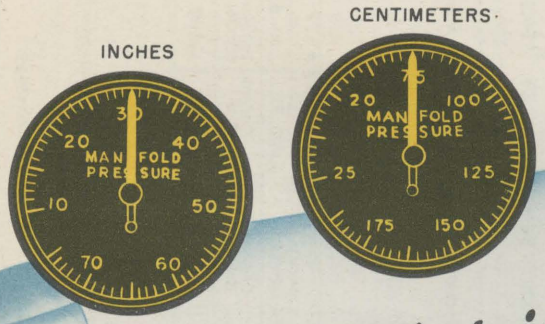
FLIGHT OPERATING CHARTS AND TABLES



Terminology

AMERICAN	BRITISH
Air Filter	Air Cleaner
Airfoil	Aerofoil
Airplane	Aeroplane
Antenna	Aerial
Battery	Accumulator
Caliber	Calibre
Carburetor	Carburettor
Center	Centre
Cockpit Enclosure	Cockpit Hood
Control Stick	Control Column
Empennage	Tail Unit
Firewall	Fireproof Bulkhead
Gasoline	Petrol
Horizontal Stabilizer	Tail Plane
Indicated Airspeed	Air-speed Indicator Reading
Land	Alight
Landing Gear	Undercarriage
Left	Port
Left Wing	Port Main Plane
Lines	Pipes
Maneuver	Manoeuvre
Manifold Pressure	Boost
Mooring Rings	Picketing Rings
Propeller	Propellor
Radio	Wireless
Radio Mast	Rod Aerial
Right	Starboard
Right Wing	Starboard Main Plane
Shock Strut	Oleo Leg
Surface Control Lock	Locking Gear
Surface Controls	Flying Controls
Trim Tab	Trimming Tab
Vertical Stabilizer	Fin
Windshield	Windscreen
Wing	Main Plane
Wing Tips	Plane Tips





Metric Units

AMERICAN	by	BRITISH to Obtain
Multiply		
U.S. Gallons (gal)	× 0.833	= Imperial Gallons (Imp. gal)
U.S. Gallons	× 3.785	= Liters
Miles per hour (mph)	× 1.609	= Kilometers per Hour (km ph)
Miles per hour	× 0.8684	= Knots
Miles	× 1.609	= Kilometers (km)
Miles	× 0.8684	= Nautical Miles
Feet (ft.)	× 0.3048	= Meters (m)
Inches (in.)	× 2.54	= Centimeters (cm)
Pounds (lb)	× 0.4536	= Kilograms (kg)
Pounds per square inch (lb/sq in.)	× 0.0703	= Kilograms per Square Centimeter (kg/sq cm.)
Inches in Mercury (in. Hg)	× 2.54	= Centimeters of Mercury (cm Hg)
Horsepower (hp)	× 1.014	= Metric Horsepower (mhp)
Degrees Centigrade (°C)	+ 17.8 × 1.8	= Degrees Fahrenheit (°F)

AIRPLANE MODELS

AT-6C and AT-6D

TAKE-OFF, CLIMB AND LANDING CHART

TAKE-OFF DISTANCE (in feet)

ENGINE MODEL

R-1340-AN-1

GROSS WEIGHT (In Lbs.)	HEAD WIND (MPH)	HARD SURFACE RUNWAY						SOD-TURF RUNWAY						SOFT SURFACE RUNWAY					
		AT SEA LEVEL		AT 3,000 FT.		AT 6,000 FT.		AT SEA LEVEL		AT 3,000 FT.		AT 6,000 FT.		AT SEA LEVEL		AT 3,000 FT.		AT 6,000 FT.	
		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.
6000	0	1000	1700	1200	2000	1500	2350	1050	1800	1350	2150	1600	2500	1300	2000	1700	2500	2100	3000
	20	550	1100	700	1300	900	1500	600	1150	800	1400	1000	1650	750	1300	1000	1600	1300	1900
	40	300	600	350	750	450	900	300	650	400	800	500	1000	350	700	500	900	650	1100
5300	0	650	1250	800	1450	950	1650	700	1300	850	1500	1050	1700	800	1400	1000	1650	1250	1900
	20	350	750	450	900	550	1050	400	800	500	950	600	1100	450	850	550	1000	700	1200
	40	150	400	200	500	250	600	150	400	200	500	250	600	200	450	250	550	350	650

NOTE: INCREASE DISTANCE **10%** FOR EACH 10°C. ABOVE 0°C. (**10%** FOR EACH 20°F. ABOVE 32°F.)

ENGINE LIMITS FOR TAKE-OFF **2250** R.P.M. & **36** IN. HG.

COMBAT MISSIONS USE **2200** R.P.M. & **32.5** IN. HG.

CLIMB DATA

FERRY MISSIONS USE **2200** R.P.M. & **32.5** IN. HG.

GROSS WEIGHT (In Lbs.)	TYPE OF CLIMB	S. L. TO 3000 FT. ALT.			6000 FT. ALT.				9000 FT. ALT.				12000 FT. ALT.				15000 FT. ALT.			
		Best I.A.S.	Miles Traveled	Time From S.L.	Best I.A.S.	Miles Traveled	Time From S.L.	Fuel From S.L.	Best I.A.S.	Miles Traveled	Time From S.L.	Fuel From S.L.	Best I.A.S.	Miles Traveled	Time From S.L.	Fuel From S.L.	Best I.A.S.	Miles Traveled	Time From S.L.	Fuel From S.L.
6000	COMBAT	115	6	2.8	115	11	5.6	12	115	18	8.8	15	110	24	12.5	18	105	35	17.5	21
	FERRY	NOTE: Use of combat climb conditions is most economical.																		
5300	COMBAT	115	5	2.3	115	9	4.7	11	115	15	7.3	14	110	21	10.5	16	105	29	14.5	19
	FERRY	NOTE: Climbing at reduced power is not economical with this airplane.																		

NOTE: Increased Elapsed Climbing Time **10%** for Each 10°C. Above 0°C. Free Air Temperature (**10%** for Each 20°F. Above 32°F.)

Fuel Includes Warm-Up and Take-Off Allowance

LANDING DISTANCE (in feet)

GROSS WEIGHT (In Lbs.)	BEST I.A.S. APPROACH	HARD DRY SURFACE						FIRM DRY SOD						WET OR SLIPPERY					
		AT SEA LEVEL		AT 3,000 FT.		AT 6,000 FT.		AT SEA LEVEL		AT 3,000 FT.		AT 6,000 FT.		AT SEA LEVEL		AT 3,000 FT.		AT 6,000 FT.	
		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.	Ground Roll
5000	75	1450	650	1550	700	1650	750	1550	700	1650	800	1750	900	2400	1600	2600	1750	2800	2000

NOTE: For Ground Temperatures Above 35°C. (95°F.) Increase Approach I.A.S. 10% and Allow 20% Increase in Ground Roll.

REMARKS: ***Use 2200 R.P.M. Full Throttle; Full Rich for Climb Above 5000 Ft.**

RED FIGURES HAVE NOT BEEN FLIGHT CHECKED

LEGEND: I.A.S.: Indicated Air Speed—M.P.H.
S.L.: Sea Level
U.S.: U.S. Gallons
NOTE: All Distances are Average.

AIRPLANE MODELS
SNJ-4 and SNJ-5

For Navy Use Only

TAKE-OFF, CLIMB AND LANDING CHART

ENGINE MODEL
R-1340-AN-1

TAKE-OFF DISTANCE (in feet)

GROSS WEIGHT (In Lbs.)	HEAD WIND		HARD SURFACE RUNWAY						SOD-TURF RUNWAY						SOFT SURFACE RUNWAY					
			AT SEA LEVEL		AT 3,000 FT.		AT 6,000 FT.		AT SEA LEVEL		AT 3,000 FT.		AT 6,000 FT.		AT SEA LEVEL		AT 3,000 FT.		AT 6,000 FT.	
	MPH	Knots	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.
6000	0	0	1000	1700	1200	2000	1500	2350	1050	1800	1350	2150	1600	2500	1300	2000	1700	2500	2100	3000
	17	15	600	1250	800	1400	1000	1600	650	1250	850	1500	1050	1750	800	1350	1200	1700	1400	2050
	34	30	350	750	450	900	550	1050	350	800	500	950	650	1200	450	850	650	1100	850	1300
	51	45	250	400	250	550	300	700	200	450	250	600	300	750	200	450	350	600	400	800
5300	0	0	650	1250	800	1450	950	1650	700	1300	850	1500	1050	1700	800	1400	1000	1650	1250	1900
	17	15	400	800	500	950	600	1150	400	850	550	1000	650	1200	500	900	600	1100	750	1300
	34	30	200	500	250	600	300	700	200	500	250	600	350	750	250	550	300	650	450	800
	51	45	100	300	100	350	150	450	100	250	200	350	250	400	150	300	150	400	250	450

NOTE: INCREASE DISTANCE **10%** FOR EACH 10°C. ABOVE 0°C. (**10%** FOR EACH 20°F. ABOVE 32°F.)

ENGINE LIMITS FOR TAKE-OFF **2250** R.P.M. & **36** IN. HG.

COMBAT MISSIONS USE **2200** R.P.M. & **32.5*** IN. HG.

CLIMB DATA

FERRY MISSIONS USE **2200** R.P.M. & **32.5*** IN. HG.

GROSS WEIGHT IN LBS.	TYPE OF CLIMB	S. L. TO 3000 FT. ALT.			6000 FT. ALT.				9000 FT. ALT.				12000 FT. ALT.				15000 FT. ALT.			
		Best I.A.S.	Miles Traveled	Time From S.L.	Best I.A.S.	Miles Traveled	Time From S.L.	Fuel From S.L.	Best I.A.S.	Miles Traveled	Time From S.L.	Fuel From S.L.	Best I.A.S.	Miles Traveled	Time From S.L.	Fuel From S.L.	Best I.A.S.	Miles Traveled	Time From S.L.	Fuel From S.L.
6000	COMBAT	100	5	2.8	100	10	5.6	12	100	16	8.8	15	95	21	12.5	18	90	30	17.5	21
	FERRY	NOTE: Use of combat climb conditions is most economical.																		
5300	COMBAT	100	4	2.3	100	8	4.7	11	100	13	7.3	14	95	18	10.5	16	90	25	14.5	19
	FERRY	NOTE: Climbing at reduced power is not economical with this airplane.																		

NOTE: Increased Elapsed Climbing Time **10%** for Each 10°C. Free Air Temperature (**10%** for Each 20°F. Above 32°F.)

LANDING DISTANCE (in feet)

GROSS WEIGHT IN LBS.	BEST I.A.S. APPROACH		HARD DRY SURFACE						FIRM DRY SOD						WET OR SLIPPERY					
			AT SEA LEVEL		AT 3,000 FT.		AT 6,000 FT.		AT SEA LEVEL		AT 3,000 FT.		AT 6,000 FT.		AT SEA LEVEL		AT 3,000 FT.		AT 6,000 FT.	
	MPH	Knots	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.	Ground Roll
5000	—	65	1450	650	1550	700	1650	750	1550	700	1650	800	1750	900	2400	1600	2600	1750	2800	2000

NOTE: For Ground Temperatures Above 35°C. (95°F.) Increase Approach I.A.S. 10% and Allow 20% Increase in Ground Roll.

REMARKS: ***Use 2200 R.P.M. Full Throttle; Full Rich for Climb Above 5000 Ft.**

CAUTION: Do Not Use This Chart for AT-6 Series Airplanes.

RED FIGURES HAVE NOT BEEN FLIGHT CHECKED

LEGEND: I.A.S.: Indicated Air Speed—M.P.H.
S.L.: Sea Level
U.S.: U.S. Gallons
NOTE: All Distances are Average.

AIRPLANE MODEL(S)

AT-6C and AT-6D

FLIGHT OPERATION INSTRUCTION CHART

Gross weight **5500** to **4500** pounds

SHEET 1 OF 2 SHEETS

External Load Items: **None**

Condition	R.P.M.	M.P. (In. Hg.)	Mixture Position	Duration In. Min.	U.S. G.P.H.	Alt. Feet
Take-Off	2250	36	FR	5	65	SL
Military Power	2250	36	FR	5	65	SL
Engine	R-1340-AN-1					

INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than total amount of fuel in airplane. Move horizontally to the right or left and select a figure equal to or greater than the air miles to be flown. Vertically below and opposite desired cruising altitude read optimum cruising conditions. *NOTES:* (A) Avoid continuous cruising in Column I except in emergency. (B) Columns (II, III, IV and V) toward the right progressively give increase in range at sacrifice in speed. (C) Manifold Pressure (M.P.), Gallons Per Hour (G.P.H.), are approximate maximum values for reference. (D) For quick reference, take-off and military power data are listed in the upper left corner of chart.

ALTERNATE CRUISING CONDITIONS

(NO WIND) — (NO RESERVE FUEL ALLOWANCE)

I (MAX. CONT. POWER) RANGE IN AIR MILES		FUEL U. S. GALS. 2	II RANGE IN AIR MILES		III RANGE IN AIR MILES		IV RANGE IN AIR MILES		FUEL U. S. GALS. 2	V (MAX. RANGE) RANGE IN AIR MILES	
STATUTE	NAUTICAL		STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL		STATUTE	NAUTICAL
		111	11 Gal. Take-Off Allowance Not Available in Flight						111		
330	290	100	490	430	620	540	700	610	100	800	690
290	250	90	440	380	560	490	630	550	90	720	620
260	220	80	390	340	500	430	560	490	80	640	550
230	200	70	340	290	440	390	490	430	70	560	480
200	170	60	290	250	370	320	420	360	60	480	420
160	140	50	240	210	310	270	350	300	50	400	350
130	110	40	190	160	250	220	280	240	40	320	280
100	90	30	140	120	180	160	210	180	30	240	210
60	50	20	90	80	120	100	140	120	20	160	140
30	30	10	40	30	60	50	70	60	10	80	70

OPERATING DATA						1 DENSITY ALT. IN FEET	OPERATING DATA						OPERATING DATA						OPERATING DATA						1 DENSITY ALT. IN FEET	OPERATING DATA					
R. P. M.	I.A.S. M. P. H.	Mixture	M.P. In. Hg.	U.S. G. P. H.	T.A.S. M. P. H.		R. P. M.	I.A.S. M. P. H.	Mixture	M.P. In. Hg.	U.S. G. P. H.	T.A.S. M. P. H.	R. P. M.	I.A.S. M. P. H.	Mixture	M.P. In. Hg.	U.S. G. P. H.	T.A.S. M. P. H.	R. P. M.	I.A.S. M. P. H.	Mixture	M.P. In. Hg.	U.S. G. P. H.	T.A.S. M. P. H.		R. P. M.	I.A.S. M. P. H.	Mixture	M.P. In. Hg.	U.S. G. P. H.	T.A.S. M. P. H.
						30000																			30000					
						25000																			25000					
2200	F.T.	F.R.	F.T.	35	190	20000													1950	F.T.	Lean	F.T.	23	180	20000					
2200	F.T.	F.R.	F.T.	40	195	15000							1950	F.T.	Lean	F.T.	25	180	1700	F.T.	Lean	F.T.	22	170	15000					
2200	F.T.	F.R.	F.T.	45	200	12000	2100	F.T.	F.R.	F.T.	36	195	1850	F.T.	Lean	F.T.	25	185	1600	F.T.	Lean	F.T.	21	165	12000	1400	F.T.	Lean	F.T.	17	150
2200	F.T.	F.R.	F.T.	50	200	9000	2000	F.T.	F.R.	F.T.	35	190	1700	F.T.	Lean	F.T.	24	175	1450	F.T.	Lean	F.T.	20	155	9000	1400	125	Lean	22	16	145
2200	F.T.	F.R.	F.T.	55	205	6000	2000	F.T.	F.R.	F.T.	35	190	1550	F.T.	Lean	F.T.	23	165	1400	135	Lean	26	19	150	6000	1400	120	Lean	22	15	130
2200	**	F.R.	32.5	55	200	3000	1950	170	Lean	30	32	180	1450	150	Lean	29	22	160	1400	135	Lean	27	18	145	3000	1400	120	Lean	23	14	125
2200	**	F.R.	32.5	50	190	S. L.	1900	170	Lean	31	31	175	1400	150	Lean	30	21	150	1400	135	Lean	28	17	135	S. L.	1400	115	Lean	23	13	115

NOTE: 1. Indicated altitude corrected for free air temperature.

2. Allow **11** U. S. gals. for warm up.
Take-off and climb to **5000** feet altitude.
Refer to "Specific Engine Flight Chart" for additional engine operation data.

****Use 32.5 in Hg. Manifold Press.**

CAUTION: Do not use this chart for SNJ Series Airplanes.

RED FIGURES ARE PRELIMINARY: SUBJECT TO REVISION AFTER FLIGHT CHECK.

LEGEND: I.A.S.: Indicated Air Speed—M.P.H.
M.P.: Approx. Manifold Pressure.
G.P.H.: Approx. U. S. Gal. Per Hour.
T.A.S.: Approx. True Air Speed—M.P.H.
F.T.: Full Throttle.
S.L.: Sea Level.
F.R.: Full Rich.

AIRPLANE MODEL(S)

AT-6C and AT-6D

FLIGHT OPERATION INSTRUCTION CHART

Gross weight **6000** to **5000** pounds

External Load Items: **Wing Bombs**

Condition	R.P.M.	M.P. (In. Hg.)	Mixture Position	Duration In. Min.	U.S. G.P.H.	Alt. Feet
Take-Off	2250	36	FR	5	65	SL
Military Power	2250	36	FR	5	65	SL
Engine	R-1340-AN-1					

INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than total amount of fuel in airplane. Move horizontally to the right or left and select a figure equal to or greater than the air miles to be flown. Vertically below and opposite desired cruising altitude read optimum cruising conditions. *NOTES:* (A) Avoid continuous cruising in Column I except in emergency. (B) Columns (II, III, IV and V) toward the right progressively give increase in range at sacrifice in speed. (C) Manifold Pressure (M.P.), Gallons Per Hour (G.P.H.), are approximate maximum values for reference. (D) For quick reference, take-off and military power data are listed in the upper left corner of chart.

(NO WIND) — ALTERNATE CRUISING CONDITIONS — (NO RESERVE FUEL ALLOWANCE)

I (MAX. CONT. POWER) RANGE IN AIR MILES		FUEL U. S. GALS. 2	II RANGE IN AIR MILES		III RANGE IN AIR MILES		IV RANGE IN AIR MILES		FUEL U. S. GALS. 2	V (MAX. RANGE) RANGE IN AIR MILES	
STATUTE	NAUTICAL		STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL		STATUTE	NAUTICAL
		111	11 Gal. Take-Off Allowance Not Available in Flight						111		
310	270	100	430	370	520	450	640	550	100	720	620
280	240	90	390	340	470	410	580	500	90	650	560
250	220	80	350	300	410	360	510	440	80	580	500
220	190	70	300	260	360	310	450	390	70	510	440
190	160	60	260	230	310	270	380	330	60	430	370
150	130	50	220	190	260	220	320	280	50	360	310
120	100	40	170	150	210	180	260	230	40	290	250
90	80	30	130	110	150	130	190	160	30	220	190
60	50	20	90	80	100	90	130	110	20	140	120
30		10	40	30	50	40	60	50	10	70	60

OPERATING DATA						1 DENSITY ALT. IN FEET	OPERATING DATA						OPERATING DATA						OPERATING DATA						1 DENSITY ALT. IN FEET	OPERATING DATA					
R.P.M.	I.A.S.M.P.H.	Mixture	M.P. In. Hg.	U.S.G.P.H.	T.A.S.M.P.H.		R.P.M.	I.A.S.M.P.H.	Mixture	M.P. In. Hg.	U.S.G.P.H.	T.A.S.M.P.H.	R.P.M.	I.A.S.M.P.H.	Mixture	M.P. In. Hg.	U.S.G.P.H.	T.A.S.M.P.H.	R.P.M.	I.A.S.M.P.H.	Mixture	M.P. In. Hg.	U.S.G.P.H.	T.A.S.M.P.H.		R.P.M.	I.A.S.M.P.H.	Mixture	M.P. In. Hg.	U.S.G.P.H.	T.A.S.M.P.H.
						30000																			30000					
						25000																			25000					
2200	F.T.	F.R.	F.T.	35	180	20000							2150	F.T.	F.R.	F.T.	30	175	2000	F.T.	Lean	F.T.	23	165	20000					
2200	F.T.	F.R.	F.T.	40	190	15000							2000	F.T.	Lean	F.T.	27	180	1800	F.T.	Lean	F.T.	23	175	15000					
2200	F.T.	F.R.	F.T.	45	195	12000	2100	F.T.	F.R.	F.T.	37	190	1900	F.T.	Lean	F.T.	27	175	1650	F.T.	Lean	F.T.	22	165	12000	1450	F.T.	Lean	F.T.	18	145
2200	F.T.	F.R.	F.T.	50	195	9000	2050	F.T.	F.R.	F.T.	39	195	1750	F.T.	Lean	F.T.	26	170	1550	F.T.	Lean	F.T.	21	155	9000	1400	F.T.	Lean	F.T.	17	140
2200	F.T.	F.R.	F.T.	55	195	6000	2000	F.T.	F.R.	F.T.	37	185	1600	F.T.	Lean	F.T.	25	160	1400	F.T.	Lean	F.T.	20	150	6000	1400	120	Lean	24	16	130
2200	**	F.R.	32.5	55	190	3000	2000	165	F.R.	30	36	175	1500	145	Lean	30	24	155	1400	135	Lean	28	19	145	3000	1400	120	Lean	24	15	125
2200	**	F.R.	32.5	50	185	S. L.	2000	165	F.R.	31	35	170	1450	145	Lean	31	23	150	1400	135	Lean	29	18	140	S. L.	1400	120	Lean	24	14	120

NOTE: 1. Indicated altitude corrected for free air temperature.
2. Allow **11** U. S. gals. for warm up.
Take-off and climb to **5000** feet altitude.
Refer to "Specific Engine Flight Chart" for additional engine operation data.
****Use 32.5 in Hg. Manifold Press.**

CAUTION: Do not use this chart for SNJ Series Airplanes.

RED FIGURES ARE PRELIMINARY: SUBJECT TO REVISION AFTER FLIGHT CHECK.

LEGEND: I.A.S.: Indicated Air Speed—M.P.H.
M.P.: Approx. Manifold Pressure.
G.P.H.: Approx. U. S. Gal. Per Hour.
T.A.S.: Approx. True Air Speed—M.P.H.
F.T.: Full Throttle.
S L.: Sea Level.
F.R.: Full Rich.

AIRPLANE MODEL(S)

SNJ-4 and SNJ-5

For Navy Use Only

FLIGHT OPERATION INSTRUCTION CHART

Gross weight **5500** to **4500** pounds

External Load Items: **None**

Condition	R.P.M.	M.P. (In. Hg.)	Mixture Position	Duration In. Min.	U.S. G.P.H.	Alt. Feet
Take-Off	2250	36	FR	5	65	SL
Military Power	2250	36	FR	5	65	SL
Engine	R-1340-AN-1					

INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than total amount of fuel in airplane. Move horizontally to the right or left and select a figure equal to or greater than the air miles to be flown. Vertically below and opposite desired cruising altitude read optimum cruising conditions. *NOTES:* (A) Avoid continuous cruising in Column I except in emergency. (B) Columns (II, III, IV and V) toward the right progressively give increase in range at sacrifice in speed. (C) Manifold Pressure (M.P.), Gallons Per Hour (G.P.H.), are approximate maximum values for reference. (D) For quick reference, take-off and military power data are listed in the upper left corner of chart.

(NO WIND) — ALTERNATE CRUISING CONDITIONS — (NO RESERVE FUEL ALLOWANCE)

I (MAX. CONT. POWER) RANGE IN AIR MILES		FUEL U. S. GALS. 2	II RANGE IN AIR MILES		III RANGE IN AIR MILES		IV RANGE IN AIR MILES		FUEL U. S. GALS. 2	V (MAX. RANGE) RANGE IN AIR MILES	
STATUTE	NAUTICAL		STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL		STATUTE	NAUTICAL
		111	11 Gal. Take-Off Allowance Not Available in Flight						111		
330	290	100	490	430	620	540	700	610	100	800	690
290	250	90	440	380	560	490	630	550	90	720	620
260	220	80	390	340	500	430	560	490	80	640	550
230	200	70	340	290	440	390	490	430	70	560	480
200	170	60	290	250	370	320	420	360	60	480	420
160	140	50	240	210	310	270	350	300	50	400	350
130	110	40	190	160	250	220	280	240	40	320	280
100	90	30	140	120	180	160	210	180	30	240	210
60	50	20	90	80	120	100	140	120	20	160	140
30		10	40	30	60	50	70	60	21	80	70

OPERATING DATA						1 DENSITY ALT. IN FEET	OPERATING DATA						OPERATING DATA						OPERATING DATA						1 DENSITY ALT. IN FEET	OPERATING DATA					
R. P. M.	I.A.S. Knots	Mix-ture	M.P. In. Hg.	U.S. G. P. H.	T.A.S. Knots		R. P. M.	I.A.S. Knots	Mix-ture	M.P. In. Hg.	U.S. G. P. H.	T.A.S. Knots	R. P. M.	I.A.S. Knots	Mix-ture	M.P. In. Hg.	U.S. G. P. H.	T.A.S Knots	R. P. M.	I.A.S. Knots	Mix-ture	M.P. In. Hg.	U.S. G. P. H.	T.A.S. Knots		R. P. M.	I.A.S. Knots	Mix-ture	M.P. In. Hg.	U.S. G. P. H.	T.A.S. Knots
						30000																			30000					
						25000																			25000					
2200	F.T.	F.R.	F.T.	35	165	20000							2100	F.T.	F.R.	F.T.	26	155	1950	F.T.	Lean	F.T.	23	155	20000					
2200	F.T.	F.R.	F.T.	40	170	15000							1950	F.T.	Lean	F.T.	25	155	1700	F.T.	Lean	F.T.	22	150	15000					
2200	F.T.	F.R.	F.T.	45	175	12000	2100	F.T.	F.R.	F.T.	36	170	1850	F.T.	Lean	F.T.	25	160	1600	F.T.	Lean	F.T.	21	145	12000	1400	F.T.	Lean	F.T.	17	130
2200	F.T.	F.R.	F.T.	50	175	9000	2000	F.T.	F.R.	F.T.	35	170	1700	F.T.	Lean	F.T.	24	150	1450	F.T.	Lean	F.T.	20	135	9000	1400	110	Lean	22	16	125
2200	F.T.	F.R.	F.T.	55	175	6000	2000	F.T.	F.R.	F.T.	35	165	1550	F.T.	Lean	F.T.	23	145	1400	115	Lean	26	19	130	6000	1400	105	Lean	22.5	15	115
2200	**	F.R.	32.5	55	175	3000	1950	145	Lean	30	32	160	1450	130	Lean	29.5	22	140	1400	115	Lean	27	18	125	3000	1400	105	Lean	22.5	14	110
2200	**	F.R.	32.5	50	165	S. L.	1900	145	Lean	31	31	150	1400	130	Lean	30.5	21	135	1400	115	Lean	27.5	17	120	S. L.	1400	100	Lean	23	13	100

NOTE: 1. Indicated altitude corrected for free air temperature.

2. Allow **11** U. S. gals. for warm up.
Take-off and climb to **5000** feet altitude.
Refer to "Specific Engine Flight Chart" for additional engine operation data.

****Use 32.5 in Hg. Manifold Press.**

CAUTION: Do not use this chart for AT-6 Series Airplanes.

RED FIGURES ARE PRELIMINARY: SUBJECT TO REVISION AFTER FLIGHT CHECK.

LEGEND: I.A.S.: Indicated Air Speed—M.P.H.
M.P.: Approx. Manifold Pressure.
G.P.H.: Approx. U. S. Gal. Per Hour.
T.A.S.: Approx. True Air Speed—M.P.H.
F.T.: Full Throttle.
S.L.: Sea Level.
F.R.: Full Rich.

AIRPLANE MODEL(S)

SNJ-4 and SNJ-5

For Navy Use Only

FLIGHT OPERATION INSTRUCTION CHART

Gross weight **6000** to **5000** pounds

External Load Items: **Wing Bombs**

Condition	R.P.M.	M.P. (In. Hg.)	Mixture Position	Duration In. Min.	U.S. G.P.H.	Alt. Feet
Take-Off	2250	36	FR	5	65	SL
Military Power	2250	36	FR	5	65	SL
Engine	R-1340-AN-1					

INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than total amount of fuel in airplane. Move horizontally to the right or left and select a figure equal to or greater than the air miles to be flown. Vertically below and opposite desired cruising altitude read optimum cruising conditions. *NOTES:* (A) Avoid continuous cruising in Column I except in emergency. (B) Columns (II, III, IV and V) toward the right progressively give increase in range at sacrifice in speed. (C) Manifold Pressure (M.P.), Gallons Per Hour (G.P.H.), are approximate maximum values for reference. (D) For quick reference, take-off and military power data are listed in the upper left corner of chart.

ALTERNATE CRUISING CONDITIONS

(NO WIND) — (NO RESERVE FUEL ALLOWANCE)

I (MAX. CONT. POWER) RANGE IN AIR MILES		FUEL U. S. GALS. 2	II RANGE IN AIR MILES		III RANGE IN AIR MILES		IV RANGE IN AIR MILES		FUEL U. S. GALS. 2	V (MAX. RANGE) RANGE IN AIR MILES	
STATUTE	NAUTICAL		STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL		STATUTE	NAUTICAL
		111	11 Gal. Take-Off Allowance Not Available in Flight						111		
310	270	100	430	370	520	450	640	550	100	720	620
280	240	90	390	340	470	410	580	500	90	650	560
250	220	80	350	300	410	360	510	440	80	580	500
220	190	70	300	260	360	310	450	390	70	510	440
190	160	60	260	230	310	270	380	330	60	430	370
150	130	50	220	190	260	220	320	280	50	360	310
120	100	40	170	150	210	180	260	230	40	290	250
90	80	30	130	110	150	130	190	160	30	220	190
60	50	20	90	80	100	90	130	110	20	140	120
30		10	40	30	50	40	60	50	10	70	60

OPERATING DATA						1 DENSITY ALT. IN FEET	OPERATING DATA						OPERATING DATA						OPERATING DATA						1 DENSITY ALT. IN FEET	OPERATING DATA					
R. P. M.	I.A.S. Knots	Mix-ture	M.P. In. Hg.	U.S. G. P. H.	T.A.S. Knots		R. P. M.	I.A.S. Knots	Mix-ture	M.P. In. Hg.	U.S. G. P. H.	T.A.S. Knots	R. P. M.	I.A.S. Knots	Mix-ture	M.P. In. Hg.	U.S. G. F. H.	T.A.S. Knots	R. P. M.	I.A.S. Knots	Mix-ture	M.P. In. Hg.	U.S. G. P. H.	T.A.S. Knots		R. P. M.	I.A.S. Knots	Mix-ture	M.P. In. Hg.	U.S. G. P. H.	T.A.S. Knots
						30000																			30000					
						25000																			25000					
2200	F.T.	F.R.	F.T.	35	160	20000							2150	F.T.	F.R.	F.T.	30	150	2000	F.T.	Lean	F.T.	23	140	20000						
2200	F.T.	F.R.	F.T.	40	165	15000							2000	F.T.	Lean	F.T.	27	155	1800	F.T.	Lean	F.T.	23	150	15000						
2200	F.T.	F.R.	F.T.	45	170	12000	2100	F.T.	F.R.	F.T.	37	165	1900	F.T.	Lean	F.T.	27	155	1650	F.T.	Lean	F.T.	22	140	12000	1450	F.T.	Lean	F.T.	18	125
2200	F.T.	F.R.	F.T.	50	170	9000	2050	F.T.	F.R.	F.T.	39	165	1750	F.T.	Lean	F.T.	26	145	1550	F.T.	Lean	F.T.	21	135	9000	1400	F.T.	Lean	F.T.	17	120
2200	F.T.	F.R.	F.T.	55	170	6000	2000	F.T.	F.R.	F.T.	37	160	1600	F.T.	Lean	F.T.	25	140	1400	F.T.	Lean	F.T.	20	130	6000	1400	105	Lean	24	16	115
2200	143	F.R.	32.5	55	165	3000	2000	145	F.R.	30	36	155	1500	125	Lean	30	24	135	1400	115	Lean	28	19	125	3000	1400	105	Lean	24	15	110
2200	139	F.R.	32.5	50	160	S. L.	2000	145	F.R.	31	35	145	1450	125	Lean	31	23	130	1400	115	Lean	29	18	120	S. L.	1400	105	Lean	24	14	105

NOTE: 1. Indicated altitude corrected for free air temperature.
2. Allow **11** U. S. gals. for warm up.
Take-off and climb to **5000** feet altitude.
Refer to "Specific Engine Flight Chart" for additional engine operation data.

CAUTION: Do not use this chart for AT-6 Series Airplanes.

RED FIGURES ARE PRELIMINARY: SUBJECT TO REVISION AFTER FLIGHT CHECK.

LEGEND: I.A.S.: Indicated Air Speed—M.P.H.
M.P.: Approx. Manifold Pressure.
G.P.H.: Approx. U. S. Gal. Per Hour.
T.A.S.: Approx. True Air Speed—M.P.H.
F.T.: Full Throttle.
S.L.: Sea Level.
F.R.: Full Rich.

SPECIFIC ENGINE FLIGHT CHART

AIRPLANE MODELS: **AT-6C** and **AT-6D—SNJ-4** and **SNJ-5**

ENGINE MODEL: **R-1340-AN-1**

CONDITION	FUEL PRESSURE (Lb/Sq In.)	OIL PRESSURE (Lb/Sq In.)	OIL TEMPERATURE (°Centigrade)
DESIRED	3-4	70-90	70
MAXIMUM	4	100	85
MINIMUM	3	50	60
IDLING	2	15	—

Maximum Permissible Diving RPM: **2640**

CONDITION	ALLOWABLE OIL CONSUMPTION	
NORMAL RATED (Max. Cont.)	8 U. S. QT/HR	— IMP.PT/HR
MAX. CRUISE	7 U. S. QT/HR	— IMP.PT/HR
MIN. SPECIFIC	— U. S. QT/HR	— IMP.PT/HR

Oil Grades: **1120** (W) **1100A** Fuel Grade: **87 or 91** Octane

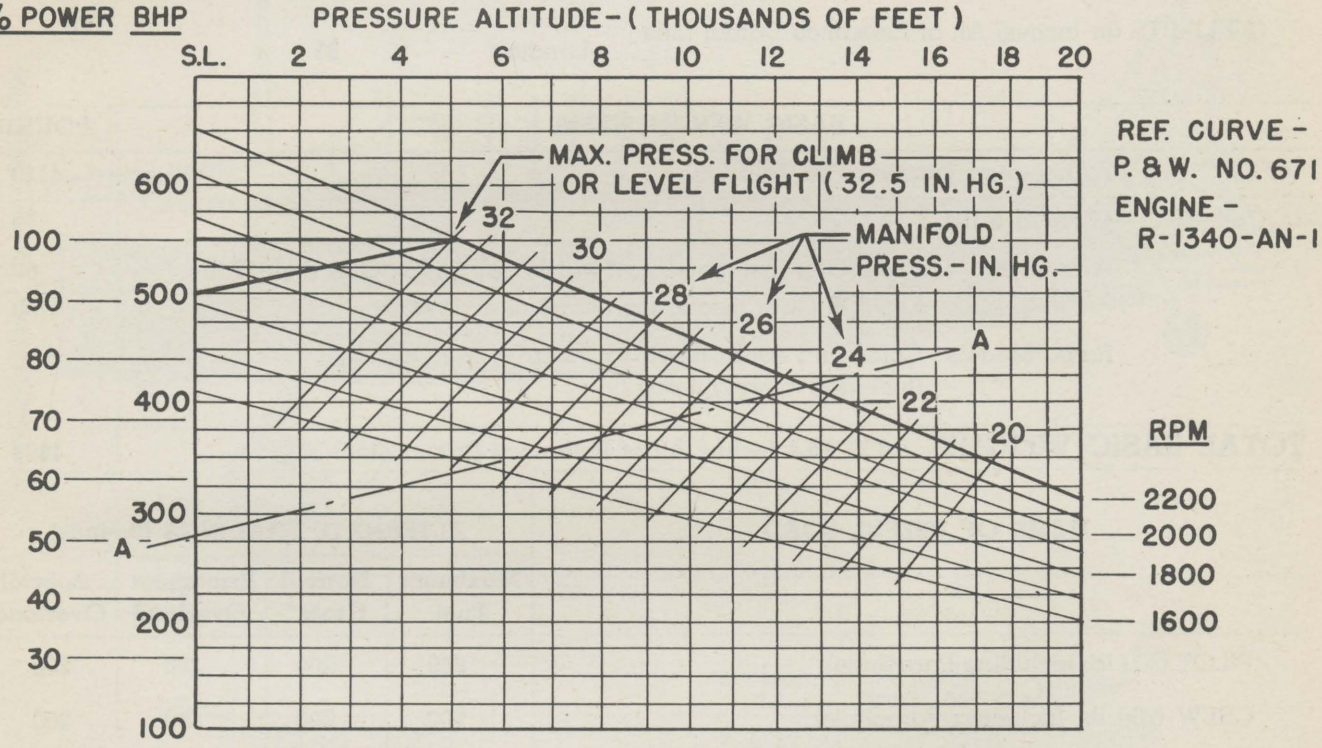
Supercharger Type: **Single Speed Geared**

OPERATING CONDITON	R.P.M.	MANIFOLD PRESSURE (Boost)	HORSE-POWER	CRITICAL ALTITUDE		MIXTURE CONTROL POSITION	FUEL FLOW (Gal/Hr/Eng.) U. S.	MAXIMUM CYL. TEMP.		MAXIMUM DURATION (Minutes)
				WITH RAM	NO RAM			°C.	°F.	
TAKE-OFF	2250	36	600	—	S. L.	FULL RICH	65	260	500	5
WAR EMERGENCY	—	—	—	—	—	—	—	—	—	—
MILITARY	2250	36	600	S. L.	S. L.	FULL RICH	65	260	500	5
NORMAL RATED (MAX. CONT.)	2200	32.5	550	5000	5000	FULL RICH	55	260	500	Maximum Continuous
MAXIMUM CRUISE	1950	28.5	400	7000	7000	LEAN*	32	230	446	NO LIMIT
MINIMUM SPECIFIC CONSUMPTION	See Flight Operation Instruction Charts in Appendix II									

REMARKS: **Avoid Cruising Below 1400 R.P.M.**

***Lean for Smooth Operation—Do Not Exceed Max. Cyl. Head Temp. Listed.**

ENGINE CHARACTERISTICS CURVE



OBTAINING POWER CONTROL

To obtain part throttle horsepower at any altitude, refer to engine characteristics curve above and proceed as follows:

1. Enter full throttle horsepower curve at given manifold pressure and RPM.

Example: 2000 RPM at 27.4 MP produces 425 HP.

2. Paralleling line A-A from the point determined in paragraph 1, locate given altitude. This is the horsepower under standard conditions.

Example: At 6300 ft., 400 HP, the normal rated power is 73%.

Note: HP varies with altitude on a line parallel to A-A regardless of RPM or MP.

WEIGHT AND BALANCE CHART

AIRPLANE MODELS: **AT-6C** and **SNJ-4**

	CONDITION	FORWARD	AFT
CG LIMITS (in Inches) Aft of Reference Datum Line	Take-off		**100.7**
	Landing	**95**	

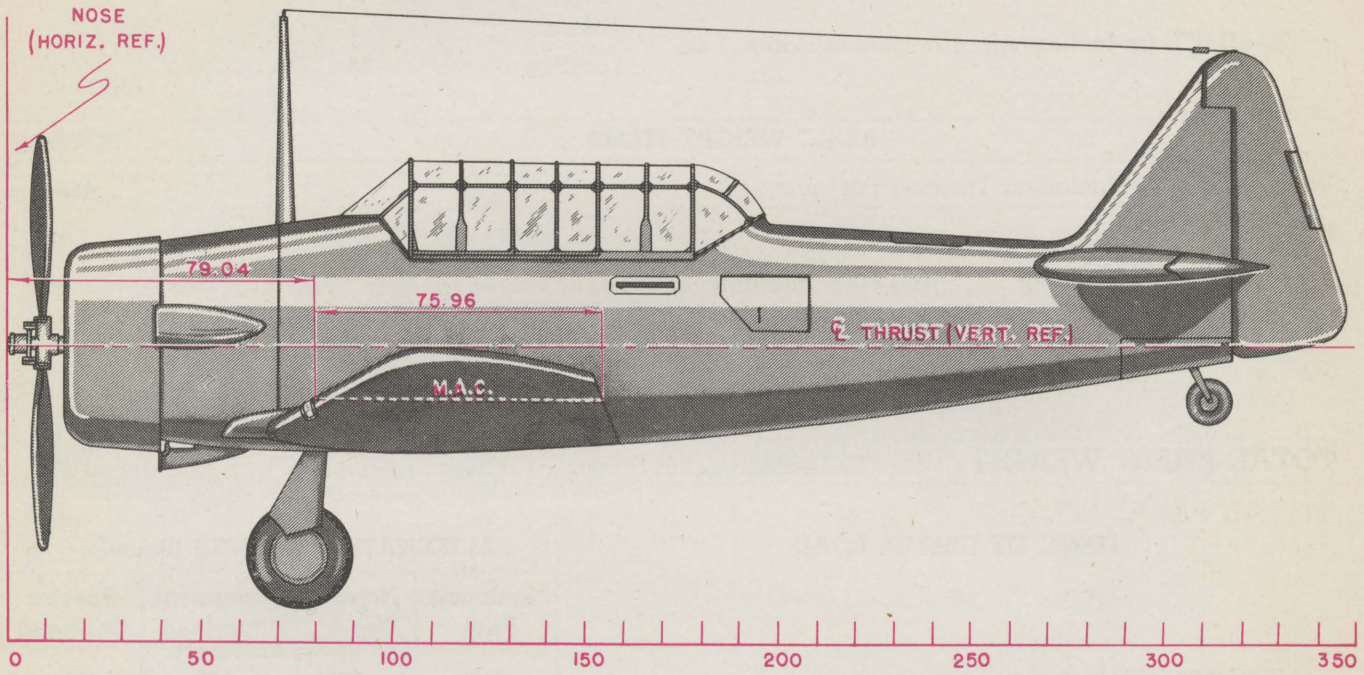
BASIC WEIGHT ITEMS		POUNDS
WEIGHT EMPTY (Including Trapped Fuel and Oil)		**4150**
EQUIPMENT: Oxygen **5** lbs.		**10**
Armament:	Fixed Gun Installations: **(Two) 30** cal. **55** lb.; Gun Sight **3** lb.	**60**
	Flexible Gun Installation: **(One) 30** cal. **45** lb.	**50**
Radio Models:	Command Set SCR-AL-183; Interphone RC-27 (Included in weight empty)	
TOTAL BASIC WEIGHT	(CG **95.4** Inches Aft of Reference Datum Line)	**4300**

ITEMS OF USEFUL LOAD	ALTERNATE LOADINGS (Pounds)			
	Maximum Fuel	Normal Gross*	Armament Overload	Special Overload*
PILOT (200 lb. Including Parachute)	**200**	**200**	**200**	**200**
CREW (200 lb. Including Parachute)	**200**	**200**	**200**	**200**
BAGGAGE (**100** lb. Maximum)				
FUEL (6 lb./U.S. Gal. or 7.2 lb./Imp. Gal.): U.S. Gal. **111** (Imp. Gal. **91**)	**670**	**670**	**670**	**670**
OIL (7.5 lb./U.S. Gal. or 9 lb./Imp. Gal.): U. S. Gal **10** (Imp. Gal. **9**)	**80**	**80**	**80**	**80**
BOMB INSTALLATIONS: (**2**) External at **259** lb. each			**520**	
AMMUNITION: (**1000**) Rounds of **30** cal.			**70**	
GUN CAMERA W-7			**20**	
CAMERA K3B Installation with extra magazine				**90**
OXYGEN INSTALLATION				**30**
GROSS WEIGHT	**5500**	**5300**	**6100**	**5600**
Distance (in Inches) That CG Is Aft of Reference Datum Line	**99.1**	**98.7**	**99.9**	**100.2**

*This condition does not include armament and oxygen equipment included in basic weight.

NOTE: Raising gear moves CG forward 0.27.

AIRPLANE LOADING DIAGRAM



ITEM NO.	ITEM	WEIGHT (LBS.)	DISTANCE HORIZ. REF.	MOMENT
	WEIGHT EMPTY	4150		+ 393300
1	Front Pilot and Parachute	200	+ 113	+ 22600
2	Rear Pilot and Parachute	200	+ 165	+ 33000
3	Fuel—111 gal.	666	+ 104	+ 69264
4	Oil—10.2 gal.	76	+ 59	+ 4484
5	Fixed Fuse. Gun	29	+ 75	+ 2175
6	Fixed Wing Gun	26	+ 85	+ 2210
7	Flexible Gun	45	+ 193	+ 8685
8	Fixed Fuse. Gun Ammunition	13	+ 75	+ 975
9	Fixed Wing Gun Ammunition	16	+ 83	+ 1328
10	Flexible Gun Ammunition	33	+ 180	+ 5940
11	20-lb. Bomb Installation	227	+ 106	+ 24062
12	30-lb. Bomb Installation	327	+ 107	+ 34989
13	100-lb. Bomb Installation	517	+ 105	+ 54285
14	Baggage Compartment, 100-lb. Cap.		+ 206	
15	Wing Gun Camera	17	+ 80	+ 1360
16	Camera, Type K-3B and Instal.	73	+ 190	+ 13870
17	Magazine, Extra Loaded	17	+ 193	+ 3281
18	Oxygen Bottle Installation	27	+ 215	+ 5805

NOTE: This diagram is applicable to airplanes up to and including Block No. 15-NT excepting ski equipped airplanes.

WINTERIZATION WEIGHT AND BALANCE CHART

AIRPLANE MODELS: **AT-6C** and **SNJ-4**

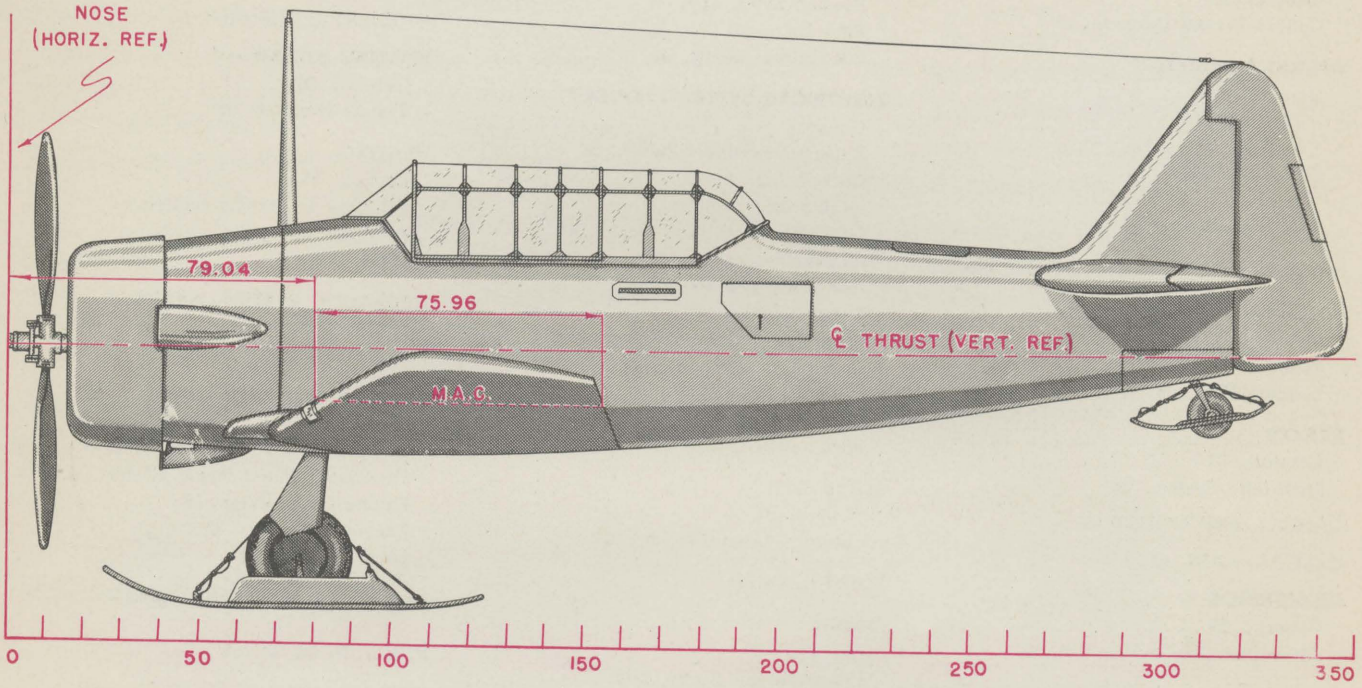
	CONDITION	FORWARD	AFT
CG LIMITS (in Inches) Aft of Reference Datum Line	Take-off		**100.7**
	Landing	**95**	

BASIC WEIGHT ITEMS			POUNDS
WEIGHT EMPTY (Including Trapped Fuel and Oil)			**4564**
EQUIPMENT:	Oxygen **5** lbs.		**10**
	Armament:	Fixed Gun Installations: **(Two) 30** cal. **55** lb.; Gun Sight **3** lb.	**60**
		Flexible Gun Installation: **(One) 30** cal. **45** lb.	**45**
	Radio Models:	Command Set SCR-AL-183; Interphone RC-27 (Included in weight empty)	
TOTAL BASIC WEIGHT	(CG **93.5** Inches Aft of Reference Datum Line)		**4700**

ITEMS OF USEFUL LOAD	ALTERNATE LOADINGS (Pounds)			
	Maximum Fuel	Normal Gross*	Armament Overload	Special Overload
PILOT (200 lb. Including Parachute)	**200**	**200**	**200**	**200**
CREW (200 lb. Including Parachute)	**200**	**200**	**200**	**200**
BAGGAGE (**100** lb. Maximum)				
FUEL (6 lb./U.S. Gal. or 7.2 lb./Imp. Gal.): U.S. Gal. **111** (Imp. Gal. **91**)	**670**	**670**	**670**	**670**
OIL (7.5 lb./U.S. Gal. or 9 lb./Imp. Gal.): U. S. Gal **10** (Imp. Gal. **9**)	**80**	**80**	**80**	**80**
BOMB INSTALLATIONS: (**2**) External at **259** lb. each			**520**	
AMMUNITION: (**1000**) Rounds of **30** cal.			**70**	
GUN CAMERA W-7			**20**	
CAMERA K-313 Installation with extra magazine				**90**
OXYGEN INSTALLATION				**30**
GROSS WEIGHT	**5900**	**5800**	**6500**	**6000**
Distance (in Inches) That CG Is Aft of Reference Datum Line	**97.3**	**96.7**	**98.2**	**99.3**

*NOTE: This condition includes Winterization and Ski Install. but not Armament and Oxygen Equipment.

WINTERIZATION AIRPLANE LOADING DIAGRAM



ITEM NO.	ITEM	WEIGHT (LBS.)	DISTANCE HORIZ. REF.	MOMENT
	WEIGHT EMPTY	4564		+ 422763
1	Front Pilot and Parachute	200	+ 113	+ 22600
2	Rear Pilot and Parachute	200	+ 165	+ 33000
3	Fuel—111 gal.	666	+ 104	+ 69264
4	Oil—10.2 gal.	76	+ 59	+ 4484
5	Fixed Fuse. Gun	29	+ 75	+ 2175
6	Fixed Wing Gun	26	+ 85	+ 2210
7	Flexible Gun	45	+ 193	+ 8685
8	Fixed Fuse. Gun Ammunition	13	+ 75	+ 975
9	Fixed Wing Gun Ammunition	16	+ 83	+ 1328
10	Flexible Gun Ammunition	33	+ 180	+ 5940
11	20-lb. Bomb Installation	227	+ 106	+ 24062
12	30-lb. Bomb Installation	327	+ 107	+ 34989
13	100-lb. Bomb Installation	517	+ 105	+ 54285
14	Baggage Compartment, 100-lb. Cap.		+ 206	
15	Wing Gun Camera	17	+ 80	+ 1360
16	Camera, Type K-3B and Instal.	73	+ 190	+ 13870
17	Magazine, Extra Loaded	17	+ 193	+ 3281
18	Oxygen Bottle Installation	27	+ 215	+ 5805

NOTE: This diagram is applicable to ski equipped airplanes up to and including Block No. 15-NT.

ALPHABETICAL INDEX


SO LONG, FELLOWS, I'LL SEE YOU TOMORROW!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