RESTRICTED

PILOT'S HANDBOOK
MODEL PB2Y-3 FLYING BOAT
U.S. NAVY
CONTRACT 78903

CONSOLIDATED AIRCRAFT CORPORATION

SAN DIEGO, CALIFORNIA

RELEASED BY
BUREAU OF AERONAUTICS
NAVY DEPARTMENT

RESTRICTED

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BY ARTICLE 112 of R.P.S.-6

PILOT'S HANDBOOK

U.S. NAVY

PB2Y-3 AIRPLANE

CONSOLIDATED AIRCRAFT CORPORATION
SAN DIEGO, CALIFORNIA

June 1942

C29-536 7-31-42
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3
3-4 FRONT VIEW OF COMPLETE
AIRPLANE

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SECTION I

INTRODUCTION

A. Purpose

The purpose of this book is to describe briefly the principal operating features of this airplane with which the flight personnel are concerned.

As is customary in multi engined aircraft, the operating duties are divided between the pilot and the flight engineer. With this division of work, it becomes essential for the pilot and flight engineer to coordinate their respective duties at all times for the safe and economical operation of the craft.

The limitations of performance and the operation of the airplane must be fully understood by the entire crew as well as by the pilot and engineer.

B. Scope

This book describes the general arrangement of the airplane and its main operation features. Detailed description and service instructions for various component parts may be found in the Erection and Maintenance Instructions manual and the service data supplied by manufacturers of aircraft equipment.

SECTION II

GENERAL DESCRIPTION OF AIRPLANE

(See Frontispiece for 3/4 Front View)

A. Type

This flying boat is an all-metal, high-wing monoplane, powered by four motors, and is designed for use as a patrol bomber. Accommodations are provided for a crew of 10 men.

The wing is of full cantilever construction, and is made up of one center section and two outer panels. The center panel is secured to the hull, and contains the engine nacelles, the retractable wing flaps, fuel compartments, and bomb bays.

The outer panels contain the ailerons, and the retractable auxiliary floats, which, when in the retracted position, form the wing tips.

Metal bulkheads and stressed metal skin form the wing structure. The ailerons are metal torque box and rib construction, fabric covered.

The hull is of alclad aluminum alloy center keel construction, divided into six main compartments by watertight bulkheads.

The two retractable wing tip floats are of aluminum alloy construction. Each float is divided into three compartments by watertight bulkheads. The floats are interchangeable.

The fixed tail surfaces are of cantilever construction, metal covered. The movable tail surfaces are composed of metal framework, fabric covered.

B. Interior Arrangement

(Ref. Figures 2-1 to 2-13)

The hull is divided into six compartments separated by five main bulkheads. Bulkheads 2, 3, 4, 5, and 6 are fitted with watertight doors in their lower portions.

The nose compartment, forward of Bulkhead 2, has two floor levels. The lower level of the nose compartment is the bomber's station. The forward portion of the upper level contains the bow gun turret. Immediately aft of the turret is the forward part of the flight deck, where the pilot's and co-pilot's stations are located. The pilot's seat and controls are on the port side, and the co-pilot's seat and controls are on the starboard side of the flight deck.

On the after portion of the flight deck, between Bulkheads 2 and 3 are located the Navigator's, Radio Operator's and Flight Engineer's stations.

The portion of the flight deck aft of station 2 is slightly lower than the portion occupied by the pilot and co-pilot. On the starboard side, aft of the pilot and co-pilot and on the lower level, is the radio operator's table and swivel chair. On the port side across from the radio operator's station and also on the lower level, is the navigator's table and stool. Immediately aft of the navigator's station, on the same side, and on the same level, is the flight engineer's station.

Below the flight deck, between Bulkheads 2 and 3 are located the Officer's living quarters.

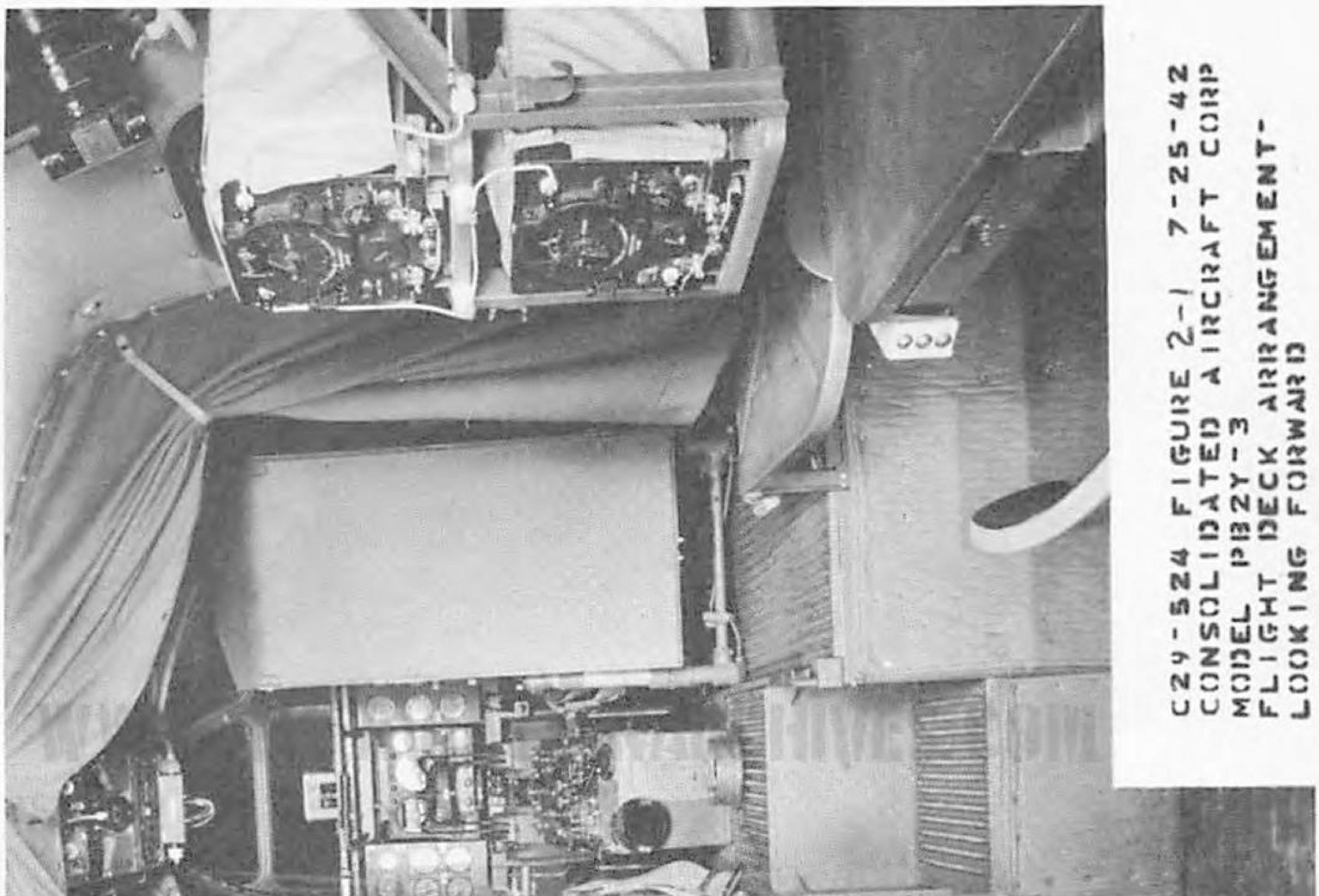
The galley and the main stairway to the flight deck are located between Bulkheads 3 and 4.

Crew bunks are located between Bulkheads 4 and 5, 6 and 7.

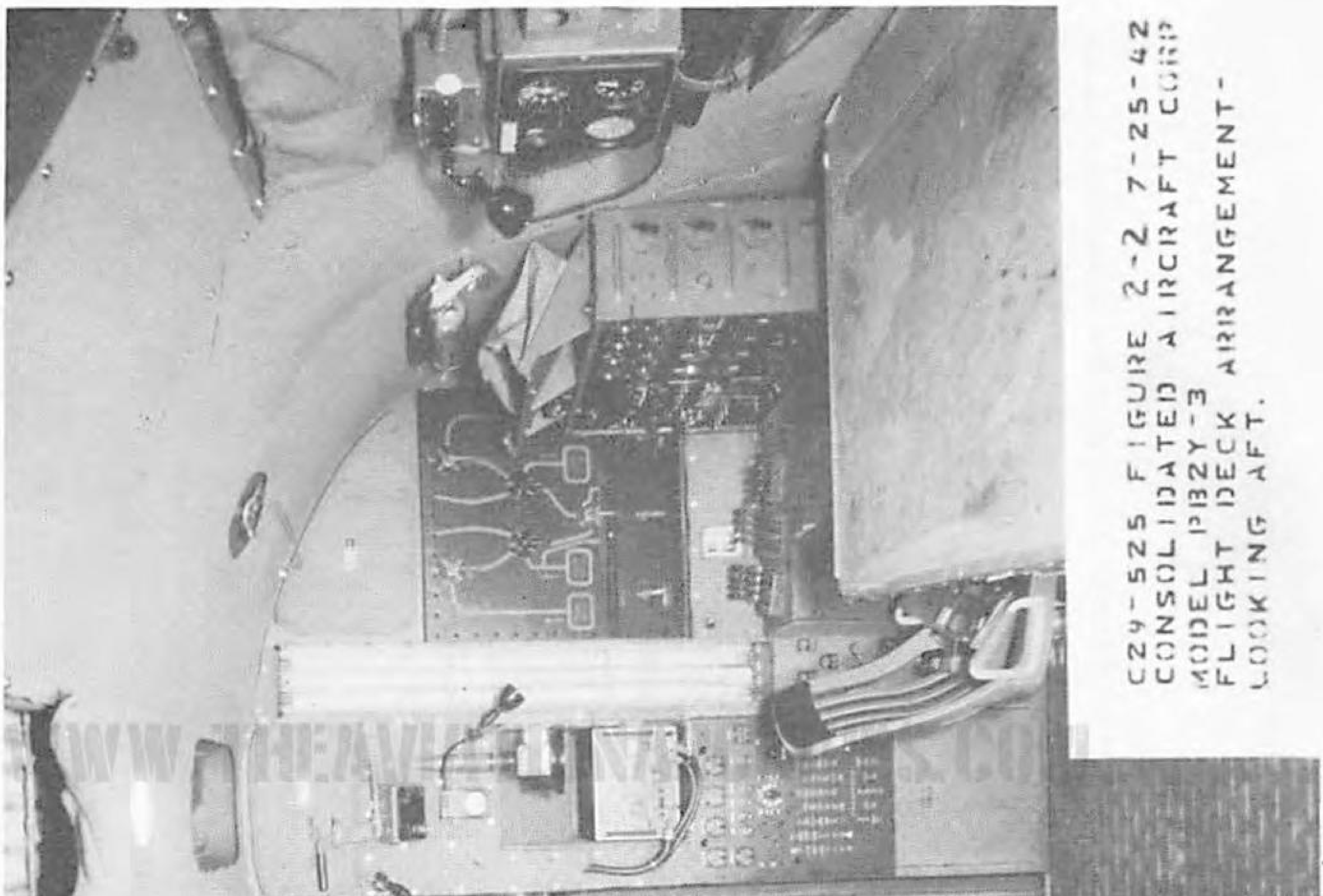
The waist gun stations, the top mid-turret, ammunition and flare stowage and comfort station are located between Bulkheads 5 and 6.

The hull aft from Bulkhead 7 to the tail contains the flare chutes, miscellaneous stowage, and the tail turret.

A diagram showing armor plate sections readily removable during flight is shown as Figure 2-14 of this section.

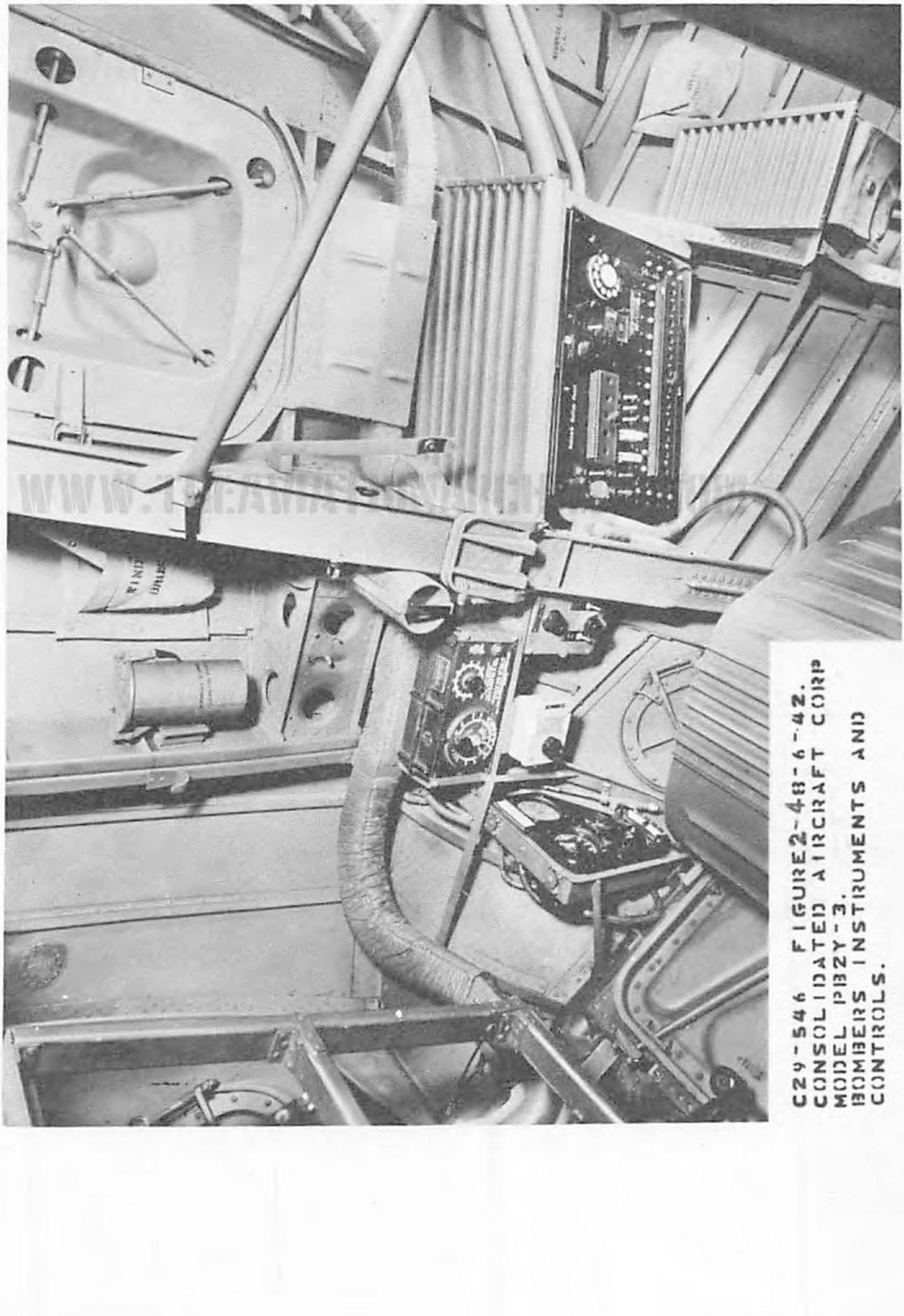


C29-524 FIGURE 2-1 7-25-42
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3
FLIGHT DECK ARRANGEMENT-
LOOKING FORWARD



C29-525 FIGURE 2-2 7-25-42
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3
FLIGHT DECK ARRANGEMENT-
LOOKING AFT.

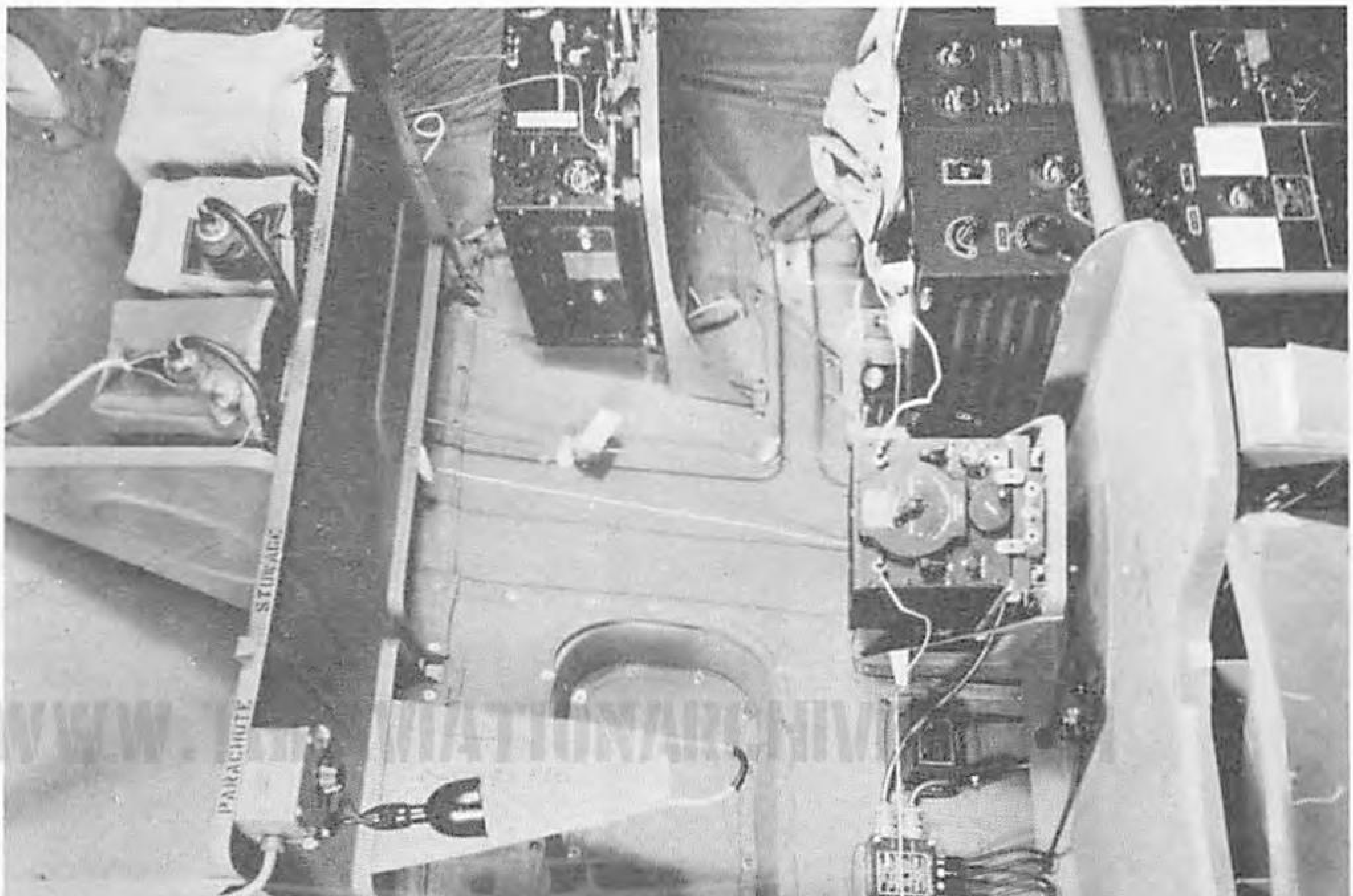
CZ9-551 FIGURE 2-38-6-42.
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3.
VIEW FROM BLKHD 2.0-
LOOKING FORWARD



C29-546 FIGURE 2-48-6-42.
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3.
BOMBERS INSTRUMENTS AND
CONTROLS.

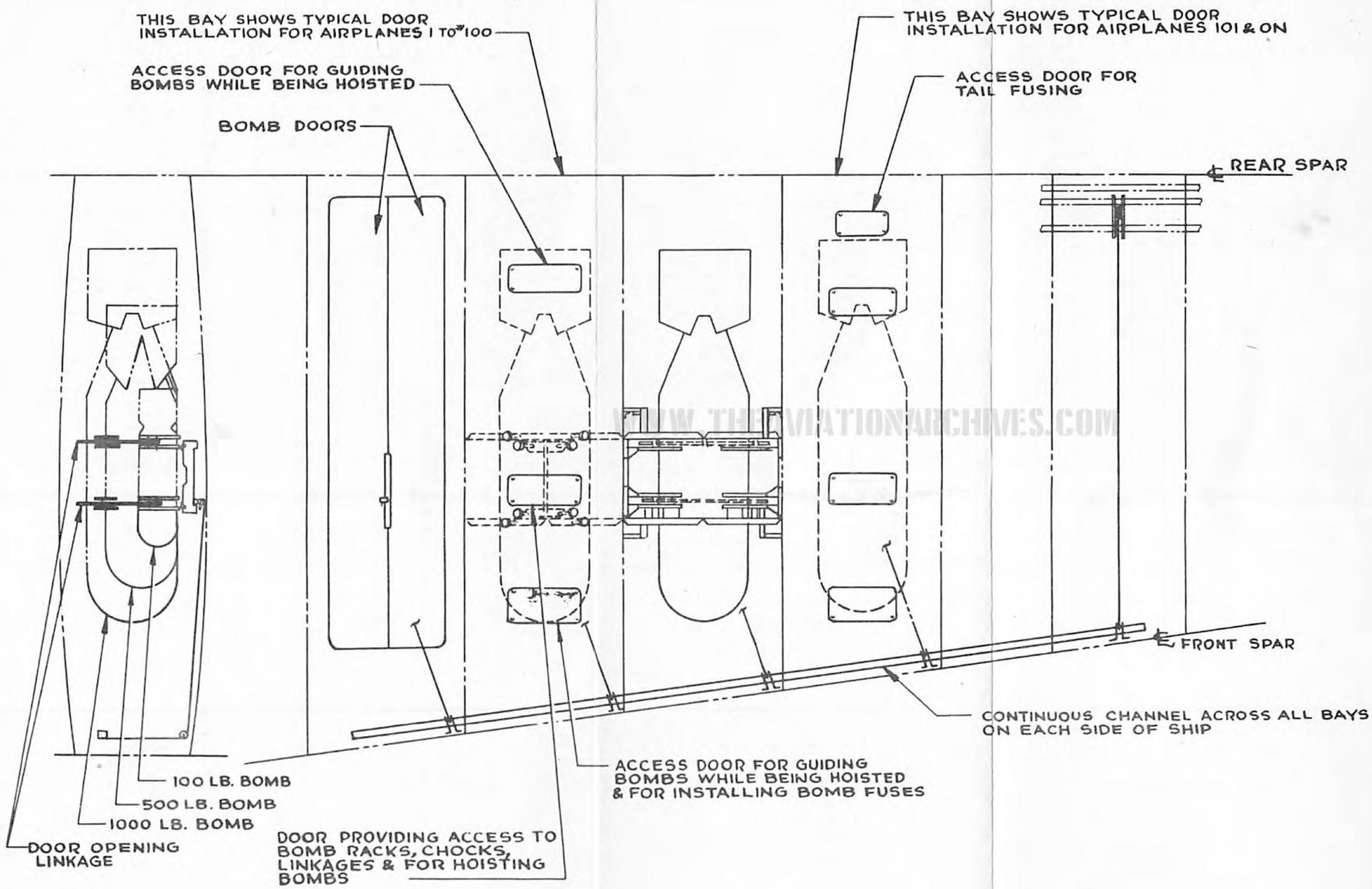
C29-560 FIGURE 2-5 8-6-42.
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3.
GALLEY EQUIPMENT FORWARD
OF BLKHD 4.0-STARBOARD
SIDE.

C29-542 FIGURE 2-6 8-6-42
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3.
NAVIGATORS STATION.



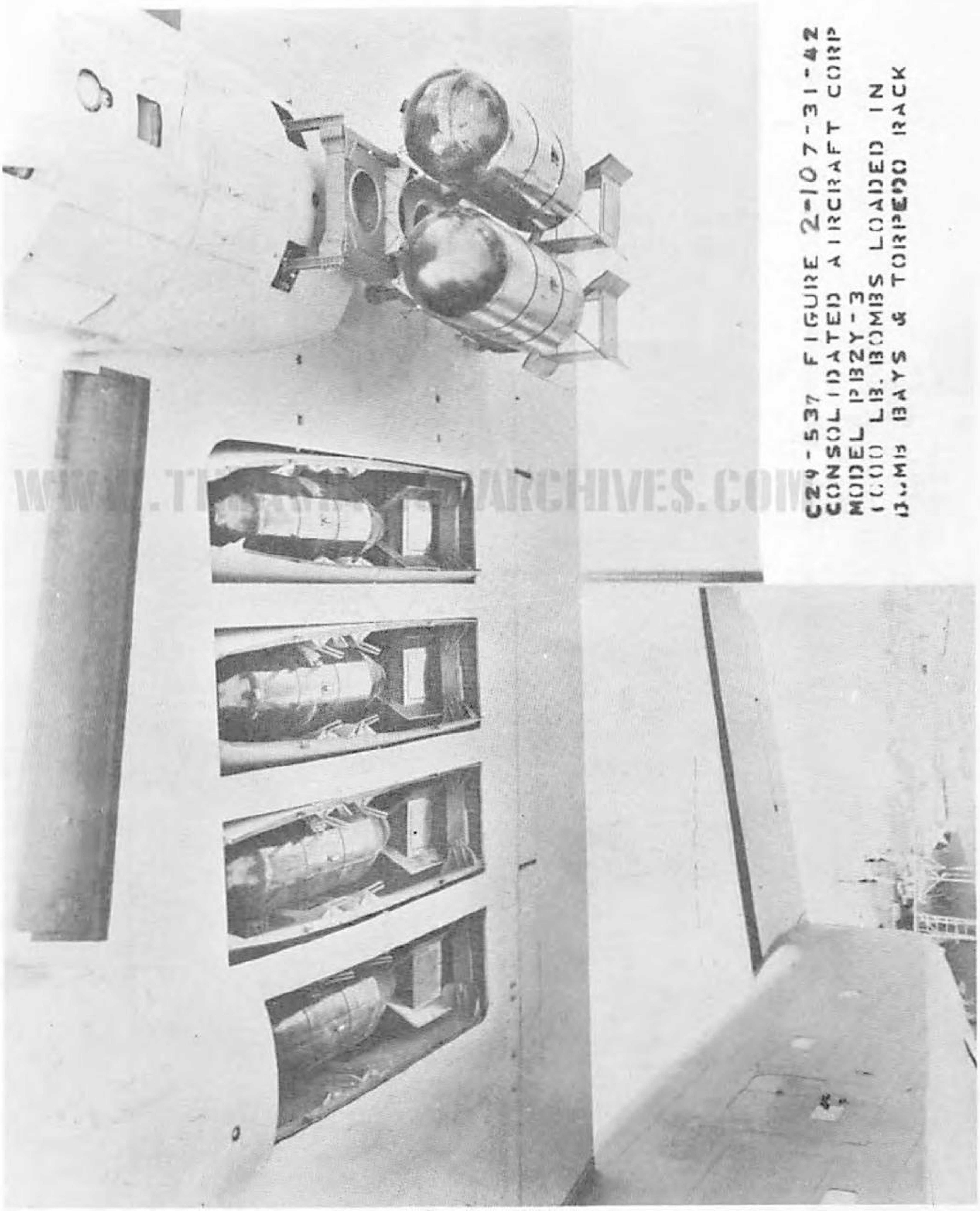
C29-541 FIGURE 2-7 8-6-42
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3
RADIO EQUIPMENT AT
OPERATORS TABLE

C29-534 FIGURE 2-8 7-25-42
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3
RADIO EQUIPMENT AFT OF
OPERATOR'S TABLE ON FLIGHT
DECK

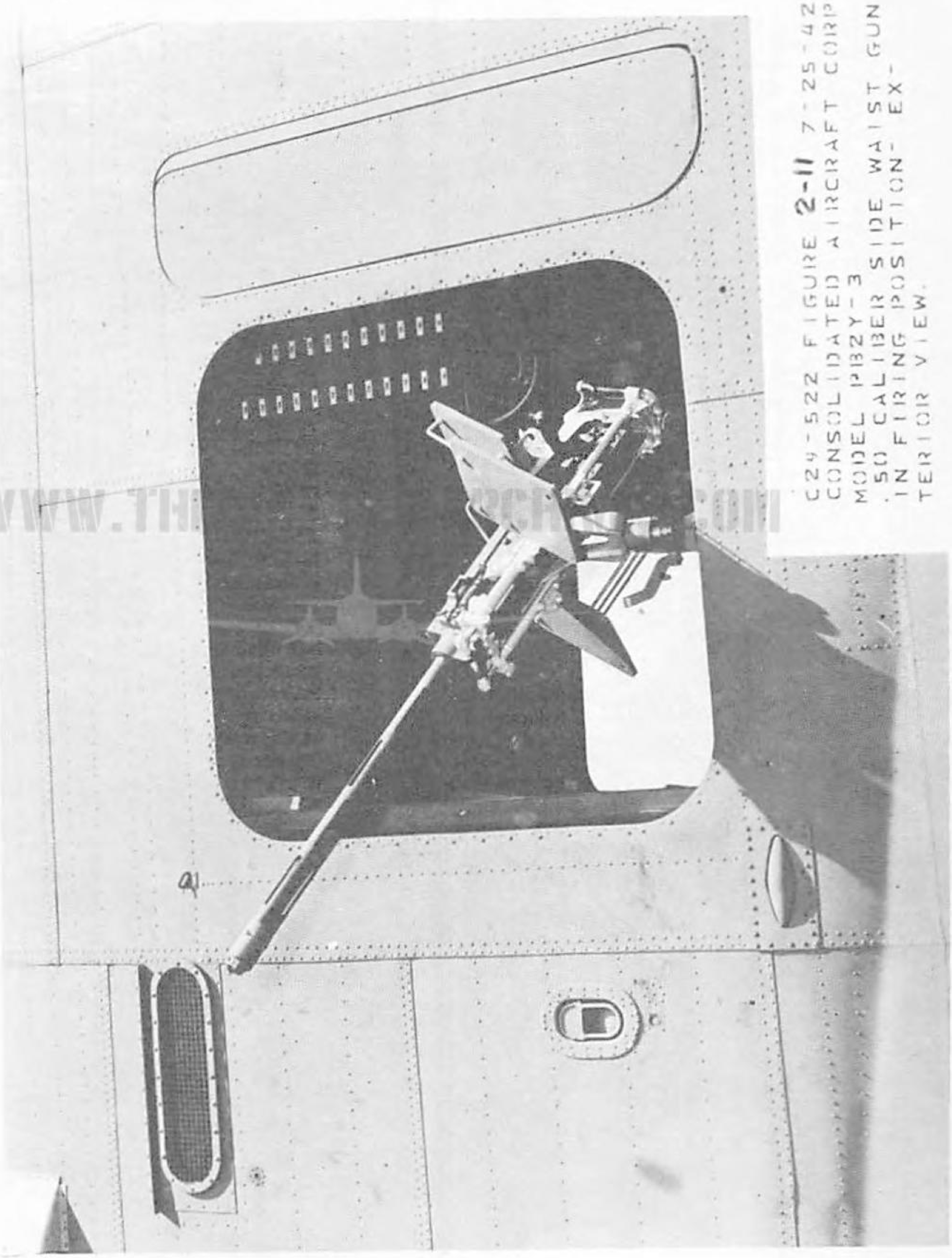


REFER TO C.A.C. DWG. 29A3099

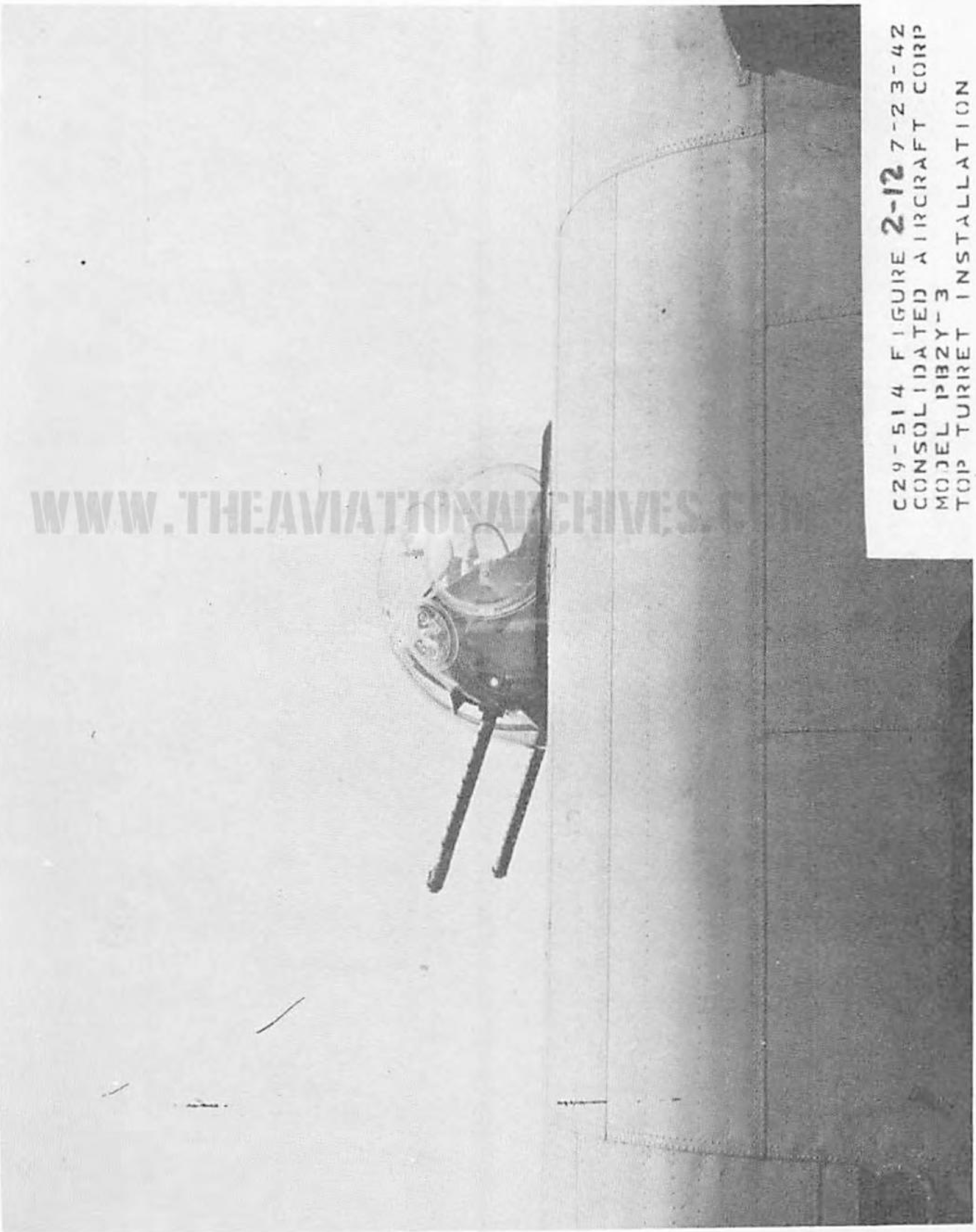
FIGURE 2-9
TYPICAL VIEW OF BOMB BAYS



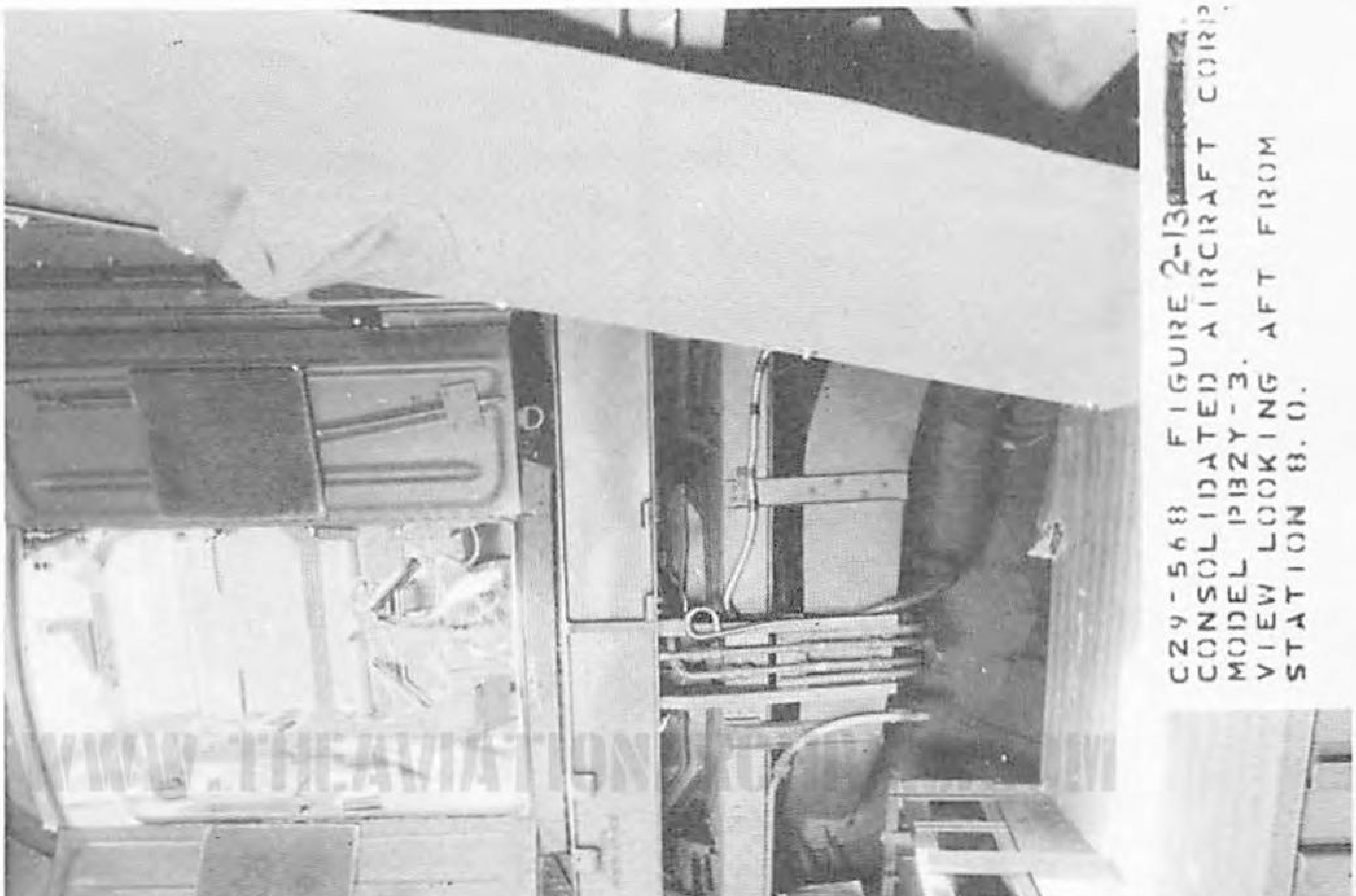
CZ9-537 FIGURE 2-107-31-42
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3
1000 LB. BOMBS LOADED IN
BOMB BAYS & TORPEDO RACK



C24-522 FIGURE 2-11 7-25-42
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3
.50 CALIBER SIDE WAIST GUN
IN FIRING POSITION- EX-
TERIOR VIEW.



C29-514 FIGURE 2-12 7-23-42
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3
TOP TURRET INSTALLATION


C29-568 FIGURE 2-13 [redacted]
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3.
VIEW LOOKING AFT FROM
STATION 8.0.

KEY TO ARMOR PLATE REMOVAL

① UNSCREW TWO HAND BOLTS AT BULKHEAD SUPPORT UNSCREW FOUR HAND BOLTS AT BASE OF ARMOR.

② ③ REMOVE THREE AN4-12 BOLTS FROM EACH SIDE OF CO-PILOT'S & PILOT'S ARMOR.

④ LOOSEN TWO AN350-4 WING NUTS & DOGS AT EACH END OF ARMOR PLATE & LIFT ARMOR FROM LOWER CHANNEL

⑤ ⑥ REMOVE AN6-13A BOLTS & CLIPS (L&R) ON TWO LOWER ARMOR PLATES. REMOVE AN4-6A BOLTS & SUPPORT ROD CLAMPS (L&R). REMOVE TWO AN73-6A BOLTS FROM SUPPORTING ANGLE - BOTTOM OF TOP PLATE.

⑦ REMOVE FOUR AN3-6A BOLTS FROM ARMOR SPLASH GUARD. REMOVE GUARD & SLIDE ARMOR INBOARD. IF ARMOR BINDS, REMOVE LOWER CHANNEL.

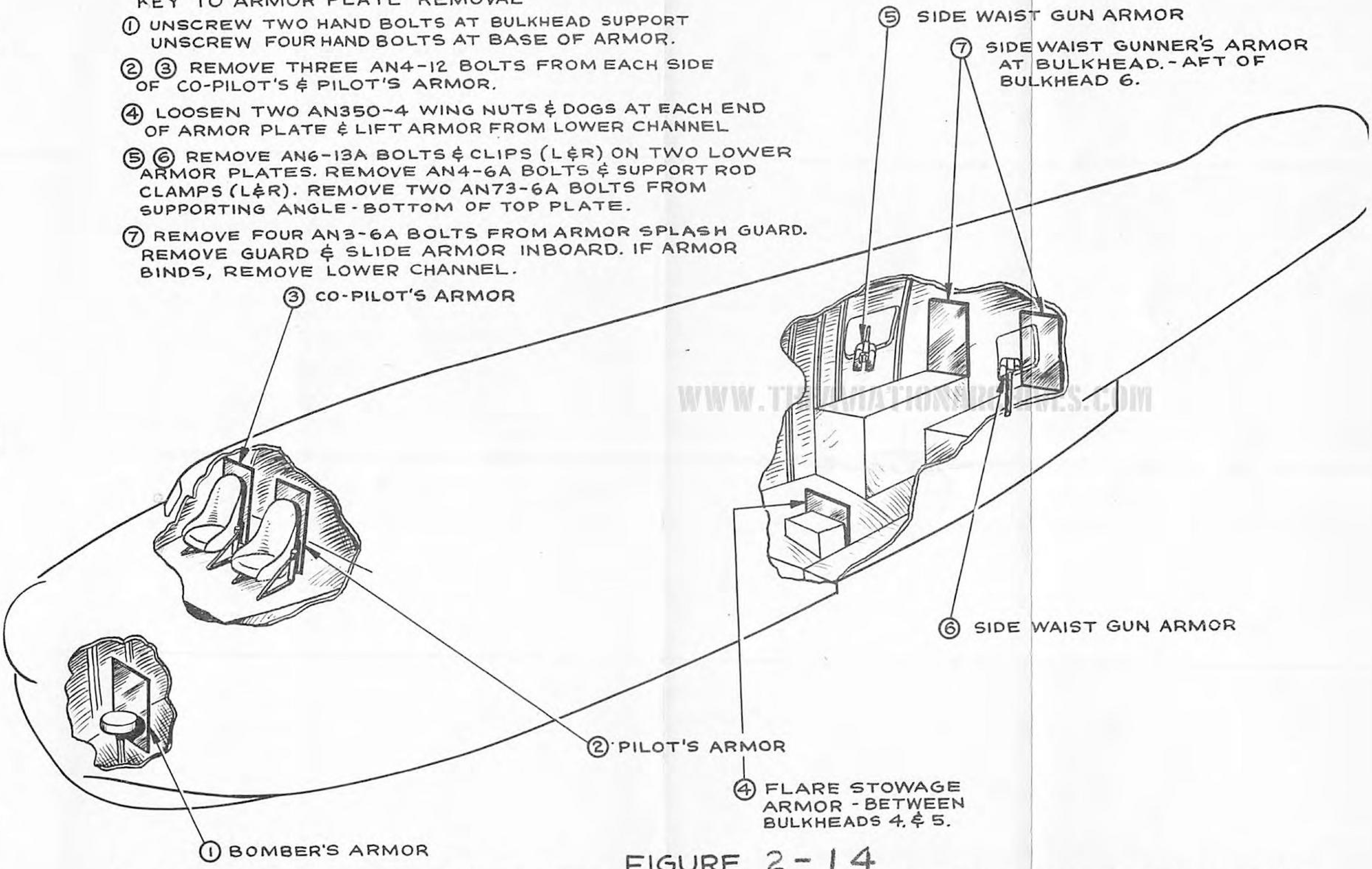


FIGURE 2-14

ARMOR PLATE SECTIONS READILY REMOVABLE DURING FLIGHT

SECTION III

COMPARTMENT ARRANGEMENT AND CONTROLS

A. Flight Controls

1. General Description (Ref. Figures 3-1,3-2,3-3,3-4)

The flight controls are the conventional dual type, with the pilot's controls on the port side of the flight deck and the co-pilot's controls on the starboard side. Elevators and ailerons are controlled by wheel assemblies mounted on rollers, which travel on tracks located at the back of the main instrument panel. This arrangement makes possible the use of the conventional surface control motions, yet eliminates the need for a control yoke across the pilot's compartment.

The two sets of rudder pedals slide in tracks on the floor, and each set is adjustable for leg length by means of adjusting levers on the outboard sides of each pair of pedals.

A control pedestal, located in the center of the cockpit floor, just forward of the pilot's and co-pilot's seats, provides a mounting for the elevator, aileron, and rudder trim tab controls, as well as for various electrical switches and controls.

2. Elevator Tab Controls

The elevator tabs are controlled by small wheels on either side of the pilot's pedestal. The degree of movement of the tabs up or down is indicated on fixed calibrated rings which encircle the wheels and are attached to the sides of the pedestal. The wheels are turned forward - toward the nose of the ship - for nose down, and aft - toward the pilots' seats for nose up.

3. Aileron Tab Controls (Ref. Figures 3-3, 3-4)

The aileron tab is in the starboard aileron. Its movement is controlled by a small hand wheel on the left hand side of the aft end of the pilot's pedestal. The movement of the wheel is clockwise to lower the right wing and counter-clockwise to raise the right wing. A position indicator is attached to the control wheel.

A fixed tab is installed on the port aileron. This tab when once set, retains its position permanently.

4. Rudder Tab Controls (Ref. Figures 3-3, 3-4)

The rudder tabs are controlled by a small crank on the top of the pilot's pedestal, on the right hand side. Turning the crank to the right trims the ship to the right. Turning the crank to the left trims the ship to the left. Degree of setting is indicated on a calibrated ring similar to the elevator tab position indicator.

5. Wing Flap Controls (Ref. Figures 3-4, 4-3)

The wing flaps are operated electrically. They are controlled by a toggle switch on the left-hand side of the pilot's pedestal and a similar switch on the flight engineer's instrument panel. The pilot's switch is the master switch of the system and overrides the flight engineer's control switch. Movement of the flaps up or down is started by placing the switch in either "FLAPS UP" or "FLAPS DOWN" position. Movement in either direction is halted when the switch is placed in neutral position.

A flap position indicator is located on the left side of the main instrument panel. A red "FLAPS UP" warning light on the flight engineer's panel flashes whenever the throttles are closed while the flaps are up.

CAUTION: Do not start to lower flaps at speeds above 130 knots. DO NOT EXCEED 110 KNOTS WITH FLAPS FULLY EXTENDED. When Mark 15 destroyer type torpedoes are carried, do not lower flaps below 25°.

6. Controls Lock (Ref. Figure 3-1)

A locking arm, pivoted at a point beneath the pilots' instrument panel, and latched in stowed position, locks the rudders when it is swung aft toward the pilot's seat. The lever stowage latch is released by means of control lock stowage knobs on the pilot's instrument panel. Care should be taken to see that the rudders are in neutral position before pulling the locking lever aft. A slight motion of the rudder pedals, at the time of locking will assist the lockpin in the empennage to seat properly.

The elevators and ailerons are locked by strapping the pilot's control wheel to the rudder locking lever after the rudders are secured.

7. Sperry Gyro-Pilot (Ref. Figures 3-1, 3-2)

The controls for the Sperry gyro-pilot

system are located on the pilots' instrument panel. Full instructions for operating the automatic pilot system are contained in the Sperry instruction manual, stowed in the manuals box.

B. Power Plant Controls (Ref. Figures 3-3, 4-3, 4-6)

The power plant controls consist of the throttles; mixture controls; supercharger controls; carburetor preheater controls; propeller switches; cowl flap switches; master, starter, and ignition switches; booster pump switches; primer solenoid switches; oil dilution switches; sight gage shut-off valves, and fuel crossover valves. The controls are divided between the pilot's and flight engineer's stations.

The throttle levers, ignition switches, master switch, and propeller governor and feathering switches are on the pilot's pedestal.

The carburetor air, mixture, and supercharger shift levers are mounted on the engineer's table.

The engine starter, primer, fuel booster pump, cowl flaps, and a set of propeller control switches are on the engineer's instrument panel.

C. Propeller Controls (Ref. Figures 3-4, 4-1, 4-3)

The propellers are Curtiss electric fast-feathering type with automatic synchronizer and speed control. The two inboard propellers may be reversed.

Controls for the propellers are located on the pilot's control pedestal and the flight engineer's instrument panel.

Further information, and a propeller operation check-off list are contained in Section IV of this handbook.

D. Auxiliary Controls

1. Auxiliary Power Plant

The starter and ignition switches for the auxiliary electric power unit are located on the flight engineer's instrument panel.

2. Rudder Pedals

The rudder pedals are adjustable fore and aft within a range of six inches. A lever on the left side of each pedal is pushed to the left with the foot to release the pedal for adjustment. When released the pedals are automatically moved aft by springs. Forward adjustment is obtained by pressing forward against the spring with the foot.

3. Seats

a. Pilots' Seats

The pilots' seats may be adjusted fore and aft as well as vertically. The backs may be tilted. These adjustments are made by means of levers on the seats.

b. Navigator's Stool

The navigator's stool is not adjustable for height, nor does it swivel. It is normally secured to the floor by means of three spring clips under three plates at the bottoms of the stool legs, but the stool may be detached from these plates by sliding outboard a few inches, until the legs are free of the plates.

c. Flight Engineer's Seat

The flight engineer's seat is a swivel chair, with the supporting pedestal fixed to the floor.

d. Radio Operator's Seat

The radio operator's seat is of the same type as the flight engineer's seat.

e. Bomber's Seat

The bomber's seat is a swivel stool which can be adjusted vertically by means of a lever at the base of the stool.

4. Wing Tip Floats

The wing tip floats are operated electrically, with controls on the pilot's pedestal and on the flight engineer's instrument panel. Each set of controls consists of two push-pull knobs - one for "FLOATS UP" and the other for "FLOATS DOWN". Once the "UP" or "DOWN" knob, has been pushed, the floats will continue to retract or extend until they are locked at the end of their travel. The movement may be stopped at any time by pulling out the knob that has been pushed in. The movement may be reversed by pushing in on the other knob. The pilot's float control switches are the master switches of the system, and override the flight engineer's control switches.

For manual operation a gear box and crank are installed on the front face of Bulkhead 3, near the centerline of the airplane. There is a shift rod to the right of the crank and a position indicator to the right of this shift rod. During normal operation the shift rod remains in a position so that the indicator reads "ELECTRIC MOTOR DRIVE". For manual operation the shift rod is pulled out untilthe indicator reads "LIGHT LOADS", or "HEAVY LOADS", as may be desired. The selection of gear ratios for light or heavy loads is to be determined by the amount of effort needed to raise or lower the floats until they are latched in position. Raising or lowering floats at speeds above 160 knots is not recommended.

5. Electric Switches (Ref. Figures 3-4, 3-8, 4-3)

The master electrical switches which control distribution of power in the airplane are to the left of the engineer's station, on the forward face of

Bulkhead 3.

The following switches are located on the pilot's pedestal:

4 Propeller safety switches.

4 Propeller control selector switches.

2 Propeller booster switches.

1 Master and 4 individual ignition switches.

1 Propeller reverse power switch.

2 Propeller pitch reversing switches.

1 Propeller control change-over switch.

2 Torpedo release circuit switches.

2 Electric receptacle switches.

1 Wing flap control switch.

2 Float control switches.

1 Master R.P.M. regulator.

1 Compass light rheostat.

1 Float check switch.

2 Landing light switches.

2 Section light switches.

1 Anchor light switch.

2 Running light switches.

2 Formation light switches.

1 Alarm bell push button.

2 Flare release switches.

1 Bomb-Torpedo release selector switch.

Pilot Director Indicator and AFC control and light switches.

4 Circuit breaker reset buttons.

The switches on the flight engineer's panel include: Propeller pitch control switches; master synchronizer unit switch; RPM regulator; main engine starter, primer, and booster pump switches; auxiliary power plant starter and ignition switches; pitot static tube heater switch; wing flap and float switches; engine cowl flap switches; propeller anti-icer rheostat; primer, oil dilution and table light switches.

The main power distribution panel contains the circuit breaker reset buttons for all circuits; the main generator and battery line switches; generator voltmeter switch; inverter switch; panel light switch and rheostat; emergency light switch; and receptacle switch.

Switches controlling the various items of communications and direction finding equipment are located on the radio operator's panels.

There is a control switch on each interphone station box, located at every crew station. The pilot's interphone remote controls and GF radio controls are on the ceiling of the pilots' compartment. They operate the interphone and GF transmitter equipment on the radio operator's table.

A recognition light switch box and key is located on the side of the hull to the right of the co-pilot's seat.

6. Fuel Dump and Dilution Controls (Ref. Figures 3-7, 3-11)

For the emergency dumping of fuel from the outboard wing tanks, a dump valve and purging system is provided. The controls consist of two dump duct and three vapor dilution system pull handles mounted, with identifying nameplates, on the front face of Bulkhead 3.

The two upper handles open the emergency dump valves. The valves close automatically when the handles are released.

The three lower handles control the duct purging and fuel tank dilution system. After fuel has been dumped and the ducts closed the purging and dilution handles must be turned, then pulled, to dilute the fuel tanks and purge the dump ducts with carbon dioxide gas.

7. Fuel Cross-Over and Drain Valves (Ref. Figures 4-2, 4-4)

Any one of the four wing tanks may be used to supply fuel to any one of the four engines; or any one tank may be filled with fuel from any of the other three tanks; or any single tank or combination of tanks may be drained or refueled by means of the selector valves contained in the fuel units box. The fuel units box is located on the front face of Bulkhead 3. A flow diagram, of lines connecting the engines, tanks and selector valves, is painted in red lacquer on the front panel of the fuel units box.

CAUTION: Never open lines between tanks or cells while engines are running. Inadvertent transfer of fuel to a tank or cell already full might cause tank or fuel lines to blow out.

8. Fuel Sight Gage Shut-Off Valves (Ref. Figures 3-7, 4-4)

Fuel sight gage shut-off valves are located above the dump and purging valves, on Bulkhead 3.

9. Heating System

The heating system consists of two Stewart-Warner #782-B 80,000 BTU central heater units, and a single Stewart-Warner #789, 8,000 BTU heater unit. One of the central heater units is installed on the starboard side of the bomber's compartment. The heated air is distributed by suitable ducting, which includes provision for defrosting the pilot's and co-pilot's windshields and the bomber's window. A butterfly valve with a Shakespeare cable control provides for optional use of the pilot's and co-pilot's windshield defroster and/or foot warmer outlets.

The aft central unit is located between stations 5 and 6 on the starboard side, and provides heat for the crew quarters, comfort station, side and top gun stations. An additional duct supplies warm air to canvas enclosures around the auxiliary power unit oil tank, the 20-gallon water storage tank and the emergency water tanks to prevent thickening of the oil and freezing of the water. This heater, through a special disposable duct system is also used for preheating the engines in cold weather. Air-fuel mixture for the tail turret heater is supplied by the mixture blower of the aft central heater. The tail turret heater supplies hot air to a defroster which is provided for the bullet-proof rear window of the tail turret.

10. Ventilating System

A fresh-air ventilating system for the flight deck and officers' quarters is provided. Air is taken in from behind the bow turret and distributed by ducts. Duct outlets are opened and closed by controls provided at the outlets.

In addition to the outside air system, the heating systems may be operated as forced air ventilating systems by running the central heater blowers with the heat turned off.

11. Wing and Tail De-Icer Controls

The wing and tail de-icer system control consists of apush-pull handle located just below the fuel valves panel, on Bulkhead 3.

12. Propeller Anti-Icer Controls

The propeller anti-icer fluid pumps are controlled by a rheostat on the engineer's instrument panel.

13. Windshield Wiper and Cleaning Spray

The pilot's and co-pilot's windshields have electrically driven wipers. The windshields and the bomber's plate-glass sighting pane are provided with facilities for spraying with an alcohol solution for clearing the glass of ice or salt spray.

A six gallon tank holds the cleaning solution, which is sprayed on the glass by an electrically driven pump. The co-pilot and the bomber have control valves at their respective stations which turn the spray on and off. The electric pump starts automatically as the valves are turned on or off. The co-pilot has the control valves for both windshields. He may shut off his windshield spray without affecting the spray for the pilot's windshield or bomber's window. The purpose of the co-pilot's shut-off valve is to make more fluid available to the pilot and bomber when the supply in the tank is low.

The windshield wipers operate independently of the spray device, being driven by a separate electric motor.

The control panel for the wiper is on the starboard side of the instrument panel, and incorporates two toggle switches, one for "on-off" and the other for "fast " or "slow" windshield wiper speed.

The "on-off" switch incorporates a circuit breaker which turns the switch to "off" position, stopping the motor in case of overloading. However, in an emergency the wiper motor will continue to operate if the toggle switch is manually held to the "on" position.

Extreme overloading will cause a circuit breaker on the main Distribution Panel to operate. If this occurs the trouble should be investigated and corrected before resetting circuit breaker.

Note: The electrically driven windshield wipers (Acrotorque System) have been temporarily eliminated from this airplane, however, provisions for subsequent installations have been made, i.e. proper holes drilled.

An anti-icer fluid spray system has been substituted temporarily. This consists of a hand pump located directly below the pilot's instrument panel on the port side. The pump is mounted on a panel marked "Left On", "Off", and "Right On". When the pump handle is turned to "Left On" and the pump actuated, anti-icer fluid is sprayed on the pilots' windshield. Likewise fluid may be sprayed on the co-pilot's windshield when the pump handle is turned to "Right On". Both pilot's and co-pilot's windshield may not be sprayed at the same time.

The fluid is obtained from the propeller anti-icer fluid tank.

The bomber's sighting window is wiped by hand. Armholes in the hull are located on either side of the window, which allow the bomber to reach outside and wipe the window with a cleaning brush, which is stowed in a canvas pocket on the starboard side of the bow compartment.

E. Useful Load Installation

1. Bomb Release System

The electrical bomb release system consists chiefly of:

a. A bomber's panel, containing the principle controls, indicator lights and automatic release devices which act in conjunction with the K-2 interval control and the bomb-sight, supplemented by the pilot's switches.

b. Dual release arming circuits to the P4D bomb shackles in the wing and on the torpedo racks and single release and arming circuits to the MK. 42 racks.

c. Single circuits to the indicator light switches in the P4D shackles.

d. Separate dual circuits, which may connect the pilots' firing key to the torpedo shackles, making them operable only by the pilot and co-pilot.

e. A single bomb salvo signal circuit to the photo flash bulb at the stern of the hull.

f. In addition, single circuits are provided terminating at the junction boxes of the main bomb compartments and on the torpedo racks to provide for electrical nose and tail fusing of special bombs.

This system provides for the following methods of bomb release:

a. The release of any single bomb by the use of either of the firing keys.

b. The release of any single bomb by the use of the bomb sight.

c. The release of a manually timed train of any number of bombs, using either of the firing keys.

d. The release of an interval-control timed train of any number of bombs, started by either of the firing keys.

e. The release of an interval-control timed train of any number of bombs started by the bomb-sight.

f. The pilot may release bombs by methods a, c, and d, but only after the bomber has set up the circuit.

g. Only the pilot and co-pilot have complete control of the torpedoes, and may release them singly or both at the same time.

h. In case of an emergency, the pilot may release the entire bomb load in the "SAFE" condition by pulling the emergency salvo release handle located at the base of the pilot's pedestal.

For chart of maximum glide angles permissible for glide bombing, refer to the Erection and Maintenance manual, Section V.

2. Torpedo Directors and Firing Key (Ref. Figures 3-3, 3-4)

Firing of the torpedoes, MK13, 13-1 and MK 15, is controlled by the pilot and co-pilot. The firing key receptacle and torpedo release switches are on the pilot's pedestal. The firing key is stowed in a canvas bag on the port side of the fuselage just aft of the pilot's seat.

The MK28 torpedo directors, when in use, are mounted on a sliding track on top of the pilot's instrument panel, directly in front of the pilot and co-pilot. The torpedo directors are stowed under the navigator's table.

Before firing torpedoes the selector switch on the pilot's pedestal, next to the firing key receptacle must be set for "RELEASE TORPEDOES". Emergency release of torpedoes is accomplished by pulling the emergency salvo release handle at the base of the pilot's pedestal.

Caution: When Mark 15 torpedoes are carried the pilot is urged to check position of torpedo starting lanyard service. See Section V, part 2, d of Erection & Maintenance Instructions for details regarding installation of starting lanyard.

3. Pyrotechnics

a. Parachute Flares

Two parachute flare release tubes are installed in the tail of the airplane, just forward of Bulkhead 3. The release mechanism is actuated by electric solenoids which are controlled by switches on the pilot's pedestal. Flares are stowed on the starboard side, just aft of Bulkhead 5.

b. Signal Pistols

A Mark-8 signal pistol (with adapter sleeve), a cartridge belt, and 24 rounds of ammunition are stowed aft of the pilot. Above the pilot's head is a blast tube through which the pistol is fired.

c. Smoke Grenades

Four H.C. smoke grenades, type M-8 are stowed in the two life rafts, on the starboard side, between Bulkheads 4 and 5.

d. Float Lights

Forty MK 4 aircraft float lights are stowed in a rack under the port waist gun.

4. Communications System (Ref. Figures 2-7, 2-8, 3-6)

a. Interphone

Communication among crew members is carried on by means of the interphone system, with station boxes located at each crew station.

b. Radio System

The main radio transmitter and receiver, DZ direction finder, R.A.X. receiver and other requipment and accessories are mounted at positions convenient to the radio operator.

Intrasquadron communication is carried on by means of the GF/RU, or ATA/RA transmitter and receiver. The main controls for these units are on the radio operator's table; but a duplicate set of controls is mounted on a remote control panel in the ceiling of the pilots' enclosure.

Further information concerning communications equipment is contained in the Erection and Maintenance Instructions.

c. Emergency Signal Equipment

A pair of semaphore signal flags is stowed above the wing, just forward of Bulkhead 4.

For location of Very's pistols, float lights, smoke grenades, etc., see Pyrotechnics, (No. 2 above).

5. Gun Armament

a. Bow Turret

The Martin Type 250 SH-1 bow turret contains twin 50-caliber machine guns and provisions for 800 rounds of ammunition. The turret is spherical in shape, and is suspended in a gimbal ring.

pivoted horizontally, so that the turret will tilt backward and forward. The entire turret assembly rotates in azimuth on a circular track. The turret will tilt backward far enough to allow the guns an elevation of 80° above horizontal. The tilt forward allows the guns to be depressed 33 1/2° below horizontal.

The turret will rotate in azimuth through an arc of 79° either side of the airplane centerline.

The turret is hydraulically actuated. Pressure for the hydraulic system is furnished by an electrically-driven pump, which is included in the power unit assembly.

Azimuth and elevation controls for the turret are on the gun grips. Other turret controls include emergency manual operation controls, shut-off switches, hydraulic valves and gun switches. Instructions for operating and servicing the turret are contained in Appendix II of the airplane Erection and Maintenance Manual.

b. Side Waist Guns

Two 50-caliber machine guns in Bell adapters are swivel-mounted on either side of the hull between Bulkheads 5 and 6. Platforms on which the gunners stand, and suitable safety belts are provided at each gun station. The rectangular gun hatch covers swing inward and latch against the inside of the hull when the guns are in firing position. Provision is made for 400 rounds of ammunition at each gun station.

c. Top Mid-Turret

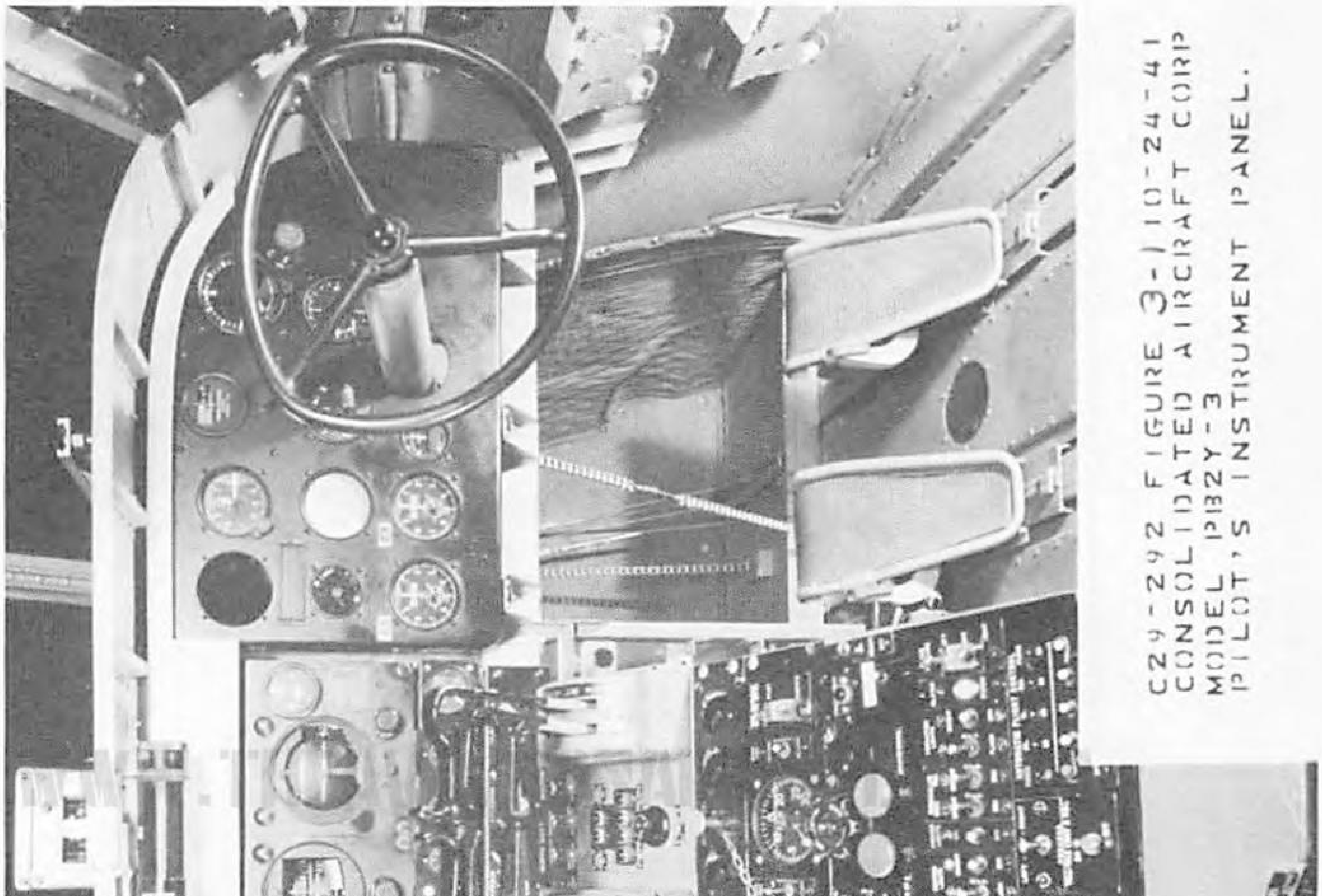
The Martin Type 250-CH top mid-turret contains two 50-caliber machine guns and provisions for 1200 rounds of ammunition. The turret rotates in azimuth, and is slotted to allow for elevation of the guns, which are mounted in Bell adapters.

This turret, like the bow turret, is hydraulically actuated, with its own independent power system, and is provided with emergency manual controls.

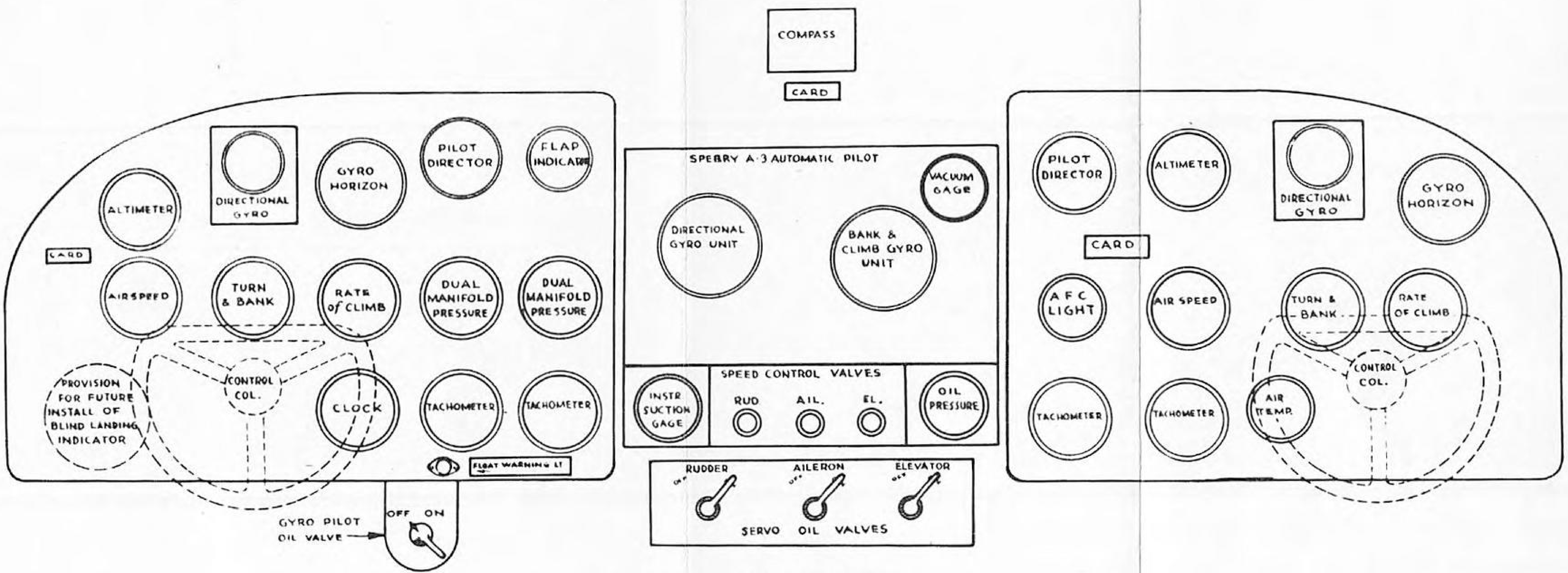
d. Tail Turret

The Consolidated Aircraft Corporation 29F4824 tail turret contains two 50 caliber machine guns, mounted in Edgewater adapters, and has provisions for a MK. 9 illuminated gunsight and for a Model N-4 camera. It is hydraulically actuated. The actuating mechanism is located near the bottom of the turret on the starboard side of the hull.

Ammunition for the tail turret guns is stowed in two boxes on the starboard side of the hull, just aft of bulkhead 8. Two servo feed tracks lead aft from the ammunition boxes to the bottom of the tail turret. The ammunition belts are drawn out of the boxes and fed along the tracks by means of two Martin electric boosters. Two more boosters, one beside each gun, draw the belts up to the guns and feed the ammunition into them. Ammunition capacity of the stowage and feed system is 1000 rounds per gun, including boxes, feed chutes and belts in turret.



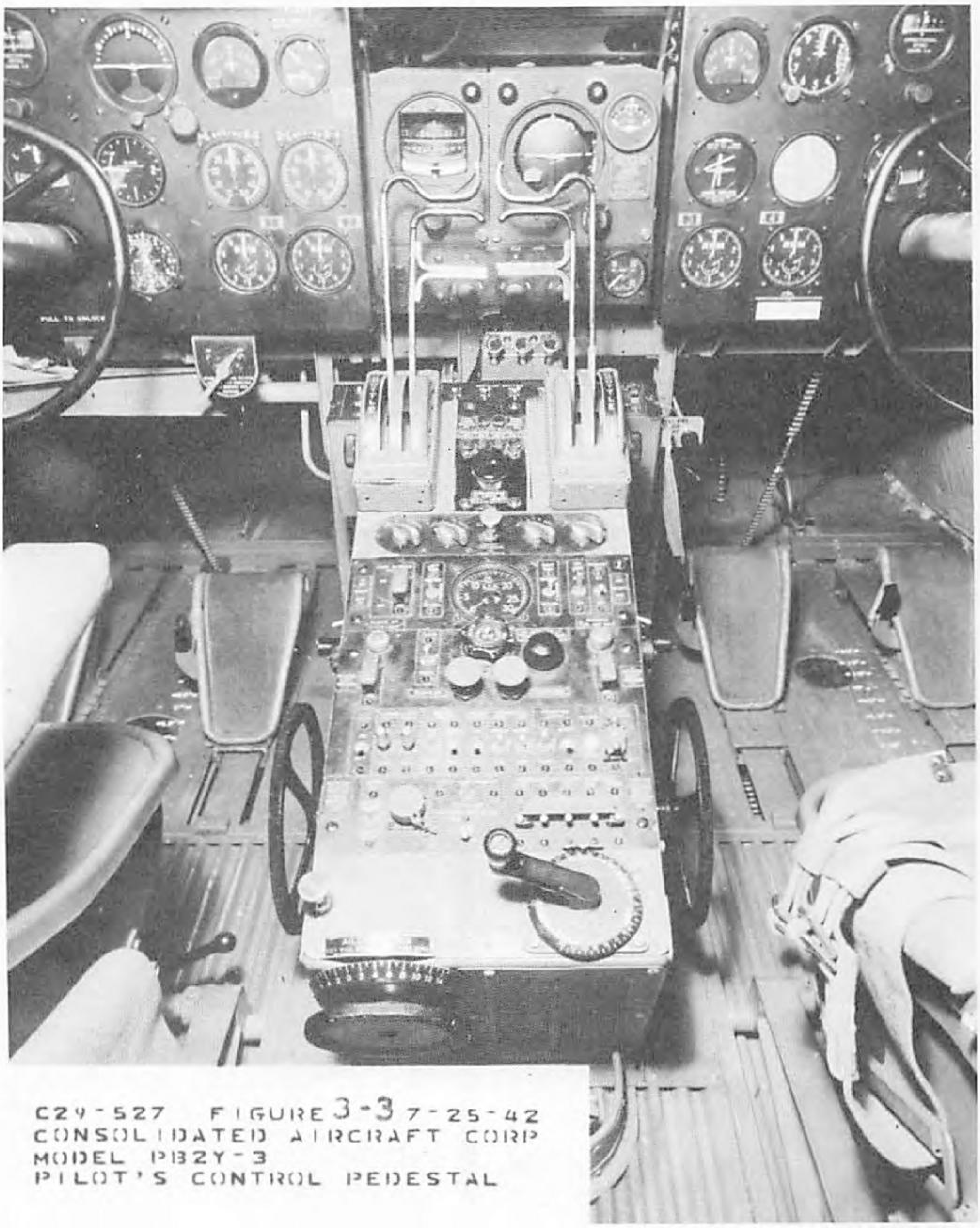
C29-292 FIGURE 3-110-24-41
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3
PILOT'S INSTRUMENT PANEL.



DAY SYSTEM OF
FLIGHT INSTRUMENTS

REFER TO C.A.C. DWG. 29F3010

FIGURE 3 - 2
PILOT'S INSTRUMENT PANEL



C29-527 FIGURE 3-3 7-25-42
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3
PILOT'S CONTROL PEDESTAL

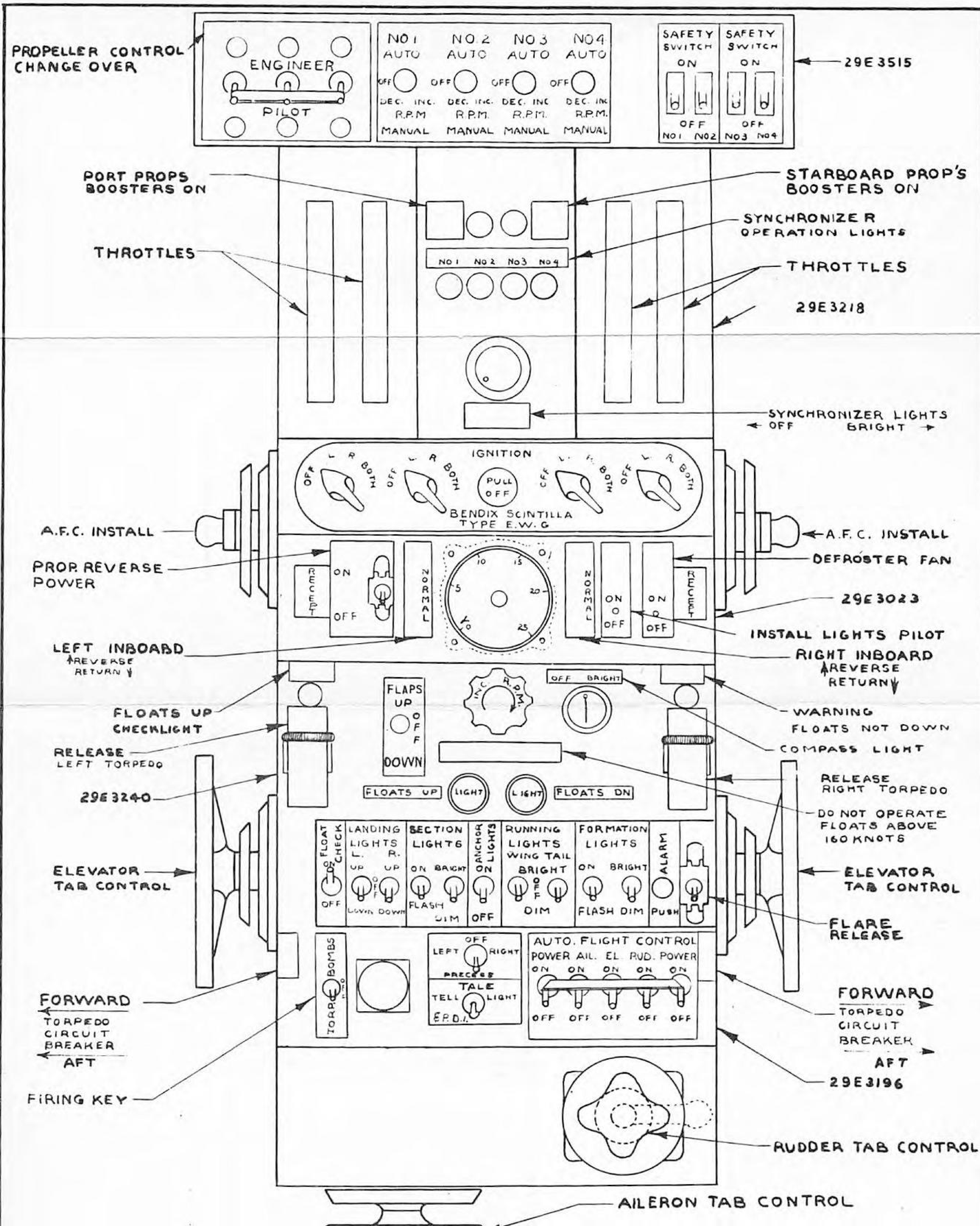


FIGURE 3-4
PILOT'S CONTROL PEDESTAL

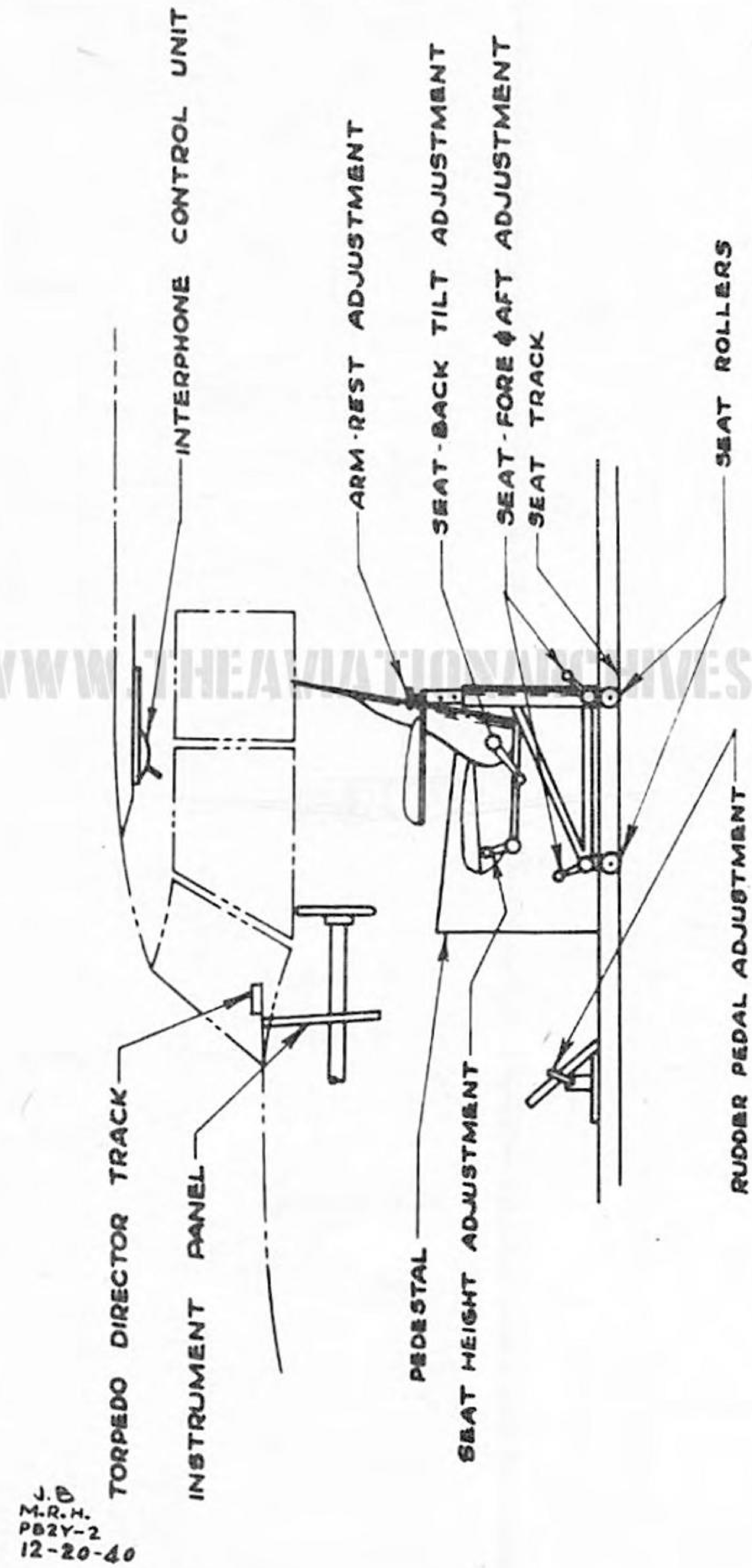
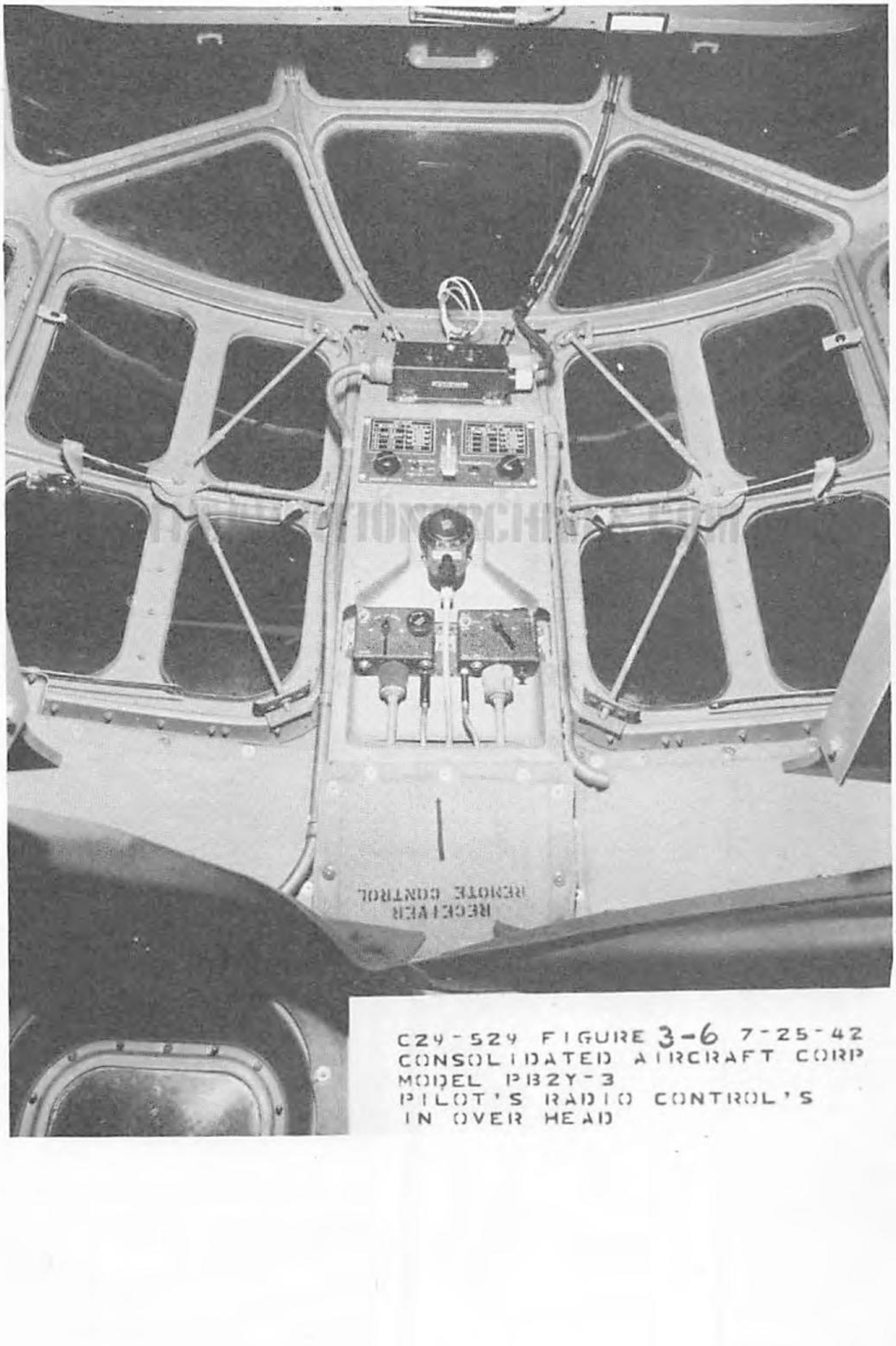
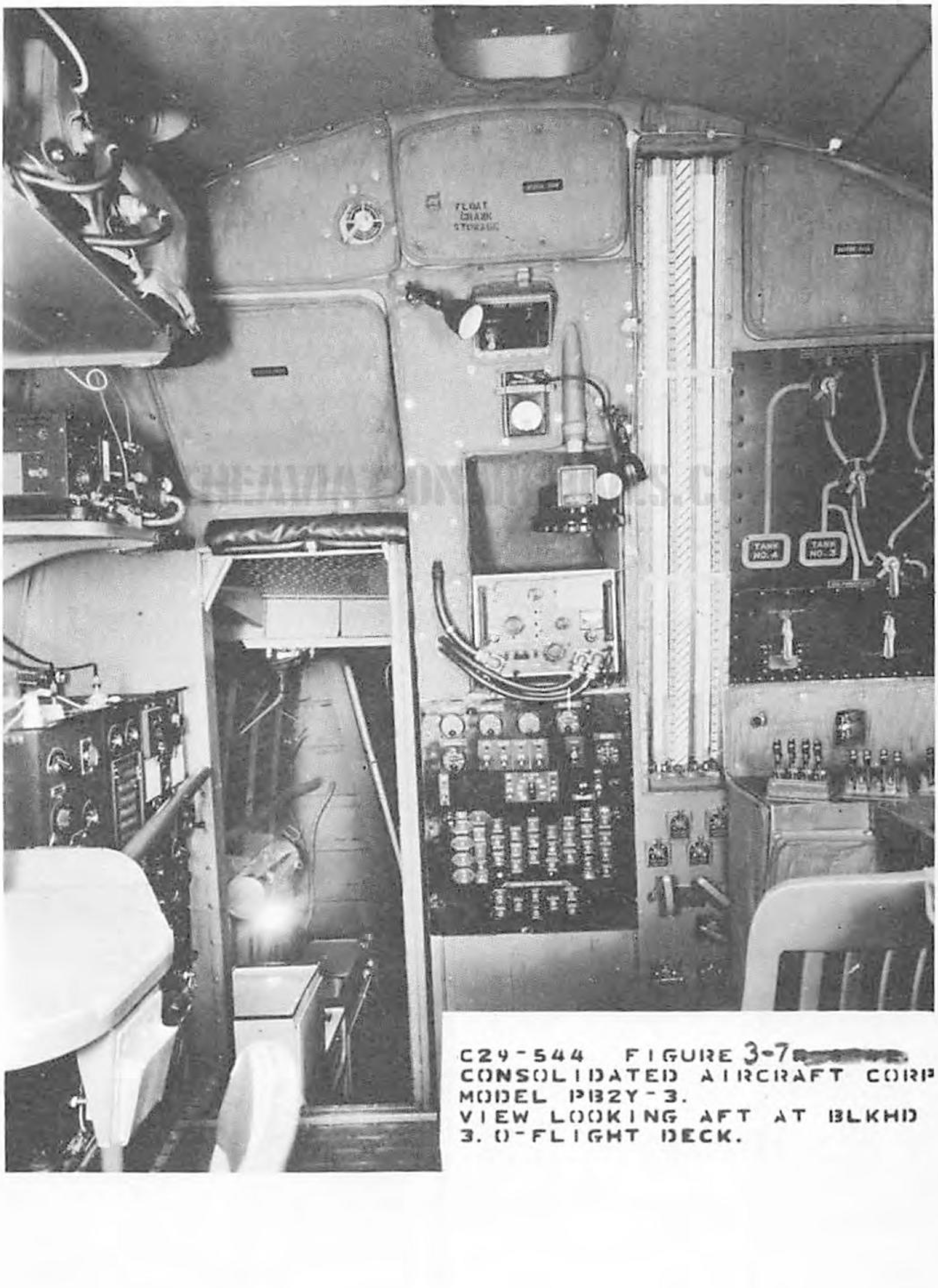


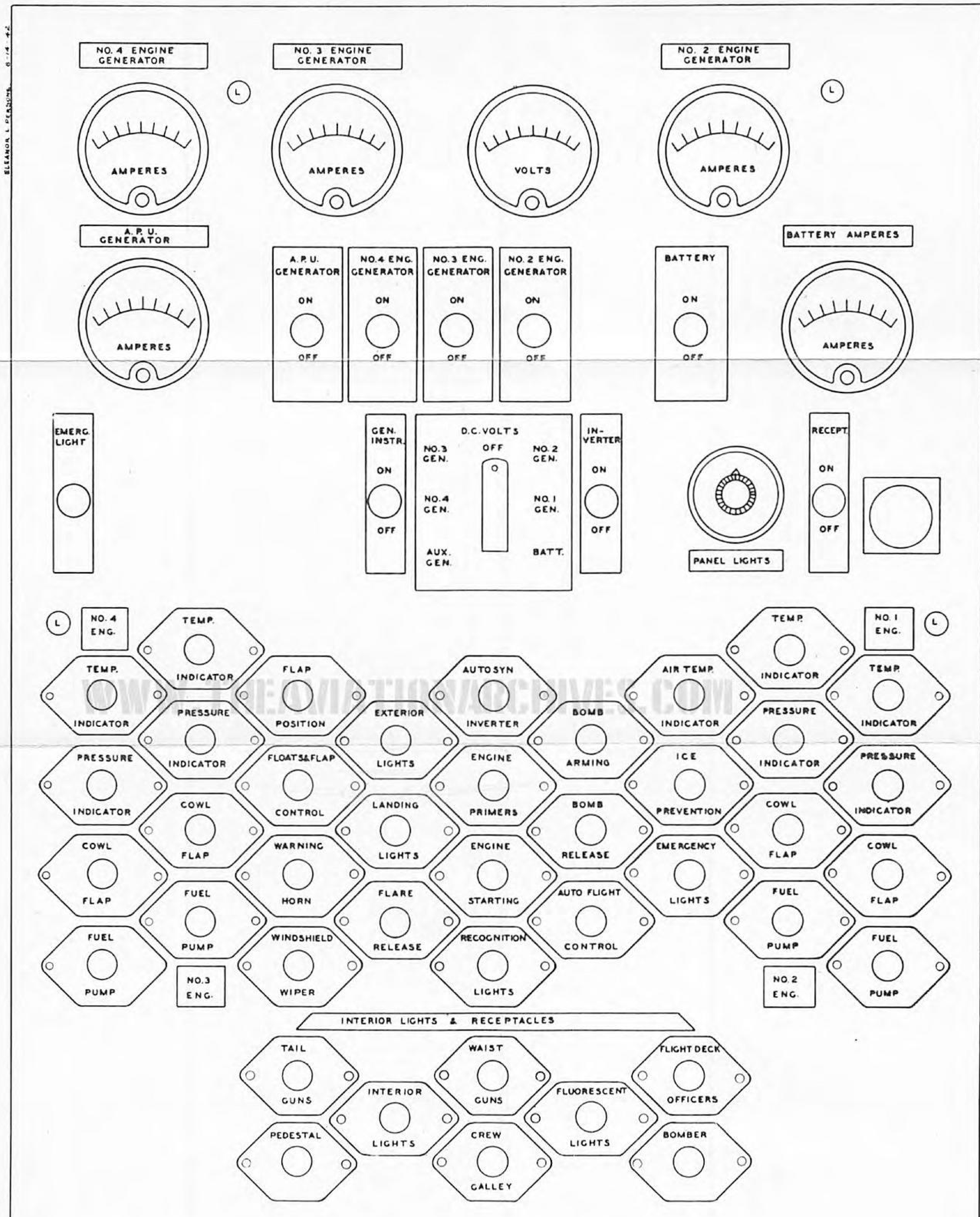
FIGURE 3-5
PILOTS AUXILIARY CONTROLS



C29-529 FIGURE 3-6 7-25-42
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3
PILOT'S RADIO CONTROL'S
IN OVER HEAD

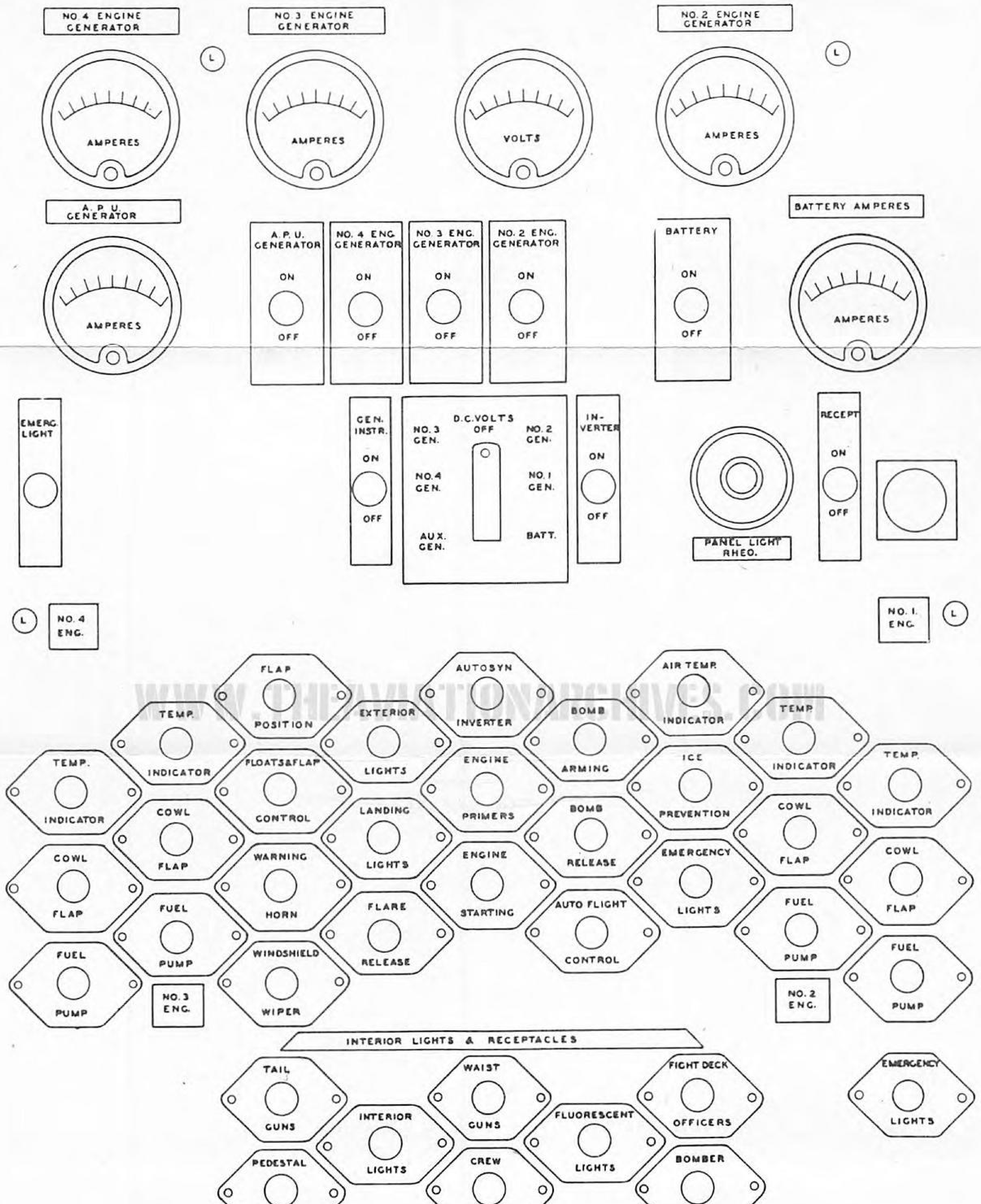


C29-544 FIGURE 3-7[redacted]
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3.
VIEW LOOKING AFT AT BLKHD
3.0-FLIGHT DECK.



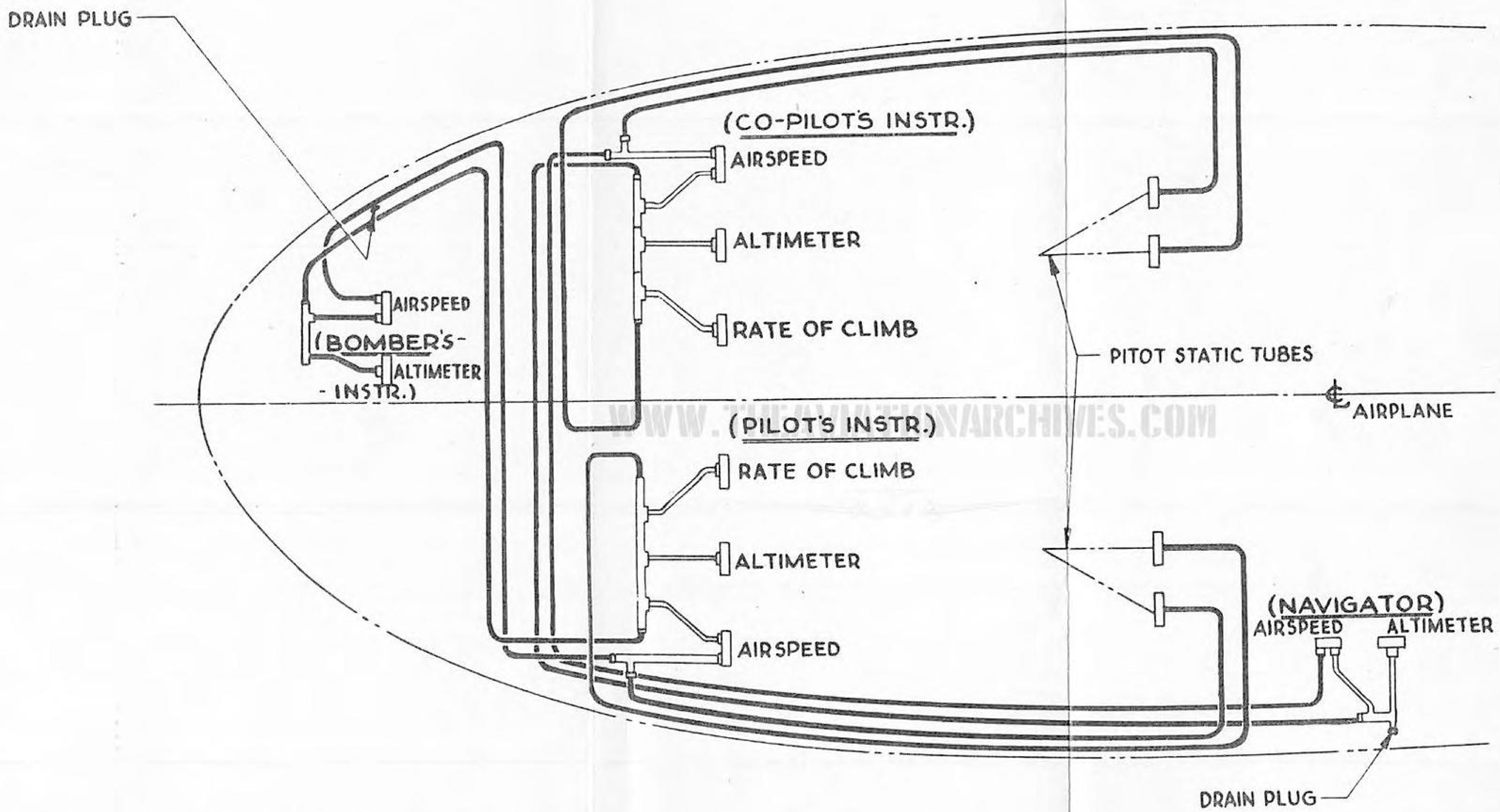
REFER TO C.A.C. DWG 29E3399
(PB2Y-3)

FIGURE 3-8
MAIN ELECTRICAL DISTRIBUTION PANEL
TYPE I



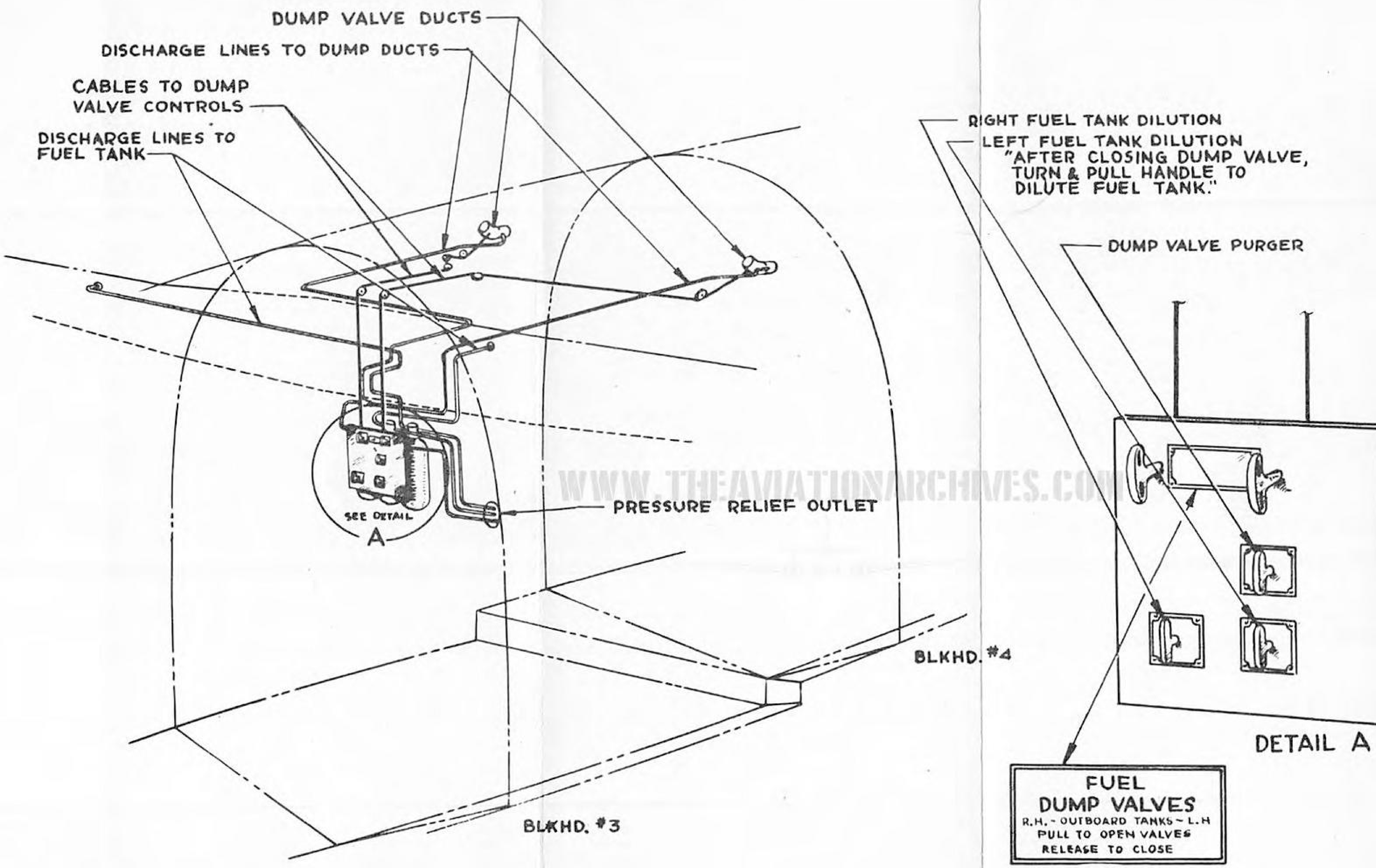
REFER TO C.A.C. DWG. 29E3399 (PB2Y-3)

FIGURE 3-9
MAIN ELECTRICAL DISTRIBUTION PANEL
TYPE 2



REFER TO C.A.C. DWG. No. 29F3302

FIGURE 3-10
AIR SPEED LINES DIAGRAM



REFER TO C.A.C. DWGS.
29G3060 & 29G3114 & 29G3041

FIGURE 3-11
FUEL DUMP AND DILUTION SYSTEM CONTROLS

POWER PLANT

A. Engines

1. General

This airplane is powered by four Pratt and Whitney R-1830-88 radial air-cooled engines, of fourteen cylinders each, with propeller shaft gear ratios of 16:9. Their power rating, based on 100 octane fuel, AN Specification VV-F-781 is as shown in the table below.

Engine power calibration curves are shown in Section V.

Rated B.H.P.	RPM	Altitude (Feet)	Manifold Press.	Aux. Supercharger	Operating Conditions
1200	2700	Sea Level	47.0"	Neutral	Take-off
1100	2550	2,500	44.0"	Neutral	Normal
1050	2550	12,000	45.0"	Low-Aux.	Normal
1000	2550	19,000	45.0"	High-Aux.	Normal

Rated Power, Each Engine, PB2Y-3 Airplane

2. Carburetors

The carburetors are Bendix-Stromberg PD12-E1, updraft, pressure injection type. The mixture ratio may be manually selected by the flight engineer, and the ratio selected is held approximately constant through variations of atmospheric conditions and engine speeds by an automatic mixture control, except when the mixture selected is "FULL RICH".

3. Magnetos

Two Scintilla SF14RN-8 magnetos are used on each engine.

4. Accessory Pumps

The two port engines are equipped with Type B-8 vacuum pumps for the de-icer system and gyro instruments. The starboard inboard engine (No. 3) drives a hydraulic pump for the gyro-pilot.

5. Superchargers

The induction system of each engine consists of an intercooler and a Stromberg injection carburetor interposed between two stages of conventional centrifugal supercharging. The main (secondary stage) supercharger is geared directly to the crankshaft and is driven at a fixed ratio of 8.48:1. The auxiliary (primary stage) supercharger is mechanically driven through a two-speed gear train and may be disengaged (neutral ratio) for conventional, single-stage operation of the engine at altitudes below which the auxiliary supercharger is not required. When the auxiliary supercharger is being engaged in either the "low ratio" (6.43:1) or the "high ratio" (8.48:1), hydraulic accelerators automatically accelerate the impeller to nearly the correct RPM before friction clutches engage and lock the gear train in whatever ratio is selected. The timing and synchronization of the accelerators and clutches are automatically controlled by a dashpot and hydraulic system.

When the auxiliary supercharger is engaged in either the low or high ratio, its discharge is regulated automatically by a throttling valve at the inlet of the auxiliary supercharger. The valve is operated by a hydraulic servo mechanism and is controlled by the air pressure at the entrance of the carburetor. The control is normally adjusted to maintain a pressure of 29" Hg absolute at the carburetor.

When the auxiliary supercharger is disengaged, air normally enters the carburetor through the flapper valves of light spring loading installed in the duct system between the intercoolers and the carburetor. However, the throttle at the entrance of the auxiliary supercharger opens to admit additional air through the inactive stage when the carburetor air pressure falls below the controlling value mentioned above.

B. Fuel System (Ref. Figures 4-2, 4-4)

1. Fuel Tanks and Cells

The fuel supply for the main engines is contained in the wing center section, which is built to accommodate three possible combinations of fuel containers: (1) Four gas-tight tanks integral with the wing structure. (2) Two outboard integral tanks and two inboard self-sealing fuel cells. (3) Four self-sealing fuel cells. Total fuel capacity of condition (1) is 4,400 gallons. Capacity for condition (2) is calculated to be 3780 gallons. Capacity for condition (3) is calculated to be 3020 gallons.

2. Fuel Dump Duct Purging and Dilution System

In cases (1) and (2) the outboard tanks are equipped with emergency dump duct purging and dilution controls, as described in Part D, item 6 of the preceding section.

3. Booster Pumps

For normal running, fuel is supplied to the carburetor under pressure by the engine-drive pumps; but for starting, and when added pressure is required at high altitudes and in emergencies, the extra pressure is supplied by electrically driven booster pumps. Switches for controlling the booster pumps are located on the engineer's instrument panel. They are marked for three positions, "OFF" "NORMAL" and "EMERGENCY". The switches are set to "EMERGENCY" only when an unusually high pressure is required. When operated in the "EMERGENCY" condition, speed of the booster pump is controlled by a rheostat. Booster pump operation is described in Part "G" of this section.

4. Primers

Engine priming is controlled by means of solenoid valves with switches on the engineer's instrument panel. Primer operation is described in Part "G" of this section.

5. Sight Gages

The fuel sight gages are four tubes of transparent plastic approximately 50" high mounted on the front face of Bulkhead 3, aft of the engineer's chair. Between each pair of sight gages is a hexagonal column with graduated scales on each of its six faces. This column may be rotated by a knurled wheel at the bottom. The scales are calibrated for the following conditions.

Capacity at 140 knots at angle of 1° between thrust line and horizontal plane.

Capacity in water-borne position, at angle of 1-3/4°.

Capacity in beaching gear position at angle of 8°.

The two scales visible on a column at any time give the quantity readings for the two sight gages at the left and right of the column.

To determine the quantity of fuel in a certain tank or set of cells, the column next to the gage to be read is rotated until the scale which is applicable to the attitude of the airplane at the particular time is visible. The fuel quantity is read directly from the scale.

6. Flowmeters

Four "Breeze" Type 88T2275 flowmeter transmitters are installed in the main fuel lines in the wing. They are connected electrically to the four flowmeter dials at the top of the engineer's instrument panel.

C. Oil System (Ref. Figure 4-5)

1. Description

Each engine has a separate oil system, consisting of an oil tank of 60 gallons capacity, with 15 gallons foaming space; an automatic temperature control valve; an oil cooler with automatic by-pass; and a pressure and temperature gage. Quantity is measured by means of a sounding rod in the oil tank filler neck.

There is no device to prevent the foaming space being filled with oil, so care must be taken to avoid putting more than 60 gallons of oil in any tank. The sounding rod should be used frequently to check the oil level when filling.

2. Oil Dilution System

Each engine is equipped with an oil dilution system to assist in cold weather starting. The solenoid dilution valve rotates the rotary temperature control valve of the oil cooler so that only the oil in the "quick warm-up" circuit is diluted. The switches for controlling the dilution valves are mounted on the engineer's instrument panel.

3. Flow of Oil

When oil flow begins in a cold system, the oil passes into the temperature control valve through the oil inlet, thence through a port into the by-pass chamber in the valve body, and thence through a port to the interior of the valve barrel where it passes over and around the bi-metallic spring to the outlet, whence it is discharged to the warm-up chamber of the oil tank without passing into the cooler.

This provision for by-passing cold oil directly from the valve to the oil tank prevents the impact of excessive oil pressure within the cooler and permits no access of oil at unsuitable pressures into the cooler warm-up jacket until such time as the temperature of the oil within the valve has reached a point where it may safely be permitted to enter the cooler inlet. When this point is reached, the temperature of the oil has expanded the bimetallic spring and rotated the valve barrel to open the port communicating with the cooler warm-up by-pass and core inlet; thereafter the resistant pressure of congealed oil within the cooler becomes sufficiently reduced through warm-up to start flow of oil through the cooler warm-up by-pass.

The oil then flows into the warm-up by-pass channels, thence through the hollw baffles, thence through the warm-up channel outlet back to the valve, and thence to the tank and motor. When the oil in the cooler core has warmed up sufficiently, flow of oil begins through the cooler inlet orifice in the core shell, thence into the core and thence by alternating cross flow through ports across the hollow baffles to the cooler outlet, through the valve to the tank and motor.

The interior of the barrel is provided with a spring control relief valve which opens at 30 lbs. pressure per square inch at any time during the sequence of rotation of the valve barrel. When this relief valve is open at such pressure, the pressure is relieved by the flow of surplus oil directly from the inlet through the relief valve to the valve barrel, and thence back to the tank. Thus this relief valve provides protection to the oil cooler core and jacket from excessive pressures due to rapid changes of oil temperature from the engine and any other unusual condition that might arise.

4. Desirable Oil Pressures

The desired oil pressure at 1400 to 2000 RPM is 85 to 105 lbs. per sq. in. The minimum permissible pressure is 65 lbs. per sq. in., except when idling.

D. Carburetor Air Control (Ref. Figures 4-2, 4-6)

1. Description

Carburetor air control levers for each engine are mounted in a quadrant on the engineer's table. Name plates at each extreme lever position on the quadrant indicate the "ALTERNATE" and "DIRECT" settings of the air intake system.

The "ALTERNATE" air valve provides a protected air source to use in case the direct intake duct is blocked by ice while the auxiliary stage supercharger is operating.

2. Operation

The "ALTERNATE" air intake should be used under any operating condition when there is even the least possibility of induction system icing. (See T.N. 36-41)

The control shall be either full off or on and shall not be left in any intermediate position.

The alternate air intake will be ineffective when operating the engine in the main stage. To clear ice from the lower intake duct or the carburetor screen, engage the auxiliary supercharger. This will raise the temperature sufficiently to clear the screen. (The supercharger shall not be engaged when the engine speed is above 2300 RPM). Return the auxiliary supercharger control to "NEUTRAL" as soon as possible, since low altitude operation with the auxiliary blower is inefficient and normally undesirable.

3. Carburetor Air Temperatures

The higher temperature of the alternate air supply causes a loss in power which may be overcome during part throttle operation by opening the throttle a little more. The actual power available when operating on the alternate air intake is not affected except at full throttle. (See T.N. 36-41).

E. Propellers

1. Description

This airplane is equipped with Curtiss, three bladed, controllable pitch, full feathering, C5325-D propellers. The pitch of the two inboard propellers is reversible. Controls are provided for automatic and manual speed control and the synchronization of all propellers.

2. Controls

a. Pilot's Propeller Controls

The propeller controls are in general duplicated at the pilot's and the engineer's stations except that the pilot has the reverse pitch controls while the engineer has the feathering controls. On the pilot's control pedestal are the following switches and indicators:

(1) 4 selector switches.
(2) 4 thermal overload circuit breaker switches.
(3) 1 master unit tachometer.
(4) 1 master synchronizer R.P.M. control knob.
(5) 2 booster operation tel lights.
(6) 4 synchronizer automatic operation tel lights.
(7) 1 propeller control change over switch.
(8) 1 propeller reverse pitch safety switch.
(9) 2 propeller reverse-return switches.

b. Engineer's Propeller Controls

On the engineer's panel are the following switches and indicators:

(1) 4 selector switches.
(2) 4 thermal overload circuit breaker switches.
(3) 1 master unit switch.
(4) 1 master unit tachometer.
(5) 1 master synchronizer R.P.M. control knob.
(6) 2 booster operation tel lights.
(7) 1 Pilot-engineer control indicator tel light (actuated by propeller control change over switch on pilot's pedestal. Light is "ON" when change over switch is on "PILOT". When this is "OFF" the engineer's selector switches are energized).

(8) 4 Feather Switches

The automatic engine speed synchronizer may be used to regulate all engines at a selected constant speed by automatically adjusting the angle of the propeller blades to correct for varying conditions such as airplane speed, engine power, and air density. All engines can be operated synchronously at any speed through the normal operating range by means of the master RPM control. Adjustment of the master RPM control unit changes the speed of a small governor-controlled motor to which the speed of each engine is automatically matched by the mechanism in the master unit.

The speed of the master unit can be adjusted and observed by both the pilot and the flight engineer. The master unit tachometers are calibrated directly in engine RPM.

The two voltage-booster indicating tel lights on the pilot's pedestal have red glass jewels. When the starboard light is "ON" it indicates that a fast pitch change is in progress on one of the starboard propellers. The port light refers similarly to the port propellers.

The four automatic operation tel lights on the pilot's pedestal have green glass jewels. When these lights are "ON", they indicate that the respective propellers are operating with the automatic synchronizer control "ON". When one or more of these lights are "OFF" it indicates that the propellers are operating as fixed pitch propellers, controllable by the flight engineer or pilot through manual operation of the RPM selector switches.

The reverse pitch safety switch controls the power for reverse operation of both the inboard propellers. This switch should be in the "OFF" position at all times during flight and should be placed in the "ON" position only when the plane is on the water and it is desired to reverse the pitch of the inboard propellers. The propellers cannot be reversed except when the reverse pitch safety switch is in the "ON" position. They can be returned to "NORMAL", however, without this switch being "ON".

One reverse-return switch is provided for each of the inboard propellers. The switch has three positions, "NORMAL", "REVERSE", and "RETURN". During all normal operation this switch must remain in the "NORMAL" position. Switch to "REVERSE" and the propeller will automatically change pitch and stop at the reverse setting.

CAUTION: To prevent engine over speeding during reversing and return from reverse, the throttles should be cut until the engines are idling.

To return the propeller to normal flight range from the reverse setting, switch to "RETURN", and the propeller will immediately assume the normal low pitch setting. As soon as this setting is reached, as indicated by the booster light going out, switch to "NORMAL" again.

The thermal overload circuit breaker switches on the flight engineer's and pilot's panels have "ON" and "OFF" positions. The function of these switches is to protect the propeller circuit against an overload and also to function as line switches. If these switches are opened by an overload on the propeller circuit, they may again be closed by placing them to the "ON" position. Investigate circuits for short circuits if switches will not stay on.

The selector switch has four positions: "AUTOMATIC", "OFF", "INCREASE RPM", and "DECREASE RPM" The purpose of this switch is to select the type of control desired for the individual propellers, as well as to provide selective fixed pitch control. With the switch at "AUTOMATIC", the propeller operates under the master synchronizer speed control. With the switch in the "OFF" position, the propeller operates as a fixed pitch propeller.

To adjust the blade angles manually, hold the switch momentarily to "INCREASE RPM" or "DECREASE RPM" as required.

It should be noted that both the pilot and engineer have complete sets of manual selector and thermal circuit breaker overload switches. The position of the "PROPELLER CHANGE OVER SWITCH" (pilot's controls) determines whether the pilot's or engineer's manual selector switches are energized. In order to avoid possible confusion as to the "CHANGE OVER SWITCH", the engineer's panel is fitted with a light which is "ON" only when the pilot's manual selectors are energized. Normally, the thermal overload circuit breaker switches on both the pilot's pedestal and engineer's panel should be kept closed at all times.

The feather switches, located under guards, have two positions: "NORMAL" and "FEATHER". During all normal propeller operation place switch at "NORMAL". For feathering, move the desired switch to the "FEATHER" position.

The master unit switch should be placed to the "ON" position whenever automatic engine speed synchronizing is desired. If desirable to operate all propellers by means of selective fixed pitch control for a protracted period, place the master unit switch in the "OFF" position to stop the master unit.

The voltage booster indicating tel lights on the engineer's panel operate in the same manner as the similar lights on the pilot's pedestal. Fast rates of the pitch change are employed in order to feather, to reverse, or to return to normal from reverse. When the desired setting is reached, the pitch change is automatically halted by one or the other of the limit switches and the indicator light will then be "OFF".

3. Operation

a. Automatic Engine Speed Synchronizer

While the engines are being warmed up, the master unit switch (on the flight engineer's panel) should be thrown "ON" and the control knob should be adjusted so that the tachometer indicator reads desired RPM for Take-off (2700). The selector switches should be in "AUTOMATIC" position. When the unit is warmed up so that it operates properly, the automatic operation indicating tel-lites will remain on. When all engines are operating at 1200 RPM or over, all propellers will decrease pitch to the high RPM (or low pitch take-off) limit setting in the hub. The throttles may then be opened whenever it is desired to take off and all engines will maintain the take-off RPM set on the master synchronizer. When it is desired to reduce the engine speed for cruising or climbing, the control knob should again be adjusted. As it is being adjusted, the speed of all engines will follow closely the speed indicated on the master unit tachometer indicator. In the event that this knob is turned more rapidly than the master unit can respond, the auto-operation tel lites will go out momentarily. This is caused by the safety feature which is incorporated in the master motor, which causes the propellers of all engines to remain in the fixed pitch position in the event the master motor for any reason fails to maintain the selected speed. It will be desirable to turn off the master unit if all propellers are operated on manual control for an extended period. Should it be desirable to synchronize only part of the engines, the selector switches for those propellers which are to be operated manually should be set for "OFF". The propeller whose switches are left in "AUTOMATIC" will be controlled by the synchronizer as long as the master unit is turned on and operating.

A failure of the master motor will at once cause the indicating tel-lites to go out and stay out. Should this occur, it will be necessary to control manually the pitch of all propellers by operating the selector switches in the increase or decrease RPM positions as required. It will also be advisable to shut off the master motor switch to prevent unnecessary drain on the battery and possible damage to the master unit.

b. Selective Fixed Pitch Control

When the propeller selector switches are moved to "OFF", the pitch of each propeller may be regulated manually by moving the switch to "INCREASE RPM" or "DECREASE RPM" as desired. The automatic synchronizer unit will have no control over the propellers when the switches are set for "MANUAL", and therefore should be shut off.

Selective fixed pitch operation may be used for cruising, take-offs, or landings. To operate propellers in fixed pitch while cruising: First, attain the desired cruising altitude, then set the throttles to their cruising position. Use the selector switches to increase or decrease RPM until desired cruising RPM is reached and all four engine tachometers read the same.

To obtain proper blade setting for a fixed pitch take-off: First obtain 45" Hg. manifold pressure with the throttles, then set propellers for 2300 RPM.

To obtain proper blade setting for a fixed pitch landing: Set throttles for a manifold pressure altitude. Adjust propeller RPM to approximately 2500 RPM. Speed of engines will be controlled entirely by throttles, after proper blade setting is established.

c. Emergency Feathering

Recommended procedure for emergency feathering is as follows:

Throw feathering switch to "FEATHER" position. Booster tel lites will indicate a fast pitch change is in progress, and will go out as soon as feather angle is reached.

Close throttle immediately.

Move mixture control to "IDLE CUT-OFF".

Turn off fuel supply to engine by means of selector valve on fuel units box.

Leave ignition on until propeller stops, then turn off.

d. Unfeathering

In connection with the unfeathering operation of the propellers the following points should be kept in mind:

It is important, when unfeathering a propeller after the engine has cooled, to idle at slow speed until the engine is thoroughly warmed up before bringing it up to speed; otherwise serious damage may result. The windmilling action while unfeathering is a powerful cranking force and will easily overspeed the engine beyond safe idling limits unless care is taken to stop the propeller pitch change at approximately 800 RPM.

After unfeathering to about 800 RPM at an airspeed of approximately 125 MPH the engine may be permitted to warm up as long as desired, without danger of overspeeding.

e. Current Overload Safety Switch

If a current overload on the propeller mechanism should cause the circuit breaker switch to open, reset switch first to full "OFF" then "ON". If switch will not stay on, investigate trouble as soon as possible.

f. Reversing Pitch of Inboard Propellers

To reverse pitch of inboard propellers:

Use throttles to reduce engine speed to 800 RPM with mixture control in "AUTO RICH".

Set reverse pitch safety switch to "ON".

Set reverse pitch control to "REVERSE". The booster tel-lite will be on until the reverse setting is reached.

Increase speed of engine being used for reversing. Be sure to wait until the tel-lite goes out before opening the throttle.

NOTE: The reverse pitch control should be used only when the airplane is on the water. Full take-off power may be used for emergency maneuvering in reverse pitch, but only for a short time and with care to see that the maximum allowable engine temperature is not exceeded. Normally, reverse pitch operation should be conducted within a range not to exceed 50% of full throttle. Engine temperature should be carefully watched during all taxiing. NEVER REVERSE PITCH OR RETURN TO NORMAL PITCH AT HIGH ENGINE SPEED.

g. Returning From Reverse Pitch

The throttles should be cut until the engines are idling. The reversing switch should be moved to "RETURN". The tel-lite will be on until the low pitch setting is reached. When it goes off, the reverse-return switch may be moved to the "NORMAL" position. It is not necessary to have the reverse pitch safety switch "ON" when returning propellers to normal. After reverse-return switches have been set in "NORMAL" position, propeller may be operated either in selective fixed pitch, or by means of the automatic synchronizer.

h. Proper Setting of Propellers While Landing

Technical Order No. 9-40 authorizes operating units to determine, for use during landing approach, the propeller RPM setting which best meets the immediate problems. This setting should be determined by considering the probable necessity for the use of maximum engine power, and the possibility of overspeeding of the engines, in addition to other factors concerning flight characteristics of the particular airplane and the type of operations being conducted.

F. Auxiliary Power Plant

1. Description

The auxiliary power plant is on the starboard side, between Bulkheads 6 and 7. It is a Lawrance Model 75B, having a 37-horsepower, horizontal, air-cooled, five-cylinder radial engine, operating a 28.5 volt D.C. generator, for supplying the 24-volt airplane electrical system. Beyond starting and stopping, the operation of the unit is completely automatic.

Fuel for the engine is taken from the main fuel tanks or cells in the wing. The fuel supply valve is on the fuel units box. A separate oil tank for the unit is located on the starboard side above the bunks, aft of station #6.

An emergency fuel supply for the auxiliary power unit may be obtained for the fuel tank auxiliary drain line. A manually operated valve controls the flow of fuel from the fuel tank drain line into the A.P.U. fuel supply line.

This valve is safety wired closed and after valve has been used, it should again be safety wired.

A CO_2 fire extinguisher system is mounted on the unit base, with an operating handle at the forward end of the starboard waist gunner's platform.

The starter, ignition switch and engine instruments occupy the upper left-hand corner of the engineer's instrument panel. In operating the unit, no work is required of the engineer after he has started the engine, other than to check the instruments frequently to be sure that the cylinder temperature, oil temperature and oil pressure are within the safe limits as given in paragraph "f" below.

2. Operation

a. Starting

(1) See that fuel valves are open.

(2) See that battery switch on main power distribution panel is "ON".

(3) See that A.P.U. generator switch, on main power distribution panel is "OFF".

(4) Turn magneto switches "ON" for both magnetoes.

(5) Close starter switch. Release it as soon as engine fires.

CAUTION: Failure to release the starting switch as soon as the engine fires will result in reversing polarity of the generator series field and consequent damage to the batteries. If it is discovered that the polarity of the series field has been reversed, stop the auxiliary power plant immediately and then start it again.

(6) As soon as engine starts, observe the oil pressure gage reading. If no pressure is indicated within a few seconds, shut the engine off. Normal oil pressure must be 55-65 lbs. per sq.in.

b. Warm Up

When the operating temperature is below 70°F. the engine will idle at about 1800 RPM after starting. As the oil warms, the engine speed will gradually increase to 4100 RPM, when the generator is not under load. Normal operating oil-in temperature is about 60°C., and should not exceed 88°C. To assist in warming up, the oil tank is surrounded with a canvas curtain to which is attached a hot air duct from the aft central heating system.

c. Loading

The A.P.U. generator switch on the main power distribution panel may be turned "ON" and load may be applied to the generator as soon as the engine comes up to speed.

OVERLOAD CAUTION: The generator is rated at 8 k.w. (280 amperes) for continuous operation, and at 12 k.w. (421 amperes) for periods not to exceed 5 minutes. DO NOT OPERATE THE POWER PLANT ABOVE NORMAL POWER OUTPUT FOR MORE THAN FIVE MINUTES AT A TIME. Allow at least ten minutes between 5 minute overload periods for the generator to cool.

d. Overspeed Cutout

An overspeed cutout assembly is attached to one of the two Scintilla magnetos - the one between Number 1 and 2 cylinder. The automatic overspeed cut-out grounds both magnetos when the engine reaches 4800 ± 100 RPM. Under normal operating conditions it will not trip. Therefore, when it does stop the engine the cause should be investigated. The most probable cause of excessive over-speed would be failure or tightness in the governor linkage, or cutting of the power switch when the generator is under full load. This would cause the engine to surge momentarily to excessive RPM. DO NOT TRY TO START ENGINE AFTER CUTOUT HAS STOPPED IT WITHOUT FIRST RESETTING CUTOUT BUTTON.

e. Stopping the Engine

(1) Remove all load from the generator by turning "OFF" the A.P.U. generator switch on the main power distribution panel.

(2) Allow engine to idle for 1/2 minute.

(3) Turn ignition switch "OFF".

f. Safe Operating Limits

Cylinder	Temperature	-	232° - $260^\circ C$
Oil	"	-	60° - $88^\circ C$
	Pressure	-	55 - 65 lbs. per sq.in.

Stop engine immediately if oil pressure does not rise to minimum within a few seconds after starting.

G. Engine Operation

1. Starting (Cold Engines)

The operation of starting the engines is divided between the pilot and flight engineer, but the general procedure is as outlined here. See the check-off list for the detailed procedure.

a. Before starting the engines, the engineer should start the auxiliary power plant. This allows the power unit to take the bulk of the starting load and prevents excessive drain on the batteries.

The aft central heater, through a special disposable duct system is used to preheat the engines during cold weather.

WARNING: Before starting engines, see that fuel valves on fuel units box are properly set. Valves must be set so that inboard tanks feed all four engines. Never open lines between tanks or cells while engines are running. Inadvertent transfer of fuel to a tank or cell already full might cause tank or fuel line failure. No less than 400 gals. of fuel should be in each of the inboard tanks at take-off.

b. With ignition switches off, turn the engine by hand to clear the cylinders. The propeller control should be set in "HIGH RPM". (Low pitch). The cowl flaps should be "OPEN". The Carburetor Air Control is to be in "DIRECT" position.

c. Place throttle in 1000 to 1200 RPM position (about 1/5 open).

d. See that supercharger control is in "NEUTRAL".

e. Set mixture at "IDLE CUT-OFF".

f. Select booster pump switch having same number as engine to be started, and set switch to "NORMAL."

NOTE: In order to clear the fuel lines of air, the mixture control may be moved to "AUTO RICH" for a short while, with the booster pump operating. The mixture control should be returned to "IDLE CUT-OFF" as soon as fuel is seen dripping from the carburetor elbow vent at the bottom of the nacelle. This operation must be performed with due caution, to avoid flooding.

g. Prime engine to be started. Prime three to five seconds with primer button, according to outside air temperature and engine temperature. Avoid excessive priming. Booster pump serving the engine to be started must be operating while the engine is being primed.

h. Energize the starter.

i. Turn ignition switch to "BOTH ON".

j. Engage starter.

k. When the engine fires, wait until the tachometer shows 300 RPM or more, then move the mixture control to "AUTO RICH". Adjust the throttle to 500 - 800 RPM.

l. Turn booster pump "OFF".

m. If the engine stops, return the mixture control to "IDLE CUT-OFF" immediately. Put throttle back to 1000 - 1200 RPM position. Do not attempt to speed warm-up of the engine by closing the cowl flaps.

If the engine has been overprimed, as indicated by excessive drainage of fuel from the supercharger drain and exhaust pipes, open the throttle wide, and with ignition switch "OFF" and mixture control in "IDLE CUT-OFF" position, turn engine over several revolutions with starter, then repeat the starting procedure.

Note: If the oil pressure starts to fluctuate or drop after a cold engine has been started with diluted oil and has run a short while, the dilution valve shall be opened intermittently for intervals of a few seconds over a period of about fifteen seconds. If the oil pressure still does not steady out, stop the engine and let rest for approximately five minutes before attempting another start. When it is assured that oil pressure is steady, close the shutoff cock in the dilution line.

2. Warm-Up

a. The engine should be idled at 800 RPM until the oil pressure rises. If the oil pressure is not up within 30 seconds, shut down the engine and investigate the oil system and gauges. Due to the delayed action of the relief valve, oil pressures up to 300 p.s.i. may occur just after starting but the pressure will drop when the oil is warmed. When the oil and fuel gauges indicate sufficient pressure, advance the throttle to obtain approximately 1000 RPM. If the engines are rough at 1000 RPM and it is believed that this roughness is the result of fouled spark plugs, it is permissible to increase the RPM (with the propeller governor control set for maximum RPM). The speed should be increased only to the point at which it is possible to obtain smooth operation and under no circumstances should the speed be increased above 1500 RPM. Operate at the increased RPM only until smooth operation is obtained and then close the throttle to obtain 1000 RPM.

b. When the oil temperature has reached 25°C (77°F) open the throttle to obtain approximately 30" of Hg. manifold pressure with the propeller control in high RPM position. Check oil pressure and oil temperature with the propeller control in the take-off RPM position, open the throttle to obtain 1785 RPM and note the loss in revolutions when switching to one magneto at a time.

c. In switching from both magnetos to one, the normal drop-off is given in the engine log book and an increase of 50% above this value is excessive. (See T.O. 39-41). The oil pressure should be between 80 and 100 p.s.i. at this RPM. The pressure will vary with RPM and may fall as low as 15 p.s.i. with the engine idling. Any appreciable change from normal oil pressure at normal conditions of RPM and oil temperatures may indicate trouble within the engine oil system.

NOTE: It is realized that the above warm-up procedure and checks cannot be accomplished under certain operating conditions, such as while the airplane is at a mooring, operating in rough water, operating within limited space, etc.

d. Check auxiliary stage supercharger control as follows:

(1) Supercharger control shall be set in the auxiliary stage neutral position.

(2) Set propeller governing at 1400-1500 RPM.

(3) Adjust throttle to obtain approximately 30" Hg. (abs.) manifold pressure and lock throttle in this position. Do not change throttle position when the supercharger control is changed.

(4) As soon as the position of the manifold pressure gage is constant, note the oil pressure and oil temperature.

(5) Shift the supercharger control to the auxiliary stage-low position. If the control is operating satisfactorily, the manifold pressure will fluctuate slightly and then stabilize at a value slightly above the original reading. The oil pressure will drop momentarily and then stabilize at a value which is approximately 10 p.s.i. lower than its original reading.

(6) Allow oil to cool to within 5°C of its original value.

(7) Shift the supercharger control to the auxiliary stagehigh position. If the control is operating satisfactorily the manifold pressure will fluctuate a few inches and then stabilize at a value slightly greater than the reading observed while operating in low ratio. The oil pressure will drop momentarily and then stabilize at approximately the same value or a few pounds lower than observed while operating in low ratio.

(8) Allow the oil to cool to within 5°C of its original value and then shift the supercharger control to the auxiliary stage-neutral position. The oil pressure should be approximately the same as was observed originally while operating in neutral.

CAUTION: In making this check, the oil temperature should be observed often and the temperature limit should not be exceeded. The changes in manifold pressure will be slight. The changes in oil pressure will vary with temperature. The pilot should become familiar with characteristics of the particular installation. He may desire to modify the foregoing procedure as he becomes better acquainted with the engines in his charge. Such modifications are permissible provided no harmful effects to the engines will result. If the pilot does not believe that the supercharger control is operating satisfactorily a check should be made with oil pressure gages installed on the clutch oil systems. See Section IV, Part A-3-d of Erection and Maintenance Instructions.

e. Check the fuel pressure to see that it is 14 to 16 p.s.i. The pressure may be expected to drop off slightly at speeds below 1000 RPM.

f. Ground running cooling is insufficient above 1400 RPM for the cylinder heads or cylinder barrels. Avoid prolonged running above 1400 RPM and keep the head temperature below 205°C on ground operation. Also, oil temperature should not exceed 95°C in accordance with T.O. 24-41.

The cowl flaps should be "OPEN" for all ground running, taxiing, take-offs, and steep climbs.

3. Taxiing

In taxiing, every effort should be made to restrict the engine speed to the minimum compatible with safe operation. Taxiing should not be done at very low or very high RPM. No restriction can be placed on taxiing RPM, but it should be noted that a large part of ignition troubles are due to fouling of plugs from idling at low speeds, or overheating of the ignition system at high engine RPM in taxiing maneuvers. The cowl flaps should be open wide for all taxiing operations.

When reversing the inboard propellers, throttle down to 800 RPM during pitch change from normal to reverse, or reverse back to normal, to avoid overspeeding of engines as the propellers pass through the flat pitch stage. Propeller reversing switches are dead until reverse power switches are closed. Open power switches as soon as taxiing operations are completed.

4. Take-Off

For take-off, the mixture control should be set in "AUTOMATIC RICH" position. The propeller must be set for 2700 RPM. The maximum allowable manifold pressure should be limited to 47" Hg. by the throttle. This value corresponds to 1200 BHP at 2700 RPM, the maximum allowable for take-off. The maximum cylinder head temperature is 260°C. Booster pumps should be switched on "NORMAL".

5. Climb and High Speed Level Flight

For maximum performance, the propeller should be governed to 2550 RPM. The mixture control should be set at "AUTOMATIC RICH" and the throttle adjusted to give the manifold pressure indicated on the power calibration curves, shown at the end of Section V. Three of these curves are shown, covering neutral, low, and high auxiliary blower stage. The altitude will determine which of these curves is applicable at any particular time. The auxiliary stage supercharger control should be operated according to the power calibration curves. It should be noted that the values given on the power calibration curves are for the condition of no ram. Carburetor ram will increase somewhat the altitudes at which it is possible to obtain rated power without going to the next higher supercharger ratio.

The maximum allowable oil-in temperature for climb and high speed level flight is 95°C in accordance with T.O. #24-41.

6. Cruising

Cruising operations may be conducted at any power below normal rated power. The maximum recommended cruising limits for the engine are indicated on the first power calibration curve at the end of Section V, which is for auxiliary stage neutral, and the second curve, which is for the auxiliary stage low ratio. Minimum specific fuel consumption is usually obtained while operating at 75 percent normal rated BMEP, provided the speed is not increased above the point at which this BMEP is obtained on the propeller load curve. If an engine is operated at 75 percent normal rated BMEP on the propeller load curve, the resulting power will be 65 percent normal rated power. The lines entitled "Maximum Recommended Cruising Limits" on the curve sheets referred to above represent a constant BMEP of 75 percent the normal rated BMEP at and below 65 percent normal rated power. If tactically feasible and provided weather conditions are not unfavorable and if minimum specific fuel consumption is desired, the engine should be operated at conditions represented by this line and at the RPM which gives full throttle. The auxiliary stage supercharger should be used only when it is impossible to obtain the desired power while the auxiliary stage is in neutral.

Since the airplane is equipped with a Curtiss propeller, continuous cruising should be conducted with the propeller in fixed pitch. The desired cruising condition should be obtained before the propeller is placed in fixed pitch and the control should always be returned to the "AUTOMATIC" position before changing the power. See T.O. #16-41.

7. Landing

In landing, the propeller governor should be set for 2550 RPM as a general rule. (See Part E-3-h of this section).

The mixture control is to be at "AUTOMATIC RICH", the cowl flaps closed during approach, and the auxiliary blower speed control in "NEUTRAL". The cowl flaps are to be opened again as soon as the landing is completed.

8. Stopping the Engines

To stop the engines, idle at 1000 RPM. The cowl flaps are to be open. When the engine cylinders have cooled below 204°C, move the mixture control to "IDLE CUT-OFF". (Turn off booster pumps if operating.)

After the engine stops, turn the individual ignition switches to "OFF". Turn the master switch to "OFF" when all motors have stopped. The fuel cock should never be shut "OFF" except in emergency or to prevent carburetor drainage and subsequent vapor lock after the engines have stopped.

9. Oil Dilution Procedure

When a temperature below -5°C (+23°F) is forecast for the period prior to the next start, the oil in each engine should be diluted as follows:

a. Open shut-off cock in dilution line.
b. Propeller control-full high pitch.
c. Engine speed constant 1000 RPM.
d. Open dilution valve (close dilution valve switch) See Note below.
e. Hold dilution valve open (switch closed) for two minutes.
f. Run engine for an additional minute, cut ignition then move mixture control into "IDLE CUT-OFF" position. This procedure is in conflict with existing stopping procedure and applies only when oil dilution is being effected.

NOTE: When the oil dilution valve is opened, there will be a sharp drop in indicated fuel pressure. Fuel pressure should return to normal immediately upon closing the valve. If it does not, stop the engine immediately and check the valve for leakage.

PRECAUTIONS:
a. Do not over dilute
b. Guard against fire
c. Dilute only when justified by forecast of low temperatures, i.e. below -5°C (+23°F)

d. Keep oil system free of sludge and water.
e. Check position of dilution line shut-off cock.

10. Mixture Control

The mixture control shall be set in the "AUTOMATIC RICH" position for all operations, except cruising. The "FULL RICH" position is used only in an emergency upon failure of the automatic control. The "AUTOMATIC LEAN" position may be used only for cruising at or below 65 percent normal rated power on propeller load where low specific fuel consumption is of major importance. The use of the "AUTOMATIC LEAN" control at any time is contingent upon satisfactory engine cooling as defined by the maximum allowable cylinder temperatures listed below.

11. Cylinder Temperatures

The operation of the engine shall be such as to maintain the cylinder temperatures within the following limits:

Take-off, maximum allowable for 5 minutes .... 260° C (500° F)

Normal Rated Power, maximum for 1 hour .... 260° C (500° F)

Continuous, maximum allowable . 232° C (450° F)

12. Cowl Flaps Operation

The cowl flaps are to be fully "OPEN" for starting and for all ground running and taxiing. During ground running and taxiing, the head temperature should be kept below 205°C. For take-off, the cowl flaps should be "OPEN". For landing, the cowl flaps should be "CLOSED" during approach, and should be "OPEN" after the airplane has settled on the water. In steep climbs the cowl flaps should be opened as much as is required to maintain proper temperatures. In other conditions, adjust for proper cooling. Do not close the cowl flaps to accelerate the warm-up.

The cowl flaps are controlled by four toggle switches at the flight engineer's station. A position indicator on the engineer's instrument panel registers the position of the cowl flaps.

13. Fuel

a. Fuel Flowmeter and Consumption Curves.

Fuel flowmeter dials at the top of the flight engineer's panel register the rate of fuel consumption for each of the four engines. Fuel consumption curves at the end of Section V of this handbook show the fuel consumption rates which may be expected under various operating conditions.

b. Fuel Units Box Valves

WARNING: Do not turn selector valves so that any engine or engines are being fed from more than one tank. One or more engines may be fed from each tank, but feeding one or both engines on a side from more than one tank with the line between tanks open may result in inadvertent transfer of fuel by the booster pumps to a tank which is already full; thereby causing a blowout in either tank or the lines; or a discharge of fuel from the vents.

Take-off should be made with the two inboard tank valves on for all four engines. This is especially important when fuel quantities are low, to insure that surges occurring in the tank during take-off will not cause any of the outlet ports to the booster pumps to become uncovered. No less than 400 Gals. of fuel should be in each of the inboard tanks at take-off.

c. Fuel Booster Pump Emergency Use

The "EMERGENCY" setting of the fuel booster pump is used when any engine fails, or when running more than one engine from one tank at high altitude.

If the engine-driven pump fails while the auxiliary supercharger is in use, the supercharger shift lever must be returned to "NEUTRAL" before the booster pump is operated in the "EMERGENCY" condition. Adjust fuel pressure to 15 lbs. per sq. in. with the rheostat.

NOTE: This rheostat affects the speed of the booster pumps only when the booster pump is operated in the "EMERGENCY" condition.

d. Fuel Transfer

Transfer of fuel from one tank to another may be accomplished by setting the fuel selector valves in the pattern indicating the desired fuel routing and operating the booster pump for the tank to be drained, so as to supply the fuel under pressure to the tank to be filled.

CAUTION: During fuel transfer, avoid current overload on booster pump as there will be no warning when the circuit breaker cuts out.

e. Fuel Specification

The engines operate on 100 octane fuel, AN specification VV-F-781.

f. Fuel Pressure

Fuel pressure at the carburetor for all operating conditions should be 14 to 16 lbs.

14. Oil

The desired oil temperatures and pressures are as follows:

Condition	Pressure lb./sq.in.	Temp. Degrees C.
Desired	85 to 105	54 to 95
Climb (Rated Pr)	85 to 105	95
Cruising	65	60 min.
Idle	15	

Regarding desirable operating oil temperatures, Technical Order No. 24-41 contains information of interest to all pilots.

15. Overspeeding

The maximum allowable engine overspeed is 3050 RPM. In dives, it is recommended that the throttle be partially opened, to give 12" to 15" manifold pressure. Mixture control should be in "AUTO RICH" and supercharger shift lever in "NEUTRAL".

H. Check-Off List

1. Starting Engines

Pilot	Flight Engineer
	1. Engines - Turn over by hand.
	2. See that airplane is secure for warm-up.
3. Instruct radio operator to connect interphone and put interphone in position #4.	
4. Switch propeller controls to engineer.	
	5. Start auxiliary power plant and lower floats.

Pilot	Flight Engineer
	6. Propeller - Turn on all safety switches and master unit switch. Set selector switches in "AUTOMATIC". Set master unit for 2700 RPM.
7. Signal flight engineer to prepare to start one of the engines.	
	8. Mixture Control - in "IDLE CUT-OFF" position.
	9. Cowl flaps - set fully open
	10. Supercharger - "NEUTRAL"
11. Throttles - Approximately 1/3 open.	
	12. Carburetor Air Control - in "DIRECT" position.
	13. Booster Pumps - set for "NORMAL".
	14. Primer - Operate 3-5 seconds
	15. Starter - Energize.
	16. Signal pilot for "CONTACT".
17. Ignition switches - "ON"	
	18. Starter - Engage.
	19. Mixture Controls - shift to "AUTO RICH" as soon as engine starts firing. If engine stops, return to "IDLE CUT-OFF" immediately.
	20. Booster pump - stop booster pump when engine picks up speed (optional).
21. Idle engines at 800 RPM.	

2. Warm-up

Pilot	Flight Engineer
	1. Cowl Flaps - Fully open
	2. Mixture Control - "AUTOMATIC RICH"
3. Warm-up engine at 1000 RPM.	
	4. Propellers - Take-off RPM
	5. Oil Pressures - Check at 1000 RPM. Should be 60

Pilot	Flight Engineer
	to 105 lbs./sq.in.
	6. Propellers - Check propeller operation.
	7. Fuel Pressure - Check to 14 - 16 lbs./sq.in. (15 lbs. desired.)
	8. Oil Temperature - 40 degrees C.
	9. Cylinder Temperatures - Minimum head temperature- 120 degrees C.
10. Throttles - open to 15" - 25" Hg. Check loss RPM when switching magnetos.	
11. Control locks - Unlock and check controls for freedom of movement.	
12. Engage automatic pilot and check operation of surface controls. Oil pressure should be 140 lbs./sq.in.	
	13. Supercharger - shift auxiliary stage from "NEUTRAL" to "LOW" to "HIGH". Make several shifts, allowing at least 3 min. between shifts.
	14. Carburetor Air Control - Check to "DIRECT" position.
	15. Remove beaching gear.
	16. Secure and close hatches.
	17. Report to pilot, "Secured for take-off".
18. Taxi into water.	

3. Take-off

Pilot	Flight Engineer
1. Trim Tabs - check elevator, rudder, and aileron settings. Set wing flaps in desired position.	
	2. Fuel Valves - left engines to left inboard tank. Right engines to right in-

Pilot	Flight Engineer
	board tank. Outboard tanks shut off.
	3. Oil - check temperature and oil pressure normal.
	4. Mixture Control - "AUTOMATIC RICH"
	5. Booster pump - on or off. (optional)
	6. Carburetor air control - set for "DIRECT" air.
	7. Cowl flaps - "OPEN".
	8. Supercharger - in "NEUTRAL".
	9. Propellers - Set for 2700 RPM.
	10. Report to pilot when engines are ready for take-off.
11. Manifold Pressure - Takeoff at 47" Hg.	
12. Engine RPM - Reduce to 2550 immediately after take-off.	
13. Manifold Pressure - Adjust to 43-1/2" Hg. for max. rate of climb.	
14. Floats - Raise, or signal Engineer to raise.	
15. Flaps - Raise, or signal Engineer to raise. Raise gradually, as flight conditions demand.	
	16. Aux. Power Unit - Stop engine immediately after take-off.

4. Landing

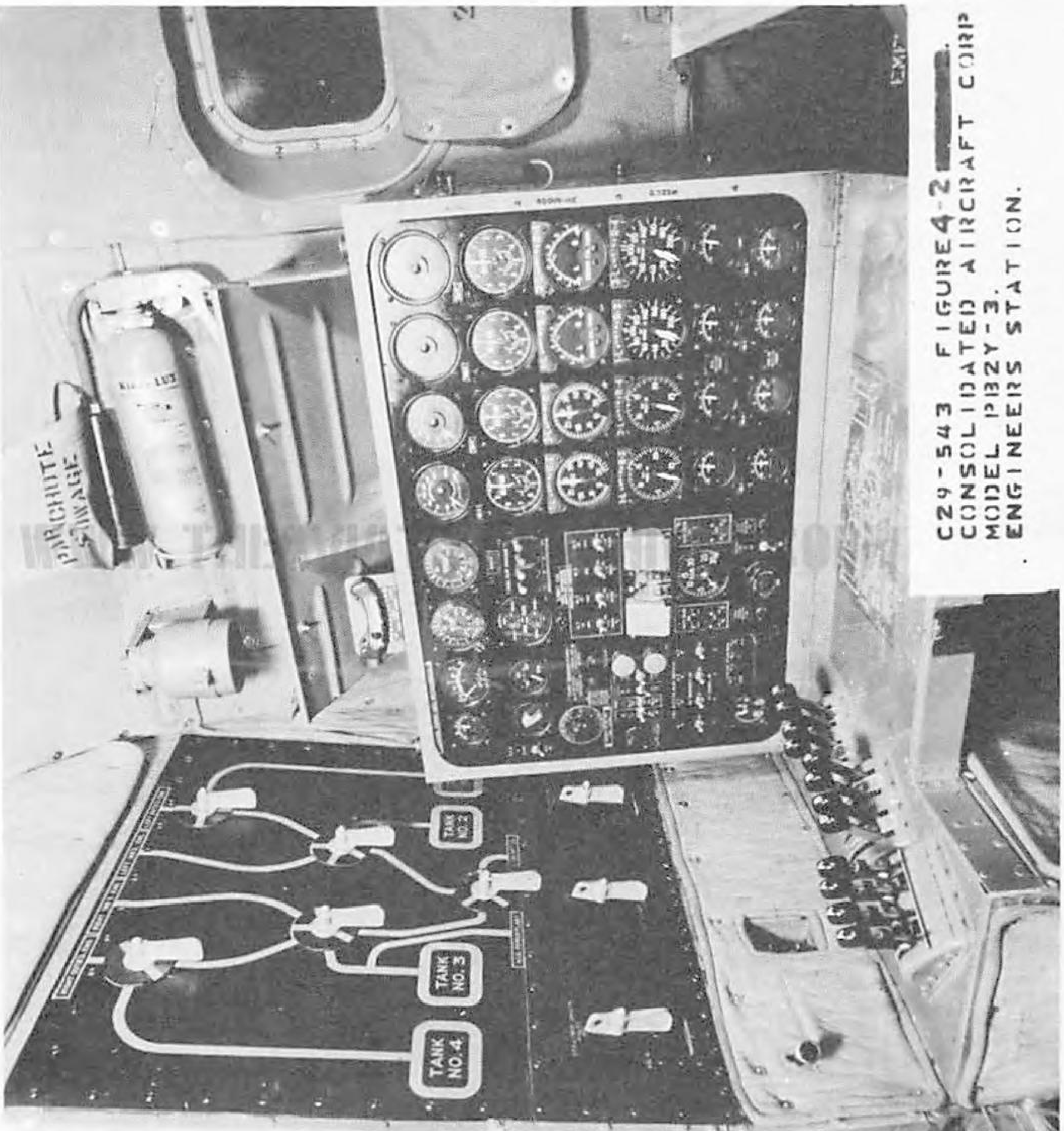
Pilot	Flight Engineer
1. Signal crew to prepare for landing.	
	2. Start auxiliary power plant at least ten minutes before landing.
3. Signal "Floats Down". (Preferably below 160 knots)	
	4. Floats - on signal from pilot, "Floats down".

Pilot	Flight Engineer
	5. Propellers - "TAKE-OFF RPM" at signal from pilot.
6. Wing flaps - "DOWN". Do not start to lower above 130 knots. Do not exceed 110 knots with flaps fully extended.	
	7. Mixture Control - set for "AUTOMATIC RICH".
	8. Supercharger - in "NEUTRAL".
	9. Cowl flaps - "CLOSED".
	10. Carburetor air temperature - on "DIRECT", except under icing conditions, rain, sleet, or snow.
	11. Crew member to stand by sea anchor after landing.

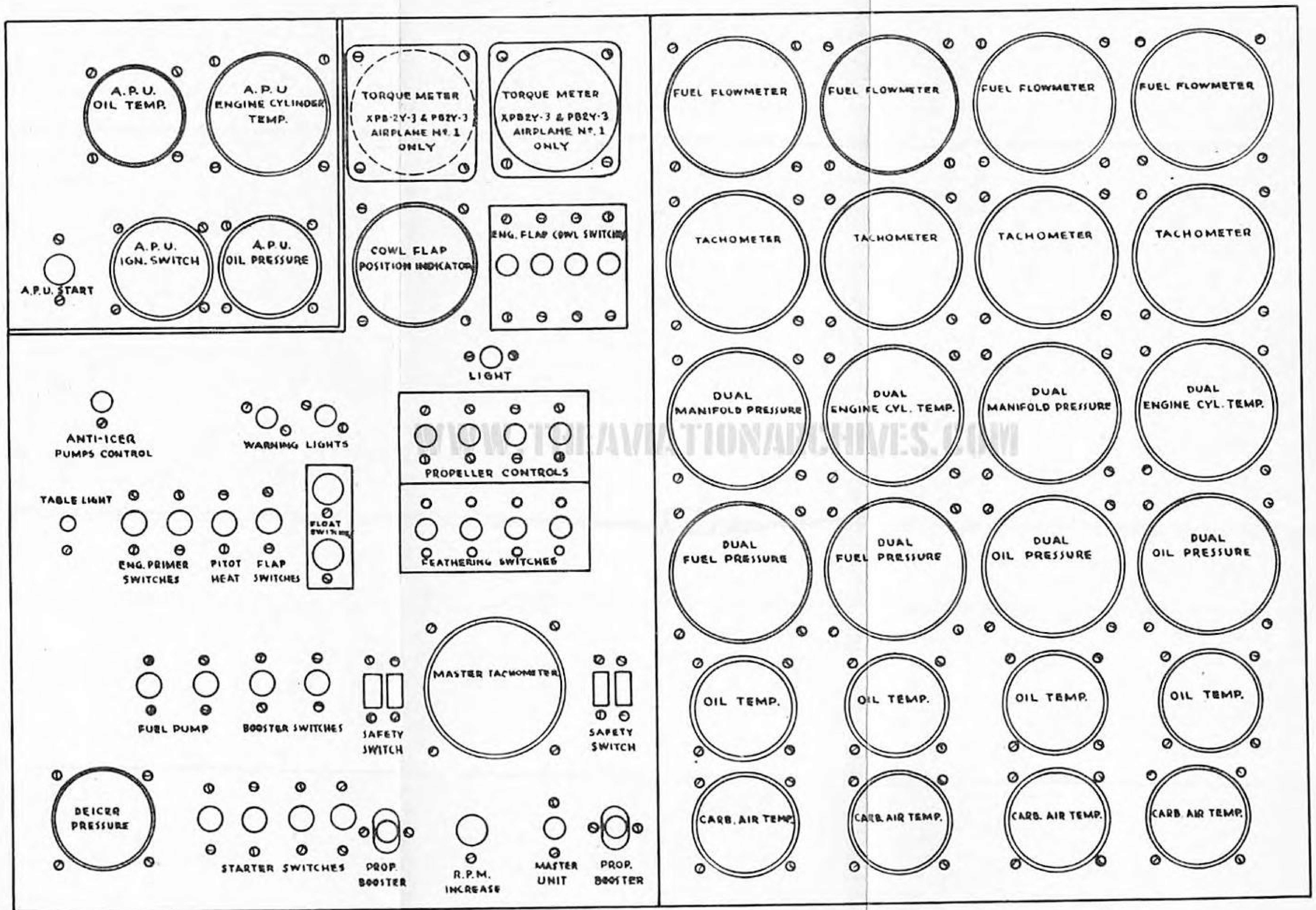
5. Stopping Engines

Pilot	Flight Engineer
	1. Cowl Flaps - "OPEN". Cylinder temperature not to exceed 204 degrees C. before stopping.
2. Throttles - 1/10 open. Idle at 800 RPM.	
	3. Propellers - Leave in "MANUAL HIGH RPM". (Low Pitch).
4. Signal engineer to stop engines.	
	5. Mixture control - put in "IDLE CUT-OFF" position. Turn off booster pumps if operating.
6. Ignition - cut switches after engines stop.	
7. Signal "SECURE" after plane is beached or secure to buoy.	
8. Control locks - lock.	
9. Radioman secure lights and interphones.	
10. Stop auxiliary power plant.	

CZ9-528 FIGURE 4-1 7-25-42
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3
PROPELLER CONTROLS ON
PILOT'S CONTROL PEDESTAL



C29-543 FIGURE 4-2 [redacted]
CONSOLIDATED AIRCRAFT CORP
MODEL PB2Y-3.
ENGINEERS STATION.



REFER TO C.A.C. DWG. No. 29F3497

FIGURE 4 -3
FLIGHT ENGINEER'S INSTRUMENTS

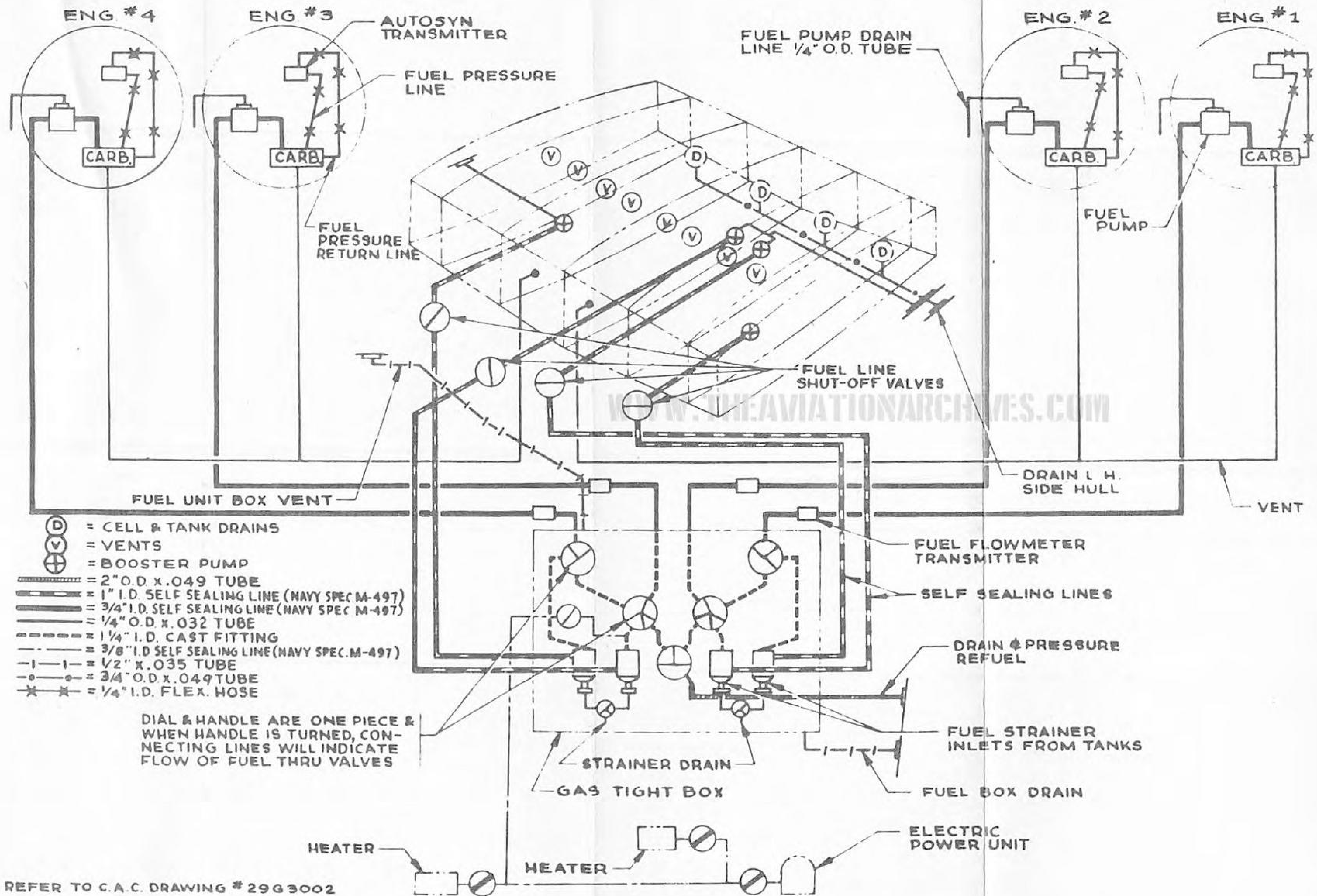
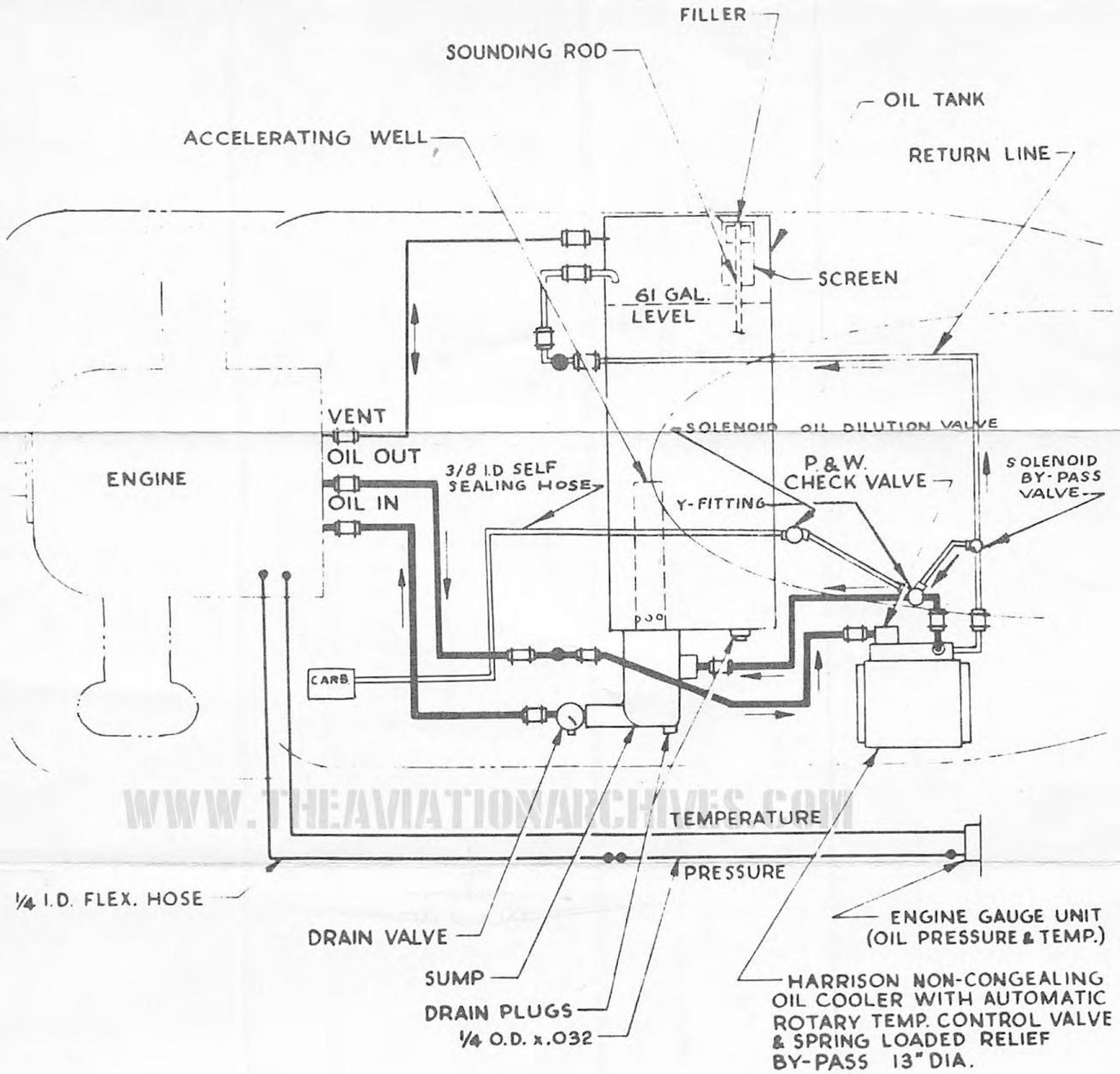


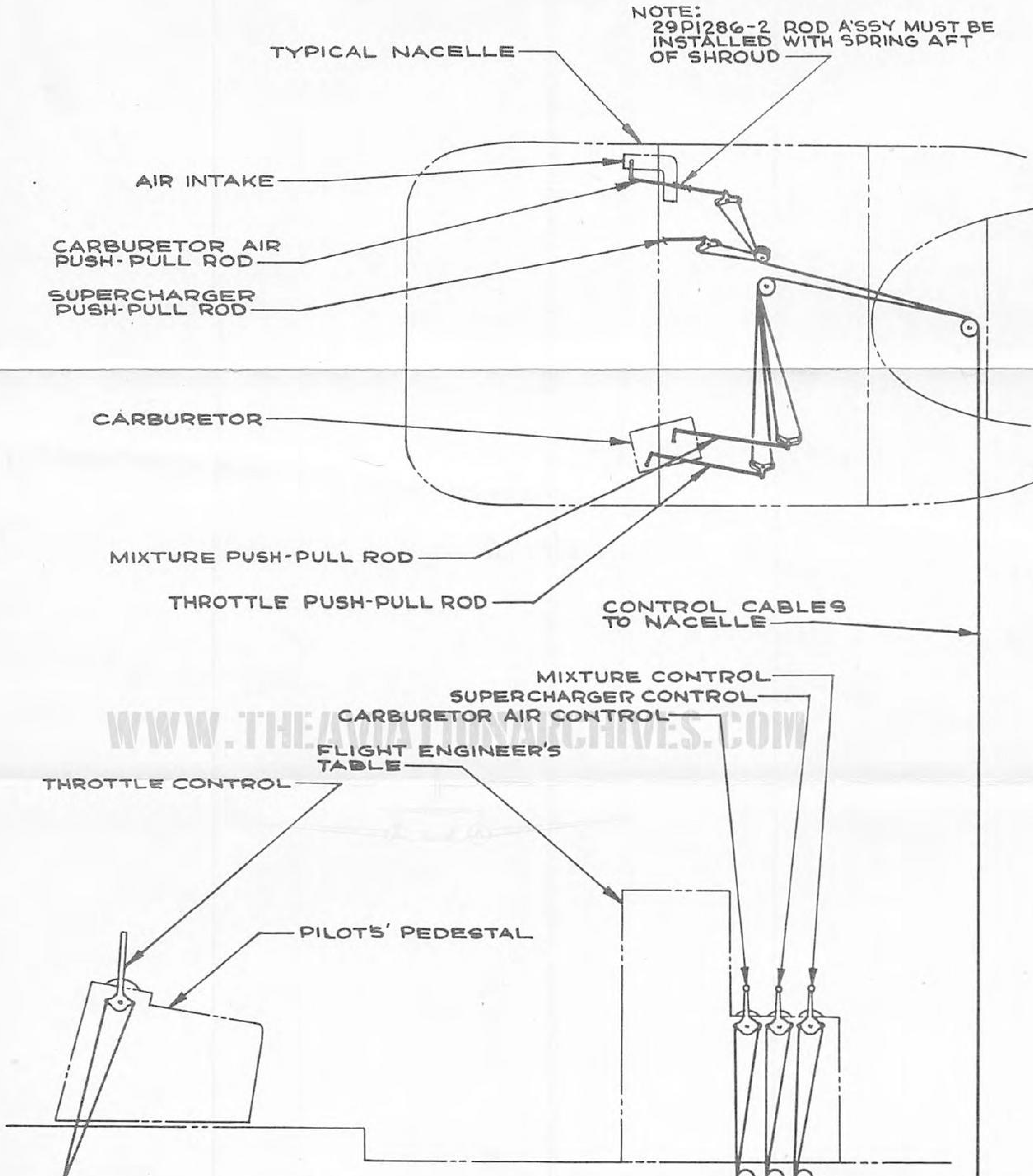
FIGURE 4 - 4
FUEL SYSTEM DIAGRAM



REFER TO C.A.C. DWG. Nº 29-0-3001

		LINES			MATERIAL
HOSE CONNECTIONS	UNION COUPLINGS	1½ O.D. x .049	1¼ O.D. x .049	¾ O.D. x .049 UNLESS OTHERWISE SPEC.	ALUM. ALLOY TUBING
					SPEC. 44T32 TEMP "A"

FIGURE 4-5
OIL SYSTEM DIAGRAM



NOTE:
CABLES TO BE RIGGED TO 35# TENSION AT NORMAL TEMPERATURES OF APPROX. 70° F.

REFER TO C.A.C. DWG. 29P3001

FIGURE 4 - 6
ENGINE CONTROLS DIAGRAM

PROPELLER CHECK-OFF LIST

PILOT'S CONTROLS	TAKE-OFF Starting and Taxi	CRUISE Automatic	CRUISE Selective Fixed Pitch	FEATHER	UNFEATHER	LANDING	REVERSE PITCH Taxi Only	NORMAL from REVERSE
SYNCHRONIZER SPEED CONTROL	TAKE-OFF RPM	Select Desired RPM	--	--	At Desired RPM	MAXIMUM CRUISE RPM	TAKE-OFF RPM	TAKE OFF RPM
SYNCHRONIZER TEL-LIGHTS (GREEN)	ON	ON	OFF	OFF	ON If AUTO	ON	ON For engines placed to AUTO	
BOOSTER TEL-LIGHTS (RED)	OFF	OFF	OFF	ON Feathering Then OFF	OFF	OFF	ON While changing pitch OFF When setting reached	
REVERSE PWR. SWITCH	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
REVERSE RETURN SWITCHES	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	REVERSE	RETURN Then NORMAL
SAFETY SWITCH	ON	ON	ON	ON	ON	ON	ON	ON
MANUAL SELECTOR SWITCH	AUTO	AUTO	As Req'd then off	-	-	AUTO	-	-
PROPELLER CONTROL CHANGE-OVER SWITCH	AS DESIRED	AS DESIRED	AS DESIRED	AS DESIRED	AS DESIRED	AS DESIRED	AS DESIRED	AS DESIRED

FIGURE 4-7

PROPELLE[illegible]ECK-OFF LIST

FLIGHT ENGINEER'S CONTROLS	TAKE-OFF Starting and Taxi	CRUISE Automatic	CRUISE Selective Fixed Pitch	FEATHER	UNFEATHER	LANDING	REVERSE PITCH Taxi Only	NORMAL from REVERSE
SAFETY SWITCHES	ON	ON	ON	--	ON	ON	ON	ON
SELECTOR SWITCHES	AUTO	AUTO	As Req'd. Then OFF	--	Incr. RPM As Req'd. Then AUTO	AUTO	AUTO	AUTO
FEATHER SWITCHES	NORMAL	NORMAL	NORMAL	FEATHER	NORMAL	NORMAL	NORMAL	NORMAL
BOOSTER TEL-LIGHTS (RED)	OFF	OFF	OFF	ON Feathering Then OFF	OFF	OFF	ON While changing pitch OFF When setting reached	
MASTER UNIT SWITCH	ON	ON	--	--	ON	ON	ON	ON
SYNCHRONIZER SPEED CONTROL	TAKE-OFF RPM	Select Desired RPM	--	--	At Desired RPM	See T.O. 9-40	TAKE OFF RPM	TAKE OFF RPM

FIGURE 4-8

SECTION V

OPERATION CHARTS, DATA AND CURVES

A. Power Calibration Curves (Ref. Figures 5-1, 5-2 and 5-3)

The engine power curves, mentioned in Part G, 5 and 6 of the previous section, follow this section as Figures 5-1, 5-2, and 5-3. One curve is given for each of the three stages of engine supercharging, that is, NEUTRAL, LOW and HIGH auxiliary stage blower.

These curves alone do not completely prescribe methods of operation. They do provide a basis for determining power from readings of the tachometer, manifold pressure gage, altimeter and carburetor air intake thermometer under flight conditions, regardless of propeller settings.

These curves were furnished for this handbook by Bureau of Aeronautics. In using them, the pilot should keep in mind the following points:

1. The charts for neutral and low auxiliary stage operation differ from the chart for high auxiliary stage in that they show resulting powers in percentages of rated horsepower rather than actual brake horsepower.

2. The standard air temperature curve shown on Figure 5-2 does not apply when auxiliary blower is in use. When low or high auxiliary stage is being used, power should be calibrated from a carburetor air temperature of 32° C, and corrected for the number of degrees difference between 32° C and true carburetor air temperature as indicated on the carburetor air thermometer.

The following example will serve to illustrate the use of Figure 5-3, the curve for high auxiliary stage.

Given: Pressure Altitude..19,000 ft.
RPM................ 2,350
Manifold Pressure.. 36" Hg.
Carburetor Air Temp.+ 110° F.
Auxiliary Stage,
High Blower

From Figure 5-3 obtain 780 BHP at 22,700 ft. for the given RPM and manifold pressure. Draw a straight line from this point parallel to the constant "Manifold Pressure - RPM" lines, to obtain 770 BHP at 19,000 ft.

Since Figure was calibrated at 90°F carburetor air temperature, a BHP correction due to temperature must be made between 90° F and the true carburetor air temperature.

$$BHP_c = BHP \times \sqrt{\frac{T_s + 460}{T + 460}}$$

$$= 770 \times \sqrt{\frac{90 + 460}{70 + 460}}$$

$$= 754.6 \text{ BHP}$$

A close approximation of the correction for carburetor air temperature can be made by applying a 1% reduction in power for each 10°F rise above 90° of the carburetor air temperature, as follows:

Rise above 90° = (110 - 90) .01 = 2%

Decrease in BHP = 770 x 2% = 15.4

BHP_c = 770 - 15.4 = 754.6 BHP

B. <u>Cruising Control Diagram</u>

True airspeed vs. brake horsepower in level flight at any pressure altitude and atmospheric temperature is shown by the accompanying chart, for any loading without external bombs. If external bombs are carried the drag is increased and the chart is not applicable.

Due to the wide variation of weight during any prolonged flight, with this airplane, a chart for a single weight will not show accurately the variation of airspeed with power. Therefore, two weights are shown which will bracket the weight variation for any flight. Data for intermediate weights may be obtained by interpolation.

An example of the use of the chart is given below:

Assume pressure altitude .... 10,000 ft.
Assume outside air temperature ..... 5° C.
Assume true indicated airspeed ..... 150 MPH

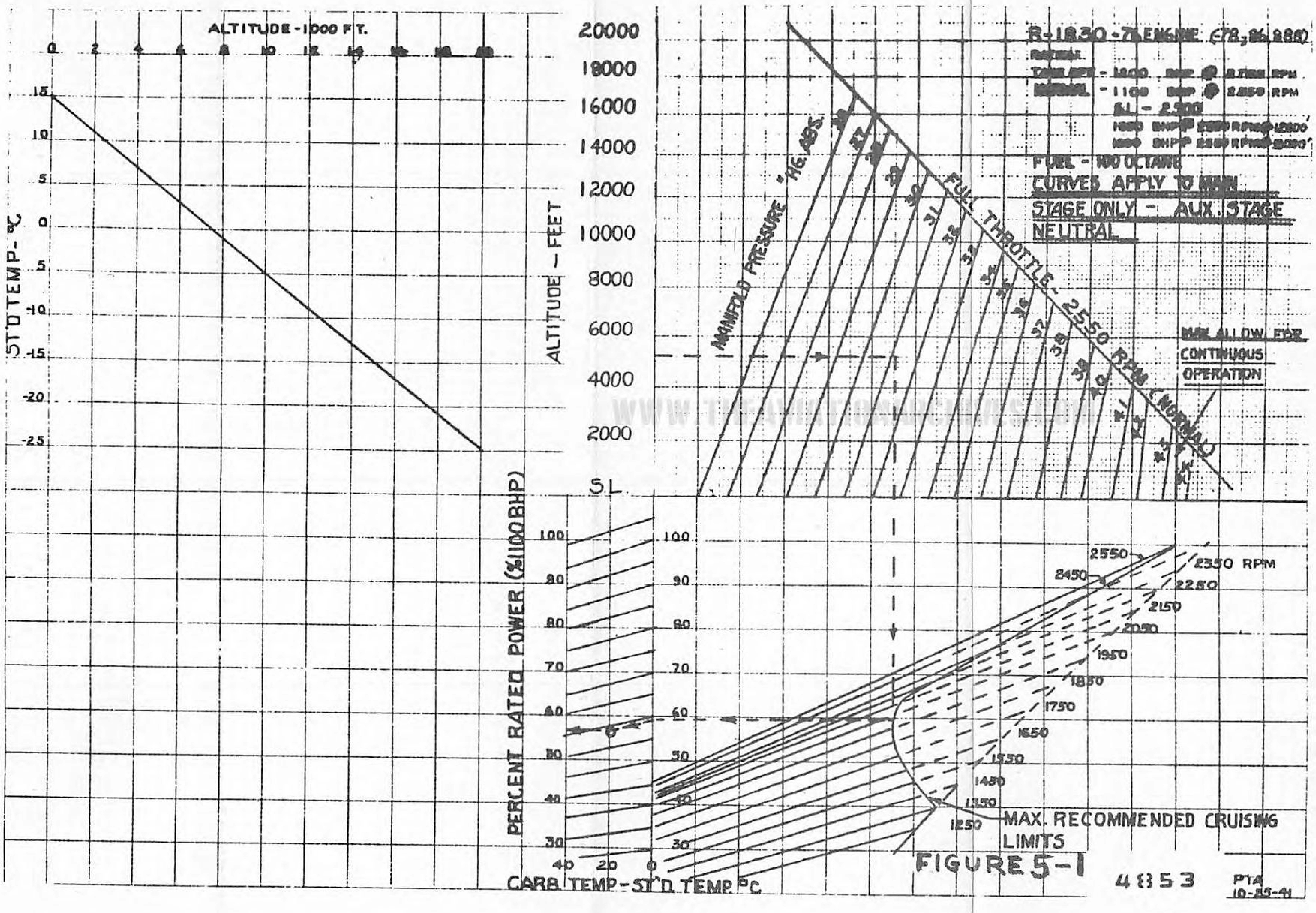
(Note: It is assumed that an airspeed indicator calibration curve is available which may be plotted as true indicated airspeed in MPH vs. airspeed indicator reading in knots).

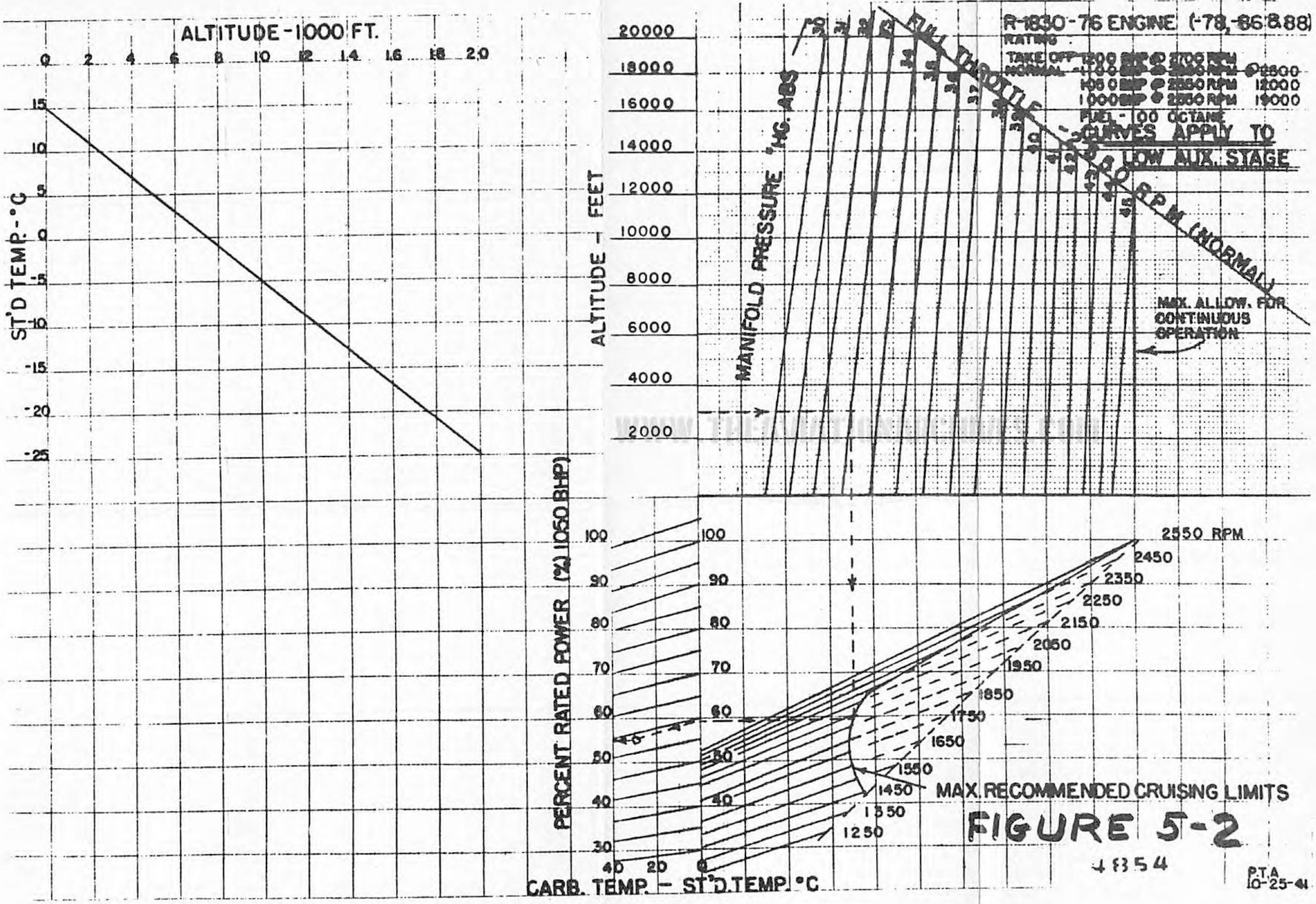
Assume weight at a particular time during flight	50,000 lbs.
True airspeed (from chart)	177 MPH
BHP/Eng. @ 60,000 lbs. (from chart).	645
BHP/Eng. @ 39,000 lbs. (from chart).	500
By interpolation BHP/Eng. @ 50,000 lbs.	576
Percent Normal Power	55

(Note: Normal Power = 1050 BHP/Eng.)

C. Fuel Consumption Curves

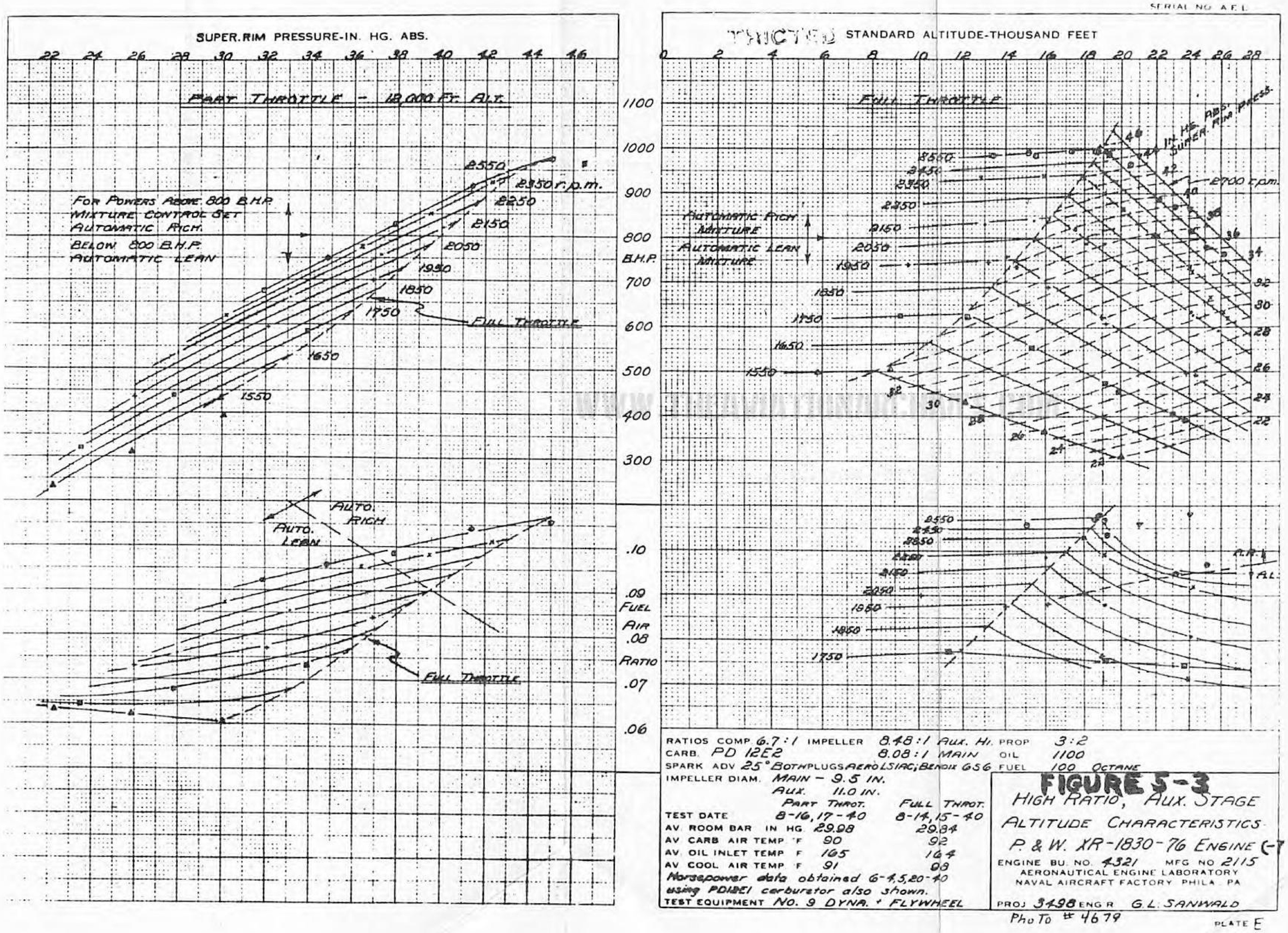
Figure 5-4 shows the Fuel Consumption curves as plotted from the best available engine test data submitted by the engine manufacturer. These curves show the fuel consumption in gallons per hour per engine as a function of RPM for three altitudes. Data for other altitudes may be obtained by interpolation.


ALTITUDE - 1000 FT.
STD TEMP - °C
ALTITUDE - FEET
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
SL
R-1830-76 ENGINE
FUEL - 100 OCTANE
CURVES APPLY TO MAIN STAGE ONLY - AUX. STAGE NEUTRAL
MANIFOLD PRESSURE "HG. ABS.
FULL THROTTLE - 2550 RPM (NORMAL)
MAX ALLOW. FOR CONTINUOUS OPERATION
PERCENT RATED POWER (%1100BHP)
2550
2450
2350 RPM
2250
2150
2050
1950
1850
1750
1650
1550
1450
1350
1250
MAX. RECOMMENDED CRUISING LIMITS
CARB. TEMP - ST'D. TEMP. °C
4853
PTA
10-25-41
FIGURE 5-1



ALTITUDE - 1000 FT.
ST'D TEMP. - °C
R-1830-76 ENGINE (-78, -86 & 88)
RATING
FUEL - 100 OCTANE
CURVES APPLY TO LOW AUX. STAGE
ALTITUDE - FEET
MANIFOLD PRESSURE "HG. ABS
FULL THROTTLE
RPM (NORMAL)
MAX. ALLOW. FOR CONTINUOUS OPERATION
PERCENT RATED POWER (%) 1050 BHP
2550 RPM
MAX. RECOMMENDED CRUISING LIMITS
CARB. TEMP. - ST'D.TEMP. °C
4854
P.T.A 10-25-41

FIGURE 5-2


SERIAL NO. A.E.L.
SUPER. RIM PRESSURE-IN. HG. ABS.
22 24 26 28 30 32 34 36 38 40 42 44 46
PART THROTTLE - 18,000 FT. ALT.
FOR POWERS ABOVE 800 B.H.P. MIXTURE CONTROL SET AUTOMATIC RICH.
BELOW 800 B.H.P. AUTOMATIC LEAN
2550
2350 r.p.m.
2250
2150
2050
1950
1850
1750
1650
1550
FULL THROTTLE
AUTO. RICH
AUTO. LEAN
FULL THROTTLE
1100
1000
900
800
B.H.P.
700
600
500
400
300
.10
.09
FUEL AIR
.08
RATIO
.07
.06
STANDARD ALTITUDE-THOUSAND FEET
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28
FULL THROTTLE
AUTOMATIC RICH MIXTURE
AUTOMATIC LEAN MIXTURE
2550
2450
2350
2250
2150
2050
1950
1850
1750
1650
1550
2700 r.p.m.
46 IN. HG. ABS. SUPER. RIM PRESS.
44
42
40
38
36
34
32
30
28
26
24
22
A.R.
A.L.
RATIOS COMP. 6.7:1 IMPELLER 8.48:1 AUX. HI. PROP 3:2
CARB. PD 12E2 8.08:1 MAIN OIL 1100
SPARK ADV 25° BOTH PLUGS AERO LS1AC; BENDIX 656 FUEL 100 OCTANE
IMPELLER DIAM. MAIN - 9.5 IN.
AUX. 11.0 IN.
PART THROT. FULL THROT.
TEST DATE 8-16,17-40 8-14,15-40
AV. ROOM BAR IN HG. 29.98 29.84
AV. CARB AIR TEMP °F 90 92
AV. OIL INLET TEMP °F 165 164
AV. COOL AIR TEMP °F 91 98
Horsepower data obtained 6-4,5,20-40 using PD12E1 carburetor also shown.
TEST EQUIPMENT NO. 9 DYNA. + FLYWHEEL
FIGURE 5-3
HIGH RATIO, AUX. STAGE
ALTITUDE CHARACTERISTICS
P. & W. XR-1830-76 ENGINE
ENGINE BU. NO. 4321 MFG NO 2115
AERONAUTICAL ENGINE LABORATORY
NAVAL AIRCRAFT FACTORY PHILA. PA
PROJ 3498 ENG'R G.L. SANWALD
PhoTo # 4679
PLATE E

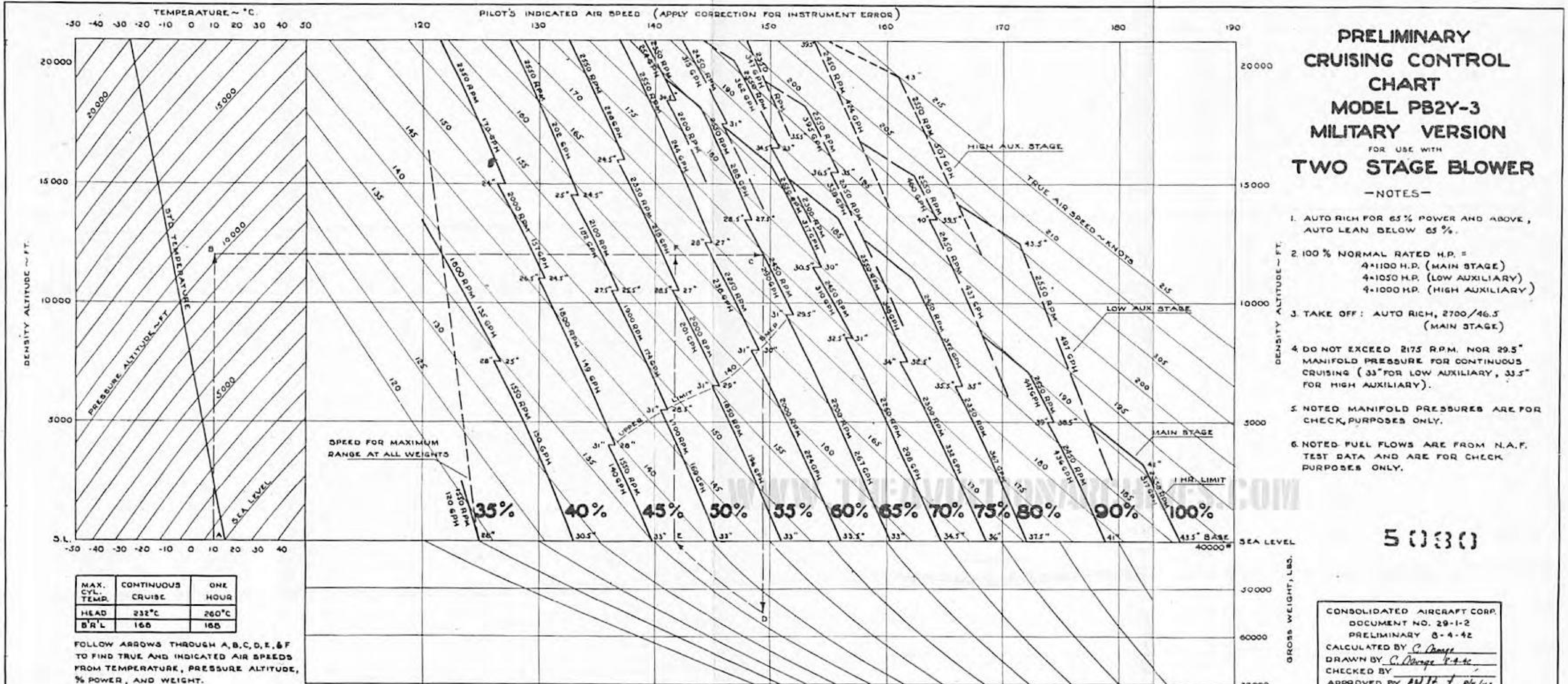
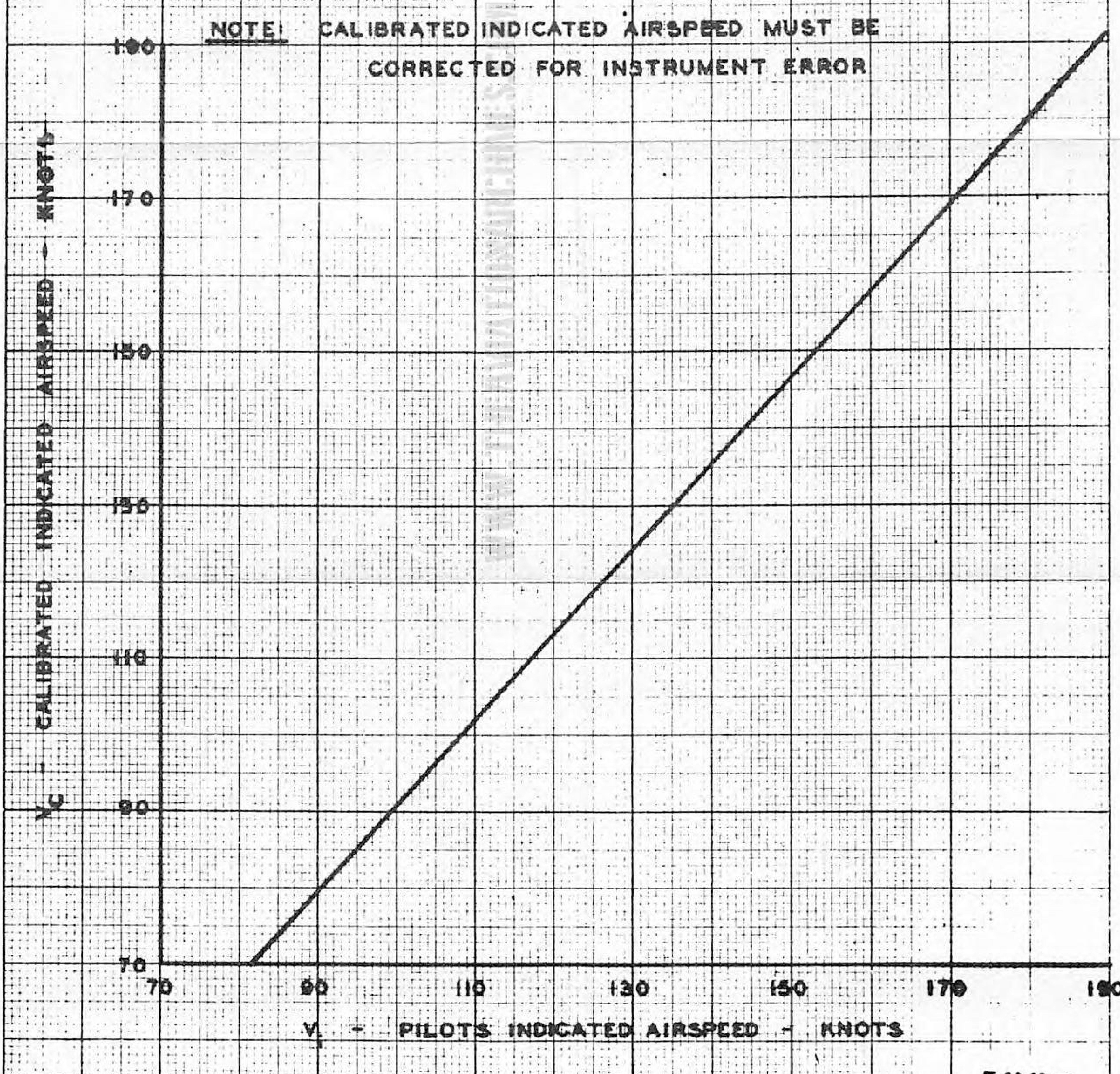

PRELIMINARY
CRUISING CONTROL
CHART
MODEL PB2Y-3
MILITARY VERSION
FOR USE WITH
TWO STAGE BLOWER
—NOTES—
1. AUTO RICH FOR 65% POWER AND ABOVE, AUTO LEAN BELOW 65%.
2. 100% NORMAL RATED H.P. = 4×1100 H.P. (MAIN STAGE) 4×1050 H.P. (LOW AUXILIARY) 4×1000 H.P. (HIGH AUXILIARY)
3. TAKE OFF: AUTO RICH, 2700/46.5 (MAIN STAGE)
4. DO NOT EXCEED 2175 R.P.M. NOR 29.5" MANIFOLD PRESSURE FOR CONTINUOUS CRUISING (33" FOR LOW AUXILIARY, 33.5" FOR HIGH AUXILIARY).
5. NOTED MANIFOLD PRESSURES ARE FOR CHECK PURPOSES ONLY.
6. NOTED FUEL FLOWS ARE FROM N.A.F. TEST DATA AND ARE FOR CHECK PURPOSES ONLY.
5080
TEMPERATURE ~ °C.
PILOT'S INDICATED AIR SPEED (APPLY CORRECTION FOR INSTRUMENT ERROR)
DENSITY ALTITUDE ~ FT.
PRESSURE ALTITUDE ~ FT.
STD TEMPERATURE
SEA LEVEL
TRUE AIR SPEED ~ KNOTS
HIGH AUX. STAGE
LOW AUX. STAGE
MAIN STAGE
1 HR. LIMIT
UPPER LIMIT
SPEED FOR MAXIMUM RANGE AT ALL WEIGHTS
35% 40% 45% 50% 55% 60% 65% 70% 75% 80% 90% 100%
BASE 40000#
GROSS WEIGHT, LBS.
MAX. CYL. TEMP. | CONTINUOUS CRUISE | ONE HOUR
HEAD | 232°C | 260°C
B'R'L | 168 | 168
FOLLOW ARROWS THROUGH A, B, C, D, E, & F TO FIND TRUE AND INDICATED AIR SPEEDS FROM TEMPERATURE, PRESSURE ALTITUDE, % POWER, AND WEIGHT.
CONSOLIDATED AIRCRAFT CORP.
DOCUMENT NO. 29-1-2
PRELIMINARY 8-4-42
CALCULATED BY C. Amage
DRAWN BY C. Amage 8-4-42
CHECKED BY
APPROVED BY

FIGURE 5-4



5083

CALCULATED BY	[signature] 1-17-43	AIRSPEED CALIBRATION FIGURE 5-5	PAGE
TRACED BY			DOC. NO. 29-[illegible]-1
CHECKED BY	C. [signature] 7-?-43		
APPROVED BY	[signature]	CONSOLIDATED AIRCRAFT CORPORATION LINDBERGH FIELD, SAN DIEGO, CALIF.	MODEL PB2Y-3
APPROVED BY			

FORM 150R

SECTION VI

NORMAL INSTRUMENT READINGS

The normal instrument readings, given in the following table have been taken from test flights and represent an average of readings taken under normal conditions. They are to be used as a guide for engine operation, but need not be regarded as defining absolute operating limits. For operating limits the pilot should consult applicable Bureau of Aeronautics T.O.'s and T.N.'s and the engine manufacturer's operating handbook, furnished with each airplane.

			START	WARM-UP	GROUND TEST	TAKE-OFF	CLIMB & HIGH SPEED	MAXIMUM CRUISE
1.	Fuel Pressure	lbs./sq.in.	3-4	15	15	15	15	15
2.	Oil Pressure	lbs./sq.in.	-	60-105	85-105	85-105	85-105	65-85
3.	Oil Temperature	Deg.C.	-	54-95 Max.80	54-60 Min.60	25 Min.	54-95	54-95 80
4.	Cyl.Head Temp. Max.	Deg.C.	-	205	205	260	260 (1 hr) 232(cont.)	232
5.	Carburetor Air Temp. Max.	Deg.C.	"DIRECT" 32°	"DIRECT" 32°	"DIRECT" 32°	"DIRECT" 41°	41°	32°
6.	Manifold Pressure	in.Hg.				47	44.0 - N 45.0 - L 45.0 - H.	34
7.	Cowl Flaps		Open	Open	Open	Open	Open-Climb Closed High Speed	Closed
8.	Mixture Control		Idle Cut-Off Auto Rich	Auto Rich	Auto Rich	Auto Rich	Auto Rich	Auto Lean

FIGURE 6-1

CHECK CHART OF ENGINE INSTRUMENT READINGS - R-1830-88 ENGINE, PB2Y-3 AIRPLANE

	START	WARM-UP	GROUND TEST	TAKE-OFF	CLIMB & HIGH SPEED	MAXIMUM CRUISE
9. Engine R.P.M.	800	1000 Low Pitch	1400	2700	2550	2175
10. Blower Speed	Neutral	0 - 5000 ft. - Neutral 5000 - 16,500 ft. - Low 16,500 - Up - High				Neutral 0 - 10,000' Low 10,000'- 16,500' High 16,500' Up

FIGURE 6-1 (Cont'd.)

CHECK CHART OF ENGINE INSTRUMENT READINGS- R-1830-88 ENGINE, PB2Y-3 AIRPLANE

SECTION VII

FLYING CHARACTERISTICS

A. Weight Distribution and Balance

The following pages contain weight distribution and balance data for all loading in combat condition, with 100% fuel cell installation and 100% armor plate protection, as well as for normal loading, with 50% fuel cell protection.

A complete breakdown of useful load distribution for various load conditions, together with special load weight table, and table of weight empty items readily removable is also given.

B. Take-Off Time vs. Weight

Figure 7-1 at the end of this section is a chart of take-off time vs. weight for varying loads. Stalling speeds vs. flap angle and stalling speeds vs. weight for varying flight conditions are charted as Figures 8-1 and 8-2 of the next section.

A. Actual Weight & Balance Summary (Ref. Report ZW-29-013 Appendix to ZW-29-010, Actual Weight & Balance)*

Gross Weight Conditions	Gross Weight	Gallons Fuel	Gallons Oil	Crew Cruising** CG(Ft) Aft Datum Line	Crew Cruising** CG %MAC	Crew Battle*** CG(Ft) Aft Datum Line	Crew Battle*** CG %MAC
Bomber - (4) 1000# Bombs	66,000	2469	140.0	27.91	28.0	28.04	28.8
Patrol - (2) 500# Bombs	65,982	2936	162.9	27.81	27.3	27.94	28.1
Bomber - (8) 1000# Bombs	66,000	1841	102.2	27.97	28.4	28.09	29.1
Bomber - (12) 1000# Bombs	66,000	1158	60.3	27.97	28.4	28.09	29.1
Bomber - (12) 100# Bombs	66,000	2847	158.4	27.88	27.8	28.01	28.6
Bomber - (20) 100# Bombs	66,000	2695	149.7	27.92	28.0	28.05	28.8
Torpedo- (2) Mk. 15 Torpedoes	66,000	1975	110.0	27.95	28.2	28.08	29.0
Torpedo- (2) Mk. 13 Torpedoes	66,000	2445	135.7	27.92	28.0	28.04	28.8
Bomber-Less Fuel & (4) 1000# Bombs	47,186			27.97	28.4	28.15	29.5
Patrol-Less Fuel & (2) 500# Bombs	47,366			27.95	28.2	28.12	29.3
Bomber-Less Fuel & (8) 1000# Bombs	46,954			28.00	28.5	28.18	29.6
Bomber-Less Fuel & (12) 1000# Bombs	47,052			28.03	28.7	28.21	29.8
Bomber-Less Fuel & (12) 100# Bombs	47,526			27.96	28.3	28.13	29.3
Bomber-Less Fuel & (20) 100# Bombs	47,510			27.97	28.4	28.14	29.4
Torpedo-Less Fuel & (2) Mk. 15 Torp.	47,308			28.01	28.6	28.18	29.6
Torpedo-Less Fuel & (2) Mk. 13 Torp.	47,488			27.98	28.4	28.16	29.5
Patrol-Less Fuel & Expendable Armament-(2)-500# Bombs	46,104			27.22	23.7		
Most Forward CG-(2) 500# Bombs	45,922			27.11	23.0		
Most Aft CG-(12) 1000# Bombs	53,882					28.28	30.3
WEIGHT EMPTY	39,463	27.41' Aft Datum Line = 24.%MAC					

* Combat Condition - With 100% Fuel Protection & 100% Armor Protection

** Crew Cruising Stations

Pilot, Radio Operator
Co-Pilot, Officers in Bunks (2)
Flight Engineer, Crew in Bunks (4)

*** Crew Battle Stations

Pilot, Radio Operator, Top Waist Gun
Co-Pilot, Bomber
Flight Engineer, Bow Gunner, Tail Gunner
Side Gunners (2)

Reference Dimensions

Reference Line Forward of L.E.W. at Root	= 19.37'
Leading Edge, M.A.C. Aft of L.E.W. at Root	= 4.01'
Leading Edge, M.A.C. Aft of Reference Line	= 23.38'
Length of M.A.C.	= 16.19'
Distance from Base Line to Deck Line	= 16.33'

Attention is called to the fact that certain "Special Load Items" (page for details) are generally installed in the airplanes at the time of delivery. However, the weight and balance computations are not included in the weight and balance of the airplane. These must be considered separately by using the weights and arms of individual items (page).

B. USEFUL LOAD - WEIGHT & DISTRIBUTION

	WEIGHT	ARM-FT
BOMBER - (4) 1000# Bomb Condition		
BOMBER 4-1000# Bombs		
Cruising Crew		
Crew & Parachutes		
Pilot	180	10.8
Co-Pilot	180	10.8
Radio Operator	180	16.4
Flight Engineer	180	19.0
Officers in Bunks (2)	360	16.0
Crew in Bunks (4)	720	36.0
Parachutes & Life Jackets - Fwd. (5)	100	15.2
Parachutes & Life Jackets - Aft. (5)	100	26.7
Total Cruising Crew & Parachutes	(2000)	23.07
Crew Battle		
Crew & Parachutes		
Pilot	180	10.8
Co-pilot	180	10.8
Flight Engineer	180	19.0
Radio Operator	180	16.4
Bomber	180	6.5
Bow Gunner	180	2.5
Top-Waist Gunner	180	43.3
Side-Waist Gunner (2)	360	46.1
Tail Gunner	180	77.8
Parachutes-Forward (5)	100	15.2
Parachutes-Aft (5)	100	26.7
Total Battle Crew & Parachutes	(2000)	27.19
Fuel (2469 Gals.)	14814	27.82
Oil (140.0 Gals.)	1027.4	22.3
Armament		
Flexible Gun Installations		
Bow Gun Installations		
(2) Guns - .50 Cal. M-2	136	1.4
(1) Electric Sight, Mk-9	1.5	2.3
(2) Electric Trigger Solenoids Mk. 4-1	7.3	1.8
(2) Gun Mount Adapters EIO	14.0	1.2
800 Rds. of .50 Cal. Ammunition	240	1.3
Total Bow Gun Install.	(398.8)	1.3
Top Waist Gun Installation		
(2) Guns - .50 Cal M-2	130.2	43.3
(1) Electric Sight, Mk-9	1.5	43.3
Electric Trigger Solenoids Mk-4-1	7.3	43.3
(2) Gun Mount Adapters EIO	14.	43.3
(2) Gun Charging Mechanisms	6.4	43.3
1200 Rds. of .50 Cal. Ammunition	360.	43.3
Total Top Waist Gun Install.	(519.4)	43.3

USEFUL LOAD - WEIGHT & DISTRIBUTION - (Cont'd.)

BOMBER (4) 1000# Bomb Condition (Cont'd)

	WEIGHT	ARM-FT
Armament (Cont'd)		
Side Waist Gun Installation (2)		
(2) Guns .50 Cal. M-2	145.8	46.1
(2) Telescope Sights MK-5	8	46.1
(2) Gun Mount Adapters E-10	28	46.1
(2) Magazine Mounts	3.6	46.1
800 Rds. .50 Cal. Ammunition With Links in Magazine Ass'ys.		
120 Rds at Gun	54.0	46.1
680 Rds at Racks	323.0	48.0
Total Side Waist Gun Install.	562.4	47.18
Tail Gun Installation		
(2) Guns .50 Cal. M-2	145.8	78.5
(1) Electric Sight Mk-9	1.5	76.8
(2) Electric Trigger Solenoids-Mk 5-1	7.0	77.3
(2) Gun Mount Adapters	14.0	78.1
(1) Trigger Switch	1.0	77.3
2000 Rds. .50 Cal. Ammunition		
1750 Rds in Containers	525.0	70.8
250 Rds on Tracks	75.0	76.6
Total Tail Gun Install.	769.3	71.1
Total Flexible Gun Install.	2249.9	47.13
4-1000# Bombs		
(4) Bombs	4000.0	27.59
(8) Bomb Shackles (P-4D)	28.4	27.6
(1) Bomb Sight (Mk 15-4)	34.8	4.3
(2) Pilot Director Indicators	1.2	
(2) Firing Keys NA-41-A	2.5	4.9
Bomb chock screws	10.2	27.6
(8) Bomb Guide Links	44.8	27.6
(8) Shackle Attaching Hangers	44.8	27.6
Intervalometer K2	8.3	3.5
Total 4-1000# Bomb Install.	4180.0	27.33
Pyrotechnics Installation		
M-8 Signal Pistol	2.5	11.3
24 Rds. ammunition	6.0	11.3
(2) Parachute Flares	39.0	64.6
(40) Float Lights	90.0	45.3
(4) Smoke Grenades	7.2	34.9
Total Pyrotechnics Install.	144.7	48.0

USEFUL LOAD - WEIGHT & DISTRIBUTION - (Cont'd.)

PATROL - (4) 1000# Bomb Condition (Cont'd.)	WEIGHT	ARM-FT
Equipment		
Radio		
G.O. Transmitting & Receiving		
Transmitter (G.O. 3,5,6, or 7-Opt.)	143.0	20.4
R.A.X. Receiver (3)	67.5	15.9
Dynamotor (Inc. in electrical)	----	----
Frequency Indicator	12.5	19.7
Mixing Box, Intercommunication Cables, Leadout Insulators, etc.	9.4	18.9
Trailing Antenna Install.	6.9	21.3
Total G.O.	239.3	19.1
D.Z.-1 Loop Equipment		
Receiver DZ-1	37.4	21.6
Loop Antenna	8.8	20.6
Filter (dynamotor)	7.3	14.6
(2) Filters	3.0	14.6
Loop Mounting Pedestal	5.5	20.5
Output Meter Loop Pedestal Extension & Connecting Cables	9.3	20.5
Total DZ-1	71.3	20.3
G.F. Transmitting & Receiving		
Transmitter	12.3	20.3
Receiver	12.6	20.4
Dynamotor	12.5	17.2
Coils, Phantom Antenna, Connecting Cables, Junction Box, etc.	19.6	15.9
Total G.F.	57.0	18.1
R.L.-24B Interphone		
Head sets (15)	7.8	22.0
Microphone (15)	6.9	22.0
Control Unit (Radio Operator)	10.9	15.8
Dynamotor	8.8	17.2
Control Unit-Pilot's	3.9	9.9
Junction Box, Make Clips, Power Cables, & Station Boxes	13.4	21.6
Total R.L.-24B	51.7	18.9
"Z.A." Landing Equipment		
Landing Indicator	4.0	7.7
Localized Signal Converter	7.4	18.9
Glide Path Receiver	8.9	18.4
Transmission Lines	9.0	24.8
Antenna Mast	8.0	25.8
Junction Boxes, Control Boxes, Adapter & Connecting Cables	15.1	14.8
Total "Z.A."	52.4	18.8
Total Radio	(471.7)	(19.1)
Navigating		
(2) Octants & Cases	13.0	16.1
(2) Navigating Watches	2.1	16.1
(1) Pair Binoculars	2.6	16.1

USEFUL LOAD - WEIGHT & DISTRIBUTION - (Cont'd.)

	WEIGHT	ARM-FT
TROL - (4) 1000# Bomb Condition (Cont'd.)		
Navigating (Cont'd.)		
Miscellaneous Charts	2.0	16.1
(1) Mark 3 Protractor	5.1	16.1
(1) Mark 7 Drift Sight	18.0	12.5
(1) Mark 2-B Drift Sight	2.3	16.1
(1) Plotting Board & base	3.5	16.1
Total Navigating	(48.6)	(14.68)
Miscellaneous		
(1) Tool Kit (Airplane)	15.0	32.0
(1) First Aid Package	2.6	33.0
Food (Emergency)	100.0	34.6
Water (Emergency)	120.0	35.4
(7) Flashlights & Batteries	16.0	33.0
Canvas Bucket	2.0	32.0
(2) Life Rafts Mark 7	128.0	34.8
Rope (300' 1-1/2" Manila)	23.0	9.6
(1) Buoy Hook & Line	6.0	7.6
(2) Tool Kits (Engine)	24.0	32.0
(1) Set Semaphore Flags	1.0	32.0
(1) Sea Anchor & Line	12.0	57.2
(1) Klaxon (Electric)	4.0	30.6
(1) Boat Hook	4.0	33.0
(2) Gals. reserve oil for A.P.U.	15.0	49.8
(3) Gals. regular oil for A.P.U.	22.5	53.5
Miscellaneous personal effects	200.0	31.1
Miscellaneous Bedding, Blankets, etc.	100.0	30.1
Food (2 days)	80.0	27.9
Water (2 days)	80.0	25.3
Signal Light & Case	11.6	12.0
(6) 2 qt. Thermos bottles	27.0	32.0
(4) 1 gal. Thermos jugs	45.0	30.0
Oxygen Equipment		
Rebreathers		
Pilot & Co-pilot	18.0	10.3
Radio Operator	9.0	17.4
Flight Engineer	9.0	19.0
Navigator	9.0	13.8
Bomber	9.0	5.4
Officer's Bunks (2)	18.0	12.5
Crew's Bunks (2)	18.0	33.2
Side Gunners (2)	18.0	43.5
Spare Cannisters	168.0	12.0
(9) Cylinders (514 cu.in. each)	216.0	9.7
Oxygen for turrets		
Bow-gun Enclosure	24.0	1.8
Top-waist gun Enclosure	24.0	43.3
Tail Gun Enclosure	24.0	76.0
Total Oxygen	(564.0)	(16.5)
Total Miscellaneous & Oxygen	(1600.7)	(24.43)
Total Equipment	2121.0	24.53
Total Useful Load	26537.	28.65

USEFUL LOAD _ WEIGHT & DISTRIBUTION (Cont'd.)

	WEIGHT	ARM_FT.
(PA)TROL - (2) 500# Bomb Condition		
Crew & parachutes - Cruising	2000.0	23.07
Crew & parachutes - Battle	(2000.0)	(27.23)
Fuel (2936 Gals.)	17616.0	27.46
Oil (162.9 Gals.)	1221.6	22.3
Armament		
Flexible Guns	(2249.9)	(47.13)
Bombs & Installation	(1165.8)	(26.65)
Pyrotechnics	(144.7)	(48.0)
Total Armament	3560.4	40.46
Equipment	2121.0	24.53
Total Useful Load	26519.0	28.40
BOMBER - (8) 1000# Bomb Condition		
Crew & parachutes - Cruising	2000.0	23.07
Crew & parachutes - Battle	(2000.0)	(27.23)
Fuel (1841 gals.)	11046.0	28.09
Oil (102.2 gals.)	766.7	22.3
Armament		
Flexible Gun Installation	(2249.9)	(47.13)
Bombs & Installation	(8208.7)	(27.46)
Pyrotechnics	(144.7)	(48.0)
Total Armament	10603.3	31.91
Equipment	2121.0	24.53
Total Useful Load	26537.0	28.79
BOMBER-(12) 1000# Bomb Condition		
Crew & Parachutes - Cruising	2000.0	23.07
Crew & Parachutes - Battle	(2000.0)	(27.23)
Fuel (1158 gals.)	6948.0	28.34
Oil (60.3 gals.)	482.6	22.3
Armament		
Flexible Gun Installation	(2249.9)	(47.13)
Bombs & Installation	(12590.8)	(27.41)
Pyrotechnics	(144.7)	(48.0)
Total Armament	14985.4	30.57
Equipment	2121.0	24.53
Total Useful Load	26537.0	28.79
BOMBER-(12) 100# Bomb Condition		
Crew & parachutes - Cruising	2000.0	23.07
Crew & parachutes - Battle	(2000.0)	(27.23)
Fuel (2847 gals.)	17082.0	27.55
Oil (158.4 gals.)	1187.8	22.3
Armament		
Flexible Gun Installation	(2294.9)	(47.13)
Bombs & Installation	(1751.6)	(28.63)
Pyrotechnics	(144.7)	(48.0)
Total Armament	4146.2	39.34
Equipment	2121.0	24.53
Total Useful Load	26537.0	28.58

USEFUL LOAD - WEIGHT & DISTRIBUTION (Cont'd.)

	WEIGHT	ARM-FT.
MBER - (20) 100# Bomb Condition		
Crew & parachutes - Cruising	2000.0	23.07
Crew & Parachutes - Battle	(2000.0)	(27.23)
Fuel (2695 gals.)	16170.0	27.67
Oil (149.7 gals.)	1123.0	22.3
Armament		
Flexible Gun Installation	(2249.9)	(47.13)
Bombs & Installation	(2728.4)	(28.32)
Pyrotechnics	(144.7)	(48.0)
Total Armament	5123.0	37.14
Equipment	2121.0	24.53
Total Useful Load	26537.0	28.67
TORPEDO - (2) Mark 15 Torpedo Condition		
Crew & parachutes - Cruising	2000.0	23.07
Crew & parachutes - Battle	(2000.0)	(27.23)
Fuel (1975 gals.)	11850.0	27.99
Oil (110.0 gals.)	824.9	22.3
Armament		
Flexible Gun Installation	(2249.9)	(47.13)
Torpedoes & Installation	(7241.7)	(27.46)
Bomb Provisions	(104.8)	(2.8)
Pyrotechnics	(144.7)	(48.0)
Total Armament	9741.1	32.30
Equipment	2121.0	24.53
Total Useful Load	26537.0	28.75
TORPEDO - (2) Mark 13 Torpedo Condition		
Crew & parachutes - Cruising	2000.0	23.07
Crew & parachutes - Battle	(2000.0)	(27.23)
Fuel (2445 gals.)	14670.0	27.81
Oil (135.7 gals.)	1017.7	22.3
Armament		
Flexible Gun Installation	(2249.9)	(47.13)
Torpedoes & Installation	(4228.9)	(27.45)
Bomb Provisions	(104.8)	(27.6)
Pyrotechnics	(144.7)	(48.0)
Total Armament	6728.3	34.47
Equipment	2121.0	24.53
Total Useful Load	26537.0	28.67

50% VS. 100% FUEL PROTECTION - NO FUEL PROTECTION NOR ARMOR PLATING VS. 100% FUEL PROTECTION AND 100%* ARMOR PLATING

The following tabulation indicates the weight and C.G. of items removed and/or added to report weight empty (100% fuel protection and 100% Armor Plating) for:

(a) 50% vs. 100% Fuel Protection
(b) No fuel protection nor Armor Plating vs. 100% fuel protection and 100% Armor Plating

	Weight	Arm	Horizontal Moment
(a) 50% vs. 100% Fuel Protection **			
Items Removed:			
(2) Outboard fuel cells	-733.0	27.7	-20304
Fuel cells removable install. Pts.	-26.0	27.5	-715
Total Removed	(-759.0)	(27.7)	(-21019)
Items Added			
(2) Fuel tank vapor dilution cyls.	+48.4	22.1	+1070
(1) Dump duct vapor dilution cyl.	+13.9	22.1	+307
(1) Dump valve release cable	+0.3	25.0	+8
Total Added	(+62.6)	(22.1)	(+1385)
(a) Total	-696.4	28.2	-19634
(b) No Fuel Protection nor Armor Plating vs. 100% Fuel Protection and 100% Armor Plating			
Items Removed:			
Fuel Cells and Installation			
(2) Inboard fuel cells	-648.0	27.2	-17626
(2) Outboard fuel cells	-733.0	27.7	-20304
Fuel cell removable Install.pts.	(-90.6)	(27.5)	(-2492)
Inboard cells	-64.6	27.5	-1777
Outboard cells	-26.0	27.5	-715
Total Fuel Cells & Inst. (removed)	(-1471.6)	(27.5)	(-40422)
Armor Plating (Removable)			
Bow gunner	-178.0	1.5	-267
Bomber	-58.8	7.2	-423
Pilot & Co-pilot	-191.3	10.7	-2047
Blkhd. #3-Flight Deck	-287.6	22.3	-6413
Top waist gunner	-187.6	44.0	-8254
Side Gunners			
At gun	-81.5	46.1	-3757
On bulkhead #6	-98.4	48.9	-4812
Tail Gunner	-35.0	78.5	-2748
Total Armor Plate (Removed)	(-1118.2)	(25.7)	(-28721)

50% VS. 100% FUEL PROTECTION - NO FUEL PROTECTION NOR ARMOR PLATING VS. 100% FUEL PROTECTION AND 100%* ARMOR PLATING (Cont'd.)

	Weight	Horizontal Arm	Horizontal Moment
(b) No Fuel Protection nor Armor Plating vs. 100% Fuel Protection and 100% Armor Plating (Cont.)			
Items Removed (Cont.)			
Bullet proof glass (Tail Turret)	-80.3	78.4	-6296
Total items removed	(2670.1)	(28.3)	(75439)
Items Added			
(1) Dump duct vapor dilution cyl.	+13.9	22.1	+307
(1) Dump valve release cable	+0.3	25.0	+8
Total Items Added	(+14.2)	(22.2)	(+315)
(b) Total	-2655.9	28.3	-75124

*100% Armor Plating does not include weight of oil cooler armor and oil tank armor, which are included in "Special Load".

**Add the difference in weight of 100% & 50% Fuel Protection (696.4#) to fuel & oil at the ratio of 18 to 1.

Readily
Removable Weight
Empty Items & Their Locations

	Weight	Horizontal Arm
Mattresses		
Officer's - Sta. #2 - #3 (4)	32.6	15.8
Crew's - Sta. #4 - #5 (4)	32.6	36.4
Crew's - Sta. #6 - #7 (2)	14.8	51.8
Pillows		
Officer's - Sta. #2 - #3 (4)	7.8	15.8
Crew's - Sta. #4 - #5 (4)	7.8	36.4
Crew's - Sta. #6 - #7 (2)	4.0	51.8
Bunks		
Officer's - Sta. #2 - #3 (4)	53.5	15.8
Crew's - Sta. #4 - #5 (4)	54.6	36.4
Crew's - Sta. #6 - #7 (2)	27.9	51.8
Entrance Ladder	14.6	32.8
Portable Tables (2)	15.2	27.3
lge & Refueling Pump & Hose (Pump = 40.5; Hose = 29.2)	69.7	22.6
Galley & Service Equipment		
Eating & Cooking Utensils, Including Coffee Pot	38.8	30.5
Tappan Combination Stove, Sink, and Locker Assembly	45.5	30.5
Tappan Combination Refrigerator, and Locker Assembly	55.4	27.1
Galley Equipment Locker	11.1	28.7
Fire Extinguishers		
Auxiliary Power Unit	15.8	51.0
Portable (4)	38.5	33.5
Work Platforms (1 set)	62.9	38.0
Torpedo Slings (2 sets)	16.2	31.7
Anchor & Handling Gear		
Anchor	60.0	5.9
nchor Line Assembly	62.0	5.9
ndant & Clamp	17.0	2.3
Davit	32.0	5.9
Davit Platform	3.6	12.1
Warm Up Handling Fitting	9.8	68.7

Readily Removable Weight Empty Items & Their Locations (Cont.)

		Weight	Horizontal Arm
Seats and Cushions			
Flight Engineer		17.6	19.0
Radio Operator		17.9	16.7
Navigator		4.3	13.8
Bombardier's Stool		2.8	6.0
Safety Belts			
Bunk	(10)	7.4	40.8
Gunners	(2)	6.0	46.1
Curtains			
Night Flying		4.2	10.2
Sun		1.5	7.7
Covers			
Window		8.2	31.7
Bulkhead #4 & #5		.9	36.4
Water Containers			
Drinking	(2)	8.4	25.3
Emergency	(3)	12.7	34.9
Bombsight Stabilizer		41.5	4.6

APPROXIMATE WEIGHT & BALANCE OF PB2Y-3 AIRPLANE AS DELIVERED

	Weight	Horizontal Arm	Moment
Weight Empty (per Report ZW-29-015 - Ship #12)	39603.0	27.38	1084425
Less Weight Empty Items Likely to be Missing From Airplane on Delivery:			
Cooking & Eating Utensils	- 38.4	30.5	- 1183
Bombsight Stabilizer	- 41.5	4.6	- 191
Outboard Cells (2)	- 759.0	27.7	- 21019
Total Missing Weight Empty Items	(- 838.9)	(26.7)	(- 22393)
Plus Special Load Items Usually Installed in Airplane on Delivery			
Wing De-Icing Boots	+ 129.3	23.3	+ 3009
Tail De-Icing Boots	+ 52.0	68.4	+ 3555
Main B.G. Lowering Mech.	+ 77.5	22.6	+ 1752
Anti-Icing Tank & Pumps	+ 24.1	23.4	+ 564
Oil Cooler Armor Plate	+ 127.0	24.4	+ 3099
Work Platforms (2) (2 Also in Weight Empty)	+ 62.9	38.0	+ 2390
Starter Cranks	+ 10.9	62.9	+ 686
Engine Covers	+ 85.0	36.5	+ 3103
Pilot's Enclosure & Turret Covers	+ 42.3	36.5	+ 1544
Parachute Flare Rack & Armor	+ 101.4	41.6	+ 4217
Bomb & Torpedo Hoisting Equipment	+ 338.9	26.6	+ 7268
Airplane Hoist Shackle	+ 16.2	33.4	+ 541
Fittings for Torpedo Racks	+ 11.0	31.4	+ 345
Prop Anti-Icing Fluid (20 Gals.)	+ 140.0	24.1	+ 3374
Total Special Load	(+1218.5)	(29.1)	(+ 35447)
Useful Load Items Likely to be Installed in Airplane on Delivery			
Complete Radio Equipment	+ 471.7	19.1	+ 9002
Bomb Bay Shackles, Hangers Links & Screws	+ 218.0	27.5	+ 6001

APPROXIMATE WEIGHT & BALANCE OF PB2Y-3 AIRPLANE AS DELIVERED (Cont.)

	Weight	Horizontal Arm	Moment
Useful Load Items Likely to be Installed in Airplane on Delivery (Cont)			
Invervalometer	+ 8.3	3.5	+ 29
Total Navigation Equipment	+ 48.6	14.8	+ 717
Misc. Ships Equipment	+ 356.7	33.2	+ 11857
Torpedo Racks (2)	+ 310.8	27.4	+ 8516
Total	(+1414.1)	(25.5)	(+ 36122)
Total as Delivered	41397.0	27.38	1133601

The weight of the Airplane as delivered (less crew, fuel, oil and bombs) is approximately 41397 lbs.

The C.G. of this Airplane at this weight is 24.7% M.A.C.

Note: See next page for Specific Weight and Arms of "Special Load" items.

SPECIAL LOAD ITEMS AND THEIR LOCATIONS*

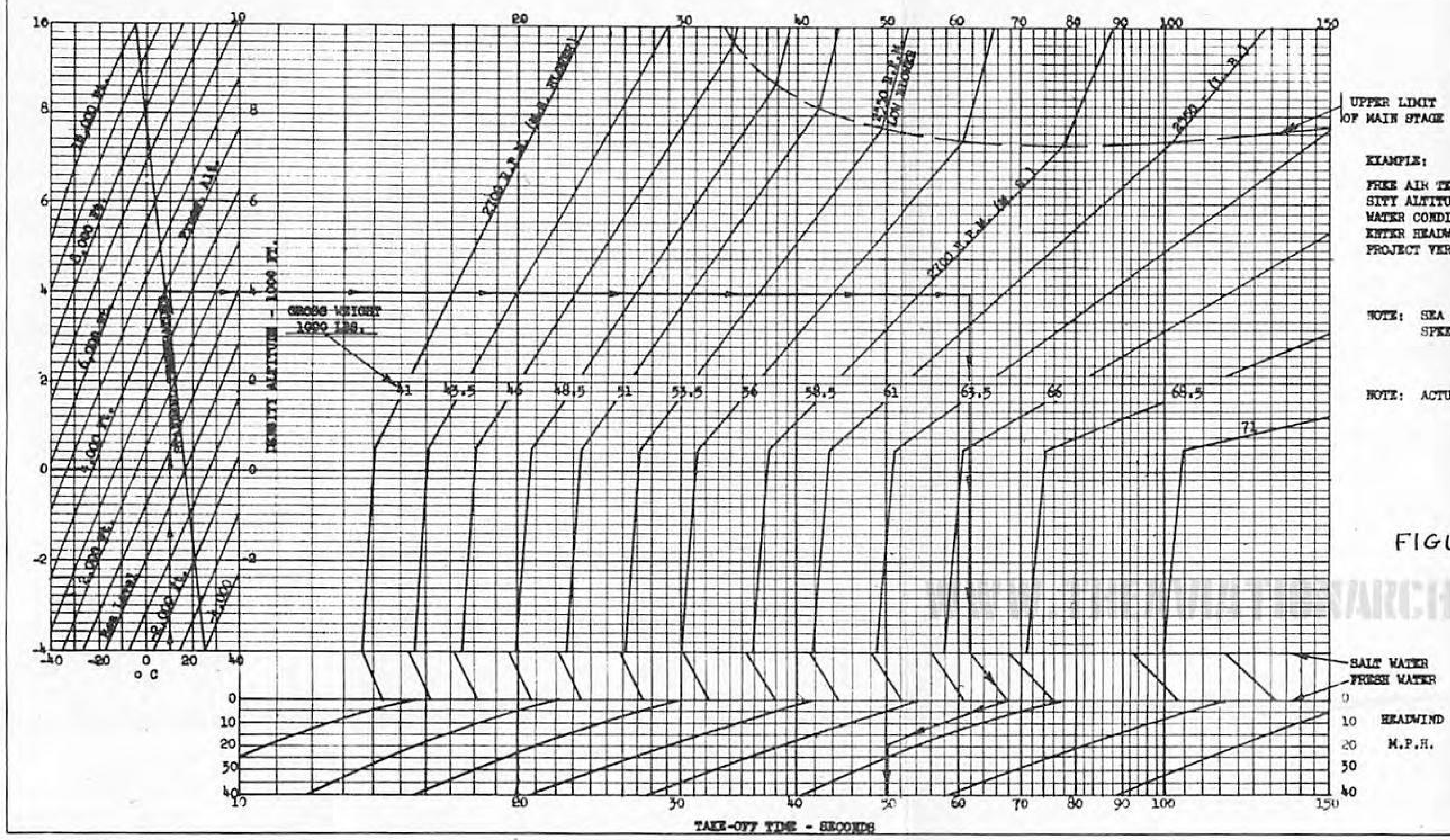
	Weight	Horizontal Arm
-Icing Boots & Fairing Strips**		
enter Panel	58.3	19.8
Outer Panels	66.0	26.6
Stabilizer	29.6	68.2
Fins	22.4	68.6
Covers**		
Pilot's Enclosure	11.1	17.2
Tail Turret	11.1	17.2
Top Waist Turret	10.6	17.2
Bow Turret	9.5	36.5
Engine	85.0	36.5
Blind Flying Curtains	3.3	36.5
Parachute Flare Inst.		
Rack & Fittings**	23.4	40.9
Armor Plate**	78.0	41.8
(10) Flares - Mk. 6	195.0	40.9
Target Towing Reel (Incl: Reel, Arm, Yoke & Supports)	67.7	59.5
Bomb & Torpedo Loading Equipt.**		
Electric Hoist	163.2	24.1
Bomb Hoisting Brackets	68.8	24.1
Bomb Hoisting Yoke	.9	24.1
Hoist Pulley Guard	1.3	24.1
orpedo Hoisting Pulley	11.1	24.1
orpedo Hoisting Bands	32.7	24.1
Torpedo Loading Platforms	60.9	38.0
Beaching Gear (In Place)		
Main Strut & Wheel Ass'y (Complete)	2230.0	22.2
Tail Strut & Wheel Ass'y (Complete)	326.0	70.5
Beaching Gear (Stowed Positions)		
Main Strut (2)	1711.5	28.1
Main Wheels (2)	408.5	27.5
Float Tanks (4)	110.0	28.1
Tail Strut & Wheel Ass'y (Complete)	326.0	27.0
Propeller Hoist	39.0	27.5
Propeller Anti-Icing Equipt.** (Removable)		
Tank (20 gal.)	12.3	24.1
Pesco Pumps & Std. Parts	11.8	22.7
Main B. G. Hoist Tackle**	16.0	28.1
Tail B.G. Hoist Tackle**	5.0	69.0
Airplane Hoist Shackle**	16.2	33.4
Main B.G. Socket Cover Plates**	.6	22.1
in B.G. Lowering Mech.**	77.5	22.5
ain B.G. Bomb Bay Stowage Tackle	14.5	28.1
Portable Engine Hoist	81.3	23.3
Main B.G. Bomb Bay Stowage Shackle	99.5	28.1

SPECIAL LOAD ITEMS (Cont'd.)

	Weight	Horizontal Arm
Main B.G. Flotation Tank Stowage Shackle	52.5	28.1
Engine Work Platforms**	62.9	38.0
Spare Starter Cranks**	10.9	32.9
Armor Plate**		
Oil Tank	443.0	22.7
Oil Cooler	127.9	24.4
Propeller Anti-Icing Fluid (20 gal)**	140.0	24.1
Commanding Officer's Portable Seat	16.0	13.1
Gun Cameras (G.S.A.P. N4)		
Bow Turret (1)	3.3	1.4
Top Waist Turret (1)	3.3	43.3
Side Waist Guns (2)	6.6	46.1
Tail Turret (1)	3.3	78.5

* Not included in weight empty.

**As a general rule, these special load items are delivered installed in the airplane. However, the weight and balance computations are not included.



EXAMPLE:

FREE AIR TEMP. OF +10°C AND PRESSURE ALTITUDE OF 3,800 FT. GIVES DENSITY ALTITUDE OF 4,000 FT. AT 60,000 LBS. PROJECT VERTICALLY DOWN TO WATER CONDITION BASE LINE FOLLOW SLOPING LINES TO FRESH WATER LEVEL. ENTER HEADWIND CHART AND FOLLOW SLOPING LINES TO HEADWIND OF 20 M.P.H. PROJECT VERTICALLY DOWN TO TAKE-OFF TIME OF 50 SECONDS.

NOTE: SEA LEVEL B.H.P. IS 4,800. KEEP WING FLAPS AT 0° UP TO HUMP SPEED AND 20° FLAPS FROM HUMP TO GETAWAY SPEED.

NOTE: ACTUAL FLIGHT TESTED VALUES ARE FOR SEA LEVEL ONLY.

FIGURE 7-1

50831

TAKE-OFF CHART
PB2Y-3 AIRPLANE

TAKE-OFF TIMES TO
LEAVE WATER

CONSOLIDATED AIRCRAFT CORP.
LINDBERGH FIELD, SAN DIEGO, CAL.

PRELIMINARY

DATE: 7-5-42 BY: J. Frick
APPROVED: C. L. Stout

DOC. NO. 29-3-1

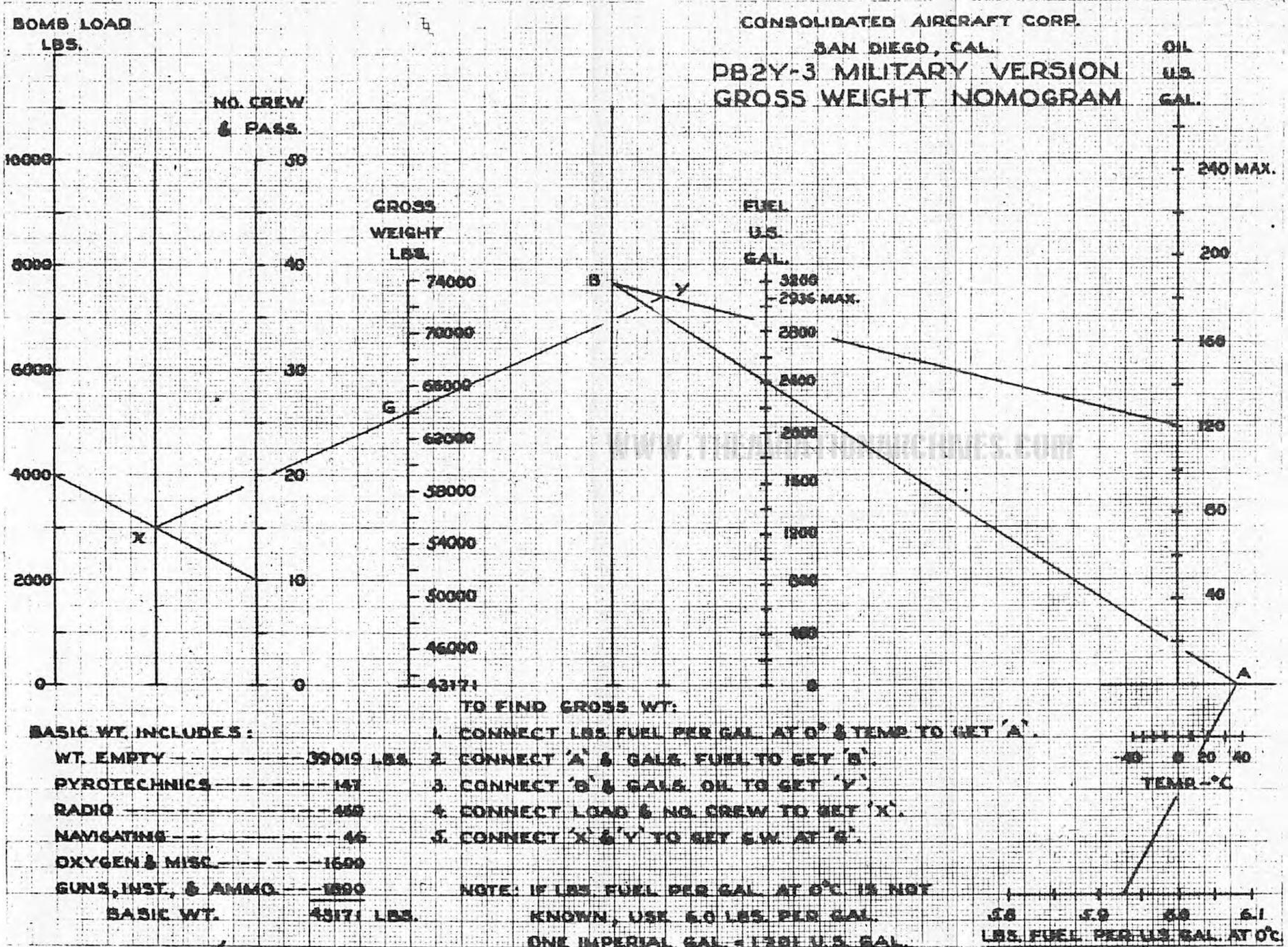


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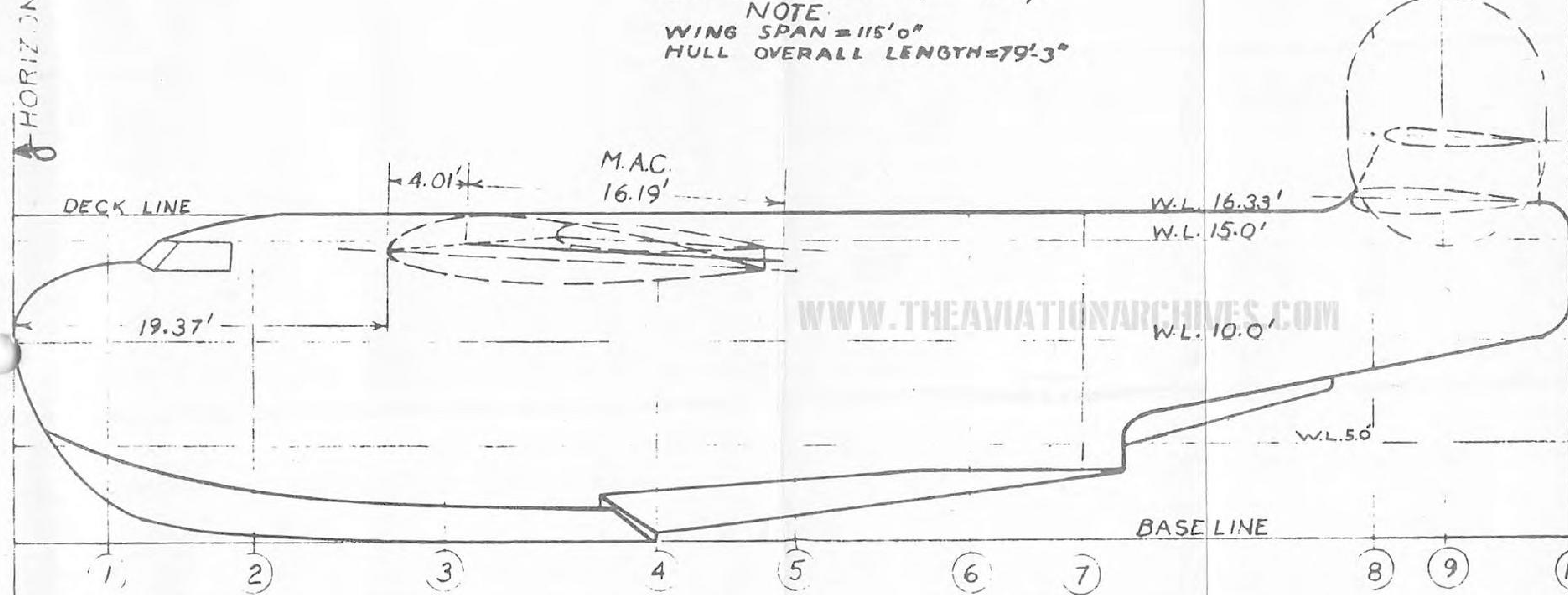
FIGURE 7-2

PB2Y-3
STATION DIAGRAM

SCALE 1/8" = 1'0" (APPROX.)

NOTE
WING SPAN = 115'0"
HULL OVERALL LENGTH = 79'-3"



STA.	FT. AFT H.R.L.
0.1	2.250
0.2	3.563
1.0	4.875
1.1	6.734
1.2	8.594
1.3	10.453
2.0	12.313
2.1	14.260

STA.	FT. AFT H.R.L.
2.2	16.208
2.3	18.156
2.4	20.104
3.0	22.052
3.1	24.052
3.2	26.052
3.3	28.052
3.4	29.583

STA.	FT. AFT H.R.L.
3.5	31.115
4.0	32.927
4.1	34.687
4.2	36.445
4.3	38.203
5.0	39.961
5.1	41.719
5.2	43.476

STA.	FT. AFT H.R.L.
5.3	45.234
5.4	46.992
6.0	48.750
6.1	50.625
6.2	52.500
7.0	54.375
7.1	56.250
7.2	58.125

STA.	FT. AFT H.R.L.
7.3	59.971
7.4	61.875
7.5	63.664
7.6	65.510
7.7	67.357
8.0	69.208
8.1	71.094
9.0	72.976

STA.	FT. AFT H.R.L.
9.1	74.760
9.2	76.333
9.3	77.791
10.0	79.25

3-12-42

FIGURE 7-3

V.H.T. GERHARDT

SECTION VIII

LANDING CHARACTERISTICS

A. Wing Flaps

For description and operation refer to Section III-A.

The effect of the flaps on the airplane in take-off and landing is shown by the curves on Figures 7-1, 8-1 & 8-2.

B. Check-Off List

Refer to Check-Off List in Section IV-H.

C. Tabulation of Landing Speeds

Refer to Figures 8-1 and 8-2 which give the speeds at which the airplane may be stalled for a landing for all positions of the wing flaps and at varying gross weights.

D. CAUTION: When the center of gravity is at the forward limit there is insufficient elevator control to permit a completely stalled landing.

E. CAUTION: When carrying Mk 15 destroyer-type torpedoes do not lower flaps below 25°.

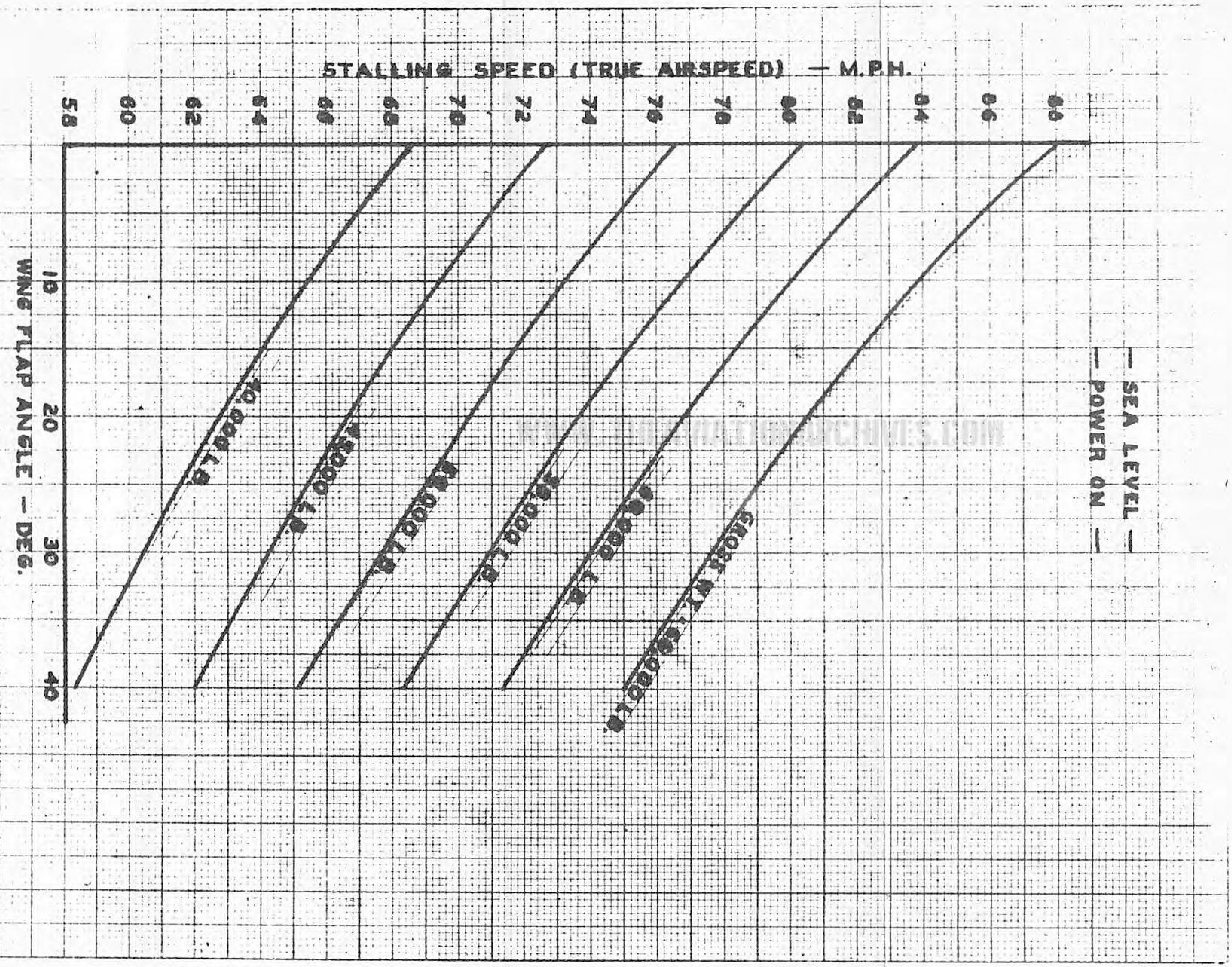


FIGURE 8-1
STALLING SPEED vs. FLAP ANGLE

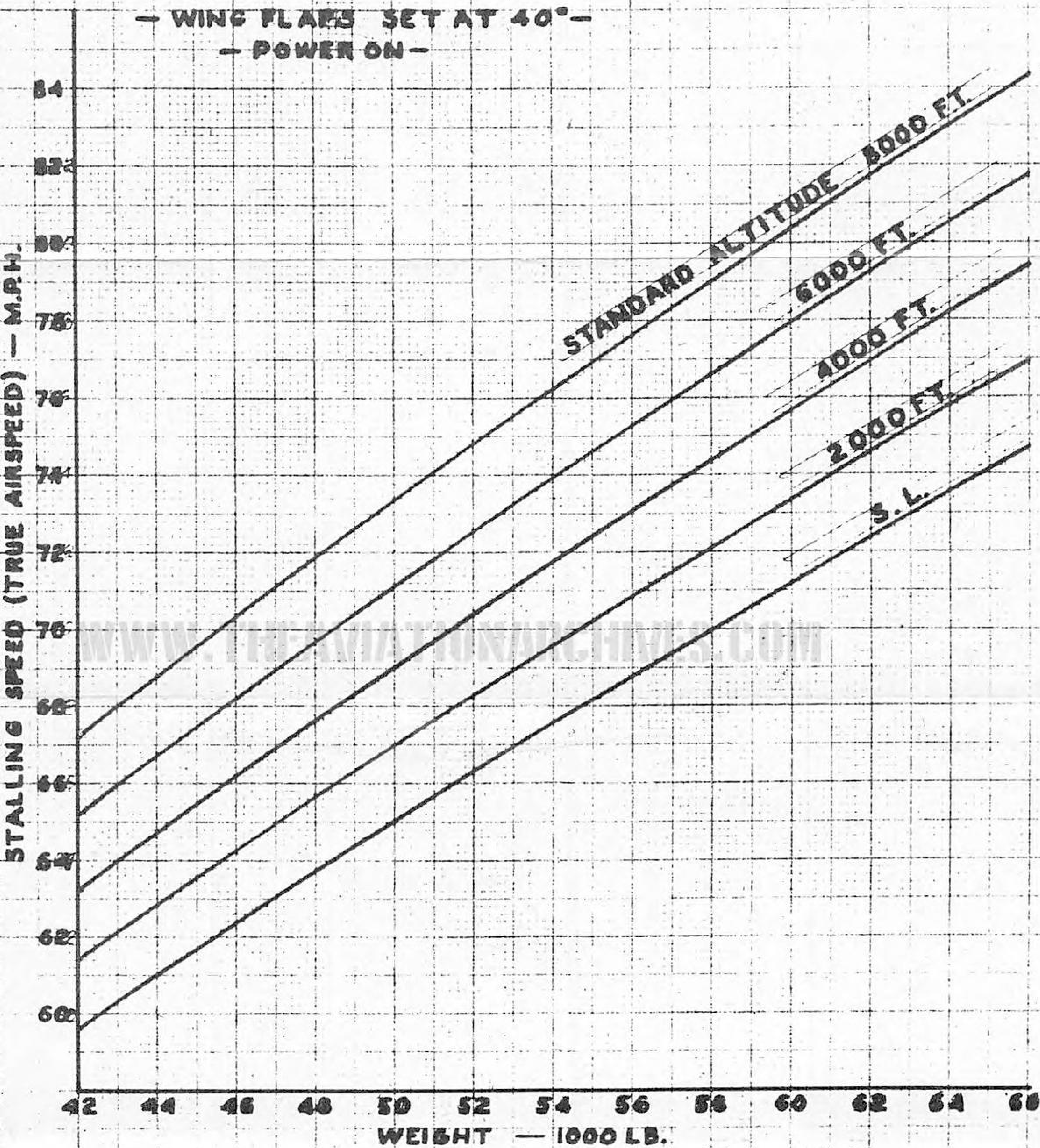


FIG. 8-2

STALLING SPEED vs. WEIGHT