

RESTRICTED  
FOR FILES B-E-G-H-O

TECHNICAL ORDER No. 01-110HA-1

**HANDBOOK OF INSTRUCTIONS**  
OF  
**OPERATION AND FLIGHT INSTRUCTIONS**  
FOR THE  
**MODELS YFM-1 AND YFM-1B MULTI-PLACE FIGHTER  
AIRPLANES**

MANUFACTURED BY  
**BELL AIRCRAFT CORP.**  
BUFFALO, N. Y.

Cont. W535-AC 11122

Specification Type Y-604, Model Y-604-1

NOTE: These instructions affect safety of flying and a copy of this Technical Order will be placed in the Special Section of the Pilot's Information File prescribed by Air Corps Circular 45-7.



**PUBLISHED BY AUTHORITY**  
OF  
**THE CHIEF OF THE AIR CORPS**  
BY THE  
**MATERIEL DIVISION**  
FIELD SERVICE SECTION  
WRIGHT FIELD  
DAYTON, OHIO

**JUNE 1, 1940**

RESTRICTED

T. O. No. 01-110HA-1

Index of revision pages issued.

<u>Pages</u>	<u>Latest Revised Date</u>
1	9-25-40
8A	9-25-40
23	12-5-40
25	12-5-40
26	12-5-40

INDEX

<u>Section</u>		<u>Pages</u>
I	Introduction and References	3
II	Description	4-10
	1. Airplane	4
	2. Power Plant	6
	3. Equipment	6-10
III	General Instructions	11-20
	1. Location of Controls	11
	2. Operation of Controls	11-20
IV	Special Instructions	21
V	Power Plant	22
VI	Flying Characteristics	23
VII	Weight Data	24
VIII	Curves	25
	Calibrated Speed and Gas Consumption	
	Curves - Cruising Control	
	Range Chart	26

ILLUSTRATIONS

<u>Figure</u>		<u>Page</u>
1	3/4 Left Rear View of Complete Airplane	2
2	Emergency Equipment and Exits	5
3	Fuel System Diagram	7
3A	Fuel System Diagram - YFM-1B Airplane	8A
4	Pilot's Cockpit Arrangement and Controls - Left Side	12
5	Pilot's Cockpit Arrangement and Controls - Right Side	13
6	Pilot's Cockpit Arrangement and Controls - Center	14
7	Landing Gear and Flap Control Box	15



RESTRICTED

T. O. NO. 01-110HA-1

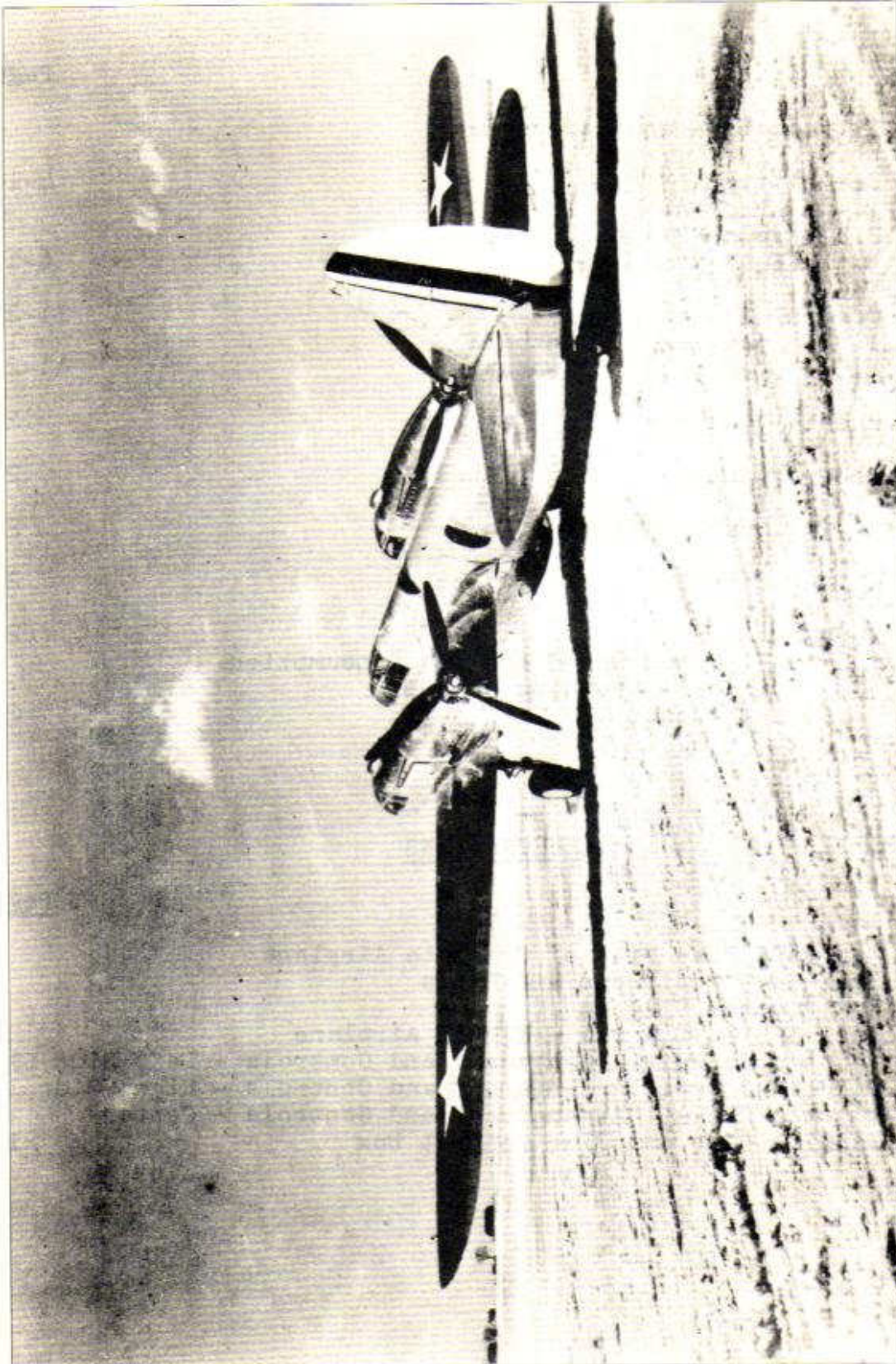


FIG. 1 - 3/4 LEFT REAR VIEW OF COMPLETE AIRPLANE

SECTION IINTRODUCTION AND REFERENCES

1. This Technical Order is the Operation and Flight Instructions for the Models YFM-1 and YFM-1B Multi-Place Fighter Airplanes. Pilots and other personnel who are required to understand the operation of these airplanes will read and be familiar with the information contained herein.

2. Reference has been made in this Handbook to the following Technical Orders which contain applicable data and instructions:

T. O. No.	00-25-5	Procedure to be followed in Case of Fires During Flight
	01-1-60	Use of Flaps
	02-1-29	Ground Operation of Aircraft Engines
	02-5A-1	Operation & Flight Instructions - V-1710-11, -13, -21 & -23 Engines
	03-20BA-1	Operation & Flight Instructions - Propellers



SECTION IIDESCRIPTION1. Airplane.

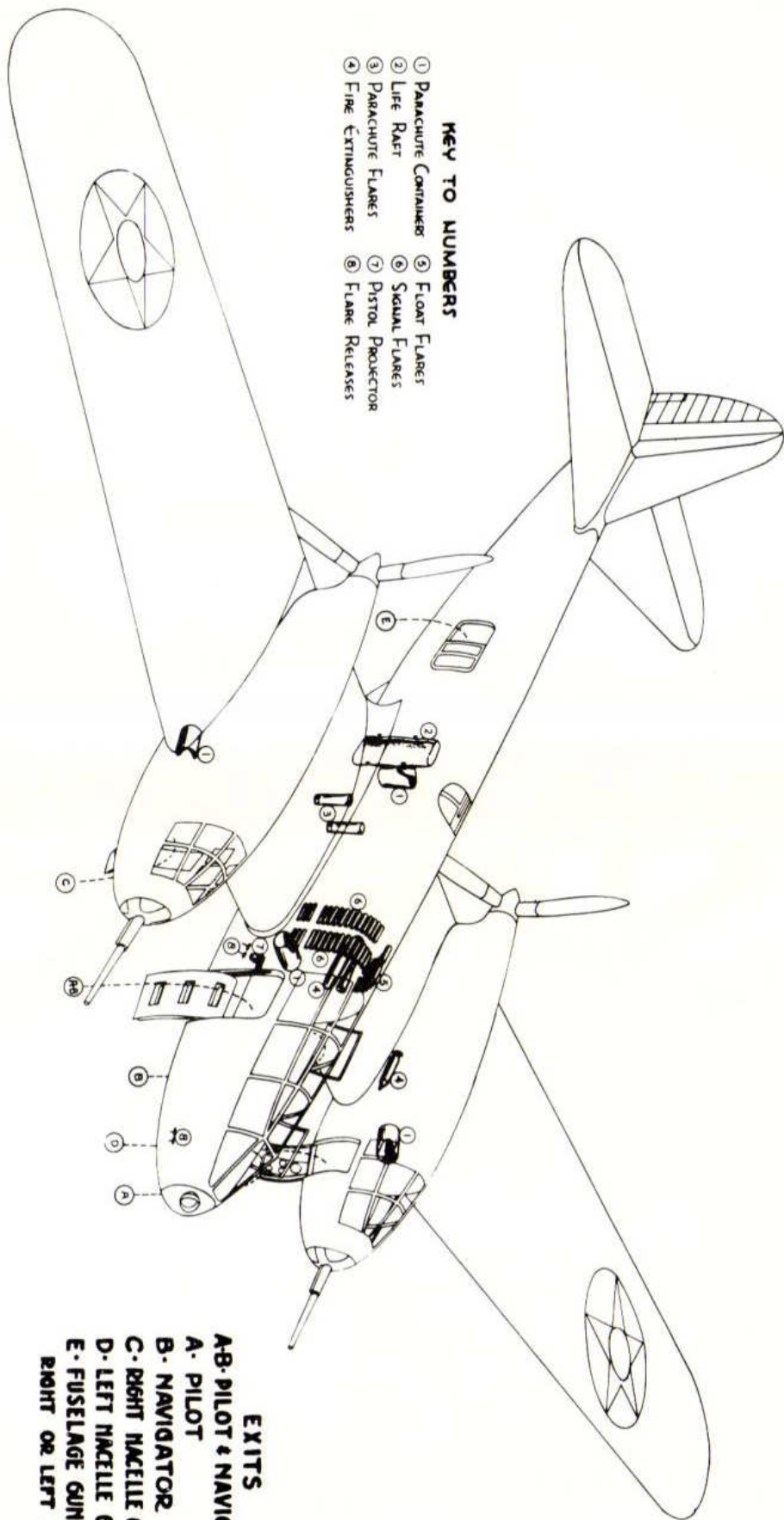
a. General. - The YFM-1 and YFM-1B airplanes are mid-wing, monoplane, multi-place fighters, each powered by two Allison engines, driving pusher propellers. The YFM-1 airplane has type V-1710-23 engines and the YFM-1B has type V-1710-41 engines. The airplanes have the following overall dimension: Span 70 feet, length 45 feet 11-3/8 inches, and height 12 feet 5 inches.

b. Wing. - The wing is of the stressed skin, box type, all metal, cantilever, construction composed of center and two outer panels, each panel being made up of a box beam, a leading edge and a trailing edge. The wing tips are detachable. The balanced ailerons of the Frise type are constructed of aluminum alloy framework and fabric covering. Each aileron is fitted with a controllable trim tab. The flaps are of the split trailing edge type, built in two sections on each side of the airplane. They are operated by a manually or electrically controlled landing gear and flap power unit.

c. Empennage. - The horizontal and vertical stabilizers are of all metal construction attached in fixed alignment to the fuselage. The rudder and elevators are of the fabric covered type, dynamically and approximately statically balanced and equipped with trim tabs controllable from the cockpit.

d. Fuselage. - The fuselage is composed of nose and tail sections joined at the wing front beam. The tail section is of semi-monocoque construction. Both sections are constructed of frames and bulkheads supported by two longitudinal beams and stiffened by stringers. A Plexiglas enclosed cabin extends from the nose of the fuselage to aft of the navigator's station. A flat laminated shatter-proof plate glass windshield section is provided at the nose of the fuselage in front of the pilot.

e. Landing Gear. - The two main wheels and tail wheel are fully retractable. The main wheels are equipped with 39" diameter smooth contour tires and hydraulic brakes. The tail wheel assembly includes a shock strut and a 19" smooth contour tire and wheel swiveling through 360° and self-centering 45° each side of its longitudinal axis. A limit switch prevents the retraction of the landing gear except when the tail wheel is in its centered position. Retraction of the tail wheel is actuated by the manually and electrically driven landing gear and flap control unit. A spring loaded locking device keeps the wheel in centered position for TAKE OFF and LANDING.



**KEY TO NUMBERS**

- ① Parachute Container
- ② Life Raft
- ③ Parachute Flares
- ④ Fire Extinguishers
- ⑤ Float Flares
- ⑥ Signal Flares
- ⑦ Pistol Projector
- ⑧ Flare Releases

**EXITS**

- A-B PILOT & NAVIGATOR
- A - PILOT
- B - NAVIGATOR
- C - RIGHT NACELLE GUNNER
- D - LEFT NACELLE GUNNER
- E - FUSELAGE GUNNER  
RIGHT OR LEFT SIDE

**FIG. 2 - EMERGENCY EQUIPMENT & EXITS**



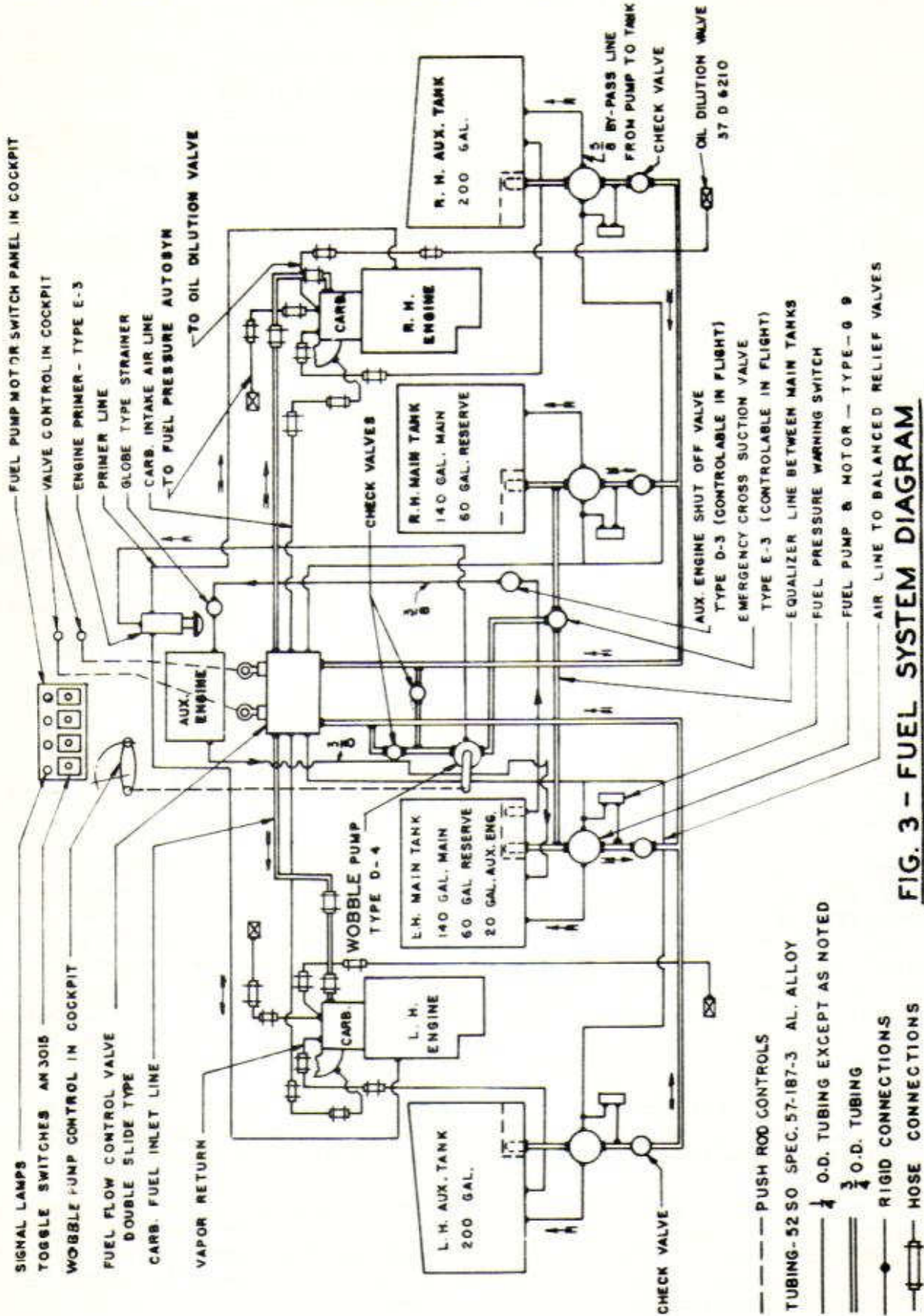
## 2. Power Plant.

- a. Engines. - See Section V for description.
- b. Auxiliary Engine. - The auxiliary engine is a 13.5 H.P., two-cylinder, gasoline engine, designed for a constant speed of 4,000 r.p.m.
- c. Propellers. - The propellers are three-blade, constant speed, full feathering, automatic selective pitch, pusher type, controlled automatically or manually.
- d. Oil System. - Oil for the main engines is carried in two 28-1/2 gallon tanks, one located aft of each engine. Cooling is provided by two oil coolers equipped with viscosity valves. Additional temperature control is provided by means of manually operated shutters located in the air outlet ducts. Oil dilution for winter flying conditions is provided.
- e. Fuel System. - Fuel is carried in four tanks with a capacity of 200 gallons each. The two main tanks are on either side of fuselage in the center section of the wing and the auxiliary tanks in the outer panels, outboard of each nacelle. A stand pipe in the left hand main fuel tank insures 20 gallons of fuel for the auxiliary engine. This fuel is in addition to the normal supply and does not register on the fuel level indicator as it is not available for operation of the main engines. See Fuel System Diagram, Figure 3.

## 3. Equipment.

- a. Flight Controls. - Dual wheel-column-stirrup flight controls are provided. A tab control unit is located convenient to each pilot.
- b. Electrical System. - A model 3718RX Eclipse, single voltage generator delivering 175 amperes at 4,000 r.p.m. is driven by the auxiliary engine. A 50 ampere, 24 volt, direct current generator driven by the right hand engine is arranged to operate in parallel with the main generator, thus providing an emergency source of power supply in event of failure of auxiliary engine or generator. Two type C-5 batteries are provided. Power for Autosyn instruments is obtained from a vibrator type converter or from the dynamotor which is an alternate source of power.
- c. Fuselage Equipment. - (1) Pilot's Seat: The pilot's seat has a lever on the right side to permit vertical adjustment. The seat back cushion is the pilot's life preserver.
- (2) Navigator's Seat: The navigator's seat is designed to permit fore and aft movement from the navigator's station to the co-pilot's station, controlled by a lever on the right side. Vertical adjustment is controlled by a lever on the left side. The seat back cushion is the navigator's life preserver.





**FIG. 3 - FUEL SYSTEM DIAGRAM**

- PUSH ROD CONTROLS
- TUBING- 52 SO SPEC. 57-187-3 AL. ALLOY
- 1/4" O.D. TUBING EXCEPT AS NOTED
- 3/4" O.D. TUBING
- RIGID CONNECTIONS
- HOSE CONNECTIONS



(3) Fuselage Gunner's Seat: The fuselage gunner's bench hinges on the right side and folds upward to stowed position. A release lever is located on the left side. A canvas seat back on the left side of the airplane is removable and is stowed on the right side. The seat cushion is the gunner's life preserver.

(4) Nacelle Gunner's Seat: The nacelle gunners are provided with folding canvas seats which are stowed in vertical position on front side of engine firewall. The seat cushion constitutes the nacelle gunner's life preserver.

(5) Emergency Equipment and Exits: (a) General: The emergency equipment and exits are illustrated in Figure 2.

(b) Parachutes: All crew members use the detachable type parachute except the pilot who uses the seat pack type.

(c) Emergency Exits: Fall-away sections on the left side of the fuselage cabin enclosure at both pilot's and navigator's stations provide emergency exits. Releases for these sections are located at the top center of each. The fuselage gunner's emergency exit is by means of either side gun turret. The entrance doors on each nacelle constitute the nacelle gunner's exits.

(d) Flotation Gear: Four compartments within each wing outer panel provide flotation in event of emergency water landing. Vent and bilge lines run from these compartments to the top outboard side of each nacelle. A bilge pump carried in the fuselage over the bomb compartment should be used at each bilge connection after emergency landing on water.

(e) Life Raft: A type A-2 five-man life raft complete with CO<sub>2</sub> cylinder is carried on the right side of the fuselage aft of the top gun turret. Inflation is accomplished by manual operation of the valve on the raft itself.

(6) Baggage: Adequate space for baggage is provided in the fuselage below the floor, forward of the bottom turret gun compartment.

d. Heating and Ventilating Equipment. - Warm air is brought to each crew station through ducts from a heater muff around the exhaust manifold of each engine. Butterfly valves at each station control the warm air to suit requirements. Pilot's, navigator's, and nacelle gunner's station are ventilated by means of sliding Plexiglas panels in either side of the cabin enclosure.

e. Fire extinguishing Equipment. - A pressure type CO<sub>2</sub> fire extinguisher is provided for the engines. One type A-14 extinguisher and one type A-2 extinguisher are also provided.



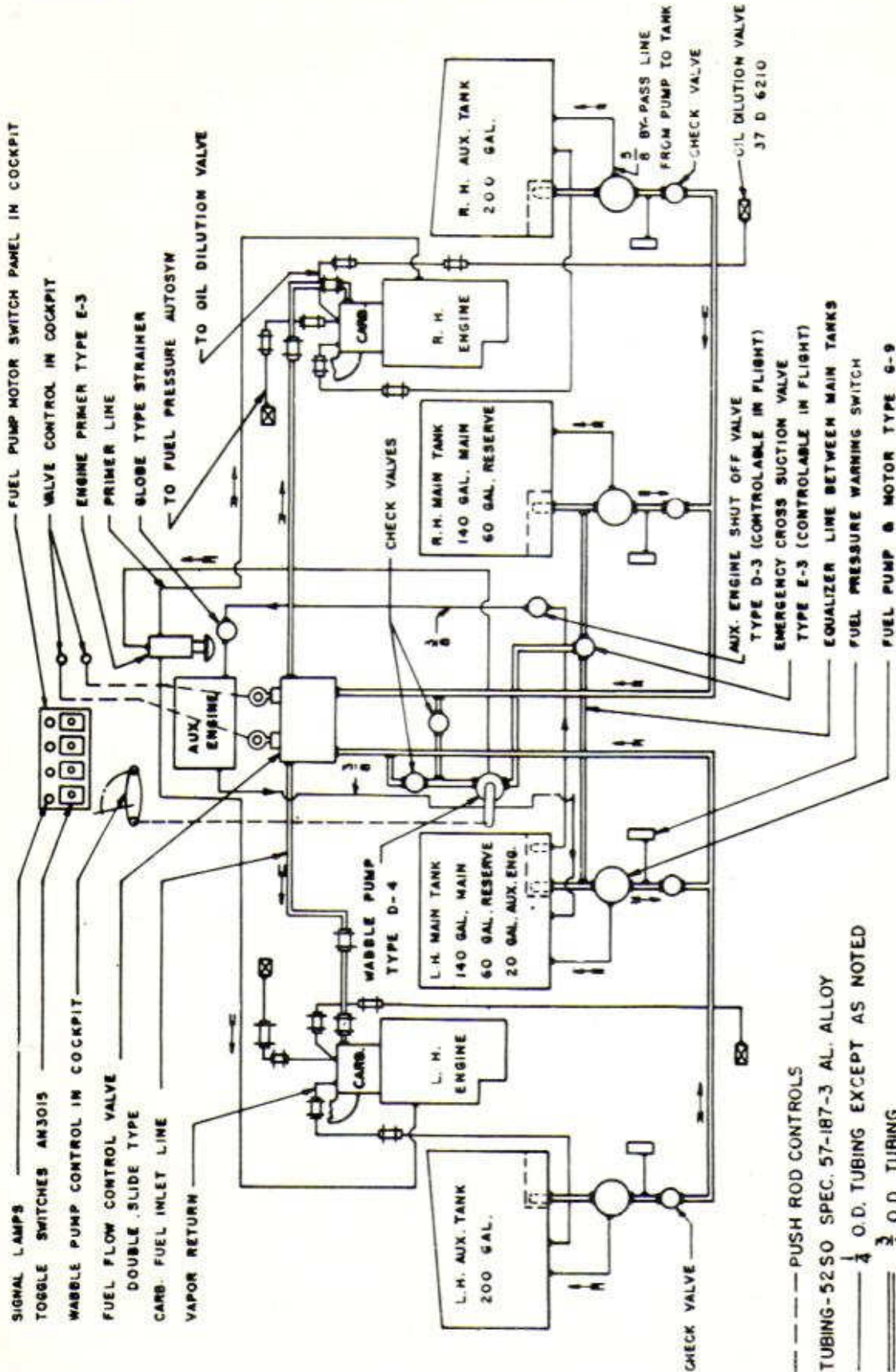


FIG. 3A - FUEL SYSTEM DIAGRAM - YFM-1B AIRPLANE



f. Communications Equipment. - A type SCR-261 Command Set is provided and an antenna loop is installed in a Plexiglas enclosure in the nose of the airplane. A fixed antenna runs from the top of the forward section of the fuselage to the top of the fin. The airplane is equipped with a 5-place interphone system with units located on right side of each station.

g. Oxygen Equipment. - The oxygen equipment consists of one Type E-1 oxygen bottle and one Type A-6 regulator for each station.

h. Bombing Equipment. - Twenty type T-5 or type M-5 bombs are carried in the fuselage between the front and rear beams of the wing center section. Bomb compartment doors are the manually operated type.

i. Gunnery Equipment. - (1) Nacelle Guns: Each nacelle accommodates one Colt 37mm automatic cannon operated by electric motors and controlled locally by electric hand control or from an electric fire control box at the navigator's station. The trigger is located on the hand control box. Selection of control is obtained through a distributing switch in each nacelle. The cannon is limited to an effective 25° cone of fire by limit switches provided. Eleven ammunition boxes, each containing two clips of five rounds, are located in the gunner's station of each nacelle. When fixed gun firing position is preferred the guns may be set manually by removing the hand crank from the distributing switch and inserting it on the aft ends of azimuth and elevation motors. Removal of 37mm cannon allows installation of type H-2 gun cameras.

(2) Fuselage Top Turret Gun: The 30 cal. type M-2 machine gun rides in a retractable 360° full swiveling turret located on the top of the fuselage just forward of the trailing edge of the wing. The gun is of the shoulder firing type and will elevate to a straight up position. A stop prevents firing into the pusher propellers. The turret is lowered and elevated by means of a crank on the left side of the fuselage. Five L-4 ammunition boxes containing 500 rounds of 30 cal. ammunition are located on the right side of the fuselage at approximately the center of the station.

(3) Fuselage Side Turret Guns: The side turret gun installations, located on both sides of the fuselage between the wing and the tail, each consist of a manually retracted turret, a door hinging aft and inboard, a 50 cal. Type M-2 machine gun mounted in a shoulder fire adapter and 1200 rounds of ammunition in ammunition boxes at the side of the fuselage ahead of each turret. Just above and aft of these ammunition boxes is a crank for extending and retracting the turret. At the bottom of the splined post is a handle lock for vertical adjustment of the gun mount and midway on the gun support arm is a lock release for rotational adjustment. The guns are held in stowed position by clips located on the floor on either side of the station.



(4) Fuselage Bottom Turret Gun: The bottom turret gun installation consists of one 30 cal. Type M-2 machine gun mounted in a type C-12 flexible gun adapter and a 180° turret located in the belly of the fuselage just forward of the side turret gun station. A turret rotation release is located on the left-hand side of the station. Five type L-4 ammunition boxes containing 500 rounds of 30 cal. ammunition are provided on the gunner's left as he faces aft.

1. Pyrotechnic Equipment. - A Type M-2 signal pistol, 15 white flares, and 15 red flares are located at the right side of the navigator. Two type M-8 flares, installed in type A-4 racks located aft of rear beam at gunner's floor, are controlled by two manually operated handles on the right side of the floor of the pilot's compartment, and two handles on the right side of the navigator's compartment.

SECTION IIIGENERAL INSTRUCTIONS

1. Location of Controls. - For location of controls, refer to Figures 3 to 7 inclusive.

2. Operation of Controls.

a. Flight Controls. - (1) General: Operation of the dual controls is conventional.

(2) Co-pilot's Control Column: The co-pilot's control column is stowed at the left side of the fuselage; to bring column into use, detach from stowage clip and rotate forward into position.

(3) Rudder Pedals: (a) The co-pilot's rudder pedals are stowed beneath the floor when not in use; to use open doors and move pedals into position.

(b) To adjust either the pilot's or co-pilot's pedals press forward on the lever located on the outer side of each pedal allowing the pedals to move forward. To return insert to under pedals and pull back. The pedals may be locked in five positions.

(4) Trim Tab: One trim tab control unit is located at the left of the pilot and one at the left of the co-pilot.

NOTE: The trim tabs are to be used only for trimming, not for balancing.

(5) Flaps: Operation of the flaps is described in paragraph b., below. Refer also to T. O. No. 01-1-60.

b. Landing Gear Controls. - (1) General: Figure 7, clearly illustrates the landing gear and flap control box which includes the tail wheel lock.

(2) Landing: Turn selector switch to "LAND". The landing gear will extend first, as shown by the landing gear indicator on the control box. When the landing gear is completely extended, the flaps will extend automatically to 40 degrees down. Any degree of flap deflection may be selected, however, by moving master switch to "OFF" position when flaps are at the desired deflection. This may be done as soon as the landing gear warning horn indicates that the wheels are down. When the master switch is moved to the "ON" position, the flaps will continue down.

(3) Take Off: Upon landing, rotate selector switch to "TAKE OFF" position to retract flaps. This operation engages a brake on the landing gear, eliminating possibility of wheel retraction while airplane is on the ground.



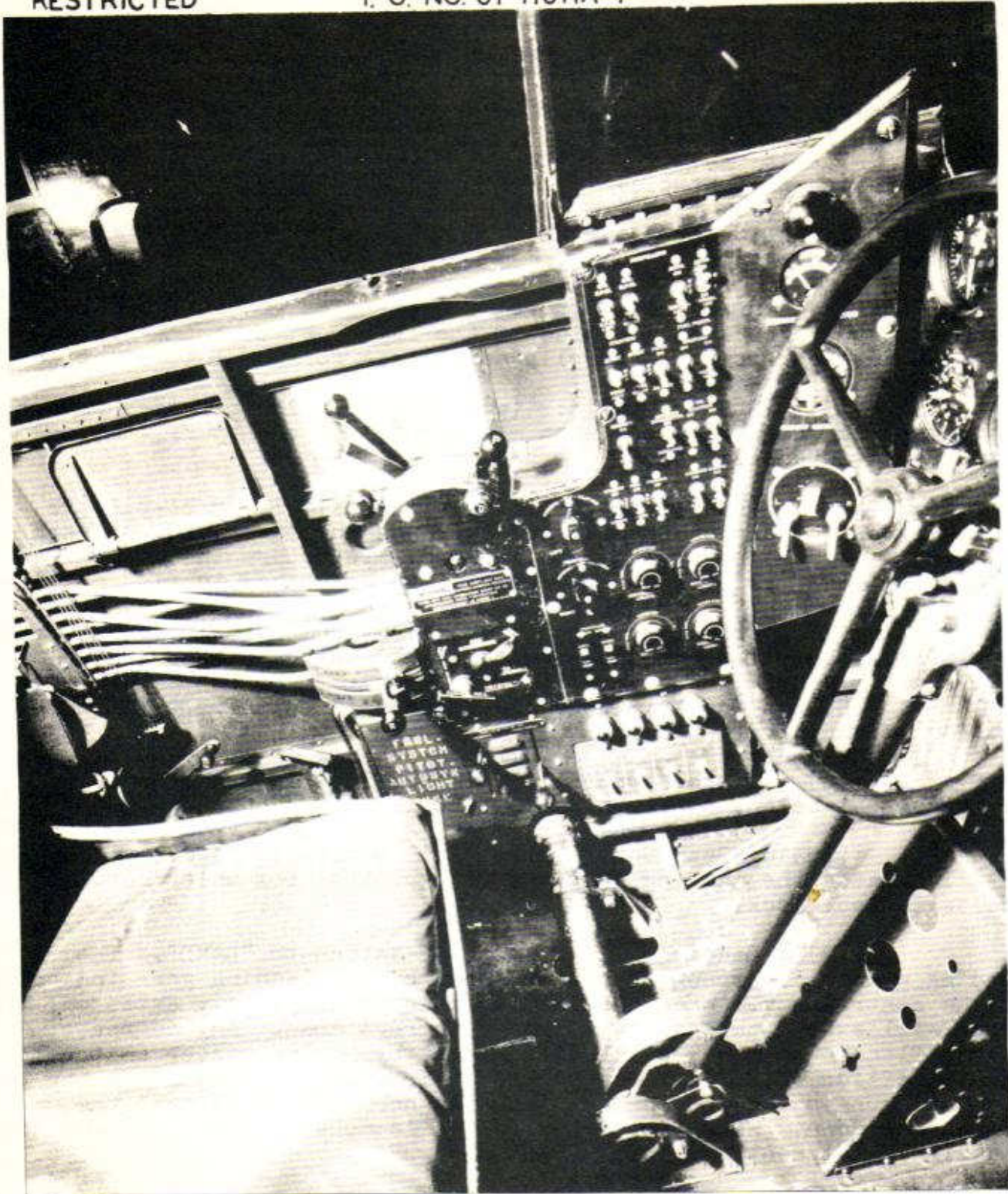


FIG. 4 - PILOT'S COCKPIT ARRANGEMENT & CONTROLS-LEFT SIDE



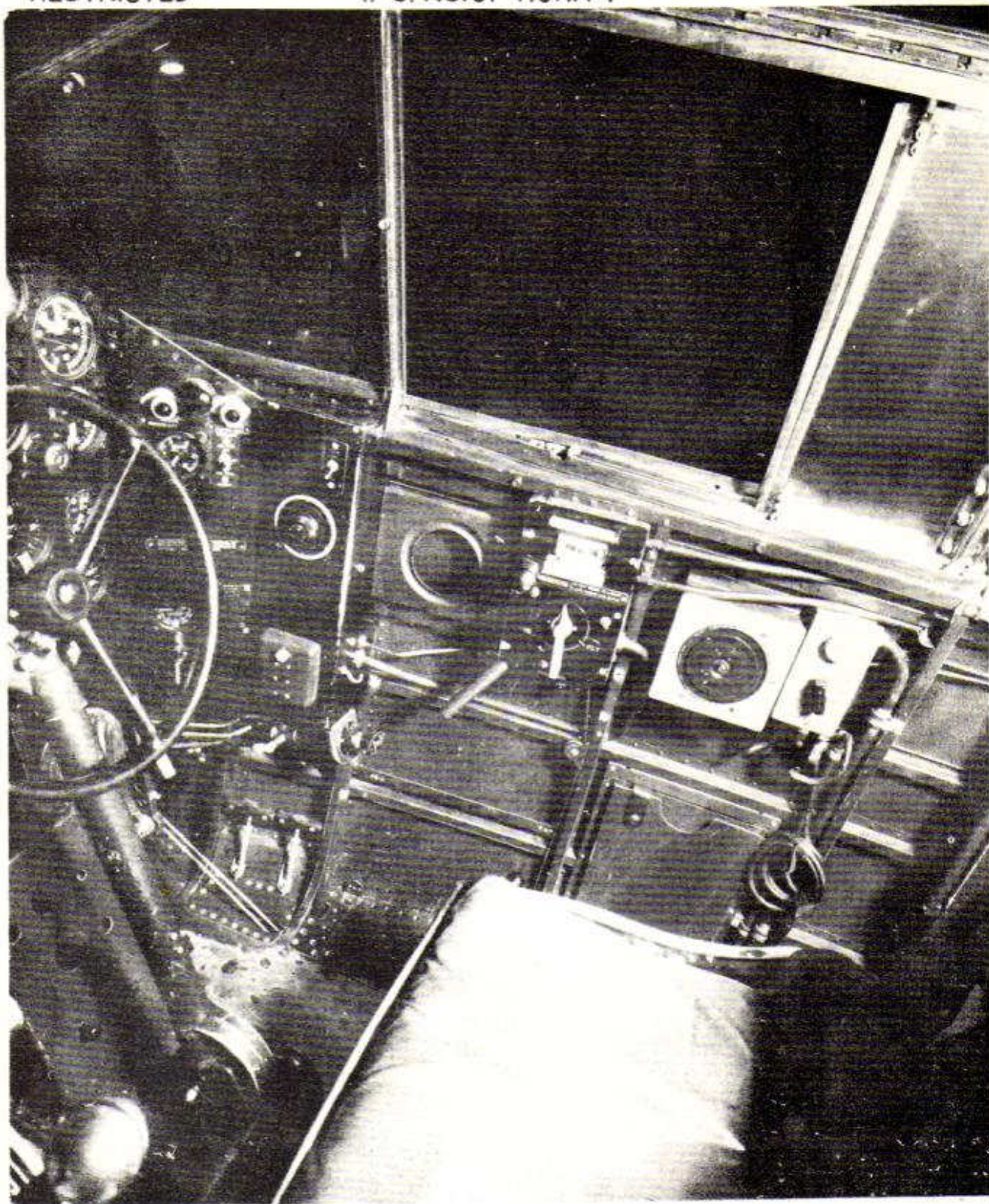


FIG. 5 - PILOTS COCKPIT ARRANGEMENT & CONTROLS - RIGHT SIDE



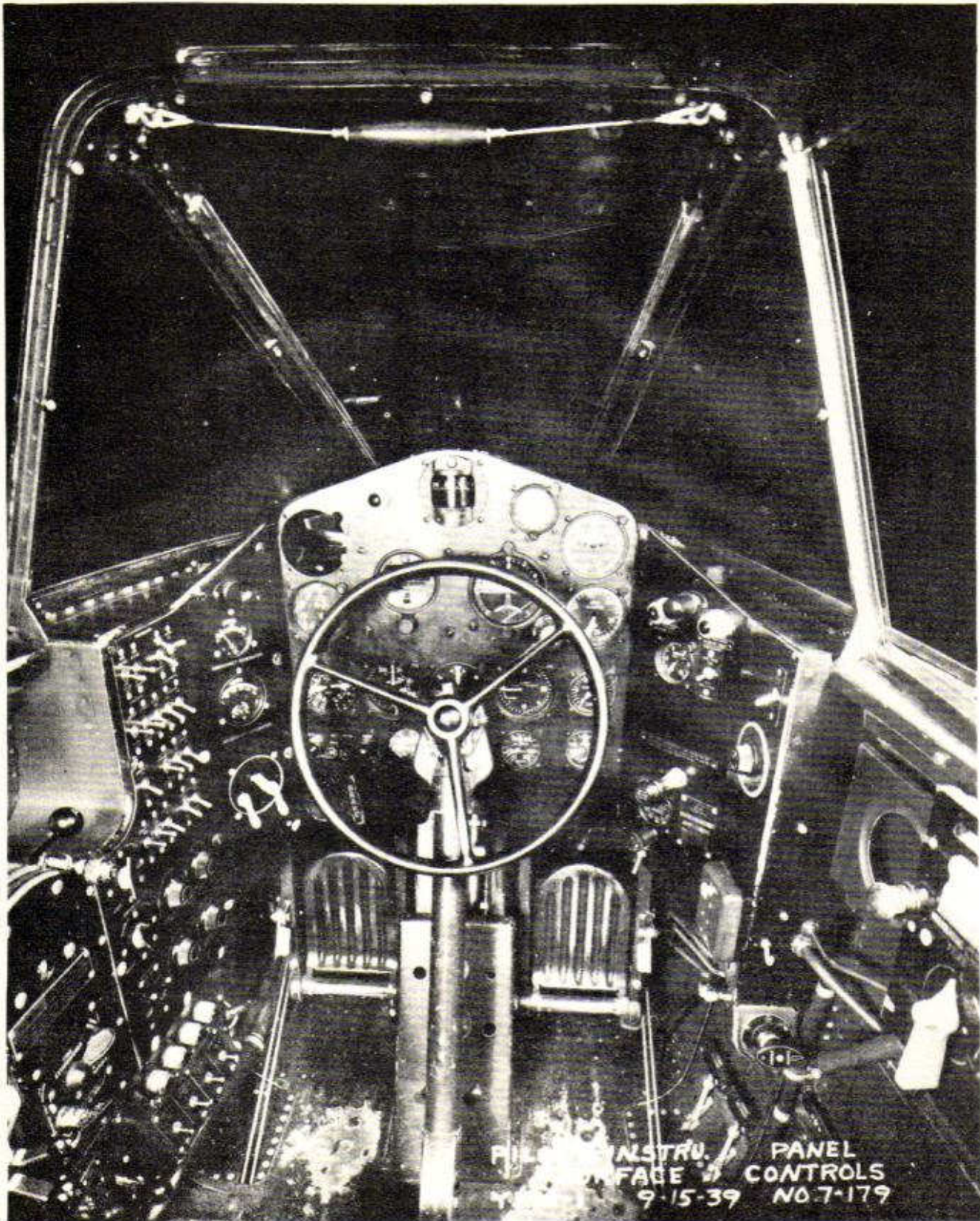


FIG. 6 - PILOT'S COCKPIT ARRANGEMENT & CONTROLS - CENTER



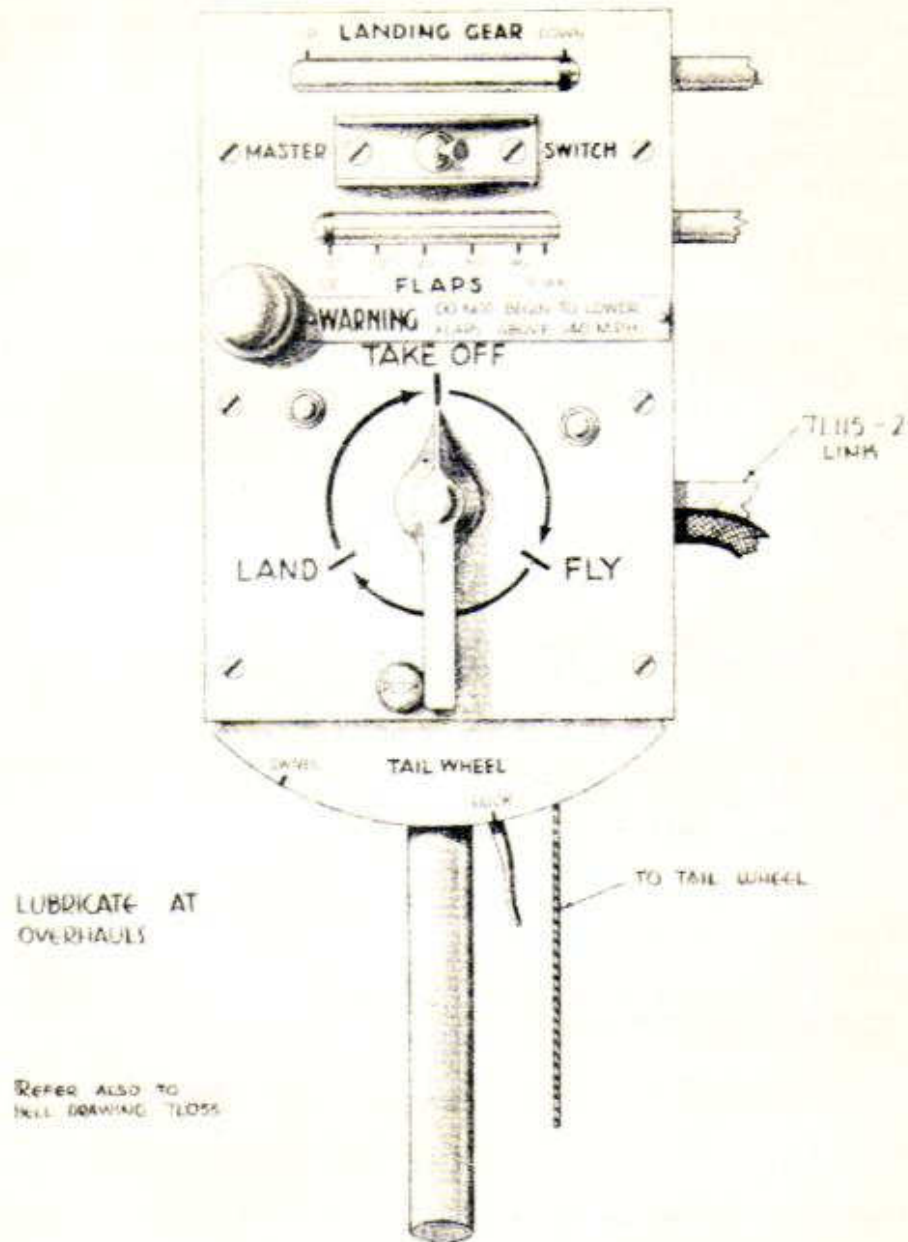


FIG. 7 - LANDING GEAR & FLAP CONTROL BOX



(4) Fly: After take-off, the landing gear is retracted by moving selector switch to "FLY" position.

NOTE: Master Switch should be in "ON" position at all times during operation of the airplane except in condition explained in (2), above.

(5) Manual Operation: To manually extend the landing gear and flaps insert hand crank into slow speed socket, in the center of the carry-thru deck. Crank until high handle loads have been eliminated, then shift to high speed socket and proceed until landing gear and flaps are extended. The high speed socket will lower the gear three times as fast as the slow speed socket.

(6) Tail Wheel Lock: Place in "Lock" position for landing and take-off.

(7) Brakes: Brake controls are incorporated in the rudder pedals. The parking brake, located in front of the pilot at the lower edge of the instrument panel may be engaged when pedals are depressed and disengaged by again depressing pedals.

c. Power Plant Controls. - (1) General: For complete operation and flight instructions, see T. O. No. 02-5A-1. T. O. No. 02-1-29 also contains essential instructions.

(2) Starting: Starting will be accomplished in accordance with T. O. No. 02-5A-1, except for the following special instructions:

(a) Place master ignition switch in center of main engine ignition switch in "ON" position, and start auxiliary engine as per paragraph (7) below.

(b) Place engine selector valve handle in "ON" position for engine to be started.

(c) Place mixture control handle of engine to be started in "IDLE CUT-OFF" position.

(d) Turn on autosyn dynamotor.

(e) Check fuel quantity indicator.

(f) Place fuel pump switch of tank desired to "ON" position. Left main tank should be used for starting left engine and right main tank for right engine. If the engine is to be started from tank on opposite side of airplane both fuel selector valves must be placed in "CROSS FEED" position and mixture control lever of engine not running placed in "IDLE CUT-OFF" position to prevent electric driven fuel pumps from flooding engines.



(g) Prime engine to be started two to four times if engine is cold, otherwise no priming is necessary.

(h) As starter is meshed, throw mixture control lever into "RICH" position. No wobble pump operation is necessary with electric driven fuel pumps.

(i) If engine does not start, return to "IDLE" CUT-OFF" position immediately to prevent flooding.

(j) If engine floods, repeat starting operation as above, but leave mixture lever in "IDLE CUT-OFF" position until engine catches. Then place in "RICH" position.

(3) Stopping: The engines will be stopped in accordance with T. O. No. 02-1-29.

(4) Fuel System. - The fuel system control panel consisting of an "OFF" and "ON" switch, a test switch and a fuel pressure signal lamp for each of the four electrically driven fuel pumps is located on the left side of the pilot's cockpit. A fuel reserve lamp which indicates when the reserve fuel is being used is located below the fuel level indicator on the left side of the main instrument panel. The mixture control incorporates the "IDLE CUT-OFF" for emergency stoppage of engines. The primer is located on the pilot's right. Tanks are selected by switches on pilot's left. Engine selector valves are operated by handles at pilot's left. Fuel equalization is obtained by operation of the cross suction valve on the fuel equalization line on the floor at the gunner's station.

(5) Supercharger Regulator in the YFM-1 Airplane: A Type A-7A supercharger regulator is installed for each supercharger. The regulator line is attached to the exhaust manifold to eliminate surging. Because of this, the supercharger control handles in the cockpit must be pulled back as the airplane gains altitude to prevent excessive boost.

(6) Propeller: (a) General: Operating instructions for the propeller are contained in T. O. No. 03-20BA-1. When controlled automatically, a predetermined engine speed is held constant by means of a governor set by the propeller control on the throttle quadrant. When controlled by manual selection, the blade angle may be varied by operation of the increase or decrease r.p.m. switch independently of the governor. Emergency fast feathering is assured by a separate switch on the pilot's electric panel which applies, through means of a voltage booster, an increased voltage of approximately three to one to the propeller motors causing the propellers to feather in 6 to 8 seconds. The markings on the propeller control are approximate and the desired r.p.m. should be obtained by relying on the tachometer.



(b) For automatic constant speed control throw switches to automatic and set propeller controls as follows:

1. For Take Off: Set propeller controls on throttle quadrant to 2950 r.p.m.

2. During Flight: Set propeller controls on throttle quadrant to desired r.p.m.

3. For Landing: Set propeller controls on throttle quadrant for 2,000 to 2,400 r.p.m. The speed should be sufficiently below take-off r.p.m. to prevent overspeeding of the engine in case a sudden burst of power is applied.

(c) For Manual Control: Throw switches to "MANUAL" and operate switches marked "INCREASE AND DECREASE R.P.M."

(d) For Feathering: Move red control switches to forward position marked "FEATHER".

(7) Auxiliary Engine: (a) To operate auxiliary engine place fuel valve located at rear of wing carry-thru on right side of airplane in "ON" position.

(b) Move auxiliary engine ignition switch on co-pilot's panel to "BOTH". This switch is safetied thru the main ignition switch.

(c) Move "Start - Generate" switch to "START" position until engine starts - then release.

(d) Move ignition switch to "IDLE" for warm up period -- then back to "BOTH".

(e) To stop engine move ignition switch to "OFF" position.

d. Other Controls. - (1) Master and Ignition Switches: These switches are clearly marked on the pilot's electrical control panel. The master switch is located above the left and right engine ignition switches and other than controlling the ignition, this master switch also controls all those circuits that are safetied through it, namely, the starter circuits, the pitot heater circuit, the fuel pressure warning circuits, the auxiliary engine ignition and fuel pump electrical circuit. This switch should always be thrown to "OFF" position before leaving the airplane.

(2) Pitot Heater: A switch on the pilot's electrical panel controls the heating element in the pitot tube.

(3) Warning Bell: Warning Bells at each crew station are operated by a switch on the pilot's control panel.



(4) Ice Eliminating Equipment: A motor operating the de-icer distributing valve is controlled by a switch on the pilot's right auxiliary panel. This panel also contains a double pole switch controlling motors on the vacuum pumps. The propeller anti-icer system control is on the pilot's right panel.

(5) Fire Extinguishing Equipment: (a) Engine Extinguisher: One type A-12 CO<sub>2</sub> extinguisher is mounted in the forward part of the fuselage under the floor. Control pull and selector valve are located on left side of pilot's electrical panel.

(b) Hand Extinguishers: One type A-14 extinguisher is located in the fuselage above the wing crawlway to the left rear of the navigator. One type A-2 extinguisher is located in the left landing gear wheel well, accessible from the ground. Refer to T. O. No. 00-25-5 for procedure to be followed in case of fire during flight.

(6) Oxygen Equipment: The pilot's regulator is situated in the right lower corner of the instrument panel. The co-pilot's regulator is readily accessible on the left. The fuselage gunner's regulator is on the right side; the nacelle gunner's regulators are conveniently located.

(7) Armament: (a) Operation sequence for the top turret gun is as follows:

1. Remove turret slot cover
2. Release gun barrel from spring clip by rotating gun barrel upward.
3. Unlatch gun mount by pressing lever at butt end of gun mount, and fold gun down inside of turret.
4. Extend turret by operating hand crank on left side of airplane.
5. Extend gun through turret slot and latch gun mount by engaging the taper pin. Top hole for operating position, bottom hole for stowed position.

(b) Operation Sequence for the two .50 caliber side turret guns is as follows:

1. Release catch.
2. Extend the turret by operating the turret retraction and extension crank.
3. Remove the gun barrel from stowage clip.



RESTRICTED

T. O. No. 01-110HA-1

- holding clip provided.
4. Swing turret door inboard and aft to
- lock by turning handle and raise opposite gun mount to the top position.
5. Release vertical adjustment of opposite
- forward and up.
6. Release rotation lock and swing gun
- gun.
7. Release vertical adjustment and raise

(c) To operate the 30 caliber belly turret gun, pull turret release lock and rotate turret to top locked position. Break gun from stowage clip and swing into firing position.

SECTION IVSPECIAL INSTRUCTIONS

## 1. Flight Limitations.

a. Maneuvers Prohibited.

Loop  
Roll  
Immelmann  
Inverted Flight  
Spin

b. Other Restrictions. - (1) Do not exceed a speed equal to the indicated high speed times 1.225.

(2) Do not exceed an indicated air speed of 140 M.P.H. with flaps down.

(3) Do not subject the airplane to load factors in excess of those listed below.

( <u>a</u> )	Preliminary - positive	3.4
	negative	.3
( <u>b</u> )	Final - positive	5.6
	negative	1.6

2. Engine Cooling System. - The engines should not be allowed to idle for a long period of time on the ground as the cooling system is designed for efficient cooling in flight only. Maximum allowable temperature of prestone before take-off is 125°C. (257°F.)

3. Landing Gear. - The pilot should be thoroughly familiar with the operation of the landing gear. When the airplane is on the ground the selector switch should be either on "LAND" or "TAKE-OFF" before operating the landing gear and flap control master switch.

4. Warning. - Due to close proximity of propeller to tail surfaces, a sudden reduction of power of one engine either through an engine failure or excessive movement of one throttle will result in a much more violent and immediate control reaction than on multi engine tractor type airplanes. Failure of one engine may result in a spin unless the other engine is retarded or trim tab control adjusted immediately. In case of failure of one engine the other engine should be retarded immediately and the throttle of good engine advanced gradually as trim tab control is adjusted to counteract turning moment. With proper adjustment of trim tab, airplanes can be safely flown on one engine. Single engine practice flights will not be engaged in below ten thousand feet. This airplane should be flown only by experienced multi engine pilots.



SECTION VPOWER PLANT

## 1. Engine.

a. General. - Each YFM-1 and YFM-1B airplane is powered with two Allison, prestone cooled, Vee type engines driving three-bladed pusher propellers through extension shafts. The engines are normally operated on 100 octane fuel and have a compression ratio of 6.65:1 and a propeller reduction gear ratio of 2:1.

b. YFM-1 Airplane. - (1) General: The type V-1710-23 engines used in the YFM-1 airplane have type B-1 exhaust driven turbo superchargers in addition to the engine driven blowers which have a gear ratio of 6.26:1.

(2) Ratings.	BHP	RPM
Normal (Sea Level)	1000	2600
Take-Off " "	1150	2950
Military " "	1150	2950

c. YFM-1B Airplane. - (1) General: The V-1710-41 engines used in the YFM-1B airplane are similar to the type V-1710-23 except that the blower gear ratio is increased to 8.77:1 to obtain power at altitude without the necessity of incorporating a turbo-driven supercharger in addition to the engine blower.

(2) Ratings.	BHP	RPM
Normal (Sea Level)	960	2600
Take-Off " "	1090	3000
Military " "	1090	3000

## SECTION VI

## FLYING CHARACTERISTICS

## YFM-1B Airplane

1. Level Flight Speeds at Design Altitude of ..... ft. with Design Gross Weight of 18,373 ..... lb.

Maximum Speed	-	m. p. h. at	-	r. p. m. with	-	b. hp. (..... % rated)
High Speed at 12,600'	-	268*	m. p. h. at	2600	r. p. m. with	1920 b. hp. (100 % rated)
Operating Speed at 12,000±240	-	2280	m. p. h. at	2280	r. p. m. with	1440 b. hp. (75 % rated)
Cruising Speed at 12,000±200	-	1900	m. p. h. at	1900	r. p. m. with	960 b. hp. (50 % rated)

2. Optimum Range and Endurance with 800 ..... gal fuel and 0 ..... lb. bombs.

At High Speed	1080	miles at	1.35	mi./gal. or	4.02	hrs. at	199	gal./hr. (s. f. c. .62)
At Operating Speed	1700	miles at	2.13	mi./gal. or	7.10	hrs. at	113	gal./hr. (s. f. c. .47)
At Cruising Speed	2180	miles at	2.73	mi./gal. or	10.9	hrs. at	73.5	gal./hr. (s. f. c. .46)

3. Practical Range and Endurance with 800 ..... gal. fuel and 0 ..... lb. bombs.

At Operating Speed	1330	miles at	1.67	mi./gal. or	5.55	hrs. at	144	gal./hr. (s. f. c. .60)
At Cruising Speed	1670	miles at	2.08	mi./gal. or	8.33	hrs. at	96	gal./hr. (s. f. c. .60)

4. Climb Data with Gross Weight of 18,373 ..... lb.

Standard Altitude	ft. S.L.	5000	10,000	15,000	20,000	25,000	29,900
Climbing Speed	m. p. h.	120	130.5	141	150.5	157	163.5
Engine Speed	r. p. m.	2600	2600	2600	2600	2600	2600
Total Power	b. hp.	1690	1780	1880	1720	1450	1200
Maximum Rate	f. p. m.	1520	1520	1520	1215	825	460
Minimum Time	min.	0	3.3	6.2	10.6	15.5	23.5
							44.1

5. Ceiling: Normal Engine Operation: Service Ceiling 29,900 ..... ft. Absolute Ceiling 31,300 ..... ft.

6. Take-off and Landing Distances—To Clear 50 ft. Obstacle at Sea Level (no wind).

Take-off	1800	ft. at	90	m. p. h.	15	deg. flap.	Gr. Wt. 18,373 lb.	Ground run	1250	ft.
Land	1377	ft. at	77	m. p. h.	Full	deg. flap.	Gr. Wt. 18,373 lb.	Ground run	852	ft.

7. References and Remarks: This airplane may be expected to give approximately the above performance with given load under standard atmospheric conditions. Figures given may vary slightly from figures listed elsewhere in this Technical Order and other technical publications for this model of airplane.

\*Temporary engine restrictions prohibit the attainment of this speed.

References: M.R.'s PHQ-M-19-1102-A, dated 6/22/40, and EXP-M-51/P642-32, dated 7/22/40

The airplane may be expected to give approximately the above performances with the weights as quoted herein.

Revised 12-5-40



SECTION VIIWEIGHT DATA

1. Weight in Pounds.	<u>Overload</u>	<u>Normal</u>
Weight Empty (Incl. Radio, Wiring, Conduits, Bomb Racks, etc.)		13,674
Useful Load		5,326
Crew - (5) at 200 lbs. each		1,000
Fuel - Normal - 400 Gal.		2,400
Fuel - (Overload - 400 Gal.)	2,400	
Oil - Normal - 28-1/2 Gal.)		214
(Overload - 30 Gal.)	225	
(Aux. Engine - 1-1/2		11
Armament		
Nacelle Guns and Ammunition		871
Fuselage Guns and Ammunition		717
Pyrotechnics (Alternate Load)	52	
Bombs (Alternate Load)		
Type T-4	340	
Type M-5	600	
Miscellaneous Equipment		113
Gross Weight		19,000
Wing Loading, Normal Gross Wt. (688 Sq.Ft.)		27.6 Lbs./Sq.Ft.
Power Loading, Normal Gross Wt. (2000 H.P.)		9.5 Lbs./H.P.
Maximum Loaded Weight Safe Flight		21,625



