

RESTRICTED

PILOT'S HANDBOOK

MODEL FM-1 AIRPLANE

MODEL R-1830-86 P. & W. ENGINE



RELEASED BY BUREAU OF AERONAUTICS NAVY DEPARTMENT

EASTERN AIRCRAFT - LINDEN DIVISION

GENERAL MOTORS CORPORATION

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FOREWORD

This Handbook is prepared for the purpose of familiarizing flying personnel with the take-off, flying and landing characteristics of this airplane; the functions of particular systems and installations, and the operation of the various automatic and manual controls.

For service and overhaul instructions, refer to the Erection and Maintenance Instructions Manual for this airplane.

This airplane is a single engine, single place, folding midwing monoplane carrier fighter. It is powered with a Pratt & Whitney two stage, 14 cylinder radial engine designed to operate on 100 octane fuel, with a take-off rating of 1200 BHP at 2700 RPM at sea level.

The total combined fuel capacity of both the main and emergency fuel tanks with self-sealing liners is 144 gallons. Equipment is provided for the installation of two (2) droppable tanks, of 50 gallons capacity each.

The wings are folded and spread manually and locked in the spread position by manually operated locking pins. The landing gear is mechanically retractable by the action of a handcrank operated by the pilot.

This airplane is equipped with .50 calibre machine guns mounted in the outer wing panels. Provision is made for the installation of two (2) wing bomb racks. It is also equipped with armor plate and bullet proof windshield.

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I
COCKPIT ARRANGEMENT
AND
CONTROLS

The arrangement of the cockpit and the locations of the various controls are shown on the accompanying photographic illustrations.

In general, the controls, and their operation, are indicated by adjacent nameplates.

FLYING CONTROLS

Aileron and Elevator Controls

Standard type stick.

Aileron Trimming Tab Control

On left aileron only. Handwheel on left hand shelf. Rotate to left to depress left wing. See Page 21.

Elevator Trimming Tabs Control

Handcrank on side of left hand shelf. Clockwise - Nose Down. See Page 21.

Rudder Control

Standard under-hung pedals
Adjustable to four (4) positions by lever on each outer pedal arm. See Page 22.

Rudder Trimming Tab Control

Handwheel on left hand shelf.
Clockwise - Nose Right. See Page 21.

Altitude & Landing Flaps Control

Handle at center of left hand shelf.
Handle Inboard - Flaps Up
Handle Outboard - Flaps Down
See Page 22.

LANDING GEAR CONTROLS

Retracting Control

Handcrank on side of right hand shelf.
Clockwise rotation raises landing gear.
Handcrank release controlled by small
lever just aft of handcrank.
Move lever aft to lower gear - Forward to
raise.

Warning Indicators

Mechanical - Small arrow head pointer in slot
on side of right hand shelf just
forward of handcrank.

Electrical - The Howler, (Warning Horn) loca-
ted on the side of the left hand
shelf, is connected in series
with the Throttle and Landing
Gear Switches; and operates only
when the engine is throttled be-
low 1200 RPM and the landing
gear is not fully extended.

Brake Control

The hydraulic brakes are operated by press-
ing on the upper part of the rudder pedals.

Tail Wheel Lock Control

Control lever on side of left hand shelf;
when forward, it locks the wheel caster in the
trailing position. When unlocked, the wheel
can swivel through a radius of 360°.

Lock for land operation and unlock for car-
rier operation and taxiing.

POWER PLANT CONTROLS

Auxiliary Supercharger Control

Three position lever with lock on left hand cockpit shelf.

Full Forward - "Neutral"
 Center Position - "Low Ratio - Aux. Stage"
 Full Aft - "High Ratio - Aux. Stage"

Carburetor Air Control

A considerable increase in carburetor air temperature occurs when the auxiliary Supercharger is engaged, in either High or Low Blower Ratio, due to the heat of the compressed air. If there is the slightest indication of carburetor icing, immediately engage the Auxiliary Supercharger. The same procedure should be used in shifting as described on Page 31. The power out-put with the Auxiliary Stage engaged shall not exceed the rating for that combination of superchargers (1050 BHP).

Cowl Flaps Control

Handcrank located on the right hand side of the instrument panel. Operates engine cowling flaps for cylinder temperature control.

Turn clockwise to Open cowl flaps.

Turn counter-clockwise to Close flaps.

Fuel Valve Control

Standard dial and handle, located on left hand cockpit shelf: five (5) positions -

Main	117 gals.
Emergency	27 gals.
Left Droppable	50 gals.
Right Droppable	50 gals.
Off	

Ignition Switch

Located on the left hand side of the main instrument panel.

Emergency Electric Fuel Pump

Control switch on left hand side of main instrument panel.

Propeller Control

Push-pull control knob located on the left hand side of the main instrument panel.

Push in to increase engine revolutions.

For close adjustment turn knob clockwise to increase revolutions.

Electric propeller control switches on left hand side of main instrument panel above propeller push-pull control knob.

See Pages 29 and 30 for propeller operating instructions.

Starter Switch

Toggle switch is located on the aft end of the pilot's distribution panel.

Starter cartridge container located on the engine mount just to the right of the generator.

Throttle & Mixture Controls

On engine control quadrant on left hand cockpit shelf.

Knurled knob, on side of control quadrant, adjusts friction on levers.

AUXILIARY CONTROLS

Arresting Hook Control

Large control handle in a slide on the left hand side of the cockpit under the cabin rail.

WARNING: Pilot shall insure that control handle is in the hook-down position prior to landing aboard a carrier.

Cockpit Ventilator Valve

Disc type ventilator valve on fixed section of cockpit enclosure above pilot's head.

Cockpit Enclosure Operating Control

Large handle in slide on right side of cockpit under cabin rail. Handle may be latched in any one of four positions: Closed, 1-1/4" Open, 5-3/8" Open and Full Open.

Angle clip on lower left corner of cabin enclosure may be used to assist in opening and closing hood.

Cabin enclosure may be locked or unlocked from the outside while in the closed position by access through the door on the right hand side of the fuselage below the windshield.

Emergency Release

The enclosure is equipped with quick release latches, consisting of release pins with red painted finger rings attached, at the forward end of the track.

To release, grasp the rings to pull out the

pins, and push the enclosure up into the airstream.

NOTE: Keep these release pins lubricated with a thin coating of grease to permit easy removal.

Electrical Distribution Panel & Switch Box

The distribution panel and switch box, located on the right hand side of the cockpit, contains the following:

Switches

Landing Light	Battery
Section Light	Gun Camera
A Approach Light	Gun Selector
Wing & Tail Running Lights	Gun Master
Formation Lights	Pitot Tube Heat
Cockpit Lights Master	Panel Receptacle
Remote Compass	Starter Cartridge
	Firing

Rheostats

Panel Light	Chartboard Light
Projection Light	Instrument Lights
Compass Light	

Instructions for the operation of the above items are on their adjacent name plates. Spare fuses and bulbs are located in the top of the box.

The recognition lights toggle switches and key switches are on the forward end of the left hand cockpit shelf.

A volt-ammeter with a selector switch for checking the generator voltage and amperage and battery voltage is located on the distribution panel.

The circuit breaker reset buttons are located on the side of the main junction box.

A panel receptacle is located on the aft end of the panel, with a switch adjacent.

The battery switch must be "ON" in order to operate any of the electrical units with the exception of:

Radio Equipment
Landing Gear Howler

To render the radio inoperative, the switch on the radio control box must be turned "OFF".

NOTE: Do not lower the landing light at speeds above 120 knots.

Signalling Device

The "T" handle control for the Molin Signal Discharger is located on the right hand side of the cockpit, at the seat.

Windshield Heat Control

The control handle is located above the left rudder pedal and just forward of the instrument panel. Pull to Open - Turn Clockwise to Lock.

Wing Folding Controls

The wings are folded and spread manually from the ground and held in the spread position by locking pins which are operated by handcranks. The handcranks are stowed in the leading edges of the wing at the folding axes, and are reached through doors secured by latches. As the locking pins are withdrawn, red metal flags are raised above the upper surface of the stub panel skin in EACH WING.

Jury struts, to hold the wings in the folded position, are stowed in the baggage compartment.

To Fold Wings

Open doors in wings, set handcranks, and turn counterclockwise to withdraw locking pins. Move wings to folded position and set jury struts in fittings in wing tips and stabilizers.

To Spread Wings

Remove jury struts, move wings up to spread position. Turn cranks clockwise to move locking pins into place.

USEFUL LOAD CONTROLSBomb Release Control

Standard Mark 4 unit below left hand shelf.
Control shall be in outboard position when not in use.

Chartboard

Located directly beneath the main instrument panel and is equipped with a clip to hold board in place when the airplane is catapulted.

Gun Charging Controls

Charging handles located outboard of the left and right hand floor channels, forward of the seat.

Gun Firing Control

Gun selector and master toggle switches on distribution panel.

Electric trigger switch button on control stick.

Gun Sights

A Mark 8 electric sight is installed. The sight rheostat and switch are on the left hand side of the main instrument panel. The switch has three positions:

Left - On
Center - Off
Right - On - Alt.

To use the sight, set switch to On and turn On rheostat. If bulb does not illuminate, set

switch to On-Alt. to use spare filament.

Oxygen Regulator

On the right hand side of the pilot's rear bulkhead.

Oxygen Shut-Off Control

Handwheel located on oxygen cylinder at right hand side of pilot's seat.

CAUTION: Oxygen equipment must be kept free from oil and grease.

Gun Camera

Provision is made for the installation of a AN-M4 gun camera in the leading edge of the left wing. The control switch is on the pilot's distribution panel.

Headrest Adjustment

The headrest is adjustable to any one of five (5) positions forward from the bulkhead. To bring the headrest forward, turn counter-clockwise, and then pull out. Notches in the shaft at 1-1/4" intervals hold the headrest in the selected position.

Radio Controls

Microphone switch on top of throttle arm. The radio controls are located on the right hand side of the cockpit.

Seat Adjustment

Standard: Control lever on right hand side of seat.

Tow Target

There is provision for the installation of a tow target release control on the cockpit floor (marked with a name plate) at the right hand side of the pilot's seat, and for a release latch on the bottom of the fuselage.

MISCELLANEOUS EQUIPMENT

Map Case

A canvas map case, including a pad and pencil holder is installed on the left hand side of the cockpit under the cabin rail.

Baggage Container

A canvas bag for baggage and miscellaneous articles is stowed in the after part of the fuselage.

NOTE: The installation of each of the foregoing items is further described in the Erection and Maintenance Instructions for this airplane.

1. CLOCK
2. CYLINDER HEAD TEMPERATURE GAGE
3. RUDDER PEDAL ADJUSTMENT LEVER
4. PROPELLER CONTROL
5. IGNITION SWITCH
6. GUN SIGHT LIGHT SWITCH
7. EMERGENCY ELECTRIC FUEL PUMP SWITCH
8. CHARTBOARD LIGHT
9. WINDSHIELD DEFROSTER
10. ALTIMETER

11. DIRECTIONAL GYRO
12. GUN SIGHT MOUNT
13. AIRSPEED INDICATOR
14. TURN & BANK INDICATOR
15. RATE OF CLIMB INDICATOR
16. GYRO HORIZON
17. MANIFOLD PRESSURE GAGE
18. TACHOMETER
19. ELEC. PANEL LIGHT
20. FUEL QUANTITY GAGE
21. PRIMER PUMP
22. COWL FLAPS HANDCRANK
23. ENGINE GAGE UNIT
24. COMPASS
25. OIL DILUTION SWITCH
26. RADIO SIGNAL LIGHT

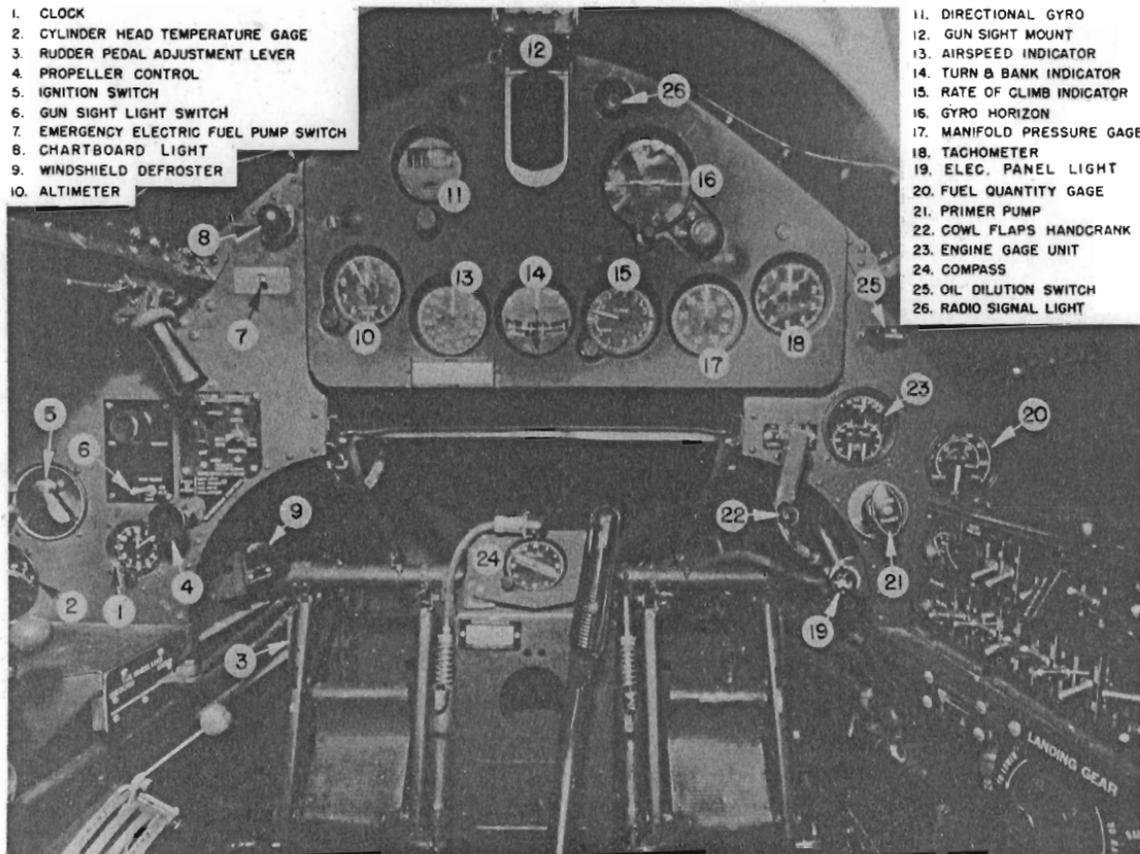


FIG. 1 INSTRUMENT PANEL

1. MAP CASE, PAD & PENGIL HOLDER
2. LANDING GEAR WARNING HORN
3. SUPERCHARGER CONTROL LEVER
4. FUEL TANK SELECTOR VALVE
5. WING FLAPS CONTROL
6. RUDDER TAB CONTROL
- 7.AILERON TAB CONTROL
8. THROTTLE CONTROL
9. MICROPHONE SWITCH BUTTON
10. MIXTURE CONTROL

11. ELECTRICAL WIRING DIAGRAM
12. ARRESTING HOOK CONTROL
13. TAIL WHEEL CASTER LOCK
14. BOMB CONTROL
15. FRICTION ADJUSTING KNOB
16. ELEVATOR TAB CONTROL
17. GUN SIGHT LIGHT RHEOSTAT
18. DROPPABLE TANK RELEASE

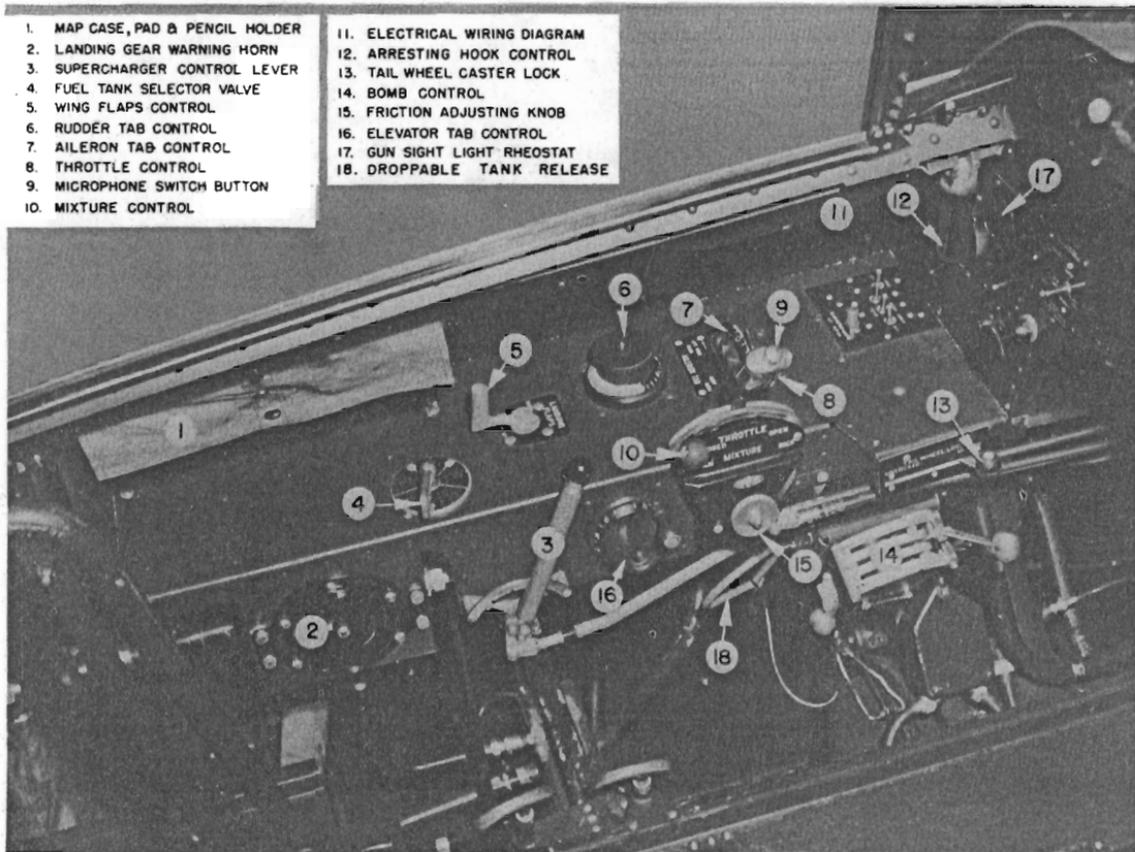
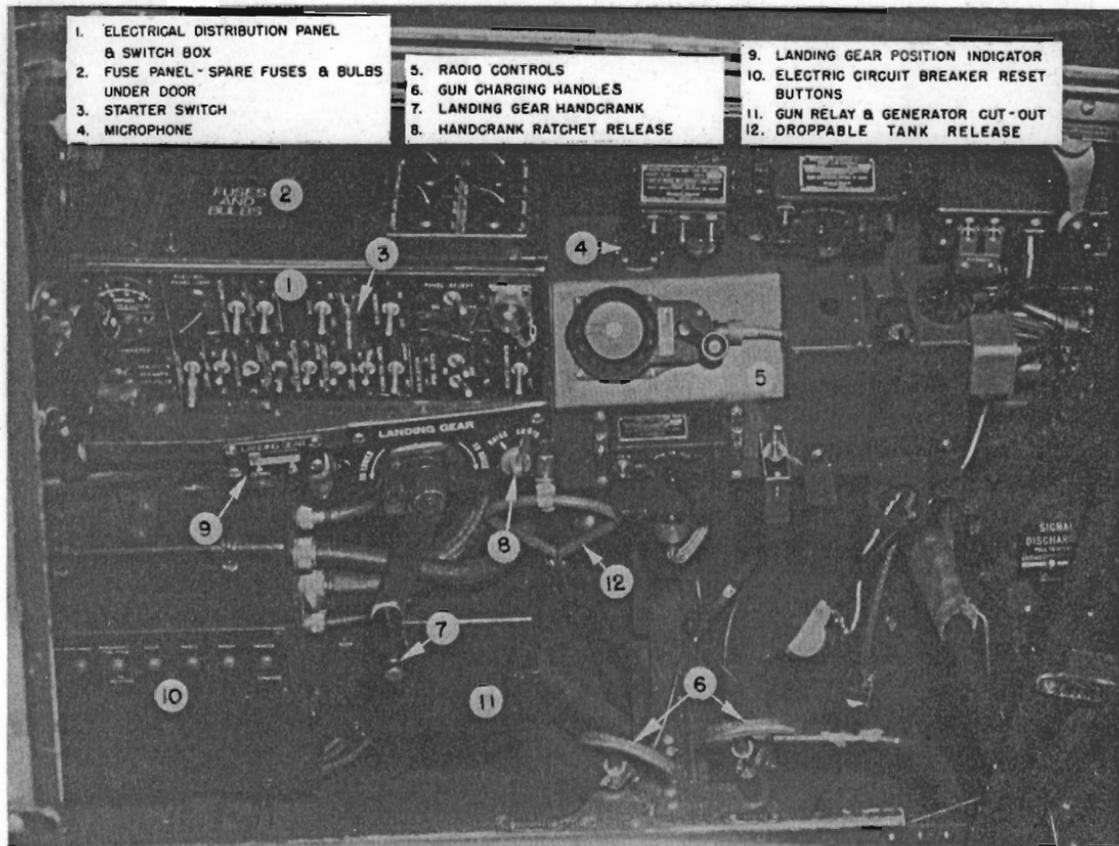


FIG. 2 COCKPIT - LEFT HAND



1. ELECTRICAL DISTRIBUTION PANEL & SWITCH BOX
2. FUSE PANEL - SPARE FUSES & BULBS UNDER DOOR
3. STARTER SWITCH
4. MICROPHONE

5. RADIO CONTROLS
6. GUN CHARGING HANDLES
7. LANDING GEAR HANDCRANK
8. HANDCRANK RATCHET RELEASE

9. LANDING GEAR POSITION INDICATOR
10. ELECTRIC CIRCUIT BREAKER RESET BUTTONS
11. GUN RELAY & GENERATOR CUT-OUT
12. DROPPABLE TANK RELEASE

FIG. 3 COCKPIT - RIGHT HAND

II OPERATION INSTRUCTIONS

1. FLYING CONTROLS

(a) Aileron Trimming Tab Control

The aileron trimming tab, located on the left aileron only, is adjustable in flight from 20° up to 20° down in relation to the chord line of the aileron.

Control is effected by turning the handwheel in the cockpit which operates a flexible shaft and drive assembly to the screw type actuator in the left aileron.

To depress the right wing rotate the handwheel clockwise.

To depress the left wing rotate counter-clockwise.

(b) Elevator Trimming Tab Control

The elevator trimming tabs are adjustable in flight from +5°54' to -10°51' in relation to the center line of the elevators (+5°54' is for max. down elevator.)

Control is effected by turning the handcrank in the cockpit which operates screw type tab actuators in each elevator through flexible shafts and torque shafts.

For "Nose Down" rotate the elevator tab control handcrank clockwise.

For "Nose Up" rotate counter-clockwise.

(c) Rudder Trimming Tab Control

The rudder trimming tab is adjustable in flight from 22°19' left to 16°26' right with respect to the center line of the rudder.

Control is effected by turning the handwheel in the cockpit which operates flexible shafts and torque tubes leading to the screw type tab actuator in the rudder.

For "right rudder" turn the handwheel clockwise.

For "left rudder" turn counter-clockwise.

(d) Rudder Pedal Adjustment

The rudder pedals are adjustable to four (4) positions.

Adjustment is accomplished as follows: With toes on adjustment levers push pedals all the way forward, then with toes under pedals bring them aft one notch at a time until the desired position is attained. Check to see that each pedal has ratcheted past the same number of notches.

(e) Landing and Altitude Flaps Control

The flaps are operated by two (2) actuating systems, a vacuum system, and a pressure system, interconnected to a single control lever on the left hand cockpit shelf, which has two (2) positions:

Handle Outboard - Flaps Down
 Handle Aft - Flaps Up

The supply sources for the vacuum system are the engine vacuum pump and the intake manifold, from which lines are led to the vacuum storage tank and thence connected to the flap actuating cylinders through the control valve. The line to the intake manifold is equipped with a check valve to permit flow from the vacuum storage tank to the intake manifold but not vice versa.

The pressure system is supplied from the carburetor air elbow where pressure is increased when the auxiliary supercharger is in either Low or High blower.

When the control lever is in the "Up" position, the forces on either side of the pistons in the actuating cylinders are equalized and the flaps are held in the up position. (Auxiliary springs aid in holding the flaps up.) When the control lever is moved to "Down" the vacuum on the aft side of the pistons and pressure on the forward side move the pistons out and the flaps are moved down.

~~The~~ The vacuum tank has sufficient capacity to operate the flaps at least twice with the engine "cut". The engine will produce vacuum with the throttle closed unless completely stopped even though the switch is "Off".

The operating force on the flaps is sufficient to hold the flaps down when the engine is idled. When power is applied, the flaps will start to come up and as more power is applied and the speed picks up the flaps will gradually come up until, at about 130 knots, the angle of droop will be approximately 10°. If the power is then re-

is then removed, the flaps will return to the down position. This feature is very helpful when it is necessary, for any reason, to "go around again" after approaching for a landing. The flaps can be left down until ample speed and height are attained, and if the valve is turned to "Up" there will be no "sinking" effect.

When using the flaps for MANEUVERING AT ALTITUDE, they will come down partially at speeds up to 140 knots. At higher speeds the force of the airflow on the flaps will overcome the hold-down force.