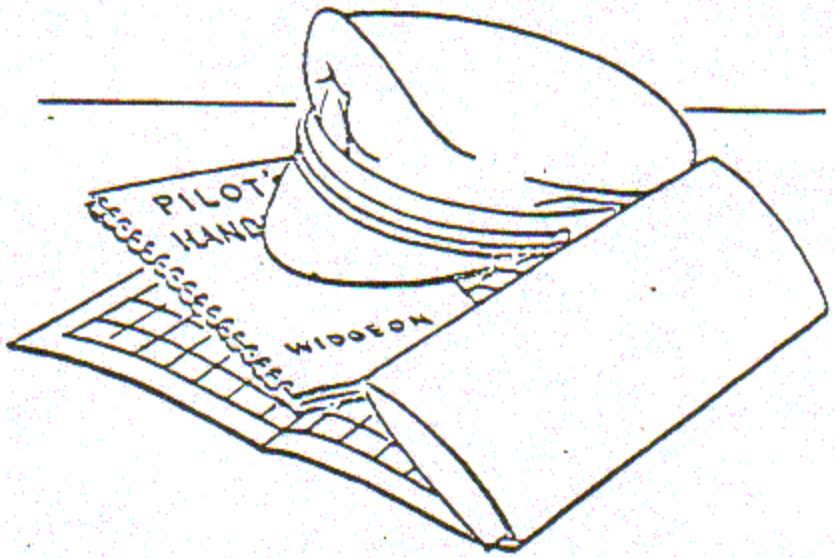
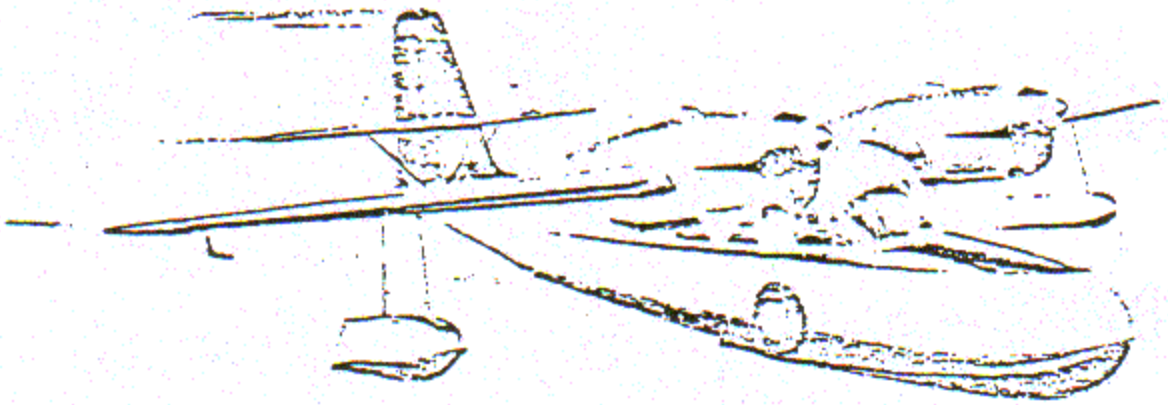
PILOT'S HANDBOOK

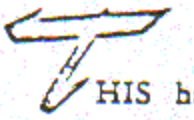


G-44A WIDGEON

GRUMMAN AIRCRAFT ENGINEERING CORPORATION
Bethpage, L. I., New York



Foreword



THIS handbook has been prepared for familiarizing owners with the flying characteristics of the WIDGEON; the functions of the systems and installations, and the operation of the automatic and manual controls.

For service and overhaul information, refer to the WIDGEON SERVICE MANUAL.

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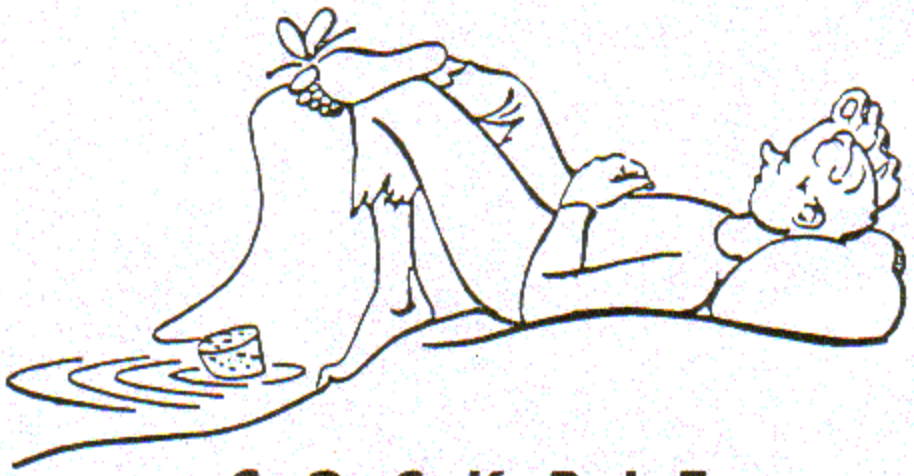
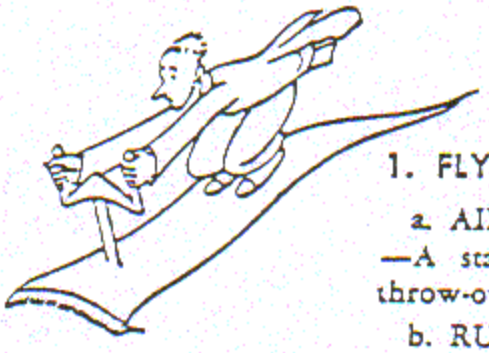
Section I



COCKPIT
Arrangement and Controls

Section I

COCKPIT ARRANGEMENT AND CONTROLS



1. FLYING CONTROLS.

a. AILERONS AND ELEVATOR.—A standard control column with throw-over wheel.

b. RUDDER. — Standard rudder and brake pedals. Removable rudder bar for co-pilot.

c. ELEVATOR TRIMMING TAB.—Handcrank on left hand side of upper control panel. Tab position indicator located above crank.

ROTATE CLOCKWISE—NOSE UP.

d. ELEVATOR BALANCE TAB.—The tab, on the right elevator, is designed for downward movement only. It is actuated by a direct cable from the wing flaps control and is not adjustable in flight. This tab automatically compensates for changes in longitudinal trim produced by lowering the flaps.

Note

It is important that the static balance tube on the upper surface is always firmly attached.

e. RUDDER TRIMMING TAB.—Handcrank on right hand side of upper control panel. Tab position indicator located above crank.

ROTATE CLOCKWISE—NOSE RIGHT.

f. WING FLAPS.—Three position hydraulic control lever on the right hand side of the upper control panel. Flap position indicator adjacent to control lever.

LEVER UP—FLAPS UP, LEVER DOWN—FLAPS DOWN
LEVER CENTER—NEUTRAL

(1) NORMAL OPERATION.—Operated hydraulically by flap control lever—controllable downward 0° to 40°. Movement may be stopped at desired degree of droop by returning the lever to NEUTRAL position.

(2) EMERGENCY OPERATION.—Thumb latches are provided to lock the flap control lever in the operating positions to permit the pilot to have one hand free if emergency hand pump operation is needed. About seven strokes are required to lower the flaps. A white up latch is located to the left of the control lever slot at the UP position and a red down latch at the DOWN position.

CAUTION

The red down latch should be used only when operating the hand pump and released immediately after pumping; otherwise, there is no flow through the valves and unreliable operation occurs.

2. LANDING GEAR CONTROLS.

Hydraulically operated main and tail wheels are extended or retracted by double-acting hydraulic cylinders. The operating pressure is supplied by the engine-driven hydraulic pump or, in emergency, by the hydraulic hand pump.

a. NORMAL OPERATION. — Landing gear movement is controlled by a lever on the left center of the upper control panel which has the DOWN and UP positions plainly marked thereon.

LEVER UP—LANDING GEAR RETRACTED
LEVER CENTER—NEUTRAL
LEVER DOWN—LANDING GEAR EXTENDED

b. EMERGENCY OPERATION.—In case of failure of the engine-driven pump (installed on left engine), use the emergency hand pump on the left side of the pilot's seat. Approximately 24 strokes

are required to retract or extend the landing gear. Two red thumb latches are provided at the right of the lever slot to lock the landing gear control lever in the desired operating position, thus enabling the pilot to have one hand free if hand pump operation is necessary.

CAUTION

The red latches should be used only when operating the hand pump and released immediately after pumping; otherwise there is no flow through the valves and unreliable operation occurs.

c. WHEEL POSITION CHECKS.

(1) INSPECTION WINDOWS.—Located at the top of each wheel pocket. The hinged covers of the wheel pockets may be raised for complete inspection.

(2) WARNING INSTRUMENT.—This instrument, designed to help prevent inadvertent landings with the landing gear in the incorrect position, is located on the top center of the main instrument panel. The signal lights when the right engine is throttled below 1,550 rpm. In the event that the wheels are neither completely UP or DOWN—DANGER WHEELS is lighted; if the wheels are in the retracted position — WHEELS UP is lighted; and if they are DOWN—WHEELS DOWN is lighted.

(3) HYDRAULIC SYSTEM PRESSURE GAGE.—Located on the right hand side of the upper control panel. When the landing gear and flap selector valves are not in use, the gage reads zero. As the landing gear is operated the pressure should read about 100 psi, and when the gear has completed its stroke, the gage shows a relief pressure of 900 psi.

d. TAIL WHEEL CASTER LOCK.—The 360° swivel type, tail wheel drag link is equipped with a lock pin which locks the caster in the trailing position. The lock pin is controlled by cable from the lock lever on the upper control panel.

LEVER UP—UNLOCKED
LEVER DOWN—LOCKED

The primary purpose of the lock is to reduce the possibility of ground looping in landing under unfavorable ground conditions. Lock the tail wheel immediately after taxiing into position for take-off. The wheel will then remain locked during flight and landing.

Unlock after the landing run has been completed in order to facilitate taxiing.

The tail wheel lock assists taxiing up and down steep ramps.

e. BRAKE CONTROLS.—The hydraulic brakes for each landing gear wheel are operated individually by toe-bars attached to the rudder pedals. It must be remembered that wet brakes may be ineffective; therefore, it is wise to taxi cautiously immediately after leaving the water. If an immediate land landing is to be made after a water take-off, the brakes will dry more rapidly with the landing gear in the DOWN position.

For parking, brakes are locked ON by lifting the knob located between the rudder pedals, then operating the brakes.

3. POWER PLANT CONTROLS.

a. CARBURETOR AIR PREHEAT.—Two push-pull T handles on the left hand side of the upper rear control panel.

PULL FOR HEAT THEN ROTATE TO LOCK

b. FUEL VALVES.—The three control levers are at the right-hand side of the upper control panel.

RIGHT TANK ON-OFF VALVE	LEVERS UP—OFF
TANK CROSS-FLOW	LEVERS DOWN—ON
LEFT TANK ON-OFF VALVE	

CAUTION

Valve must be closed on empty tank. At least two valves must be ON simultaneously to operate both engines.

c. IGNITION.—Single unit, double switch at the center of the upper control panel.

d. MASTER SWITCH.—Lever at center of the upper rear control panel.

LEVER RIGHT—SWITCH ON
LEVER LEFT—SWITCH OFF

e. THROTTLES.—Levers located at lower edge of the upper control panel.

LEVERS FORWARD—THROTTLES OPEN
LEVERS AFT—THROTTLES CLOSED

f. MIXTURE.—Two levers at center of the upper rear control panel. IDLE FUEL CUT-OFF sectors painted red.

LEVERS FULL UP—IDLE FUEL CUT-OFF
LEVERS UP—LEAN POSITION
LEVERS DOWN—RICH POSITION

g. STARTERS.—Two push buttons on electrical switch panel.

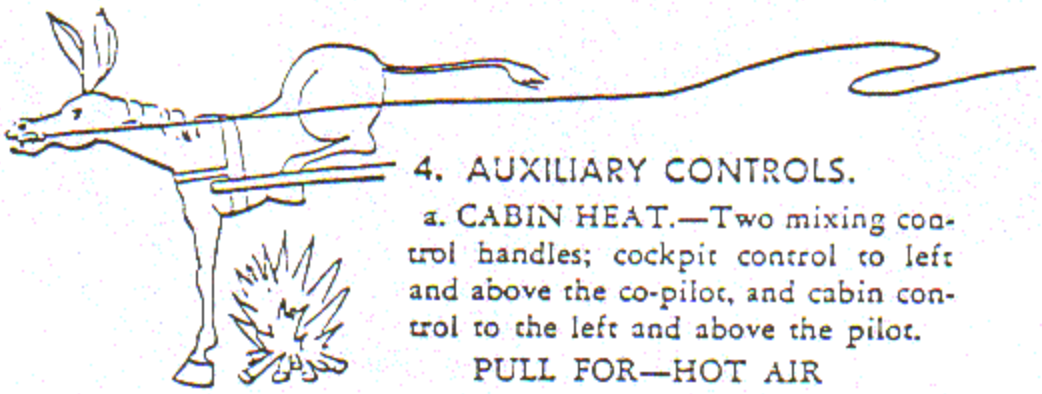
PUSH TO START ENGINE

h. WOBBLE PUMPS.—Lever at right- and left-hand side of the upper rear control panel.

RIGHT LEVER—RIGHT ENGINE PUMP
LEFT LEVER—LEFT ENGINE PUMP

i. ELECTRIC FUEL PUMPS.—On late model airplanes electric fuel pumps replace the wobble pumps. These pumps are an emergency means for maintaining fuel pressure. They should be used whenever the fuel pressure gage needles drop below 2 psi. It is advisable to utilize these pumps during take-offs and landings at extreme altitudes and temperatures.

j. PRIMER PUMP.—The hand primer pump is located on the left-hand side of the main instrument panel. Primer is supplied by operating the left wobble pump or the left electric fuel pump depending on the installation.



4. AUXILIARY CONTROLS.

a. CABIN HEAT.—Two mixing control handles; cockpit control to left and above the co-pilot, and cabin control to the left and above the pilot.

PULL FOR—HOT AIR
PUSH FOR—COLD AIR

An adjustable ventilator is located in the cabin ceiling.

b. ELECTRICAL SWITCHES, CIRCUIT BREAKER RESET BUTTONS AND RHEOSTATS.—The following equipment is on the electrical switch panel:

SWITCHES	CIRCUIT BREAKERS
Landing Light (Left)	Landing Light (2)
Navigation Lights	Navigation Lights
Pitot Heat	Instruments
Anchor Light	Transmitter
Generator	Receiver
Landing Light (Right)	Electric Fuel Pumps
Electric Fuel Pumps	Compass Light
Starter Buttons	Cockpit Lights
RHEOSTATS	**INSTRUMENT**
Compass Light	Volt-Ammeter
Cockpit Lights	

(1) CIRCUIT BREAKERS.—These units automatically open a circuit when an overload occurs, thus preventing damage to the electrical devices in the circuit. If the overload is only momentary, resetting the circuit breaker by pushing its reset button, will restore normal operation. Repeated opening of the circuit breaker indicates an electrical or mechanical defect in the circuit which requires that repairs be made.

c. RADIO.—Control panel located on the forward right-hand side of the cabin.

1. Airspeed Indicator
2. Turn and Bank Indicator
3. Rate of Climb
4. Artificial Horizon
5. Directional Gyro
6. Altimeter
7. Engine Primer
8. Vacuum Gage
9. Clock
10. Compass
11. Landing Gear Indicator
12. Manifold Pressure
13. Tachometers
14. Fuel Pressure,
15. Oil Pressure
16. Oil Temperature
17. Carburetor Air Temperature
18. Fuel Quantity
19. Outside Air Temperature

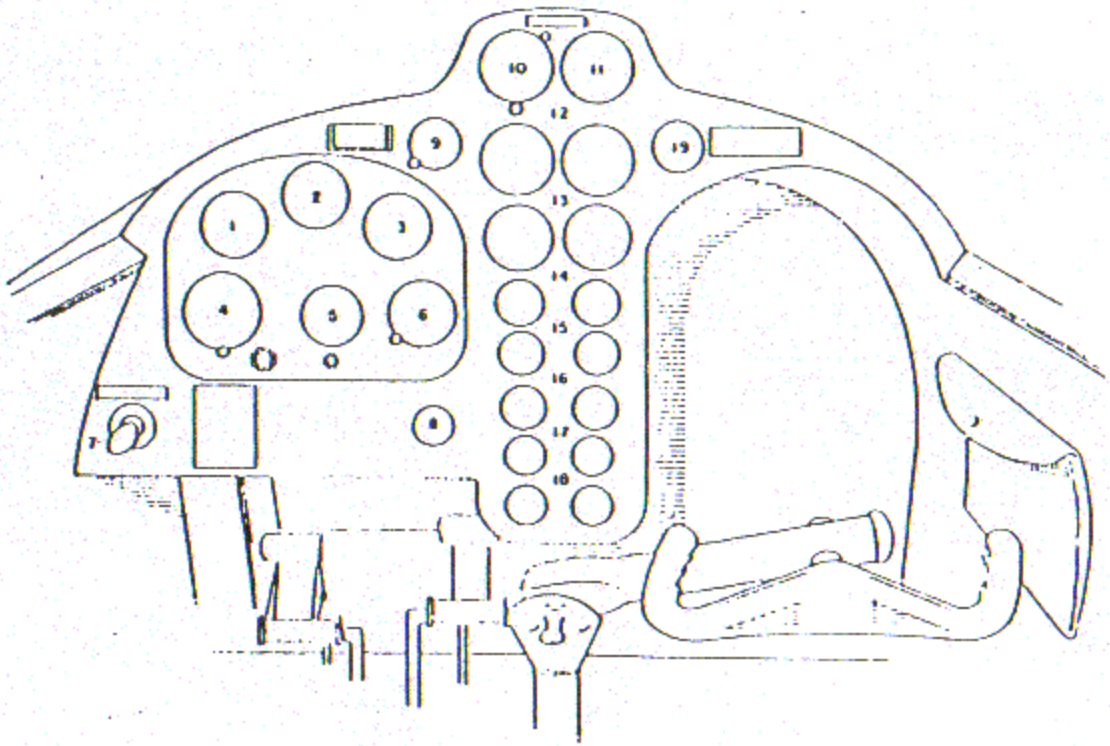
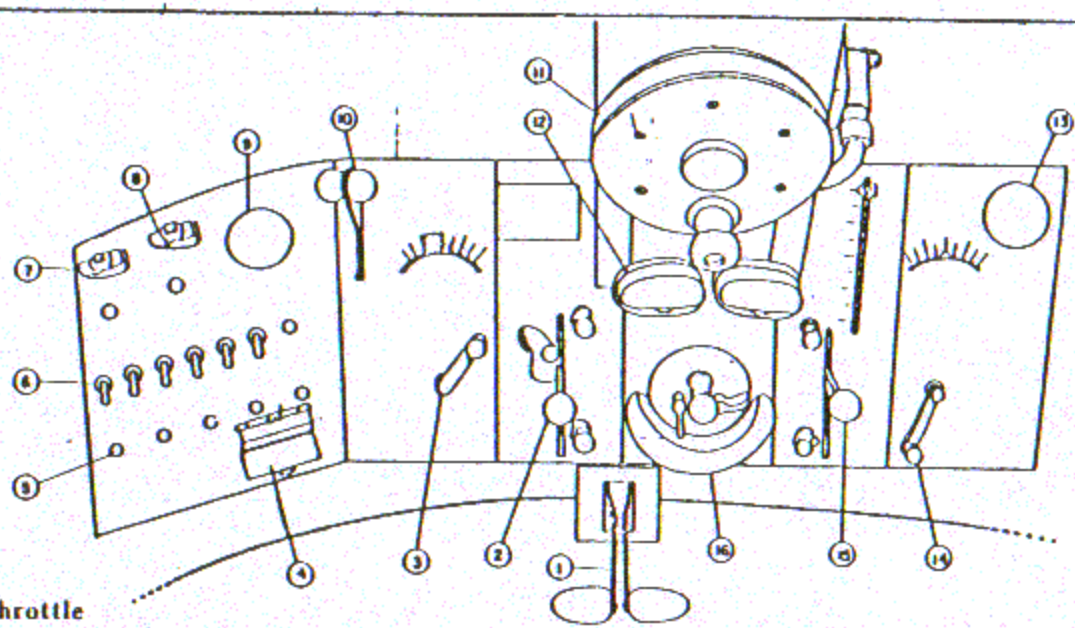
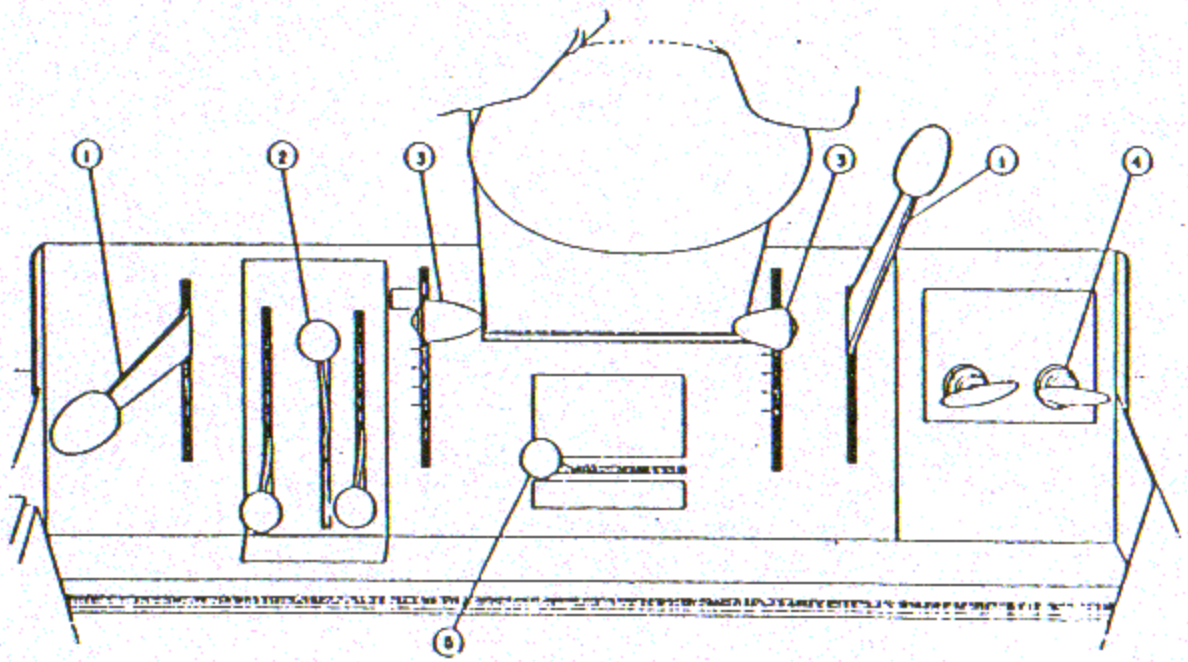


Figure 1—Main Instrument Panel



1. Throttle
2. Landing Gear Lever and Latches
3. Elevator Trim Tab Control and Indicator
4. Starter Switches
5. Circuit Breaker Reset Buttons (8)
6. Switches—Landing Light (L)
   Navigation Lights
   Pitot Tube Heat
   Anchor Light
   Generator
   Landing Light (R)
7. Direction Indicator Light Rheostat
8. Compass Light Rheostat
9. Volt-Ammeter
10. Tail Wheel Lock
11. Trailing Antenna and Reel
12. Cockpit Lights
13. Hydraulic Pressure Gage
14. Rudder Trim Tab Control and Indicator
15. Wing Flaps Lever and Latches
16. Ignition Switch

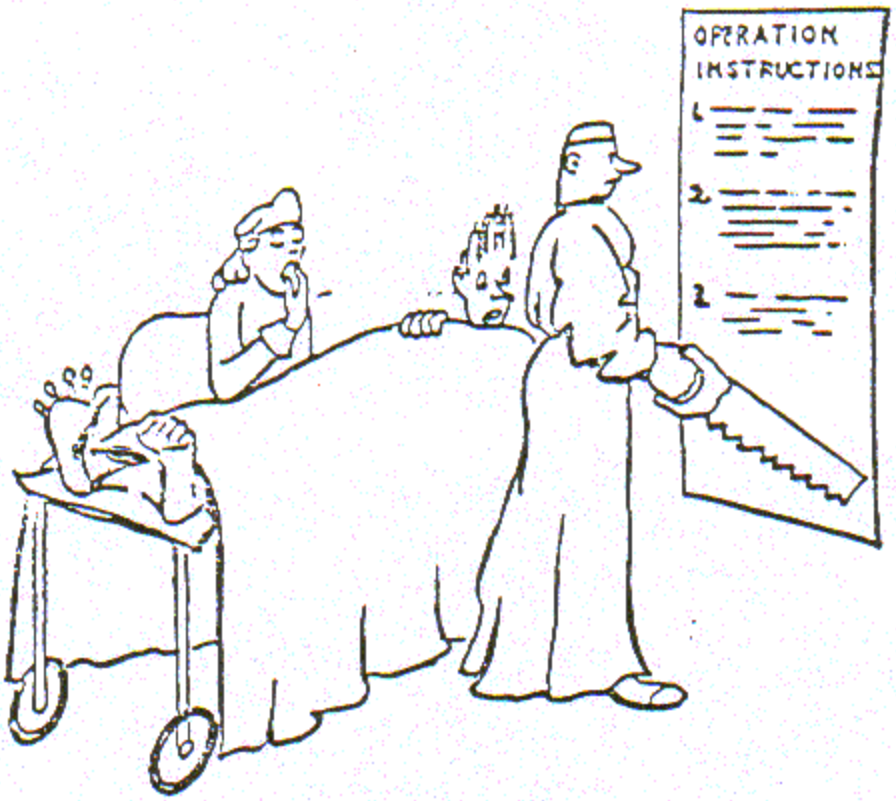
Figure 2—Upper Control Panel



1. Wobble Pump Levers (on airplanes without electrical fuel pumps)
2. Fuel Valve Levers—Left Tank—Cross-Flow—Right Tank
3. Mixture Controls
4. Carburetor Air Temperature Controls
5. Battery Switch

Figure 3—Upper Rear Control Panel

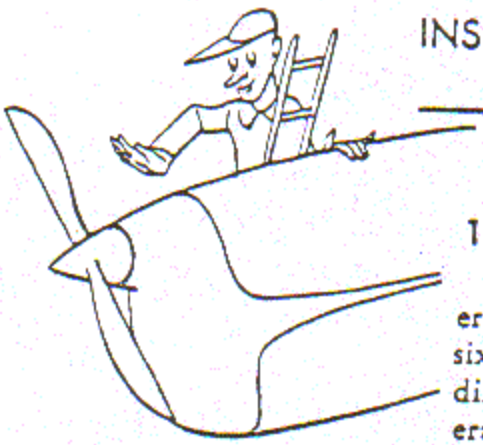
Section II



Operating Instructions

Section II

OPERATING INSTRUCTIONS



1. POWER PLANT.

a. ENGINE.—This airplane is powered with two Ranger Model 6-440C-5, six-cylinder in-line, inverted air-cooled, direct-drive engines which may be operated on either 87 or 91 octane fuel. These engines are not supercharged. The combined engines are rated:

400 hp at 2,450 rpm, with 28 in. hg
300 hp at 2,300 rpm, with 22 in. hg
300 hp at 2,350 rpm, with 21.5 in. hg
Fuel Spec.—87/91 octane
Oil Spec.—SAE #50.

b. PROPELLERS.—This airplane is normally equipped with Sensenich wooden, two-bladed, fixed-pitch propellers.

Diameter, 82 in.

Pitch (at ¾ radius), 72 in.

Under standard sea-level atmospheric conditions, the static ground rpm is approximately 2,060.

It should be remembered that temperature and humidity conditions affect wooden propellers, even after short periods without use. They sometimes warp slightly and not alike on either blade, thereby changing the speed characteristics of their respective engines. This is the usual explanation if one engine does not turn-up as fast as the other, and normally does not indicate a power loss. Several hours of running may bring the propellers back to their former speed.

It is usual practice on twin-engine airplanes to synchronize the

speed of the engines by their sound, even though the tachometer readings may be slightly different.

c. CARBURETOR AIR CONTROLS.—The carburetor air preheat duct, mounted below the carburetor, is fitted with a mixing valve arrangement which is controlled by T handles on the upper rear control panel.

PULL FOR HEAT THEN ROTATE TO LOCK.

Hot or cold air, or any desired mixture of both, may be supplied to the carburetors. Temperatures of intake air at the carburetor are indicated on the main instrument panel. A total heat rise of 60° is available at an outside air temperature of 30° F.

d. MIXTURE CONTROL.—The following expressions are used in manual adjustment of the mixture control:

FULL RICH.—Setting of the mixture control lever in the position which gives the maximum fuel flow.

BEST POWER.—Setting of the mixture control lever which, with a given fixed throttle setting, results in maximum engine rpm. At leanest fuel flow, further leaning of the mixture would cause a decrease in engine rpm.

SMOOTH OPERATION.—The setting for BEST POWER is obtained and then the mixture enriched until the engine speed drops 20 to 30 rpm.

MAXIMUM ECONOMY. — Obtained by adjusting to BEST POWER and then leaning to obtain a decrease of 40 to 50 rpm. This should not be done above 21 in. Manifold Pressure.

The carburetors are fitted with IDLE FUEL CUT-OFFS which provide for stopping the flow of fuel to the carburetor jets when the mixture control levers are in the FULL UP position on the mixture segment. This portion of the control unit is painted RED.

e. ENGINE STARTING.—It is recommended that the engines, after standing as long as over night, be pulled through several complete revolutions by hand before starting. The starter buttons, for the Eclipse starters, are located on the electrical switch panel.

The right engine should be started first as the generator is located on this engine. If the battery is low, with the right engine running at approx. 1,200 rpm, the generator will be supplying sufficient current to start the left engine.

Proceed as follows:

(1) Carburetor air control on full COLD.

(2) Select the best combination of fuel valves; however, at

least two valves must be ON. Valve must be closed on an empty tank.

(3) Put master battery switch to ON position.

(4) Set mixture control to FULL RICH position.

(5) The selective primer is connected to the left fuel system. To assure filling the primer, operate the left wobble pump until a pressure of 3½-4½ psi shows on the fuel pressure gage. Later model airplanes are equipped with electric fuel pumps. In planes so equipped, use the electric pump to obtain the required fuel pressure. Normally hand primer pump operation is not necessary unless the weather is extremely cold. The primer pump should be turned off immediately after using.

(6) Pump the throttle several strokes through its complete throw. Throttle and wobble pump should be operated together until fuel is seen coming from the drain line located at the bottom of the nacelle. Overpriming is not indicated at all times by fuel coming from the carburetor drain unless in a continual flow while trying to start.

(7) With the throttle partly open, PUSH-IN the master ignition switch marked PULL-OFF, and turn the individual switch to the LEFT position as this magneto is equipped with an impulse unit. Press the starter button and hold it in the ON position while the throttle is still pumped slightly. As soon as the engine starts, turn the individual ignition switch to the BOTH position. When the engine catches, the throttle is brought to almost fully closed position and the engine set to run at approximately 800 to 900 rpm. If the engine stops, the throttle should be pumped for about 3 or 4 short strokes and the starter button pressed again.

Note

As soon as the engine starts, check the oil pressure gage. If no pressure is indicated after 30 seconds running, the engine should be stopped and checked.

(8) If the engine, after starting, shows any indication of missing or lean running, it will be necessary to pump the throttle at the closed position, using very short strokes.

(9) If the engine is overprimed, the throttle should be opened wide and the engine turned backward several revolutions by hand with the master ignition switch OFF. Also the throttle can be opened wide with the ignition switch OFF and the starter used to turn over the engine.

(10) For extremely cold weather operation, the engines may be preheated with conventional heater pots and blowers. The in-line engine does not require the elaborate hood necessary for a radial. The only caution should be that the directed emission of the hot air does not blister the insulation of the front plug lead. It should be either disconnected and pushed aside, or covered with a temporary metal deflector if the air blast is extremely hot.

In cold weather when the oil has not been preheated, keep the engine throttled as low as possible until a temperature rise is registered (approx. 600-700 rpm).

CAUTION

During cold weather starting if the battery is low after starting the right engine, follow the above procedure on this engine before attempting to start the left. Only after the required oil temperature and pressure are reached, increase the rpm on the right engine to 1,200 in order to cut in the generator. This output will then assist in starting the left engine without a serious drain on the battery.

f. WARM-UP.—The warm-up period is most important in order to allow all parts to expand properly to their normal running clearances .

The carburetor heat control should be left in the full COLD position except when actual carburetor icing is experienced

Note

In reving up the engine be sure that the control wheel is full back because of the high thrust line.

After the oil gage indicates pressure, run the engine at 800 to 900 rpm until the pressure is normal for this speed which will be between 50 and 70 lbs. This warm-up period should be extended for at least 5 minutes after reaching normal temperature and pressure at which time increase the rpm to 1,000. It is recommended that these speeds not be exceeded until the oil temperature registers 100°F. Use FULL RICH mixture for all speeds when running on the ground near sea level.

The rpm check is made as follows:

These engines are rated at sea level and therefore should be checked at full throttle. As cooling of the engine is insufficient

while on the ground, any prolonged running at or near full throttle should be avoided. Check oil pressure and temperature. Note drop in rpm when switching to one magneto at a time. Drop in engine speed when operating on either magneto alone should not exceed 50 rpm.

Check for acceleration being sure that the mixture control is in the FULL RICH position.

g. TAKE-OFF.—Set mixture control to FULL RICH position, manifold pressure 29 in. hg, and 2,100 rpm (approx.)

h. CLIMB.—At full throttle, the engines operate at special rich settings. At slightly less than full throttle, the fuel consumption drops to the normal curve. Therefore, in order to avoid excess heating and engine wear, climbing should be done at full throttle or with power reduced to 75%.

Manifold pressure 75% power:

SL	23.5 in.hg
2,000 ft	23.0 in hg
4,000 ft	22.5 in hg
6,000 ft	22.0 in hg
8,000 ft	21.5 in hg

i. HIGH SPEED CRUISING.—Recommended cruising power is 75% or less at all altitudes.

Mixture control is set at FULL RICH below 4,000 ft and at SMOOTH OPERATION above 4,000 ft.

Rated rpm 2,450.

Maximum allowable rpm 2,250.

j. ECONOMICAL CRUISING.—Economical cruising will be obtained by conducting cruising operations in a range not to exceed 60% of the normal sea level hp. See Engine Operating Chart, Engine Performance Curves and Range-Load Data Chart herein, for values for manifold pressure and engine speed for various altitudes and fuel consumption, which may be used as a guide in controlling engine operation. Maximum economy will be about 103 mph indicated air speed at full load—4,525 lbs. The minimum cruising speed should not be less than 103 mph true indicated air speed at all altitudes.

If roughness is experienced at high altitudes, the mixture control should be leaned out, the amount depending on the altitude and rpm.

k. STOPPING ENGINES.—Air cooled engines cool rapidly and should not be shut down too quickly except in extreme emergencies. In stopping, the engines shall be allowed to turn over at 800 to 1,000 rpm for a few minutes to allow the cylinders to cool properly.

When the airplane is parked and is to be left with no one in the cockpit, both engines should be shut down in the following manner:

(1) Brakes should be on PARKING. Tail wheel in alignment and LOCKED. Put mixture controls in IDLE CUT-OFF.

(2) Advance throttles to about half way and allow engines to starve for gas. When fully stopped, pull throttles to CLOSED position—turn both ignition switches to OFF position. Pull main ignition button OUT. Then shut OFF master battery switch and close valves to L & R gas tanks.

(3) Do not touch the propellers until the engines have cooled down. With a hot engine, there is always the possibility of the engine firing when the propeller is turned.

2. FUEL SYSTEM.

a. TANKS.—The fuel is carried in two integral wing tanks.

LEFT WING TANK	54 U.S. GAL.
RIGHT WING TANK	54 U.S. GAL.
Total	108 U.S. GAL.

b. QUANTITY GAGE.—An electric fuel quantity gage, for each wing tank, is located on the main instrument panel. They are controlled by a switch on the electrical panel.

A fuel strainer, wobble pump and relief valve or an electric fuel pump are mounted in each nacelle.

As shown by the fuel system diagram herein, the system is essentially a complete separate unit for each engine, and is normally used as such with each tank feeding its own engine directly. There is, however, a cross-flow valve enabling both engines to be run simultaneously from either tank.

CAUTION

When using the cross-flow valve, the valve on the tank not being used should be closed. If a tank should run dry when all three valves were open, air would enter both systems resulting in engine failure.

It should be remembered that for both engines to run, two valves must be ON; three valves should not be on at once if the fuel is very low.

3. OIL SYSTEM.

a. TANKS.—The oil for each engine is carried in a single tank, one in each engine nacelle, aft of the firewall.

TANK CAPACITY—3½ U.S. GAL.
FOAMING SPACE—1 U.S. GAL.

Situated at the left side of each engine is a 5 in. dia oil cooler with thermostatic oil temperature control. It maintains the oil-in temperature at approximately 140°F to 170°F. The thermostatic control valve causes the oil to by-pass the cooler when the oil-in temperature is below approximately 120°F., returning the oil to the upper section of the tank.

The vent line is provided between the top of the oil tank and the rear of the crankcase. The oil drain valve is installed at the bottom of the firewall.

TEMPERATURES—Maximum 200°F—Desired 140°F to 170°F
PRESSURES—Maximum 70 psi—Desired 60 psi
Minimum 50 psi cruising—Minimum 15 psi idling

ENGINE OPERATING CHART

(with Sensenich 82-RS-72 Propellers)

CRUISING POWER	LEVEL FLIGHT	ALTITUDE (Feet)		
		Sea Level	4000	8000
75% (MAXIMUM)	RPM	2260	2330	2370
	Man. Press.	23.5	22.5	21.5
62½% RECOMMENDED	RPM	2150	2200	2250
	Man. Press.	22.0	21.0	20.0
50% ECONOMICAL	RPM	1975	2025	2075
	Man. Press.	19.5	18.5	17.5

CRUISING POWER	CRUISING SPEED M.P.H.	GALS./HR. Full Rich Mixture	WITH FULL TANKS	
			Maximum Endurance	Maximum Range
75% (MAXIMUM)	142 at Sea Level	24.0	4½ Hrs.	640 Mi.
	150 at 6000 ft.			675 Mi.
62½% RECOMMENDED	130 at Sea Level	20.0	5½ Hrs.	715 Mi.
	138 at 6000 ft.			750 Mi.
50% ECONOMICAL	120 at 1200 ft.	16.5	6½ Hrs.	780 Mi.
	125 at 6000 ft.			810 Mi.

RANGE-LOAD DATA

Crew and Passengers	Baggage (POUNDS)	Fuel (GALLONS)	Range at 62½% Power at 6,000 Feet
3	74	108	750 miles
4	12	90	620 miles
4	192	60	410 miles
5	22	60	410 miles

Figure 4—Engine Chart and Load Data

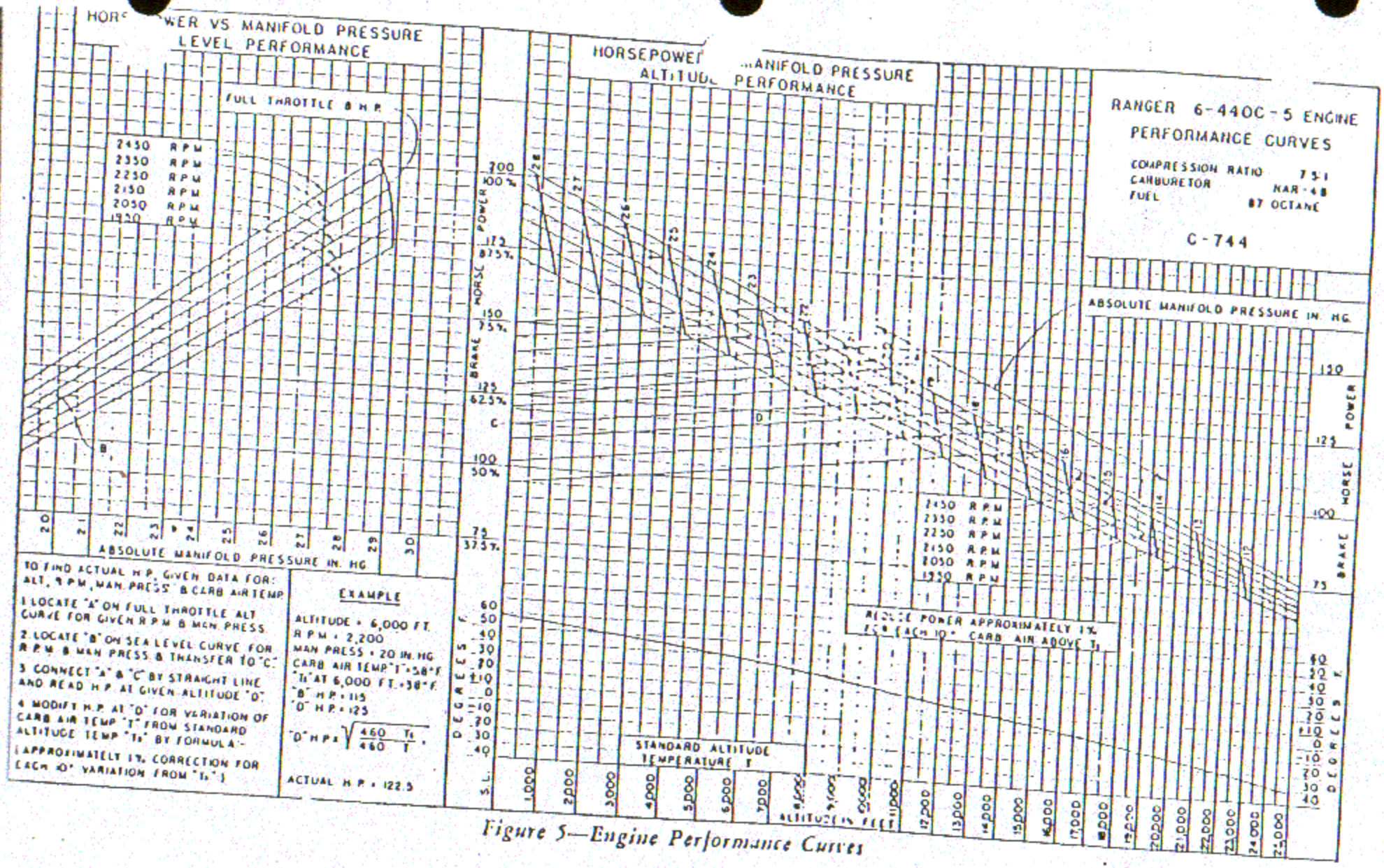


Figure 5—Engine Performance Curves

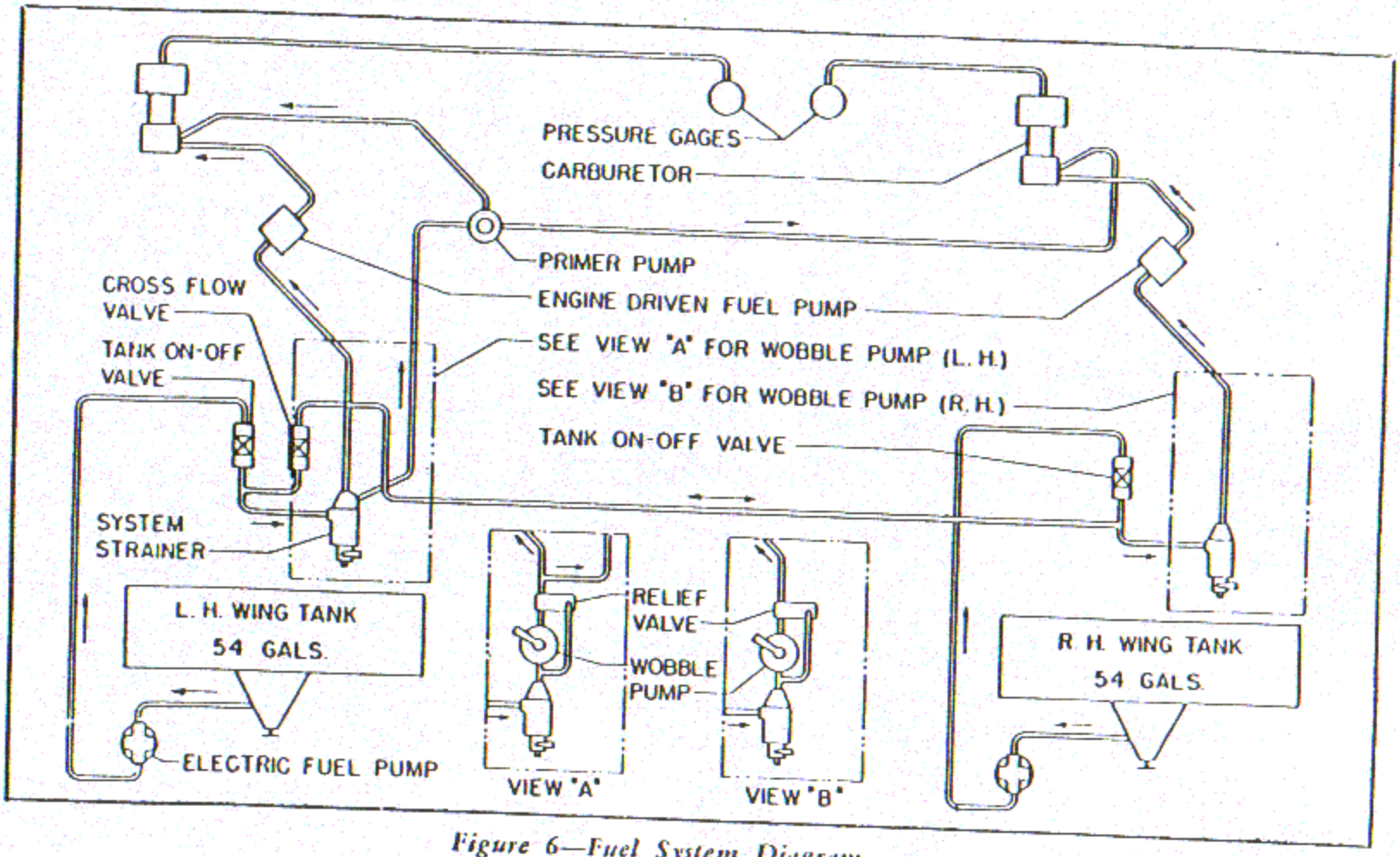
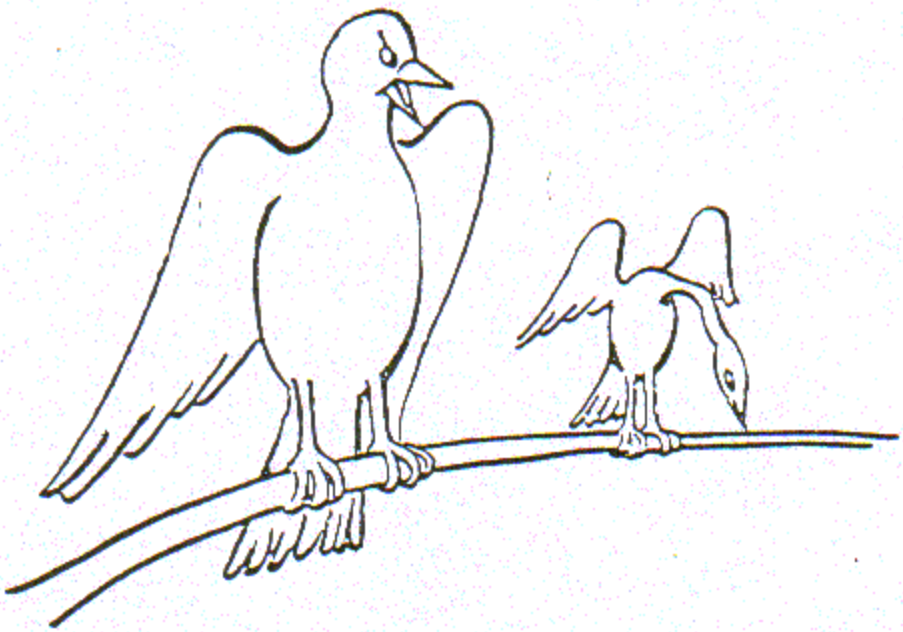


Figure 6—Fuel System Diagram

Section III



Flying Characteristics

Section III

FLYING CHARACTERISTICS

1. BALANCE.

Check weight data for balance before take-off. Refer to Weights Handbook.

2. MANEUVERS.

a. TAXIING. — By extending the wheels when taxiing on water, the maneuvering characteristics are improved; forward speed is reduced and sharper turns can be made—however, wheels should not be lowered in water less than three feet deep.

Following water maneuvering with wheels DOWN, the use of the emergency hand hydraulic pump will be found convenient for retracting the gear after the engines are stopped.

When approaching a beach with the intention of taxiing out, it is considered good practice to come in slowly and at an oblique angle (not straight on) in order to determine if the surface is sufficiently firm to support the wheels.

While taxiing it will be easier to decrease the rpm on the fast engine and increase the rpm of the other to keep straight.

b. LAND TAKE-OFF.—The land take-off run is approximately 900 feet at sea level with gross load and no wind. Both wheels should

be braked after take-off and before retraction of the landing gear to prevent excessive tire wear caused by their rotation against the wheel pocket bumper pads.

c. WATER TAKE-OFF.—A water take-off with full load under no wind conditions can be made in approximately 25 seconds.

d. SPRAY REDUCTION.—The durability of the propellers is greatly reduced if they are subjected to severe spray conditions. A little thought and attention by the pilot will eliminate a great deal of the spray thrown outward from the hull.

It will be noted that at all normal taxiing speeds, the bow wave lies flat and passes well below the propellers. As the speed increases, the point at which the bow wave leaves the chine moves rapidly rearward until it is soon entirely behind the propellers. However, the speed creates a feather of spray that strikes the tips for a moment before this point is reached. This can be clearly observed when the water is calm, though the pattern is distorted in rough water.

The pilot should reduce the spray-beating period by getting through it rapidly and by holding the bow as high as possible to get the spray well aft early in the run. It is suggested that power be applied moderately as the plane accelerates to the spray point at which time the throttles should be fully advanced smartly and the wheel held full back.

Spray conditions are frequently less in rough or choppy waters because the stronger wind reduces the critical period. However, a little care in choice of time and position of take-off will avoid passing through higher than average waves at the critical conditions. For example, the pilot should clear his own waves after a downwind taxi before starting the take-off.

Adherence to these suggestions will decrease propeller deterioration.

As on any flying boat, the torque during take-off will cause a list to the left which may be disregarded. It is more noticeable under no-wind conditions. A very slight turn to the left during the start of the take-off will assist in raising the left float early.

e. USE OF FLAPS.—Deflection of the trailing edge flaps opens slots at their leading edge, thus obtaining the advantage of a relatively high lift and low drag at small angles. They are, therefore, much more effective than split flaps during such low speed operations as take-off, climb and single engine performance.

Best flap position for take-off:

Take-Off	12 to 15°
Climb	0 to 12°

f. FUEL SYSTEM OPERATION.—If a tank should run dry in flight and after switching tanks, the farthest engine from the tank being used will not start immediately, it has been found that dropping the wing on this side will help considerably in getting gas to the engine.

g. SINGLE ENGINE FLIGHT.—In the event of failure of one engine, the operating engine should be opened to full power and the airplane retrimmed. The indicated airspeed should be held to 90 mph at 4,000 ft or 95 mph near sea level in order best to maintain altitude or achieve minimum rate of descent. Five degree flaps will assist in single-engine operation.

The ability to fly well on one engine improves rapidly as the load is decreased. At full gross load of 4,525 pounds, single engine flight is seriously affected by turbulence, ragged flying, rain on the wings, etc. Unless the inoperative engine is rough, as from a mechanical failure, the throttle should be opened to permit maximum wind-milling rpm. However, in very cold weather, the congealing of the oil will eventually stop the engine.

h. PROCEDURE FOR SINGLE ENGINE FLIGHT.

(1) Operating engine:

Full rich mixture.
Full throttle.
Zero or minimum carburetor heat.

(2) Inoperative engine:

If turning smoothly—cut switch, full throttle.
If rough—close throttle, cut switch.
If desired to decrease load—leave fuel valve ON, unless danger of fire from spitting.

(3) Trim with rudder tab.

(4) Assume 90 mph—4,000 ft or above.
Assume 95 mph—1,000 ft or below.

(5) Flaps—0°.

3. CHECK-OFF LISTS.

TAKE-OFF

(1) Fuel	On best tank
(2) Mixture	Full rich
(3) Manifold Pressure	29 in. hg
(4) Engine Speed	2,100 rpm (approx.)
(5) Carburetor Heat	On cold
(6) Elevator Tab	Neutral
(7) Rudder Tab	Neutral
(8) Tail Wheel	Locked
(9) Flaps	12° or as desired

FLIGHT CRUISING

(1) Wheels	Retracted
(2) Oil Pressure	50 psi min.
(3) Oil Temperature	200°F max.
(4) Fuel Pressure	2.5 to 3.5 psi
(5) Carburetor Heat	Cold unless needed

LANDING

(1) Landing Gear	Down-land, Up-water
(2) Mixture	Full rich
(3) Fuel	Best tank combination
(4) Tail Wheel	Locked
(5) Flaps	40° or as desired.

GRUMMAN WIDGEON N278L- Check list:

(1) Before starting engines:
- a. Exterior pre-flight check-complete.
- b. Controls-free
- c. Landing gear control-down for land.
- d. Radio & electric switches-Off.
- e. Master switch-On; Generator switches-On
- f. Hydraulic breaker switch-On: Check pressure
- g. Fuel-Both tanks On : Crossfeed-Off
- h. Mixtures-Rich
- i. Trim tabs-Neutral
- j. Tail wheel-Unlock for taxiing.
- k. Flaps-Up.

(2) Start engines: Right engine first.
- a. Check fuel-On, Mixture-Rich, Right fuel pump switch-On, pump throttle to prime if cold, crank starter, Mag switch-On.
- b. Fuel pump switch-Off, check oil pressure
- c. Start left engine as above.

(3) Before take-off:
- a. Engine instruments in green operating rang
- b. Power & mag check- 1500 RPM for mags.
- c. Exercise props-2000 RPM or higher.
- d. Fuel pumps-On
- e. Carburetor heat-Cold.
- f. Check mixture rich-Fuel-on, crossfeed-off
- g. Tail wheel-lock
- h. Flaps-12°or as desired.
- i. Take-off: Best single engine climb 82 Kts

(4) Cruise: (Gear-Up, Flaps-Up)
- a. Fuel pumps off
- b. For climb-3,000 RPM, Full throttle.
- c. Cruise- 2,600-2,800 RPM, 25"
- d. Trim & Mixture-as desired. Instruments-nor

(5) Before landing:
- a. Gear- Down for land-Up for water.
- b. Hydraulic pressure-Up, Visual check gear
- c. Mixture-Rich
- d. Fuel-Best tank combination
- e. Tail wheel-locked
- f. Flaps- 40°or as desired.
- g. Fuel pumps-On.
- h. Carb heat-On

(6) After landing:
- a. Flaps-Up , Fuel pumps-Off
- b. Tail wheel-Unlock

(7) Stopping: Mixtures-cut off, mags-off.
Radios & elect-Off, Master switch-Off.