CESSNA AIRCRAFT CO.

WICHITA, KANSAS

Your 1959 Cessna 180

WARNING

PITOT HEATER MUST BE ON WHEN OPERATING BELOW 40°F IN INSTRUMENT METEROLOGICAL CONDITIONS. 0890018-2

OWNER'S MANUAL

Additional copies of this manual

WARRANTY

■ The Cessna Aircraft Company warrants each new airplane, manufactured by it, to be free from defects in material and workmanship under normal use and service, provided, however, that this warranty is limited to making good at the Cessna Aircraft Company's factory any part or parts thereof which shall, within ninety (90) days after delivery of such airplane to the original purchaser, be returned to the Company with transportation charges prepaid, and which upon Company examination shall disclose to the Company satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and all other obligations or liabilities on the part of the Company, and the Company neither assumes nor authorizes any other person to assume for it any other liability in connection with the sale of its airplanes.

■ This warranty shall not apply to any airplane which shall have been repaired or altered outside the Company's factory in any way so as, in its judgment, to affect its stability or reliability, nor which has been subject to misuse, negligence or accident.

P-170—McCORMICK—2000—11/1/58

PREPARED BY SMS
CHECKED BY TK
APPROVED BY TMK

McCAULEY PROPELLER SYSTEMS
A TEXTRON COMPANY

TR 929

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

CESSNA AIRCRAFT MODELS

180, A, B, C, D, E and F
(Landplanes/Skiplane/Floatplanes/Amphibian)

and

182, A, B, C, D, E, F, G, H, J, K and L

Reg. No. LN-IKO

Serial No. C-180-50435

STC No. SA01033CH

GENERAL

The information in this supplement is FAA approved material and must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the McCauley 2A34C203/90DCA-X propeller model is installed in accordance with McCauley STC approved data. The information contained herein supplements or supersedes the basic flight manual only in those areas listed. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

FAA Approved: Joseph C Miess
for Royace L. Prather, Manager
Chicago Aircraft Certification Office

DATE: APR 29 1999

LOG OF REVISIONS

Revision Number	Revised Pages	ECN	Description of Revision	McCauley Date/Approval	FAA Approval

NOTE: All changes are indicated by black vertical line along the right margin.

I. Limitations

Propeller Model:	McCauley 2A34C203/90DCA-X
Propeller Diameter – Landplane & Skiplane:	82 inches maximum 80.5 inches minimum repair
Propeller Diameter – Floatplane & Amphibian:	88 inches maximum 86.5 inches minimum repair
Propeller Blade Angles:	At 30" station, low: 12.5°, high 25.0° (Landplane/Skiplane) At 30" station, low: 10.0°, high 24.5° (Floatplane/Amphibian)
Spinner:	McCauley D-7519-1 (180 thru 180F and 182 thru 182G) D-7520 (182H thru 182L)

II. Procedures
No Change

III. Performance
No Change

Equipment List/Weight and Balance Record
Equipment List/Weight and Balance Record revised by STC installer for removal of existing propeller and addition of McCauley propeller.

Congratulations . . .

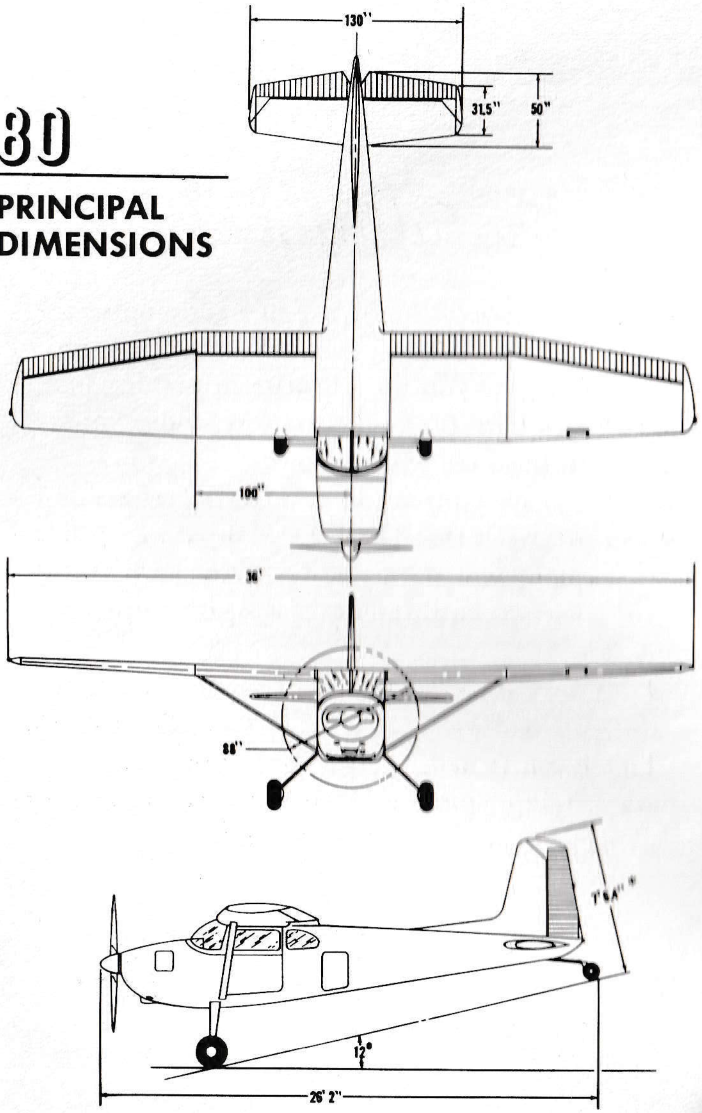
■ You are now the owner of a truly outstanding airplane. The Cessna 180 has been engineered to give you the ultimate in performance, styling, durability, flying comfort, and economy for both business and pleasure.

■ We share your pride as a Cessna owner and have prepared this Owner's Manual as a guide to acquaint you with your airplane and its fine construction, equipment, ease of operation and its care.

■ Every fine possession is worth caring for, and this is especially true of your Cessna 180. This book is dedicated to help you get the utmost flying enjoyment and service from your airplane with a minimum of care.

180

PRINCIPAL DIMENSIONS



*With optional rotating beacon, add approximately 2½ inches.

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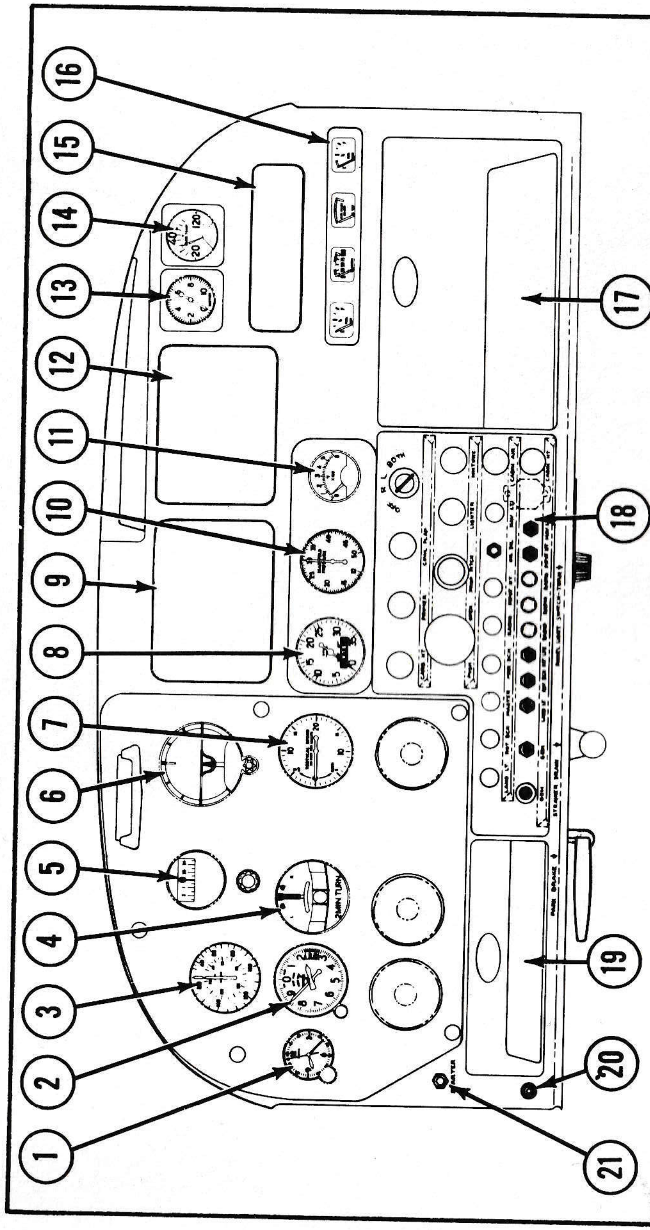


1. Clock
2. Altimeter
3. Airspeed Indicator
4. Turn-and-Bank
5. Directional Gyro
6. Attitude Gyro
7. Vertical Speed Indicator
8. Tachometer
9. Optional Radio Space
10. Manifold Pressure Gage
11. Cylinder Head Temperature Indicator
12. Optional Radio Space
13. Suction Gage
14. Carburetor Air Temperature Gage
15. Optional Radio Space
16. Fuel and Oil Gages
17. Glove Compartment
18. Control Panel (See Figure 1-2)
19. Map Compartment
20. Headset Jack
21. Starter Button

Figure 1-1. Instrument Panel

Section I

description

ONE OF THE FIRST STEPS in obtaining the utmost performance, service, and flying enjoyment from your Cessna is to familiarize yourself with your airplane's equipment, systems, and controls. This section will tell you where each item is located, how it operates and its function.

ENGINE.

Your Cessna 180 is powered by a Continental O-470-K horizontally-opposed six-cylinder engine. It develops 230 horsepower at 2600 rpm and full throttle for both take-off and maximum continuous power.

THROTTLE.

The throttle (figure 1-2) incorporates a knurled, friction-type locknut to secure it at any desired setting.

NOTE

Because of the constant-speed propeller mechanism, standard-equipment on your Cessna 180, advancing the throttle will *not* increase the engine rpm. It will increase the manifold pressure. With each power increase, the constant-speed propeller automatically takes a larger "bite" enabling the engine to run at a constant speed at all times.

Engine rpm can be changed by adjusting the propeller control. Refer to "PROPELLER PITCH CONTROL" paragraph on page 1-5 for this procedure.

MIXTURE CONTROL.

The mixture control (figure 1-2) has a double-button knob with a friction lock to prevent inadvertent leaning or shutting off the fuel supply. To operate the control, grasp the knob between the thumb and two fingers and squeeze the buttons together, releasing the lock. Then push the knob in for rich mixture or pull it out for lean mixture. Release pressure on the knob to lock the control.

Pulling the knob all the way out seats the fuel metering valve in the carburetor so that it acts as an idle cutoff for stopping the engine.

Detailed information on leaning the mixture in flight is contained in Section III.

CARBURETOR AIR HEAT CONTROL.

The carburetor air heat control knob (figure 1-2) operates a butterfly valve in the carburetor air intake. The valve proportions cold air from the airscoop and hot air from the exhaust heater muff to maintain proper carburetor air temperature. The push-pull control has a double-button knob with a friction lock, identical to the mixture control. To increase the carburetor air temperature, pull the control out; to decrease it, push the control in. The control may be set in any desired position between full-hot (full out) and full-cold (full in).

Carburetor heat should not be used when taxiing on dirty, dusty or sandy fields, except briefly just before take-off, since the air entering the heater muffs does not pass through the intake filter. After a full-stop landing under these conditions, return the heat control to the full-cold position so the engine will receive filtered air.

Carburetor ice can form during ground operation with the engine idling. Just after the magneto check prior to take-off, pull the carburetor heat knob full on to remove any ice in the carburetor and check the control for proper function. After this short check, be sure to return the knob to the full cold position, so that maximum power will be available for take-off.

During climb, watch the engine for any sign of icing — roughness or loss of manifold pressure. Remember, icing will not produce a drop in rpm after you have set up climb power, since the propeller will change pitch to compensate for the power loss. *If the engine begins to ice, apply full carburetor heat at once.*

IGNITION SWITCH.

The key-operated ignition switch (figure 1-2) controls the dual-magneto ignition system. The four switch positions are "OFF," "R," "L" and "BOTH." Always operate the engine on both magnetos. Combustion is smoother and more complete when the cylinder charge is fired at two points. The "R" and "L" switch positions are for checking purposes only.

ENGINE PRIMER.

The engine primer knob (figure 1-2) operates a plunger-type pump which injects a charge of raw fuel into the cylinder intake ports. Normally, at least two strokes of the primer are necessary to start the engine even in warm weather.

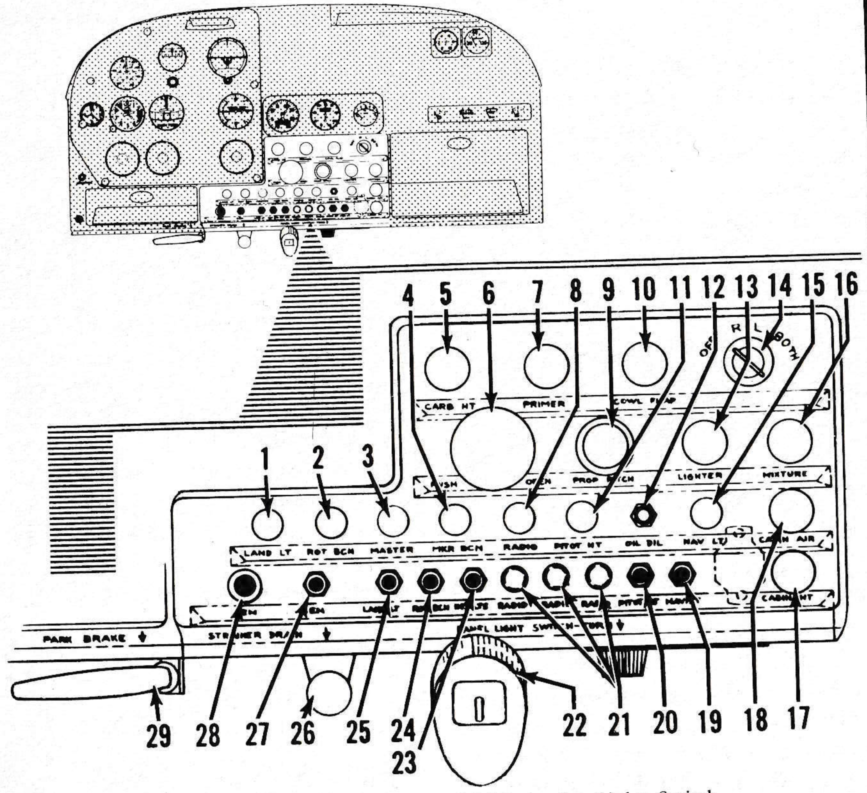
NOTE

Only five cylinders are primed by the engine primer. The right rear cylinder (No. 1) provides the manifold pressure source connection and is not primed.

To operate the primer, proceed as follows:

1. First, unlock the plunger by turning the knob counterclockwise until the knob pops part way out.
2. Slowly pull the plunger all the way out and then push it all the way in. This action is termed "one stroke of the primer."

Normal weather will require two strokes of the primer, and very cold



1. Landing Light Switch
2. Rotating Beacon Switch
3. Master Switch
4. Marker Beacon
5. Carburetor Heat Knob
6. Throttle
7. Primer Knob
8. Radio Switch
9. Propeller Pitch Control Knob
10. Cowl Flap Control Knob
11. Pitot Heat Switch
12. Oil Dilution Switch
13. Cigar Lighter
14. Ignition Switch
15. Navigation Lights Switch
16. Mixture Control Knob
17. Cabin Heat Knob
18. Cabin Air Knob
19. Navigation Light Circuit Breaker
20. Pitot Heat Circuit Breaker
21. Radio Circuit Breakers
22. Microphone
23. Instrument Light Circuit Breaker
24. Rotating Beacon Circuit Breaker
25. Landing Light Circuit Breaker
26. Fuel Strainer Drain Knob
27. Generator Circuit Breaker
28. Generator Warning Light
29. Parking Brake Handle

Figure 1-2. Control and Switch Panel

(–20° F) weather may require three or more strokes.

Normally, the engine is started immediately after priming. In very cold weather turn engine over while priming. It may be necessary to continue priming until the engine runs smoothly.

STARTER BUTTON.

A push-button switch (figure 1-1) energizes the starter relay. Engagement of the starter is automatic, taking place with the first rotation of the starter motor. Never press the starter button while the propeller is in motion; if the starter drive is engaged while the engine is turning, the drive mechanism may be damaged.

MANIFOLD PRESSURE GAGE.

A manifold pressure gage (figure 1-1) indicates the pressure of the fuel-air mixture entering the engine cylinders and is calibrated in inches of mercury. By observing the manifold pressure gage and adjusting the propeller and throttle controls, the power output of the engine can be adjusted to any power setting recommended in the operating procedures of Section II or the performance charts in Section V.

CYLINDER HEAD TEMPERATURE GAGE.

The cylinder head temperature gage (figure 1-1) is calibrated in degrees Fahrenheit. By observing the gage, cowl flaps and power settings may be adjusted to keep the cylinder head temperatures within limits. The gage is self-powered, operated by a thermocouple mounted under the lower spark plug on the left rear engine cylinder, which normally will operate at the highest temperature.

COWL FLAPS.

Satisfactory engine performance depends upon operation within temperature limitations, indicated by the green arc on the cylinder head temperature and oil temperature gages. Since engine temperatures depend upon the flow of air passing over the cylinders and through the oil cooler, the control of this air is important. Cowl flaps, adjusted to the need, will meter enough air for the adequate cooling and maximum efficiency of the engine under varying conditions. Opening the cowl flaps, while on the ground, steps up the volume of air necessary for engine cooling. In flight, closing the cowl flaps, as required, restricts the flow of air, thereby reducing the cooling and cowl flap drag to a minimum.

COWL FLAPS CONTROL.

The cowl flaps control (figure 1-2) has a thumb-button lock and may be set in any position required for proper engine cooling. Pulling the control out opens the cowl flaps; pushing it in closes them. The lock releases when the thumb button is pressed in.

PROPELLER.

A constant speed propeller is standard equipment on your Cessna 180, and provides your airplane with maximum performance at take-off, during climb, and while cruising.

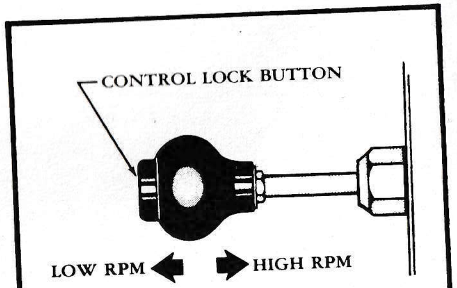
PROPELLER CONTROL.

The propeller control knob (figure 1-2) changes the setting of the propeller governor to control engine speed. The knob incorporates a friction lock and a vernier screw for close adjustments. With the control knob full in, the propeller is in the high rpm position; pulling the control out places the propeller in low rpm. The control may be moved through its full range by depressing the locking button in the center of the knob, while close adjustments are made by rotating the knob, clockwise to increase rpm or counterclockwise to decrease it. The knob may be rotated without depressing the locking button.

For all ground operations, and for take-off, the control should be full in (high rpm). After take-off, reduce throttle first, then reduce rpm. Since a small control movement will produce a considerable rpm change, you should set up climb and cruise rpm by screwing the knob in or out.

NOTE

> When increasing power, increase rpm, then open the throttle. When decreasing power, close the throttle, then reduce rpm. High manifold pressure and low rpm combinations may produce excessive cylinder pressures. This technique will avoid such harmful combinations.



PROPELLER PITCH CONTROL

Propeller surging (rpm variation up and down several times before engine smooths out and becomes steady) can be prevented by smooth throttle and propeller control operation. *Do not change throttle and propeller control settings with jerky and rapid motions.*

OIL SYSTEM.

The Continental O-470-K engine has a wet sump oil system which uses the engine sump as an oil tank. Other major components of the system are an engine-driven oil pump and an oil cooler integrally mounted on the engine.

Oil temperature is regulated automatically in this system by a thermostatically-controlled oil cooler. The thermostat shuts off the passage of oil through the cooler whenever the oil temperatures are below 150° F. Ordinarily, the oil cooler is adequate to keep oil temperatures well within the normal operating range as indicated by the green arc on the oil temperature indicator. However, in high outside air temperatures, when the capacity of the cooler is insufficient to maintain normal oil temperatures, the cowl flaps can be opened and set as necessary to provide adequate cooling.

OIL LEVEL.

The oil capacity of the Continental O-470-K engine is twelve quarts. The quantity can be checked easily by opening the access door on the left side of the engine cowl and reading the oil level on the dipstick, located just back of the rear engine baffle.

The dipstick incorporates a spring lock which prevents it from working loose in flight. To remove the dipstick, rotate it until the spring lock is disengaged, then pull the dipstick up and out. When replacing the dipstick, make sure that the spring lock is engaged.

NOTE

Oil should be added if below nine quarts and should be full if an extended flight is planned.

Oil level readings for the floatplane and amphibian will register considerably below the equivalent calibrations for the landplane. This is due to the difference in attitude of the airplanes when being serviced (the landplane is inclined approximately 12° in three-point attitude while the floatplane and amphibian are almost horizontal when at rest on the water). To provide accurate oil level readings for the floatplane and amphibian, two asterisk marks have been stamped on the back side of the dipstick. The upper asterisk indicates the twelve quart level and the lower asterisk indicates nine quarts. The oil filler is accessible through the top cowl access door.

After adding oil, make sure that it is on firmly and turned clockwise as far as it will go to prevent loss of oil through the filler neck.

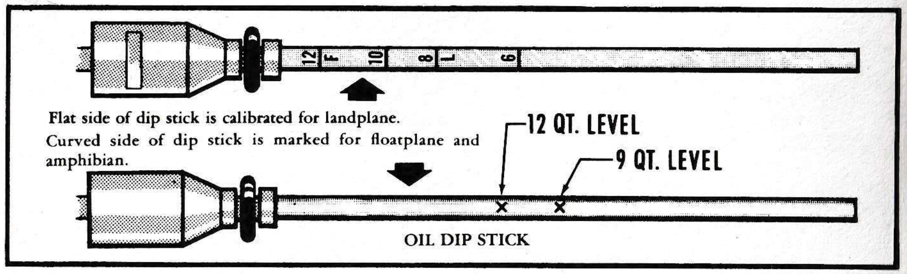
OIL SPECIFICATION AND GRADE.

Aviation grade engine oil is recommended for your Cessna 180. Oil should be changed at least every 25 hours of operation. When adding or changing oil, use the grades in the following table:

Average Outside Temperature	Recommended Oil Grade
Below 40° F	SAE 30
Above 40° F	SAE 50

NOTE

During oil changes, remove and clean the oil filter screen lo-



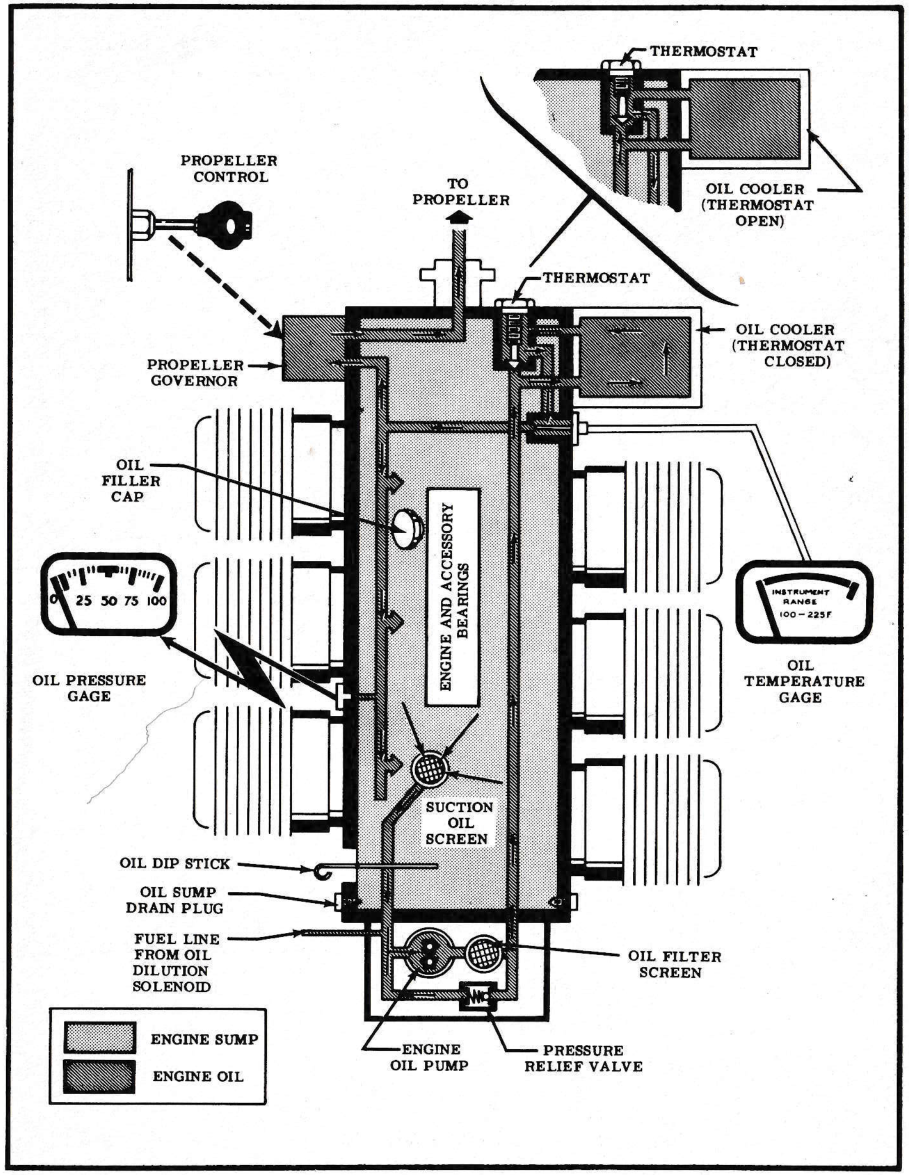


Figure 1-3. Oil System Schematic

cated on the right side of the engine accessory section.

OIL TEMPERATURE GAGE.

The oil temperature gage (figure 1-1) is a capillary-type instrument. Its dial is marked with a green arc to indicate the normal oil temperature operating range. Refer to Section IV for instrument markings.

OIL PRESSURE GAGE.

The oil pressure gage (figure 1-1) is an electrically-operated instrument powered by the airplane's electrical system. It is calibrated in pounds per square inch. Refer to Section IV for instrument markings.

OIL FILTER.

A throwaway-type Fram Type PB55 aircraft oil filter may be installed as optional equipment on your Cessna 180. The filter should be replaced at least every 100 hours, or oftener if operating conditions produce abnormal oil contamination.

OIL DILUTION SYSTEM.

To permit easier starting in extremely low temperatures, an optional oil dilution system is available. Used immediately before the engine is shut down, this system injects fuel into the engine oil and reduces its viscosity. When the engine is again operated, the fuel evaporates and is discharged through the breather so the oil resumes its normal viscosity.

The oil dilution system consists of a solenoid valve on the engine firewall, connected to the fuel strainer outlet and to the oil pump inlet. The valve is opened by pressing a push-button switch on the instrument panel.

Detailed operating procedures for the oil dilution system are contained in Section III.

AIR INDUCTION SYSTEM.

Air is ducted to the carburetor from an air scoop located on the bottom of the engine cowl. Dirt and other foreign matter is filtered from the incoming air by a filter screen located in the air scoop. Proper cleaning and servicing of this air filter is important to increase life and maintain top efficiency of the engine. The filter should be serviced every 25 hours (during regular oil change) or oftener when operating in dusty conditions. Under extremely dusty conditions, daily maintenance of the air filter is recommended. Refer to the servicing instructions stamped on the carburetor air filter for the servicing procedure to be used.

FUEL SYSTEM.

Fuel is supplied to the engine from two rubberized, bladder-type fuel cells, one located in each wing. For these tanks, fuel is gravity-fed through a fuel selector valve and fuel strainer to the engine carburetor.

Fuel system drain locations and servicing procedures may be found in Section V.

FUEL SPECIFICATION AND GRADE.

Only aviation grade fuel should be used except under emergency conditions. The recommended fuel is 80 oc-

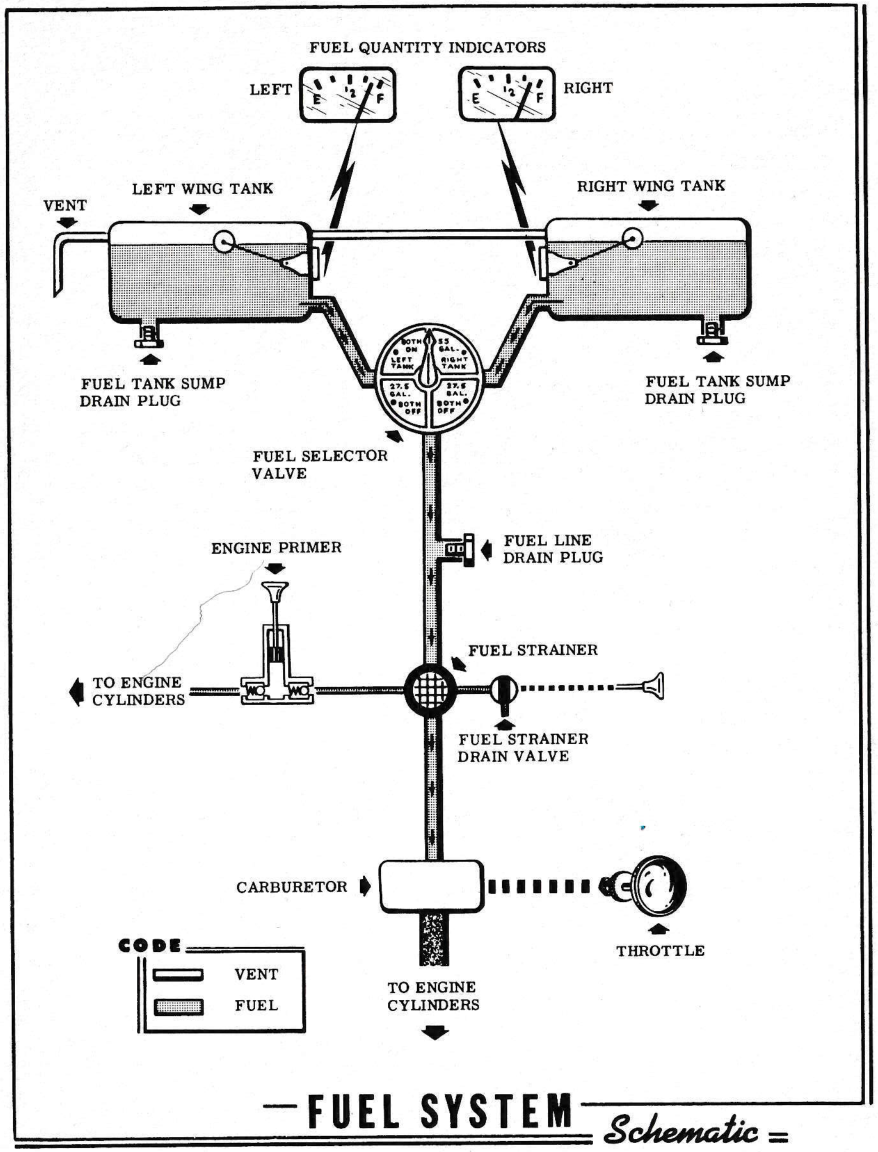


Figure 1-4.

tane minimum rating. Highly leaded fuels are not recommended. Filling the fuel tanks immediately after flight will reduce the air space and minimize moisture condensation in the fuel tanks.

FUEL SELECTOR VALVE.

A rotary-type fuel selector valve is located between the front seats at the aft end of the cabin floor tunnel. The valve has four positions labeled "BOTH OFF," "LEFT TANK," "BOTH ON," and "RIGHT TANK." The "BOTH OFF" position shuts off both fuel tanks from the fuel system and allows no fuel to pass the fuel selector valve. The "LEFT TANK" or "RIGHT TANK" position allows fuel to flow from only one fuel tank at a time, while "BOTH ON" permits simultaneous flow from both tanks. Important — The fuel valve handle is the pointer for the fuel selector valve and indicates the setting of the valve by its position above the dial. *Take off with the handle in the "BOTH ON" position to prevent inadvertent take off on an empty tank.*

FUEL STRAINER DRAIN KNOB.

A fuel strainer drain knob marked "STRAINER DRAIN" (figure 1-2) below the instrument panel provides a quick, convenient method of draining water and sediment that may have collected in the fuel strainer. The fuel strainer is located in the lower aft section of the engine compartment just forward of the firewall.

About two ounces of fuel (3 to 4 seconds of drain knob operation) should be drained from the strainer before the initial flight of the day or after each refueling operation to insure against the presence of water or sediment in the fuel.

The spring-loaded drain valve in the strainer is open when the fuel strainer drain knob is pulled out all the way. The drain valve automatically closes when the knob is released.

FUEL QUANTITY INDICATORS.

Electrically-operated fuel quantity indicators (figure 1-1) identified "LEFT" and "RIGHT" indicate the

FUEL QUANTITY DATA (U. S. GALLONS).

TANKS	NO	USABLE FUEL ALL FLIGHT CONDITIONS	ADDITIONAL USABLE FUEL FOR LEVEL FLIGHT ONLY	UNUSABLE FUEL	TOTAL FUEL VOLUME EACH
LEFT WING	1	27.5 gal.	3.5 gal.	1.5 gal.	32.5
RIGHT WING	1	27.5 gal.	3.5 gal.	1.5 gal.	32.5

amount of fuel remaining in their respective tanks.

NOTE

> After the master switch is turned on, a warming period is required before the indicator needles will arrive at the actual reading. Also, the needles will require several seconds to readjust themselves to the actual reading after any abrupt change in flight attitude of the airplane.

A red arc extending from the empty to ¼ full range on each indicator dial warns the pilot that its respective tank is ¼ full or less. Do not take off if the pointer is in the red arc.

ELECTRICAL SYSTEM.

Electrical energy is supplied by a 12-volt, direct-current system powered by an engine-driven generator of 35 or 50-ampere capacity. A 12-volt storage battery, located aft of the baggage compartment curtain, serves as a stand-by power source, supplying current to the system when the generator is inoperative, or when the generator voltage is insufficient to close the reverse-current relay.

MASTER SWITCH.

Power to the bus, from which all electrically-operated equipment is supplied, is controlled by the master switch (figure 1-2). The switch opens and closes the operating circuit of the battery solenoid and the field circuit of the generator.

If an electrical malfunction occurs in flight, the master switch may be turned off and the engine will continue to run, since its magneto ignition system is entirely separate from the electrical system. However, with the master switch off you will not have the benefit of the stall warning indicator, the fuel quantity and oil pressure gages, or the optional turn-and-bank indicator. If possible, you should isolate and turn off the faulty circuit, then pull on the master switch again.

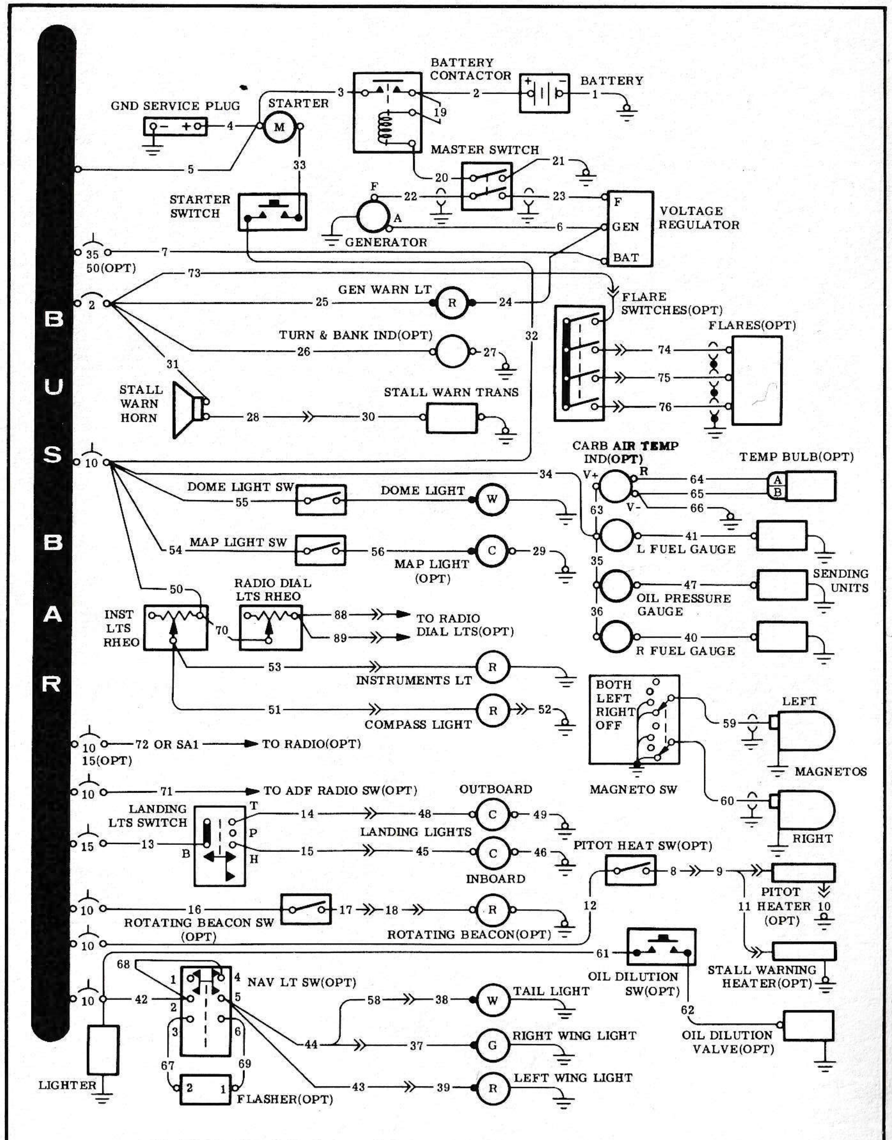
Whenever the airplane is parked the master switch should be turned off to prevent battery drain.

GENERATOR WARNING LIGHT.

A red generator warning light (figure 1-2) labeled "GEN", gives an indication of generator output. It will remain off at all times when the generator is functioning properly. The light will not show drainage on the battery. It will illuminate: when the battery or external power is turned on prior to starting the engine; when there is insufficient engine rpm to produce generator current; and when the generator becomes defective.

CIRCUIT BREAKERS.

All the electrical circuits in the airplane are protected by circuit breakers. The stall warning and turn-and-bank indicators are safeguarded by an automatically resetting circuit breaker mounted behind the instrument panel. The remaining electrical circuits are protected by "push-to-reset" circuit



ELECTRICAL SYSTEM *Schematic*

Figure 1-5.

breakers on the instrument panel. The name of the circuit is indicated below each circuit breaker.

If a circuit is inoperative, press the circuit breaker button to reset the breaker. If this does not restore the circuit, it should be checked for shorts, defective parts, or loosened connections. If a circuit breaker pops out continually, its circuit should be checked.

FLIGHT CONTROL SYSTEM.

Conventional wheel and rudder pedal controls are provided to operate the primary flight control surfaces (ailerons, rudder and elevators). The horizontal stabilizer is adjusted manually through the use of the stabilizer trim control wheel located between the two front seats. The rudder trim tab is adjustable on the ground only. The wing flaps are controlled by a hand lever mounted between the front seats.

CONTROLS LOCK.

A controls lock is provided as standard equipment to lock the ailerons and elevators in neutral position. Thus, these control surfaces are protected from damage caused by buffeting in high winds. The controls lock has a large red metal flag which covers the airplane master switch as a reminder to remove it before starting the engine.

NOTE

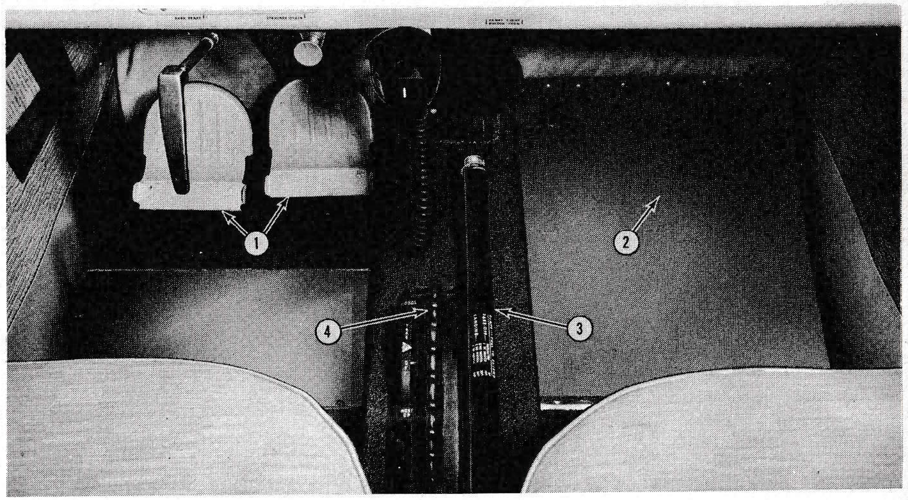
This controls lock is designed for use in moderately-gusty winds up to 30 or 40 mph. When storm conditions are forecast, additional precautions should be taken.

To install the controls lock, pull the control wheel back until the hole in the control wheel shaft is aligned with the hole in the collar assembly mounted on the instrument panel. Position the controls lock on the right side of the control wheel shaft so that the lettering on the red flag is legible. Insert the short shaft of the controls lock down through the holes in the collar assembly and control wheel shaft. Check that the controls lock is fully inserted. To remove the controls lock, pull it up and out of the collar assembly and control wheel shaft.

When not in use, the controls lock may be stored in the glove compartment.

ADJUSTABLE STABILIZER CONTROL WHEEL.

Design of the airplane enables the entire stabilizer to be trimmed to meet different load and speed conditions. The stabilizer is adjusted by rotating the adjustable stabilizer control wheel located to the left of the flap control handle. Nose attitude of the airplane is indicated by a position indicator incorporated in the adjustable stabilizer control wheel mechanism. Forward movement of the wheel trims the nose down. Backward movement of the wheel trims the nose up. This allows the elevator forces to be trimmed out for the various load and flight conditions. (Control wheel loads are very heavy when the stabilizer is not prop-



1. Pilot's Rudder Pedals
2. Footrest
3. Wing Flap Handle
4. Adjustable Stabilizer Control Wheel

Figure 1–6. Lower Forward Section of Cabin

erly set). Take-off is made with indicator in "TAKE-OFF" position.

WING FLAP HANDLE.

The wing flaps are controlled by a wing flap control handle between the two front seats. The handle is operated by depressing the thumb button and moving the handle to the desired flap setting. By releasing the thumb button, the handle can be locked to provide 0, 10, 20, 30 and 40 degree flap positions.

The flaps may be lowered or raised during normal flying whenever the airspeed is less than 100 mph. The flaps supply considerable added lift and drag; the resulting action steepens the glide angle of the airplane enabling the pilot to bring the airplane in over an obstruction and land shorter than could be done without flaps.

The use of flaps is not recommended for take-offs in strong cross-winds. For additional information on the use of wing flaps for take-off, refer to page 3-5.

Wing Flap Settings

For take-off	Up (0°)
	1st notch (10°)
	2nd notch (20°)
For landing	3rd notch (30°)
	4th notch (40°)

TACTAIR AUTOMATIC FLIGHT CONTROLS.

The optional Tactair automatic flight control system is a pneumatic system consisting of bellows attached to the manual control surface cables, specially-modified gyro instruments and a control head mounted on the instrument panel. The entire system is powered by the engine-driven vacuum pump.

The control surface servo bellows respond to pneumatic signals from the gyro instruments and the control head, to maintain the attitude set on the control head by the pilot. The servos may be overridden at any time, by operating the aileron and elevator controls. The pressure required to overpower the servos is not excessive and no damage to the system will result, even if the servos are overpowered for some time. When the controls are released, the autopilot will return the airplane to the attitude set on the control head.

The pickup units in the gyro instruments automatically change both the amount and the rate of change in their signals in accordance with the amount and rate of deviation of the airplane from the selected attitude. Thus, a large and rapid deviation will produce a large and rapid signal. The servo's response likewise will be large and rapid. However, as the airplane responds, the signals will diminish at a rate exactly proportional to the rate at which the airplane is returning to normal. The servos, in turn, bring the control surfaces back to neutral in the same pattern. The autopilot thus controls the airplane just as the human pilot would. Corrections are smooth and precise and at no time do they produce excessive flight loads on the airplane.

The Tactair system is available in three configurations. The T-1 Roll Stabilizer consists of the aileron servos, attitude gyro and a control head. As its name implies, its primary purpose is to maintain lateral stability. The T-2 Heading Lock unit adds a modified directional gyro to the system, using the bank control of the roll stabilizer unit to maintain preset headings. The T-3 Autopilot unit consists of the aileron servos, attitude and directional gyros, control head and an elevator servo for longitudinal control.

The directional gyro used with the T-2 and T-3 systems has an additional compass card placed above the regular card and linked to the heading lock pickups in the gyro. To set a course, the course selector knob to the right of the compass card window is rotated until the desired heading on the upper card falls under the lubber line.

Detailed operating instructions will be found in Sections II and III.

LANDING GEAR.

MAIN LANDING GEAR.

Your airplane is equipped with Cessna's Safety Landing Gear. It consists of a tapered, spring steel leaf supporting each main wheel. This spring leaf is made from the highest quality chrome-vanadium steel, heat-treated and shot peened for added fatigue resistance.

TAIL GEAR.

The tail gear on your 180 consists of a tapered, tubular spring at the aft end of the fuselage. The lightweight, tubular spring is rubber cushioned to cut down landing shock. It is made of high grade, chrome-vanadium steel, shot-peened for additional fatigue resistance. The tailwheel is steerable through an arc of 24° each side of neutral. Beyond this travel, the tailwheel becomes free swiveling.

SEAPLANE FLOATS.

Edo seaplane floats are optional equipment for your Cessna 180. The floats have retractable water rudders which when lowered are interconnected with the air rudder. The water rudders are retracted by pulling up on the metal ring on the floorboard tunnel just ahead of the stabilizer trim wheel. The rudders are held up by placing the ring on a hook under the instrument panel, near the instrument lights rheostat.

AMPHIBIOUS LANDING GEAR.

Your 180 can be equipped with Edo amphibious landing gear, consisting of standard-type floats with retractable wheels. Each float has a main wheel and a nose (or bow) wheel, both fully retractable and mounted on air-oil shock struts. The main wheel retracts to a position slightly above and aft of the float step, which shields the wheel hydrodynamically. The nosewheel retracts up to the bow point of the float where it serves as a bumper for floating docks and obstructions. Each float also has a retractable water rudder.

On water and in the air, the 180 Amphibian is operated, in all respects, the same as the 180 floatplane.

AMPHIBIOUS LANDING GEAR CONTROLS.

Retraction and extension of the amphibious landing gear wheels is controlled by a two-position switch, marked "UP" and "DOWN," on the instrument panel. Beside the switch are two position lights. The upper (blue) light comes on when the gear is fully retracted, remaining on until the gear is lowered. The lower (red) light comes on when the gear is down and locked, remaining on until the gear is retracted. Neither light burns while the gear is in an intermediate position. Gear position can be double-checked by glancing through a small window of clear plastic on each float and noting the position of the retract mechanism lock. When the locking fitting is completely aft, the gear is down and locked.

The electrical circuits for the gear retraction mechanism are protected by a separate push-to-reset circuit breaker for each float.

BRAKE SYSTEM.

The hydraulic brakes on the main wheels are conventionally operated by applying toe pressure to either the pilot's or copilot's rudder pedals. Master cylinders are connected directly to the pilot's pedals; braking motion from the copilot's pedals is transmitted to the pilot's pedals by mechanical linkage. The brakes also may be set by operating the parking brake control.

PARKING BRAKE HANDLE.

The parking brake handle (figure 1-2) is mounted below the instrument panel directly in front of the pilot's seat. The handle locking mechanism is connected by cables to the pilot's rudder pedals which actuate the brake master cylinders. To set the parking brake, grasp the handle and while turning it counterclockwise ¼ turn (handle pointing downward), pull it out using moderate pressure.

NOTE

Toe pressure may be applied to the rudder pedals to aid in setting the brakes if desired; however, this operation is not necessary.

To release the parking brake, turn the handle clockwise ¼ turn and allow it to return to the stowed position.

INSTRUMENTS.

All flight instruments, and others which require special protection from vibration, are mounted in a shock-mounted section of the instrument panel directly in front of the pilot. Engine indicators and the fuel and oil gages are arranged on the right side of the instrument panel, which also has provisions for various radio installations. The magnetic compass is mounted on the windshield center-strip and the optional free air temperature indicator is incorporated in the right cabin ventilator. For accurate free air temperature readings, the ventilator should be opened slightly.

PITOT-STATIC SYSTEM.

The airspeed indicator, altimeter, and vertical speed indicator (figure 1-1) are operated by the pitot-static system. This system measures the difference between impact air pressure picked up by a pitot tube under the left wing and a static port on the left side of the fuselage, just back of the firewall.

To keep the pitot tube opening clean, a cover may be placed over the pitot tube whenever the plane is idle on the ground. The static pressure port openings should be kept free of polish, wax, or dirt for proper indicator operation.

PITOT HEATER.

A pitot heater can be installed as optional equipment, to prevent ice from obstructing the pitot tube opening. This system consists of an electrical heating element mounted within the pitot tube and a pitot heater switch on the instrument panel.

TURN-AND-BANK INDICATOR.

The turn-and-bank indicator (figure 1-1) is an electrically-operated instrument. Turned on by operation of the master switch, the indicator remains in operation until the master switch is turned off. The indicator has no separate control switch.

STALL WARNING INDICATOR.

The stall warning indicator is an electric horn controlled by a transmitter unit in the leading edge of the left wing. This system is in operation whenever the master switch is turned on. The transmitter responds to changes in the airflow over the leading edge of the wing as a stall is approached. Since the same changes in airflow occur with every stall, the unit functions regardless of attitude, altitude, speed, weight and other factors which affect stalling speeds. Thus, it will warn you of an incipient stall under all conditions. In straight-ahead and turning flight, the warning will come 5 to 10 mph ahead of the stall.

Under safe flight conditions, the only time you may hear the warning horn will be a short beep as you land. Usually there will be no signal on a properly-executed landing because the unit makes allowance for ground effect. The unit automatically cuts out on the ground, although high surface winds may produce signals while taxiing. The unit has no silencing switch which could be left off inadvertently.

A heater can be installed as optional equipment, to remove ice from the transmitter unit. The heater element is installed with the optional pitot heater. Both the pitot and stall warning transmitter heaters are controlled by the pitot heater switch.

SEATS.

FRONT SEATS.

The front seats are individually mounted on tracks and are adjustable fore and aft. The seat adjustment handle is located within easy reach on the left front side of each front seat. To adjust the seat, pull up on the handle on the left side of the seat and slide the seat to the most comfortable position.

NOTE

Test the front seats for secure latching after adjusting them to the desired position.

RECLINING FRONT SEATS.

To make long flights more comfortable by permitting the pilot and front seat passenger to shift their positions, optional reclining front seats are available. The backs of these seats may be rotated through three positions by pulling up on the handle on the right side of the seat and leaning back or forward.

REAR SEAT.

The rear seat accommodates two people. The back of the seat is hinged at the bottom to permit seat adjustment and easy access to the baggage compartment. A seat adjustment handle is located behind and at the top of the rear seat back.

CABIN TEMPERATURE CONTROL SYSTEM.

The cabin temperature control system was designed to provide fresh air to the cabin at all times, with a means of regulating the air temperature.

Cabin temperature is controlled by the cabin heat and cabin air knobs (figure 1-2). The heat knob controls temperature of the incoming air while the cabin air knob controls its volume. With the cabin heat knob pushed full in, unheated air is ducted to the cabin. As the knob is pulled out,

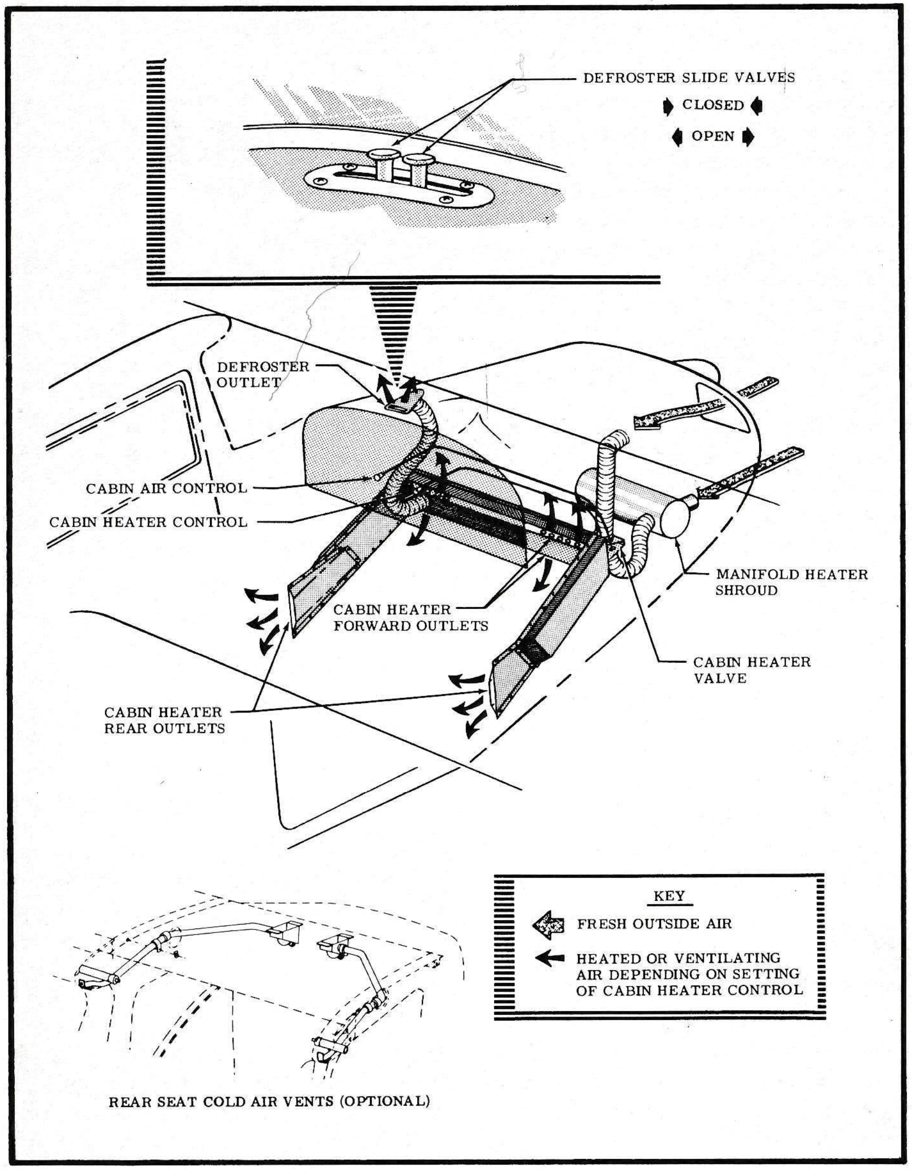


Figure 1-7. Cabin Air Temperature System

more and more heated air is added. With the knob pulled all the way out, all of the air entering the cabin through the cabin temperature control system is heated. Pulling out the cabin air knob reduces the volume of air passing through the system.

Air outlets are provided in front of the pilot's and copilot's rudder pedals and at the door posts. The windshield defroster outlet, in the instrument panel deck just behind the left windshield, has a slide valve to control airflow through it.

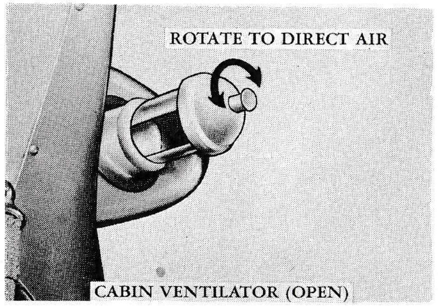
To provide a flow of warm air, pull the cabin heat knob out. *To provide a flow of cool air,* push in the cabin heat knob.

To prevent any air (hot or cold) from entering the cabin through the heater ducts, push the cabin heat knob in and pull out the cabin air knob.

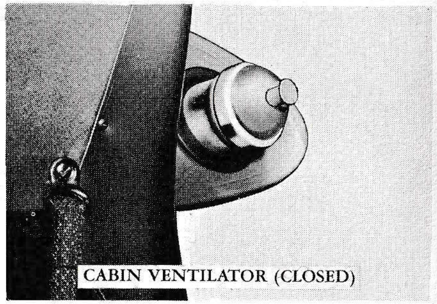
(Never pull the cabin air knob out when the cabin heat knob is out. This may result in overheating of the heater muff hoses.)

CABIN VENTILATORS.

Additional ventilation for the cabin area is provided by a manually-ad-



CABIN VENTILATOR (OPEN)


CABIN VENTILATOR (CLOSED)

justed cabin ventilator, on each side of the cabin in the upper corner of the windshield.

To provide a flow of air, pull ventilator tube out. The amount of air entering the cabin can be regulated by varying the distance that the ventilator tube is extended.

To change the direction of airflow, rotate the ventilator tube to the position desired.

To stop the flow of air, push the ventilator tube all the way in.

REAR SEAT VENTILATORS.

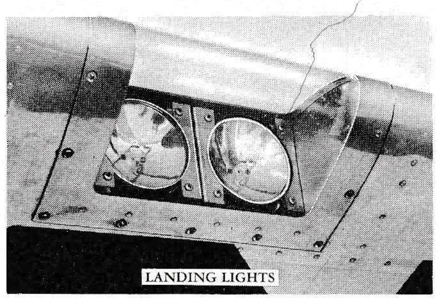
Additional cold air for rear seat passengers is provided by optional ventilation outlets installed in the ceiling just behind the radio loudspeaker. The flow of air may be adjusted by turning a knurled ring on the rim of each outlet. The outlets are ball-and-socket type and may be turned to direct the air in the desired direction.

LIGHTING EQUIPMENT.

NAVIGATION LIGHTS.

The conventional navigation lights are controlled by the navigation lights

switch (figure 1-2). The optional navigation lights flasher system uses a three-position switch. The middle detent on the switch is the steady position and all the way out is the flashing position.


LANDING LIGHTS

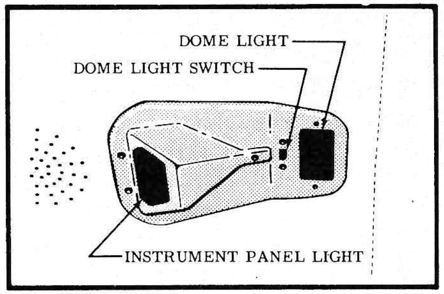
LANDING LIGHTS.

The landing light consists of two lamps mounted side-by-side in the leading edge of the left wing. Both lamps are adjusted to give proper illumination of the runway during take-off and landing. During taxi, only one lamp should be used, to prevent an unnecessary drain on the battery during periods of low engine speed when the generator is not charging. The landing light switch (figure 1-2) is a three-position, push-pull switch. *To turn one lamp on for taxiing,* pull the switch out to the first stop. *To turn both lamps on for landing,* pull the switch out to the second stop. *To turn lights off,* push the switch all the way in.

ROTATING BEACON.

A rotating anti-collision beacon may be mounted on the tip of the vertical fin. In clear weather, its flashing red beam may be seen for several miles in all directions, making it particularly valuable in the high-density traffic around busy airports. *It should not be used, however, when flying through clouds or overcast;* its moving beam reflected from water droplets or particles in the atmosphere, particularly at night, can produce vertigo and loss of orientation.

The beacon is turned off and on by a push-pull switch on the instrument panel.



INSTRUMENT LIGHTS.

An instrument light with a red lens is mounted in the cabin ceiling. Both the instrument light and the compass light are controlled by a rheostat switch (figure 1-2) located on the bottom edge of the instrument panel. *To turn the compass and instrument lights on,* rotate the instrument light rheostat knob clockwise until the desired illumination is obtained. *To turn the lights off,* turn the knob counterclockwise.

RADIO DIAL LIGHT.

A rheostat switch is provided with factory-installed radios to control your radio dial lights. The rheostat switch is located on the bottom edge of the instrument panel to the right of the instrument light rheostat switch. *To turn the radio dial lights on,* rotate the radio dial light rheostat switch clockwise until the desired illumination is obtained. *To turn the lights off,* turn the switch counterclockwise as far as it will go.

DOME LIGHT.

A white dome light is mounted in the cabin ceiling and is controlled by a slide switch mounted just ahead of the dome light.

MAP LIGHT.

An optional map light mounted just under the left cabin ventilator is controlled by a slide switch mounted on the left door post. The light is adjustable to shine in various directions, and a lens adjustment knob, integrally mounted on the light, can be used to change the beam from spot to flood illumination.

MISCELLANEOUS EQUIPMENT.

CABIN DOORS.

Two cabin doors are provided on your airplane. Each door incorporates a flush-type door handle on the outside and a conventional door handle on the inside.

To open the door from the outside, apply pressure on the forward end of the flush handle, and pull out on the aft end of the handle until the door latch releases. To open the door from the inside, rotate inside door handle down and forward.

NOTE

When closing the door, the inside handle must be in the unlocked position (neutral). Otherwise, the locking bolt will interfere with the door jamb.

Both cabin doors can be locked from the inside. To lock either door, rotate inside door handle aft and up as far as it will go, approximately 90 degrees. To unlock, rotate handle down.

The left door can be locked from the outside by means of a key-operated lock. The same key that is used for the ignition also locks the door.

A door stop in the front edge of each cabin door will hold the door open for easy loading of your airplane. To engage the door stop, swing the door out to the limit of its travel and release. The stop disengages as the door is pulled shut.

CABIN WINDOWS.

The rear cabin windows are of the fixed type and do not open. The cabin door windows are a full door width, providing you with excellent side visibility. They are hinged along the top allowing them to open outward for additional ventilation.

To open the cabin door windows, depress the small lock release button and turn the handle upward. The window will open outward without pressure due to spring-loaded limit

arms in the upper portion of the window assembly.

NOTE

Caution should be exercised when opening these windows during flight since air pressure will tend to "pop" them outward with considerable force. This may result in damage to the limit arms. Therefore it is recommended that you hold firmly to the handle and ease the window outward to its open limit.

BAGGAGE COMPARTMENT.

The baggage compartment is located immediately aft of the rear seat. To reach the compartment from inside the cabin, rotate the rear seat adjustment handle (top center of rear seat back) upward, disengaging the adjustment bars from the retaining brackets. The rear seat back then can be rotated forward and down.

The baggage compartment door on the left side of the fuselage has the same flush type handle as the cabin doors and is locked or unlocked with the same key. A limit chain keeps the door from being opened back against the fuselage.

COAT HANGER HOOK.

For your convenience, a coat hanger hook has been installed in the cabin ceiling above the back of the rear seat. Coats can be hung, full-length and wrinkle-free, between the back of the rear seat and the baggage shelf, without interfering with the comfort of rear seat passengers.

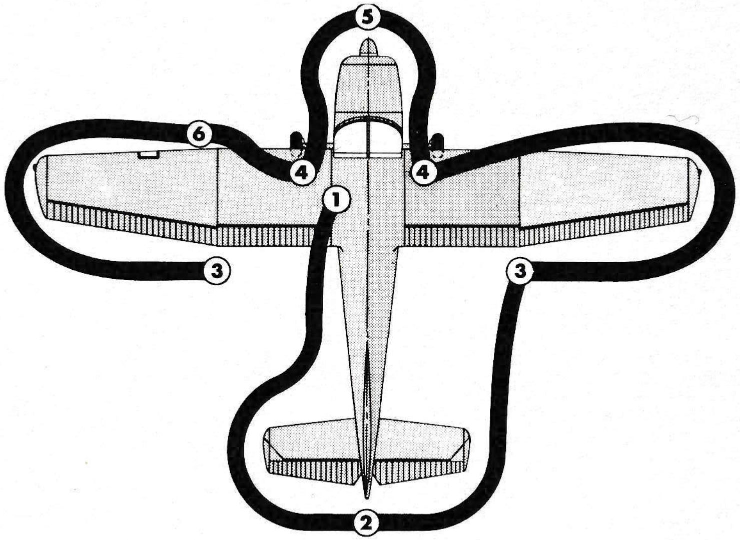
LOADING YOUR CESSNA.

There are several different ways to load your Cessna, all of which are satisfactory. However, from experience, we have found the following sequence to be most convenient under average loading conditions:

First, load your baggage in the baggage compartment.

Next, load the front seats.

Finally, load the rear seat.



(1) a. Remove control lock, if installed.
b. Turn on master switch and check quantity of fuel (two gages).
c. Make sure master and ignition switches are off.
d. On first flight of day, operate fuel strainer drain knob (pulled out for approximately four seconds) to clear fuel strainer of any water or sediment.

(2) a. Remove rudder lock, if installed.
b. Inspect tail surface hinges and hinge bolts.
c. Disconnect tie-down chain.
d. Inspect tail wheel spring, steering arms, steering chains and tire inflation.

(3) a. Remove aileron lock, if installed.
b. Check aileron and flap hinges.

(4) a. Check main wheel tire for cuts, bruises, and proper inflation.
b. Inspect airspeed static source hole on side of fuselage for stoppage.
c. Remove fuel tank cap and check fuel level.
d. Disconnect tie-down chain.

(5) a. Check propeller and spinner for nicks and security.
b. Examine propeller for oil leakage.
c. Make visual check to insure that drain valve is closed after draining operation.
d. Check oil level. Do not operate on less than nine quarts. Fill for extended flight. For floatplane, refer to "OIL LEVEL" paragraph in Section I.
e. Check carburetor air filter for restrictions by dust or other foreign matter.
f. Inspect cowl access doors for security.

(6) a. Remove pitot tube cover, if installed.
b. Inspect pitot tube opening for stoppage.
c. Check fuel tank vent opening for stoppage.
Repeat steps 3 and 4.

Figure 2-1. Exterior Inspection Diagram

Section II

operating check list

AFTER FAMILIARIZING YOURSELF with the equipment of your Cessna 180, your primary concern will normally be the operation of your airplane. This section lists, in Pilot's Check List form, the steps necessary to operate your Cessna efficiently and safely. It is not a check list in its true form as it is considerably longer, but it does cover briefly all of the points that you would want to or should know concerning the operation of your Cessna 180.

The flight and operational characteristics of the Model 180 Cessna are normal in all respects. There are no "unconventional" characteristics of operations that need to be mastered. All controls respond in the normal way within the entire range of operation of the airplane.

BEFORE ENTERING AIRPLANE.

(1) Perform an exterior inspection in accordance with figure 2-1.

BEFORE ENTERING AMPHIBIAN.

(1) Perform an exterior inspection of the applicable items in figure 2-1.
(2) Inspect the floats for dents, cracks, scratches, etc.
(3) Remove the cover plates and inspect the floats for water, following water operations.
  a. If water is found in any of the bays it may be readily removed using a sponge.
  b. Tighten the cover plates securely in place after inspecting each bay.
(4) Check the wheel struts for proper inflation.

BEFORE STARTING ENGINE.

(1) Adjust seat to a comfortable position, check to see that seat locking mechanism is secure, and fasten safety belt.
(2) Check rudder, ailerons, and elevators for free and correct movement.
(3) Landing gear switch "DOWN" (amphibian on land).
(4) Check wing flaps at all positions.

(5) Water rudders "UP" (Amphibian on land).
(6) Pull cowl flap control to full open position.
(7) Turn fuel selector valve to "BOTH". (Take-off on less than ¼ tank is not recommended.)
(8) Rotate adjustable stabilizer control wheel so that indicator is in "TAKE-OFF RANGE".
(9) Set altimeter and clock.
(10) Test operate brakes and set parking brake.
(11) Make sure radio switches are "OFF".
(12) For night flights, test operate all exterior and interior lights. Make sure flashlight is on board in usable condition.

STARTING ENGINE.

(1) Set mixture control to "FULL RICH" (full in).
(2) Set carburetor heat to "COLD" (full in).
(3) Set propeller control for "HIGH RPM" (full in).
(4) For an initial start in normal air temperatures, use two strokes of the engine primer. (A hot engine may need no priming).
(5) Turn master switch "ON".
(6) Open throttle approximately ½ inch.
(7) Turn ignition switch to "BOTH".
(8) Clear the propeller.
(9) Push starter button until engine fires.

NOTE

If engine has been over-primed, start engine with throttle opened ¼ to ½ full open. Be sure to reduce throttle to idle position when engine fires.

WARM-UP AND GROUND TEST.

(1) Adjust engine speed to 800 to 1000 rpm.
(2) Check for an oil pressure indication within 30 seconds in normal weather and 60 seconds in cold weather. If no indication appears, shut off engine and investigate.
(3) Avoid the use of carburetor heat unless icing conditions prevail.
(4) Continue the warm-up while taxiing out to the active runway.
(5) Check the rpm drop on each magneto at 1700 rpm. The maximum allowable drop is 125 rpm.
(6) Check carburetor heat by noticing rpm drop when heat is applied.
(7) a. Hartzell Propeller — Check propeller operation in high and low pitch at 1700 rpm. Return control to low pitch (full in) and reduce power.

b. McCauley Propeller — At 1700 rpm move propeller control out until a slight drop in rpm is noticed. Then return propeller to low pitch (full in) position. This drop in rpm shows that governor operation is satisfactory.

(8) If engine accelerates smoothly and oil pressure remains steady at some value between 30 and 60 psi, the engine is warm enough for take-off.

BEFORE TAKE-OFF.

(1) Recheck free and correct movement of flight controls.
(2) Recheck adjustable stabilizer control wheel setting.
(3) Recheck cowl flaps "OPEN".
(4) Turn carburetor heat "OFF" (full in) unless extreme icing conditions prevail.
(5) Recheck propeller in low pitch (full in).
(6) Check autopilot disengaged.

TAKE-OFF.

NORMAL TAKE-OFF.

(1) Apply full throttle smoothly to avoid propeller surging.
(2) Maintain a moderately tail-low attitude throughout the take-off run.
(3) Keep heels on floor to avoid dragging brakes.
(4) Level off slightly after take-off to accelerate to an efficient climb speed.

MINIMUM RUN TAKE-OFF.

(1) Wing flaps 20° (second notch).
(2) Hold brakes while applying full throttle.
(3) Release brakes and hold tail-low attitude during take-off run.
(4) Keep heels on floor to avoid dragging brakes.
(5) Fly airplane off ground in almost 3-point attitude.

AMPHIBIAN TAKE-OFF ON LAND.

(1) Wing flaps 20° (second notch).
(2) Apply full throttle smoothly to avoid propeller surging.
(3) Keep heels on floor to avoid dragging brakes.
(4) When amphibian feels light, (60-70 mph) apply light back pressure to control wheel and allow aircraft to fly off smoothly.
(5) After take-off, level off slightly and accelerate to an efficient climb speed and retract landing gear.

OBSTACLE CLEARANCE TAKE-OFF.

(1) Wing flaps 20° (second notch).
(2) Hold brakes while applying full throttle.
(3) Release brakes and maintain a moderately tail-low attitude during take-off run.

(4) Keep heels on floor to avoid dragging brakes.
(5) Level off slightly to accelerate to best angle-of-climb speed (60 mph I.A.S.).

AMPHIBIAN OR FLOATPLANE TAKE-OFF ON WATER.

(1) Wheels "UP" (Amphibian).
(2) Water rudders "UP".
(3) Wing flaps 20° (second notch).
(4) Apply full-up elevator and advance throttle slowly to full throttle.
(5) Place airplane on float step by releasing control wheel back pressure after bow wave source moves aft of the wing strut.
(6) When airplane feels light, apply light control wheel back pressure and allow airplane to fly off smoothly.

TAKE-OFF IN STRONG CROSSWIND.

(1) Apply full throttle.
(2) The nose of the airplane is pointed into the wind, placing the airplane in a crabbed attitude. (The angle of crab depends on the velocity and direction of the wind).
(3) Guide the airplane down the center of the runway in the crabbed attitude (using the rudder) with usual acceleration to attain flying speed.

CLIMB.

(1) If no obstacle is ahead, climb out with flaps up at 100-120 mph with 23 inches manifold pressure and 2450 rpm. If maximum climb performance is desired, use full throttle, 2600 rpm, and 90 mph I.A.S. at sea level (see figures 6-2, 6-3 or 6-4). Reduce climb speed about ½ mph for every 1000 feet of altitude above sea level.
(2) To climb over an obstacle with flaps up, the best angle-of-climb speed (70 mph I.A.S.) should be used, (gear retracted on amphibian.)
(3) Cowl flaps are normally "OPEN" for climbs in normal air temperatures.
(4) Mixture should be "FULL RICH" unless engine is rough due to rich mixture.

CRUISING.

(1) Close cowl flaps.
(2) Select cruising power setting from Range Charts in Section VI. Maximum power setting for cruising is 23 inches of manifold pressure at 2450 rpm.
(3) After speed is stabilized, trim airplane with stabilizer control wheel.
(4) Lean mixture as follows: pull mixture control out until airspeed starts to drop or engine becomes rough; then, enrichen mixture slightly beyond this point. Any change in altitude, power, or carburetor heat will require a change in lean mixture setting. Do not lean mixture with power setting above 23 inches of manifold pressure and 2450 rpm.
(5) Check engine instruments for indications within their normal operation ranges (green arcs).

LET-DOWN.

(1) Set mixture control "FULL RICH" (full in).
(2) Reduce power to obtain desired let-down rate at cruising speed.
(3) Apply enough carburetor heat to prevent carburetor icing if icing conditions exist.
(4) Disengage autopilot before entering traffic pattern.

BEFORE LANDING — LANDPLANE.

(1) Set fuel selector valve to "BOTH".
(2) Recheck mixture "FULL RICH" (full in).
(3) Set propeller control for at least 2450 rpm so that high power will be available in the event of a "go-around".
(4) Close cowl flaps.
(5) Apply carburetor heat before closing throttle.
(6) Glide at 80-90 mph I.A.S. with flaps up.
(7) Lower wing flaps at airspeeds below 100 mph.
(8) Maintain 70-80 mph I.A.S. with flaps extended.
(9) Trim airplane with adjustable stabilizer for glide.

NOTE

This is very important because the ability of the airplane to land three-point is dependent upon the stabilizer being adjusted for hands-off trim in the glide.

BEFORE LANDING — AMPHIBIAN ON LAND.

(1) Extend landing gear below 130 mph.
(2) Check for Red landing gear indicator light.
(3) Water rudders "UP".
(4) Set fuel selector valve to "BOTH".
(5) Recheck mixture "FULL RICH" (full in).
(6) Set propeller control for at least 2450 rpm so that high power will be available in the event of a "go-around."
(7) Close cowl flaps.
(8) Apply carburetor heat before closing throttle.
(9) Glide at 85-95 mph with flaps up.
(10) Lower wing flaps at airspeeds below 100 mph.
(11) Maintain 80-90 mph with flaps extended.
(12) Trim airplane with adjustable stabilizer for glide.

BEFORE LANDING — AMPHIBIAN OR FLOATPLANE ON WATER.

(1) Wheels "UP" (Amphibian).
(2) Check for Blue landing gear indicator light (amphibian).
(3) Water rudders "UP".
(4) Set fuel selector valve to "BOTH".
(5) Recheck mixture "FULL RICH" (full in).
(6) Set propeller control for at least 2450 rpm so that high power will be available in the event of a "go-around".
(7) Close cowl flaps.
(8) Apply carburetor heat before closing throttle.
(9) Glide at 90-95 mph with flaps up.
(10) Lower wing flaps at airspeeds below 100 mph.
(11) Maintain 80-85 mph with flaps extended.
(12) Trim airplane with adjustable stabilizer for glide.

LANDING.

NORMAL LANDING — LANDPLANE.

(1) Landing technique is conventional for all flap settings.

NORMAL LANDING — AMPHIBIAN ON LAND.

(1) Land on main wheels first. (Nose slightly above level flight attitude).
(2) Lower nose wheels gently to runway after speed is diminished.
(3) Avoid excessive braking unless obstacle is ahead.

NORMAL LANDING — AMPHIBIAN AND FLOATPLANE ON WATER.

(1) Landing technique is conventional for all flap settings.

SHORT FIELD LANDING — LANDPLANE.

(1) Make a power-off approach at 70 mph I.A.S. with flaps down 40°.
(2) After three-point landing, apply heavy braking.
(3) As speed diminishes, reduce braking to safe amount.

SHORT FIELD LANDING — AMPHIBIAN ON LAND.

(1) Make a power-off approach at 80-85 I.A.S. with flaps 40°.
(2) Land on main wheels first.
(3) Lower nose wheels to ground immediately after touch-down.
(4) Apply heavy braking as required.

LANDING WITH CROSSWIND GEAR IN A STRONG CROSSWIND.

(1) Establish a crab angle during approach and land while crabbing into the wind. The crosswind gear will automatically compensate for the

crabbed position of the airplane.

LANDING IN STRONG CROSSWIND — AMPHIBIAN ON LAND.

(1) If field length permits, land with flaps retracted.
(2) Use wing low, crab, or combination method of drift correction.
(3) Land in a nearly level attitude.
(4) Lower nose wheels to runway immediately after touchdown and hold the control wheel forward.
(5) Maintain a straight path by using a combination of ailerons, up-wind rudder (amphibian weathercocks downwind on land) and occasional up-wind braking.

GO-AROUND.

(1) Apply full throttle and increase engine speed to 2600 rpm if necessary.
(2) Turn carburetor heat "OFF".
(3) Retract landing gear on amphibian.
(4) Reduce flap setting to 20°.
(5) Trim airplane for climb.
(6) Open cowl flaps.
(7) Retract wing flaps as soon as all obstacles are cleared and a safe altitude and airspeed are obtained.

AFTER LANDING.

(1) Open cowl flaps.
(2) Raise wing flaps.
(3) Carburetor heat "OFF".
(4) Stop engine by pulling mixture control knob to "FULL LEAN" (full out). Do not open throttle as engine stops.
(5) After engine stops, turn ignition switch "OFF".
(6) Turn off all switches. If master switch is left on, battery may be discharged.
(7) Set parking brakes, if required.

Section III

operating details

THE FOLLOWING PARAGRAPHS cover in somewhat greater detail the items entered as a Check List in Section II. Not every item in the list is discussed here. Only those items of the Check List that require further explanation will be found in this section.

CLEARING THE PROPELLER.

"Clearing" the propeller should become a habit with every pilot. Making sure no one is near the propeller before the engine is started should be a positive action. Yelling "clear" in loud tones is best. An answering "clear" from ground crew personnel is the response that is required.

ENGINE OPERATING PROCEDURE.

You have a new Continental engine made to the highest standards available. This engine has been carefully operated in its run-in and flight tests, so that the engine, as you receive it, is in the best possible condition. Proper engine operation will pay you rich dividends in increased engine life. The following points are mentioned so that you may receive the maximum of trouble-free operation and low maintenance cost.

STARTING ENGINE.

Weak intermittent explosions followed by puffs of black smoke from the exhaust stacks indicate overpriming or flooding. Excess fuel can be cleared from the combustion chambers by setting mixture control in "FULL LEAN" position, throttle "FULL OPEN", ignition switch "OFF", and then cranking the engine through several revolutions.

If engine is underprimed, which is most likely in cold weather with a cold engine, repeat starting instructions.

WARM-UP.

The warm-up should be conducted at 800-1000 rpm while headed into the wind with cowl flaps open. Part of this warm-up should be accomplished during taxi. The engine speed should not exceed 1600 rpm while the oil is cold.

ENGINE OPERATION DURING TAKE-OFF.

Most engine harm results from improper operation before the engine is properly warmed and temperatures stabilized. For this reason, on your initial take-off, use maximum power only when and as necessary for safe operation of the airplane, reducing power as soon as possible.

ENGINE OPERATION DURING CLIMB.

The instructions given under "ENGINE OPERATION DURING TAKE-OFF" also apply to climbs at low altitudes where high engine power is available. At higher altitudes where relatively low power is obtainable and when the engine has had time to warm up sufficiently, full throttle may be used for climb.

Engine speeds above 2450 rpm do not increase the rate-of-climb appreciably because part of the extra horsepower taken from the engine is lost due to lower propeller efficiency at high engine speeds. Furthermore, the gain in rate-of-climb at 2600 rpm is accompanied by a sizable increase in fuel consumption.

ENGINE OPERATION DURING CRUISING.

Maximum power for cruise is obtained with 23 inches of manifold pressure and 2450 rpm. Greater range can be obtained at lower power settings as shown in the range charts in Section VI. These ranges are based on flight test data with lean mixture at all altitudes. Mixture leaning is accomplished as follows: pull mixture control out until airspeed starts to drop or engine becomes rough; then enrichen mixture slightly beyond this point. Any change in altitude tude, power, or carburetor heat will require a change in lean mixture setting. Do not lean mixture with power setting above 23 inches of manifold pressure and 2450 rpm.

Application of full carburetor heat in cruising may enrichen the mixture to the point of engine roughness. To avoid this, lean the mixture as instructed in the foregoing paragraph.

ENGINE OPERATION DURING LET-DOWN.

Let-downs should be performed with cowl flaps "CLOSED", mixture "RICH", and enough power to keep engine warm and cylinders clear. To maintain a constant rate of descent, it is necessary to periodically reduce power because, for a given throttle setting, the manifold pressure increases as altitude is lost. The propeller control may be left in a low rpm position for efficiency and low noise level.

IDLING ENGINE.

Your engine is set to idle well below 600 rpm, but at engine speeds below 600 rpm, satisfactory piston lubrication cannot be maintained. Therefore, it is recommended that the engine not be allowed to operate below 600 rpm for long intervals.

STOPPING ENGINE.

Allow sufficient idling time after landing to reduce cylinder temperature below the operating range before stopping the engine. The engine should be stopped by moving the mixture control to lean position (con-

trol full out). After the propeller has stopped, turn the ignition switch "Off", and leave the mixture control full out.

TAXIING.

TAXIING WITH CROSSWIND GEAR.

Taxiing with cross-wind landing gear is performed in essentially the same manner as with conventional gear. Only on rough terrain or with sudden applications of rudder or brakes will the castering be noticed, the effect being similar to skidding a short distance on icy pavement.

NOTE

Fast movement over deep ruts or tracks should be avoided. In the event that the airplane is stopped in a "castered" position, it is necessary to taxi the plane forward slowly one or two revolutions of the wheels to return them to the "centered" position.

NOTE

To familiarize the pilot with the action and response of cross-wind landing gear, it is suggested that the airplane be taxied around the perimeter of a quarter-mile square under windy conditions. In this way the gear will be subjected to all directions of wind pressure; head-on, side (both left and right) and tail wind.

TAXIING (AMPHIBIAN ON LAND).

The bow wheels are full swiveling on this aircraft. Steering is accomplished by use of the brakes which are installed on the main wheels. An occassional tapping of the brakes is all that is required to maintain the desired taxi path under normal conditions.

When taxiing in a strong crosswind it will be necessary to use a considerable amount of UP-WIND brake since the amphibian weathercocks DOWNWIND on land, which is contrary to the normal tendency of the Model 180. Winds in excess of 30 mph may cause the downwind main strut to "bottom", which will allow the plane to tilt 3° to 5° in that direction. The Amphibian will feel buoyant then since the wind can get under the upwind wing. Although the aircraft has been safely taxied in crosswinds of 40 mph this is recommended only in cases of emergency due to the excessive wear on the brakes.

Taxiing should be done with the propeller in the "HIGH RPM" position and the cowl flaps "FULL OPEN". Carburetor heat should be "OFF" unless icing conditions prevail.

TAXIING (FLOATPLANE AND AMPHIBIAN ON WATER.)

Taxi with propeller in "HIGH RPM", cowl flaps "FULL OPEN", carburetor heat "OFF", and water rudders "DOWN". It is best to limit the engine speed to 800-1000 rpm for normal taxi because water piles up in front of the float bow at higher engine speeds. When taxiing with a forward center-of-gravity loading, choppy water, and a strong tail wind, it is possible to partially submerge the float bow in a turn when more than 800 rpm is used.

Although taxiing is very simple with the twin water rudders, it is sometimes necessary to "sail" the seaplane in close quarters. In addition to the normal flight controls one may use the wing flaps, ailerons, cabin doors, and water rudders to aid in "sailing".

To taxi great distances, it may be advisable to taxi on the step with the water rudders retracted. Turns on the step may be made with safety providing they are not too sharp and if ailerons are used to counteract the overturning tendency. All water taxiing should be done with the cowl flaps "FULL OPEN", and close attention should be paid to cylinder head and oil temperatures.

Do not taxi the Amphibian in water with the landing gear extended except when beaching the airplane. If the landing gear is extended, there is a much stronger tendency for the bows to submerge while taxiing downwind. In the retracted position, the nose wheels will serve as bumpers for floating docks and obstructions.

SKIPLANE TAXIING.

Taxiing a skiplane is somewhat similar to taxiing a landplane without brakes on soft sod. The tail ski does not turn the airplane as effectively as a tail wheel, therefore it is necessary to allow for a larger turning radius in a turn.

TAKE-OFF.

LANDPLANE AND SKIPLANE NORMAL TAKE-OFF.

Normal take-offs are accomplished with wing flaps up, cowl flaps open, full throttle, and 2600 rpm. Reduce power to 23 inches of manifold pressure and 2450 rpm as soon as practical to minimize engine wear.

AMPHIBIAN ON LAND NORMAL TAKE-OFF.

Normal take-offs are accomplished with wing flaps extended 20° (second notch), cowl flaps open, full throttle and 2600 rpm. As speed increases, the elevator control should be gradually moved to the neutral position and when the airplane feels light (60-70 IAS) a light back pressure on the control wheel will allow the airplane to fly off smoothly.

The landing gear should be retracted when the point is reached where a wheels down forced landing on that runway would be impractical.

LANDPLANE AND SKIPLANE OPTIMUM TAKE-OFF.

The use of 20 degree wing flaps reduces the total take-off distance over a 50-foot obstacle by about 20%. Therefore, for increased take-off performance, the recommended technique is to lower wing flaps 20 degrees (second notch) prior to the start of the take-off run. The airplane should be maintained in a tail-low attitude throughout the run to avoid bouncing on rough fields and to obtain a short

take-off distance. Tail-high take-offs are not recommended except in crosswinds because they unnecessarily prolong the take-off runs.

USE OF WING FLAPS FOR TAKE-OFF.

For normal flying conditions, the use of 20 degree (second notch) wing flaps will shorten the take-off distance to clear a 50 foot obstacle. This is a result of slower forward speeds even though the use of wing flaps lessens the rate-of-climb.

Consult the take-off charts in Section VI to determine ground-run and take-off distance. *Never use 30 degree or 40 degree flaps for take-off.*

REMEMBER

Under marginal conditions, start retracting flaps before you begin to lose airspeed and rate-of-climb. Don't raise the flaps below the "Flaps Up" stalling speed shown in the chart (figure 3-1) but slowly release them as soon as you reasonably can after take-off; preferably 50 feet or more above the terrain or obstacles.

FLOATPLANE OR AMPHIBIAN WATER TAKE-OFF.

Take-off performance from water is much better with wing flaps 20 degrees throughout the take-off run. Normal procedure is to apply full throttle and 2600 rpm while holding the control wheel fully aft. As the floatplane accelerates, attention should be directed to the point where the bow wave leaves the float. When this bow wave source moves aft of the wing strut, it is time to relax back pressure and allow the floatplane to go up on the step. It is possible to feel acceleration or deceleration caused by proper and improper elevator positions while operating on the step. When the seaplane feels light, apply light back pressure and allow seaplane to fly off smoothly.

Under heavy load and glassy water conditions, it may be advisable to apply abrupt back pressure for breaking away from the surface. Care should be exercised to avoid a stall following this procedure. An alternate procedure is to roll the floatplane over on one float during the run and apply back pressure when the opposite float is clear of the water.

If porpoising is encountered while on the step, apply additional back pressure to correct the excessively nose-low attitude.

CLIMB.

LANDPLANE AND SKIPLANE CLIMB.

Normal climbs are conducted at 100-120 mph with wing flaps up, 23 inches of manifold pressure, 2450 rpm, and cowl flaps opened as required for engine cooling. With full throttle and 2600 rpm, the best rate-of-climb speed varies from 90 mph I.A.S. at sea level to 84 mph I.A.S. at 10,000 feet. If an obstruction dictates using a steep climb angle, the best angle-of-climb speed should be used with wing flaps up, full throttle, and

2600 rpm. The best angle of climb speed is 70 mph, I.A.S.

NOTE

> Steep climbs at these low speeds should be of short duration because of poor engine cooling.

If 20 degree wing flaps were used for take-off, they should be left at 20 degrees until all obstacles are cleared. To clear an obstacle with wing flaps 20 degrees, the best angle-of-climb speed (60 MPH, IAS) should be used. If no obstructions are ahead, a best "flaps up" rate-of-climb speed (90 MPH, IAS) would be most efficient. These speeds vary slightly with altitude, but they are close enough for average field elevations.

Upon reaching a safe altitude and airspeed, the wing flaps should be retracted slowly and power adjusted for climb.

In cross-country flying, it is suggested that the airplane be climbed at 120 mph, I.A.S. at low altitude to about 100 mph I.A.S. at high altitude. This type of climb provides good engine cooling and better visibility during a long climb. Also, this higher climb speed is about as efficient in terms of overall trip speed and fuel consumption as a maximum performance climb to cruising altitudes.

It should be remembered that most engine wear occurs at high power and with cold oil. High power is not obtainable at high altitudes, so full throttle operation at high altitude is not harmful to the engine.

FLOATPLANE AND AMPHIBIAN CLIMB.

If no obstructions are to be cleared, climb out at 76 mph, I.A.S., and retract the wing flaps slowly upon reaching a safe altitude. Then reduce power to 23 inches of manifold pressure and 2450 rpm. Normal climbs are conducted at 90-110 mph with wing flaps up and cowl flaps opened as required for engine cooling. If optimum flaps up climb performance is desired, climb at 87 mph I.A.S. at sea level with full throttle and 2600 rpm. Reduce this climb speed about ½ mph for each 1000 feet above sea level.

To climb out **steeply over an obstacle**, it is best to use the best angle-of-climb speed with wing flaps up. This speed varies from 65 mph I.A.S. at sea level to 76 mph I.A.S. at 18000 feet.

NOTE

> Steep climbs at these low speeds should be of short duration because of poor engine cooling.

To clear an obstacle with 20 degree wing flaps, use the best angle-of-climb speed of 50 mph I.A.S. at sea level. Increase this climb speed about ½ mph for each 1000 feet above sea level.

Upon reaching a safe altitude and airspeed, retract the wing flaps slowly, especially when flying over glassy water, because a loss of altitude is not very apparent over such a surface.

CRUISE.

The cruising information in this section is applicable to landplane, ski-plane, floatplane, and amphibian.

Cowl flaps are normally closed in cruising flight for the following three reasons:

(1) Open cowl flaps will overcool the engine in cruising flight even in extremely hot temperatures.

(2) Airplane drag is increased considerably due to the increased flow of cooling air through the engine baffles and because of the additional frontal area exposed to the air stream.

(3) Open cowl flaps take severe buffeting in cruise which reduces the service life of these flaps.

Cruising charts are presented in figures 6-5 through 6-8. It can be seen that the speeds for maximum range are much lower than normal cruise speed. Since the main advantage of the airplane over ground transportation is speed, one should use the high cruising speeds obtainable. However, if a destination is slightly out of reach in one hop at normal cruising speed, it would save time and money to make the trip non-stop at some lower speed. An inspection of these cruising charts shows the long ranges obtainable at lower cruising speeds.

These charts are based on flight tests with lean mixture and 55 gallons of fuel for cruising. Allowances for fuel reserve, headwinds, take-offs and climb or variations in mixture leaning technique should be made and are in addition to those shown in the charts.

Normal cruising is done at 60% to 70% power. A maximum cruising power of approximately 75% is allowable with 23 inches mercury manifold pressure and 2450 rpm. Various percent powers can be obtained with a number of combinations of manifold pressures, engine speeds, altitudes, and outside air temperatures. However, at full throttle and a constant engine speed and a standard air temperature, a specific power may be obtained at only one altitude. For example at full throttle and 2450 rpm the following speeds are obtainable at various powers and altitudes:

% BHP	ALTITUDE	TRUE AIRSPEED
75	6700	162
70	8400	161
65	10300	159

This table shows that cruising can be done most efficiently at higher altitudes because very nearly the same cruising speed can be maintained at much less power. This means a saving in fuel consumption and engine wear.

TACTAIR AUTOMATIC FLIGHT CONTROLS.

Although it is possible to take off and land with the Tactair units engaged, merely by overpowering them, you will find that control forces are greater and your feel of the airplane is diminished. *Before taking off or* *landing make sure the master valve knob is off (pushed in).*

Since it is entirely pneumatic and operated by the engine-driven vacuum pump, the Tactair system needs no warm-up period before engagement. It may be used at any altitude up to 20,000 feet; above 20,000 feet, atmospheric pressure is insufficient to supply the necessary control forces.

Before engaging the system, trim the airplane straight and level and center the knobs on the control head. Then pull out the master valve control knob. If the airplane is not trimmed, or the knobs are not centered, as soon as the unit is engaged the airplane's attitude will change. The change will not be abrupt and no excessive loads will be imposed on the airframe, but operation will be smoother if both airplane and control head knobs are trimmed before engagement.

T-1 ROLL STABILIZER OPERATION.

To operate the T-1 roll stabilizer unit, center the trim knob and pull on the master valve knob. With the roll trim knob centered, the unit will immediately level the wings from any attitude within the limits of the gyro. The trim knob may be rotated to obtain up to 10 degrees of bank. Sharp turns, either for heading or maneuvers, may be made merely by overriding the unit with the control wheel.

T-2 HEADING LOCK OPERATION.

Engagement of the T-2 unit is identical to the T-1, except for the additional caging and setting of the directional gyro and setting the course selector card before engaging the unit. Once the unit is engaged, turns to a new heading may be made merely by turning the course selector knob to the new heading. If the new heading is within 80 degrees of the former heading, the unit will make a one-degree-per-second turn to the new heading. (If the new heading is more than 80 degrees from the original, the autopilot will turn to the reciprocal of the new heading.) If the airplane hunts or oscillates, adjust the roll trim knob until the selector card and directional gyro are aligned. The airplane may be slightly wing-low; it is in this manner that the unit trims out torque effects.

Turns may be made by overriding the stabilizer unit. When you release the controls, the airplane will return to the course selector heading if it is within 80 degrees, or to its reciprocal.

Caging the directional gyro eliminates the heading lock feature; however, the relation of the two compass cards will send a continuous signal to the control head. If the cards are aligned, the signal will be balanced and the wing will remain level as with the T-1. If the cards are not aligned, a continuous bank signal will be sent, attempting to match the compass cards. As soon as the gyro is uncaged, the heading lock will function as usual.

T-3 AUTOPILOT OPERATION.

To engage the T-3 autopilot, turn the airplane straight and level, hands-off. Set the autopilot pitch and turn knobs to center and the course selector card to coincide with the heading on the directional gyro. Then pull on the master valve knob.

The roll and heading lock functions of the T-3 unit are identical to the T-2, except that the heading lock knob on the control head must be pulled on to engage the heading lock. In addition, the turn knob on the control head may be used to make turns up to 30 degrees of bank. Displacing the turn knob automatically disengages the heading lock; after the turn knob is returned to center, the heading lock may be engaged once more and the airplane will return to the heading set on the course selector, or to its reciprocal, whichever is closer.

The tab under the turn knob can be moved left or right to change the roll zero point up to two degrees, if necessary, to trim out torque effects and prevent hunting. Move the tab until the course selector card and directional gyro card are aligned. Changes in power settings may require readjustment of the tab.

The pitch and control knob on the right side of the control head may be set to maintain a nose-up or nose-down attitude up to approximately 10 degrees down or 15 degrees up. For best results, the stabilizer should be adjusted with changes in attitude, power or center of gravity, just as you would in manual-control flight. The pitch control unit can overcome an out-of-trim condition, but it may produce oscillations in doing so since there is no automatic trim tab control. Your ride will be smoother if you adjust the trim manually.

EMERGENCY PROCEDURES.

If a malfunction should occur in any of the autopilot units, it can be overridden merely with pressure on the normal flight controls and the entire autopilot may be disengaged by pushing in the master control valve knob. Leaks in the system will produce only a loss of suction. If the suction gage reading falls below 3.5 in. Hg, push in the master control knob to disengage the autopilot. All the available suction then will be directed to the instruments.

STALLS.

The stalling speeds shown in figure 3-1 are for aft C.G. and full gross weight conditions. Speeds are given as true indicated airspeeds because indicated airspeeds are inaccurate in the low speed range. Other loadings may result in minimum flying speeds rather than stalling speeds. The horn stall warning indicator produces a steady signal approximately 5 mph before the actual stall is reached and remains on until the airplane flight attitude is changed. Fast landings will not produce a signal.

The stall characteristics are conventional for the flaps up and flaps down condition. Slight elevator buffeting may occur just before the stall with flaps down.

STALLING SPEEDS
POWER OFF, MPH T.I.A.S.

CONDITION	ANGLE OF BANK 0°	30°	60°
LANDPLANE (2650 LBS.)			
Flaps Up	62	67	88
Flaps Down 20°	57	61	81
Flaps Down 40°	56	60	79
AMPHIBIAN AND FLOATPLANE (2850 LBS.)			
Flaps Up	63	68	89
Flaps Down 20°	60	64	85
Flaps Down 40°	57	61	80

Figure 3-1. Stall Chart

LANDING.

LANDPLANE AND SKIPLANE LANDING.

Normal landings are made power-off with any flap setting. The approach is steep with full wing flaps, but slips are permissible with wing flaps extended if necessary.

Since the ability of the elevator to produce a stall is dependent upon the adjustable stabilizer being set for "AIRPLANE NOSE UP", it is important that the airplane be completely trimmed in the approach glide. If the airplane fails to land three point with the control wheel fully back, it is probable that the adjustable stabilizer is not adjusted for the landing condition.

Approach glides should be made at 80-90 mph with wing flaps up, or 70 to 80 mph with wing flaps down, depending upon the turbulence of the air.

Heavy braking may be used initially in the landplane ground run if the control wheel is held full back.

AMPHIBIAN GROUND LANDINGS.

Power-off approaches and landings may be made with any flap setting. It is recommended however that a power approach and landing be made to reduce the rapid rate of descent which accompanies the power-off approach. The landing approach attitude and flare is the same as for an aircraft equipped with tricycle gear. The approaches should be made at 85-95 mph with the flaps up and 80-90 with the flaps down, depending upon the air turbulence.

FLOATPLANE AND AMPHIBIAN WATER LANDINGS.

Power-off landing may be made with any wing flap setting. Slips are also permitted with flaps extended. However, with glassy water it is recommended that a power approach and landing be made with zero or 20 degree wing flaps to maintain a low rate-of-descent.

EMERGENCY GEAR PROCEDURE.

The Amphibian is not equipped with an emergency system to operate the landing gear. If the appropriate position light does not show the gear to be in a locked position (either UP or DOWN) a visual check may be made by observing the main landing gear latch fittings in the float inspection windows. The nose gear is partially visible over the float bow when in the retracted position. The landing gear circuit breakers should be checked to determine if the circuit breaker has been broken. If the circuit has been broken, wait approximately three minutes for the thermal unit to cool, then press the circuit breaker button to reset the breaker.

If pushing the circuit breaker and restoring power to the circuit does not complete the retraction or extension cycle, then a mechanical failure has occurred. The recommended procedure in this case is to retract the other gear, if it was extended, and land on the sod. A damp grassy surface is preferable.

Landings of this sort have produced no tendency to nose over, even when conducted on hard surfaced runways, and will result in little or no damage to the floats.

CAUTION

DO NOT land in the water with the wheels either partially or fully extended. If the landing MUST be accomplished on water and the gear is partially or fully extended, it is suggested that a power ON, full stall landing with full flaps (40°) would be the best procedure.

COLD WEATHER OPERATION.

Prior to starting in cold weather, it is advisable to pull the propeller through several times by hand to "limber" the partially congealed oil, thus conserving battery energy. Precautions which should be taken prior to pulling the propeller through are to check that the mixture is in "Full Lean," the ignition switch is "Off," and the throttle is "Closed" (full out position).

Approximately 4-8 strokes of the primer will be required to start a cold engine. Under extreme conditions it may even be necessary to keep the engine running on the primer until the engine warms up slightly.

Under cold conditions, the warm-up and pre-take-off checks should be lengthened to provide more time to bring the engine up to temperature. This will usually require approximately three minutes warm-up at 800 RPM and an equal amount of time for pre-take-off checks.

During cold weather operations, no indication will be apparent on the oil temperature gage prior to take-off. If the engine accelerates smoothly and the oil pressure remains normal, the engine should be ready for take-off.

Rough engine operation in cold weather can be caused by a combination of an inherently leaner mixture due to the dense air and poor vaporization and distribution of the fuel-air mixture to the cylinders. The effects of these conditions are especially noticeable during operation on one magneto in ground checks where only one spark plug fires in each cylinder.

To operate the engine without a winterization kit in occasional outside air temperatures from 10° F to 20° F, the following procedure is recommended:

(1) Use full carburetor heat during engine warm-up and ground check.

(2) Use minimum carburetor heat required for smooth operation in take-off, climb, and cruise.

(3) Select relatively high manifold pressure and RPM settings for optimum mixture distribution, and avoid excessive manual leaning in cruising flight.

(4) Avoid sudden throttle movements during ground and flight operation.

For continuous operation in temperatures consistently below 20° F the Cessna winterization kit should be

installed. This kit consists of an oil cooler shutter, a shutter control, oil cooler cover plate, intake manifold cross-over tube cover and carburetor air intake restrictor cover. The installation of these components will greatly improve engine operation. Winterization kits are available at your dealer for a nominal charge.

When operating in sub-zero temperatures, avoid using partial carburetor heat. Partial heat may raise the carburetor air temperature to the 32-degree to 80-degree range where icing is critical under certain atmospheric conditions.

The landplane is eligible for use with skis. Your dealer will be glad to give you details on their installation on your airplane.

OIL DILUTION SYSTEM (OPTIONAL EQUIPMENT).

If your airplane is equipped with an oil dilution system, and very low temperatures are expected, dilute the oil before stopping the engine. Determine the dilution time required for the anticipated temperature, from the Oil Dilution Table. With the engine operating at 1,000 rpm, hold down the oil dilution switch button the necessary time. Fuel will flow into the oil pump at the rate of 1 quart every 90 seconds. If more than four quarts of fuel appears necessary to dilute the oil for the anticipated temperature, check the oil level before starting to dilute. With a full sump, only four quarts may be added without risk of overflow and its attendant fire hazard. To make room for the additional fuel some oil must be drained before dilution. The total volume of fuel and oil must not exceed 16 quarts.

During the dilution period, watch the oil pressure closely. A slight, gradual pressure drop is to be expected as the oil is thinned. Stop the engine, however, if any sharp fluctuation in pressure is observed; it may be caused

OIL DILUTION TABLE

	TEMPERATURE		
	0° F	−10° F	−20° F
Dilution Time	1½ min.	3¾ min.	6 min.
Fuel Added	1 qt.	2½ qt.	4 qt.

NOTE: *Maximum fuel and oil in sump for take-off is 13 quarts.*

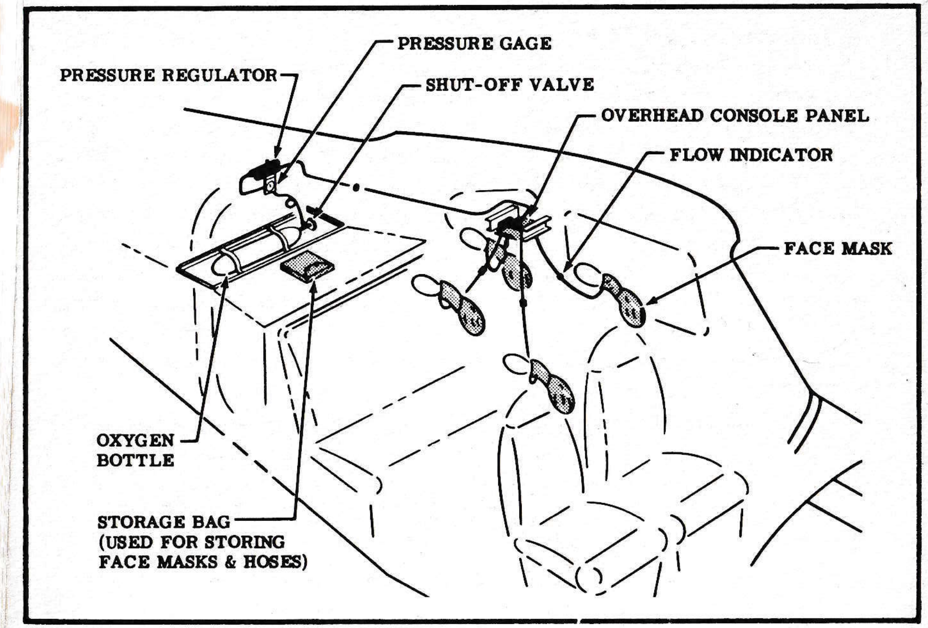


Figure 3-2. Oxygen System Diagram

by an oil screen clogged with sludge washed down by the fuel.

NOTE

When the dilution system is used for the first time each season, the oil should be changed and the oil screens cleaned to remove sludge accumulations washed down by the fuel. Use the full dilution period, drain the oil, clean the screens, refill with fresh oil and redilute as required for the anticipated temperature before the engine has cooled completely.

On starting and warm-up after diluting the oil, again watch the oil pressure closely for an indication of sludge blocking the screens. If the full dilution time was used, starting with a full sump, run the engine long enough to evaporate some of the fuel and lower the sump level before take-off. Otherwise, the sump may overflow when the airplane is nosed up for climb.

OXYGEN SYSTEM.

An oxygen system, capable of supplying oxygen for a pilot and three passengers is available as optional equipment for your airplane. It is completely automatic and requires no manual regulations.

The system consists of an oxygen cylinder, a pressure gage, pressure regulator, outlet couplings, and four disposable type oxygen masks, complete with rubber hoses and position indicators. The face masks and hoses are stored in a plastic bag on the baggage shelf when not in use.

The system will provide oxygen for the times shown in figure 3-3.

The supply of oxygen for the system is stored, under high pressure, in an oxygen cylinder located just aft of the baggage compartment. High pressure oxygen flows from the cylinder and is carried through stainless steel tubing through an oxygen pressure gage to an automatic, continuous-flow oxygen regulator. The oxygen is reduced to low pressure by the regulator and is carried through aluminum tubing to four continuous-flow couplings which are mounted in a console panel located in the cabin ceiling. When the oxygen mask hoses are plugged into the couplings, oxygen is

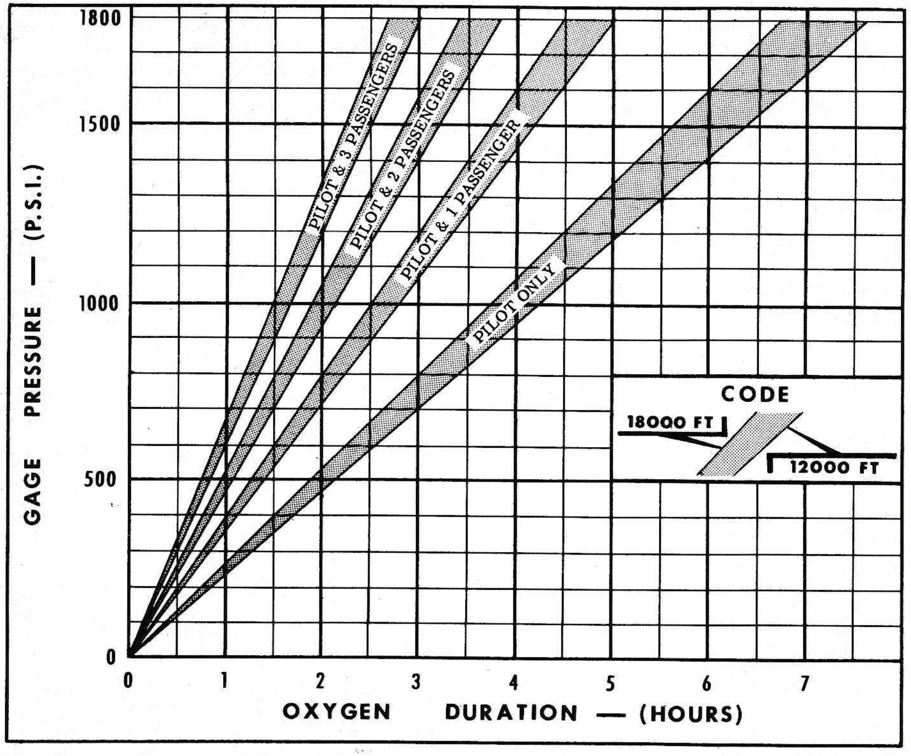


Figure 3-3. Oxygen Duration Chart

permitted to flow through rubber tubing to the oxygen masks. A flow indicator in each hose line disappears from view to show that oxygen is flowing.

WARNING

USE NO OIL! Keep oil and grease away from all oxygen equipment. Also keep equipment free of organic material (dust, lint, etc.). Be sure hands and clothing are free of oil before handling equipment.

OXYGEN SYSTEM OPERATION.

Prior to flight, check to see that valve on the oxygen cylinder is full open (full counterclockwise). Note oxygen pressure gage reading to be sure that there is an adequate supply of oxygen for the trip.

To use oxygen system, proceed as follows:

a. Select mask and hose from plastic bag on baggage shelf.
b. If mask is not connected to hose, attach by inserting short plastic tube securely into oxygen delivery hose.
c. Attach mask to face.
d. Select oxygen coupling in overhead console panel. Push dust cover to one side and insert end of mask hose into coupling. Oxygen will start to flow and no further adjustments are necessary.

NOTE

If the red oxygen flow indicator for the face mask hose line is out of sight, oxygen is flowing.

OXYGEN CYLINDER.

The oxygen cylinder is equipped with a shut-off valve and can be easily removed and recharged by any commercial supplier of breathing grade or aviation (dry) grade oxygen.

When fully charged, the oxygen cylinder is filled to 1800 p.s.i. at 70° F and contains 48 cubic feet of oxygen. The oxygen cylinder should be refilled whenever the oxygen system pressure drops below 300 p.s.i.

To remove the oxygen cylinder for servicing, proceed as follows:

a. Open baggage door and unfasten rear baggage compartment upholstery panel on the right side of the airplane.
b. Turn the oxygen cylinder valve off by turning clockwise as far as it will go.
c. Disconnect oxygen line from oxygen cylinder.
d. Loosen the two cylinder mounting clamps and slide oxygen cylinder forward and out of the airplane.

To reinstall oxygen cylinder, reverse the above procedure.

WARNING

Lubricants or sealing compounds on the flared tube or compression fittings must not be used. No sealing compound should be used on either the flares or threads to prevent leakage. Oil, grease, soap, or other fatty materials in contact with oxygen constitute a very serious fire hazard and such contact is to be avoided. Only anti-seize and sealing compounds which have been approved under Spec. MIL-C-5542 can be used safely.

OXYGEN SYSTEM PRESSURE GAGE.

An oxygen system pressure gage is installed in the rear cabin wall just above the baggage shelf and is easily read by the cabin occupants. The gage indicates the pressure of oxygen entering the system from the cylinder. The recommended operating pressure range for the system is from 1800 to 300 p.s.i. The gage pressure reading also can be used to determine the amount of oxygen left in the system (see figure 3-3).

OXYGEN REGULATOR.

The oxygen regulator, located behind the rear cabin wall, automatically reduces the oxygen high pressure, supplied by the oxygen cylinder, to a low pressure of practical magnitude for line distribution. The regulator contains a fine mesh screen which prevents entry of foreign particles into the system.

To relieve the users of the necessity for making periodic adjustments while in flight, the regulator automatically compensates for changes in altitudes and furnishes the required oxygen distribution pressures at all times.

QUICK DISCONNECT COUPLINGS.

Four continuous-flow couplings, flush mounted in the ceiling console panel, provide individual outlets for the oxygen system. Spring-loaded covers are provided to keep out dust when the couplings are not in use. Insertion of the oxygen mask hoses into the couplings effect leak-proof connections and automatically open the couplings to allow free flow of oxygen to the masks. Withdrawal of the hoses automatically cuts off the oxygen flow.

The oxygen rate-of-flow to the user is determined by an orifice installed in the inlet side of each coupling. The passenger coupling orifices are .016 inch diameter and the pilot coupling orifice is .023 inch diameter. The .023 inch diameter orifice provides approximately double the rate-of-flow as that delivered through the .016 inch diameter orifices. The larger rate-of-flow is provided primarily for the pilot, but can be used for any of the cabin occupants who desire additional oxygen.

FACE MASKS.

The face masks used with the oxygen system are of the disposable, partial-rebreathing type and are stored in a plastic bag on the baggage shelf. The face masks have the advantage of low cost, feather lightness, comfort, and the elimination of the necessity of cleaning and sterilizing. Their users can carry on normal conversations including normal use of the microphone. The masks are durable and the frequent user can mark his mask for identification and reuse it many times.

The face mask receives oxygen through a rubber tube into the rebreather bag. On exhalation, the first air exhaled (which is rich in oxygen because it never reaches the lungs) is exhaled into the bag, combining with the oxygen. As soon as the bag is filled, the remainder of the exhaled breath (which is low in oxygen, because it has been in the lungs) is exhaled to the atmosphere through upper sides of the bag.

On inhalation, the user inhales the oxygen-enriched contents of the bag. When the bag is emptied, air is drawn through the upper sides of the mask to finish satisfying the inhalation volume of the user. Additional masks are available at Cessna Dealers.

OXYGEN FLOW INDICATOR.

An oxygen flow indicator is provided in each face mask hose line. It provides visual proof of oxygen flow and operates in any position. A red indicator disappears when oxygen is flowing.

Section IV

operating limitations †

OPERATIONS AUTHORIZED.

Your Cessna 180, with standard equipment as certificated under CAA Type Certification No. 5A6, is approved for day and night operation under VFR.

Additional optional equipment is available to increase its utility and to make it authorized for use under IFR day and night. When operated for hire at night, certificated flares are required.

MANEUVERS — NORMAL CATEGORY.

The model 180 exceeds the requirements of the Civil Air Regulations, Part 3, set forth by the United States Government for airworthiness. Spins and aerobatic maneuvers are not permitted in normal category airplanes in compliance with these regulations. In connection with the foregoing, the following gross weights and flight load factors apply:

	LANDPLANE AND SKIPLANE		FLOATPLANE		AMPHIBIAN	
Gross Weight	2650 lbs.		2820 lbs.		2850 lbs.	
Flight Load Factor* Flaps Up	+3.8	−1.5	+3.8	−1.5	+3.8	−1.5
Flight Load Factor* Flaps Down	+3.0		+ 3.3		+3.3	

†Your airplane must be operated in accordance with the CAA-approved Airplane Flight Manual. If there is any information in this section which contradicts the CAA-approved manual, it is to be disregarded.

*The design load factors are 150% of the above and in all cases the structure meets or exceeds design loads.

AIRSPEED LIMITATIONS FOR LANDPLANE, SKIPLANE AND FLOATPLANE.

The following chart lists the certificated true indicated airspeed limits for the Cessna 180 landplane, skiplane and floatplane.

Never Exceed (Glide or dive, smooth air) . . . . 184 mph (red line)
Caution Range . . . . 160-184 mph (yellow arc)
Maximum Structural Cruising Speed . . . . 160 mph
(Level flight or climb)
Normal Operation Range . . . . 64-160 mph (green arc)
Maximum Speed Flaps Extended . . . . 100 mph
Flap Operation Range . . . . 55-100 mph (white arc)
Maneuvering Speed* . . . . 122 mph

*(The maximum speed at which you can use abrupt control travel without exceeding the design load factor.)

AIRSPEED LIMITATIONS FOR AMPHIBIAN.

The following chart lists the certificated true indicated airspeed limits for the Cessna 180 amphibian.

Never Exceed (Glide or dive, smooth air) . . . . 164 mph (red line)
Caution Range . . . . 130-164 mph (yellow arc)
Maximum Structural Cruising Speed . . . . 130 mph
(Level flight or climb)
Normal Operation Range . . . . 64-130 mph (green arc)
Maximum Speed Flaps Extended . . . . 100 mph
Flap Operation Range . . . . 55-100 mph (white arc)
Maneuvering Speed* . . . . 129 mph

*(The maximum speed at which you can use abrupt control travel without exceeding the design load factor.)

ENGINE OPERATION LIMITATIONS.

Power and Speed . . . . 230 bhp at 2600 rpm

ENGINE INSTRUMENT MARKINGS.

OIL TEMPERATURE INDICATOR
Normal Operating Range . . . . Green Arc
Do Not Exceed . . . . Red Line

OIL PRESSURE GAGE
Idling Pressure . . . . 10 psi (red line)
Normal Operating Range . . . . 30-60 psi (green arc)
Maximum Pressure . . . . 100 psi (red line)

MANIFOLD PRESSURE GAGE
Normal Operating Range . . . . 15-23 in. Hg (green arc)

CYLINDER HEAD TEMPERATURE
Normal Operating Range . . . . 300-425° F (green arc)
Do not exceed . . . . 500° (red line)

TACHOMETER
Normal Operating Range . . . . 2200-2450 rpm (green arc)
Cautionary Range . . . . 2450-2600 rpm
Do Not Exceed (Engine rated speed) . . . . 2600 rpm (red line)

FUEL QUANTITY INDICATORS
Empty (5 gallons unusable each tank) . . . . E (red line)
*Not recommended for take-off . . . . E to ¼ (red arc)

*This fuel available for all normal operations.

WEIGHT AND BALANCE.

All aircraft are designed for certain limit loads and balance conditions. These specifications for your 180 are charted on page 4-4.

A weight and balance report and equipment list is furnished with each airplane. All the information on empty weight c.g. and allowable limits for your particular airplane, as equipped when it left the factory, is shown. Changes in the original equipment affecting weight empty c.g. are required by the C.A.A. to be recorded in the repair and alteration form 337.

Using the weight empty, c.g. location, and moment from the weight and balance report *for your airplane* and following the example, the exact moment may be readily calculated which, when plotted on the upper chart will quickly show whether or not the c.g. is within limits. Refer to the loading graph for moment values of items to be carried.

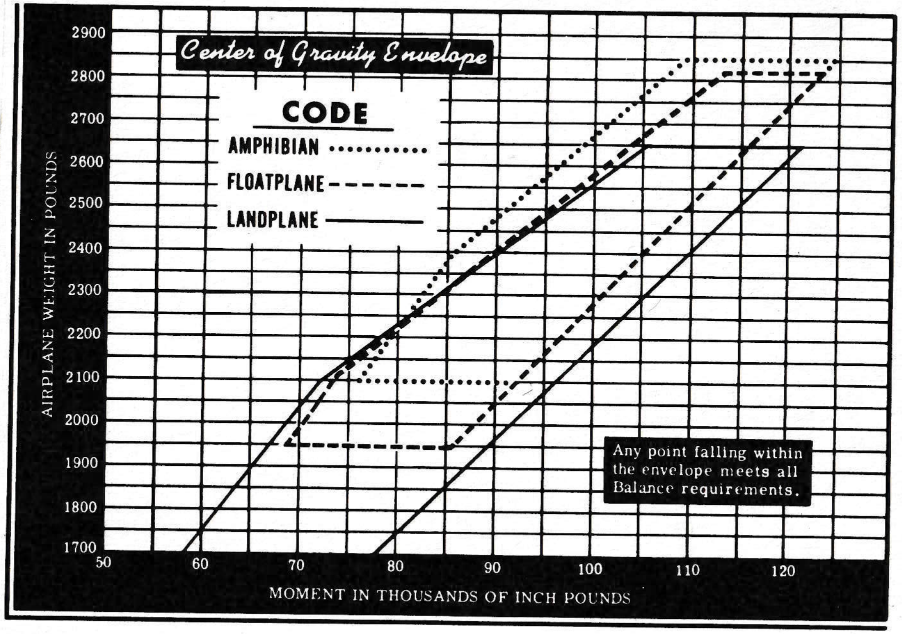
EXAMPLE FOR AN AIRPLANE WITH A LICENSED EMPTY WEIGHT OF 1615 LBS. AND A MOMENT OF 57,305 IN. LBS.

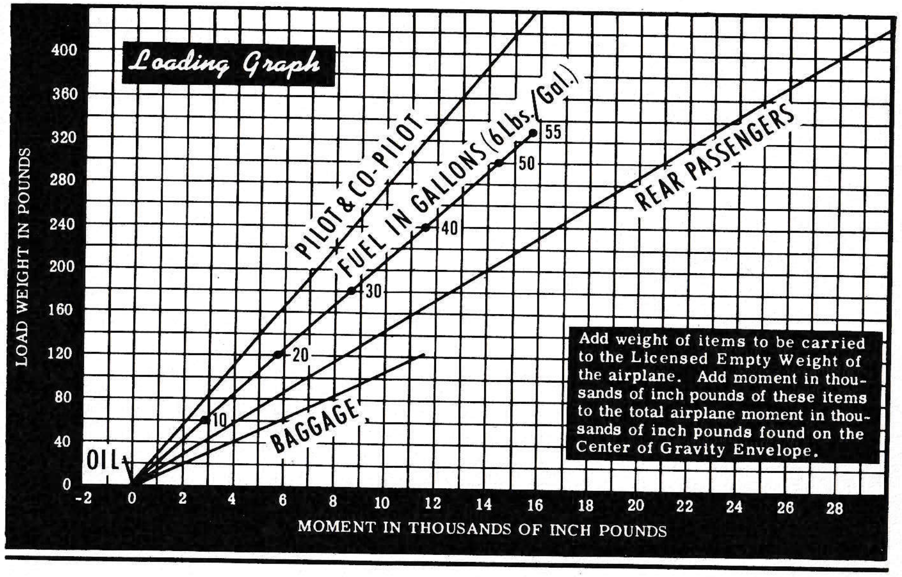
	WT.	MOMENT 1000
EMPTY WEIGHT (LICENSED)	1615.0	+57.3
OIL (12 QTS.)	22.5	− 0.3
PILOT & PASSENGER (1)	340.0	+12.2
REAR PASSENGERS (2)	290.0	+20.4
FUEL (MAXIMUM) 55 GAL.	330.0	+15.7
BAGGAGE (TO MAKE GR. WT.)	52.5	+ 5.0
Total	2650.0	110.3

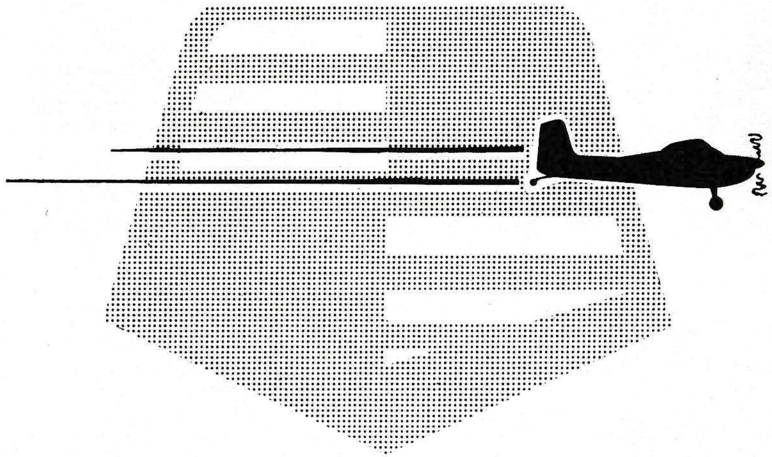
Locate this point (2650.0-110.3) on the center of gravity envelope graph, and, since the point falls within the envelope, the above loading meets all balance requirements.

NOTE

The above problem is an example of only one of many different loading configurations. To best utilize the available payload for *your* airplane, the loading charts should be consulted to determine proper load distribution.


Center of Gravity Envelope
CODE
AMPHIBIAN
FLOATPLANE
LANDPLANE
AIRPLANE WEIGHT IN POUNDS
2900
2800
2700
2600
2500
2400
2300
2200
2100
2000
1900
1800
1700
50
60
70
80
90
100
110
120
MOMENT IN THOUSANDS OF INCH POUNDS
Any point falling within the envelope meets all Balance requirements.


Loading Graph
LOAD WEIGHT IN POUNDS
400
360
320
280
240
200
160
120
80
40
0
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
MOMENT IN THOUSANDS OF INCH POUNDS
PILOT & CO-PILOT
FUEL IN GALLONS (6 Lbs./Gal.)
10
20
30
40
50
55
REAR PASSENGERS
BAGGAGE
OIL
Add weight of items to be carried to the Licensed Empty Weight of the airplane. Add moment in thousands of inch pounds of these items to the total airplane moment in thousands of inch pounds found on the Center of Gravity Envelope.



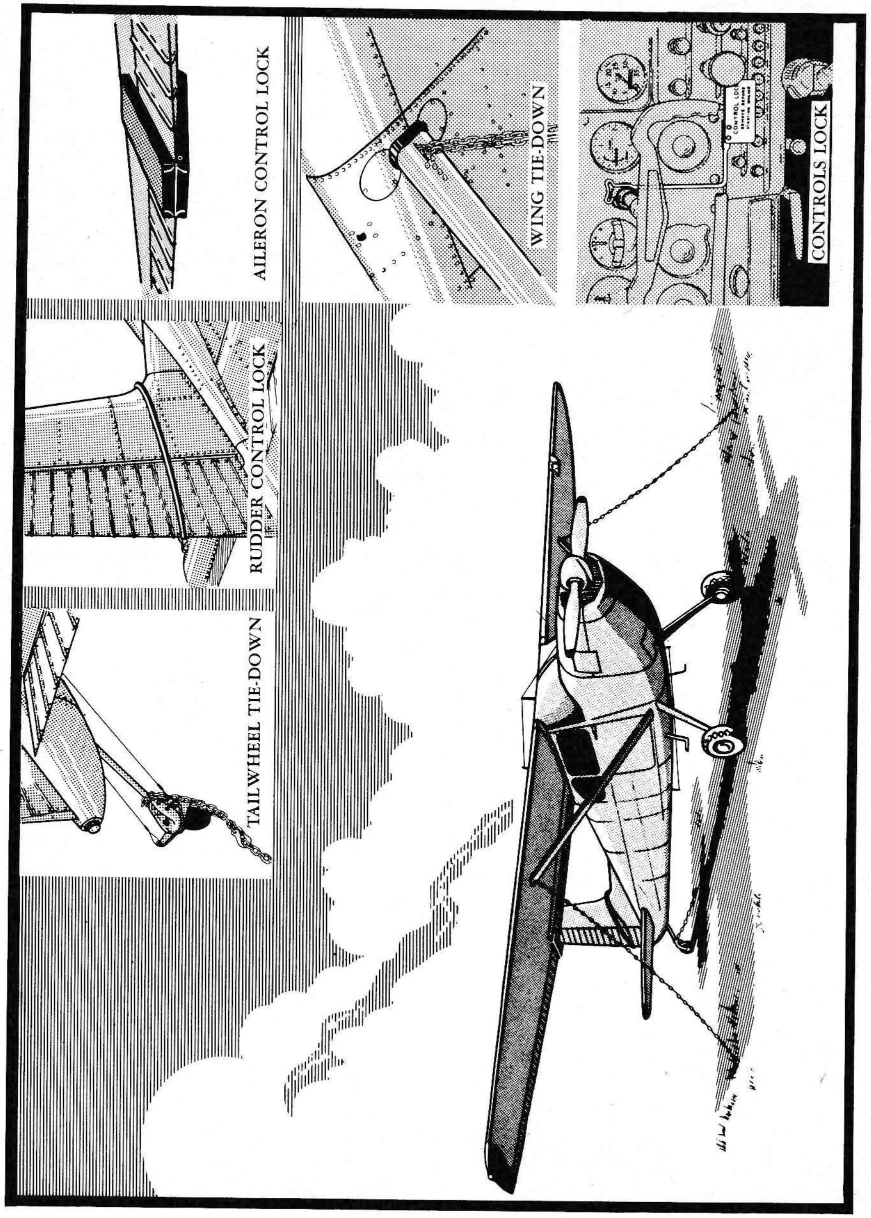


Figure 5-1. Airplane Tie-Down Procedure

Section V

care of the airplane— owner's responsibilities

If Your Airplane is to retain that new plane performance, stamina and dependability, certain inspection and maintenance requirements must be followed. It is always wise to follow a planned schedule of lubrication and maintenance based on the climatic and flying conditions encountered in your locality.

Keep in touch with your Cessna dealer and take advantage of his knowledge and experience. He knows your airplane and how to maintain it. He will remind you when lubrications and oil changes are necessary and about other seasonal and periodic services.

GROUND HANDLING.

Proper ground handling will prevent costly repairs due to careless methods of moving the airplane about on the ground. When maneuvering the airplane by hand, push at the front edge of the stabilizer adjacent to the fuselage, at the root of the dorsal fin, and at the landing gear or the strut root fitting. Do not lift the empennage by the tip of the elevator; likewise, do not shove sidewise on the upper portion of the fin.

MOORING YOUR AIRPLANE

Proper tie-down procedure is your best precaution against damage to your parked airplane by gusty or strong winds. To tie down your airplane securely, proceed as follows:

(1) Tie sufficiently strong (700 pounds tensile strength) ropes or chains to the wing tie-down fittings located at the upper end of each wing strut.

(2) Secure the opposite ends of these ropes or chains to tie-down rings suitably anchored to the ground.

(3) Tie a rope or chain around the tail gear spring and secure the opposite end to a tie-down ring in the ground.

(4) Install surface control locks between the flap and aileron of each wing.

(5) Install controls lock on control wheel shaft.

(6) Install surface control lock over fin and rudder.

STORAGE.

The all-metal construction in your Cessna makes outside storage practical. Inside storage will increase its life just as inside storage does for your car. If an airplane must remain inactive for a time, cleanliness is probably the most important consideration — whether your airplane is inside or outside. A small investment in cleanliness will repay you many times not only in keeping your airplane looking like new, but in keeping it new.

While the airplane is stored, turn the propeller by hand, or have it turned, every few days to keep the bearings, cylinder walls and internal parts lubricated. If the storage is to be for an extended period and turning the propeller is impractical, the engine should be preserved in accordance with Continental Motors Corporation instructions. If the airplane is stored outside, leave the propeller in a horizontal position, to prevent water seepage into the hub mechanism. Filling the fuel tanks will help prevent condensation and increase the life of tanks, lines and fittings.

Airplanes are built to be used and regular use tends to keep them in good condition. An airplane left idle for any great length of time is likely to deteriorate more rapidly than if it is flown regularly, and should be carefully checked over before being put back into service.

LIFTING AND JACKING.

The airplane may be lifted by a sling around the aft section of the fuselage and a sling attached to the engine mount-to-fuselage attachment fitting or to lifting lugs on the engine. The cowl upper half must be removed for application of the sling at the engine mount-to-fuselage attachment fitting.

Jacking point brackets and hoisting rings are available as optional equipment and insure easy, safe handling of the airplane. A block of hardwood sawed at an angle to fit between the fuselage and the landing gear spring may be used as a jacking point to hold the airplane when working on a wheel or tire. *Do not use the brake casting as a jacking point.*

LANDING GEAR, WHEELS, AND TIRES.

The landing gear consists of a single tapered spring steel leaf for each leg which is made from the highest quality chrome-vanadium steel, heat treated and shot peened for added fatigue resistance. No maintenance of this spring is necessary other than paint to prevent rusting.

Correct tire pressure is essential to realize the full benefit of the spring landing gear properties and obtain maximum tire wear. Correct air pressure for a 6.00 x 6 six-ply tire is 28 lbs./sq. inch gage pressure. An accumulation of oil and grease on the tires will have an adverse effect on tire life and should be removed with soap and water. The 6.00 x 6 wheel is a two piece type, cast of magnesium alloy and equipped with a single disc type brake.

To check tire pressures or inflate the tires on airplanes equipped with tubeless tires use the filler needle stowed in the glove box and follow the instructions which accompany it. To change a tubeless tire, remove the wheel from the airplane, completely deflate the tire and disassemble the wheel halves. With the wheel disassembled, protect from damage the inner wheel flanges and the large O-ring between the two halves, to prevent leaks.

On crosswind gear-equipped airplanes, remove the wheel and brake assembly intact. The wheel then may be disassembled in the usual manner.

When reassembling the wheel halves, torque the wheel bolts to 83 pound-feet, drawing them all down together to avoid warping the wheel.

The wheel alignment has been properly set at the factory. Wheels should have zero toe-in and zero camber with the airplane in a three-point attitude and loaded with full fuel and oil and two people in the front seats. Excessive tire wear indicates an improper wheel setting for the "on the ground" weight at which you are operating. See your dealer or distributor for re-alignment.

The brake master cylinders, located in the cabin at the rudder and brake pedals, incorporate a reservoir of brake fluid to replace leakage losses. The reservoir should be kept full and should be checked periodically. The brake master cylinders should be serviced, as required, with MIL-H-5606, a petroleum base hydraulic fluid. *(Do not use castor oil base hydraulic fluid.)* Adjustment of the brake is not necessary. Whenever the brakes feel spongy, bleed out the entrapped air from the top of the actuating cylinder at the brake and refill the hydraulic reservoir at the pedals.

The tailwheel tire is removed and replaced by taking the tailwheel apart the same as the main wheel. Correct tailwheel pressure is 35 lbs./sq. inch gage pressure.

FLOAT AND AMPHIBIOUS GEAR.

For all maintenance and lubrication required on Edo floats and amphibious floats, refer to the Edo manuals. These Edo manuals also give proper ground handling, mooring, beaching, lifting and jacking instructions for your float or amphibious airplane. For any maintenance not peculiar to floatplanes and not covered in Edo manuals, follow the requirements listed in this section of your owners manual.

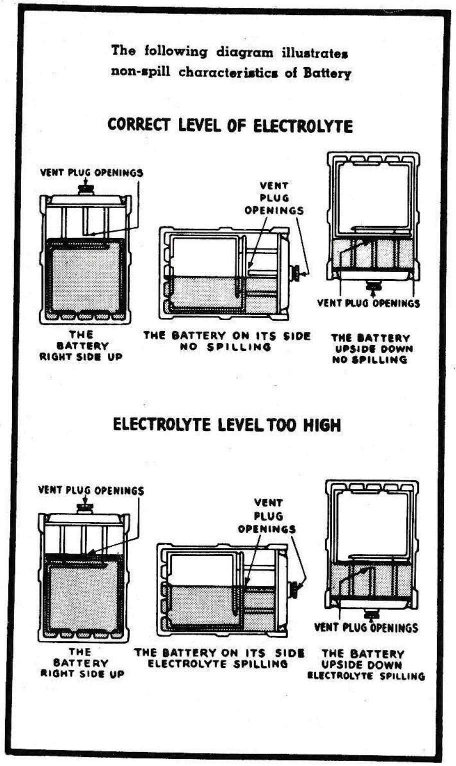
BATTERY.

The battery is located behind the baggage compartment and is accessible by opening the rear baggage compartment wall.

Check the battery electrolyte level at least every 30 days, and oftener in hot weather. With the airplane in three-point position, add distilled water to maintain the electrolyte level even with the center hole in the horizontal baffle plate (the plate with holes in it approximately two inches below the filler plug). With the airplane level, the electrolyte should be even with the baffle plate. *Do not overfill.* The space above the baffle plate acts as a reservoir to contain the electrolyte when the battery is tipped or inverted. If the battery is overfilled, the reservoir cannot retain the excess, which will spill from the vents during maneuvers.

Keep the battery connections clean and tight, for full battery voltage and proper operation of the voltage regulator. When checking the battery, neutralize any spilled electrolyte and corrosion deposits with a baking soda solution, followed by a thorough rinsing. Do not use excessive amounts of baking soda solution.

Normally, the airplane should not be operated with the master switch in the "OFF" position nor should it be operated without a battery or with battery disconnected. Damage to the generator and the voltage regulator may be the result.



WINDSHIELD AND WINDOWS.

The windshield is a single, full-floating unit of free-blown "Longlife" plastic. To clean and prevent scratches and crazing, wash the windshield and plastic windows carefully with plenty of soap and water, using the palm of the hand to feel and dislodge dirt and mud. A soft cloth, chamois or sponge may be used, but only to carry water to the surface. Rinse thoroughly, then dry with a clean, moist chamois.

Rubbing the surface of the plastic builds up an electrostatic charge so that it attracts dust particles in the air. Wiping with a moist chamois will remove both the dust and this charge.

Remove oil and grease with a cloth moistened with kerosene. Never use gasoline, benzine, alcohol, acetone, carbon tetrachloride, fire extinguisher

or anti-ice fluid, lacquer thinner or glass cleaner. These materials will soften the plastic and may cause it to craze.

After removing dirt and grease, if the surface is not seriously scratched it should be waxed with a good grade of commercial wax. The wax will fill in minor scratches and help prevent further scratching. Apply a thin, even coat of wax and bring it to a high polish by rubbing lightly with a clean, dry soft flannel cloth. Do not use a power buffer; the heat generated by the buffing pad will soften the plastic.

Do not use a canvas cover on the windshield unless snow or freezing rain is anticipated. Canvas covers may cause the plastic to craze.

ALUMINUM SURFACES.

The clad aluminum surfaces of your Cessna require only a minimum of care to keep them bright and clean. The airplane may be washed with clear water to remove dirt; oil and grease may be removed with gasoline, naphtha, carbon tetrachloride or other nonalkaline solvents. While household detergent soap powders are effective cleaners, they should be used cautiously since some are strongly alkaline and may attack the aluminum.

Dulled aluminum surfaces may be cleaned effectively with a mixture of about two quarts of denatured alcohol, two quarts of water and a package of powdered Bon Ami.

PAINTED SURFACES.

With only a minimum of care, the painted exterior of your Cessna will retain its brilliant gloss and rich color for many years. The paint should not be waxed or polished for approximately 30 days after it is applied so that any solvent remaining in the paint may escape. After this initial curing period, regular waxing with a good automotive wax will help preserve the luster and will afford a measure of protection from damage.

Fluids containing dyes, such as fuel and hydraulic oil, if accidentally spilled on the surface should be flushed away at once to avoid a permanent stain. Battery electrolyte must be flushed off at once, and the area neutralized with an alkali such as baking soda solution, followed by a thorough rinse with clear water.

ENGINE COMPARTMENT.

The engine section should be kept free of an accumulation of oil, grease, and dirt to prevent a fire hazard. The bulkhead between the cabin and the engine section is stainless steel and may be cleaned with recommended solvent cleaners for grease and oil.

Under average conditions, the oil should be changed, the oil filter screen removed and cleaned and the carburetor air filter serviced every 25 hours. Under more severe dust conditions, the carburetor air filter should be serviced more frequently; daily servicing is recommended when extremely dusty conditions are encountered. The service instructions on the filter should be followed.

If the optional oil filter is installed, it should be replaced whenever the oil on the dipstick appears dirty, or at least at every fourth oil change (100 hours).

INTERIOR CARE.

Keeping the inside of your airplane clean is no more difficult than taking care of the rugs and furniture in your home. It is a good idea to occasionally take the dust out of the upholstery with a whisk broom and a vacuum cleaner.

If spots or stains get on the upholstery, they should be removed as soon as convenient before they have a chance to soak and dry. Cleaning fluids having a carbon tetrachloride or a naphtha base are recommended. Soap or detergents and water are not recommended for use on the seats since they will remove some of the fire retardant with which the seats have been treated. When using recommended cleaners, the following method is suggested:

(1) Carefully brush off and vacuum all loose particles of dirt.

(2) Wet a small, clean cloth with cleaning fluid and wring out thoroughly. Then open the cloth and allow the fluid to evaporate a trifle.

NOTE

Don't use too much fluid. The seat cushions are padded with foam rubber, and since some volatile cleaners attack rubber, these pads may be destroyed if the material gets soaked with the cleaner.

(3) Tap the spot lightly with the cloth, but don't rub it. Tapping the fabric will pick up particles which are embedded too deeply to be removed by brushing. Repeat several times, using a clean part of the cloth each time.

(4) Moisten another piece of clean cloth with cleaner and allow to evaporate until barely damp. Now rub the spot lightly, working from the outside in toward the center. (This keeps the spot from spreading and is less likely to leave a ring). If necessary, repeat several times. Brush again, to remove any further particles which may have become loosened.

Spots or stains on the vinyl headliner material and Royalite door and side panels are easily removed using a clean cloth slightly dampened with water. A few light strokes over the area usually removes all dirt. Persistent stains may be removed by using a mild soap. The soap should be removed thoroughly with a clean damp cloth and the area dried after cleaning.

PROPELLER.

Maintenance of the constant speed propeller on your 180 should offer no problem. Standard, periodic inspection and lubrication of the propeller and spinner will discover any minor propeller troubles before they have a chance to become serious. An occasional wiping of the propeller blades with an oily cloth will result in cleaning off grass and bug stains and will assist materially in corrosion-proofing in salt water areas. Oil and grease stains may be removed with carbon tetrachloride or any non-alkaline grease solvent. Before entering the airplane, examine the propeller for oil leakage and check the blades for nicks and cracks. In ground test, follow the recommended procedure of checking the operation of the propeller through its full range. It is advisable to turn the propeller into a horizontal position when preparing the airplane for tie-down or hangaring. This position prevents water from draining between the clamp and blade into the blade bearing.

Propeller maintenance is limited to dressing out small blade nicks, minor repairs to the spinner, cleaning and lubrication which does not require disassembly. Maintenance and repairs requiring disassembly of the propeller may be done only by a CAA-authorized propeller repair station. Contact your Cessna Dealer about such work. He will be happy to help you.

CONTROL SYSTEMS.

Figures 5-2 to 5-9 inclusive outline the flight control systems, showing the cable routing, control travel limits, and the locations of control travel stops and cable turnbuckles. The single-wrap method of safetying turnbuckles, using .040 Monel wire is satisfactory and approved by the CAA. Procedures for rigging the control systems are outlined in the following paragraphs.

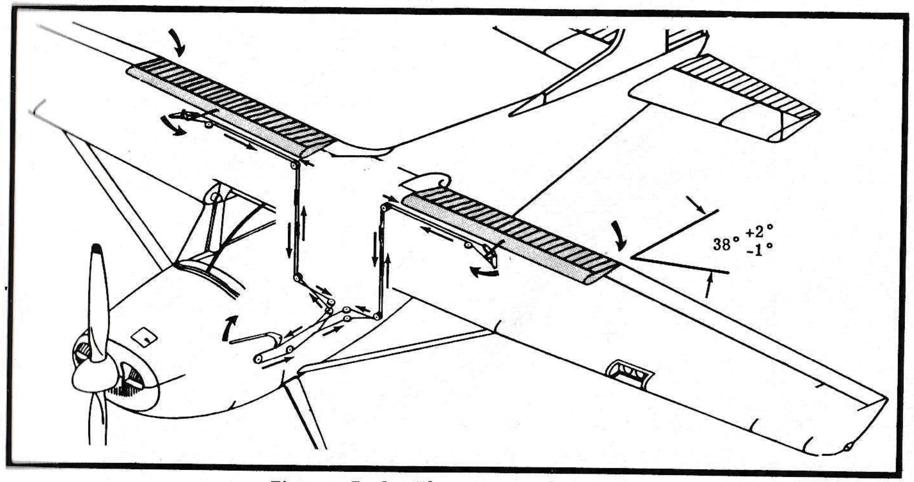


Figure 5–2. Flap Control System

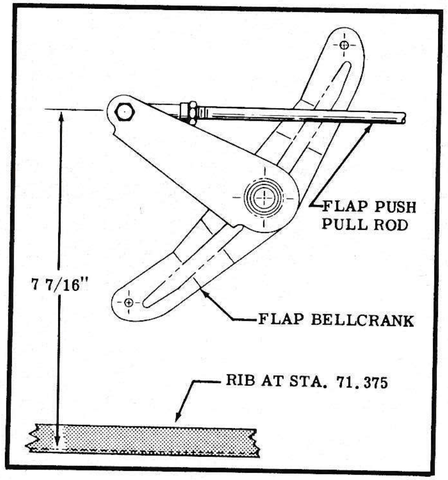


Figure 5-3. Flap Bellcrank Adjustment

FLAPS

(1) Place the flap handle in the 0° flap position.

(2) Hold the flap in the full-up position by applying firm hand pressure upward and forward against trailing edge of flap.

(3) Adjust the flap push-pull rod until the flap bellcrank is in the position shown in figure 5-3.

(4) Release the hand pressure that was applied to the flap trailing edge in step 2 and tighten the flap-up cable turnbuckle located behind the rear cabin door post until the cable has a tension of 20-40 lbs.

(5) Repeat steps 2 thru 4 for the opposite flap.

(6) Move flap handle to the flap full-down position.

(7) Tighten the turnbuckles of the flap-down cables until the cables have a tension of 20 to 40 pounds.

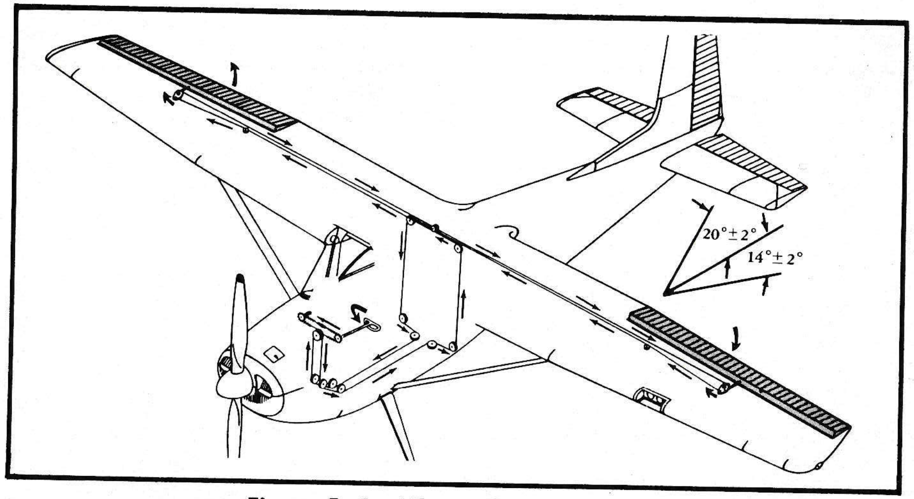


Figure 5-4. Aileron Control System

AILERONS

(1) Place control wheels in neutral position and place a neutral bar across the top of both wheels, using tape or a clamp to secure them. Install chain over sprockets, leaving approximately nine links inboard of the chain guard on each side of the turnbuckle.

(2) String cables back through system.

(3) The ailerons are restricted in travel by a feature built into the bellcranks. Stops in the bellcrank allow a total travel of 34°. In rigging the ailerons, it is important that the bellcranks are neutralized. Connect the cables and adjust bellcrank to a position as shown in figure 5-5. Cable tension should be approximately 30 pounds with the control wheels full-forward. Maintain this position in checking tension.

(4) Adjust ailerons to neutral position by reference to the wing flaps. This adjustment is made by disconnecting the aileron push-pull tube from the bellcrank, and making adjustment on the rod end at the aileron.

(5) Check travel, which should be 20° up and 14° down with a tolerance of plus or minus 2°.

(6) Check control for correct function: wheel right, right aileron up, left aileron down.

(7) Any correction necessary on the travel can be made by tightening the direct cable and loosening the carry-through cable, or vice versa. *Note:* After corrections have been made, recheck aileron neutral position and readjust per instructions in Step 4.

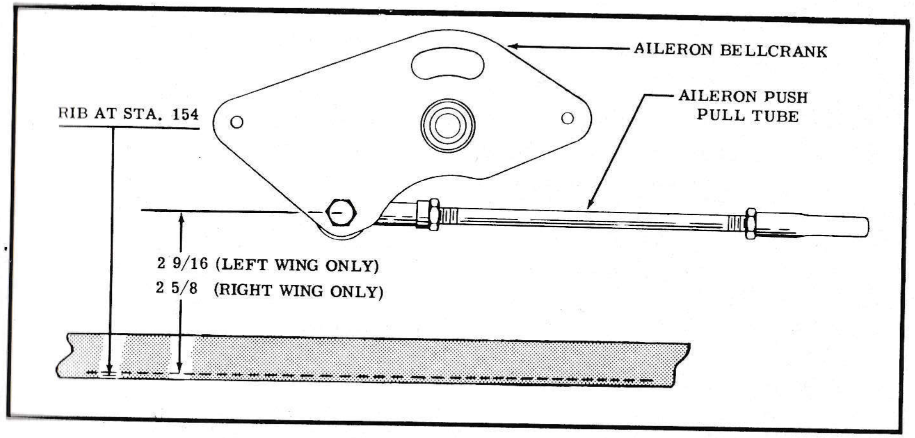


Figure 5-5. Aileron Bellcrank Adjustment

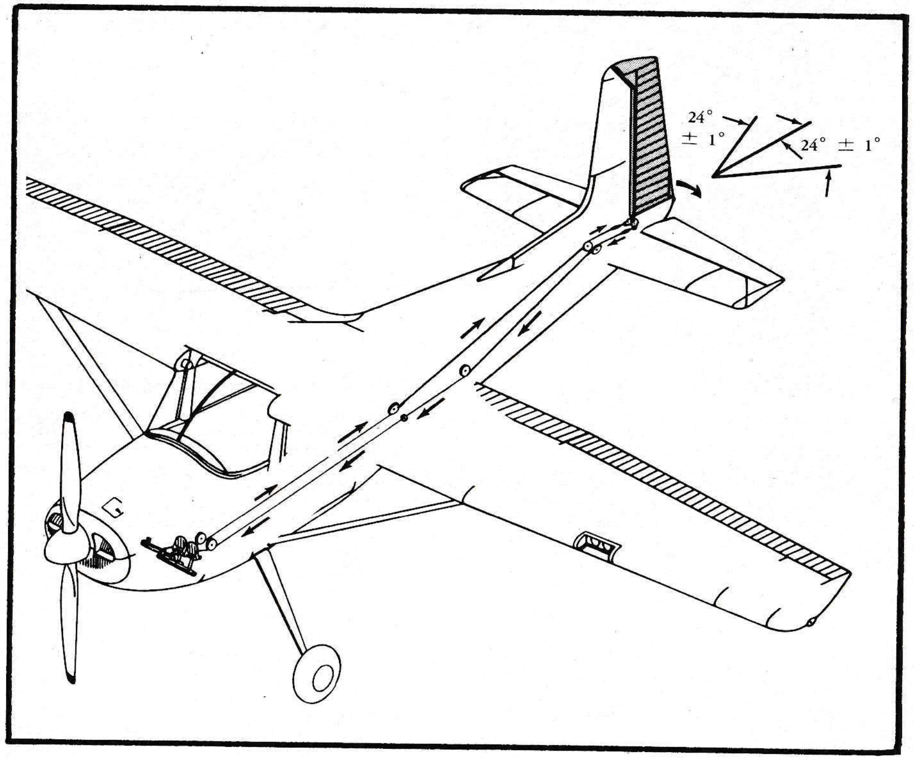


Figure 5–6. Rudder Control System

RUDDER

Rudder travel is 24° left and 24° right of centerline of the airplane, with a tolerance of plus or minus 1°. Travel is controlled by stops located on the extreme rear fuselage bulkhead. Adjustment is made by screwing the bolts, which serve as stops, in or out.

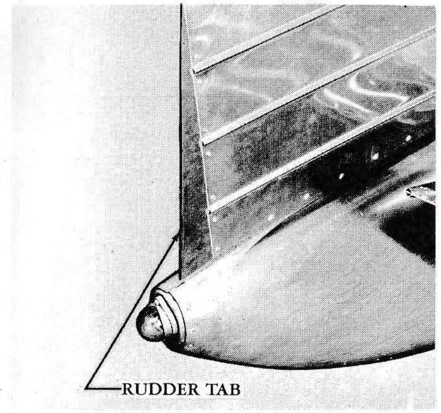
(1) Rig stops to allow correct travel of rudder.

(2) Install cables and, with the rudder in neutral position, tighten turnbuckles until rudder pedals are neutral, 6 inches aft of the firewall, measuring to the hingeline of the brake pedal. Tension should be 20 to 40 lbs.

(3) Check to make sure cables do not rub side holes in bulkheads.

RUDDER TAB.

The rudder tab is a fixed tab located on the trailing edge of the rudder and can be set by bending, in either direction, the amount desired.



ELEVATORS

Elevator travel is 25° ±1° up and 23° ±1° down with the stabilizer in its full-down position. This travel is controlled by two stops located adjacent to the rear elevator bellcrank in the rear of the fuselage.

(1) Move the stabilizer trim wheel until the stabilizer is full-down.

(2) Streamline the elevator with the stabilizer for neutral position.

(3) Set the aft elevator bellcrank stops for an elevator travel of 25° ±1° up and 23° ±1° down.

(4) With elevator in full down position, the measurement from firewall to the edge of the chain sprocket hub on the control column should be ½″

(5) Tighten cables to approximately 20 to 40 lbs.

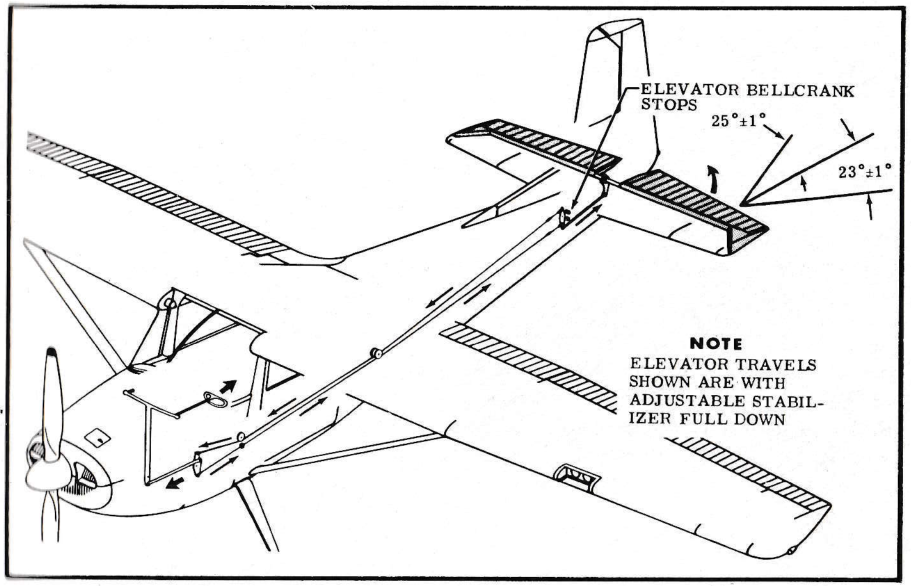


Figure 5–7. Elevator Control System

STABILIZER TRIM CONTROL

The stabilizer trim is changed by screw-jack actuators linked by a chain and cable system to the stabilizer control wheel. Down travel of the stabilizer is limited by a horizontal bulkhead and upward travel is limited by a fixed stop. *Note:* The stabilizer must be removed to rig the screw-jack actuators.

(1) Install cables. Turn stabilizer control wheel to full-back position and the screw-jack actuators to full-down position.
(2) Set the chain on the sprockets at the actuators and the control wheel, allowing two chain links to extend forward of the bulkhead in front of the left actuator.
(3) Tighten the cables to a tension of 10 to 15 pounds.
(4) Install stabilizer and fin.
(5) Check the operation of the system by turning the control wheel full forward to see if the stabilizer moves through its full operational range.
(6) Reinstall remaining tail surfaces, tail cone, fairing, and inspection plates removed for the above steps.

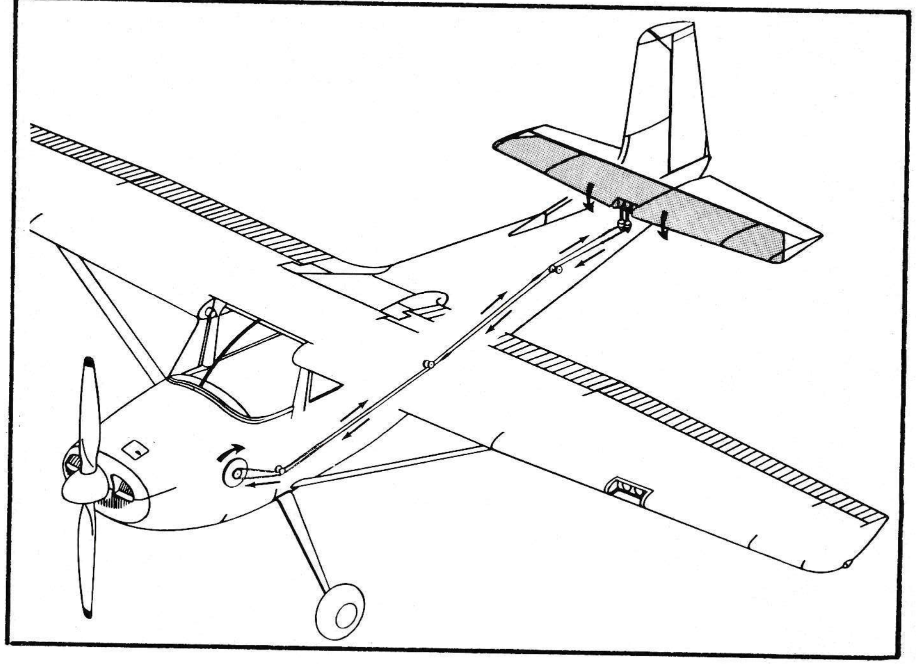


Figure 5–8. Adjustable Stabilizer Control System

COWL FLAPS

Rig the cowl flaps as shown in figure 5-9.

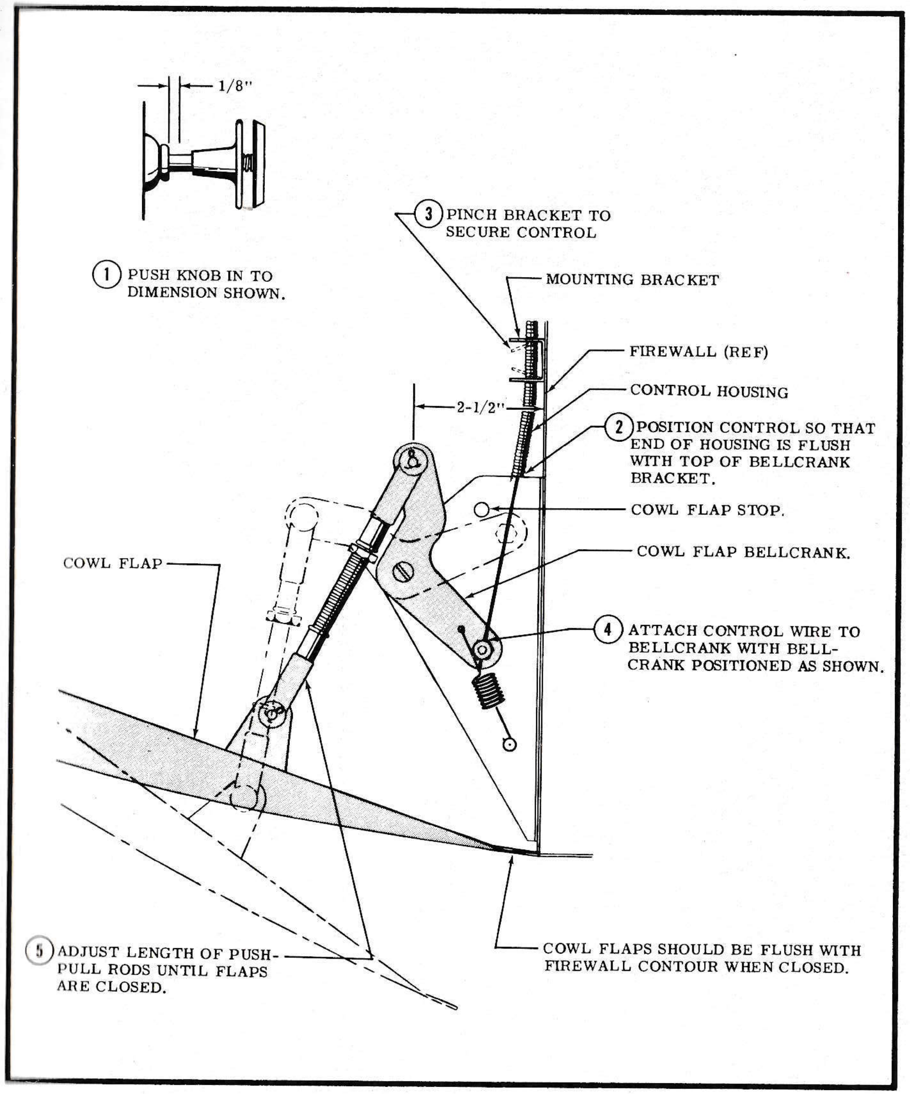


Figure 5–9. Cowl Flap Adjustment

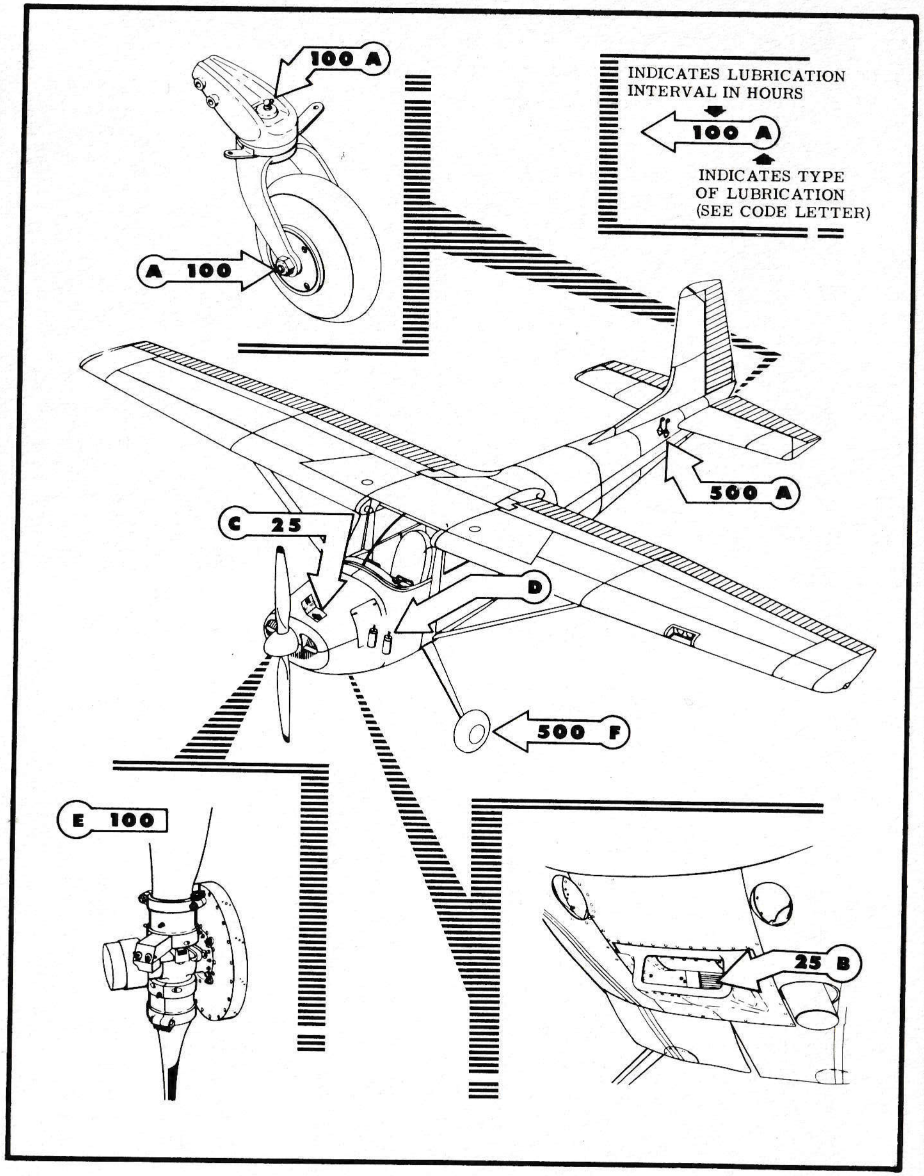


Figure 5-10. Lubrication Diagram

CARE — RESPONSIBILITIES

LUBRICATION CODE

Code Letter

A——MIL-L-7711 — Grease

B——Carburetor Air Filter — Service every 25 hours or oftener when operating in dusty conditions. Under extremely dusty conditions, daily maintenance of the air filter is recommended. Service the air filter in accordance with the instructions stamped on it.

C——Engine Oil Sump — Check dip-stick before each flight. Drain and refill every 25 hours, and clean oil filter screen.

D——Brake Master Cylinder — Should be checked and refilled periodically with MIL-H-5606 Hydraulic Oil (Petroleum base).

E——Hartzell propeller — Grease propeller every 100 hours. To prevent entrapping air and high pressures, remove the grease fitting adjacent to the fitting being greased. Fill each fitting until grease oozes from adjacent fitting hole. Add equal amounts of grease at each clamp to retain propeller balance.

When lubricating Hartzell propellers, the following greases are recommended in the order of listing:

a. Lubriplate 630 AA
Fiske Brothers, Newark, N. J.
b. Stroma HT-1 (Z-801 Grease)
Union Oil Co. of California.
c. RPM Aviation Grease No. 2
Standard Oil Co. of California.
d. Stroma LT-1 (Z-815 Grease)
Union Oil Co. of California.
e. RPM Aviation Grease No. 1
Standard Oil Co. of California.
f. Lubriplate 707
Fiske Brothers, Newark, N. J.
g. Mobilgrease Aero General Purpose
Socony Mobil Oil Co.
h. No. 84 Medium Grease
Keystone Lubricating Co.
i. Texaco Regal Starfak Special.

McCauley Propeller — Mechanism is sealed and requires no lubrication between overhauls.

F——MIL-L-3545 Wheel Bearing Grease.

LUBRICATION AND SERVICING.

Specific lubrication points, intervals and specifications are shown on figure 5-9. In addition, all pulleys, control surface hinge bearings, bellcrank clevis bolts, flap actuating handle, brake pedal pivots, rudder pedal cross-bars, door hinges and latches, Bowden controls, throttle and control rod universal (if unsealed), should be lubricated with SAE 20 General Purpose oil every 1,000 hours or oftener as required.

In general, roller chains (aileron, stabilizer wheel, stabilizer actuator) and control cables tend to collect dust, sand and grit when they are greased or oiled. Except under seacoast conditions, more satisfactory operation results when the chains are wiped clean occasionally with a clean, dry cloth.

The lubrication and servicing intervals shown in the chart are recommended as maximum for average conditions. Under more severe conditions, these intervals should be shortened accordingly.

The fuel tank sumps and fuel lines should be drained at least every 100 hours, to remove accumulated water and sediment. Sump drain plugs are located on the underside of each wing and the line drain plug is on the underside of the fuselage, directly beneath the fuel tank selector valve.

The air filters on the gyro instruments and the servo units of the Tact-air autopilot should be replaced every 25 hours, or oftener if severe dust conditions are encountered. Sluggish or erratic gyro response with normal suction gage reading indicate the filters are clogged with dirt. The vacuum pump oil separator should be removed, flushed with solvent, dried and replaced at 100-hour intervals. The screen on the suction relief valve should be checked occasionally and if it is dirty, should be removed, washed with solvent and replaced. If suction gage readings are too high, check the screen before attempting to adjust the relief valve.

WING ADJUSTMENT.

Initial rigging is accomplished by setting the two eccentric bushings on each rear spar attachment at neutral position. These two eccentric bushings should always be rotated together whenever the setting is changed. Never rotate them separately. If flight test shows excessive wing heaviness, re-rig by rotating the proper bushings, which will increase or decrease the angle of attack of the wing.

AIRPLANE FILE.

There are miscellaneous data, information and licenses that are a part of the airplane file. The following is a check list for that file:

A. To be carried in the airplane at all times:
  (1) Aircraft Registration Certificate (Form ACA 500A).
  (2) Aircraft Airworthiness Certificate (CAA Form ACA 1362).
  (3) CAA approved flight manual.
  (4) Airplane Radio Station License (if transmitter installed).
  (5) Airplane Log Book.
  (6) Engine Log Book.

B. To be maintained but not necessarily carried in the airplane at all times:
  (1) Weight and Balance Report or latest copy of the Repair and Alteration Form 337.
  (2) Equipment List.
  (3) A form containing the following information: Model, Registration Number, Factory Serial Number, Engine Number and Key Number (duplicate keys are available through your Cessna dealer).

Most of the requirements listed under items A and B are requirements of the United States Civil Air Regulations. Since the requirements of other nations may differ from this list, owners of exported airplanes should check with their own aviation officials to determine their individual requirements.

INSPECTION SERVICE AND INSPECTION PERIODS.

With your airplane you will receive an Owner's Service Policy. This policy has coupons attached to it which entitle you to an initial inspection and a no-charge 100 hour inspection. If you take delivery from your Dealer, he will perform the initial inspection before delivery of the airplane to you. If you pick up the airplane at the factory, plan to take your Cessna to your Dealer reasonably soon after you take delivery of it. This will permit him to check it over and to make any other minor adjustments that may appear necessary. Also, plan an inspection by your Dealer at 100 hours or 90 days, whichever comes first. This inspection also is performed by your Dealer for you at no charge. While these important inspections will be performed for you by any Cessna Dealer, in most cases you will prefer to have the Dealer from whom you purchase the airplane accomplish this work for you.

Civil Air Regulations require all airplanes to have a periodic (annual) inspection as required by the administrator, performed by a person designated by the administrator. In addition, 100-hour periodic inspections made by an "appropriately rated mechanic" are required if the airplane is flown for hire. The Cessna Aircraft

Company recommends the 100-hour periodic inspection for your airplane. The procedure for this 100-hour inspection has been carefully worked out by the factory and is followed by the Cessna Dealer organization. The complete familiarity of the Cessna Dealer organization with Cessna equipment and with factory-approved procedures provides the highest type of service possible at lower cost.

Time studies of the 100 hour inspection at the factory and in the field have developed a standard flat-rate charge for this inspection at any Cessna Dealer. Points which the inspection reveals requiring modification or repairs will be brought to the owner's attention by the dealer and quotations or charges will be made accordingly. The inspection charge does not include the oil required for the oil change.

Every effort is made to attract the best mechanics in each community to Cessna service facilities. Many Dealers' mechanics have attended Cessna Aircraft Company schools and have received specialized instruction in maintenance and care of Cessna airplanes. Cessna service instruction activity in the form of service bulletins and letters is constantly being carried on so that when you have your Cessna inspected and serviced by Cessna Dealers' mechanics the work will be complete and done in accordance with the latest approved methods.

Cessna Dealers maintain stocks of genuine Cessna parts and Service facilities consistent with the demand.

Your Cessna Dealer will be glad to give you current price quotations on all parts that you might need and will be glad to advise you on the practicability of parts replacement versus repairs that might, from time to time, be necessary.

100-HOUR INSPECTION.

Prior to the inspection, the engine should be run up to check for general engine smoothness, magneto drop, and generator operation. Any irregular engine indications should be noted.

During preliminary run-up:

a. Check all engine instrument readings.
b. Exercise propeller, noting response through pitch range.
c. Check magneto drop, noting particularly any difference between drop on left and right magnetos.
d. Check engine response to changes in power.
e. Check all engine controls for smooth operation.

I. Remove or open the following access openings, cowlings, fairings and inspection plates.
  1. Round inspection plates at upper end of wing struts.
  2. Lower half of wing root fairings.

  3. Round inspection plate at aileron bellcrank and at inboard end of ailerons on underside of wings.
  4. Round inspection plates at flap bellcrank and in wing flap well.
  5. Propeller spinner.
  6. Tail group fairings.
  7. Engine cowl.
  8. Three round inspection plates on the underside of the cabin section outside skins.
  9. Landing gear strut fairings.
  10. Inspection plates under carpet between front and rear seats.
  11. Tunnel covers between the front seats.
  12. Open curtains at the aft end of the baggage compartment for access to the interior of the tail cone. Open the headliner zipper above the rear seat.

II. Engine Check.
  1. Inspect cowling and propeller spinner for condition.
  2. Check starter and generator for leaks and security. Wipe or wash off any oil seepage at pinion gear shaft in starter adapter.
  3. Check oil pan and cylinder bases for oil leakage.
  4. Wash down the engine with a good solvent.
  5. Check engine mounting bolts for security.
  6. Remove rocker box covers and check general condition of valve parts to disclose any improper oiling or wear.
  7. Check intake manifold, elbows and rubber connections for condition and security.
  8. Remove spark plugs, clean, check gap clearance (.015 to .018), test and replace, using solid copper gaskets.
  9. Check high tension cables for security and condition.
  10. McCauley Propeller:
     a. Blades for nicks, cracks, bends, corrosion.
     b. Hub for cracks, oil leaks, loose nuts, safeties.
     c. Blade angle at low pitch.

     Hartzell Propeller:
     a. Blades for nicks, cracks, bends, corrosion.
     b. Hub for cracks, oil leaks, corrosion; loose attaching bolts, dowel pins and safeties; counterweights for cracks, corrosion, loose attaching bolts; weight slugs for loose screws and broken safeties.
     c. Blade angle at low pitch.
     d. Blade clamp lubrication.
  11. Check governor for leaks, security.

12. Check for full range movement of carburetor throttle arm, mixture control lever, carburetor heater control valve, cowl flap, propeller governor and their controls.
13. Check all engine baffles for cracks, position and security of fastening.
14. Remove oil screen. Clean, inspect and replace it, using new gaskets. Change optional oil filter.
15. Check magneto timing.
16. Check the exhaust system for cracks, loose connections, leaks and condition.
17. Check cabin heat and carburetor heat hoses and shrouds for leaks, burning and general condition.
18. Check intake air box for cracks and leaks. Remove and service air filter. If flocking is worn or screen damaged, replace filter.
19. Check cowl flaps for correct rig, security, damage.

III. Fuel drains.

1. Drain wing tank fuel sumps.
2. Drain sediment and water by removing fuel line drain plug on the underside of the fuselage.
3. Remove and clean fuel strainer bowl and screen; replace, tighten and safety.
4. Remove drain plug from bottom of carburetor float chamber, remove and clean strainer. Turn fuel on and flush out any water, sediment or trapped air, replace strainer and plug. Safety the plug.

IV. Landing Gear, Steering and Brakes.

1. Examine tires, wheels, and struts for wear and damage. Check tire inflation.
2. Test operate brakes to disclose excess pedal travel or sponginess.
3. Check brake lining wear with feeler gage. Visually check condition of brake discs, disc keys and anti-rattle clips.
4. Check level of brake fluid.
5. Check tailwheel steering system for operation and condition.
6. Kick each main wheel fore-and-aft, observing strut-to-fuselage attachments. Check tightness and security of strut-attaching bolts and U-bolts.
7. Check tailwheel and spring for damage, steering cables for frays, tension.

V. Wings.

1. Check front and rear wing bolts attaching wings to fuselage.
2. Check strut bolts for security.

3. Check all wing control surfaces for freedom of movement and bolts for security.
4. Check aileron bellcranks, pulleys, cables. Check for correct aileron travel.
5. Check flap bellcranks, tracks, and pulleys. Check for correct flap travel.

VI. Empennage and Surfaces.

1. Check both stabilizer and vertical fin for possible damage.
2. Check attaching bolts on both fin and stabilizer for security.
3. Check rudder and elevator attaching bolts for security and surfaces for freedom of movement.
4. Check elevator and rudder hinges.
5. Check operation and travel of rudder, elevator and stabilizer trim control systems.

VII. Cabin and Fuselage.

1. Check cleanliness and condition of cabin, upholstery and transparent plastic areas.
2. Check front seat travel stops and seat adjustment mechanism.
3. Check seat belts, buckles and attaching fittings.
4. Check door hinges, door and window latches.
5. Replace instrument air filters (optional gyros only).
6. Check instruments for correct function and instrument dial markings for accuracy and legibility.

VIII. Electrical System.

1. Check electrical system by operating the lights, starter, radio and all accessories which are incorporated in the electrical system.
2. Check level and specific gravity of battery electrolyte. Check battery terminals and cables for corrosion and security.

CESSNA Sales and Service DEALERS

CROSS COUNTRY SERVICE

On your cross country travels make it a point to stop at a Cessna service station for your service requirements. Your Dealer will be glad to supply you with a copy of a current service station list, or if you wish, you may write to the Service Department, Cessna Aircraft Company, Wichita, Kansas, asking for it and it will be promptly mailed to you.

CESSNA SERVICE PUBLICATIONS

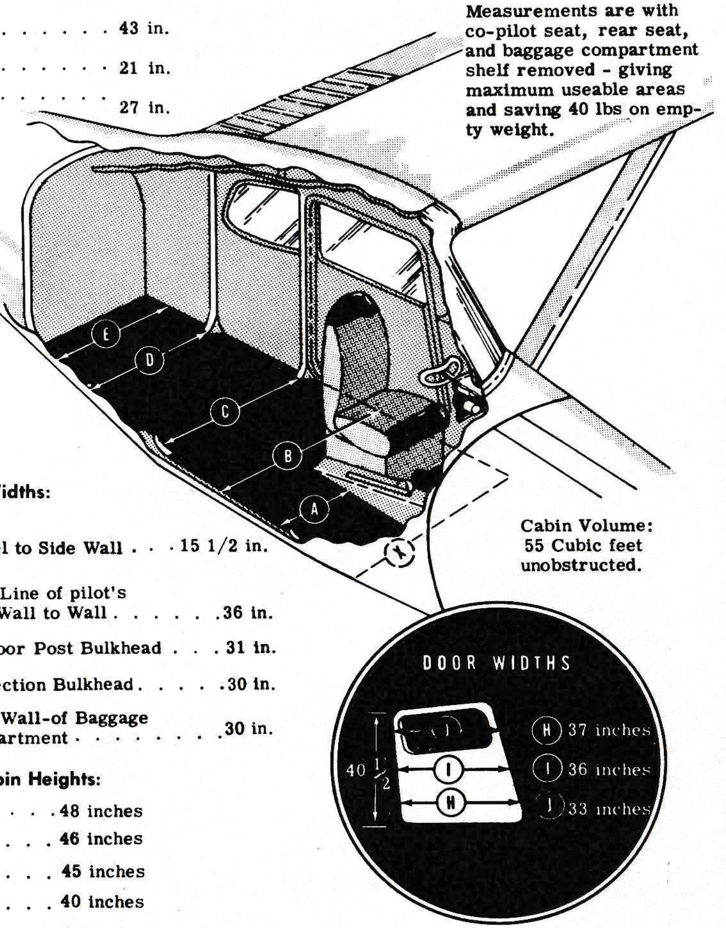
The Cessna Aircraft Company publishes and revises, as necessary, Manuals, Parts Catalogs, Service Letters and Service News Letters. This material goes to all authorized Cessna Service Stations so that they have the latest authoritative information for servicing your Cessna.

Your Cessna Dealer has an owner follow-up system to notify you when he receives information that applies to your Cessna. In addition, if you wish, you may choose to receive similar notification directly from the Cessna Service Department. A subscription card is supplied to you in your airplane file for your use, should you choose to request this service. Your Cessna Dealer will be glad to supply you with details concerning these follow-up programs, and stands ready through his Service Department to supply you with fast, efficient, low cost service.

Cabin (floor) Lengths:

FROM	TO	
E	C	43 in.
C	B	21 in.
B	X	27 in.

NOTE
Measurements are with co-pilot seat, rear seat, and baggage compartment shelf removed - giving maximum useable areas and saving 40 lbs on empty weight.



Cabin (floor) Widths:

At Point		
A	Tunnel to Side Wall	15 1/2 in.
B	Rear Line of pilot's Seat-Wall to Wall	36 in.
C	Aft Door Post Bulkhead	31 in.
D	Aft Section Bulkhead	30 in.
E	Rear Wall-of Baggage Compartment	30 in.

Cabin Volume: 55 Cubic feet unobstructed.

Cabin Heights:

AT:	
A	48 inches
B	46 inches
C	45 inches
D	40 inches
E	21 inches

INTERNAL CABIN MEASUREMENT

Section VI

operational data

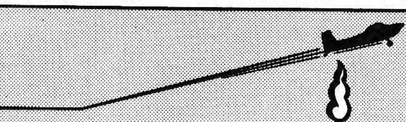
THE OPERATIONAL DATA shown on the following pages are compiled from actual tests with the airplane and engine in good condition and using average piloting technique and lean mixture. You will find this data a valuable aid when planning your flights. However, inasmuch as the number of variables involved precludes great accuracy, an ample fuel reserve should be provided. The graphs make no allowance for wind, navigational error, pilot technique, warm-up, take-off, climb, etc. All of these factors must be considered when estimating reserve fuel.

In addition to the advantages of comfort and safety, airplanes are primarily an exceptionally rapid mode of transportation. Therefore, to realize the maximum usefulness from your Cessna, take advantage of the power your engine can develop. For normal cruising, choose a cruising power setting which gives you a fast cruising speed. If your destination is over 600 miles, it may pay you to fly at lower power settings, thereby increasing your range and allowing you to make the trip non-stop with ample fuel reserve. Use the range charts to solve flight planning problems of this nature.

MODEL 180 LANDPLANE				MODEL 180 FLOATPLANE & AMPHIBIAN			
FLAPS UP		FLAPS DOWN		FLAPS UP		FLAPS DOWN	
IAS	TIAS	IAS	TIAS	IAS	TIAS	IAS	TIAS
60	68	40	56	60	66	40	54
80	82	50	60	80	80	50	59
100	100	60	67	100	98	60	65
120	118	70	74	120	118	70	72
140	138	80	83	140	136	80	81
160	157	90	92	160	155	90	90
180	176	100	101			100	101

Figure 6-1. Airspeed Correction Table

LANDPLANE TAKE-OFF DATA

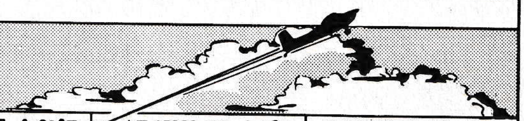


TAKE OFF DISTANCE WITH 20° FLAPS FROM HARD SURFACE RUNWAY

GROSS WEIGHT LBS.	HEAD WIND MPH	AT SEA LEVEL & 59°F. GROUND RUN	AT SEA LEVEL & 59°F. TO CLEAR 50' OBSTACLE	AT 2500 FT. & 50°F. GROUND RUN	AT 2500 FT. & 50°F. TO CLEAR 50' OBSTACLE	AT 5000 FT. & 41°F. GROUND RUN	AT 5000 FT. & 41°F. TO CLEAR 50' OBSTACLE	AT 7500 FT. & 32°F. GROUND RUN	AT 7500 FT. & 32°F. TO CLEAR 50' OBSTACLE
2100	0	335	715	390	810	465	935	560	1100
	15	185	465	225	540	270	625	330	745
	30	75	260	95	305	125	365	160	450
2400	0	440	895	525	1040	630	1210	770	1465
	15	255	600	310	700	380	835	475	1020
	30	115	350	150	420	190	510	245	640
2650	0	555	1080	665	1260	790	1500	965	1835
	15	330	735	405	865	490	1050	655	1345
	30	160	445	205	535	255	665	335	845

NOTE: INCREASE DISTANCES 10% FOR EACH 25 DEGREES F. ABOVE STANDARD TEMPERATURE FOR PARTICULAR ALTITUDE

LANDPLANE CLIMB DATA



GROSS WEIGHT LBS.	AT SEA LEVEL & 59°F BEST CLIMB IAS MPH	AT SEA LEVEL & 59°F RATE OF CLIMB FT/MIN	AT SEA LEVEL & 59°F GAL. OF FUEL USED	AT 5000 FT. & 41°F BEST CLIMB IAS MPH	AT 5000 FT. & 41°F RATE OF CLIMB FT/MIN	AT 5000 FT. & 41°F From SL FUEL USED	AT 10000 FT. & 23°F BEST CLIMB IAS MPH	AT 10000 FT. & 23°F RATE OF CLIMB FT/MIN	AT 10000 FT. & 23°F From SL FUEL USED	AT 15000 FT. & 5°F BEST CLIMB IAS MPH	AT 15000 FT. & 5°F RATE OF CLIMB FT/MIN	AT 15000 FT. & 5°F From SL FUEL USED	AT 20000 FT. & -12°F BEST CLIMB IAS MPH	AT 20000 FT. & -12°F RATE OF CLIMB FT/MIN	AT 20000 FT. & -12°F From SL FUEL USED
2100	87	1595	1.5	82	1315	2.7	78	1035	4.1	73	760	5.7	68	480	8.0
2400	88	1315	1.5	84	1065	3.0	80	815	4.7	76	560	6.8	71	305	10.3
2650	90	1130	1.5	86	890	3.3	83	650	5.3	78	415	8.2	74	175	13.4

NOTE: FLAPS UP, FULL THROTTLE, 2600 RPM, & MIXTURE LEANED FOR SMOOTH OPERATION ABOVE 5000 FT. FUEL USED INCLUDES WARM-UP & TAKE-OFF ALLOWANCE

Figure 6–2. Take-Off and Climb Chart (Landplane)

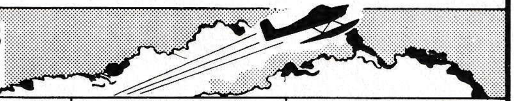
FLOATPLANE AND AMPHIBIAN WATER TAKE-OFF

TAKE-OFF DISTANCE WITH 20° FLAPS FROM SHELTERED WATER

GROSS WEIGHT LBS.	HEAD WIND MPH	AT SEA LEVEL & 59° F. WATER RUN	AT SEA LEVEL & 59° F. TO CLEAR 50' OBSTACLE	AT 2500 FT. & 50° F. WATER RUN	AT 2500 FT. & 50° F. TO CLEAR 50' OBSTACLE	AT 5000 FT. & 41° F. WATER RUN	AT 5000 FT. & 41° F. TO CLEAR 50' OBSTACLE	AT 7500 FT. & 32° F. WATER RUN	AT 7500 FT. & 32° F. TO CLEAR 50' OBSTACLE
2300	0	905	1595	1090	1930	1365	2410	1685	2975
	15	575	1110	700	1360	895	1720	1120	2160
	30	310	700	395	875	515	1135	670	1450
2600	0	1110	2170	1365	2665	1715	3335	2125	4130
	15	725	1565	905	1945	1155	2455	1450	3065
	30	410	1040	530	1310	700	1690	905	2150
2850	0	1345	2840	1670	3510	2130	4495	2650	5655
	15	900	2100	1125	2620	1465	3405	1860	4340
	30	530	1435	685	1825	915	2415	1190	3135

NOTE: INCREASE DISTANCES 10% FOR EACH 25° DEGREES F. ABOVE STANDARD TEMPERATURE FOR PARTICULAR ALTITUDE.

FLOATPLANE AND AMPHIBIAN CLIMB DATA



GROSS WEIGHT LBS.	AT SEA LEVEL & 59° F. BEST CLIMB IAS MPH	AT SEA LEVEL & 59° F. RATE OF CLIMB FT/MIN	AT SEA LEVEL & 59° F. GAL OF FUEL USED	AT 5000 FT. & 41° F. BEST CLIMB IAS MPH	AT 5000 FT. & 41° F. RATE OF CLIMB FT/MIN	AT 5000 FT. & 41° F. From SL FUEL USED	AT 10000 FT. & 23° F. BEST CLIMB IAS MPH	AT 10000 FT. & 23° F. RATE OF CLIMB FT/MIN	AT 10000 FT. & 23° F. From SL FUEL USED	AT 15000 FT. & 5° F. BEST CLIMB IAS MPH	AT 15000 FT. & 5° F. RATE OF CLIMB FT/MIN	AT 15000 FT. & 5° F. From SL FUEL USED	AT 20000 FT. & -12° F. BEST CLIMB IAS MPH	AT 20000 FT. & -12° F. RATE OF CLIMB FT/MIN	AT 20000 FT. & -12° F. From SL FUEL USED
2300	83	1480	1.5	81	1150	2.9	78	820	4.8	73	490	7.1	69	160	12.0
2600	85	1230	1.5	83	925	3.2	80	625	5.3	76	325	8.5	73	20	19.1
2850	87	1055	1.5	85	770	3.5	82	485	6.1	79	200	10.8			

NOTE: FLAPS UP, FULL THROTTLE, 2600 RPM, & MIXTURE LEANED FOR SMOOTH OPERATION ABOVE 5000 FT. FUEL USED INCLUDES WARM-UP & TAKE-OFF ALLOWANCES.

Figure 6–3. Water Take-Off and Climb Chart (Floatplane and Amphibian)

AMPHIBIAN TAKE-OFF—LAND

TAKE-OFF DISTANCE WITH 20° FLAPS FROM CONCRETE RUNWAY

GROSS WEIGHT LBS.	HEAD WIND MPH	AT SEA LEVEL & 59° F.		AT 2500 FT. & 50° F.		AT 5000' FT. & 41° F.		AT 7500 FT. & 32° F.	
		GROUND RUN	TO CLEAR 50' OBSTACLE	GROUND RUN	TO CLEAR 50' OBSTACLE	GROUND RUN	TO CLEAR 50' OBSTACLE	GROUND RUN	TO CLEAR 50'OBSTACLE
2400	0	710	1135	855	1365	1050	1685	1310	2095
	15	480	765	585	935	730	1170	925	1480
	30	290	460	360	580	465	740	600	965
2600	0	875	1400	1085	1735	1340	2145	1685	2695
	15	610	975	755	1210	940	1505	1210	1935
	30	375	605	480	765	605	970	800	1285
2850	0	1205	1925	1465	2345	1820	2915	2330	3725
	15	835	1340	1030	1650	1305	2085	1695	2715
	30	530	845	670	1070	865	1385	1155	1850

NOTE: INCREASE DISTANCE 10% FOR EACH 25 DEGREES F. ABOVE STANDARD TEMPERATURE FOR PARTICULAR ALTITUDE.

AMPHIBIAN CLIMB DATA

GROSS WEIGHT LBS.	AT SEA LEVEL & 59° F.			AT 5000 FT. & 41° F.			AT 10000 FT. & 23° F.			AT 15000 FT. & 5° F.			AT 20000 FT. & -12° F.		
	BEST CLIMB IAS MPH	RATE OF CLIMB FT/MIN	GAL OF FUEL USED	BEST CLIMB IAS MPH	RATE OF CLIMB FT/MIN	From SL FUEL USED	BEST CLIMB IAS MPH	RATE OF CLIMB FT/MIN	From SL FUEL USED	BEST CLIMB IAS MPH	RATE OF CLIMB FT/MIN	From SL FUEL USED	BEST CLIMB IAS MPH	RATE OF CLIMB FT/MIN	From SL FUEL USED
2300	83	1480	1.5	81	1150	2.9	78	820	4.8	73	490	7.1	69	160	12.0
2600	85	1230	1.5	83	925	3.2	80	625	5.3	76	325	8.5	73	20	19.1
2850	87	1055	1.5	85	770	3.5	82	485	6.1	79	200	10.8			

NOTE: FLAPS UP, FULL THROTTLE, 2600 RPM, & MIXTURE LEANED FOR SMOOTH OPERATION ABOVE 5000 FT. FUEL USED INCLUDES WARM-UP & TAKE-OFF ALLOWANCES.

Figure 6-4. Land Take-Off and Climb Chart (Amphibian)

OPERATIONAL DATA

LANDPLANE CRUISE AND RANGE PERFORMANCE

Altitude	RPM	M. P.	BHP	%BHP	TAS MPH	Gal/Hr.	End. Hours	Mi/Gal.	Range Miles
2500	2450	23	175	76	158	14.2	3.9	11.2	615
		22	166	72	154	13.4	4.1	11.5	635
		21	157	68	151	12.7	4.3	11.9	655
		20	148	63	148	12.0	4.6	12.2	670
	2300	23	164	71	154	13.1	4.2	11.7	645
		22	153	67	149	12.2	4.5	12.3	680
		21	143	62	145	11.5	4.8	12.7	695
		20	135	59	142	11.0	5.0	12.9	710
	2200	23	153	67	149	12.1	4.6	12.4	680
		22	144	63	146	11.4	4.8	12.8	700
		21	135	59	142	10.8	5.1	13.2	725
		20	126	55	138	10.2	5.4	13.5	740
Maximum Range Settings	2000	20	107	47	126	8.7	6.3	14.4	795
		19	99	43	121	8.2	6.7	14.8	810
		18	89	39	113	7.5	7.3	15.0	825
		17	81	35	105	7.0	7.9	15.1	830
5000	2450	23	179	78	163	14.5	3.8	11.2	615
		22	169	73	159	13.6	4.0	11.7	640
		21	161	70	156	13.0	4.2	12.0	660
		20	150	65	151	12.2	4.5	12.5	685
	2300	23	167	73	158	13.4	4.1	11.8	650
		22	158	69	155	12.6	4.4	12.2	675
		21	148	64	151	11.9	4.6	12.7	700
		20	139	60	146	11.2	4.9	13.1	720
	2200	23	157	68	155	12.4	4.4	12.5	685
		22	148	64	151	11.7	4.7	12.9	710
		21	138	60	146	11.0	5.0	13.3	730
		20	131	57	143	10.5	5.2	13.6	750
Maximum Range Settings	2000	19	103	45	126	8.5	6.5	14.9	820
		18	94	41	118	7.9	7.0	15.1	830
		17	86	37	111	7.3	7.5	15.2	835
		16	79	34	103	6.8	8.0	15.1	830
7500	2450	21	163	71	161	13.1	4.2	12.2	670
		20	153	67	157	12.4	4.4	12.7	700
		19	143	62	152	11.7	4.7	13.0	715
		18	133	58	147	11.0	5.0	13.4	735
	2300	21	151	66	156	12.2	4.5	12.7	700
		20	142	62	151	11.6	4.7	13.0	715
		19	133	58	147	11.0	5.0	13.3	735
		18	125	54	142	10.5	5.2	13.5	745
	2200	21	143	62	152	11.4	4.8	13.4	735
		20	134	58	148	10.7	5.1	13.8	760
		19	126	54	143	10.2	5.4	14.0	770
		18	118	51	138	9.7	5.7	14.3	790
Maximum Range Settings	2000	19	107	47	131	8.7	6.3	15.0	825
		18	98	43	123	8.1	6.8	15.2	835
		17	90	39	116	7.6	7.2	15.3	840
		16	82	36	107	7.0	7.8	15.3	840

Cruise performance is based on standard conditions, zero wind, lean mixture, 55 gallons of fuel, no fuel reserve and 2650 pounds gross weight.

Figure 6-5. Range Chart (Landplane)

LANDPLANE CRUISE AND RANGE PERFORMANCE

Altitude	RPM	M.P.	BHP	%BHP	TAS MPH	Gal/Hr.	End. Hours	Mi/Gal.	Range Miles
10,000	2450	19	146	63	156	11.9	4.6	13.1	735
		18	137	60	152	11.2	4.9	13.5	745
		17	127	55	146	10.6	5.2	13.8	755
		16	118	51	141	10.0	5.5	14.0	770
	2300	19	137	60	152	11.1	5.0	13.7	750
		18	128	56	147	10.5	5.2	14.0	770
		17	118	51	141	9.8	5.6	14.3	790
		16	109	47	134	9.2	6.0	14.5	795
	2200	19	129	56	148	10.4	5.3	14.2	780
		18	120	52	142	9.8	5.6	14.6	800
		17	112	49	136	9.3	5.9	14.7	805
		16	103	45	129	8.7	6.3	14.9	815
Maximum Range Settings	2000	18	102	44	128	8.4	6.5	15.2	835
		17	93	40	120	7.8	7.1	15.4	845
		16	87	38	114	7.4	7.4	15.4	845
		15	80	35	105	6.9	8.0	15.2	835
15,000	2450	16	124	54	150	10.4	5.3	14.4	790
		15	114	50	142	9.8	5.6	14.6	805
		14	105	46	135	9.2	6.0	14.7	810
	2300	16	115	50	143	9.6	5.7	14.8	815
		15	107	47	136	9.1	6.0	15.0	825
		14	98	42	127	8.5	6.5	15.0	825
	2200	16	109	47	138	9.1	6.0	15.2	835
		15	101	44	130	8.6	6.4	15.2	835
		14	92	40	120	8.0	6.9	15.1	830
Maximum Range Settings	2000	16	93	40	122	7.8	7.1	15.7	865
		15	86	37	112	7.3	7.5	15.3	855
		14	78	34	101	6.8	8.1	14.9	820
20,000	2450	13	102	44	133	9.0	6.1	14.9	820
		12	93	40	122	8.3	6.6	14.6	805
	2300	13	96	42	126	8.4	6.6	15.1	830
		12	87	38	113	7.7	7.1	14.6	805
	2200	13	90	39	118	7.8	7.0	15.1	830
		12	81	35	103	7.2	7.7	14.4	790

Cruise performance is based on standard conditions, zero wind, lean mixture, 55 gallons of fuel, no fuel reserve, and 2650 pounds gross weight.

Figure 6-6. Range Chart (Landplane)

FLOATPLANE AND AMPHIBIAN CRUISE AND RANGE PERFORMANCE

Altitude	RPM	M.P.	BHP	%BHP	TAS MPH	Gal/Hr.	End. Hours	Mi/Gal.	Range Miles
2500	2450	23	175	76	142	14.2	3.9	10.0	550
		22	166	72	139	13.4	4.1	10.4	570
		21	157	68	137	12.7	4.3	10.8	595
		20	148	63	134	12.0	4.6	11.2	615
	2300	23	164	71	139	13.1	4.2	10.6	585
		22	153	67	136	12.2	4.5	11.1	610
		21	143	62	133	11.5	4.8	11.6	640
		20	135	59	130	11.0	5.0	11.8	650
	2200	23	153	67	136	12.1	4.6	11.2	615
		22	144	63	133	11.4	4.8	11.7	645
		21	135	59	130	10.8	5.1	12.0	660
		20	126	55	127	10.2	5.4	12.5	685
Maximum Range Settings	2000	18	89	39	107	7.5	7.3	14.2	780
		17	81	35	101	7.0	7.9	14.5	795
		16	76	33	96	6.6	8.3	14.6	800
		15	67	29	87	5.9	9.3	14.7	810
5000	2450	23	179	78	147	14.5	3.8	10.1	560
		22	169	73	144	13.6	4.0	10.6	580
		21	161	70	142	13.0	4.2	10.9	600
		20	150	65	139	12.2	4.5	11.4	625
	2300	23	167	73	144	13.4	4.1	10.7	590
		22	158	69	141	12.6	4.4	11.2	615
		21	148	64	138	11.9	4.6	11.6	640
		20	139	60	135	11.2	4.9	12.0	665
	2200	23	157	68	141	12.4	4.4	11.4	625
		22	148	64	138	11.7	4.7	11.8	650
		21	138	60	135	11.0	5.0	12.3	675
		20	131	57	132	10.5	5.2	12.6	690
Maximum Range Settings	2000	19	103	45	118	8.5	6.5	13.9	765
		18	94	41	113	7.9	7.0	14.4	790
		17	86	37	107	7.3	7.5	14.6	805
		16	79	34	100	6.8	8.0	14.6	805

Cruise performance is based on standard conditions, zero wind, lean mixture, 55 gallons of fuel, no fuel reserve, and 2850 pounds gross weight.

Figure 6-7. Range Chart (Floatplane and Amphibian)

FLOATPLANE AND AMPHIBIAN CRUISE AND RANGE PERFORMANCE

Altitude	RPM	M. P.	BHP	%BHP	TAS MPH	Gal/Hr.	End. Hours	Mi/Gal.	Range Miles
7500	2450	21	163	71	146	13.1	4.2	11.1	615
		20	153	67	143	12.4	4.4	11.5	635
		19	143	62	140	11.7	4.7	12.0	660
		18	133	58	136	11.0	5.0	12.4	680
	2300	21	151	66	142	12.2	4.5	11.6	640
		20	142	62	139	11.6	4.7	12.0	660
		19	133	58	136	11.0	5.0	12.4	680
		18	125	54	132	10.5	5.2	12.5	685
	2200	21	143	62	140	11.4	4.8	12.3	675
		20	134	58	136	10.7	5.1	12.7	700
		19	126	54	133	10.2	5.4	13.0	715
		18	118	51	129	9.7	5.7	13.3	730
Maximum Range Settings	2000	18	98	43	117	8.1	6.8	14.4	790
		17	90	39	111	7.6	7.2	14.6	805
		16	82	36	104	7.0	7.8	14.9	820
		15	64	28	83	5.7	9.6	14.5	795
10,000	2450	19	146	63	144	11.9	4.6	12.1	665
		18	137	60	140	11.2	4.9	12.5	685
		17	127	55	136	10.6	5.2	12.8	705
		16	118	51	131	10.0	5.5	13.1	720
	2300	19	137	60	140	11.1	5.0	12.6	695
		18	128	56	136	10.5	5.2	13.0	710
		17	118	51	131	9.8	5.6	13.4	735
		16	109	47	126	9.2	6.0	13.7	755
	2200	19	129	56	137	10.4	5.3	13.1	720
		18	120	52	132	9.8	5.6	13.5	740
		17	112	49	128	9.3	5.9	13.8	760
		16	103	45	122	8.7	6.3	14.0	770
Maximum Range Settings	2000	18	102	44	121	8.4	6.5	14.4	790
		17	93	40	115	7.8	7.1	14.8	810
		16	87	38	110	7.4	7.4	14.9	820
		15	80	35	103	6.9	8.0	14.9	820

Cruise performance is based on standard conditions, zero wind, lean mixture, 55 gallons of fuel, no fuel reserve, and 2850 pounds gross weight.

Figure 6-8. Range Chart (Floatplane and Amphibian)

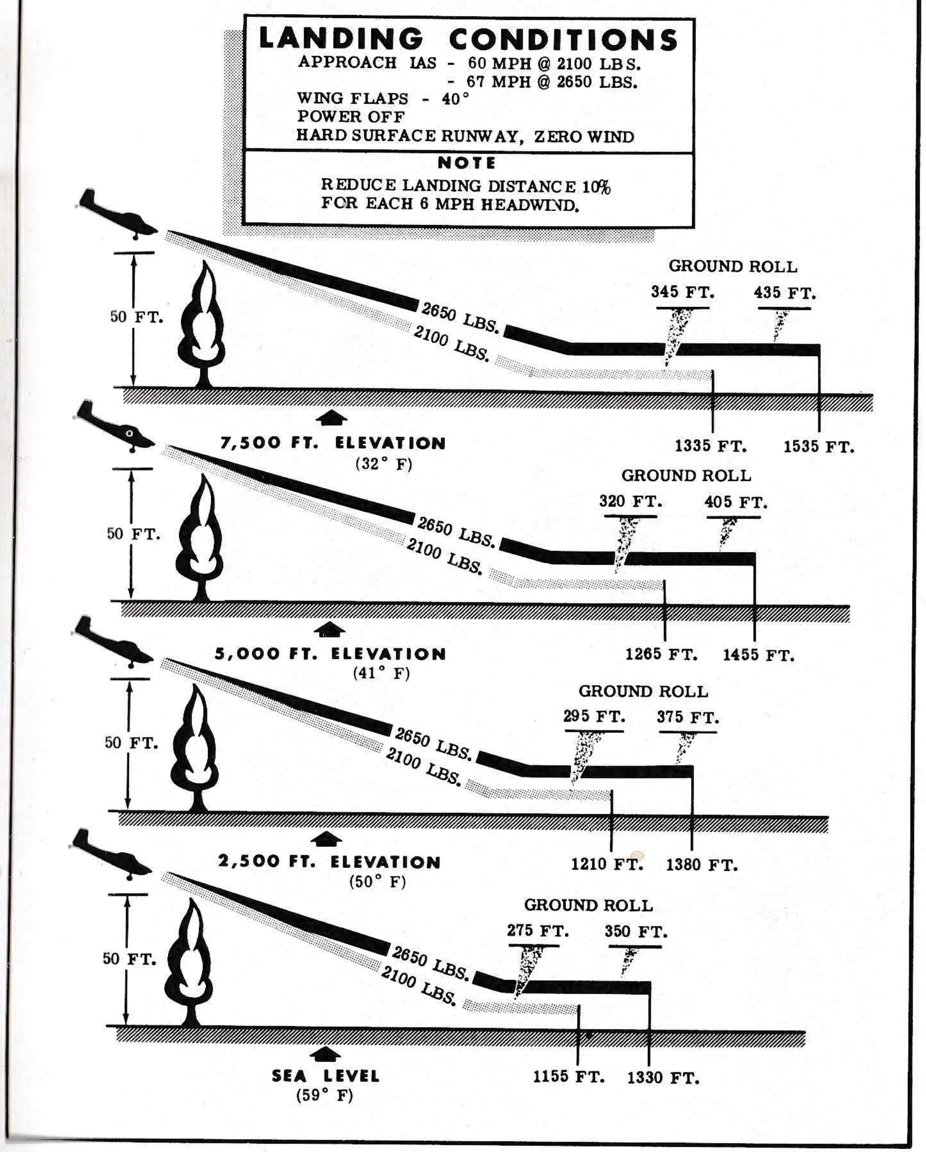


Figure 6-9. Landing Diagram (Landplane)

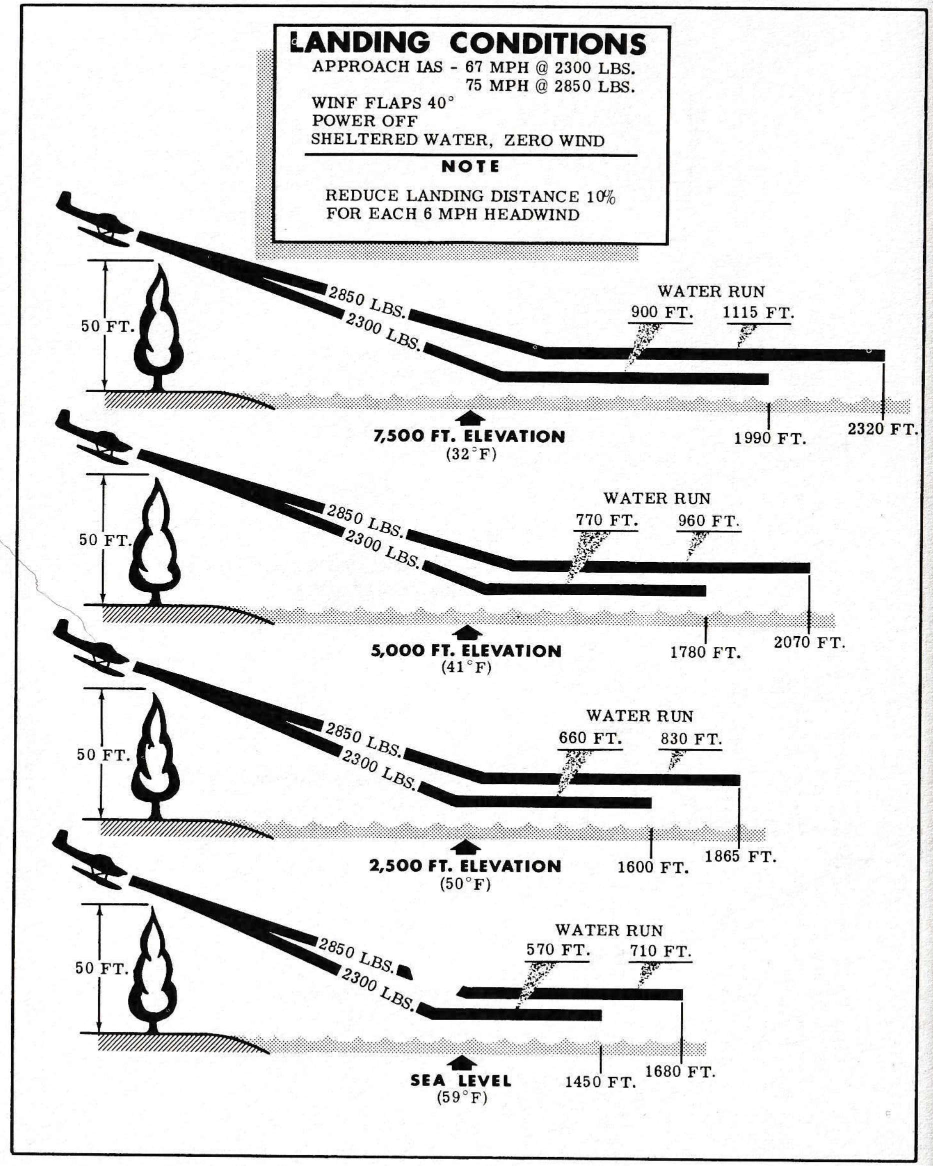


Figure 6–10. Water Landing Diagram (Floatplane and Amphibian)

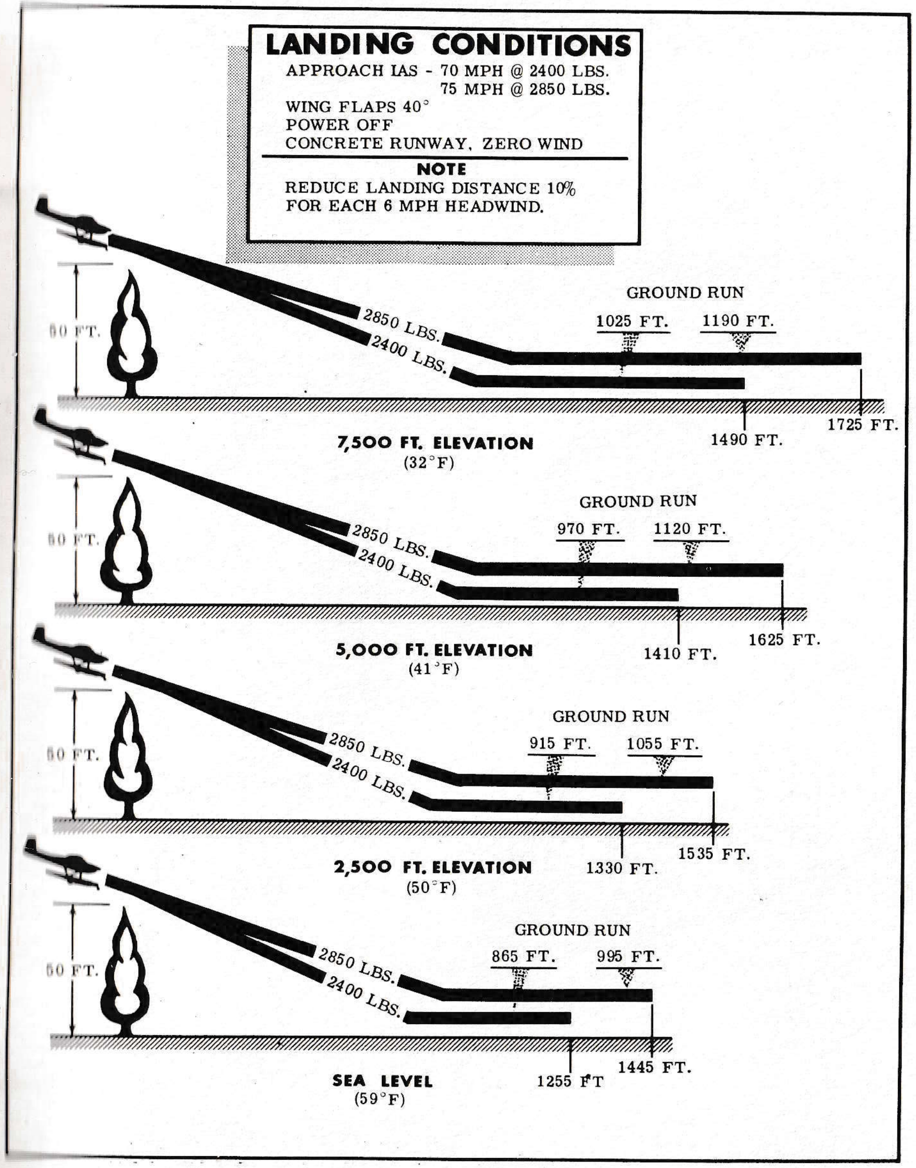


Figure 6–11. Land Landing Diagram (Amphibian)

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