

1959 Cessna 172

Owners Manual

N7084T

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

The power plant used in your Cessna 172 is a six cylinder, 145 horsepower, Continental Model O-300-A engine. Continental's accumulated years of experience in the manufacture of light aircraft engines assure you of a precision made, skillfully engineered product. The built in Red Seal quality, which is now yours, is your guarantee of maximum safety, trouble-free operation, and low maintenance cost.

ENGINE CONTROLS

Throttle. The throttle is the largest of the engine controls and is a push-pull type control. Engine speed is increased by pushing the throttle in or decreased by pulling it out.

NOTE

To prevent creeping, tighten the knurled friction-type locknut on the control. Turning the nut clockwise increases friction on the throttle; turning it counterclockwise decreases friction.

Mixture Control Knob. The mixture control incorporates a locking lever to prevent inadvertent pulling out of the knob, resulting in leaning or shutting off the fuel supply in the carburetor. To lean the mixture, depress the locking lever while pulling out on the mixture control knob. This operation can be accomplished with one hand, using the thumb to depress the locking lever and two fingers to pull out the control. The locking lever is intended only to prevent inadvertent leaning; the control knob may be pushed in, for rich mixture, without depressing the lever.

The mixture control is normally set at "full rich" (all the way in) for starting, take-off, and climb. Maximum performance takeoffs from high elevation fields may be made with the mixture leaned out for maximum engine rpm. However, a full rich mixture is preferred for better engine cooling.

Carburetor Air Heat Knob. The carburetor air heat knob is a push-pull control which operates the carburetor air intake butterfly to proportion the hot and cold air entering the carburetor. Pulling the control out raises the temperature of the carburetor air, while pushing it in decreases the temperature- The full-hot position is all the way out and full-cold is all the way in.

Air entering the engine through the heater muff does not pass through the intake filter. Therefore, carburetor heat should not be used when taxiing on dirty, dusty or sandy fields, except briefly to clear the engine immediately before take-off. 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 air heat knob full on to check the function of the carburetor air heater and to remove any ice in the carburetor. After this short check, be sure to push the carburetor air heat knob in to the full cold position. This will give maximum power for the takeoff. During climb, watch the engine for any sign of icing (roughness or loss of rpm). If the engine begins to ice, apply full carburetor heat at once.

When full carburetor heat is applied the engine will lose about 275 RPM in cruising flight or 360 RPM at full throttle. In addition to the RPM loss, the engine will run roughly, due to excessively rich mixture. Therefore, *it may be necessary to lean the engine when full carburetor heat is used.*

Excessively lean fuel-air mixture will cause overheating and possibly detonation. *Do not lean the mixture unless an increase in engine rpm. results.*

The correct way to use carburetor heat is to first use full heat to remove any ice that is forming. By trial and error, determine the minimum amount of heat required to prevent the ice from forming; each time removing any ice that is formed by applying full heat. On each subsequent trial, increase the amount of heat applied until no ice forms. On approach glide just before reducing power, apply full carburetor heat and leave in this position. Refer to Cold Weather Operation, page 3-6, for use of carburetor heat in sub-zero temperatures.

Ignition Switch. The key-operated ignition switch controls the dual magneto ignition systems. There are four switch positions designated clockwise as follows: "OFF", "R", "L", and "BOTH". The engine should be operated on both magnetos ("BOTH" position). The "R" and "L" positions are for checking purposes only.

Engine Primer. The manual plunge type engine primer delivers an initial charge of raw fuel to the cylinder for easier starting. *For an initial start in normal air temperatures, use two strokes of the primer. Usually, a hot engine will need no priming.*

To operate the primer, proceed *follows*:

- (a) First, unlock the plunger by turning the knob counter clockwise until the knob pops part way out.
- (b) Slowly pull the plunger all the way out and then push the plunger all the way in. This action is termed "one stroke of the primer."
- (c) Normal winter weather will require two to four strokes of the primer, and very cold (-20' F.) weather may require
- (d) Normally, the engine is started immediately after the priming operation. In very cold weather, it is recommended that the engine be turned over while priming. It may be necessary to continue priming until the engine runs smoothly

Starter Handle. The T-shaped start-r handle engages and energizes the engine starter when the handle is pulled out. *Do not pull out on the starter handle while the engine is running.*

CARBURETOR AIR FILTERING SYSTEM

Dirt and other foreign matter is filtered from the carburetor air by a filter screen located in the air scoop on the bottom of the engine cowl. 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 the regular oil change) or more often when operating in dusty conditions. *Under extremely dusty conditions such as operation from dirt runways or ramps, daily maintenance of the air filter is recommended.* Refer to the servicing instructions stamped on the carburetor air filter for the procedure to be used.

OIL SYSTEM

Oil Level. The oil capacity on the Continental O-300-A engine is eight 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 dip stick located adjacent to the oil tank cap. In replacing the dipstick, make sure that it is firmly back in place. In replacing the oil filler cap, 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. While the minimum oil supply is four quarts, oil should be added if below six quarts and should be full if an extended flight is planned.

Oil Specification and Grade, Aviation grade oil is recommended for your Cessna 172 and should be changed every 25 hours of operation. When adding or changing oil, use the grades in the following table:

<i>Average Outside Temperature</i>	<i>Recommended Oil Grade</i>
<i>Below 50' F.</i>	<i>SAE 2</i>
<i>Above 50' F.</i>	<i>SAE 40</i>

Oil System Indicators

Oil Temperature Gage. The capillary type oil temperature gage (figure is marked with a green arc to show the normal operating range of oil temperatures. A red radial line marks the upper limit of allowable temperature. There is no minimum operating temperature.

Oil Pressure Gage. The oil pressure gage is a direct-reading instrument indicating pressure in pounds per square inch. A green arc on the dial defines the normal operating range. Red radial lines mark the upper operating pressure limit and the minimum idling pressure.

Oil Dilution System (Optional Equipment)

To permit easier starting in extremely low temperatures, an optional oil dilution system is available. Used immediately before the engine is shutdown, 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 a tapped plug in the end of the low pressure oil screen on the engine. 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.

FUEL SYSTEM

Fuel is supplied to the engine from two 21-gallon aluminum tanks, (of which 18.5 gallons in each tank are useable in all flight conditions) one located in each wing. From these tanks fuel flows by means of gravity through a fuel selector valve and fuel strainer to the engine carburetor.

Fuel Specification and Grade (*Aircraft 7084T has been modified to use automobile gasoline*)

Aviation grade fuel should always be used except under emergency conditions. The recommended fuel is 80 octane rating minimum with a lead content of not more than ½ cc per gallon. Highly leaded fuels are not recommended. Filling the fuel tanks immediately after flight will reduce the air space and minimize the moisture condensation in the fuel tanks.

Fuel System Controls

Fuel Selector Valve. A rotary type fuel selector valve is located at the aft end of the cabin floor tunnel between the front seats. The valve has four positions labeled "BOTH OFF", "LEFT TANK", "RIGHT TANK", and "BOTH ON". The "BOTH OFF" position seals both wing tanks off from the rest of the fuel system and allows no fuel to pass beyond the selector valve. The "LEFT TANK" position allows fuel to flow from the left wing tank to the engine. The "RIGHT TANK" position permits fuel to flow from the right wing tank to the engine. The "BOTH ON" position provides fuel flow from both tanks simultaneously to provide maximum safety. *Important* - The fuel valve *handle* indicates the setting of the valve by its positions above the valve dial.

Fuel Strainer Drain Valve. A fuel strainer drain valve is located on the bottom of the fuel strainer and is accessible by reaching through the bottom rear opening of the engine cowl just forward of the firewall. This valve provides a quick simple method of draining any water or sediment that might have collected in the fuel strainer. A two ounce quantity of fuel should be drained from the fuel strainer before the initial flight of the day or after each refueling operation.

Fuel Tank Sump Drain Plugs. A fuel tank drain plug is located on the underside of each wing in line with the rear edge of the cabin door and out a few inches from the fuselage. These plugs are used to drain any sediment or water that may collect in the fuel tanks. Draining the tank sumps is normally required only at each 100 hour inspection period.

Fuel Line Drain Plug. A fuel line drain plug is located on the under side of the airplane directly below the fuel tank selector valve. At each 100-hour inspection period, this plug should be removed to drain any sediment or water that might have accumulated in the fuel line.

FUEL QUANTITY INDICATORS

Electrically-operated fuel quantity indicators, identified "LEFT" and "RIGHT," indicate the amount of fuel remaining in their respective tanks. A red arc extending from empty to 1/4 full on each indicator dial warns that its tank is 1/4 full or less. *Takeoffs are not recommended when the fuel gage pointers are in the red arc.*

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.

ELECTRICAL SYSTEM

Electrical energy is supplied by a 12-volt, direct-current system power by an engine-driven generator. A 12 volt storage battery serves as a standby power source, supplying current to the system when the generator inoperative, or when the generator voltage is insufficient to close the reverse-current relay.

ELECTRICAL SYSTEM CONTROLS

Master Switch. All electrical circuits in the airplane except the engine ignition system are controlled by the master switch. Pulling out on the switch knob closes the generator field circuit and the operating circuit of the battery relay, permitting the generator to function and connecting the battery to the airplane bus.

If a short circuit or other malfunction should develop in the electrical system, the master switch may be turned OFF. The engine will continue to run, since the magnetos are completely separate from the electrical system.

Fuses. Fuses for the various electrical devices are marked to show the circuits protected by each, and the capacity of the fuses. Fuses are removed by unscrewing the fuse retainers and lifting out fuse. Spare fuses are located in a clip on the inside of the glove compartment door. The turn and bank indicator and stall warning indicator are protected with an automatically resetting circuit breaker which provides intermittent emergency operation of these devices in case of a faulty circuit.

GENERATOR WARNING LIGHT

The red generator warning light indicates generator output. The light remains off as long as the generator functions properly. If a malfunction interrupts generator output, the light will illuminate. It also will illuminate when the battery or external power is on, before starting the engine, and whenever engine speed is insufficient to produce generator output. The light does not show battery drain.

FLIGHT CONTROL SYSTEM.

Conventional wheel and rudder pedal controls are provided to operate the primary flight control surfaces (ailerons, rudder, and elevators). The elevator trim tab, located on the right elevator, is mechanically operated from the front seats. The rudder trim tab is adjustable on the ground only.

Control Lock. To protect the ailerons and elevators from buffeting by wind while the airplane is parked, a control lock is provided as standard equipment. The lock consists of a pin with a large red metal flag. *To install* the lock, the control wheel is pulled back halfway and centered, placing the elevators and ailerons in neutral. In this position, a hole in the control wheel shaft is aligned with holes in the collar around the shaft at instrument panel. The pin then is inserted in the collar and shaft from the top and right, so that the metal flag covers the starter handle. Make sure the pin is inserted completely. The flag serves as a reminder that the controls are locked and prevents operation of the starter handle until the lock is removed. When not in use, the lock should be kept in the glove compartment, where it will be available whenever needed-

NOTE

This control 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.

Elevator Tab Control Wheel. The elevator trim tab is an auxiliary movable control surface on the trailing edge of the right elevator, used to neutralize control wheel forces in flight. The tab is set by rolling forward or backward the tab control wheel on the floor between the two front seats. A tab position indicator incorporated in the tab while mechanism indicates the nose attitude of the airplane. Forward and aft movement of the wheel trims nose down and up, respectively. This allows the airplane to be trimmed to fly level with a wide selection of load and speed conditions. Takeoff is made with the tab position set in TAKEOFF position

Wing Flap Handle. The wing flaps are operated by moving the wing flap handle on the floor between two front seats. The handle is operated by depressing 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 airspeed is less than 100 mph. The flaps supply added lift and considerable drag; the resulting actions 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 with flaps. The use of flaps is not recommended for crosswind takeoffs

For unusually short field takeoffs, apply 10 degrees flaps (first notch) prior to takeoff. An alternated procedure of applying 10 degrees just before the airplane is ready to leave the ground may be used in lieu of the above method of leaving the flaps in the 10-degree position throughout the entire ground run. For further discussion of the use of wing flaps for take-off, see page 3.2

Wing Flap Settings

For Normal takeoff	Up 0 degrees
For Shortest takeoff	1 st Notch 10 degrees
For Landing	2 nd Notch 20 degrees
	3 rd Notch 30 degrees
	4 th Notch 40 degrees

LANDING GEAR

MAIN LANDING GEAR

Your airplane is equipped with Cessna's patented Safety Landing Gear. It consists of a tapered, spring steel leaf supporting each main wheel. Simple and strong, this landing gear requires a minimum of maintenance.

SPEED FAIRINGS (OPTIONAL EQUIPMENT)

Speed fairings are available as optional equipment for your airplane. The design purpose of speed fairings is to increase the speed of the aircraft and add to its beauty.

To obtain the maximum speed increase, it was necessary to keep the clearance between the tire and speed fairing to a minimum. An accumulation of mud, snow or ice in the wheel opening will have a braking effect on the wheel. If these elements cannot be avoided, make an inspection of the wheel fairings before each flight and remove any accumulations which may be forming

NOSE GEAR

A steerable nose gear, incorporating an air and oil shock strut, is mounted on the firewall. Nose wheel steering is accomplished through normal operation of the rudder pedals. The nose wheel is steerable through an arc of approximately 8 degrees each side of neutral, after which it becomes free-swiveling up to a maximum deflection of 30 degrees to either side of center. By using the brakes, the airplane can be pivoted about the outer wing strut fitting. The nose wheel is automatically located in the centered position while the aircraft is in the air. Movement of the rudder pedals will not affect the nose wheel while the airplane is in flight. Thus, the pilot has the assurance that the nose wheel will be straight at the initial landing touchdown.

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. The rotation of the pedals actuates the brake cylinders resulting in a braking action on the main landing gear wheels. The brakes may also be set by operating the parking brake.

INSTRUMENTS

All instruments are mounted on the instrument panel with the exception of a free air temperature gage and magnetic compass. The free air temperature gage (optional equipment located in the right cabin ventilator). For correct readings, the ventilator must be slightly open. The magnetic compass is mounted on the windshield centerstrip.

Turn and Bank Indicator (Opt Equipment). The turn and bank indicator, if installed as optional equipment, is an electrically operated instrument. Turned on by the master switch, the indicator remains in operation until the master switch is turned off. The indicator has no separate control switch.

Pitot-Static System Indicators The altimeter, airspeed and optional vertical speed indicators are operated by the pitot-static system. This system measures the difference between the impact air-pressure entering the pitot tube, mounted on the leading edge of the left wing, and static air pressure obtained from a static port mounted on the left forward side of the fuselage. 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 port should be kept free of polish, wax, or dirt for proper airspeed indicator operation.*

Stall Warning Indicator. The stall warning indicator is an electrically operated horn which gives warning whenever a stall is approached, regardless of speed, attitude, altitude, weight or other factors which change the stalling speed. The stall warning horn transmitter is adjusted to give an audible warning approximately 5 mph above the normal straight ahead stalling speed. Other attitudes and speeds provide a wider margin. The only time you may hear the Indicator under safe flight condition will be merely a short beep as you land. Usually no warning will be evident on a properly executed landing because the Indicator takes the ground effect into consideration. (If the airplane is leveled off high, however, the indicator will signal.) The Indicator automatically cuts out on the ground, although high surface winds may give signals when taxiing. It therefore requires no silencing switch which might be inadvertently left off.

A manual is provided in the airplane kit which describes in detail the many useful purposes of this instrument.

LIGHTING EQUIPMENT

Navigation Lights. The conventional navigation lights are controlled by the navigation lights switch (figure 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 Light. (Optional Equipment). The landing light consists of two lamps mounted side-by-side in the leading edge of the left wing. One of the lamps is adjusted to give proper illumination of the runway during landing and take-off while the other lamp is set to provide illumination of the ground for taxiing purposes. The landing light switch has three positions and turns on either one lamp or both. *To turn on the taxi light,* pull the switch out to the first stop. *To turn on both landing and taxi lights,* pull the switch out to the second stop. *To turn the lights off,* push the switch all the way in.

Rotating Beacon (Optional Equipment). 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 circuit breaker switch on the instrument panel. *Pushing in* on the switch button turns on the beacon; *pulling it out* turns the beacon off. A short circuit or overload will trip the circuit breaker and force the switch button out.

Instrument Light. A red instrument light is mounted on the cabin ceiling to illuminate the instrument panel during night operation. A rheostat switch under the edge of the instrument panel controls instrument light and the compass light. *To turn on the compass and instrument lights*, rotate the instrument rheostat switch clockwise until the desired illumination is obtained. *To turn lights off*, turn the switch counter clockwise as far as it will go.

Map Light. A map light is adjacent to the left cabin ventilator and is controlled by a slide mounted on the left doorpost. The light is fully adjustable to shine in any direction, and a lens adjustment knob integrally-mounted on the light makes it possible to change the beam from a spot to a flood illumination

Dome Light. A dome mounted in the cabin ceiling and is controlled by a toggle switch mounted in the base of the dome light

CABIN VENTILATORS

All ventilation for the cabin area, excluding the ventilation obtained through heater ducts, is provided by manually-adjusted cabin ventilators. Two ventilators are installed: one on the left side of the cabin in the upper corner of the windshield, and the other in the same position on the right side of the fuselage.

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.

CABIN HEATER

A manifold-type cabin heater, incorporating a windshield-defrosting duct, is standard equipment in your 172. The cabin heat knob moves a mixer valve to proportion hot and cold air for the desired cabin temperature. Pulling the knob out permits heated, fresh air to enter the cabin through holes in each end of a duct running completely across the firewall. The rear cabin area is heated and ventilated by ducts, one on either side of the cabin, extending along each wall and terminating at the door posts.

A defroster opening just behind the windshield provides a flow of air to keep the windshield free of condensation and frost. The defroster outlet has no separate control for either volume or temperature.

The defrosting air will be hot or cool depending on the setting of the cabin heat knob.

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

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

Never pull the cabin air knob out when the cabin heat knob is out. Doing so may result in overheating the heater muff hoses.

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*, simply pull up the handle and slide the seat to most comfortable position.)

NOTE

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

REAR SEAT

The rear seat has provisions to accommodate two people. The back of the seat is hinged at the bottom permit seat adjustment and easy access to the baggage compartment. An adjustment handle is located below and at the top of the rear seat back

MISCELLANEOUS EQUIPMENT

CABIN DOORS

Two cabin doors are provided on your Cessna 172. Each door incorporates a flush type door handle the outside and a conventional handle on the inside. To open the door from the outside, pull out on the forward edge of the flush type handle. To open the door from the inside, rotate the inside door handle down.

The right cabin door can be locked from the inside only. To lock the door, push up on the thumb latch located on the aft part of the door just below the window. To unlock, push down on the thumb latch.

The left door can be locked from the outside only with a key operated lock. The same key that is used for the ignition is also used to lock the door.

CABIN WINDOWS

All windows in the cabin with the exception of the left door window are of the fixed type and do not open. The window mounted in the left door is hinged along the top of the window and opens out and up. *To open the door window*, pull up and push out on the window latch. With the window latch completely extended, the window will remain open. *To close the window*, pull the window latch in and down.

BAGGAGE COMPARTMENT

A baggage compartment is located just aft of the rear seat. To reach the baggage compartment, grasp the seat adjustment handle in the center of the rear seat back and gently pull forward and down.

COAT HANGER HOOK

For your convenience, a coat hanger hook has been installed in the cabin ceiling above the back of the rear seat. Your 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.

UTILITY SHELF

A utility shelf is located just above the baggage compartment. This shelf will prove very handy for storing hats, brief cases, and small articles.

MAP POCKET

Maps and frequently-used flying aids may be stored in a map pocket in the left forward side panel, where they are in easy reach of the pilot's seat. Bulkier items, magazines, and small articles may be stored in the pockets on the backs of the front seats.

ASSIST HANDLE

A raised ridge in the center of the instrument panel deck serves as an assist handle. It is useful when moving the front seats forward and getting in and out of the airplane,

LOADING YOUR MODEL 172

The recommended procedure loading your Model 172 is ask *First*, load the baggage compartment. *Next*, load the front seats. *Finally*, load the rear seat.

SECTION II - Operating checklist

After familiarizing yourself with the equipment of your Cessna 172, 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 172.

The flight and operational characteristics of the Model 172 Cessna are normal in all respects. There are no "unconventional" characteristics or operations that need to be mastered. All controls respond in the normal way within the entire range of operation of the airplane. All airspeeds mentioned in sections II and III are indicated airspeeds. Corresponding true indicated airspeeds may be obtained from the airspeed correction table in section V.

A. BEFORE ENTERING THE AIRPLANE.

- (1) Perform an exterior inspection of the airplane.

B. BEFORE STARTING THE ENGINE.

- (1) Operate controls and make a visual check for proper operation.
- (2) Make sure windshield is clean for maximum visibility.
- (3) Adjust seat for comfort and distance to rudder pedals.

NOTE

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

- (4) Check brakes and set parking brake,
- (5) Fasten and check safety belt.

C. STARTING THE ENGINE.

- (1) Set carburetor heat to "cold" (Full in).
- (2) Set mixture control to "full rich" (Full in).
- (3) Set fuel tank selector to "both tanks". (Take-off on less than 1/4 tank is not recommended.)
- (4) For an initial start in normal air temperatures, use two strokes of the primer. Usually, a hot engine will need no priming.
- (5) Clear propeller.
- (6) Turn master switch to "BOTH."
- (7) Turn ignition switch
- (8) Open throttle 1/8" (to idle position).
- (9) Start engine by pulling starter control.

D. WARM-UP AND GROUND TEST.

- (1) Do not allow the engine to operate at more than 800 rpm. for the first 60 seconds after starting. After starting if oil gauge does not begin show pressure within 30 seconds in the summertime and about twice that long in very cold weather, stop engine and investigate. Lack of pressure may cause serious engine damage.
- (2) Avoid the use of carburetor heat unless icing conditions prevail.
- (3) After one to two minutes running at 800 rpm., continue warmup while taxiing to the active runway. Do not overheat the engine running engine at high speed while on the ground. When the accelerates smoothly and oil pressure remains steady, you are ready for takeoff

NOTE

To avoid propeller tip abrasion, do not run up engine on loose cinders or gravel.

A. BEFORE TAKE-OFF.

- (1) Apply toe brakes.
- (2) Set altimeter.
- (3) Set trim tab to "takeoff " position

- (4) Check oil pressure –should show 30 to 40 psi (minimum)
- (5) Check engine magnetos at 1600 rpm by switching off separately each magneto momentarily. The maximum allowable rpm. drop on either magneto is 100 rpm. Switch to both magnetos before continuing
- (6) Check carburetor heat and leave on full heat until take-off .
- (7) Full throttle check is recommended only when condition of the engine is in doubt. The engine should run smoothly and turn with carburetor heat off, 2260 to 2360 rpm. The engine should idle between 400 and 500 rpm. Except for short check, do not idle below 600 rpm.

F. TAKE-OFF.

NORMAL TAKE-OFF.

- (1) Flaps 0 degrees (retracted).
- (1) Carburetor Heat - "OFF" (full in).
- (2) Advance throttle slowly to full throttle.
- (3) Avoid dragging brakes by keeping heels on floor.
- (4) Apply slight back pressure on the elevator control to raise nosewheel when take-off speed is reached.

NOTE

Do not raise the nose of the airplane excessively high as this will only lengthen the take-off run.

- (6) Climb at 80 MPH.

MINIMUM GROUND RUN TAKE-OFF.

- (1) Wing flaps 10' (First notch).
- (2) Apply full throttle while holding brakes.
- (3) Release brakes.
- (4) Take-off slightly tail low.

OBSTACLE CLEARANCE TAKE-OFF.

- (1) Wing flaps 0 degrees (retracted).
- (2) Apply full throttle while holding brakes.
- (3) Release brakes.
- (4) Take-off slightly tail low.
- (5) Level off momentarily to accelerate to best angle of climb speed (60 MPH).

SOFT OR ROUGH FIELD TAKE-OFF WITH NO OBSTACLE AHEAD.

- (1) Wing flaps 10-degrees (First notch).
- (2) Apply full throttle and raise nosewheel clear of ground with elevator control back pressure.
- (3) Takeoff in a tail-low attitude.
- (4) Level off momentarily to accelerate to a safe airspeed,
- (5) Retract flaps slowly as soon as a reasonable altitude is obtained. (see "Take-off paragraph on page 3-2)

TAKE-OFF IN STRONG CROSSWIND.

- (1) Flaps 0 degrees (retracted).
- (2) Apply full throttle and use sufficient aileron into the wind to maintain wings level.
- (3) Hold nosewheel on ground 5-10 MPH above normal take-off speed.
- (4) Take-off abruptly to prevent airplane from settling back to runway while drifting-

A. G. CLIMB.

- (1) If no obstacle is ahead climb out with flaps up at 80-90 MPH with throttle. If maximum rate of climb is desired use full throttle at 75 MPH, at sea level (see figure 18). Reduce climb speed about 1/2 mph for every 1000 feet of altitude above sea level.
- (2) To climb over an obstacle after take-off use the best angle of climb speed of 60 MPH, with full throttle and flaps up.
- (3) Mixture should be "Full Rich" unless engine is rough due to rich mixture.

CRUISING.

- (1) Recommended cruising rpm. - 2450-2650 (See page 4-2).
- (2) Trim airplane by adjusting elevator tab.

- (3) Oil pressure - 30-40 lbs./ sq. in.
- (4) Oil temperature - within green arc range.
- (5) Lean mixture to maximum rpm.; then enrichen mixture until rpm begins to decrease.
- (6) Lean mixture as required to obtain smooth engine operation when using carburetor heat in cruise.

I. 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 icing if icing conditions exist

J. BEFORE LANDING.

- (1) Set fuel selector to "Both".
- (2) Recheck mixture "Full Rich" (full in).
- (3) Apply carburetor heat before closing throttle
- (4) Glide at 70-80 MPH, with flaps up.
- (5) Lower flaps as desired below 100 MPH.
- (6) Maintain 65-75 MPH, with flaps extended.
- (7) Trim airplane with elevator trim tab for glide.

K. LANDING.

NORMAL LANDING.

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

SHORT FIELD LANDING.

- (1) Make a power-off approach at 60 MPH, with flaps 40' (fourth notch)
- (2) Land on main wheels first.
- (3) Lower nosewheel to ground immediately after touchdown.
- (4) Apply heavy braking as required.

NOTE

Excessive braking will skid tires, resulting in lengthened ground run and tire damage.

LANDING IN STRONG CROSSWIND.

- (1) Use minimum flap setting required for field length.
- (2) Use wing low, crab, or combination method of drift correction.
- (3) Land in a nearly level attitude.
- (4) Hold straight course with steerable nosewheel and occasional braking if necessary.

L. AFTER LANDING.

- (1) Raise flaps after completion of landing roll.
- (2) Normal glide and taxiing should cool engine sufficiently; however, if excessive amount of taxiing is necessary, allow engine to cool before cutting ignition by allowing to idle at 800 rpm. two to three minutes.
- (3) Stop engine by pulling mixture control knob to full lean position. Do not open throttle as engine stops.
- (4) After engine stops, turn ignition switch "off"
- (5) Turn all switches "off ". Be sure - otherwise your battery may run down over night.
- (6) Set parking brake, if required.

MODIFIED FUEL MANAGEMENT PROCEDURE

With a combination of highly volatile fuel, high fuel temperature, high operating altitude, and low fuel flow rate in the tank outlet lines, there is a remote possibility of accumulating fuel vapor and encountering power irregularities on some airplanes. To minimize this possibility, the following operating procedures are recommended-

- (1) Take-off and climb to cruise altitude on "both" tanks. (This is consistent with current recommendations.)
- (2) When reaching cruise altitude above 5000 feet MSL, promptly switch the fuel selector valve from "both, tanks to either the "right" or "left" tank.

- (3) During cruise, use "left" and "right" tank as required.
- (4) Select "both" tanks for landing as currently recommended.

POWER RECOVERY TECHNIQUES

In the remote event that vapor is present in significant amounts to cause a power irregularity, the following power recovery techniques should be followed:

OPERATION ON A SINGLE TANK

Should power irregularities occur when operating on a single tank power can be restored immediately by switching to the opposite tank. In addition, the vapor accumulation in the tank on which the power irregularity occurred will rapidly dissipate itself such that that tank will also be available for normal operation after it has been unused for approximately one (1) minute.

OPERATION ON BOTH TANKS

Should power irregularities occur with the fuel selector on both tanks the following steps are to be taken to restore power:

- (1) Switch to a single tank for a period of 60 seconds.
- (2) Then switch to the opposite tank and power will be restored.

SECTION III - Operating details

The following paragraphs cover in somewhat greater detail the items entered as a Check List in Section II. Every item in the list is not discussed here. Only those items on the checklist that required 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.

1. **STARTING:** Ordinarily, the engine starts best and smoothly with proper priming and the throttle opened 1/8 inch. Check the oil pressure as soon as engine is running.
2. **WARM UP:** Warm the engine for one or two minutes at 800 to 1000 rpm, headed into the wind where possible. The remainder of the warm-up should be accomplished while taxiing and should not exceed 1600 rpm. Engine ground operation or idling in summer temperatures should be limited to the very minimum and, in most cases, starting, taxiing to the end of the runway, and checking the engine quickly is an adequate amount.
3. **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 quickly as possible.
4. **CRUISING:** The maximum recommended cruising rpm's are 2450 rpm at sea level, 2550 rpm at 5000 ft., and 2650 rpm at 10,000 ft. These rpm's will produce approximately 70% power at the given altitudes. Greater range can be obtained at lower rpm settings as shown in the cruise performance chart. At any cruising altitude, adjust mixture control for best power by pulling knob out until maximum rpm. is obtained with fixed throttle; then push control forward toward "full rich" until rpm starts to decrease. Readjust for each change in power, altitude, or carburetor heat.
5. **LET DOWN:** The cruising glide should begin far enough away from destination so that a gradual descent can be made with power on, with mixture full rich. On approaching the landing field, the engine should be throttled down gradually and the glide, with closed throttle, should not be longer than necessary.
6. **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 prolonged intervals.
7. **STOPPING ENGINE:** The engine should always be allowed to idle (600 to 800 rpm) for two to three minutes before stopping. This not only permits the temperature of the various engine parts to equalize, but works oil up around the pistons and rings, thus leaving the engine in good condition for the next start. Providing the engine has been idled for approximately two minutes, it is recommended that the engine be stopped by using the mixture control. The procedure should be to place the mixture control in full lean position (pull control out as far as possible). Do not open throttle as engine stops. After the engine stops, turn the ignition switch to the "off" position.

TAXIING.

Release the parking brake before taxiing and use the minimum amount of power necessary to start the airplane moving. During taxi, and especially when taxiing downwind, the rpm should be held down to prevent excessive taxi speeds. Taxiing should be done at a speed slow enough to make the use of brakes almost entirely unnecessary. Using the brakes as sparingly as possible will prevent undue wear and strain on tires, brakes, and landing gear. Normal steering is accomplished by applying pressure to the rudder pedal in the direction the airplane is to be turned. For smaller radius turns, at slow speed, the brakes may be used on the inside wheel. At slow taxi speed, this airplane may be pivoted about the outboard strut fitting without sliding the tires. When taxiing in crosswinds it is important that speed and use of brakes be held to a minimum and that all controls be utilized to maintain directional control and balance.

NOTE

Caution should be used when taxiing over rough fields to avoid excessive loads on the nosewheel. Rough use of brakes and power also add to nose wheel load. A good rule of thumb: "Use minimum speed, power, and brakes."

Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips. Full throttle runups over loose gravel are especially harmful to propeller tips. When takeoffs must be made over a gravel surface, it is very important that the throttle be advanced slowly. This allows the airplane to start rolling before high rpm is developed, and the gravel will be blown back of the propeller rather than pulled into it. When unavoidable small dents appear in the propeller blades, they should be immediately corrected as described in section V under propeller care.

TAKE-OFF

Normal and obstacle clearance takeoffs are performed with flaps retracted. The use of 10 degrees flaps will shorten the ground run approximately 10%, but this advantage is lost in the climb to a 50-foot obstacle. However, if 10 degrees of flaps are used in the ground runs, it is preferable to leave them extended rather than retract them in the climb to the obstacle. The exception to this rule would be in a high altitude takeoff in hot weather where climb would be marginal with flaps 10 degrees. Flap deflections of 30 degrees and 40 degrees are not recommended at any time for take-off. General rules for flap operation during take-off are as follows:

Don't under marginal conditions leave flaps on long enough that you are losing both climb and airspeed. *Don't* release flaps with airspeed below flaps up stalling speed. (See stalling speed table on page 3-3). *Do* slowly release the flaps as soon as you reasonably can after take-off, preferably 50 feet or more over terrain or obstacles.

Consult the take-off chart (figure 18) for take-off distances under various gross weight, altitude, and headwind conditions.

CLIMB

For detailed data, see climb performance chart in Section VI. Climbs are conducted at 80-90 mph with flaps up and full throttle for best engine cooling. The best *rate-of-climb* speeds range from 75 m.p.h. level to 70 mph. at 10,000. If an obstruction dictates the use of a steep climb angle, the best *angle of climb* speed should be used with flaps up and full throttle. These speeds vary from 56 m.p.h. at sea level to m.p.h. at 10,000 feet.

NOTE

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

CRUISE

For cruise data, see cruise performance chart in Section VI.

Range and endurance figures are given for lean mixture, from 2500 feet to 12,500 feet and for rich at altitudes of 2,500 feet and 5,000 feet. All figures are based on zero wind, 37 gallons of fuel for cruise, McCauley 7651 propeller, 2200 pounds gross weight, and standard atmospheric conditions. For lean mixture figures, mixture is leaned to maximum rpm. Allowances for fuel reserve, headwinds, takeoffs and climb, and variations in mixture leaning technique should be made and are in addition to those shown on the charts. Other indeterminate variables such as carburetor metering characteristics, engine and propeller conditions, and turbulence of the atmosphere may account for variations of 10% or more in maximum range.

STALLS

The stalling speeds shown above are for forward c.g. normal category, full gross weight conditions. Other loadings result in slower stalling speeds. The horn stall warning indicator produces a steady signal 5 to 10 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.

LANDING

Normal landings are made power off with any flap setting. Slips are prohibited in full flap approaches because of a downward pitch encountered under certain combinations of airspeed and sideslip angle. Approach glides are normally made at 70-80 m.p.h. with flaps up, or 65-75 with flaps down, depending upon the turbulence of the air. The elevator trim tab is normally adjusted in the glide to relieve elevator control forces.

Landings are usually made on the main landing wheels to reduce the landing speed and the subsequent need for braking in the landing roll. The nose wheel is lowered gently to the runway after the speed is diminished to avoid unnecessary nose gear strain. This procedure is especially important in rough field landings.

Heavy braking in the landing roll is not recommended because of the probability of skidding the main wheels with the resulting loss of braking effectiveness and damage to the tires.

COLD WEATHER OPERATION

Prior to starting on cold mornings, it is advisable to pull the propeller through several times by hand to "break loose" or "limber" the oil, thus conserving battery energy. In extremely cold (-20°F) weather, prime the engine as follows:

- (1) Clear propeller.
- (2) Turn master switch "on".
- (3) With magneto switch "off and throttle closed, prime the engine four to ten strokes as the engine is being turned over.
- (4) Turn magneto switches "on".
- (5) Open throttle 1/8" (to idle position) and start engine by pulling starter control. Note: In extremely cold weather a few strokes of the primer as the engine fires will enable the engine to keep running. (Avoid over-priming.) After priming, push primer all the way in and turn to locked position to avoid possibility of engine drawing fuel through the primer. Do not pull out on starter for a second starting attempt until engine has come to a complete stop from the first attempt. Failure to do this may result in damage to the starting gear.

During cold weather operations, no indication will be apparent on the oil temperature gage prior to take-off if outside air temperatures are very cold. After a suitable warm-up period (2-5 minutes at 1000 rpm), accelerate the engine several times to higher engine rpm if the engine accelerates smoothly and the oil pressure remains normal and steady, the airplane is ready for take-off.

When operating in sub-zero temperatures, avoid using partial carburetor heat. Partial heat may increase the carburetor air temperature to the 32 – 80 degree F. range, where icing is critical under certain atmospheric conditions. For operation at temperatures consistently below freezing, a winterization kit consisting of plates for closing cowl openings is available at your distributor or dealer for a nominal charge.

Oil Dilution (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 60 seconds. If more than one minute of dilution (one quart 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 one quart 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 table indicates the amount of oil to drain for various dilution times. The total volume of fuel and oil must not exceed 9 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 by an oil screen clogged with sludge washed down by the fuel.

OIL DILUTION TABLE
TEMPERATURE

	0 degrees F	-10 degrees F	- 20 degrees F
Dilution Time	1 min	1-1/2 Min	2-1/4 Min
Fuel Added	1 pt	1 ½ qt	2-1/4 qt
Oil Drained (sump full)	0 qt	1.2 qt	1 – ¼ qt

Maximum sump capacity-9 qt
Maximum for takeoff – 8qt

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 reduce 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 takeoff. Otherwise, the sump may overflow when the airplane is nosed up for climb.

SECTION IV -Operating limitations

OPERATIONS AUTHORIZED.

Your Cessna 172 with standard equipment as certificated under CAA Type Certificate No. 3A12 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. An owner of a properly equipped 172 is eligible to obtain approval for its operation on single engine scheduled airline service on VFR.

MANEUVERS - NORMAL CATEGORY.

The Model 172 exceeds the requirements of the Civil Air Regulations. Part 3, set forth by the United States Government for airworthiness. Spins and acrobatic 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:

Gross Weight.....	2200	lbs.
Flight Load Factor* Flaps Up.....	+ 3.8	-1.52
Flight Load Factor* Flaps Down	+ 3.5	

* The design load factors are 150% of the above and in 211 cases the structure meets or exceeds design loads. Your airplane must be operated in accordance with all CAA approved markings, placards and checklists in the airplane. If there is any information in this section which contradicts the CAA approved markings, placards and check lists, it is to be disregarded.

MANEUVERS - UTILITY CATEGORY.

This airplane is not designed for purely acrobatic flight. However, in the acquisition of various certificates such as commercial pilot, instrument pilot and flight instructor, certain maneuvers are required by the C.A.A. All of these maneuvers are permitted in the Cessna 172 when operated in the utility category. In connection with the utility category, the following gross weight and flight load factors apply, with recommended entry speeds for maneuvers as shown.

Maximum Design Weight	1950	lbs.
Flight Maneuvering Load Factor, Flaps Up	+4.4	-1.76
Flight Maneuvering Load Factor, Flaps Down.....	+ 3.5	

OPERATING LIMITATIONS

No acrobatic maneuvers are approved except those listed below:

<i>Maneuver.....</i>	<i>Entry Speed</i>
Chandelles.....	115 mph (100 knots)
Lazy Eights	115 mph (100 knots)
Steep Turns	115 mph (100 knots)
Spins.....	Slow Deceleration
Stalls (Except Whip Stalls)	Slow Deceleration

The baggage compartment and rear seat must not be occupied.

Aerobatics that may impose high inverted loads should not be attempted The important thing to bear in mind in flight maneuvers is that the Cessna 172 is clean in aerodynamic design and will build up speed quickly with the nose down. Proper speed control is an essential requirement for execution of any maneuver and care should always be exercised to avoid excessive speed which in turn can impose excessive loads. In the execution of all maneuvers avoid abrupt use of controls.

AIRSPPEED LIMITATIONS

The following are the certificated true indicated airspeed limits for the Cessna 172:

Maximum (Glide or dive, smooth air)	160 mph (red line)
Caution Range (Level flight or climb)	140-160 mph (yellow arc)
Normal Range (Level flight or climb)	59-140 mph (green arc)
Flap Operating Range	55-100 mph (white arc)

ENGINE OPERATION LIMITATIONS.

Power and Speed..... 145 bhp at 2700 rpm

ENGINE INSTRUMENT MARKINGS.

OIL TEMPERATURE GAGE.

Normal Operating Range..... Green Arc

Maximum Allowable..... Red Line

OIL PRESSURE GAGE.

Minimum Idling5 psi (red line)

Normal Operating Range.....30-45 psi (green arc)

Maximum50 psi (red line)

FUEL QUANTITY INDICATORS.

Empty (2-1/2 gallons unusable each tank)E (red line)

*Not recommended for take-off E to 1/4 (red arc)

*This fuel available for all normal operations.

TACHOMETER.

Normal Operating Range:

At sea level 2200-2450 (inner green arc)

At 5000 feet 2200-2550 (middle green arc)

At 10,000 feet 2200-2650 (outer green arc)

Maximum Allowable 2700 (red line)

WEIGHT AND BALANCE.

All aircraft are designed for certain limit loads and balance conditions. These specifications for your 172 are charted on page 4-1.

A weight and balance report and equipment list for your particular airplane when it left the factory is furnished. Changes in original equipment affecting empty weight c. g. are required by the C.A.A. to be recorded in the repair and alteration form 337. Using the empty weight, c. g. location, and moment derived from the latest of these two sources, and following the example shown, the exact moment may be readily calculated. This exact moment, when plotted on the center of gravity envelope, 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.

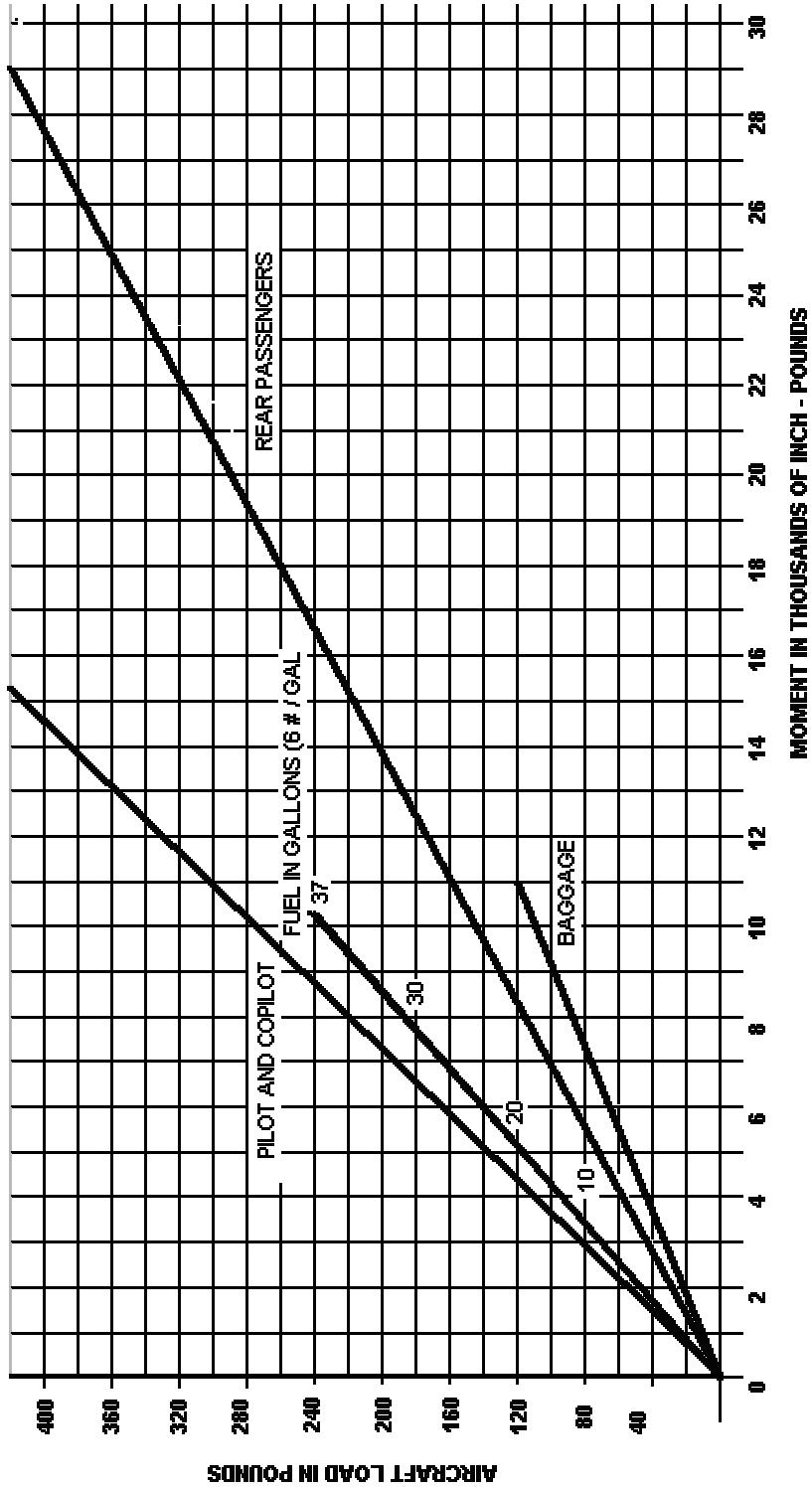
The utility category is solely for the purpose of instructing and training in certain flight maneuvers. The weight and balance considerations limit the airplane to a pilot with or without co-pilot, full gas, no baggage and no rear seat baggage *or passenger*. The utility category envelope has been included in the weight and balance charts. The weight and moment of your airplane in the utility category may be determined by following the example shown for figuring a normal category airplane weight and moment. The utility weight and moment, when plotted on the center of gravity envelope, should fall within the "Utility" portion of the envelope for safe operation.

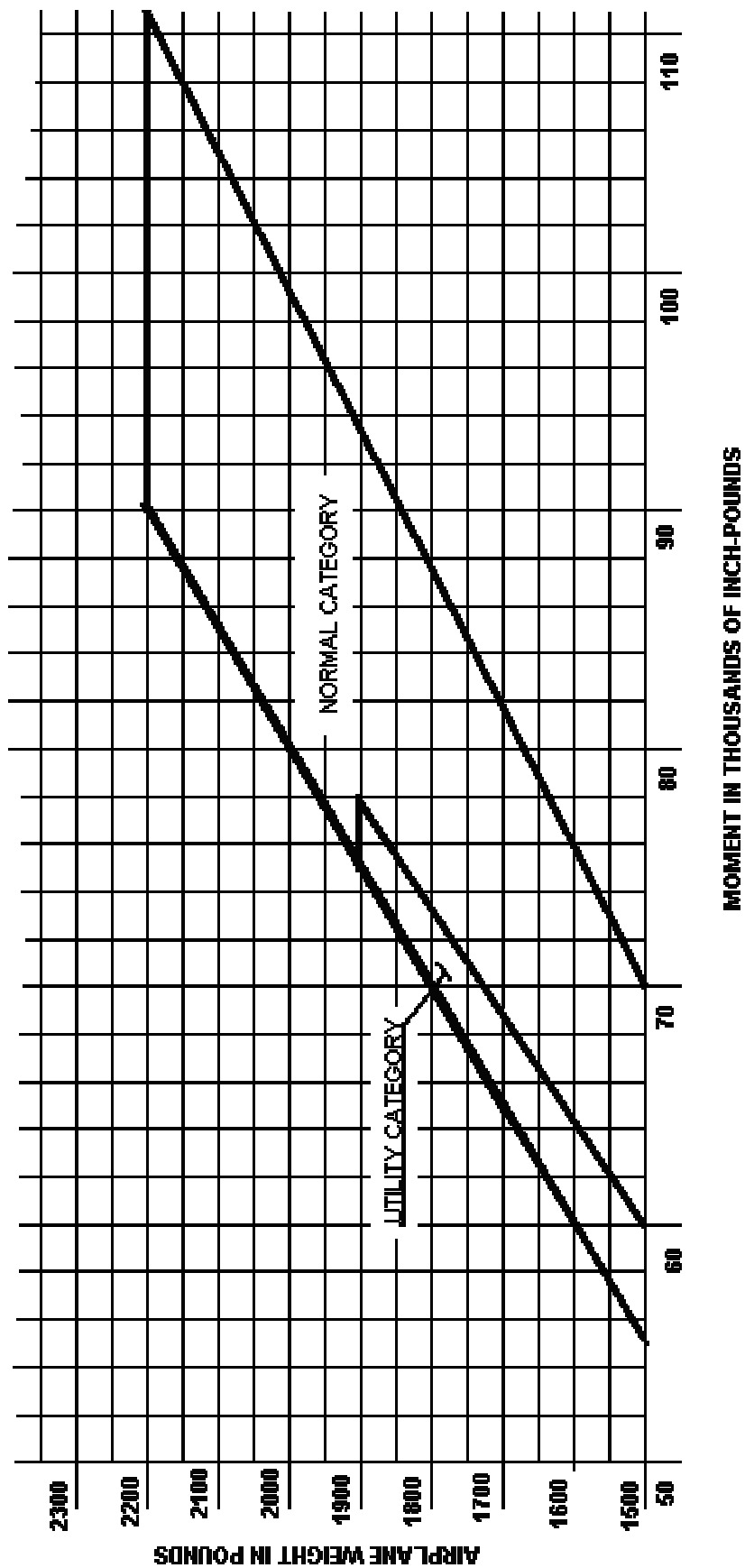
EXAMPLE FOR A NORMAL CATEGORY AIRPLANE WITH A LICENSED EMPTY WEIGHT OF 1290 LBS. AND A MOMENT OF 49,260 IN. LBS.		
	WT	MOMENT / 1000
EMPTY WEIGHT (LICENSED).....	1317.76	+49.7
OIL	15	- 0.3
PILOT & PASSENGER	340	+12.2
REAR PASSENGERS	290	+20.3
FUEL (MAXIMUM) 37 GAL	222	+10.7
BAGGAGE (TO MAKE GR. WT.)	15	+ 1
Total	2199.76	93.6

Locate this point (2200 at 93.6 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 on page 4-4 should be consulted to determine proper load distribution.





SECTION V – Care of the airplane – Owner’s responsibilities

(omitted)

SECTION VI – Operational Data

The Operational data shown on the following pages are compiled from actual tests with airplane and engine in good condition and using average piloting technique and best power mixture. You will find this data a valuable aid when planning your flights. However, inasmuch as the number of variables included precludes great accuracy, an ample fuel reserve should be provided. The range performance shown makes 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.

To realize the maximum usefulness from your 172, take advantage of the high cruising speeds. However, if range is of primary importance, it may pay you to fly at a low cruising rpm thereby increasing your range and allowing you to make the trip non-stop with ample fuel reserve. Use the range table on page 6.3 to solve flight planning problems of this nature.

In the table (Figure 19), range and endurance are given for lean mixture, from 2,500 feet to 12,500 feet and for rich mixture at altitudes of 2,500 feet and 5,000 feet. All figures are based on zero wind, 37 gallons of fuel for cruise, McCauley 7651 propeller, 2200 pounds gross weight, and standard atmospheric conditions. For lean mixture figures, mixture is leaned to maximum rpm. Allowances for fuel reserve, headwinds, takeoffs and climb, and variations in mixture leaning technique should be made and are in addition to those shown on the charts. Other indeterminate variables such as carburetor metering characteristics, engine and propeller conditions, and turbulence of the atmosphere may account for variations of 10% or more in maximum range.

AIRSPEED CORRECTION TABLE - FLAPS UP OR DOWN (mph)											
IAS	40	50	60	70	80	90	100	110	120	130	140
TAS	52	58	65	73	82	92	101	111	120	130	139

Figure 17. Airspeed Correction Table

TAKEOFF DATA										
TAKE-OFF DISTANCE WITH FLAPS UP FROM HARD SURFACE RUNWAY										
GROSS WT POUNDS	IAS AT 50 FT	HEAD WIND MPH	SEA LEVEL 59°F		2500 FT. 50°F		5000 FT 41°f		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
1600	56	0	356	806	420	956	505	1145	610	1390
		15	230	525	275	630	335	765	375	960
		30	130	290	160	360	200	455	255	580
1900	63	0	515	1175	615	1700	750	1710	955	2175
		15	350	790	420	960	525	1190	675	1535
		30	210	475	260	590	330	745	425	990
2200	69	0	725	1650	880	2000	1080	2455	1365	3100
		15	505	1145	620	1405	775	1760	990	2255
		30	315	720	400	910	510	1160	675	1530

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

CIMB DATA												
TAKE-OFF DISTANCE WITH FLAPS UP FROM HARD SURFACE RUNWAY												
GROSS WT POUNDS	SEA LEVEL 59°F			2500 FT. 50°F			5000 FT 41°f			7500 FT 32°f		
	BEST RATE OF CLIMB IAS (mph)	RATE OF CLIMB (FPM)	GAL OF FUEL USED	BEST RATE OF CLIMB IAS (mph)	RATE OF CLIMB (FPM)	GAL OF FUEL USED	BEST RATE OF CLIMB IAS (mph)	RATE OF CLIMB (FPM)	GAL OF FUEL USED	BEST RATE OF CLIMB IAS (mph)	RATE OF CLIMB (FPM)	GAL OF FUEL USED
1600	70	1115	1.0	66	860	1.9	63	605	2.9	59	350	4.3
1900	72	880	1.0	70	640	2.2	67	410	3.5	63	190	5.8
2200	75	660	1.0	73	445	2.6	70	240	4.7	68	30	10.9

NOTE; FLAPS UP, FULL, THROTTLE, AND MIXTURE LEANED FOR SMOOTH OPERATION ABOVE 5000 FT. FUEL USED INCLUDES WARM-UP AND TAKE OFF ALLOWANCE..

Figure 18. Take-Off & Climb Chart

CRUISE PERFORMANCE WITH RICH MIXTURE								
ALT	RPM	BHP	% BHP	TAS MPH	Gal / Hr	End. Hours	Mile/Gal	Range mi.
2,500	2100	66	45	94	7.2	5.1	13.1	484
	2200	74	51	102	7.8	4.7	13.0	482
	2300	83	57	108	8.5	4.4	12.8	474
	2400	92	64	114	9.2	4.0	12.4	458
	2500	103	71	120	10.1	3.7	11.9	440
	2600	116	80	126	11.2	3.3	11.3	417
	2700	128	89	131	12.6	2.9	10.3	382
5,000	2100	63	43	93	7.1	5.2	13.1	483
	2200	70	48	100	7.8	4.8	12.8	475
	2300	78	54	107	8.4	4.4	12.7	469
	2400	87	60	113	9.1	4.0	12.4	457
	2500	97	67	119	10.0	3.7	12.0	443
	2600	107	74	125	10.8	3.4	11.5	426
	2700	120	83	131	12.1	3.1	10.8	401
CRUISE PERFORMANCE WITH LEAN MIXTURE								
2,500	2100	66	45	94	5.7	6.5	16.5	610
	2200	74	51	102	6.5	5.7	15.7	580
	2300	83	57	108	7.3	5.1	14.9	552
	2400	92	64	114	8.1	4.6	14.1	521
	2500	103	71	120	9.0	4.1	13.3	491
	2600	116	80	126	10.1	3.6	12.4	458
	2700	128	89	131	11.2	3.3	11.6	430
5,000	2100	63	43	93	5.5	6.7	16.8	621
	2200	70	48	100	6.1	6.0	16.3	601
	2300	78	54	107	6.8	5.4	15.6	578
	2400	87	60	113	7.6	4.8	14.8	546
	2500	97	67	119	8.5	4.3	14.0	518
	2600	107	74	125	9.4	3.9	13.3	491
	2700	120	83	131	10.5	3.5	12.4	460
7,500	2100	60	42	89	5.3	7.0	16.9	625
	2200	66	46	97	5.8	6.4	16.7	620
	2300	73	51	105	6.4	5.8	16.4	607
	2400	82	56	111	7.2	5.2	15.5	575
	2500	91	63	118	8.0	4.6	14.8	548
	2600	101	70	124	8.9	4.2	14.0	519
10,000	2100	58	40	84	5.0	7.3	16.6	641
	2200	63	44	94	5.5	6.7	17.0	629
	2300	70	48	102	6.2	6.0	16.6	613
	2400	77	53	109	6.8	5.5	16.1	596
	2500	86	59	117	7.5	4.9	15.9	574
	2600	93	64	122	8.2	4.5	14.9	552
12,500	2200	61	42	90	5.3	6.9	16.8	623
	2300	66	46	98	5.8	6.4	16.9	626
	2400	74	51	107	6.5	5.7	16.6	612
	2500	80	55	114	7.0	5.2	16.2	597

shaded areas are cruising rpm setting that are not recommended for the given altitude

Figure 19 Cruise Performance Chart

LANDING CONDITIONS

Approach airspeed: 64 mph at 2200 pounds
51 MPH at 1600 pounds

Wing Flaps 40
Power Off
Hard Surface Runway

Reduce landing distance by 105 for each 6 mph of wind

Elevation	Speed IAS	GROUND RUN	TO CLEAR 50' OBS.
Sea level (59°F)	1600	530	870
	2200	880	1115
2,500 (50°F)	1600	550	915
	2200	720	1180
5,000 (41°F)	1600	585	940
	2200	796	1245
7,500 (32°F)	1600	615	1010
	2200	800	1315

Figure 20 Landing Distances