MOONEY

EXECUTIVE 21

OWNERS MANUAL

1968

OPERATE THIS AIRCRAFT ONLY – ❶ after reading owners manual ❷ with owners manual on board ❷ after you are fully qualified & understand all of the aircraft operating characteristics & limitations

1968
MOONEY

EXECUTIVE 21

OWNERS MANUAL

MODELS
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Foreword

This manual is issued as your operating guide for the Mooney Executive 21. It is important that you--regardless of your previous experience--carefully read the handbook from cover to cover and review it frequently.

IMPORTANT: THIS MANUAL CONTAINS Federal Aviation Agency–Delegation Option Authority APPROVED LIMITATIONS AND MUST BE CARRIED IN THE AIRCRAFT AT ALL TIMES.

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SECTION I. GENERAL DESCRIPTION

SEC I

DESIGN FEATURES

The MOONEY EXECUTIVE 21 is a low-wing four-place aircraft with a retractable gear. A four-cylinder engine powers the aircraft for economical, high-performance flight. Licensing under Federal Aviation Agency regulations assures that your Mooney meets the requirements of Normal Category aircraft at full gross weight.

AIRFRAME

The airframe has a welded, tubular-steel cabin structure enclosed in sheet-aluminum skins. Stressed skins rivet to main and auxiliary spars in the wing, stabilizer, and vertical fin. The laminar-flow wing has full wrap-around skins with flush riveting over the forward two thirds of the wing area.

For pitch trim control, the empennage pivots on the aft fuselage. A torque-tube-driven jack screw, bolted to the rear tail cone bulkhead, sets the stabilizer angle of attack.

The forward-opening cabin door provides access to both front and rear seats. The baggage compartment door is above the wing trailing edge to enable baggage loading from the ground.

POWER PLANT

The power plant is a four-cylinder fuel-injected engine that develops 200 horsepower. A 50-ampere 12-volt generator supplies ample electrical power for all standard and optional equipment when the engine is operating at flight power settings.

The hydraulic propeller governor, using engine oil pressure for increasing blade pitch to control engine speed, regulates the controllable-pitch constant-speed propeller. Spring and blade aerodynamic forces decrease blade pitch.

FLIGHT CONTROLS

Conventional dual controls link to the control surfaces through push-pull tubes.

The Mooney Positive Control (P.C.) system is standard equipment. P.C. is a lateral stability control system that provides a high degree of roll and yaw stability, thereby enhancing the inherent wings-level flight characteristics of the aircraft. The system works full time from takeoff through landing but can be easily deactivated or overpowered for flight maneuvers. P.C. allows you, the pilot, to devote more time to navigation, traffic surveillance, and communications.

LANDING GEAR

The tricycle landing gear allows maximum taxi vision and ground maneuvering. Hydraulic disc brakes and a steerable nose wheel aid in positive directional control during taxiing and crosswind landings.

The standard gear is manually retracted. A gear warning horn along with red and green position lights help prevent inadvertent gear-up landings. An electrically operated gear is available at extra cost. The electric gear system incorporates an airspeed-actuated switch that helps prevent gear retraction until a safe airspeed is attained. An emergency gear extension system is installed with the optional electric gear system.

SPECIFICATIONS OUTLINE

POWER PLANT

TYPE: Four-cylinder, air cooled, horizontally opposed,

and fuel-injected engine with a wet-sump lubricating system.

Model (Lycoming)	IO-360-A1A
Rated Horsepower @ 2700 RPM	200
Bore	5.125 IN.
Stroke	4.375 IN.
Displacement	361.0 CU. IN.
Compression Ratio	8.7:1
Fuel Injector, Bendix	RSA-5-AD1
Magnetos, Scintilla	S4LN-200 Series

PROPELLER

TYPE: Constant-speed hydraulically-controlled propeller with a single-acting governor.

Model (Hartzell)	HC-C2YK-1B/7666 A-2
Diameter	74 IN.
Blade Angle (@ 30 IN. STA):	
Low	14° ± 0°
High	29° ± 2°

LANDING GEAR

TYPE: Manually retracted tricycle gear with rubber shock discs, steerable nose wheel, and hydraulic disc brakes.

Wheel Base	5 FT 11-9/16 IN.
Wheel Tread	9 FT 3/4 IN.
Tire Size:	
Nose	5.00 x 5
Main	6.00 x 6
Tire Pressure:	
Nose	49 PSI
Main	30 PSI

FUEL & OIL

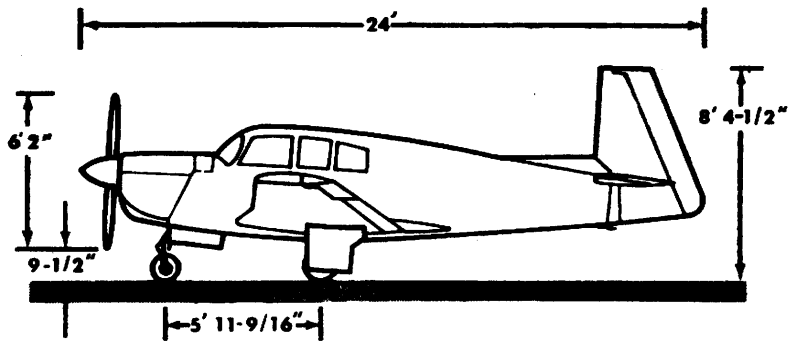
Usable Fuel Capacity	64 GAL
Minimum Fuel Octane Rating (aviation grade)	100/130
Oil Capacity (6 QTS MIN for flight)	8 QTS

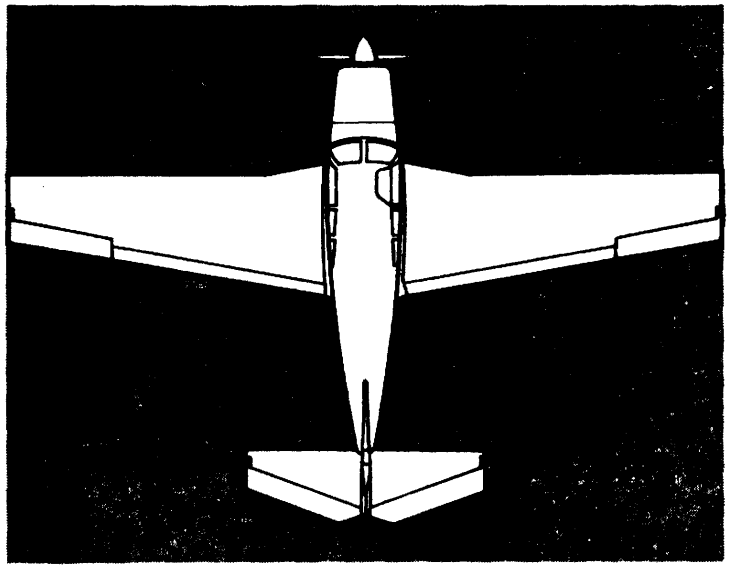
WEIGHT & LOADING

Gross Weight	2740 LBS
Approximate Empty Weight (with standard equipment)	1640 LBS
Useful Load	1100 LBS
Wing Loading @ Gross Weight (PSF)	16.4
Power Loading @ Gross Weight (PHP)	13.7

BAGGAGE COMPARTMENT

Maximum Loading (unless limited by weight envelope):	
Baggage Area	120 LBS
Hat Rack	10 LBS





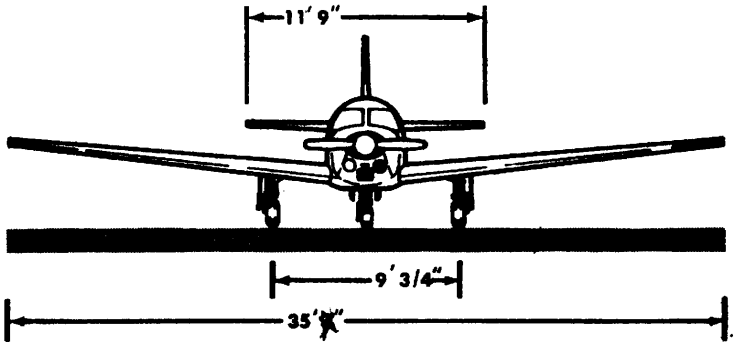


FIGURE 1-1. DIMENSIONED THREE VIEW

SECTION II. SYSTEMS OPERATIONS

SEC II

Acquiring a working knowledge of the Executive 21 controls and equipment is one of your important first steps in developing a fully efficient operating technique. This Systems Operations section describes location, function, and operation of systems' controls and equipment. It is advisable for you, the pilot, to familiarize yourself with all controls and systems while sitting in the pilot's seat and rehearsing the systems operations and flight procedures portions of this manual.

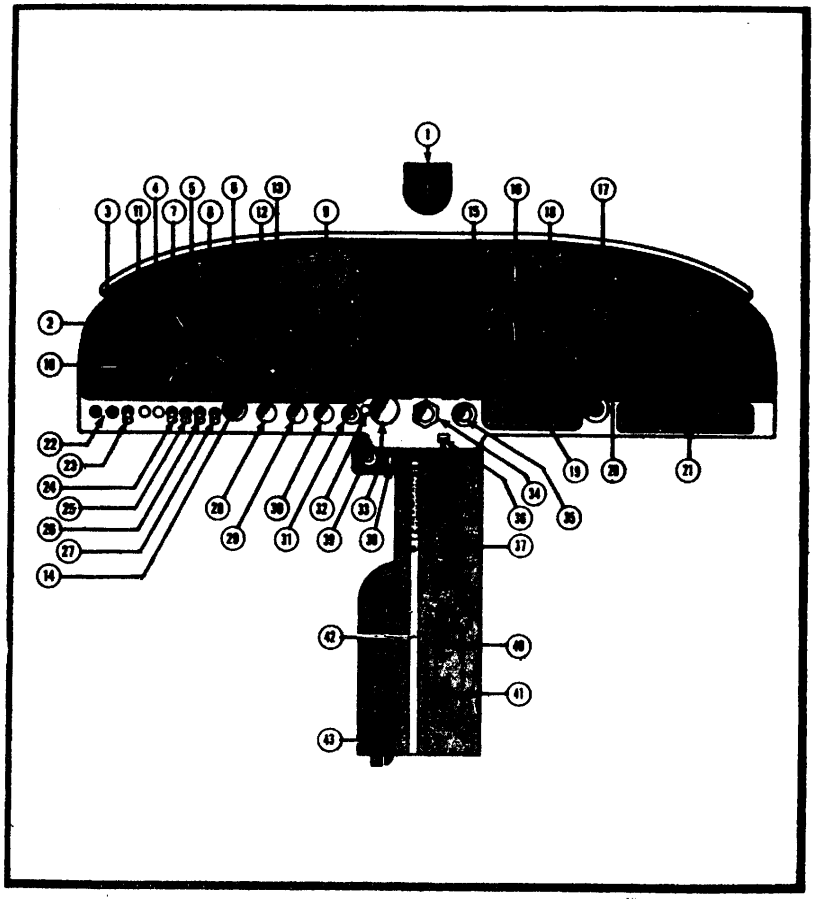


FIGURE 2-1. INSTRUMENT PANEL

WINDSHIELD CENTER POST

1. Magnetic Compass

LEFT PANEL

2. Master Switch
3. Ignition-Starter Switch
4. Gear-Up Signal Light
5. Gear-Down Signal Light
6. HI-LO Vacuum Warning Lights
7. Airspeed Indicator
8. Artificial Horizon
9. Directional Gyro
10. Rate-of-Climb Indicator
11. Altimeter
12. EGT Gage
13. Turn Coordinator
14. P.C. Roll-Trim Knob

RADIO PANEL

15. Radio Equipment

RIGHT PANEL

16. Tachometer
17. Glove Box
18. Manifold Pressure/Fuel Pressure Gage
19. Engine Cluster Gage:
    - Fuel Quantity Gage (L tank)
    - Fuel Quantity Gage (R tank)
    - Ammeter
    - Oil Pressure Gage
    - Oil Temperature Gage
    - Cylinder Head Temperature Gage
20. Cigarette Lighter
21. Main Circuit Breaker Panel Cover

SUBPANEL

22. Head Phone & Microphone Jacks (optional)
23. Electric Fuel Pump Switch
24. Pitot Heat Switch
25. Anticollision Light
26. Position Lights Switch
27. Landing Light Switch
28. Park Brake Control
29. Cabin Heat Control
30. Cabin Vent Control
31. Power Boost Control
32. Unfiltered Ram Air Warning Light

ENGINE CONTROLS:

33. Throttle Control
34. Mixture Control
35. Propeller Control
36. Wing Flap Control Knob
37. Wing Flap Pump Handle
38. Gear Lever Safety Latch
39. Cowl Flap Control

WHEEL WELL

40. Stabilizer Trim Position Indicator
41. Wing Flap Position Indicator
42. Gear Retracting Lever

CABIN FLOOR

43. Stabilizer Trim Control Wheel
44. Fuel Tank Selector Valve Drain
45. Fuel Tank Selector Knob

POWER PLANT

ENGINE CONTROLS

The throttle, mixture, and propeller controls are centrally located on the instrument panel; the mixture and propeller controls are vernier push-pull controls with center-button locks that prevent "creeping." Depressing the lock button in the knob overrides the vernier and allows movement throughout the full control range. Rotating the vernier knob clockwise increases the setting; counterclockwise rotation decreases the setting. The push-pull throttle control regulates manifold pressure. Pushing the control forward increases manifold pressure. Turning the friction lock holds throttle position.

The hexagon-shaped push-pull control between the throttle and propeller control regulates the engine fuel-air ratio (mixture). Precise mixture settings are established with the mixture control vernier while observing the EGT gage on the pilot's panel. The propeller control regulates the propeller governor which in turn controls engine RPM. Pushing the propeller control forward increases RPM (low pitch), and pulling the control aft decreases RPM (high pitch). Fine pitch changes are made by turning the knob to increase or decrease RPM.

FIGURE 2-2. ENGINE AIR INDUCTION SYSTEM

The engine induction-air control is on the subpanel immediately to the left of the throttle control. To the right of the induction-air control is an amber caution light that illuminates when the induction-air control knob (marked UNFILTERED RAM AIR PULL ON) is set for ram air and the gear is down. When operating at full throttle, using ram air will increase the manifold pressure by allowing engine induction air to bypass the induction air filter. The use of ram air must be limited to clean, dust-free air at altitude. The engine will operate on direct unfiltered air when the induction air control knob is pulled aft. The amber caution light reminds the pilot to push the engine induction air control forward for filtered air before landing. Should the induction air filter clog, alternate air will automatically draw into the engine. A spring-loaded door in the induction system will open by induction vacuum to allow air to enter the engine from inside the cowling.

All engine instruments except the EGT gage are grouped in the right instrument panel. Color arcs on instrument faces mark operating ranges. Proper interpretation of engine instrument readings is essential for selecting optimum control settings and for maintaining maximum cruise fuel economy. Engine limitations are given in Section V.

IGNITION SYSTEM

The left magneto has a set of fixed-retard breaker points that aid in smoother, easier starting. A battery-powered starting vibrator supplies a long-duration boosted spark.

The starter-ignition switch, mounted on the left of the instrument panel, combines both ignition and starting functions. Turning the ignition key clockwise through R, L, and BOTH to the START MAG position and then pushing forward on the key and receptacle engages the starter. Releasing the key when the engine starts allows the switch to return by spring action to the BOTH position. For safety, the starter-ignition switch must be left at OFF when the engine is not running.

FUEL SYSTEM

Two integral sealed sections carry the fuel in the forward inboard area of the wings. Full fuel capacity is 64 gallons. There are sump drains at the lowest point in each tank for taking fuel samples to check for sediment contamination and condensed water accumulation. Section VII discusses the fuel sampling procedure.

An illuminated three-position fuel selector handle on the cabin floor sets the selector valve below the floorboard for LEFT tank, RIGHT tank, or the OFF position. The fuel selector valve assembly contains a valve for draining condensed water and sediment from the lowest point in the fuel lines before the first flight of the day and after each refueling. Section VII discusses the selector valve flushing procedure.

Fuel feeds from one tank at a time to the selector valve and through the electric fuel pump enroute to the engine-driven pump and the fuel injector unit. Electric fuel-level transmitters in the tanks operate fuel gages in the engine cluster. The master switch actuates the fuel quantity indicator system to maintain a constant indication of fuel remaining in each tank. The fuel pressure gage registers line pressure delivered to the injector. Vents in each fuel tank allow for overflow and ventilation.

OIL SYSTEM

The engine has a full-pressure wet-sump oil system with an 8-quart capacity. The automatic bypass control valve routes oil flow around the oil cooler when operating temperatures are below normal or when the cooling radiator is blocked.

The engine oil should be kept at 6 to 8 quarts. Lycoming Service Instruction 1014 (latest revision) gives recommended oil specifications and oil change intervals.

ENGINE COOLING

The down-draft engine cooling system provides ground and inflight power plant cooling. Engine baffling directs air over and around the cylinders and out the cowl flap openings. Cowl flap doors allow proper air flow on the ground and during low-speed high-power climb. Pulling the cowl flap control opens the cowl flaps.

VACUUM SYSTEM

An engine-driven vacuum pump supplies suction for the vacuum-operated gyroscopic flight instruments, the retractable step, and the Mooney Positive Control system. Air entering the vacuum-powered instruments is filtered; hence, sluggish or erratic operation of vacuum-driven instruments may indicate that a clogged vacuum filter element is preventing adequate air intake. The HI or LO indicator light above the artificial horizon will glow if vacuum is above or below limits.

INSTRUMENTS

FLIGHT INSTRUMENTS

All primary flight instruments are grouped on the floating shock-mounted flight panel directly in front of the pilot's seat. The basic gyro flight references are the artificial horizon, the directional gyro, the vertical speed indicator, and the turn coordinator. Standard flight instrumentation also includes the airspeed indicator and the altimeter. The flap-position indicator is on the aft end of the nose wheel well.

A standard eight-day clock is mounted in the pilot's control wheel. The magnetic compass is mounted on the windshield post above the instrument panel. The outside air temperature gage with probe is installed through the windshield.

A pitot tube, mounted on the lower surface of the left wing, picks up airspeed indicator ram air. An optional heated pitot prevents pitot tube icing when flying in moisture-laden air. Static ports on each side of the tail cone supply static air pressure for the altimeter, the airspeed indicator, and the vertical speed indicator. An optional alternate static pressure source valve may be installed.

A stall warning horn, triggered by a sensing vane on the left wing leading edge, will sound when airspeed drops to near stall speed. Landing gear position lights on the panel will show red when the gear is retracted. Reducing power below 10 inches manifold pressure when the gear is not in the down-and-locked position will cause the gear warning horn to sound.

FLIGHT CONTROLS

PRIMARY FLIGHT CONTROLS

Push-pull tubes with self-aligning rod end bearings actuate the primary flight control surfaces. Beveled aileron trailing edges help reduce pilot control forces required for flight maneuvering. A spring-loaded interconnect device indirectly joins the aileron and rudder control systems to assist in lateral stability during flight maneuvers. Control surface gap strips minimize airflow spoilage at the hinge slots and reduce drag.

POSITIVE CONTROL

The Mooney Positive Control (P.C.) system provides a high degree of roll and yaw stability, thereby enhancing the inherent wings-level flight characteristics of the aircraft. Positive Control will hold an average heading over a long period of time when the aircraft is trimmed properly. However, without the installation of a magnetic heading lock, P.C. will not maintain an absolute preselected heading.

The system is a pneumatically operated, two-axis automatic control installation superimposed upon the primary flight control systems. An electro-vacuum-powered turn coordinator supplies pneumatic inputs to servo units that link to the aileron and rudder control systems. Since the engine-driven vacuum pump is the power source, P.C. is operative whenever the propeller is windmilling at more than 1000 RPM.

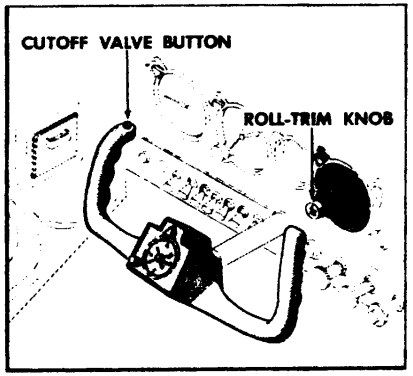


FIGURE 2-3. P.C. SYSTEM CONTROLS

The thumb-operated cutoff button on the left hand grip of the pilot's control wheel is shown in Figure 2-3. Depressing this button any time during flight will render the Positive Control system completely inoperative for flight maneuvers or manual flying. When the cutoff valve button is released, the aircraft will return unassisted to wings-level flight. P.C. can be manually overriden with little effort if the system should malfunction. Manually over-powering the system will not damage the aircraft or the P.C. components.

The roll-trim knob on the turn coordinator, as shown in Figure 2-3, provides an aileron trim function through the P.C. system. Rotating the knob trims the aircraft about its roll axis to compensate for asymetrical fuel and passenger loadings.

The P.C. system is installed to help alleviate pilot fatigue. But like any other system in the aircraft, P.C. must be monitored frequently to check for proper functioning.

The Executive 21 (M20F) is certified as a Normal Category aircraft. No acrobatic maneuvers including spins are approved. However, if a spin is inadvertently approached or entered, depressing the cutoff valve button on the left hand-

grip of the pilot's control wheel will de-energize the P.C. system while using normal spin recovery techniques. Spin recovery can be executed from the co-pilot's side by overpowering the P.C. system.

TRIM CONTROLS

For pitch trim control, the entire empennage pivots on the tail cone attachment points to increase or decrease the horizontal stabilizer angle of attack. This design allows flight trim establishment with minimum control surface deflection. A pointer in a slot located on the aft end of the nose wheel well indicates stabilizer trim position. Forward rotation of the trim wheel lowers the nose; rearward rotation raises the nose in flight.

WING FLAP CONTROLS

The wide-span flaps are hydraulically controlled by a hand-operated pump that actuates a hydraulic cylinder. A relief valve releases the hydraulic pressure at a slow rate as springs (or air forces) raise the flaps. Hydraulic fluid used in the system is common to both the flap and brake systems. Setting the flap-shaped control adjacent to the pump handle in the DOWN position and pumping the handle lowers the flaps to the desired angle of deflection. Flap position is indicated by a pointer on the aft end of the nose wheel well. The intermediate mark in the pointer range is the flap TAKE-OFF setting. The flap-

FIGURE 2-4. GEAR & FLAP CONTROLS

shaped control is placed in the UP position to retract the flaps. To stop the flaps at an intermediate setting during retraction, the flap-shaped control is simply placed in the DOWN position.

A horn emitting a sound of a different pitch than the gear warning horn warns of approaching stall. The stall warning horn is inoperative when the master switch is off.

LANDING GEAR

MANUAL GEAR RETRACTION SYSTEM (STANDARD)

The standard tricycle landing gear is unique in that it is manually retracted. The system operates by direct mechanical linkage. Manual retraction of the gear is aided by bungee-type springs in the fuselage and assist springs in the wing that balance the weight of the gear. Rubber shock discs in the welded steel tubular gear structure absorb the shock of landing and rough terrain taxiing. Red and green lights on the instrument panel indicate gear position. Pressing forward the indicator lens housing test-illuminates the lights.

There are three ways to see that the manually retracted gear is down-and-locked:

(1) The geardown indicator light illuminates.
(2) The safety latch on the retraction lever handle socket is engaged.
(3) The gear warning horn does not sound at approach power settings of below 10 inches manifold pressure.

The red indicator light (marked GEAR–UNLOCK) comes on when the handle on the retraction lever is not fully engaged in the down-and-locked position, thereby warning of an unsafe-to-land condition. The green light (marked GEAR–LOCK DN) indicates that the handle is properly engaged in the down position and the gear is in the landing configuration.

The thumb-operated safety latch on the down socket helps prevent accidental gear unlocking. The throttle-actuated gear warning horn sounds intermittently when the throttle is retarded below 10 inches manifold pressure with the gear retracted.

Depressing the safety latch button, sliding the gear handle from the down socket, and moving the lever rapidly to the floor between the seats retracts the gear. Sliding the handle into the uplock socket completes the operation. The more rapid the movement of the lever, the easier it is to retract the gear. The gear will retract easiest at low airspeeds. Sliding the gear handle from the uplock socket and moving the lever forward to the instrument panel lowers the gear. Sliding the handle into the downlock socket and checking the green indicator light and safety latch for a down-and-locked indication completes the gear lowering operation.

ELECTRIC GEAR RETRACTION SYSTEM (OPTIONAL)

The two-position electric gear control switch, identified by its wheel-shaped knob, is located near center of the instrument panel.

There are three ways to see that the electrically-actuated gear is down-and-locked:
(1) The geardown indicator light illuminates.
(2) The indicator marks align as seen through the floorboard window.
(3) The gear warning horn does not sound at approach power settings of below 10 inches manifold pressure.

Position indicator lights and a warning horn provide visual and audible gear position signals. A red signal light (marked GEAR–UNLOCK) will show continuously when the gear is fully retracted. A green signal light (marked GEAR–LOCK DN) to the left of the actuating switch shows continuously when the gear is fully extended. Both lights are out as the gear changes position.

The illuminated gear-down position indicator in the floor-

board aft of the wheel well has two marks that align when the gear is down. Retarding the throttle below 10 inches manifold pressure causes the gear warning horn to sound unless the gear is down-and-locked.

An airspeed-actuated safety switch in the pitot system prevents landing gear retraction until attaining a safe takeoff airspeed. The safety switch is not designed to substitute for the gear switch in keeping the gear extended while taxiing, taking off, or landing.

EMERGENCY GEAR-EXTENSION SYSTEM (WITH ELECTRIC GEAR)

The emergency gear extension handcrank on the left upholstery panel near the pilot's knee is for manually driving the the electric gear actuating motor if the electrical system should malfunction. Section IV discusses the emergency gear extension procedure.

BRAKE & STEERING SYSTEMS

The main gear wheels incorporate self-adjusting disc-type hydraulic brakes. The pilot's rudder pedals have individual toe-actuated brake cylinders linked to the rudder pedals. Depressing the toe pedals and pulling out the parking brake control on the instrument panel sets the brakes for parking. Pushing the parking brake control forward releases the brakes.

It is inadvisable to set the parking brake control when the brakes are overheated after heavy braking or when outside temperatures are unusually high. Trapped hydraulic fluid may expand with heat to damage the system. Wheel chocks are normally used for long-time parking and mooring.

Rudder pedal action steers the nose wheel. Gear retraction relieves the rudder control system of its nose wheel steering loads and centers the wheel to permit aligned retraction into the nose wheel well.

ELECTRICAL POWER

GENERATOR & BATTERY

The direct-current electrical power system has a 35-ampere-hour 12-volt negative-ground storage battery in the tailcone. The ammeter in the instrument cluster indicates battery charging or discharging rate. A power loss in the generator or voltage regulator will be shown as a discharge reading on the ammeter at flight power settings; a discharged battery will be shown as a high charge reading.

The master switch turns on the entire electrical power supply system. The master switch must not be flipped off and on in flight while electrical equipment is operating.

CIRCUIT BREAKERS

Push-to-reset or toggle-switch circuit breakers protect all of the circuits in the electrical power systems. Circuit

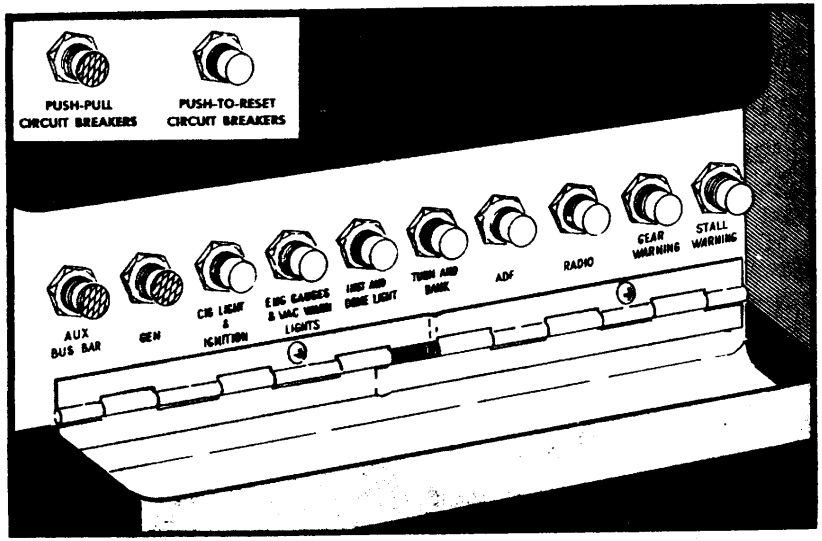


FIGURE 2-5. MAIN CIRCUIT BREAKER PANEL

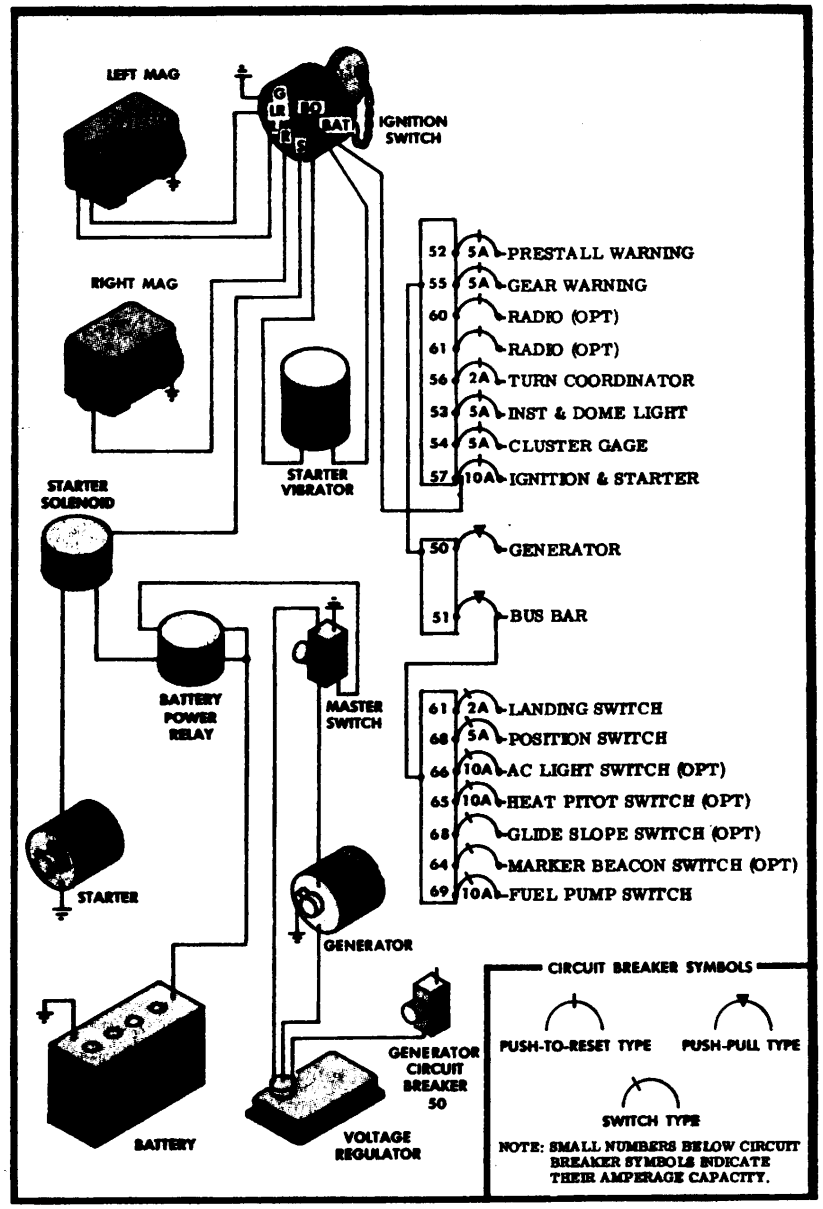


FIGURE 2-6. ELECTRICAL SYSTEM SCHEMATIC

breakers automatically break the electrical current flow if the systems receive an overload, thus preventing damage to electrical wiring. The main circuit breaker panel is in the right subpanel and is covered with a bottom-hinged door. Figure 2-5 illustrates the main circuit breaker panel with its push-to-reset button-type standard equipment circuit breakers. All switch-type circuit breakers are on the lower left side of the pilot's instrument panel.

If an electrical circuit is found inoperative and its circuit breaker button is in the out position, it is advisable to wait two or three minutes to permit the breaker contacts to cool before pressing the button to reactivate the circuit. If resetting a second time does not restore power, the circuit breaker must be left open until the circuit is checked for loose connections or defective parts. Failure to observe this precaution may result in an electrical fire.

The main-power circuit breaker on the left side of the main breaker panel furnishes an emergency overload break between the generator and the individual button-type circuit breakers. Depressing the main-power circuit breaker button will usually restore an overloaded circuit. If pressing the button a second time fails to reactivate the circuit, the main-power circuit breaker must remain open. Since the generator is then cut out of the power circuit, the storage battery supplies electrical power in steadily diminishing output.

INDICATOR LIGHTS

Warning or signal lights are displayed on the instrument panel: the HI and LO vacuum warning lights, the gear UNLOCK and LOCK DN lights, and the UNFILTERED AIR ON light. The purpose or function of each of these lights is discussed elsewhere in this chapter. The warning lights may be dimmed for night flight (the amber ram air caution

light does not dim). Pressing forward on the lens housings tests the warning lights; turning the lens housings dims them.

CABIN LIGHTING

The rheostat knobs in the headliner control instrument lights, overhead spot lights, and the compass light. Rotating the knob clockwise turns on and increases light intensity. An overhead dome light illuminates the cabin.

CABIN ENVIRONMENT

HEATING & VENTILATING SYSTEMS

Three ventilating systems provide cabin environmental control suited to individual pilot and passenger preferences. Heated air from the engine exhaust muffler and cool air from an airscoop on the co-pilot side is individually controlled and mixed to the desired temperature. The distribution duct system directs air to the pilot and co-pilot and to the aft cabin area. Valves or louvers at the vent system outlets control airflow. The left side fresh-air scoop has an adjustable eyeball inlet.

The cabin overhead ventilating system works independently of the cabin heating and ventilating system. Rotating the knob above the pilot seat extends or retracts the overhead airscoop to control air intake and to prevent air-buffeting at high cruising speeds. Small directional vent deflectors with inner knob volume controls, within easy reach of each occupant, distribute incoming outside air as individually desired.

The cabin heat control is marked CABIN HEAT. Opening the side airscoop control (labeled CABIN VENT) and setting the cabin heat control turns on cabin heat. To lower cabin

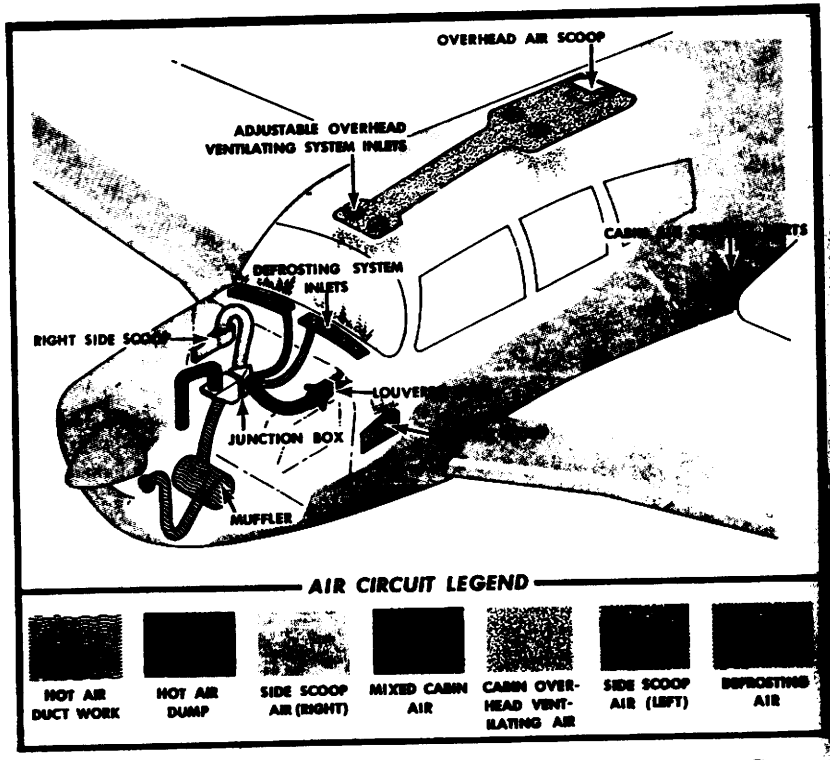


FIGURE 2-7. CABIN HEATING & VENTILATING

temperature, the cabin heat control is pushed toward the OFF position. Completely closing the cabin heat control and fully opening the cabin vent control, with the overhead airscoop extended, supplies maximum fresh air circulation. In case of engine fire, the cabin heating system must be turned off.

The right side airscoop has outlets under the side panel for installation of radio or autopilot equipment cooling ducts.

WINDSHIELD DEFROSTING SYSTEM

The defrosting system diverts warm air from the cabin heating system ductwork and distributes this air over the

windshield interior surfaces. Closing the discharge control forces heated air to flow from the defrosting nozzles at the windshield base. The discharge controls must be closed for maximum defroster airflow.

To avert windshield damage when using maximum defrost airflow, the cabin vent control should be in the open position (full aft) to prevent excessively hot air from being directed to the windshield.

CABIN

SEATS & SAFETY BELTS

The front seats are individually mounted and may be adjusted fore and aft to fit individual comfort preferences. Resetting a seat back is accomplished by pulling the seat back forward, rotating the large cam selector knob at the lower back juncture, and allowing the back to return to the new position. The rear seat back can be adjusted by leaning forward in the seat, pulling the catch lever at the forward end of the side panel arm rest, and adjusting the seat back to the desired position.

Safety belts, if worn properly, keep occupants firmly in their seats in rough air and during maneuvers. These belts are mechanically simple and comfortable to wear. They are seat-attached to allow easy seat adjustment.

BAGGAGE & CARGO AREAS

The baggage compartment has 15 cubic feet of baggage or cargo space and two pair of floor tiedown straps. The standard loose equipment, consisting of tiedown eyebolts, jack points, tiedown rings, a fuel sampling cup, and a towbar are stowed in the baggage compartment. The rear seat backs can be removed for additional cargo space by pulling the spring-loaded lock pins at the seat back base and sliding the seat back rearward.

Notes . . . . . .

SECTION III. NORMAL PROCEDURES

GROUND OPERATIONS

FLIGHT OPERATIONS

Before flying your Mooney, it is necessary that you become thoroughly familiar with all techniques needed to operate its systems and equipment safely and efficiently.

This section of the manual provides you with a quick and easy reference to normal operating procedure recommendations. Checklist procedures are enumerated in steps that cover cockpit controls and instruments in left-to-right and top-to-bottom patterns. These procedures are intended to assist you in developing good flying techniques under average conditions. While close attention to each step is important for safe and efficient operation, sound judgment may occasionally be called for in making exceptions when circumstances require a deviation in operating procedure.

GROUND OPERATIONS

PREFLIGHT

In addition to completing the preflight check, visually inspect all of the aircraft exterior prior to each flight with particular attention to detection of loose rivets and dents. When checking under the aircraft, look for fuel and oil leaks indicated by oil runs or fuel dye stains.

> WARNING: Check the aircraft weight and balance before proceeding with the flight. Consult the Weight & Balance Record, furnished in the airplane file, for detailed data needed to calculate load distribution and limitations.

Standard atmospheric temperatures are below freezing above 8000 feet altitude, and it is possible that condensed water in the fuel lines will freeze to cause fuel starvation. Therefore, always drain the fuel selector sump (as described in Section VII) at each preflight inspection.

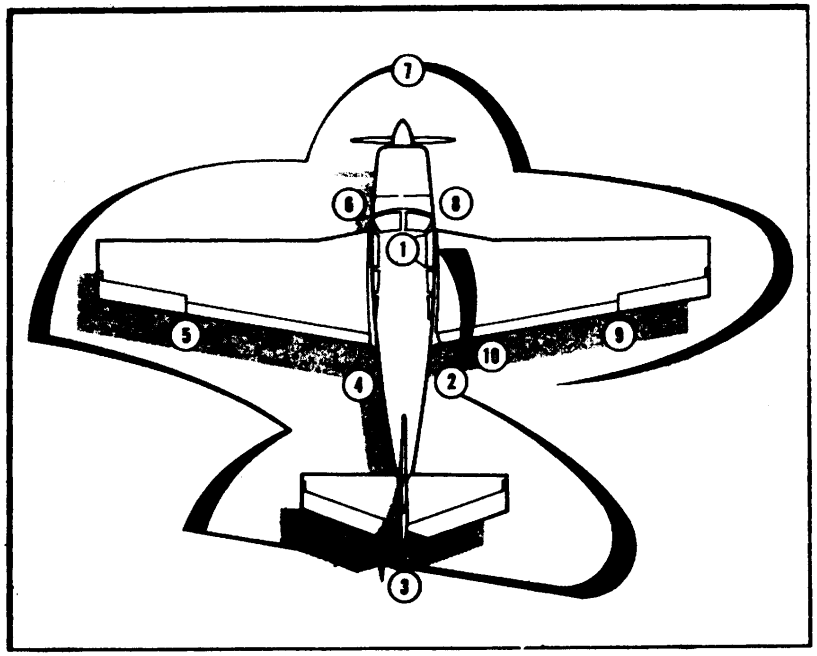


FIGURE 3-1. PREFLIGHT WALK AROUND DIAGRAM

PREFLIGHT CHECK

1. Master and Ignition Switches--OFF.
   Fuel Selector Drain--Selector handle on R, then on L; PULL RING, hold five seconds, then release.
2. Instrument Static Port--UNOBSTRUCTED.
   Tail Tiedown--REMOVE.
3. Empennage--CHECK.
   Remove all ice, snow, or frost.
4. Tail Cone Access Door--SECURE.
   Instrument Static Port--UNOBSTRUCTED.

5. Wing Skins--CHECK.
   Flap and Attach Points--CHECK.
   Aileron and Attach Points--CHECK.
   Wing Tip and Navigation Light--CHECK.
   Remove all ice, snow, or frost.
6. Left Wing Leading Edge--CHECK.
   Pitot Tube and Stall Switch Vane--UNOBSTRUCTED.
   Fuel Tank--CHECK QUANTITY; SECURE CAP.
   Chock and Tiedown--REMOVE.
   Left Main Gear Shock Discs and Tire--CHECK.
   Fuel Tank Sump Drain--SAMPLE.
   Tank Vent--UNOBSTRUCTED.
   Fuel Selector Drain Valve--CLOSED.
   Windshields--CLEAN.
   Left Side Engine Cowl Fasteners--SECURE.
7. Propeller--CHECK for nicks and cracks.
   Forward Engine Components--CHECK starter, generator belt, etc.
   Power Boost Air Scoop--CHECK closed and sealed.
   Landing Light--CHECK.
   Nose Gear--CHECK tire; check for towing damage.
   Shock Discs--CHECK.
8. Right Side Engine Cowl Fasteners--SECURE.
   Engine Oil Level--CHECK (Full for extended flight).
   Windshield--CLEAN.
   Fuel Tank Sump Drain--SAMPLE.
   Tank Vent--UNOBSTRUCTED.
   Chock and Tiedown--REMOVE.
   Right Main Gear Shock Discs and Tire--CHECK.
   Fuel Tank--CHECK QUANTITY; SECURE CAP.

9. Right Wing Leading Edge--CHECK.
   Wing Skins--CHECK.
   Wing Tip and Navigation Light--CHECK.
   Aileron and Attach Points--CHECK.
   Flap and Attach Points--CHECK.
   Remove all ice, snow, or frost.
10. Baggage Door--SECURE.

BEFORE STARTING

After everyone has entered the aircraft, close and latch the door. Be sure all baggage is secure and that all necessary charts, computers, and other loose items are aboard and securely stowed so that they will not be thrown about the cabin if rough air is encountered in flight. See that all safety belts are fastened and that the seats are adjusted and locked in comfortable positions. With the pilot's seat properly set, you should be able to fully deflect all flight controls. Be sure there is a flashlight aboard for night flights.

BEFORE-STARTING CHECK

1. All Switches--OFF.
2. Radios--ALL OFF.
3. Gear Lever (or Switch)--DOWN and LOCKED.
4. Wing Flaps--CHECK all positions; return to RETRACT.
5. Engine Induction Air--FILTERED AIR.
6. Parking Brake Control--PULL ON.
7. Throttle--CLOSE.
8. Propeller--HIGH RPM.
9. Main Circuit Breaker Panel--CHECK.

10. Cowl Flaps--OPEN.
11. Mixture Control--IDLE CUTOFF.
12. Fuel Selector Handle--SET for fuller tank.
13. Electric Fuel Pump--OFF.
14. Cabin Heat--OFF.

STARTING

Before starting the engine, make sure the surrounding area is clear. It is good practice to call "CLEAR" before engaging the starter, and to direct the propeller blast to an open area before running up the engine. To prevent propeller damage, keep engine RPM low while operating on loose gravel.

The continuous-flow fuel injector will spray fuel into the intake ports whenever fuel is under pressure in the lines and the mixture control is not at IDLE CUTOFF. Under these conditions fuel injects into the cylinders even when the engine is not running. Fuel-injected engines have no separate priming system as do carburetor-equipped engines, but greater care is required during starting to prevent over priming and flooding of fuel injected engines. Do not keep the mixture control in the FULL RICH position for longer than a few seconds when starting the engine.

The starting checklist is recommended for normal starting procedures; however, under extreme climatic conditions, alter the starting procedure to accommodate existing conditions. If the engine does not start after 10 or 15 seconds of cranking, discontinue cranking and allow the starter to cool for approximately five minutes before cranking again. Allowing the starter to cool intermittently will prolong starter life.

Open the cowl flaps for all ground operations except during

extremely cold weather. Avoid prolonged engine operation on the ground to prevent overheating. Engine warmup with the cowl flaps closed can cause unnecessary engine friction and wear.

STARTING CHECK

1. Master Switch--ON.
2. Fuel Quantity Indicators--CHECK for conformity to observed quantity.
3. Press-to-Test Indicator Lights--CHECK.
4. Landing Gear Lock DN Light--GREEN.
5. Electric Fuel Pump--ON.
6. Throttle--OPEN 1/4 to 1/2 IN.
7. Mixture Control--OPEN to FULL RICH and return to IDLE CUTOFF.
8. Ignition-Starter Switch--turn to START and PRESS forward.
9. Mixture Control--OPEN slowly until engine starts, then FULL RICH.
10. Throttle--Set for 1000 to 1200 RPM.
11. Oil Pressure Gage--25 PSI MIN (If there is no pressure indication within 30 seconds, PULL mixture control to IDLE CUTOFF and check oil system.)
12. Fuel Pressure Gage--GREEN ARC.
13. Lights--As required.
14. Radios--ON and CHECK.

15. Anticollision Light--ON.
16. Pitot Heater--CHECK and note ammeter deflection.
17. Stabilizer Trim Indicator--TAKEOFF.
18. Fuel Selector Handle--CHECK right and left.

Flooded-Engine Clearing

1. Throttle--FULL OPEN.
2. Mixture Control--IDLE CUTOFF.
3. Electric Fuel Pump--OFF.
4. Ignition-Starter Switch--turn to START and PRESS forward.
5. Throttle--RETARD when engine starts.
6. Mixture Control--OPEN slowly to FULL RICH.
7. Electric Fuel Pump--ON.

Hot-Engine Starting

If the engine fails to achieve a normal start, flush the fuel injector with fresh fuel as follows: (This operation must be rapid enough to prevent the fresh fuel from percolating.)

1. Mixture Control--IDLE CUTOFF.
2. Throttle--OPEN 1/4 to 1/2 IN.
3. Electric Fuel Pump--ON.
4. Mixture Control--FULL RICH for 3 to 5 seconds, then IDLE CUTOFF.

5. Ignition Switch--START and PRESS.
6. Mixture Control--OPEN slowly to FULL RICH when engine starts.

Hot-Weather Starting

Nacelle temperatures increase rapidly after engine shutdown in extreme hot weather to cause vaporization in the fuel lines and fuel evaporation in the manifold. Hot weather restarting procedure alternatives depend on the length of time the engine has been shutdown. When restarting a hot engine, operate at 1200 to 1500 RPM for several minutes to disperse residual heat in the engine compartment. In most instances, the procedure outlined for hot-engine starting may be used for an engine operating under hot weather conditions.

Cold-Weather Starting

The starting procedure for a cold engine is the same as the normal starting procedure, except that additional priming (mixture control set at FULL RICH) may be necessary. During extremely cold weather it is advisable to preheat the oil and engine compartment with ground heaters.

Hand Cranking

If it becomes necessary to start the engine with a low battery when external power is not available, proceed as follows:

1. Wheel Chocks--INSTALL.
2. Parking Brake--SET.
3. Controls and Switches--SET for normal start except IGNITION OFF.

4. Propeller--HIGH RPM (Pull propeller through two or more complete revolutions with IGNITION OFF.)

   WARNING: When hand cranking the engine, stand clear of the propeller until the ignition-starter switch is turned to the START position and the starting vibrator is energized.

5. Ignition-Starter Switch--turn to START but DO NOT PRESS forward.
6. With ignition switch held in START position, hand crank the engine.
7. Ignition-Starter Switch--release to BOTH as soon as engine starts.
8. Mixture Control--slowly push forward to FULL RICH.
9. Proceed with normal-starting check.

WARMUP & TAXIING

Allow the engine to warmup at 1000 to 1200 RPM; normally, taxiing will sufficiently warm the engine. The engine is warm enough for takeoff when it will develop full RPM and when the throttle can be opened without backfiring, skipping, or a reduction in oil pressure. Release the parking brake, and as the aircraft moves forward apply the toe brakes lightly to check brake effectiveness. Nose wheel steering, through rudder pedal action, is ordinarily sufficient for ground maneuvering. But, when necessary, make tighter turns by applying inside braking.

CAUTION: Never rely on the retraction safety switch to keep the electric gear extended while taxiing, taking off, or landing. Always check the electric gear switch position.

Taxi with the mixture FULL RICH and the propeller at HIGH RPM to prevent engine overheating. Avoid prolonged ground operation at low RPM that will tend to foul the spark plugs.

WARNING: While taxiing before takeoff, make sure that the Positive Control system is functioning normally and that the gyro instruments have erected properly.

The control wheel will tend to move in the opposite direction from the taxi turn when P.C. is working properly. The absence of flight control movement, or extreme control movement in either direction without prompt return to neutral, indicates a P.C. malfunction that should be corrected before flight. Taxi turns also present an opportunity to check the directional gyro for proper indication. The turn coordinator should indicate a bank in the direction of the turn.

Before runup, head the aircraft into the wind and center the nose wheel. It is always a good practice to stop the airplane with the nose wheel centered, since running up the engine or starting to taxi with the nose wheel in a cocked position imposes high side loads on the nose gear.

Minimize engine ground operation to prevent overheating. Monitor cylinder head and oil temperatures. Check the propeller governing system by advancing the throttle to 1700 RPM; then, pull the propeller control full aft (decrease RPM). As soon as a 100 RPM drop is noted, return the propeller control to FULL INCREASE RPM. In cold weather, repeat the cycle two or three times to flush the system with fresh, warm oil. Then, check R and L magnetos, returning the switch to BOTH between checks. Neither magneto should drop off more than 125 RPM when operated individually nor should the difference between the two exceed 50 RPM. With this check completed, slowly close the throttle to 1000-1200 RPM and complete the before-takeoff check.

BEFORE-TAKEOFF CHECK

1. Flight Controls--CHECK for unrestricted travel.
2. Altimeter--SET to field elevation (Obtain tower or weather station barometric pressure; check altimeter barometric pressure to determine deviation.)
3. Directional Gyro--SET to magnetic compass or runway heading.
4. Flight Instruments--CHECK.
5. Engine Instruments--CHECK.
6. Clock--SET and wind as needed.
7. Electric Fuel Pump--ON (Check rise in fuel pressure.)
8. Fuel Selector Handle--SET for fuller tank.
9. Stabilizer Trim--SET for TAKEOFF.
10. Flaps--SET for TAKEOFF.
11. Propeller--CYCLE and CHECK at 1700 RPM.
12. Magnetos--CHECK at 1700 RPM.
13. Seat Belts--FASTENED.
14. Seats--LOCKED.
15. Door and Pilot Window--LATCHED closed.
16. Check floor area for retraction lever clearance.

Before applying power for takeoff, quickly recheck for:

1. Propeller--FULL INCREASE.

2. Trim Indicator--TAKEOFF.
3. Flap Indicator--TAKEOFF.
4. Fuel Selector Handle--FULLER TANK.
5. Cowl Flaps--OPEN.
6. Power Boost--FILTERED AIR ON.

WARNING: Do not change fuel tanks immediately before takeoff.

Proceed with takeoff as soon as the above checklist is complete. If it is necessary to hold for clearance instructions, run the engine at 1400-1500 RPM to insure proper cooling and to minimize spark plug fouling.

FLIGHT OPERATIONS

TAKEOFF

When ready for takeoff, apply power slowly to avoid picking up loose stones, etc., with the propeller. (On short fields you may prefer to hold the brakes until gaining full power.) As the aircraft accelerates continue increasing power until reaching full throttle. Then tighten the throttle friction lock to prevent throttle creep.

As speed increases during the takeoff roll, apply back pressure on the control wheel at about 65 to 75 MPH. The aircraft will tend to rock into a nose-high attitude as it breaks ground. To compensate for this tendency, slowly relax some of the elevator back pressure as the nose wheel leaves the runway. Keep the nose on the horizon just after the aircraft breaks ground to allow smooth flight from the runway without an abrupt change in pitch attitude.

When making a cross-wind takeoff, hold the nose wheel on the runway longer and accelerate to a higher speed than normal. Pull up abruptly to avoid contact with the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

Retract the landing gear only when safely airborne and in good control. Retract the flaps when the aircraft has cleared all obstacles and has gained an indicated airspeed of about 80 to 90 MPH.

After takeoff:
(1) Apply the brakes to stop wheel rotation.
(2) Retract the gear.
(3) Reduce propeller RPM to 2550-2600.
(4) Retract the flaps.
(5) Establish climb-out attitude.
(6) Turn off the electric fuel pump, and check the fuel pressure indication to insure that the engine-driven fuel pump is maintaining fuel pressure.

CLIMB

An enroute climb speed of 115-120 MPH IAS is recommended for improved engine cooling and forward visibility. The speed for maximum rate of climb is a straight-line variation from 113 MPH IAS at sea level (decreasing approximately one MPH per 1000 FT increase in altitude) to 102 MPH IAS at 10,000 FT. The speed for maximum angle of climb (obstacle clearance) is about 94 MPH IAS at full power, gear and flaps up. The recommended power setting for normal climb is 2600 RPM and 26 inches manifold pressure.

Manifold pressure will drop with increasing altitude at any throttle setting. Power can be restored by gradually opening the throttle.

At full throttle, setting the power boost control for ram air allows induction air to bypass the air filter to add induction ram air pressure which increases manifold pressure, thus increasing ceiling altitude.

WARNING: Turn power boost off when encountering icing conditions. Do not fly this aircraft in known icing conditions.

Using unfiltered induction air when flying in snow or other IFR conditions can be hazardous. Snow can accumulate in the fuel injector impact tubes, or moisture can freeze in the inlet passages under icing conditions to cause loss of power. Therefore, do not use power boost when flying in sleet, snow, rain, or moisture-laden air near freezing temperatures. Under these conditions, ice can form in the inlet duct or fuel injector impact tubes even though no visible moisture is apparent on the airframe.

After establishing climb power and trimming the aircraft for climb, check to insure that all controls, switches, and instruments are set and functioning properly.

CRUISE

Careful and detailed flight planning for each trip will increase operating efficiency. The weather, route, load, and starting and arrival time will affect altitude selection and over-all flight efficiency.

The performance tables in Section VI will aid in selection of optimum cruise power settings. Cruise power is that portion of the power spectrum where the mixture may be leaned; which is to say, leaning is limited to 75 percent power or less. Leaning the mixture increases engine operating temperatures. Leaning above 75 percent power may cause detonation and engine damage. Do not lean below 5000 FT.

Upon reaching cruise altitude, trim the aircraft for level flight. Allow acceleration to cruise airspeed. Then reduce manifold pressure and RPM to desired cruise power, and close the cowl flaps. Lean the mixture once cruise power is established. Very exacting fuel-air mixtures can be selected by observing the exhaust gas temperature gage (EGT) while adjusting the mixture control vernier. Operate the mixture control slowly to allow for the slight lag in the EGT indicator.

CAUTION: Do not lean the mixture at power settings above 75 percent rated power. In selecting a cruise RPM, the engine must not be continuously operated for cruise purposes within the range of 2100 to 2350 RPM. Recommended cylinder head temperature for continuous cruise operation is 400°F or less.

For best economy lean the mixture by turning the mixture control vernier counterclockwise until the EGT indicator shows a peak (maximum) temperature and starts to decrease. Then, enrich by turning the mixture control clockwise until, the temperature drops 25°F (one mark on the gage) from peak temperature.

For best power (maximum airspeed), lean the mixture by turning the mixture control vernier counterclockwise to peak temperature, and then enrich by turning clockwise until the EGT indicator shows a drop of 100°F (four marks on gage) below the peak temperature.

POWER CHANGES

When making power changes it is advisable to always increase RPM before increasing manifold pressure, and to decrease manifold pressure before reducing RPM. Always stay within the established operational limitations, and always operate controls slowly and smoothly.

Aerodynamic efficiency is optimum in the normal indicated cruise ranges. The airspeed indicator is marked with a green arc from 69 to 175 MPH and a yellow arc from 175 to 200 MPH. When flying at lower altitudes, it is possible to cruise at airspeeds above 175 MPH in the yellow arc. The yellow arc indicates the range of airspeeds in which you must exercise caution when flying in rough air or gusts. Rough air is defined as flight in turbulence of a degree that is uncomfortable to the pilot and passengers. Reduce speed when encountering rough air or gusts, and operate only in the airspeed indicator green arc range.

WARNING: Operate this aircraft as a Normal Category airplane in compliance with the operating limitations stated in the form of placards, markings, and manuals. No acrobatic maneuvers including spins are approved. However, if a spin is inadvertently approached or entered, depressing the cutoff valve button on the left handgrip of the pilot's control wheel will de-energize the P.C. system for spin recovery.

A recommended technique for spin recovery is: briskly apply full rudder against the spin, followed immediately by rapid forward movement of the control wheel as required. The ailerons should be neutralized and the throttle closed if not already. When rotation stops, neutralize the controls and recover from the resulting dive. Spin recovery can be executed from the co-pilot's side by overpowering the P.C. system.

Do not attempt maneuvers involving approach to stalling angle or those requiring full application of rudder, elevators, or ailerons above 135 MPH CAS.

Thoroughly familiarize yourself with the flight characteristics of the aircraft with Positive Control inoperative. This can be done by simply holding down the cutoff button while making turns and maneuvers. Check the P.C. system frequently during each flight to insure that it is functioning properly, particularly when IFR or marginal weather may be encountered.

Positive Control will hold an approximate heading over a period of time; however, it will not hold an exact heading without the installation of a magnetic heading lock. To check for a P.C. malfunction while in flight, first establish a moderate bank; then, release the controls to see if the aircraft will return to straight wings-level flight as indicated by the artificial horizon. Repeat the procedure with a turn in the opposite direction. Sluggish, erratic, or incomplete bank recovery warns of a malfunction in the P.C. system.

In the event of a complete engine power loss, P.C. will continue to operate as long as the propeller is windmilling at 1000 RPM or more. Loss of vacuum (indicated by a LO vacuum warning light) will automatically make the P.C. system inoperative. However, the turn coordinator will continue to operate on electrical power. The turn coordinator can be used as a visual flight reference if other gyro instruments become inoperative.

Proper fuel management during flight will help maintain lateral trim and will also serve as a fuel quantity check. After takeoff with both tanks full, use fuel from one tank for one hour; then, switch to the other tank and note the time. Use all the fuel from the second tank. The remaining fuel endurance in the first tank can be calculated from the time it took to deplete the second tank, less one hour. You must remember, however, that this endurance calculating procedure can be relied upon only if power and mixture remain the same and an allowance is made for the extra fuel used during climb. For estimation purposes, consider fuel cosumption during a full-power climb to be 25 percent higher than that of best-power cruise, and 35 percent higher than that of best-economy cruise.

CAUTION: Do not allow the engine to lose power or quit before you switch fuel tanks. If a tank runs dry and the engine quits, retard the throttle before restarting. Restarting with an advanced throttle may cause engine overspeeding that can lead to mechanical malfunction.

LETDOWN

Plan your letdown well in advance of estimated landing time. Generally, a power-on descent is most desirable. A gradual rate of descent at cruising speed permits power settings sufficiently high to maintain proper engine temperatures and to prevent spark plug fouling. Sudden power reductions at higher airspeeds can damage the engine by causing it to cool too rapidly.

Establish a gradual letdown by reducing power below cruise while maintaining cruise airspeed throughout the descent. Monitor cylinder head and oil temperatures throughout descent to guard against over cooling. Oil in the oil cooler can congeal very rapidly after a power reduction when flying in cold weather.

CAUTION: Do not lower gear above 120 MPH IAS. Do not lower flaps above 125 MPH IAS. Do not exceed 125 MPH IAS with the flaps down.

BEFORE-LANDING CHECK

1. Engine Induction Air--FILTERED AIR amber light out.
2. Fuel Selector Handle--SET for fuller tank.
3. Electric Fuel Pump--ON.
4. Mixture Control--FULL RICH.
5. Propeller--FULL INCREASE.
6. Airspeed--REDUCE to 120 MPH.
7. Landing Gear--DOWN and LOCKED; green light on.
8. Seat Belts--FASTENED.
9. Flaps--As required (below 125 MPH IAS).

10. Trim--As required.

LANDING

Ordinarily, you should complete the Before-Landing Check on the downwind leg. To allow for a safe margin above stall speed throughout approach, hold airspeed above 90 MPH until the flaps are lowered. Degree of flap deflection needed will vary according to landing conditions, but for most landings you should lower flaps about half way just prior to turning into base leg. Extend flaps as required on final approach to adjust for variations in wind, glide angle, and other variables.

> WARNING: The stall warning horn and the landing gear warning horn are inoperative when the master switch is in the OFF position.

> CAUTION: Do not allow the aircraft to touch down in a nose-low attitude or at too high an airspeed. Either of these conditions will allow the nose wheel to contact the runway first, which may cause the aircraft to porpoise and damage the gear.

On final, trim the aircraft to fly hands-off at an approach speed of about 80 MPH. As you cross the runway end markers, reduce power to idle. Slow the rate of descent by increasing back pressure on the control wheel until the aircraft settles on the runway in a slightly nose-high attitude. (When high, gusty winds prevail, or when landing crosswind, approach at a higher airspeed.) Slowly relax back pressure and gently lower the nose wheel to the runway so the nose gear steering system can be used to help control taxi direction.

Unless a short roll is necessary, you should allow the aircraft to slow to a moderate taxi speed before applying brakes. After leaving the runway, turn off the electric fuel pump, open the cowl flaps, retract the flaps, and reset the trim for TAKEOFF. Hold taxi power setting between 1000 and

1200 RPM to permit uniform engine cooling.

Execute short-field landings with partial power and full flaps on final approach. Reduce power to idle during flare-out, and touch down first on the main wheels before allowing the nose wheel to make contact. You may apply brakes as soon as all wheels are firmly on the ground. For maximum braking effect, raise the flaps and apply back pressure on the control wheel as you apply brakes. Do not skid the main wheels, as doing so will reduce braking effectiveness and damage the tires.

AFTER LANDING & TAXIING CHECK

1. Electrical Fuel Pump--OFF.
2. Cowl Flaps--OPEN.
3. Wing Flaps--RETRACT.
4. Stabilizer Trim--TAKEOFF.
5. Throttle--1000 to 1200 RPM.

SHUTDOWN CHECK

1. Throttle--IDLE at 1000 to 1200 RPM until cylinder head temperature starts to drop.
2. Cowl Flaps--OPEN.
3. Radios--OFF.
4. Electrical Switches--OFF.
5. Mixture Control--IDLE CUTOFF.
6. Throttle--RETARD as engine stops firing.
7. Ignition-Starter Switch--OFF when propeller stops.

8. Parking Brake--Set (for short-time parking).
9. Trim--TAKEOFF.
10. Flaps--RETRACTED.
11. Master Switch--OFF.
12. Control Wheel--LOCK with right seat belt.
13. Overhead Air Scoop--CLOSED.
14. Wheel Chocks and Tiedown--As required.

CAUTION: Do not leave the flaps in the fully extended position while the aircraft is parked. Solar heat can expand the hydraulic fluid to damage the flap actuating systems.

FAA/DOA APPROVED

EMERGENCY OPERATION & PROCEDURES

MOONEY MODEL M20F
EXECUTIVE 21

OPERATE THIS AIRCRAFT ONLY – ● after reading owners manual ● with owners manual on board ● after you are fully qualified & understand all of the aircraft operating characteristics & limitations

SEC IV

MOONEY AIRCRAFT, INC.
DOA-SW-1

Approved by K C Scott

Date 7-20-67

LOG OF REVISIONS

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EMERGENCY OPERATIONS & PROCEDURES

In case of engine fire, turn cabin heater off.

Turn power boost off if icing conditions are inadvertently encountered.

WARNING: A discharged storage battery may prevent the gear from fully extending by electrical power.

EMERGENCY GEAR-EXTENSION (WITH ELECTRIC GEAR)

To manually extend the landing gear:

1. Pull landing gear actuator circuit breaker to OFF position.
2. Place gear switch in DOWN position.
3. Push handcrank engage lever forward to engage drive mechanism.
4. Crank handcrank clockwise to fully lower the gear. The gear is down-and-locked when the green light comes on. In case of electrical malfunction, check the visual gear-down indicator marks for alignment.

CAUTION: Do not attempt to manually retract the electric landing gear.

WARNING: Do not operate landing gear electrically with handcrank engaged.

POSITIVE CONTROL (LATERAL STABILITY AUGMENTATION SYSTEM)

The pilot can override the system at any time in the event of a P.C. malfunction. Complete disengagement may be accomplished by depressing the cutoff valve.

In the event of partial or complete vacuum failure (indicated by a red light on the gyro horizon), the lateral stability augmentation system will automatically become inoperative.

AIRCRAFT LIMITATIONS & OPERATIONS

MOONEY MODEL M20F
EXECUTIVE 21

OPERATE THIS AIRCRAFT ONLY – ● after reading owners manual ● with owners manual on board ● after you are fully qualified & understand all of the aircraft operating characteristics & limitations

SEC V

MOONEY AIRCRAFT, INC.
DOA-SW-1

Approved by R C Scott

Date 7-20-67

LOG OF REVISIONS

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OPERATING LIMITATIONS

The following limitations must be observed in the operation of this airplane:

AIRSPEED LIMITATIONS

Never Exceed Speed . . . . . 174 KT. 200 MPH CAS

Max Structural Cruising Speed 152 KT 175 MPH CAS

Max Maneuvering Speed . . . 117 KT 135 MPH CAS

Max Gear Operating Speed . . . 104 KT 120 MPH CAS

Max Gear Extended Speed . . . 104 KT 120 MPH CAS

Max Flap Operating Speed . . . 109. . 125 MPH CAS

AIRSPEED INSTRUMENT MARKINGS

Radial Red Line . . . . . 200 MPH CAS
(Never exceed speed which is the maximum safe airspeed)

Yellow Arc . . . . . 175 to 200 MPH CAS
(Denotes range of speeds in which operations should be conducted with caution and only in smooth air)

Green Arc. . . . . 69 to 175 MPH CAS
(Denotes normal operating speed range)

White Arc . . . . . 64 to 125 MPH CAS
(Denotes speed range in which flaps may be safely lowered)

POWER PLANT

Engine . . . . . Lycoming Model IO-360-A1A

Engine limits for all operations . . . . . 200 BHP, 2700 RPM

Fuel . . . . . 100/130 octane aviation gasoline

Propeller . . . . . Hartzell Constant Speed
Hub HC-C2YK-1B
Blade 7666A-2
Pitch setting at 30-inch station: High $29^{o} \pm 2^{o}$; Low $14^{o} \pm 0^{o}$

Cowl Flaps . . . . . Open for takeoff, climb, and ground operations. Open as required for continuous operation to maintain cylinder head temperature below 400° F. (Do not open above 150 MPH.)

POWER PLANT INSTRUMENTS

Tachometer
- Radial Red Line (Rated) . . . . . 2700 RPM
- Green Arc--Narrow (Rated operating range) . . . . . 2500-2700 RPM
- Green Arc--Wide (Recommended operating range) . . . . . 2350-2500 RPM
- Red Arc--Wide (No continuous operation in this range) . . . . . 2100-2350 RPM

Cylinder Head Temperature
- Radial Red Line (Maximum) . . . . . 475 DEG F
- Green Arc (Operating range) . . . 300-400 DEG F
- Yellow Arc (No continuous operation) . . . . . 450-475 DEG F

Oil Pressure
- Radial Red Line (Minimum idling) . . . . . 25 PSI
- Radial Red Line (Maximum) . . . . . 100 PSI
- Green Arc (Operating range) . . . . . 60 to 90 PSI
- Yellow Arc (Idling range) . . . . . 25 to 60 PSI
- Yellow Arc (Starting & warm-up range) . . . . . 90 to 100 PSI

Fuel Pressure
- Radial Red Line (Minimum) . . . . . 14 PSI
- Radial Red Line (Maximum) . . . . . 30 PSI
- Green Arc (Operating range) . . . . . 14 to 30 PSI

Oil Temperature
- Radial Red Line (Maximum) . . . . . 245 DEG F
- Green Arc (Operating range) . 100 to 225 DEG F

OTHER INSTRUMENTS AND MARKINGS

Vacuum Warning Lights. . ."High" light 5.00 IN. HG
"Low" light 4.25 IN. HG

Illumination of the HI or LO vacuum warning light indicates that the vacuum system has malfunctioned.

The following equipment is vacuum operated:

1. Artificial horizon
2. Directional gyro
3. Positive control system and autopilot if installed
4. Retractable step

WEIGHT & CENTER-OF-GRAVITY LIMITS

Maximum Weight . . . . . 2740 LBS

Center of Gravity (Gear Down):
Most Forward 41.0 IN. (Fus. Sta. in IN.)
13.4% MAC . . . . . 2250 LBS
Intermediate Forward 41.8 IN. (Fus. Sta. in IN.) 14.7% MAC . . . . . 2470 LBS
Forward Gross 45.0 IN. (Fus. Sta. in IN.)
20.1% MAC . . . . . 2740 LBS
Rear Gross 50.1 IN. (Fus. Sta. in IN.)
28.7% MAC . . . . . 2740 LBS
MAC (IN. at Wing Sta. 93.83) 59.18

Datum (station zero) is 5 inches aft of the center line of the nose gear attaching bolts, and 33 inches forward of the wing leading edge at wing station 59.25.

WARNING: See Weight & Balance Record for loading schedule.

NOTE: It is the responsibilty of the airplane owner and the pilot to insure that the airplane is properly loaded.

NOTE: The front seat positions can adversely affect CG limitations at the most rearward loading. Allowable baggage weight may be dictated by seat positions.

MANEUVERS

This airplane must be operated as a normal category

airplane. Acrobatic maneuvers, including spins, are unauthorized.

NOTE: Maneuvers involving approach to stalling angle or full application of elevator, rudder, or aileron should be confined to speeds below maneuvering speed. No snap maneuvers or whip stalls are approved at any speed. No inverted maneuvers are approved.

FLIGHT LOAD FACTORS

Maximum Positive Load Factor, Flaps Up 3.8
Maximum Positive Load Factor, Flaps Down (33°) 2.0
Maximum Negative Load Factor, Flaps Up 1.5

TYPES OF OPERATION

Do not operate in known icing conditions.

This is a normal category aircraft approved for VFR/IFR, day or night operations, provided the following instruments and equipment are installed and operating properly.

REQUIRED EQUIPMENT

VISUAL FLIGHT RULES – DAY

Airspeed indicator

Altimeter
Magnetic direction indicator (Mag compass)
Tachometer
Manifold pressure gage
Oil pressure gage
Oil temperature gage
Cylinder head temperature gage
Fuel quantity gage for each tank
Fuel pressure gage
Landing gear position indicator
Master switch
Battery and generator
Circuit breakers and fuses
Seat belts for all occupants

VISUAL FLIGHT RULES – NIGHT

All equipment and instruments specified for VFR – day
Position lights
Electric landing light (if used for hire)

INSTRUMENT FLIGHT RULES

All equipment and instruments specified for VFR – night
Gyroscopic rate-of-turn indicator
Bank indicator
Sensitive altimeter adjustable for barometric pressure
Clock with sweep second hand
Artificial horizon
Directional gyro
Adequate power source for each gyro instrument

Two-way radio communications system and navigational equipment appropriate to the ground facilities to be used

NOTE: Caution should be exercised when installed communications equipment interrupts the navigation signal during transmissions.

OPERATING PROCEDURES

NORMAL

This airplane must be operated as a normal category airplane in compliance with the operating limitations stated in the form of placards, markings, and manuals. No acrobatic maneuvers, including spins, are approved.

Circuit breakers are located on the lower right hand side of the co-pilot's instrument panel. The main power circuit breaker is on the circuit breaker panel. All circuit breakers are push-to-reset type.

Retract flaps after landing.

Turn power boost off for takeoff, landing, or any time when operating in dusty conditions.

All warning devices are inoperative when the master switch is off.

Do not open storm window above 150 MPH.

Stall warning is provided by a horn emitting a sound of a different pitch than the gear warning horn.

The lateral stability augmentation system cutoff valve, located in the left hand grip of the pilot's control wheel, cuts off the system when depressed.

The roll-trim knob on the turn coordinator provides a command trim function. Rotation in a clockwise direction trims right; counterclockwise rotation trims left.

To preclude fuel starvation, avoid extreme sustained side slips toward the tank in use when that tank contains less than 48 pounds of fuel.

EMERGENCY

Emergency procedures are contained in the Emergency Procedures section of the Owners Manual.

PERFORMANCE INFORMATION

Up to 220 FT altitude loss may occur during stalls at maximum weight.

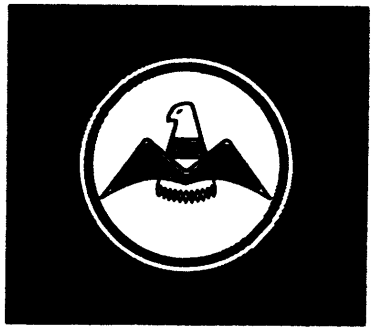
LOADING INFORMATION

Loading information is contained in the aircraft Weight & Balance Record.

Load in accordance with loading schedule.
Maximum weight in baggage compartment 120 pounds.
Maximum weight in hatrack 10 pounds.

SECTION VI. PERFORMANCE

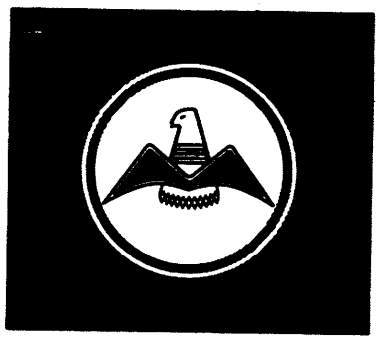
SECTION VI. PERFORMANCE



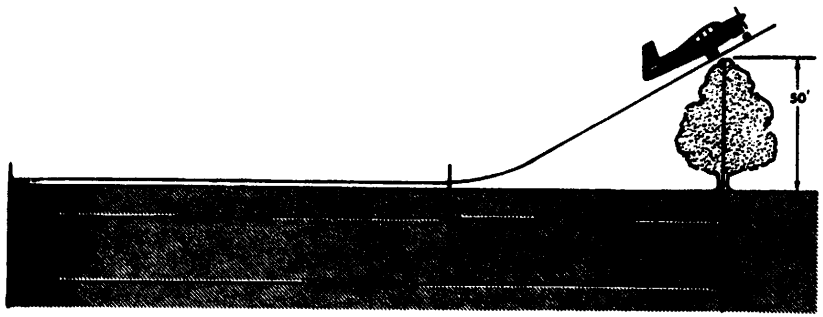
SEC VI

All performance tables and graphs are grouped in this section of the manual for quick and easy reference. This graphic information is presented to show performance that may be expected from the aircraft, and to assist you in planning your flights with reasonable detail and accuracy. All data has been compiled from test flights with the aircraft and engine in good operating condition while using average piloting techniques. Note that the cruise performance data (pages 6-8 thru 6-14) makes no allowance for wind and navigation errors. All performance charts and graphs are based on operation with no wind on level, paved runways. In using this data, allowances must be made for actual conditions.

A carefully detailed and analyzed flight plan will yield maximum performance. After making a flight plan based on estimates taken from the data in this section, you should check your actual performance and note the difference between your forecast conditions and actual flight performance so that your future estimates may be more accurate.



TAKEOFF DISTANCE (OVER 50-FOOT OBSTACLE)

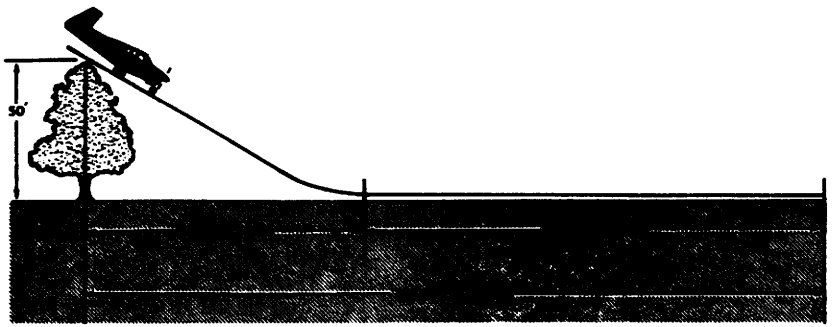


ALTITUDE IN FEET (MSL)	TEMP IN °F	TAKEOFF WEIGHT OF 2300 LBS			TAKEOFF WEIGHT OF 2740 LBS		
		TAKEOFF RUN (FEET)	AIR DISTANCE (FEET)	TOTAL DISTANCE (FEET)	TAKEOFF RUN (FEET)	AIR DISTANCE (FEET)	TOTAL DISTANCE (FEET)
SEA LEVEL	100°	690	505	1195	1070	600	1670
	59°	595	425	1020	880	505	1385
	20°	495	360	855	725	430	755
2500	90°	800	575	1375	1150	680	1830
	50°	730	510	1240	1050	605	1655
	10°	615	440	1055	880	525	1405
5000	80°	980	690	1670	1460	815	2275
	41°	900	615	1515	1320	730	2050
	0°	740	525	1265	1090	625	1115
7500	70°	1210	830	2040	1780	985	2765
	32°	1105	745	1850	1630	880	2510
	−10°	910	620	1530	1340	740	2080

TAKEOFF CONDITIONS:

WING FLAPS -- TAKEOFF POSITION
COWL FLAPS -- OPEN
POWER -- 2700 RPM, MAX MANIFOLD PRESSURE, POWER BOOST OFF.
HARD SURFACE RUNWAY
ZERO WIND

LANDING DISTANCE (OVER 50-FOOT OBSTACLE)



		LANDING WEIGHT OF 2300 LBS			LANDING WEIGHT OF 2740 LBS		
ALTITUDE IN FEET (MSL)	TEMP IN °F (STD)	AIR DISTANCE (FEET)	GROUND DISTANCE (FEET)	TOTAL DISTANCE (FEET)	AIR DISTANCE (FEET)	GROUND DISTANCE (FEET)	TOTAL DISTANCE (FEET)
SEA LEVEL	100°	820	690	1510	1060	850	1910
	59°	775	640	1415	1000	785	1785
	20°	735	590	1325	945	725	1670
2500	90°	865	740	1605	1115	910	2025
	50°	820	685	1505	1055	845	1900
	10°	775	635	1410	995	780	1775
5000	80°	910	800	1710	1175	985	2160
	41°	865	740	1605	1115	910	2025
	0°	810	680	1490	1050	835	1885
7500	70°	965	860	1825	1250	1070	2320
	32°	915	800	1715	1185	990	2175
	−10°	855	735	1590	1110	905	2015

LANDING CONDITIONS:

WING FLAPS -- FULL DOWN

POWER OFF

APPROACH IAS -- 80 MPH

HARD SURFACE RUNWAY, ZERO WIND

CLIMB PERFORMANCE

STANDARD ALTITUDE (THOUSANDS OF FEET)	RATE OF CLIMB (FPM AT 2740 LBS)	RATE OF CLIMB (FPM AT 2300 LBS)	BEST ANGLE OF CLIMB SPEED (MPH CAS)	BEST RATE OF CLIMB SPEED (MPH CAS)
16	100	250	94	96
15	160	315	94	97
14	220	380	94	98
13	280	450	94	99
12	340	515	94	100
11	400	585	94	101
10	460	650	94	103
9	520	720	94	104
8	575	785	94	105
7	635	855	94	106
6	695	920	94	107
5	760	990	94	108
4	815	1060	94	109
3	875	1130	94	110
2	935	1195	94	111
1	995	1260	94	112
SL	1055	1330	94	113

CONDITIONS:

1. GEAR UP
2. FLAPS UP
3. COWL FLAPS OPEN
4. FULL RICH MIXTURE
5. FULL THROTTLE--2700 RPM
6. POWER BOOST ON

AIRSPEED CORRECTIONS

IAS (MPH)	CALIBRATED AIRSPEED (MPH)					
	0° FLAPS		15° FLAPS		33° FLAPS	
	POWER ON	POWER OFF	POWER ON	POWER OFF	POWER ON	POWER OFF
65	65	66	65	67	63	67
70	70	71	70	71	68	71
80	80	81	79	81	77	81
90	90	90	89	90	87	90
100	99	100	99	100	96	100
110	108	110	108	110	106	109
120	118	120	118	120	115	118
130	128	129				
140	137	139				
150	147	149				
160	157	158				
170	167	168				
180	177	178				
190	187	188				
200	197	197				

NOTE: The calibrated airspeeds shown correct only for errors caused by the position of airspeed system components, and do not include any correction that may be required for individual airspeed indicators. Airspeed indicators may have errors up to 2.5 MPH.

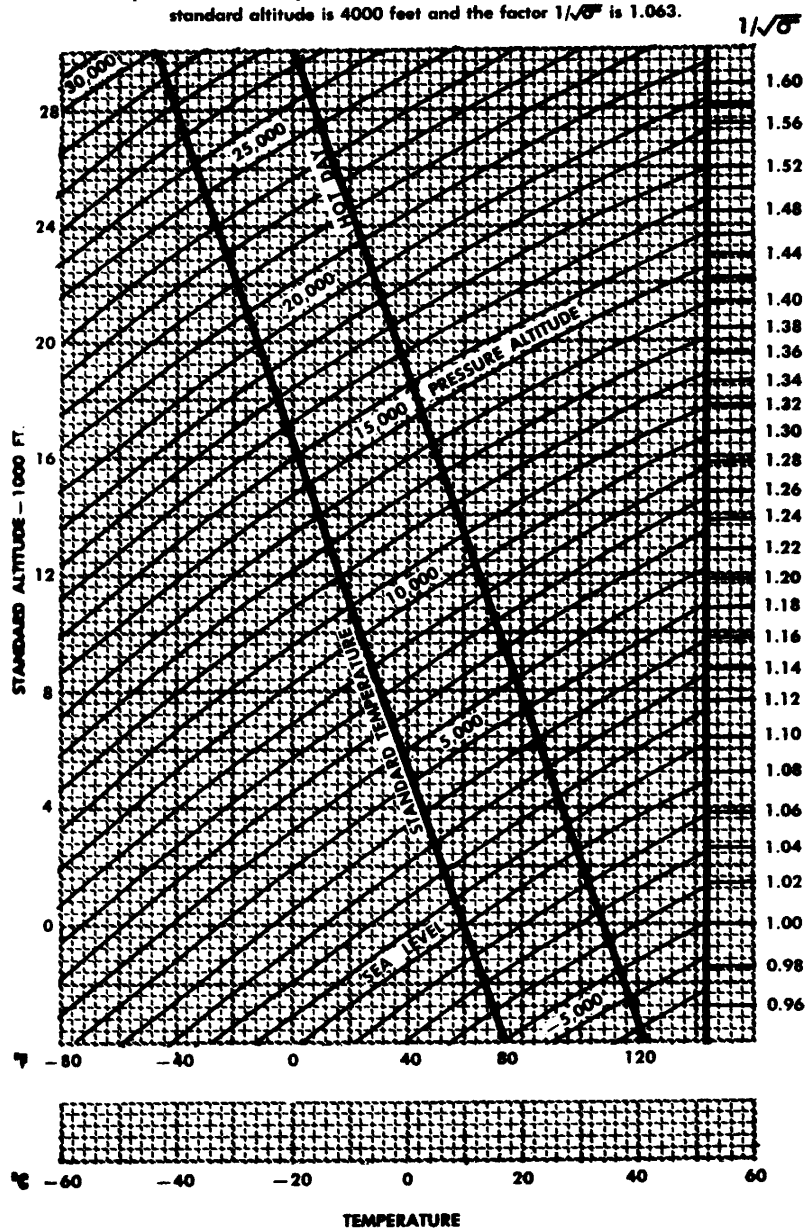
STALL SPEEDS (POWER OFF)

GROSS WEIGHT (2740 LBS)		ANGLE OF BANK			
		0°	20°	40°	60°
FLAPS & GEAR UP	MPH	68	71	80	98
	KNOTS	59	62	71	85
FLAPS 15° GEAR DOWN	MPH	64	67	76	93
	KNOTS	56	58	66	81
FLAPS 33° GEAR DOWN	MPH	62	65	74	90
	KNOTS	54	56	64	78

CONDITIONS: 1. GROSS WEIGHT (2740 LBS) 2. POWER OFF 3. IAS IN MPH & KTS 4. FORWARD C.G.

ALTITUDE CONVERSION

Example: If ambient temperature is 80°F and pressure altitude is 2000 feet, standard altitude is 4000 feet and the factor $1/\sqrt{\sigma}$ is 1.063.



CRUISE & RANGE DATA CONDITIONS:

1. All Cruise and Range Data tables allow for: a climb out at 200 horsepower to 3000 feet; a continued climb at maximum power (power boost on), full-rich mixture, and best rate-of-climb airspeed to cruise altitude; a cruise to destination at the specified power and mixture setting; and a 45-minute fuel reserve at the same altitude and power setting. The data is also based on 64 gallons of usable fuel, standard atmosphere, and no wind. Takeoff weight is 2740 pounds or 2300 pounds.

2. The data is taken from flight tests at full-rich mixture settings above 75 percent rated power and at best-power mixture settings for cruise at 75 percent rated power or less. (For best power mixture, set EGT at 100°F below peak EGT on rich side of peak.)

3. When interpolating the cruise and range data for non-standard conditions, note that each 10°F increase above standard temperature will cause a one percent reduction in horsepower, while each 10°F decrease below standard temperature will cause a one percent increase in horsepower.

CRUISE & RANGE AT BEST POWER (SEA LEVEL, 59°F)

LEANING PROCEDURE:
1. Use FULL RICH mixture above 75% power.
2. For 75% power and below, lean mixture to 100° below peak EGT (rich).

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED (MPH) 2740 LBS	TRUE AIRSPEED (MPH) 2300 LBS	ENDURANCE (HR:MIN)	RANGE (STAT MI) 2740 LBS	RANGE (STAT MI) 2300 LBS
2700	28.4	99.9	18.6	111.4	177	179	2-42	478	484
	27.0	93.5	17.3	104.1	172	174	2-56	509	515
	26.0	89.0	16.5	98.8	169	171	3-08	532	539
	25.0	84.5	15.6	93.6	166	168	3-21	558	565
2600	26.0	85.1	15.7	94.3	166	168	3-19	554	561
	25.0	80.7	14.9	89.3	163	165	3-33	581	588
	24.0	76.4	14.1	84.3	159	161	3-48	609	617
	23.0	72.1	10.5	63.1	155	158	5-20	835	847
2500	25.0	77.0	14.2	85.1	160	162	3-46	605	613
	24.0	72.9	10.6	63.7	156	159	5-17	830	842
	23.0	68.7	10.1	60.6	152	155	5-35	857	871
	22.0	64.6	9.6	57.5	149	151	5-55	887	903
2400	24.0	69.3	10.2	61.1	153	156	5-32	853	867
	23.0	65.4	9.7	58.2	149	152	5-51	881	896
	22.0	61.5	9.2	55.2	145	149	6-12	910	928
	21.0	57.5	8.7	52.3	141	145	6-36	940	961
2350	23.0	63.7	9.5	56.9	143	151	6-00	893	909
	22.0	59.9	9.0	54.1	144	147	6-21	922	940
	21.0	56.1	8.5	51.2	139	143	6-45	952	974
	20.0	52.2	8.1	48.4	135	139	7-12-	982	1009
1950	19.0	38.3	6.3	38.0	110	120	9-21	1070	1147

CRUISE & RANGE AT BEST POWER (2500 FT, 50°F)

LEANING PROCEDURE:
1. Use FULL RICH mixture above 75% power.
2. For 75% power and below, lean mixture to 100° below peak EGT (rich).

RPM	MAN PRES (IN. HG)	%BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED (MPH) 2740 LBS	TRUE AIRSPEED (MPH) 2300 LBS	ENDURANCE (HR:MIN)	RANGE (STAT MI) 2740 LBS	RANGE (STAT MI) 2300 LBS
2700	27.5	98.1	19.2	109.3	180	182	2-46	495	501
	26.0	91.7	17.0	101.9	175	177	3-01	527	533
	25.0	87.2	16.1	96.8	172	174	3-13	552	558
	24.0	82.7	15.3	91.6	168	170	3-26	578	585
2600	26.0	87.7	16.2	97.4	172	174	3-11	549	555
	25.0	83.4	15.4	92.4	169	171	3-24	574	581
	24.0	79.0	14.6	87.4	165	167	3-38	601	609
	23.0	74.7	10.8	65.0	161	164	5-08	830	842
2500	25.0	79.6	14.7	88.0	166	168	3-36	598	605
	24.0	75.4	10.9	65.6	162	165	5-05	825	837
	23.0	71.2	10.4	62.5	158	161	5-22	852	866
	22.0	67.1	9.9	59.4	154	157	5-41	881	897
2400	24.0	71.8	10.5	62.9	159	162	5-20	849	862
	23.0	67.8	10.0	59.9	155	158	5-37	876	891
	22.0	63.8	9.5	57.0	151	154	5-57	905	922
	21.0	59.8	9.0	54.0	147	150	6-19	934	955
2350	23.0	66.1	9.8	58.7	153	156	5-46	888	904
	22.0	62.2	9.3	55.8	149	153	6-06	917	935
	21.0	58.3	8.8	52.9	145	149	6-28	946	968
	20.0	54.4	8.3	50.0	140	144	6-53	976	1002
1950	19.5	41.5	6.7	40.4	118	128	8-41	1062	1128

CRUISE & RANGE AT BEST POWER (5000 FT, 41°F)

LEANING PROCEDURE:
1. Use FULL RICH mixture above 75% power.
2. For 75% power and below, lean mixture to 100° below peak EGT (rich).

RPM	MAN PRES (IN. HG)	%BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED (MPH) 2740 LBS	TRUE AIRSPEED (MPH) 2300 LBS	ENDURANCE (HR:MIN)	RANGE (STAT MI) 2740 LBS	RANGE (STAT MI) 2300 LBS
2700	25.0	90.0	16.7	99.9	178	180	3-05	545	552
	24.0	85.4	15.8	94.7	174	177	3-18	571	578
	23.0	80.9	14.9	89.5	170	173	3-32	599	607
	22.0	76.3	14.0	84.2	166	169	3-47	629	638
2600	25.0	86.0	15.9	95.4	175	177	3-16	567	574
	24.0	81.7	15.1	90.4	171	174	3-29	594	601
	23.0	77.3	14.2	85.4	167	170	3-44	622	631
	22.0	72.9	10.6	63.7	163	166	5-13	853	867
2500	25.0	82.1	15.2	91.0	171	174	3-27	591	598
	24.0	77.9	14.4	86.1	168	171	3-41	618	626
	23.0	73.7	10.7	64.3	164	167	5-10	847	861
	22.0	69.5	10.2	61.2	160	163	5-27	876	891
2400	25.0	78.2	14.4	86.5	168	171	3-40	616	624
	24.0	74.2	10.8	64.7	164	169	5-08	844	858
	23.0	70.2	10.3	61.7	161	164	5-24	871	886
	22.0	66.2	9.8	58.7	157	160	5-43	899	916
2350	24.0	72.3	10.6	63.3	163	166	5-15	857	871
	23.0	68.4	10.1	60.4	159	162	5-32	883	899
	22.0	64.5	9.6	57.5	155	158	5-51	911	930
	21.0	60.6	9.1	54.5	151	154	6-12	940	962
1950	19.3	42.6	6.9	41.2	122	132	8-25	1062	1129

CRUISE & RANGE AT BEST POWER (7500 FT, 32°F)

LEANING PROCEDURE:
1. Use FULL RICH mixture above 75% power.
2. For 75% power and below, lean mixture to 100° below peak EGT (rich).

RPM	MAN PRES (IN. HG)	%BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED (MPH) 2740 LBS	TRUE AIRSPEED (MPH) 2300 LBS	ENDURANCE (HR:MIN)	RANGE (STAT MI) 2740 LBS	RANGE (STAT MI) 2300 LBS
2700	23.0	83.6	15.4	92.6	177	179	3-23	591	599
	22.0	79.0	14.6	87.3	173	176	3-37	620	630
	21.0	74.3	10.8	64.8	168	172	5-05	855	869
	20.0	69.7	10.2	61.3	164	167	5-25	886	902
2600	23.0	79.9	14.7	88.4	173	176	3-34	614	623
	22.0	75.5	10.9	65.6	169	173	5-01	847	861
	21.0	71.0	10.4	62.3	165	168	5-19	877	892
	20.0	66.5	9.8	59.0	160	164	5-39	907	926
2500	23.0	76.2	14.0	84.2	170	173	3-47	639	649
	22.0	72.0	10.5	63.0	166	169	5-15	870	885
	21.0	67.7	10.0	59.9	162	165	5-33	899	917
	20.0	63.5	9.4	56.7	157	161	5-54	930	950
2400	23.0	72.6	10.6	63.5	167	170	5-12	866	881
	22.0	68.5	10.1	60.5	163	166	5-30	894	911
	21.0	64.4	9.6	57.4	158	162	5-49	923	942
	20.0	60.4	9.1	54.4	153	158	6-11	952	975
2350	23.0	70.8	10.4	62.1	165	168	5-20	878	894
	22.0	66.8	9.9	59.2	161	164	5-38	906	924
	21.0	62.8	9.4	56.2	156	160	5-57	934	955
	20.0	58.8	8.9	53.3	151	156	6-19	964	988
1950	19.2	44.0	7.0	42.3	126	137	8-07	1059	1126

CRUISE & RANGE AT BEST POWER (10,000 FT, 23°F)

LEANING PROCEDURE:
1. Use FULL RICH mixture above 75% power.
2. For 75% power and below, lean mixture to 100° below peak EGT (rich).

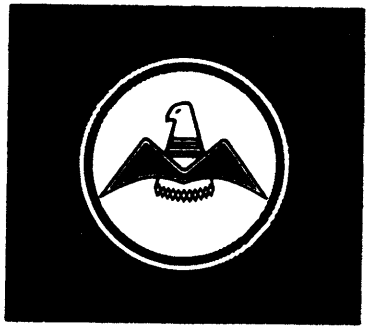
RPM	MAN PRES (IN. HG)	%BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED (MPH) 2740 LBS	TRUE AIRSPEED (MPH) 2300 LBS	ENDURANCE (HR:MIN)	RANGE (STAT MI) 2740 LBS	RANGE (STAT MI) 2300 LBS
2700	21.0	77.0	14.2	85.0	175	178	3-44	643	654
	20.0	72.3	10.5	63.3	170	174	5-12	879	895
	19.0	67.6	10.0	59.8	165	169	5-32	911	930
	18.0	62.9	9.4	56.3	160	164	5-54	944	966
2600	21.0	73.6	10.7	64.2	171	175	5-07	870	886
	20.0	69.1	10.1	60.9	167	171	5-25	900	918
	19.0	64.5	9.6	57.5	162	166	5-46	932	953
	18.0	60.0	9.0	54.2	156	161	6-10	964	990
2500	21.0	70.1	10.3	61.7	168	172	5-21	893	910
	20.0	65.8	9.7	58.5	163	167	5-40	923	943
	19.0	61.5	9.2	55.3	158	163	6-02	954	977
	18.0	57.2	8.7	52.1	152	158	6-26	984	1014
2400	21.0	66.7	9.9	59.1	164	168	5-36	916	936
	20.0	62.6	9.3	56.1	159	164	5-56	946	968
	19.0	58.5	8.8	53.0	154	159	6-18	975	1003
	18.0	54.4	8.3	50.0	148	155	6-43	1004	1039
2350	21.0	65.0	9.6	57.9	162	166	5-44	928	949
	20.0	61.0	9.1	54.9	157	162	6-04	957	981
	19.0	57.0	8.7	51.9	152	158	6-27	986	1016
	18.0	53.0	8.2	48.9	145	153	6-52	1013	1052
1950	19.0	45.1	7.2	43.0	130	141	7-53	1056	1126

CRUISE & RANGE AT BEST POWER (12,500 FT, 17°F)

LEANING PROCEDURE:
1. Use FULL RICH mixture above 75% power.
2. For 75% power and below, lean mixture to 100° below peak EGT (rich).

RPM	MAN PRES (IN. HG)	%BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED (MPH) 2740 LBS	TRUE AIRSPEED (MPH) 2300 LBS	ENDURANCE (HR:MIN)	RANGE (STAT MI) 2740 LBS	RANGE (STAT MI) 2300 LBS
2700	19.0	70.2	10.3	61.7	172	176	5-19	902	921
	18.0	65.4	9.7	58.2	166	171	5-40	935	956
	17.0	60.7	9.1	54.6	160	166	6-03	968	995
	16.0	55.9	8.5	51.1	153	160	6-30	1000	1035
2600	19.0	67.0	9.9	59.3	168	173	5-33	924	944
	18.0	62.5	9.3	56.0	163	168	5-54	955	980
	17.0	57.9	8.8	52.6	156	162	6-18	986	1018
	16.0	53.4	8.2	49.2	148	157	6-46	1016	1058
2500	19.0	63.9	9.5	57.0	164	169	5-47	945	969
	18.0	59.5	9.0	53.8	158	164	6-10	976	1004
	17.0	55.2	8.4	50.5	151	159	6-35	1004	1042
	16.0	50.8	7.9	47.3	144	153	7-03	1030	1081
2400	19.0	60.7	9.1	54.7	160	166	6-03	967	994
	18.0	56.6	8.6	51.6	154	161	6-26	995	1030
	17.0	52.4	8.1	48.5	147	155	6-52	1021	1067
	16.0	48.3	7.6	45.4	139	149	7-22	1043	1105
2350	19.0	59.2	8.9	53.5	158	164	6-11	978	1007
	18.0	55.1	8.4	50.5	151	159	6-35	1005	1042
	17.0	51.1	7.9	47.5	144	153	7-02	1029	1079
	16.0	47.0	7.4	44.5	135	147	7-32	1049	1116
1950	19.0	46.8	7.4	44.3	135	147	7-34	1050	1118

SECTION VII. SERVICING



SEC VII

GROUND HANDLING

Scheduling of preventive maintenance is largely your responsibility as the aircraft operator. A general knowledge of the working order of the aircraft is necessary to perform day-to-day service procedures and to determine when unusual service or shop maintenance is needed.

Service information in this section of the manual is limited to service procedures which you, the operator, will normally perform or supervise yourself. Accomplishment of these service procedures will not adequately substitute for 50-hour, 100-hour, and annual inspections and specialized maintenance at Mooney Service Centers.

It is wise to follow a planned schedule of periodic lubrication and preventive maintenance based on climatic and operating conditions where your aircraft is in service. Federal Aviation Agency regulations require that all airplanes have annual inspections performed by a designated FAA representative. A 100-hour periodic inspection by an "appropriately-rated mechanic" is required if the aircraft is flown for hire.

To be sure of factory recommended service, it is advisable to keep in contact with your authorized Mooney Service Center. Authorized Mooney sales and service personnel have current service, modification, and operating information that will help you maintain maximum aircraft utility and safety. They will be glad to answer questions and advise you concerning upkeep of your airplane.

A current Mooney Service Directory List is furnished with your new aircraft. This directory lists qualified service operators throughout the United States and the Free World where competent service can be obtained from factory-trained mechanics. The directory is revised occasionally and a current copy can be obtained from your Mooney dealer.

Should an extraordinary and difficult problem arise concerning repair or upkeep of your aircraft, consult the Customer Service Department, Mooney Aircraft, Inc., Box 72, Kerrville, Texas 78028. Phone Area Code 512 257-4043.

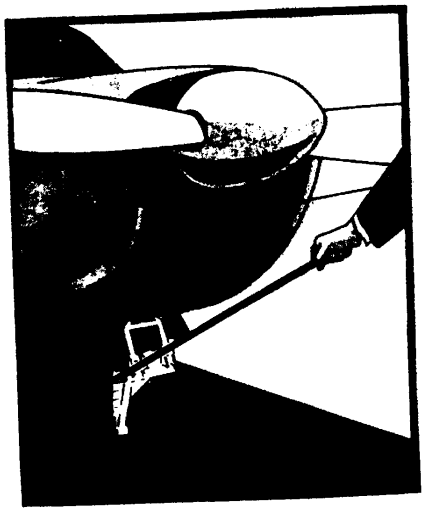


FIGURE 7-1. TOWING

TOWING

For maneuvering the aircraft in close quarters, in the hangar, or on the ramp, use the tow bar furnished with the aircraft loose equipment. Figure 7-1 shows the tow bar attached to the nose gear for manual ground maneuvering. When using the tow bar, never exceed the maximum nose gear turning angle indicated on the nose wheel turn indicator. Towing the aircraft with another vehicle is not recommended, as damage to the gear structure could result.

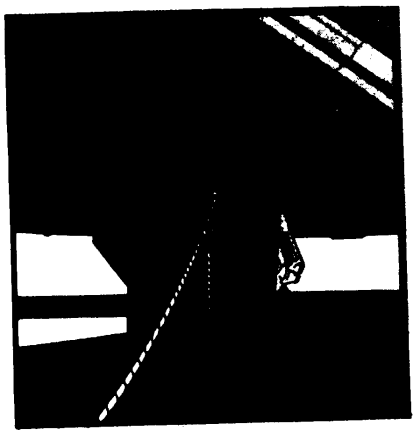


FIGURE 7-2. REMOVABLE TIEDOWN EYEBOLT LOCATION

MOORING

As a precaution against wind damage, always tie down the aircraft when parked outside. Removable wing tiedown eyebolts, supplied with the loose equipment, screw into wing receptacles marked HOIST POINT just outboard of each

main gear as shown in Figure 7-2. Replace these eyebolts with jack point fixtures when it is necessary to lift the aircraft with jacks. The tail tiedown ring is under the tail skid.

To tie down the aircraft:
(1) Park the airplane facing the wind.
(2) Fasten the co-pilot seat belt through the flight control wheel.
(3) Fasten strong ground-anchored chain or rope to the installed wing tiedown eyebolts, and place wheel chocks fore and aft of each wheel.
(4) Fasten a strong ground-anchored chain or rope to the empennage tiedown ring.

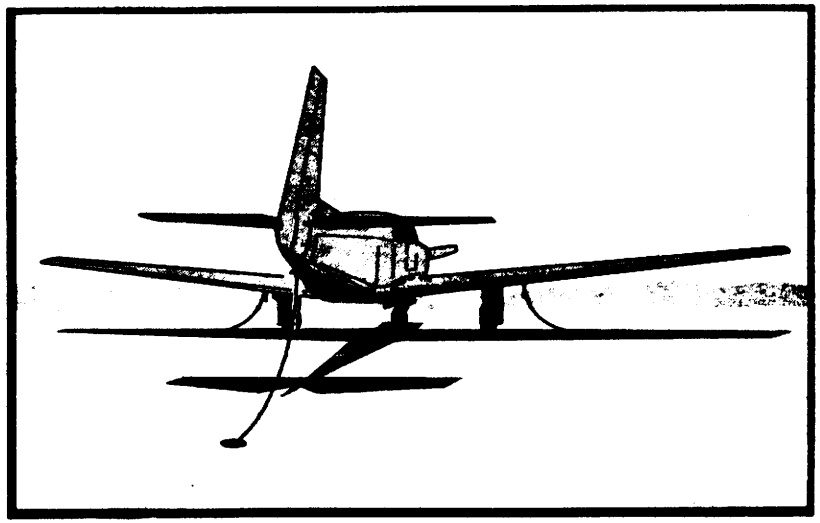


FIGURE 7-3. MOORING

SERVICING

REFUELING

Integral sealed tanks in the front inboard sections of the wings carry the fuel. With the aircraft standing on level

ground, service each fuel tank after flight with 100/130 octane aviation-grade gasoline. Both tanks have fuel level indicators that are visible through the fuel filter ports. These indicators show the 25-gallon fuel level in each tank.

Before filling the fuel tanks when planning a maximum weight flight configuration, consult the Weight & Balance Record in the airplane file for loading data.

CAUTION: Never use aviation fuel of a lower grade than 100/130 octane. Aviation fuel grades can be distinguished by their color: 80/87 octane is red, 91/96 octane is blue, 100/130 octane is green, 115/145 octane is purple.

Sample fuel from the sump drain in each tank before the first flight of the day and after each refueling to check for water or sediment contamination.

WARNING: Allow five minutes after refueling for water and sediment to settle in the tank and fuel selector valve drain before taking fuel samples or draining the selector valve.

FIGURE 7-4. FUEL SAMPLING

Figure 7-4 shows tank sump drain access. These drains are near each wing root forward of the wheel wells. A small plastic cup is supplied in the loose equipment kit for obtaining fuel samples. To collect a fuel sample, insert the cup actuator prong in the sump drain receptacle and push upward to open the valve momentarily and drain fuel into the cup. If water is in the fuel, a distinct line separating the water from the gasoline will be seen

through the transparent cup wall. Water, being heavier, will settle to the bottom of the cup, while the colored fuel will remain on top. Continue taking fuel samples until all water is purged from the tank.

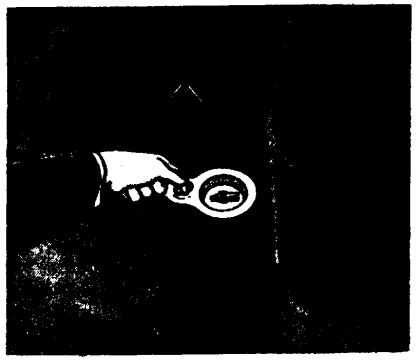


FIGURE 7-5. SELECTOR VALVE CONTROLS

The fuel tank selector valve drain control is on the cabin floor forward of the pilot's seat. To flush the fuel selector valve sump and the lines leading from the wing tanks to the selector valve, turn the selector handle to the left, and pull the fuel drain control for about five seconds. Repeat the procedure for the right tank, being sure that the fuel drain control knob is returned to the closed position and that the drain valve is not leaking.

ENGINE LUBRICATION

FIGURE 7-6. OIL DIPSTICK ACCESS

The new Lycoming engine has been carefully run-in and rigidly tested at the factory. Operate the new engine at full power within the limitations given in Section V. Before every flight, check the engine oil level and replenish as necessary. (During the first 50 hours of operation, add only straight mineral oil. Do not add a detergent-type oil.) Oil capacity is eight quarts. Figure 7-6 shows the dipstick and its access cover located in the rear area of the engine cowling.

The preservative oil in the new engine should be removed after the first 25 hours of operation. Replace the original preservative oil with only straight mineral oil. Do not change to or add additive-type oil (high detergent or compounded) during the first 50 hours of operation, or until a normal rate of oil consumption has been established.

After oil consumption has stabilized, any straight mineral or additive-type engine oil may be used that conforms to Lycoming specification No. 301E. Following the break-in period it is permissible to change from straight mineral (break-in) oil to an additive (high detergent) oil and observe the normal oil-change intervals.

However, when changing from straight mineral oil to an additive-type oil at a later time (up to 250 hours after break-in), the following precautionary measures should be observed:

(1) Change the oil again after not more than five hours of operation.
(2) Check all oil screens for evidence of sludge or plugging. Change the oil every 10 hours if sludge conditions prevail. Change the oil at normal intervals after sludge conditions improve.
(3) If the engine has been allowed to operate on straight mineral oil for several hundred hours, or if the engine is in an excessively dirty condition, defer the change to additive oil until after engine overhaul and operation for at least 50 hours.

Your Mooney Dealer will change the engine oil in addition to performing all other service and inspection procedures needed when you bring your airplane in for its 50-hour, 100-hour, and annual periodic inspections. The engine oil should, however, be replaced at 25-hour intervals after prolonged flight in adverse weather, after continuous operation at high power settings, or when making short flights with long ground-idle time. Excessive oil sludge buildup indicates that the oil system needs servicing at less than 50-hour intervals.

Lycoming Service Instruction No. 1014 (latest revision) lists recommended oil types and replacement intervals. Your Mooney Dealer has approved brands of lubricating oil and all consumable materials necessary to service your airplane.

GEAR & TIRE SERVICE

The aircraft is equipped with standard-brand tires and tubes. Keep the main gear tires inflated at 30 PSI and the nose tire at 49 PSI for maximum service life. Proper inflation will minimize tire wear and impact damage. Visually inspect the tires at preflight for cracks and ruptures, and avoid taxi speeds that require heavy braking or fast turns. Keep the gear and exposed gear retraction system components free of mud and ice to avert retraction interference and binding. If it becomes necessary to use an unusual degree of force to retract the gear, have the gear system rigging checked by an authorized mechanic.

The gear warning horn may be checked in flight by retarding the throttle with the gear up. The gear horn should sound with an intermittent note at about 10 inches manifold pressure.

BATTERY SERVICE

The 12-volt 35-ampere-hour electrical storage battery is located aft of the baggage area. Check battery fluid level every 25 flight hours. To gain access to the battery, open the aft fuselage access panel.

To service the battery, remove the battery box cover and check the terminals and connectors for corrosion. Add distilled water to each battery cell as necessary; keep the fluid at one-quarter inch over the separator tops. Check the fluid specific gravity for a reading of 1.265 to 1.275. A recharge is necessary when the specific gravity is 1.240

or lower. Start charging at four amperes and finish at two amperes; do not allow battery temperature to rise above 120°F during recharging. Keep the battery at full charge to prevent freezing in cold weather and to prolong service life.

If appreciable corrosion is noticed, flush the battery box with a solution of baking soda and water. Do not allow soda solution to enter the battery cells. Keep cable connections clean and tightly fastened, and keep overflow lines free of obstruction.

MAINTENANCE

PROPELLER CARE

The high stress to which propeller blades are subjected makes their careful inspection and maintenance vitally important. Check the blades for nicks, cracks, or indications of other damage before each flight. Nicks tend to cause high-stress concentrations in the blades which, if ignored, may result in cracks. Remove any nicks deeper than approximately .010 inch before the next flight.

It is not unusual for the propeller to have some end play as a result of manufacturing tolerances in the parts. This end play has no adverse affect on propeller performance, because centrifugal force firmly seats the blades when in operation.

EXTERIOR CARE

As with any paint applied to a metal surface, an initial curing period is necessary for developing the desired qualities of durability and appearance. Therefore, do not apply wax or polish to the new aircraft exterior until two or three months after delivery. Wax substances will seal paint from

the air and prevent curing. Do wash the exterior to prevent dirt from working into the curing paint, but hold buffing to a minimum until curing is complete and there is no danger of disturbing the undercoat.

Before washing the exterior, be certain the brake discs are covered, a pitot cover is in place, and all static-air buttons are masked off. Remove grease or oil from the exterior by wiping with a cotton cloth saturated in kerosene. Flush away loose dirt and mud deposits before washing the exterior with an aircraft-type washing compound mixed in warm water. Use soft cleaning cloths or a chamois, and avoid harsh or abrasive detergents that might scratch or corrode the surface. It is essential that all cleaning compounds and application cloths be free of abrasives, grit, or other foreign matter. Use a prewax cleaner to remove a heavy oxidation film. For nonoxidized or precleaned surfaces, apply a good exterior-finish wax recommended for protection of acrylic-enamel finishes. Carefully follow the manufacturer's instructions. A heavier coating of wax on the leading edges of the wings, empennage, and nose section will help reduce drag and abrasion in these areas.

If fuel, hydraulic fluid, or any other dye-containing substance is found on the exterior paint, wash the area at once to prevent staining. Immediately flush away spilled battery acid, and treat the area with a baking soda-and-water solution, followed by a thorough washing with a mild aircraft detergent and warm water.

Before wiping the windows or windshield, flush the exterior with clear water to remove particles of dirt. Household window cleaning compounds should not be used as some contain abrasives or solvents which could harm plexiglas. An anti-static plexiglas cleaner is good for cleaning and polishing the windshield and windows.

INTERIOR CARE

Normal household cleaning practices are recommended for

routine interior care. Frequently vacuum clean the seats, rugs, upholstery panels, and headliner to remove as much surface dust and dirt as possible. Occasionally wash the fine leather or vinyl upholstery and kick panels with a mild soap solution to prevent dirt from working into the surface. Wipe clean with a slightly damp cloth and dry with a soft cloth. Never apply furniture polishes. Foam-type shampoos and cleaners for vinyl, leather, textiles, and plastic materials are good for removing stains and reconditioning the entire interior. Spray-on dry cleaners are also recommended. Grease spots on fabric should be removed with a jelly-type spot lifter.

Never use denatured alcohol, benzene, carbon tetrachloride, acetone, or gasoline for cleaning plexiglas or interior plastics. Carefully follow the manufacturer's instructions when using commercial cleaning and finishing compounds.

Do not saturate fabrics with a solvent which could damage the backing and padding materials. To minimize carpet wetting, keep foam as dry as possible and gently rub in circles. Use a vacuum cleaner to remove foam and to dry the materials. Use a damp cloth or a mild soap solution to clean interior garnish plastic, vinyl trim, and metal surfaces.

REQUIRED DATA

The following documents must be carried with the aircraft at all times.

(1) Airworthiness Certificate (displayed).
(2) Aircraft Registration Certificate (displayed).
(3) Radio Station License (if transmitter is installed).
(4) Weight & Balance Record (including equipment list).
(5) Owners Manual.
(6) Aircraft and Engine Log Books.