SUPER 21

MODEL M 20 E

1966
1967
OWNERS MANUAL

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

MOONEY *AIRCRAFT, INC.*

SUPER 21

OWNERS MANUAL

YEAR	MODEL	SERIAL NUMBERS
1966	M20E	832 THRU 1308
1967	M20E	670001 THRU 670062

Issued March 1967

Congratulations

Thank you for choosing a Mooney.

The wisdom of your selection of a Mooney Super 21 will be proved many times as your hours in this exceptional airplane increase.

It takes a long time and a lot of flying to appreciate all of the many outstanding features built into the Super 21.

This owners manual will help you know your airplane better and will make your experience with the Super 21 more enjoyable.

Welcome to the rapidly growing family of Mooney owners.

MOONEY AIRCRAFT, INC.
KERRVILLE, TEXAS

Note...

This manual contains Federal Aviation Agency – Delegation Option Authority approved limitations and must be carried in the Super 21 at all times.

SUPER 21

OWNER'S MANUAL

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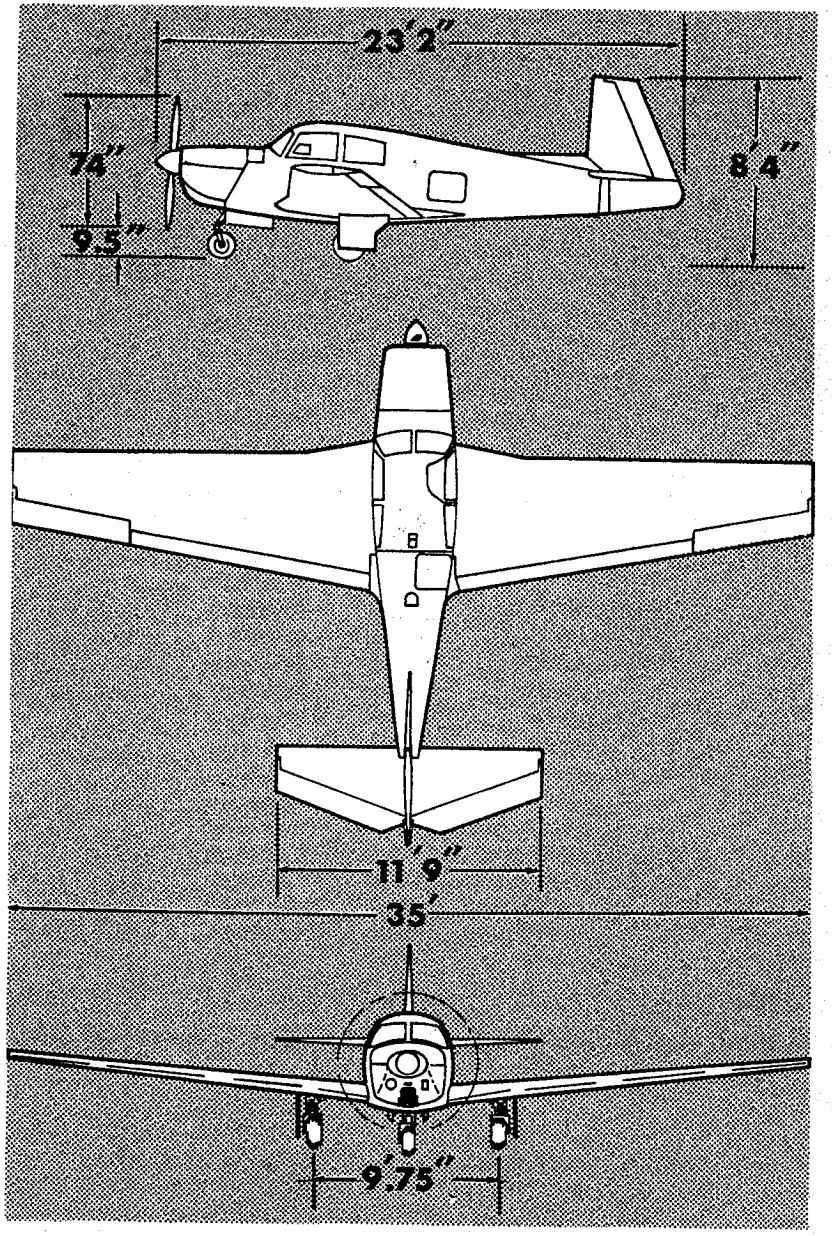
(FAA/DOA APPROVED DATA)



PART I
DESCRIPTION AND OPERATION OF COMPONENTS

GENERAL

The Super 21 is a single engine four-place low wing, retractable tricycle landing gear airplane. The design and operation of this aircraft are conventional with few exceptions. This section will describe some of the components of the aircraft and operating details.

PROPELLER

The Super 21 uses an aluminum alloy constant speed propeller of 74 inch diameter. The pitch of the blades is controlled by engine oil pressure which acts to increase blade angle of attack and thereby control engine speed. The propeller control in the cabin operates the propeller governor which controls the oil pressure provided to the propeller hub. The governor setting functions to maintain the engine at a constant speed by actuating blade angle of attack. In essence then, the function of the propeller control in the cabin is to regulate and maintain the rotational speed of the engine at a desired setting.

POWER PLANT

The Super 21 is powered by the Lycoming 200 hp IO-360-A1A four cylinder engine. This engine uses 100/130 octane fuel. Four rubber bushings on the aft side of the engine provide mounting and vibration isolation. Engine manifold pressure is regulated by the push-pull throttle control on the panel.

POWER BOOST

A unique Power Boost feature of the Super 21 provides increased manifold pressure when operating at full throttle. This is accomplished by pulling the Power Boost control out, which causes induction air to by-pass the engine air filter to permit the engine to operate on direct ram air. Because the engine will be operating on unfiltered air when the Power Boost is used. it should be operated only in clean, dust free

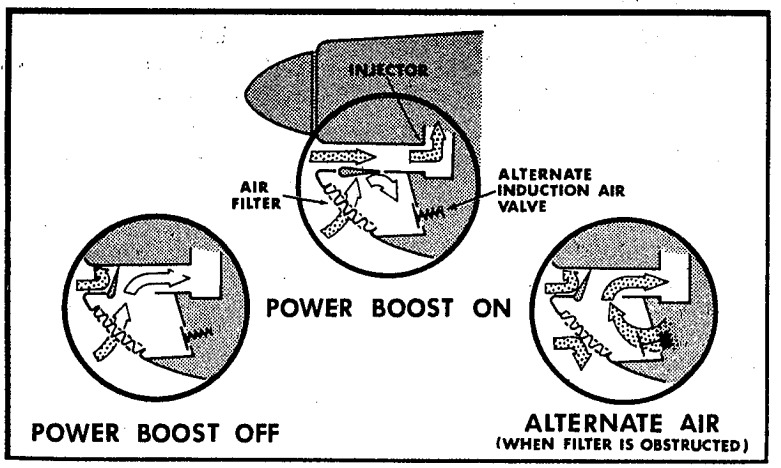
air at altitude, and turned off for take-off and landing. Because the Power Boost is effective only when the throttle is in the fully opened position, its advantages generally will be realized at altitudes above 5,000 feet where flight is often with full throttle. A light is provided on the panel by the Power Boost control to remind the pilot to push the control in (to filtered air) before landing. This light will come on when the gear is lowered while Power Boost is on.

WARNING

Do not fly this aircraft in icing conditions.

Turn Power Boost off when icing conditions are inadvertently encountered. Icing conditions prevail any time the temperature and moisture conditions combine to produce the possibility of impact ice.

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 passages under icing conditions and cause loss of power. Therefore it is imperative that the Power Boost not be used 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 unit even though no visible moisture is apparent on the airframe.



FUEL–AIR MIXTURE

The fuel injector unit of the 10-360 engine has provisions for adjusting the fuel-to-air ratio as required at different altitudes. The fuel-to-air ratio (mixture) is regulated by the hexagon shaped push-pull control located between the throttle and propeller controls in the cabin. This control has a vernier adjustment feature for obtaining precise mixture settings. An exhaust gas temperature gage is provided to indicate the optimum mixture setting.

ENGINE COOLING

The engine baffling directs air flow over the cylinders for cooling in flight. Cowl flaps are provided on the lower cowling to allow more free air flow on the ground and during low speed, high power conditions (i.e., climb conditions). Cowl flaps should always be open on the ground, and prolonged engine operation on the ground should be avoided to prevent engine overheating. A push-pull control is provided below the instrument panel and to the right of the pilot for operation of the cowl flaps.

ENGINE LUBRICATION

The engine has a pressure-type wet-sump lubrication system. It has an eight quart capacity; however, as a general rule, when the oil level drops below six quarts, one quart is added. This will maintain the oil level between the six and seven quart level. Refer to Lycoming Service Instruction 1014 (latest revision) for oil type and replacement interval recommendations.

An oil temperature thermostat, located in the oil reservoir, is set for 180° F. to assure adequate operating engine oil temperatures. The oil cooler is mounted on the lower left side of the cowling. An oil filter is available as optional equipment.

ENGINE IGNITION

The ignition system has the following features:

1. Two Bendix magnetos, the left magneto being equipped with a set of retard breaker points.
2. A starting vibrator, located on the upper firewall, which furnishes a shower of sparks for starting.
3. A switch which combines both ignition and starting functions.
4. Shielded spark plugs and ignition harness to suppress radio noises.

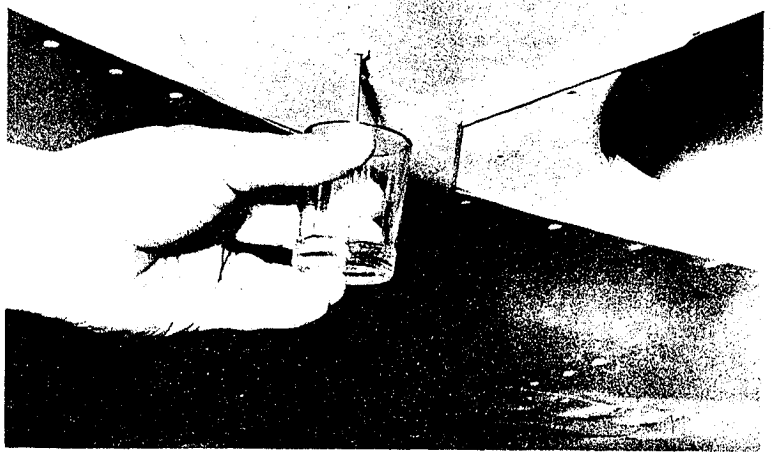
When the push-type starter switch is activated in the "start" position, the starter vibrator sends an interrupted current through the retard-breaker points while the right magneto is grounded out. The left magneto then provides a fixed retard and a long duration, boosted spark for starting.

FUEL SYSTEM

Fuel is carried in 26 gallon, sealed sections in the front portion of each wing root. Tank vents allow ventilation as fuel is depleted and overflow when fuel expands in hot weather.

The fuel tanks each have a sump drain under the wing from which fuel may be sampled to check for water or sediment contamination. A small plastic cup with an actuator prong is provided to obtain fuel samples. If water is present in the fuel,

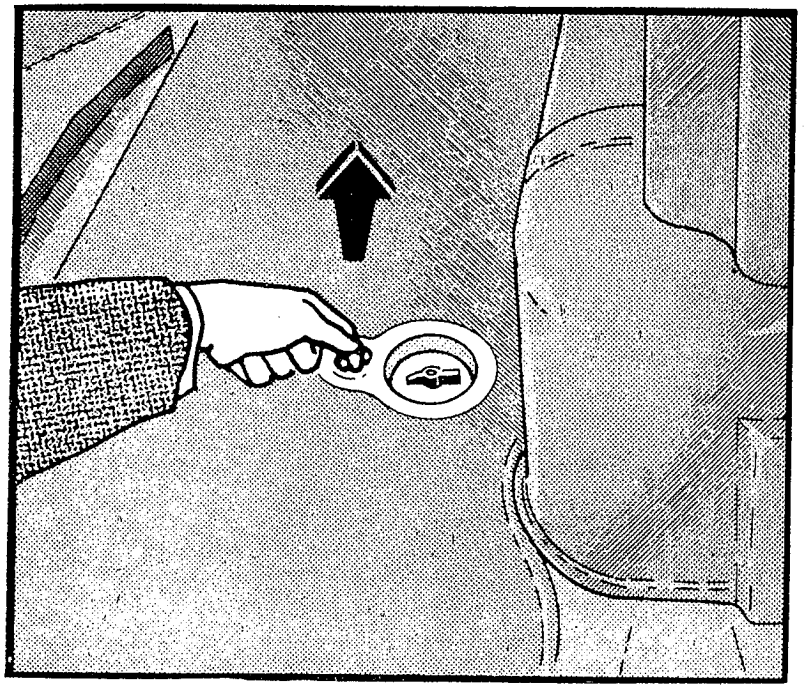
SAMPLING FUEL FROM MAIN TANKS



a distinct line separating the water from the gasoline may be seen through the plastic cup. Water, being heavier, will be on the bottom of the cup, and the colored fuel will be on top.

Aluminum fuel lines feed the fuel from the tank to a two-way, positive-setting selector valve on the floor ahead of the pilot's seat. The selector valve feeds fuel from one of the tanks at a time, and also has an "off" position for extended periods of storage or for emergency use. The selector valve also contains a sump drain which is actuated by pulling the ring adjacent to the fuel valve handle. Switch the selector valve handle to the right and left tanks to drain the respective lines. Be sure sump drain returns to normal closed position after releasing the ring. Fuel is fed from the selector valve through the electric boost pump, then to the engine driven pump and into the fuel injector unit. The electric boost pump is turned on for take-off and landing to provide fuel pressure if the engine driven pump malfunctions.

SELECTOR DRAIN VALVE



WARNING

Under no circumstances should aviation fuel of a lower grade than 100/130 octane be used. Aviation fuels may be distinguished by their color: 80 octane is red, 91 octane is blue, and 100 octane is green.

ELECTRICAL SYSTEM

The electrical system is provided with a 50-amp, 12-volt generator and a 35 amp-hour battery which is located aft of the baggage compartment. All electrical systems can be turned off by the master switch which actuates a relay located at the battery. The master switch for the electrical system is located

at the left-hand side of the flight panel. The electrical system operates all the electrical accessories listed below:

1. Radios
2. Engine starter
3. Starter vibrator
4. Navigation lights and interior lights
5. Landing light
6. Rotating beacon (if installed)
7. Heated pitot (if installed)
8. Turn coordinator
9. Cigarette lighter
10. Electric landing gear (if installed)
11. Fuel gages
12. Electric fuel pump
13. Stall warning horn
14. Landing gear warning horn and warning lights

NOTE: The engine has its own separate electrical system and will continue to run, even though the master switch has been turned off, or even though the accessory electrical system should malfunction.

Interior Lights

Panel illumination is provided by two adjustable spot lights mounted on the headliner and individual post lights for the instrument panel. These lights are controlled by rheostats. The fuel selector valve is illuminated by a small light mounted under the panel on the left side. The intensity of this light is controlled by rotating the lens housing.

Ammeter

The ammeter in the engine instrument cluster will indicate if the battery is charging or discharging. A malfunction in the generator or voltage regulator will be shown as an ammeter discharge at flight power settings. A low battery will cause a high charge indication.

Electrical Panel

The electrical panel is divided into two parts:

a. The electrical toggle switches, on the lower left side of the pilot's panel, act in combination both as on-off switches and as breaker switches. Should any of these circuits be overloaded, the switch automatically turns to the "off" position.

   These switches are, from left to right:

   1. The electrical fuel pump
   2. An optional equipment switch (Marker beacon)
   3. An optional equipment switch (Glide slope)
   4. An optional equipment switch (Pitot heat)
   5. An optional equipment switch (Rotating beacon)
   6. The navigation lights
   7. The landing light

b. The circuit breakers which are located on the lower right side of the copilot's panel, are covered by a breaker panel cover. These circuit breakers are of the push-to-reset type.

AIRFRAME

The structure of the Super 21 is of conventional all-metal design. The cabin section consists of tubular steel structure covered with aluminum sheet metal. The center windshield post and the firewall are stainless steel.

The wing, stabilizer, and fin have a main spar design and an auxiliary spar with stressed skin to carry torsional loads. The tail cone is a conventional semi-monocoque design. The seat design features contoured construction. The front seats are adjustable fore and aft and have adjustable three-position backs. The rear seat back may be removed for additional cargo space.

The entire empennage pivots around two attachment points to the tail cone to provide stabilizer trim. A screw mechanism actuates the empennage movement at the rear bulkhead when the trim control wheel is operated.

LANDING GEAR

Manual System

The landing gear is unique in that it is manually retracted by the pilot by means of a lever in the cabin. The system is operated by direct mechanical linkage and has proven to be one of the most reliable and maintenance-free retraction systems available. An electrically powered landing gear retraction system is also available at extra cost and is described in the following section.

The manual system is aided by bungee type springs in the fuselage and assist springs in the wing, which balance the weight of the gear. Rubber discs are used for shock absorption in the welded steel tube gear structure. Grease fittings are provided at certain important lubrication points on the landing gear.

The position of the gear is indicated by lights on the panel which will warn of an unlocked condition. These lights may be dimmed by rotating the lens housing to prevent glare at night. Press the lens housing in to test the bulbs. The red indicator light will come on if the handle on the retraction lever is not sufficiently engaged in the down and locked position, thereby indicating an unsafe-to-land condition. The green light indicates that the handle is properly engaged in the down position, and the gear is in the landing configuration. A thumb operated latch is provided on the down socket to prevent unlocking of the gear when it is down unless it is deliberately released.

To retract the gear, depress the safety latch button and slide the gear handle from the down-lock socket. Move the handle rapidly to the floor between the seats. Slide the gear handle into the up-lock socket, and the operation is complete. The more rapid the movement of the handle, the easier it is to retract the gear. The gear retracts easiest at low airspeeds.

To lower the gear, slide the gear handle from the up-lock socket and move the handle forward to the instrument panel. Slide the gear handle into the down-lock socket and check the gear warning light for a gear-down indication (a green light). The landing gear warning horn will sound intermittently when the throttle is retarded below 10 IN. HG with the gear in the retracted position.

Electrical Gear System (optional)

The optional electrical landing gear retraction system is operated by the wheel-shaped switch on the upper portion of the flight panel. To raise the gear, the knob is pulled out and the switch moved up to its upper detent. An "airspeed switch" is incorporated in the electrical circuit which prevents landing gear retraction until a safe airspeed is attained.

CAUTION

Never rely on the airspeed safety switch to keep the gear extended while taxiing, taking off or landing. Always check the gear switch for the down position.

A limit switch will stop the gear in its retracted position; the gear-up light will come on, and the gear switch will require no further attention until landing. To lower the landing gear, the knob is pulled out, moved down, and placed in the lower detent. A limit switch will stop the gear system when the proper locking force has been exerted to hold the gear down, and the green gear-down-light will come on.

WARNING

A discharged storage battery may prevent the landing gear from fully extending.

There are three ways to check that the gear is completely down and locked:

1. The green "safe-to-land" indicator light (on the left panel) will come on.
2. The black indicator marks, as seen through the glass in the floorboard, will be aligned.
3. Retard throttle fully, and if no warning horn is heard the gear should be down and locked. The gear warning horn emits an interrupted sound of a different pitch than the stall warning horn.

When these conditions are fulfilled, the aircraft may be landed with no further attention to the landing gear system.

Manual Operation of the Electrical Landing Gear System

If the gear does not come down due to electrical malfunction, etc., the system may be operated manually as described below:

1. Pull landing gear circuit breaker OFF.
2. Put gear switch in the gear down position.
3. Push crank engage handle forward.
4. Crank clockwise approximately fifty (50) turns to lower the gear.
5. Gear is down when green gear light is on. If a total electrical malfunction occurs, check gear visual indicator. DO NOT RETRACT GEAR IN FLIGHT WITH MANUAL HAND CRANK.

FLIGHT CONTROLS

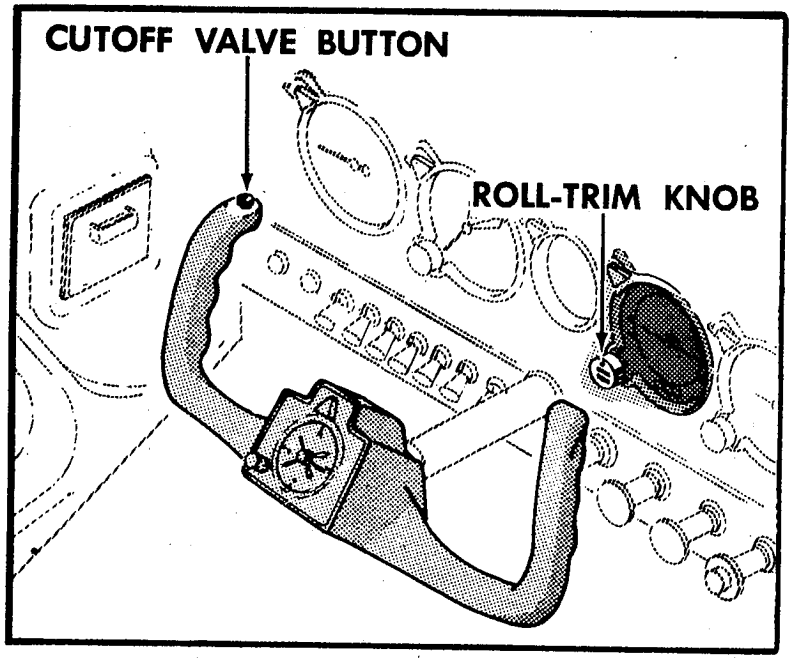
The ailerons, elevators, and rudder operate conventionally. Push-pull tubes with self-aligning rod end bearings actuate these control surfaces. The ailerons have a differential linkage (i.e., up travel is greater than down travel) to minimize adverse yaw when they are deflected. Gap strips on the hinge line minimize air spillage from the high to the low pressure side of the control surfaces. The ailerons have beveled trailing edges to lower pilot control force.

POSITIVE CONTROL SYSTEM

The Mooney Positive Control (PC) system provides a high degree of roll stability by supplying pneumatic inputs to servo units linked to the rudder and aileron control systems. Since the engine-driven vacuum pump supplies the pneumatic power, PC is in operation whenever the engine is running and the vacuum system is functioning properly.

The PC system cut-off valve located in the pilot's left-hand control wheel handle provides system cut-off when depressed. The aircraft can be maneuvered easily when this valve is held down. When the valve is released, the airplane will tend to return to straight and wings level flight from any attitude. The turn coordinator instrument supplies the controlling signals for the PC system. The "Roll Trim" knob in the turn coordinator provides an aileron trim function. Clockwise rotation trims to the right;

PC SYSTEM CONTROLS



counterclockwise rotation trims to the left. In the event of malfunction, the pilot can easily override the system at any time. Complete disengagement may be accomplished by depressing the cut-off valve. In the event of complete loss of vacuum (indicated by a red light above the gyro horizon), the PC system will automatically become inoperative. Excluding malfunction of the vacuum system, PC will continue to operate even after a complete engine power loss as long as the propeller is windmilling at approximately 1000 rpm or above.

The turn coordinator operates on both vacuum and electrical power, thereby providing fail-safe turn coordinator operation.

This aircraft is not approved for spins. In the event that the pilot inadvertently approaches or enters a spin, the Positive Control system can be overpowered from either the pilot's or copilot's side and the controls used for normal spin recovery techniques. The pilot should use the cut-off valve located in the pilot's left control wheel handle to cut off the PC system when employing spin recovery control procedures.

WARNING

While taxiing before take off, the PC system should be checked for proper functioning by noting movements of the flight controls in taxi turns. When PC is functioning properly, the control wheel will tend to rotate in the opposite direction of the taxi turn. The absence of flight control movement during taxi turns, or extreme control movement in either direction without prompt return to neutral, indicates a PC malfunction that should be corrected before flight.

The pilot must become familiar with the flight characteristics of the airplane with the PC system inoperative. This is accomplished simply by holding down the cut-off valve button while making turns and maneuvers. Frequently check the PC system during flight to see that it is functioning properly, particularly if IFR conditions are anticipated. To check for a malfunction while in flight, first establish a moderate bank. Then release the controls to see if the aircraft will return promptly to straight wings-level flight as shown 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 PC system. PC is installed to help alleviate pilot fatigue, but the system should be monitored frequently to check for proper functioning like any other system in the aircraft.

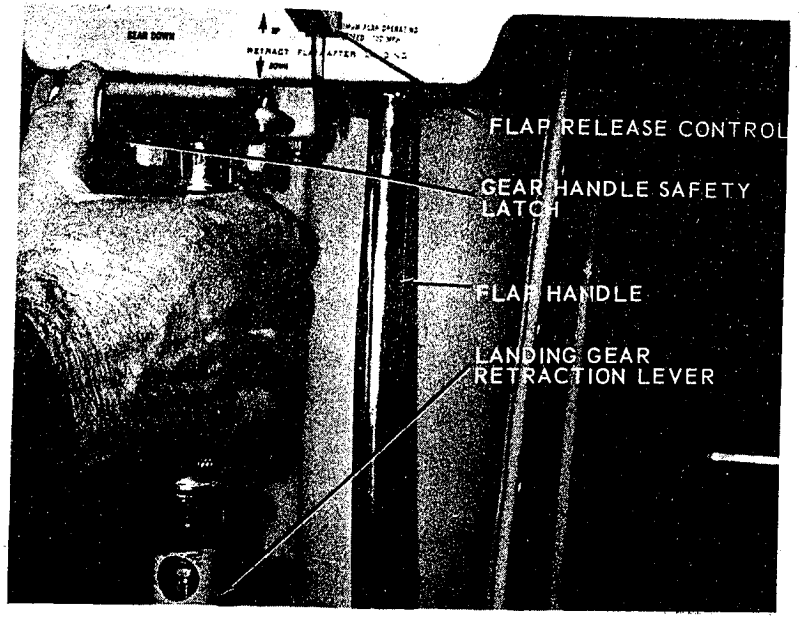
TRIM SYSTEM

A small control wheel on the floor between the front seats actuates the adjustable stabilizer via a gear reduction and torque tube linkage which actuates the empennage jack screw. A friction lock is provided on the pilot side of the trim control pedestal. Rotating the friction screw clockwise increases trim friction. The position of the stabilizer is indicated by a pointer on the aft side of the nose wheel well. The intermediate mark in the pointer range is the normal take-off setting of the trim control. The trim system also changes the setting of the trim bungees connected to the elevator horns to obtain trim assist from the elevators.

FLAPS

The wide span flaps are hydraulically controlled by a hand operated pump which actuates a hydraulic cylinder. A relief valve is provided which releases the flaps at a slow rate as the springs (or air pressure) raise them. Hydraulic fluid used is the same as the brake system fluid and is stored in the hydraulic reservoir on the aft side of the firewall. To lower the flaps, first set the flap-shaped control (adjacent to the flap handle) in the down position. Then pump the handle to obtain the desired setting: two strokes for take-off; four and one-half strokes for full deflection or any intermediate setting. To raise the flaps, place the control in the up position. The flaps will then rise at a controlled rate to the up position or they may be stopped at an intermediate position by placing the control in the down position again. The position of the flaps is indicated by a pointer on the aft side of the nose wheel well. The intermediate mark in the pointer range is the flap take-off setting.

GEAR AND FLAP CONTROLS



CAUTION

Do not leave the flaps in the full down position while the aircraft is parked. Trapped fluid in the system can be expanded by solar heat causing damage to the system.

VACUUM SYSTEM

An engine-driven vacuum pump powers the gyroscopic instruments (artificial horizon & directional gyro), the Mooney Positive Control System, and the automatic retractable step. Vacuum pump output is governed by a regulator. HI-LO indicator lights on the instrument panel will show when vacuum is above or below limits. Test the warning lights by pressing forward the lens housing of each light; if operative the light will show red. To dim these lights during night flight, turn the lens housings clockwise.

When the engine is started and sufficient vacuum is produced, a vacuum servo will raise the cabin entry step to the stowed position. A spring will pull the step down when the engine is stopped and vacuum is relieved.

BRAKES

The Super 21 is equipped with hydraulic disc brakes on the main gear which are operated independently by toe pressure on the rudder pedals. The brakes may be set for parking by depressing the toe pedals and pulling out the lock valve control which is located on the panel to the right of the pilot's control column. Hydraulic fluid for the brake and flap systems is stored in a reservoir on the top aft side of the firewall. Co-pilots brakes are available as optional equipment.

HEATING AND VENTILATION SYSTEMS

Lower Heat and Vent System

Cabin heat is obtained from a muff which surrounds the engine muffler. From this muff, a flexible duct transmits

heated air to a junction box on the aft side of the firewall on the copilot's side. Cool air is also ducted to this junction box from the flush air scoop on the right side of the airplane. The warm and cool air entering the junction box can be individually controlled to provide the combination required for the desired temperature. From the junction box, air is ducted to the pilot and co-pilot's feet, to the rear cabin, and to the windshield defrosters. Pilot and co-pilot heating and ventilating outlets have individual controls.

Defroster System

In order to obtain the maximum flow of heated air through the windshield defroster outlets, the rear cabin, pilot, and co-pilot airflow valves should be closed. With these valves in the closed position, the airflow is forced through the defroster outlets.

CAUTION

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 through the system to the windshield, which could cause windshield deterioriation.

WARNING

In case of engine fire, turn the cabin heater "Off".

Upper Ventilation System

The upper ventilation system consists of a retractable air scoop on top of the cabin section which supplies four individually controlled ceiling outlets. The scoop control knob, located above the pilot, is turned counterclockwise to open (extend) the scoop to obtain ram air. To minimize drag and prevent air buffeting in the cabin at higher airspeeds, open the overhead air scoop only enough to obtain sufficient air supply to the outlets. The outlets can be controlled individually by turning the inner knob to adjust the air volume and rotating the deflector to obtain air flow in the desired direction.

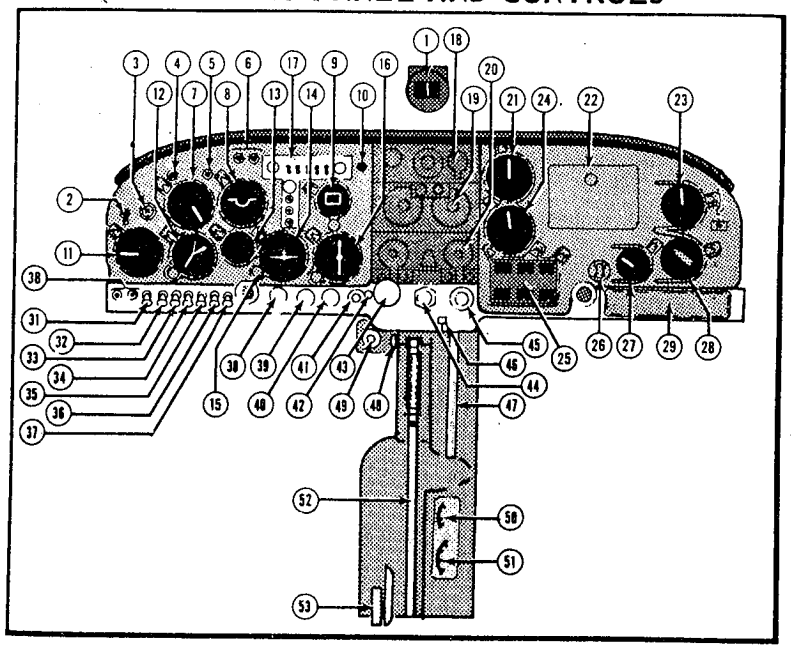
Left Side Air Scoop

The left side air scoop has one outlet which has a volume control and can be adjusted directionally. This scoop also has two outlets behind the upholstery panel which provide an additional source of air for radio cooling.

Radio Cooling Outlet

In addition to the outlets on the left scoop for radio cooling tubes, the right side flush air scoop provides air for the radio vent grill which is mounted on the firewall, directly forward of the center radio panel. This grill directs air aft to insure sufficient air flow to prevent multiple radio installations from overheating. The tube supplying the grill has a control valve near the scoop to decrease air flow in extremely cold weather.

INSTRUMENT PANEL AND CONTROLS



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. Electric Gear Retraction Switch (optional)
11. Rate-of-Climb Indicator
12. Altimeter
13. Optional Equipment
14. Turn Coordinator
15. PC Roll-Trim Knob
16. Radio Equipment
17. Communications Controls (optional)

RADIO PANEL
18. Radio Equipment or Autopilot (optional)
19. Radio Equipment (optional)
20. Radio Equipment (optional)

RIGHT PANEL
21. Tachometer
22. Glove Box or Radio Equipment (optional)
23. Manifold Pressure/Fuel Pressure Gage (or optional radio equipment)
24. Manifold Pressure/Fuel Pressure Gage (or optional radio equipment)
25. Engine Cluster Gage:
    - Fuel Quantity Gage (L tank)
    - Fuel Quantity Gage (R tank)
    - Ammeter
    - Oil Pressure Gage
    - Oil Temperature Gage
    - Cylinder Head Temperature Gage
26. Cigarette Lighter
27. Exhaust Gas Temperature Gage
28. Manifold Pressure & Fuel Pressure Gage (optional location)
29. Main Circuit Breaker Panel Cover

SUBPANEL
30. Headset & Microphone Jacks (optional)
31. Electric Fuel Pump Switch
32. Marker Beacon Switch (optional)
33. Glide Slope Switch (optional)
34. Pitot Heat Switch (optional)
35. Rotating Beacon Switch (optional)
36. Navigation Lights Switch
37. Landing Light Switch
38. Parking Brake Control
39. Cabin Heater Control
40. Cabin Vent Control
41. Power Boost Control
42. Unfiltered Air Warning Light

ENGINE CONTROLS
43. Throttle Control
44. Mixture Control
45. Propeller Control
46. Wing Flap Control Knob
47. Wing Flap Hydraulic Pump Handle
48. Gear Lever Safety Latch
49. Cowl Flap Control

WHEEL WELL
50. Stabilizer Trim Position Indicator
51. Wing Flap Position Indicator
52. Gear Retracting Lever

CABIN FLOOR
53. Stabilizer Trim Control Wheel
54. Fuel Tank Selector Valve Drain (not illustrated)
55. Fuel Tank Selector Knob (not illustrated)

PART II

FLIGHT PROCEDURES

GENERAL

This section will describe recommended flight procedures necessary for the proper operation of your Super 21. The aircraft is normally flown from the left seat. However, when equipped with optional dual brakes, a copilot or instructor has full control of the aircraft and access to all instruments and controls. The copilot can override the Mooney PC system easily without depressing the cut-off valve located on the left control wheel.

WEIGHT & BALANCE

The aircraft weight and center of gravity location can be determined from the information and examples shown in the Weight & Balance Record provided with the airplane.

The maximum allowable take-off weight of the Super 21, including fuel, oil, baggage, and passengers is 2575 pounds. If there is doubt concerning the weight or C.G. location of a proposed loading, that loading should be checked per the weight and balance data.

The hat rack compartment, aft of the main baggage compartment, is to be used only for the storage of light, soft items.

WARNING

The hat rack area is limited to ten pounds weight for balance purposes.

PRE-FLIGHT INSPECTION

The following pre-flight inspection is recommended:

1. Check all switches off.
2. Remove tiedowns or wheel blocks, check tires and prop clear of rocks, holes, etc.

3. Check wings and control surfaces clear of ice, snow, or frost.
4. Check the propeller blades for nicks or cracks.
5. Check the oil level to six quarts or above.
6. Inspect the cowling for loose attachments.
7. Inspect the tires for proper inflation.
8. Inspect the air filters for cleanliness.
9. Check the left tank for fuel level and drain sump.
10. Check the left aileron for freedom of travel.
11. Inspect the left flap.
12. Inspect the elevator and rudder for freedom of travel. (Rudder travel will be limited by nose gear steering mechanism.)
13. Inspect the right flap.
14. Inspect the right aileron for freedom of travel.
15. Check the right fuel tank for fuel level and drain sump.
16. Check lights if flight is at night.

ENTERING THE AIRPLANE

After entering the cabin, close the door by pulling on the pull strap and rotating the handle forward to the latched position. DO NOT SLAM THE DOOR. Check that the gear retraction handle (or electric gear switch) is in the gear down and locked position. Drain the fuel selector valve on the floorboard and turn the selector to the proper tank. Be sure the drain returns to "OFF" position and that the pull ring is properly positioned in the cavity provided. If the flight is at night, check to assure a flashlight is on board.

STARTING THE ENGINE

The following starting procedures are recommended; however, the starting characteristics of each engine may vary slightly which could necessitate some variation from these recommendations.

1. Gas selector on fullest tank.
2. All radio switches and electrical switches off.
3. Brakes on.

4. Power Boost control in filtered air (OFF) position.
5. Cowl flaps open.
6. Check throttle for unlocked position – 1/8" open.
7. Mixture control full aft (idle cut-off).
8. Propeller control full forward (high rpm).
9. Master switch on (green gear indicator light, "Low Vacuum" warning light, and the electric turn coordinator should come on).
10. Turn boost pump on and note fuel pressure indication.
11. Move mixture to full rich (forward) position for three seconds and return to idle cut-off (aft). Do not keep the mixture control in the full rich position more than a few seconds with the boost pump on to avoid flooding the engine.
12. Turn ignition switch to "Start" and press in.
13. When engine fires, hold start switch on for another second, then allow the spring loaded switch to return to "Both."
14. Move mixture control to "Full Rich" (forward) slowly.

NOTE: Flooded engine—throttle full open, mixture control in "idle cut-off," boost pump off. When engine starts, retard throttle, move mixture to "Full Rich" and turn on boost pump.

COLD WEATHER AND MANUAL STARTING

In extremely cold weather it may be necessary to provide additional fuel priming to the engine by holding the mixture control in the full rich position a few seconds longer than usual. It may be necessary to preheat the engine and engine oil prior to starting.

NOTE: If oil pressure is not indicated on the oil pressure gauge within 30 seconds, stop the engine immediately and determine the cause.

In the event that it becomes necessary to start the engine with a low battery and no external battery source is available, use the following procedure:

1. As the engine is "hand propped," hold the magneto switch in the "start" position to operate the starter vibrator and furnish a retarded spark to the engine.

WARNING

When "hand propping" the engine, stand clear of the propeller until the starter vibrator is energized. Do not push the magneto switch forward as this will engage the starter.

2. When the engine starts, release the switch to the "Both" position.

TAXIING AND GROUND OPERATION

The nose gear is linked directly to the rudder pedals to provide steering. The brakes may be applied independently to assist steering for sharper turns.

Caution should be used when operating on rough terrain. It is recommended that minimum power be used for starting to taxi on sod or gravel fields. Too much power will cause the propeller to suck up stones and thus nick the blades. Excessive speed over rough ground should be avoided to preclude pitch down of the nose

The engine is air-pressure cooled and depends on the forward speed of the airplane to maintain proper cooling. It is recommended that the following precautions be observed for proper engine cooling:

1. When stopped, head the airplane into the wind.
2. Open the cowl flaps (control full aft).
3. Operate the engine on the ground only with the propeller in high rpm setting (control forward).
4. Keep mixture "Full Rich" (control forward).
5. Do not overheat engine by prolonged ground running. Monitor the cylinder head temperature gauge.

PRE TAKE-OFF CHECK

When operating on gravel fields, it is recommended that the run-up be made while taxiing to avoid nicking the propeller. Warm up the engine at 1000 to 1200 rpm. Avoid prolonged idling at low engine speeds as this practice may result in fouled spark plugs. The engine is warm enough for take-off when it can develop full rpm and the throttle can be opened without backfiring or skipping of the engine or the throttle can be opened without a reduction in oil pressure.

Check the following items before take-off:

1. Check flight controls for travel and smoothness of operation.
2. Check fuel quantity indicator, selector valve, and fuel pressure.
3. Check instruments:
   a. Set altimeter to field elevation.
   b. Check oil pressure and temperature.
   c. Check ammeter for indication.
   d. Check cylinder head temperature.
   e. Set clock.
   f. Check manifold pressure gauge and tachometer for readings proportional to engine power.
   g. Check rate of climb, airspeed, and turn coordinator for zero readings.
   h. Check artificial horizon and directional gyros for proper orientation.
   i. Test gear indicator lights and vacuum warning lights.
4. Set trim to take-off setting (check indicator).
5. Check cowl flaps open.
6. Set wing flaps to take-off setting (check indicator).
7. Turn on boost pump.
8. Check magnetos at 1700 RPM for smooth operation and maximum drop of 125 RPM with variation of 50 RPM maximum between magnetos.
9. Exercise the propeller at 1800-2000 RPM by pulling the propeller control to the "full-out" position. After the tachometer has shown a drop-off of 100 RPM, push the propeller control to the "full-in" position.

10. Check mixture rich (full forward).
11. Check lights if flight is at night.
12. Check all seat belts.
13. Close door and pilot window and latch shut.
14. Clear floor for retraction handle clearance.

WARNING

Do not fly this aircraft in icing conditions.

TAKE-OFF AND CLIMB

When applying power for take-off, move the throttle to the full open position slowly to avoid picking up loose stones, etc., with the propeller. Apply back pressure to the control wheel at about 65-75 mph airspeed. When the aircraft breaks ground, it will tend to "rock" into a nose-high attitude. To compensate for this tendency, relax some of the elevator back pressure as the nose-wheel leaves the ground. For best results and a smoother take-off, do not allow the nose of the aircraft to lift above the horizon during take-off. After some practice, you will find that you can make your smoothest take-offs by applying elevator back pressure as flying speed is approached and then slowly reducing the back pressure as you feel the nose wheel lifting from the ground. This will allow the aircraft to fly smoothly from the runway without any abrupt change in pitch attitude.

As soon as the airplane is airborne and under good control, perform the following procedures:

1. Apply brakes to stop wheel rotation.
2. Retract the gear.
3. Reduce the propeller rpm to 2550-2600.
4. Retract the flaps.
5. Establish climb-out attitude.
6. Turn electric fuel pump to the "off" position.
   (Note fuel pressure indication to verify that the engine driven fuel pump will provide fuel pressure.)

An enroute climb speed of 115-120 MPH IAS is recommended for improved cooling and good visibility. The speed for maximum rate of climb is a straight line variation from 113 MPH IAS at sea level (decreasing approximately one MPH IAS per 1000 FT.) to 102 MPH IAS at 10,000 FT. The speed for maximum angle of climb (obstacle clearance) at Full Power, Gear and Flaps UP is about 94 MPH IAS. Recommended power setting for normal climb is 2600 RPM and 26 inches manifold pressure.

POWER CHANGES

The following sequence is recommended for increasing or decreasing power settings.

To Increase Power

First, increase engine speed (rpm) by means of the propeller control.
Second, increase manifold pressure by means of the throttle.

When operating at full throttle and additional power is desired, the Power Boost control may be pulled out, provided the atmosphere is free of visible dust. This will allow the engine air flow to by-pass the filter and provide approximately one inch Hg additional manifold pressure. Do not use Power Boost on take-off or landing.

To Decrease Power

First, reduce manifold pressure by means of the throttle.
Second, decrease engine speed (rpm) by means of the propeller control.

CRUISE PROCEDURES

When the desired altitude is reached, use the following procedures:

1. Close cowl flaps.
2. Trim nose down to level flight.
3. Reduce manifold pressure and rpm to desired setting. See performance charts in Section IV.

4. Set the mixture control for the fuel/air ratio desired. This is accomplished by use of the exhaust gas temperature indicator on the right side of the panel. For best economy, lean the mixture by turning the control counterclockwise until the indicator shows a peak (maximum) temperature and starts to decrease. Then enrich the mixture (turn control clockwise) until the temperature drops 25° F. minimum (one mark on the gage) from the peak.

   To obtain a best power (maximum airspeed) setting, lean to peak temperature and then enrich the mixture (turn control clockwise) until the indicator shows a 100° F. drop (four marks on the gauge) from the peak temperature.

   Do not lean the mixture at power settings above 75% rated power.

   Operation of the mixture control should be slow enough to allow for the slight lag in the EGT instrument.

WARNING

In selecting a cruise rpm, the engine must not be continuously operated for cruise purposes within the range of 2100 to 2350 rpm.

INDICATED AIRSPEED

The superior aerodynamic efficiency of your airplane manifests itself in the normal indicated cruise speeds. Your airspeed indicator is marked with a green arc to 150 mph and a yellow arc starting at 150 mph and ending at 189 mph. At lower altitudes, it is possible to cruise at indicated airspeeds above 150 mph and in the yellow cautionary arc. The yellow arc indicates speeds at which the pilot must exercise caution when encountering rough air or severe gusts. Rough air is considered to be a condition uncomfortable to pilot and passengers. Therefore, under these conditions, do not operate at airspeeds within the yellow arc.

WARNING

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. Maximum speed landing gear extended, 120 mph. Maximum speed for operation of gear, 120 mph. Maximum maneuvering flight load factor: flaps up +3.8 −1.5; flaps down +2.0.

FUEL MANAGEMENT

The following method is useful for monitoring remaining fuel. After take-off with both tanks full, use one tank only until one hour of fuel is depleted from it. Then switch to the second tank and record the time of switch-over on the elapsed time indicator on the clock. Use all the fuel in the second tank. Then, the time of fuel remaining in the first tank is the time it took to deplete the second tank, less one hour. However, this will be correct only if the cruise altitude and power setting remain unchanged. If a tank runs dry and the engine loses power, retard the throttle before restarting. Restarting with advanced throttle may cause engine over-speeding and can lead to mechanical malfunction.

LET-DOWN PROCEDURES

It is recommended that power let-downs be made in order to keep the engine from cooling too rapidly. By reducing the manifold pressure to some figure below cruise setting and then retaining cruise speed, a let-down can be made without excessive cooling of the engine. Do not open the cowl flaps for let-down.

LANDING PROCEDURES

Use the following check list before landing:

1. Fuel selector on fuller tank.
2. Boost pump on.
3. Mixture full rich (control forward).
4. Power Boost OFF (control full forward).
   NOTE. Warning light adjacent to Power Boost control will be on if gear is down and Power Boost is not off.
5. Landing gear down (lower at 120 mph or less).
   NOTE: The low frequency Warning Horn will sound intermittently (beep) if gear is not down and locked and throttle is retarded. Check for green "down and locked" light. If green light is not working, it can be screwed out and replaced in flight with the red "Gear Up" light to verify the locked position.
6. Propeller high rpm (control forward).
7. Seat belts fastened.

It is recommended that the base leg be flown at 90 mph. Upon turning final, or sooner if necessary, extend the desired amount of flaps. Flap speed is 100 mph. As the flaps are extended, the aircraft will become nose heavy. Roll the trim back so that the aircraft will glide hands-off at approximately 80 mph. The addition of a slight amount of power will flatten out the glide considerably. The high frequency stall warning horn will blow continuously if airspeed is reduced to within 5 to 10 mph of stalling speed.

NORMAL LANDING

Begin your flare-out for landing closer to the ground than you ordinarily would. This is done for two reasons:

1. The Super 21 sits lower to the ground than most aircraft.
2. The Super 21 requires very little altitude to make a transition from a glide to a landing attitude. A slight addition of back pressure is sufficient to stop the rate of descent.

It is recommended that full flaps be used on normal landings, because of the added visibility over the nose that it affords. However, the use of full flaps tends to make an aircraft nose-heavy,

and it is therefore necessary to roll the trim well back to make a good landing.

In a normal final landing approach, the aircraft should be trimmed for hands-off flight to the point of flare-out.

CAUTION

Under no circumstances should the aircraft be allowed 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.

A good landing has been made when the main gear gently touches down before the nose wheel is allowed to make contact with the runway. This is the conventional and safest landing procedure for tricycle-gear aircraft.

After leaving the runway:

1. Open cowl flaps.
2. Retract wing flaps.
3. Taxi at 1000 to 1200 RPM for uniform engine cooling.
4. Set trim for TAKE-OFF.
5. Turn boost pump off.

STOPPING THE ENGINE

Stop the engine in the following manner:

1. Idle the engine at 1000 to 1200 RPM.
2. Pull the mixture control to the "idle cutoff" position.
3. As the engine stops firing, retard the throttle all the way out to reduce engine vibration.
4. When the propeller stops, turn the magneto and master switches to the "off" position.

PART III

SERVICE AND MAINTENANCE

GENERAL

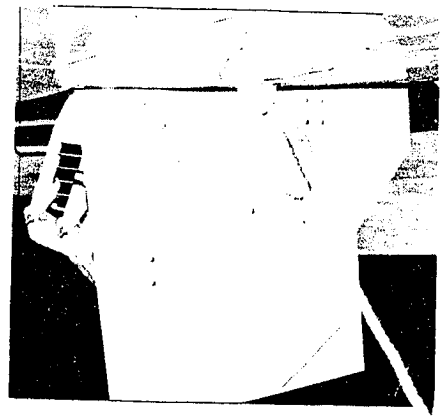
This section will present service and maintenance information that is of a general or routine nature only. For more detailed information concerning maintenance that is more extensive, see the appropriate Mooney Service and Maintenance Manual. In the back of the Service and Maintenance Manual is a series of inspection guides covering recommended twenty-five, fifty and one-hundred hour inspections. It is recommended that you have these inspections and other maintenance performed at the nearest Mooney Service Center where factory trained mechanics are available.

If it becomes necessary to consult the Mooney factory concerning a specific problem, contact the Product Support Department, Mooney Aircraft Corporation, Louis Schreiner Field, Kerrville, TX 78028, Telephone, (210) 896-6000, ext. 219.

GROUND HANDLING

A small hand tow bar is provided with the aircraft which fits into the nose gear lower structure to facilitate maneuvering the

WING TIEDOWN RING



HAND TOW BAR

airplane by hand. When towing the airplane, do not exceed the maximum turning angle indicated on the nose wheel turn indicator. Towing with a tractor or other vehicle is not recommended, as damage to the gear structure can result if the nose wheel is turned beyond its limit in either direction.

Removable tiedown rings are provided for the wing which screw into an attachment marked "Hoist Point" outboard of each main gear. The bearing points provided for jacking or hoisting the airplane also fit into these attachments. The tail tiedown ring is located under the tail skid.

PROPELLER

Before each flight the propeller blades should be checked for any nicks, cracks, or signs of other damage. Nicks cause high stress concentrations in the blades which could start a crack. Have a mechanic remove any nicks as soon as possible. It is not unusual for the propeller to have a certain amount of end-play. This is a result of manufacturing tolerances in the parts. Small differences at the blade root are magnified many times at the tip. This end-play has no adverse effect on the performance or operation of the propeller. As soon as the propeller begins to rotate, the centrifugal force of the blades seats them positively and rigidly against the bearing.

Sometimes it may be noted that the tachometer needle wavers in straight and level flight. If it is excessive, it may be further checked to determine if the problem lies in the propeller governor system or in the tachometer by doing the following:

1. Move the propeller control to the "high RPM" position. The RPM should increase to 2700.
2. Reduce the manifold pressure until the RPM is below 2700. At this time, the propeller will be in fixed pitch.

If the tachometer needle continues to waver, the problem lies in the tachometer and cable system itself. If the tachometer needle stabilizes, then the problem lies in the governor and propeller system. To eliminate this condition, have your mechanic purge or clean the propeller system.

If surging of the propeller occurs during take-off or climb out, it may be caused by air in the system or foreign matter in the governor passages.

ENGINE

Use 100/130 octane aviation fuel only. The wing sumps are drained with the plastic cup by inserting the center prong into the drain hole to release the valve.

Overflow vents are incorporated in each fuel tank to allow for overflow of the tank and ventilation as fuel is depleted.

The Power Boost ram air scoop located above the engine air filter should be closed off when the aircraft is on the ground. The scoop door should be checked frequently to insure that the door is closed and sealed properly.

The air filter should be removed and cleaned every 25 hours or more often if unusually dusty conditions are encountered. Refer to Lycoming Service Instruction No. 1014 (latest revision) for engine oil type recommendations and replacement intervals. Oil capacity is eight quarts – six minimum for flight.

BATTERY

The battery should be checked every 25 hours of flight or every 30 days (whichever comes first) for proper fluid level. The battery is located aft of the baggage compartment and is easily accessible through the large access panel on the left side of the airplane.

CARE OF INTERIOR

Normal cleaning methods may be used for routine cleaning of the aircraft interior. The fabric on the seats and side panels may be cleaned with any spray-on type dry cleaner. The side panels and headliner may be cleaned with a damp cloth or an aircraft detergent and water solution. Do not use alcohol on interior plastics. Draftsman's dry cleaning pad can be used for removing light soil from the cloth headliner.

CARE OF EXTERIOR

The acrylic enamel paint used on the exterior does not require waxing. However, if you desire to wax the exterior, a period of 90 days since the airplane was painted should be allowed before waxing to insure proper curing of the paint. When washing the exterior use only mild aircraft detergents. Do not use a combination cleaner and wax on the exterior.

WINDOWS

The Plexiglas windows should be kept clean and waxed. Remove dirt or mud with your hand while flushing with water. Do not rub the windows with a cloth or chamois while cleaning. After cleaning, rinse and dry with a moist chamois. Remove oil or grease with a cloth soaked in kerosene. Do not use solvents other than kerosene on Plexiglas. After cleaning, polishing wax may be applied and rubbed lightly with a soft dry cloth. Do not use a power buffer as the heat generated by it may soften the surface of the windows.

LANDING GEAR

The landing gear retraction system should be rigged only by a mechanic familiar with the gear rigging procedures of the aircraft. The landing gear should be kept free of mud or ice to prevent interference when retracted. If you notice an unusual force when operating the manual retraction system, return the lever to the down and locked position and have the gear checked after landing. The gear warning horn may be checked in flight by retarding the throttle with the gear up. The horn should sound at about ten inches Hg manifold pressure.

All three tires should be maintained at 30 psi.

VACUUM OPERATED STEP

The operation of the step may be checked easily on the ground by starting the engine and maintaining sufficient engine speed to turn off the "Low Vacuum" light while an observer checks the step retraction. The step should retract slowly and smoothly into the fuselage. If there is evidence of binding as the step retracts, the support blocks should be examined for alignment. The step strut should be kept clean, and a silicone-spray lubricant should be applied occasionally.

REQUIRED DATA

The following items must be carried with the aircraft at all times:

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

SERVICE BULLETINS AND INSTRUCTIONS

Service Bulletins and Instructions are available from Mooney Distributors. It is recommended that all owners maintain contact with authorized service operators listed in the Mooney Service Directory to be assured of factory recommended service.

PART IV

PERFORMANCE DATA

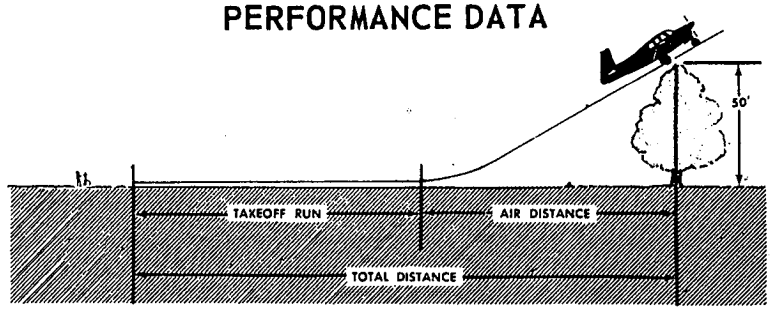


FIGURE 1

TAKE OFF & CLIMB DATA

		TAKE OFF WEIGHT 2200 LBS.				TAKE OFF WEIGHT 2575 LBS.			
Alt. Feet	Temp. °F	Ground Run Feet*	Total Dist. to Clear 50'*	Max. R/C Ft/Min	Best R/C Speed IAS	Ground Run Feet*	Total Dist. to Clear 50'*	Max. R/C Ft/Min	Best R/C Speed IAS
SEA LEVEL	100°	675	1175	1260	109	910	1550	980	109
	59°	575	1000	1400	113	760	1300	1120	113
	20°	495	860	1545	116	640	1090	1265	116
2500'	90°	720	1250	1130	107	1085	1855	850	107
	50°	675	1175	1265	110	910	1550	985	110
	10°	570	990	1410	113	750	1280	1130	113
5000'	80°	850	1480	1000	105	1330	2270	720	105
	41°	720	1250	1130	108	1085	1855	850	108
	0°	645	1120	1280	111	875	1490	1000	111

TAKE OFF CONFIGURATION:

* Gear down, full rich mixture, 15° (take off position) flaps
Wind calm–hard surface runway

CLIMB CONFIGURATION:

Gear Up – Best Power Mixture – Cowl Flaps Open – Flaps Up

FIGURE 2

SUPER 21 CLIMB PERFORMANCE

CONFIGURATION: GEAR UP, BEST POWER MIXTURE
FLAPS UP, FULL THROTTLE,
2700 RPM, COWL FLAPS OPEN

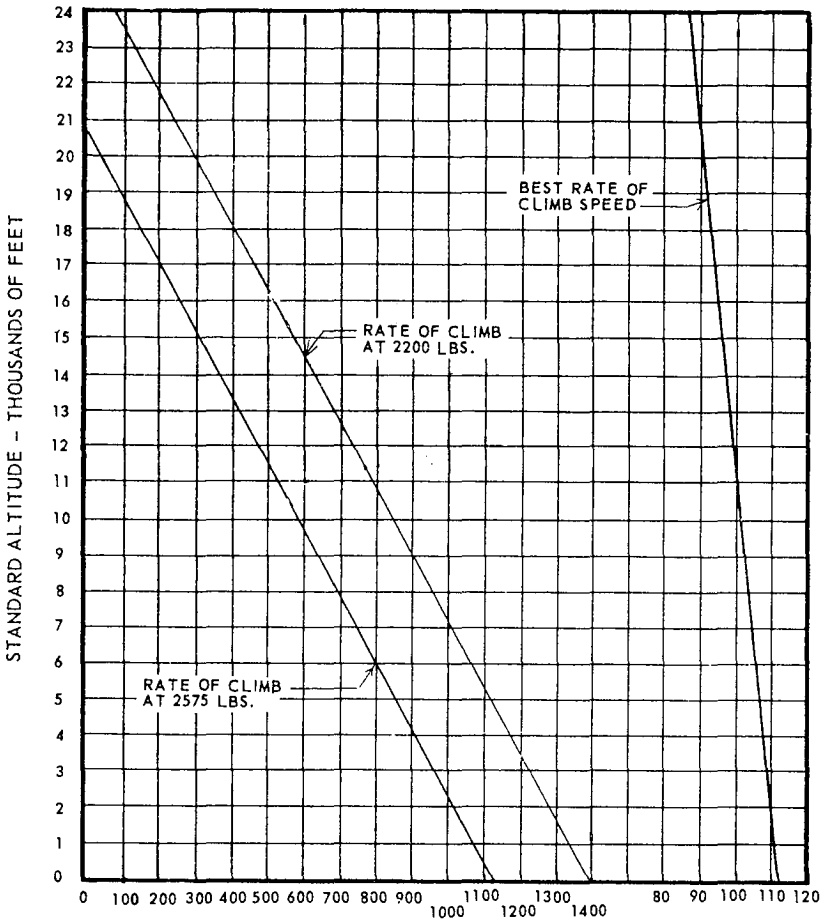


FIGURE 3

CRUISE & RANGE DATA

2200 LBS. & 2575 LBS.: BEST POWER MIXTURE
52 GAL. USABLE FUEL; NO RESERVE FOR RANGE CALCULATIONS
STANDARD ATMOSPHERE

ALTITUDE 2500 FT. MSL

R.P.M.	M.P. IN. HG.	B.H.P.	% B.H.P.	GAL. HOUR	LBS. HOUR	TRUE AIRSPEED		ENDURANCE		RANGE STATUTE MILES	
						2575#	2200#	HRS.	HR:MIN.	2575#	2200#
2700	27.5	193	97	13.8	83.0	193	197	3.76	3:46	726	741
	26.0	181	91	12.8	77.0	187	191	4.05	4:03	757	774
	25.0	170	85	12.3	73.5	184	188	4.24	4:14	780	797
	24.0	162	81	11.8	70.5	180	184	4.43	4:26	797	815
2600	26.0	173	87	12.2	73.0	183	187	4.27	4:16	781	798
	25.0	164	82	11.6	69.5	180	184	4.49	4:29	808	826
	24.0	156	78	11.2	67.0	177	181	4.66	4:40	825	843
	23.0	148	74	10.8	64.5	173	177	4.84	4:50	837	857
2500	25.0	157	79	11.2	67.0	175	179	4.66	4:40	816	834
	24.0	149	75	10.8	64.5	170	174	4.84	4:50	823	842
	23.0	142	71	10.3	62.0	167	171	5.03	5:02	840	860
	22.0	133	67	9.8	59.0	162	166	5.29	5:17	857	878
2400	24.0	142	71	10.1	60.5	165	169	5.16	5:10	851	872
	23.0	134	67	9.8	58.5	161	165	5.33	5:20	858	879
	22.0	127	64	9.3	56.0	156	160	5.57	5:34	869	891
	21.0	119	60	8.9	53.5	151	155	5.83	5:50	880	904
2350	23.0	128	64	9.3	55.5	159	163	5.62	5:37	894	916
	22.0	119	60	8.8	52.5	154	158	5.94	5:56	915	939
	21.0	112	56	8.4	50.5	149	153	6.18	6:11	921	946
	20.0	105	53	8.0	48.0	145	149	6.50	6:30	943	969
1950	17.25	67	34	5.6	33.5	114	119	9.31	9:19	1061	1108

ACCURACY OF DATA IS ± 3%
EACH 100 LBS. CHANGE IN AIRPLANE WEIGHT WILL AFFECT T.A.S. BY 1.1 MPH

FIGURE 3A

CRUISE & RANGE DATA

2200 LBS. & 2575 LBS.: BEST POWER MIXTURE
52 GAL. USABLE FUEL; NO RESERVE FOR RANGE CALCULATIONS
STANDARD ATMOSPHERE

ALTITUDE 5000 FT. MSL

R.P.M.	M.P. IN. HG.	B.H.P.	% B.H.P.	GAL. HOUR	LBS. HOUR	TRUE AIRSPEED		ENDURANCE		RANGE STATUTE MILES	
						2575#	2200#	HRS.	HR:MIN.	2575#	2200#
2700	25.0	176	91	12.6	75.5	193	197	4.13	4:08	797	814
	24.0	167	83	12.0	72.0	190	194	4.33	4:20	823	840
	23.0	158	79	11.5	69.0	185	189	4.52	4:31	836	854
	22.0	151	75	11.2	67.0	176	180	4.66	4:40	820	839
2600	25.0	170	85	12.0	72.0	191	195	4.33	4:20	827	844
	24.0	161	81	11.5	69.0	186	190	4.52	4:31	841	859
	23.0	154	77	11.1	66.5	183	187	4.69	4:41	858	877
	22.0	145	73	10.7	64.0	178	182	4.88	4:53	869	888
2500	25.0	163	82	11.5	69.0	187	191	4.52	4:31	845	863
	24.0	154	77	11.0	66.0	183	187	4.73	4:44	866	885
	23.0	146	73	10.5	63.0	179	183	4.95	4:57	886	906
	22.0	139	70	10.1	60.5	175	179	5.16	5:10	903	924
2400	25.0	154	77	10.8	65.0	183	187	4.80	4:48	878	898
	24.0	146	73	10.4	62.5	180	184	4.99	4:59	898	918
	23.0	138	69	9.9	59.5	177	181	5.24	5:14	927	948
	22.0	132	66	9.7	58.0	173	177	5.38	5:23	931	952
2350	24.0	139	70	9.8	59.0	177	181	5.29	5:17	936	957
	23.0	132	66	9.5	57.0	173	177	5.47	5:28	946	968
	22.0	125	63	9.1	54.5	168	172	5.72	5:43	961	984
	21.0	117	59	8.6	51.5	164	168	6.06	6:04	994	1018
1950	17.0	69	35	5.7	34.0	118	122	9.18	9:11	1083	1120

ACCURACY OF DATA IS ± 3%
EACH 100 LBS. CHANGE IN AIRPLANE WEIGHT WILL AFFECT T.A.S. BY 1.1 MPH

FIGURE 3B

CRUISE & RANGE DATA

2575 LBS. & 2200 LBS.; BEST POWER MIXTURE
52 GAL. USABLE FUEL; NO RESERVE FOR RANGE CALCULATIONS
STANDARD ATMOSPHERE

ALTITUDE 7500 FT. MSL

R.P.M.	M.P. IN. HG.	B.H.P.	% B.H.P.	GAL. HOUR	LBS. HOUR	TRUE AIRSPEED		ENDURANCE		RANGE STATUTE MILES	
						2575#	2200#	HRS.	HR:MIN.	2575#	2200#
2700	23.0	162	81	11.8	70.5	190	194	4.43	4:26	842	859
	22.0	155	78	11.3	68.0	187	191	4.59	4:35	858	877
	21.0	146	73	10.8	65.0	182	186	4.80	4:48	874	893
	20.0	136	68	10.3	61.5	177	181	5.07	5:04	897	918
2600	23.0	158	79	11.4	68.5	187	191	4.55	4:33	851	869
	22.0	149	75	10.8	65.0	183	187	4.80	4:48	878	898
	21.0	140	70	10.3	62.0	179	183	5.03	5:02	900	920
	20.0	131	66	9.8	59.0	173	177	5.29	5:17	915	936
2500	23.0	151	76	10.8	65.0	183	187	4.80	4:48	878	898
	22.0	143	72	10.4	62.5	180	184	4.99	4:59	898	918
	21.0	135	68	9.9	59.5	176	180	5.24	5:14	922	943
	20.0	126	63	9.4	56.5	169	173	5.52	5:31	933	955
2400	23.0	144	72	10.3	61.5	180	184	5.07	5:04	913	933
	22.0	136	68	9.8	58.5	177	181	5.33	5:20	943	965
	21.0	128	64	9.4	56.5	174	178	5.52	5:31	960	983
	20.0	119	60	8.9	53.5	170	174	5.83	5:50	991	1014
2350	23.0	136	68	9.7	58.0	177	181	5.38	5:23	952	974
	22.0	128	64	9.3	55.5	174	178	5.62	5:37	978	1000
	21.0	121	61	8.9	53.5	169	173	5.83	5:50	985	1009
	20.0	113	57	8.4	50.5	164	168	6.18	6:11	1014	1038
1950	16.9	72	36	5.8	34.5	123	127	9.04	9:02	1112	1148

ACCURACY OF DATA IS ± 3%
EACH 100 LBS. CHANGE IN AIRPLANE WEIGHT WILL AFFECT T.A.S. BY 1.1 MPH

FIGURE 3C

CRUISE & RANGE DATA

2575 LBS. & 2200 LBS.; BEST POWER MIXTURE
52 GAL. USABLE FUEL; NO RESERVE FOR RANGE CALCULATIONS
STANDARD ATMOSPHERE

ALTITUDE 10,000 FT. MSL

R.P.M.	M.P. IN. HG.	B.H.P.	% B.H.P.	GAL. HOUR	LBS. HOUR	TRUE AIRSPEED		ENDURANCE		RANGE STATUTE MILES	
						2575#	2200#	HRS.	HR:MIN.	2575#	2200#
2700	21.0	150	75	11.1	66.5	187	191	4.69	4:41	877	896
	20.0	141	71	10.5	63.0	184	188	4.95	4:57	911	931
	19.0	133	67	10.1	60.5	179	183	5.16	5:10	924	944
	18.0	123	62	9.7	58.0	173	177	5.38	5:23	931	952
2600	21.0	144	72	10.5	63.0	184	188	4.95	4:57	911	931
	20.0	136	68	10.1	60.5	181	185	5.16	5:10	934	955
	19.0	127	64	9.7	58.0	176	180	5.38	5:23	947	968
	18.0	118	59	9.2	55.0	168	172	5.67	5:40	953	975
2500	21.0	138	69	10.1	60.5	181	185	5.16	5:10	934	955
	20.0	130	65	9.7	58.0	177	181	5.38	5:23	952	974
	19.0	122	61	9.3	55.5	173	177	5.62	5:37	972	995
	18.0	113	57	8.8	52.5	166	170	5.94	5:56	986	1010
2400	21.0	132	66	9.7	58.0	178	182	5.38	5:23	958	979
	20.0	123	62	9.2	55.0	174	178	5.67	5:40	987	1009
	19.0	116	58	8.7	52.0	169	173	6.00	6:00	1014	1038
	18.0	108	54	8.3	50.0	162	166	6.24	6:14	1011	1036
2350	21.0	125	63	9.1	54.5	175	179	5.72	5:43	1001	1024
	20.0	116	58	8.6	51.5	169	173	6.06	6:04	1024	1048
	19.0	109	55	8.3	49.5	164	168	6.30	6:18	1033	1058
	18.0	101	51	7.8	46.5	157	161	6.71	6:43	1053	1080
1950	16.9	75	38	5.9	35.5	128	132	8.79	8:47	1125	1160

ACCURACY OF DATA IS ± 3%
EACH 100 LBS. CHANGE IN AIRPLANE WEIGHT WILL AFFECT T.A.S. 1.1 MPH

FIGURE 3D

CRUISE & RANGE DATA

2575 LBS. & 2200 LBS.; BEST POWER MIXTURE
52 GAL. USABLE FUEL; NO RESERVE FOR RANGE CALCULATIONS
STANDARD ATMOSPHERE

ALTITUDE 15,000 FT. MSL

R.P.M.	M.P. IN. HG.	B.H.P.	% B.H.P.	GAL. HOUR	LBS. HOUR	TRUE AIRSPEED		ENDURANCE		RANGE STATUTE MILES	
						2575#	2200#	HRS.	HR:MIN.	2575#	2200#
2700	17.5	125	63	9.8	58.5	181	185	5.33	5:20	965	986
2600	17.5	120	60	9.3	55.5	177	181	5.62	5:37	995	1017
2500	17.5	116	58	8.9	53.5	174	178	5.83	5:50	1014	1038
2400	17.5	110	55	8.4	50.5	168	172	6.18	6:11	1038	1063
2350	17.5	103	52	7.9	47.5	163	167	6.57	6:34	1071	1097
1950	16.8	81	41	6.3	37.5	139	143	8.32	8:19	1156	1190

ACCURACY OF DATA IS ± 3%
EACH 100 LBS. CHANGE IN AIRPLANE WEIGHT WILL AFFECT T.A.S. BY 1.1 MPH

FIGURE 4

STALL SPEED Vs. BANK ANGLE

GROSS WEIGHT 2575 LBS.; I.A.S. MPH; POWER OFF

FLAP SETTING	0° BANK	20° BANK	40° BANK	60° BANK
0° (Flaps Up)	67	69	78	96
15° (Take Off)	64	67	76	94
33° (Landing)	57	61	69	90

FIGURE 5

MAXIMUM RANGE

The speed at which the M20E is most efficient (i.e. the Ratio of Lift to Drag is at a Maximum) is 107 MPH INDICATED AIRSPEED, Gear & Flaps Up. Flying at this airspeed will give maximum range under zero wind conditions.

GLIDE RANGE

Landing gear and flaps up, no wind, 2575 lbs. gross weight

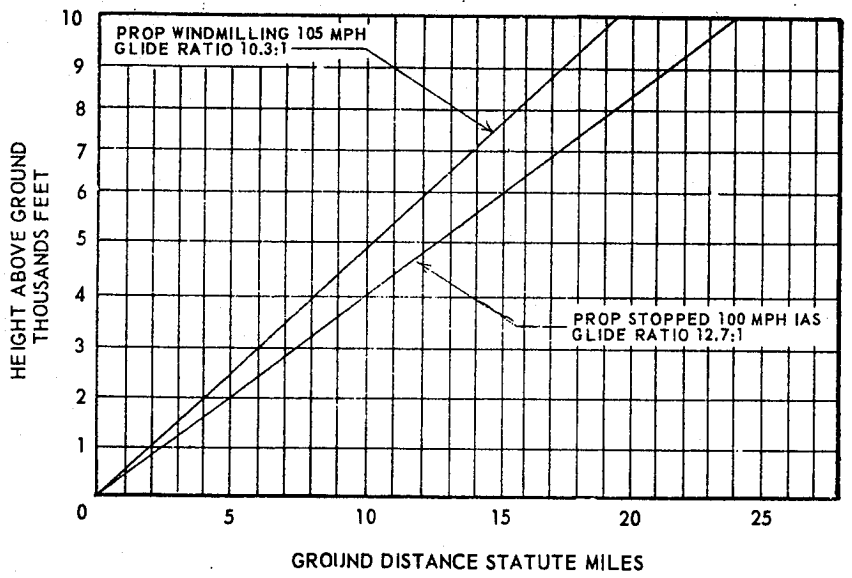
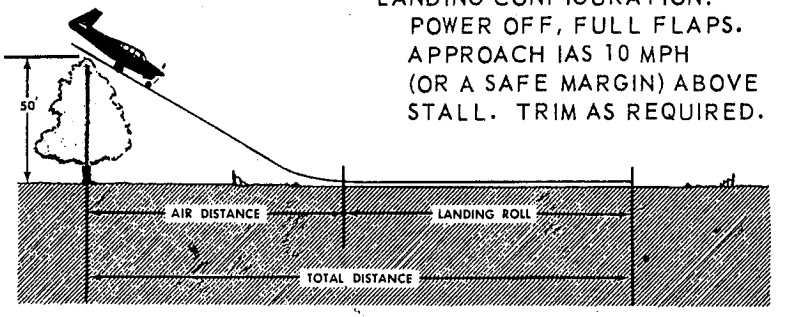


FIGURE 6

LANDING DATA



LANDING CONFIGURATION:
POWER OFF, FULL FLAPS.
APPROACH IAS 10 MPH
(OR A SAFE MARGIN) ABOVE
STALL. TRIM AS REQUIRED.

LANDING DISTANCES

STANDARD ATMOSPHERE. HARD SURFACE RUNWAY.
WIND CALM. BRAKES APPLIED DURING ROLL OUT.

		LANDING WEIGHT = 2200 POUNDS			LANDING WEIGHT = 2575 POUNDS		
ALTITUDE FEET MSL	TEMP. (STD.) °F	AIR DISTANCE (FEET)	GROUND ROLL (FEET)	TOTAL DISTANCE (FEET)	AIR DISTANCE	GROUND ROLL	TOTAL DISTANCE
SEA LEVEL	59°	815	550	1365	955	595	1550'
2500	50°	835	595	1430	980	640	1620
5000	41°	870	640	1510	1015	690	1705
7500	32°	890	690	1580	1045	750	1795

PART V
OPERATING LIMITATIONS

This document or a copy thereof must be carried in the airplane at all times.

I. OPERATING LIMITATIONS

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

A. Airspeed Limitations

Never Exceed Speed	189 MPH C.A.S.
Maximum Structural Cruising Speed	150 MPH C.A.S.
Maximum Maneuvering Speed	132 MPH C.A.S.
Maximum Gear Operating Speed	120 MPH C.A.S.
Maximum Gear Extended Speed	120 MPH C.A.S.
Maximum Flap Operating Speed	100 MPH C.A.S.

B. Airspeed Instrumentation Markings and their Significance

Radial Red Line – 189 MPH
(Never Exceed Speed which is the Maximum Safe Airspeed)
Yellow Arc – 150 to 189 MPH
(Denotes Range of Speeds in which Operations should be Conducted with Caution and Only in Smooth Air)
Green Arc – 70 to 150 MPH
(Denotes Normal Operating Speed Range)
White Arc – 63 to 100 MPH
(Denotes Speed Range in which Flaps may be Safely Lowered)

NOTE: Maneuvers involving approach to stalling angle or full application of elevator rudder or aileron should be confined to speeds below maneuvering speed.

C. Power Plant

Engine	Lycoming Model IO-360-A1A
Engine Limits	Limits for all operations – 2700 RPM, 200 HP
Fuel	100/130 Octane Aviation Gasoline, 52 Gal.
Propeller	Hartzell Constant Speed Hub HC-C2YK-1 Blade 7666-2 Pitch Setting at 30-inch station: High 29° ± 2°, Low 14 ± 0
Cowl Flaps	Open for Take-off and Climb (Do Not Open Above 150 MPH)

D. 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° F
Green Arc (Operating Range)	300° to 450° 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° F
Green Arc (Operating Range)	100° to 225° F

E. Other Instruments and Markings

Vacuum Warning Lights

"High" light	5.0 inches of Hg.
"Low" light	4.25 inches of Hg.

F. Weight and Center of Gravity Limits

Maximum Weight – 2575 Pounds

Center of Gravity

Most Forward – 42 Inches (15%, MAC) Gear Down, 2100 Pounds

Forward Gross – 46.5 Inches (22.6% MAC) Gear Down, 2575 Pounds

Rear Gross – 49.0 Inches (26.8% MAC) Gear Down, 2575 Pounds

Datum – Center Line of Nose Gear Attachment Bolts. (Airplane Sta. 0) 33 Inches Forward of Wing Leading Edge at Wing Sta. 59.25 (Inboard Edge of Stall Strip)

Warning: See Weight and Balance Record for Loading Schedule.

Note: a. The front seat positions can adversely affect C.G. limitations at most rearward loading. Allowable baggage weight dictated by seat positions.

b. It is the responsibility of the airplane owner and the pilot to insure that the airplane is properly loaded.

G. Maneuvers

This airplane must be operated as a normal category airplane. Acrobatic maneuvers, including spins, are unauthorized.

H. Flight Load Factors

Maximum Positive Load Factor, Flaps Up	3.8
Maximum Positive Load Factor, Flaps Down	2.0
Maximum Negative Load Factor, Flaps Up	-1.5

I. Types of Operations

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.

1. Visual Flight Rules - Day

   a. Airspeed indicator
   b. Altimeter
   c. Magnetic direction indicator (Mag compass)
   d. Tachometer
   e. Oil pressure gage
   f. Oil temperature gage
   g. Cylinder head temperature gage
   h. Fuel quantity gage for each tank
   i. Fuel pressure gage
   j. Landing gear position indicator
   k. Master switch
   l. Battery and generator
   m. Circuit breakers and fuses
   n. Seat belts for all occupants

2. Visual Flight Rules - Night

   a. All equipment and instruments specified for VFR-day
   b. Position lights
   c. Electric landing light (if used for hire)

3. Instrument Flight Rules

   a. All equipment and instruments specified for VFR-night.

   b. 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.
   c. Gyroscopic rate-of-turn indicator
   d. Bank indicator
   e. Sensitive altimeter adjustable for barometric pressure
   f. Clock with sweep second hand
   g. Artificial horizon
   h. Directional gyro
   i. Adequate power source for each gyro instrument.

II. OPERATING PROCEDURES

A. Normal

1. 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.

2. Trip-Free circuit breakers are located on the lower right hand side of the copilot's instrument panel. Push to reset.

3. Load in accordance with loading schedule. Maximum weight in baggage compartment 120 pounds. Maximum weight in hat rack 10 pounds.

4. Retract flaps after landing.

5. Do not open storm window above 150 MPH.

6. Turn Power Boost (unfiltered ram air) OFF for takeoff, landing, or any time when operating in dusty conditions.

7. The stall warning horn is inoperative when the master switch is off.

B. Emergency

1. In case of engine fire turn cabin heater off.

2. Turn Power Boost (unfiltered ram air) OFF if icing conditions are inadvertently encountered.

3. Manual operation of the optional electric landing gear system.

   a. Pull landing gear circuit breaker OFF.

   b. Put gear switch in the down position.

   c. Push crank engage knob forward.

   d. Crank clockwise approximately fifty (50) turns to lower the gear.

   e. Gear is down when the green gear light is on. If total electrical malfunction occurs, see visual indicator.

4. Do not retract optional electric landing gear with the manual system.

III. LOADING INFORMATION

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