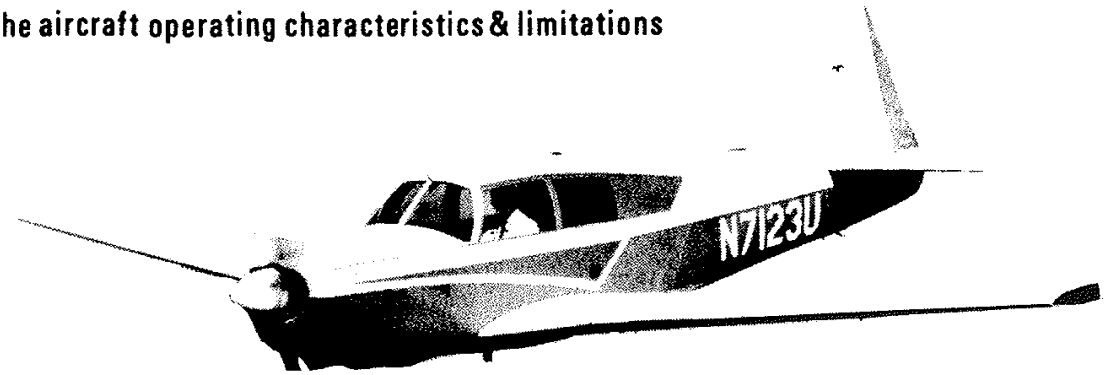
MARK 21
MODEL M 20 C

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



OWNERS MANUAL

1962 - 1963 - 1964
DATA INCLUDED

1965

MOONEY AIRCRAFT, INC.

#1184

NOTE: Information in the 1965 MARK 21 owner's manual also applies to the 1962 through 1964 models with the exceptions noted on this insert.

The following serial numbers of the M 20 C are affected:

MODEL	YEAR	SERIAL NUMBER
M 20 C	1962	1852, 1940 thru 2207, 2209 thru 2255, 2257 thru 2296
M 20 C	1963	2208, 2256, 2297 thru 2622
M 20 C	1964	2623 thru 2741, 2743 thru 2806
M 20 C	1965	2742, 2807 thru 3184

Supplement to the 1965 MARK 21 (M 20 C) owners manual

PART I DESCRIPTION AND OPERATION OF COMPONENTS

FUEL SYSTEM (Reference page 3)

The fuel tank capacity of the 1962 and 1963 Mark 21 is 24 gallons per wing tank or 48 gallons total fuel. The '62 and '63 models do not have a pull ring to drain the fuel selector sump from the cabin. In these models the selector sump is drained from outside using the same procedure recommended for draining the wing tanks. 1962 and 1963 models have a gascolator in the nose wheel well which can be inspected and drained from outside the aircraft.

LANDING GEAR: (Reference page 6)

The thumb operated safety latch for the landing gear retraction lever has not been factory installed on serial numbers 1852, 1940 through 2050.

POSITIVE CONTROL SYSTEM: (Reference page 8)

The Positive Control section does not apply to 1962, 1963 or 1964 models unless retrofit installation of the PC system has been made.

TRIM SYSTEM: (Reference page 9)

The friction adjustment for the trim control wheel does not apply to 1962 models.

FLAPS: (Reference page 9)

The 1962 and 1963 model flaps are retracted by pulling the release knob adjacent to the flap handle.

VACUUM SYSTEM: (Reference page 10)

1962, '63 and '64 models do not have a vacuum operated cabin entry step. These models have a manually operated step retraction system activated by a hand crank on the left side panel near the pilot's knee. Turning the crank clockwise raises the step; counter clockwise, lowers the step.

The vacuum regulator will maintain vacuum between 3.5 and 5.0 inches of mercury on 1962, 1963 and 1964 models. The vacuum warning lights for these airplanes are set accordingly.

HEATING AND VENTILATION SYSTEMS: (Reference pages 10 and 11)

1962 models do not have rear heat outlets. There is no left side air scoop on 1962, 1963 or 1964 production aircraft. Serial numbers 1852 and 1940 through 2693 do not have a firewall-mounted radio cooling grill.

PART II FLIGHT PROCEDURES

WEIGHT AND BALANCE: (Reference page 14)

1962 models are not equipped with the utility shelf aft of the main baggage compartment. Therefore, related weight limitation does not apply.

ENTERING THE AIRCRAFT: (Reference page 15)

Drain the fuel selector valve sump from outside the aircraft on 1962 and 1963 models.

STARTING THE ENGINE: (Reference page 15)

"Push to Start" feature was installed on the ignition switch beginning with 1963 models. On earlier aircraft, turning the ignition switch to "start" engages the starter and the "shower of sparks" ignition.

COLD WEATHER AND MANUAL STARTING: (Reference page 16

To manually start aircraft with serial numbers 1852 and 1940 through 2342 use the following procedures:

(1) Turn off the "starter disconnect switch" located on the upper center section of the firewall under the instrument panel. The switch disconnects the starter so that only the starter vibrator operates when the magneto switch is turned to the start position.
(2) As the engine is "propped", hold the magneto switch in the "start" position. This operates the starter vibrator and furnishes retarded spark to the engine.
(3) When the engine starts, release the switch to the "both" position and place the starter disconnect switch in the "on" position.

Aircraft serial numbers from 2343 may be manually started as described on page 16.

PART III SERVICE AND MAINTENANCE

VACUUM STEP: (Reference page 27)

The maintenance check of the step retraction does not apply to 1962, 1963 or 1964 models.

REQUIRED DATA: (Reference page 28)

The F.A.A. approved flight manual is part of the required data for 1962 and 1963 models. Placards in the aircraft and data in the owner's manual supercede the flight manual data for later models.

PART IV PERFORMANCE DATA (Reference pages 29-37)

Performance data shown applies to all 1962, '63, '64 and '65 models except for endurance and range on '62 and '63 planes which carry 48 gallons of fuel. Following are the '62-'63 cruise and range tables:

CRUISE AND RANGE DATA
AVERAGE GROSS WEIGHT = 2200 POUNDS
BEST POWER MIXTURE - 48 GALLONS USABLE FUEL
NO RESERVE FOR RANGE CALCULATIONS - STANDARD ATMOSPHERE

ALTITUDE 2500' MSL

RPM	MANIFOLD PRESSURE INCHES Hg	BRAKE HORSE POWER	PERCENT BRAKE HORSE POWER	GALLONS HOUR	POUNDS HOUR	(1) TRUE AIR-SPEED	ENDURANCE HR:MIN.	RANGE STATUTE MILES
2600	27.0	170	95	14.4	86.4	185	3:20	616
	26.0	162	90	13.4	80.4	180	3:35	644
	25.0	155	86	12.8	76.8	175	3:45	656
	24.0	147	82	12.0	72.0	170	4:00	680
2500	26.0	159	88	13.1	78.6	178	3:40	651
	25.0	151	84	12.3	73.8	174	3:54	679
	24.0	144	80	11.6	69.6	168	4:08	695
	23.0	136	76	11.0	66.0	163	4:22	711
2400	25.0	148	82	11.7	70.2	171	4:06	701
	24.0	140	78	11.0	66.0	166	4:22	724
	23.0	132	73	10.4	62.4	160	4:37	739
	22.0	125	70	9.8	58.8	154	4:54	755
2300	24.0	136	76	10.7	64.2	163	4:29	732
	23.0	128	71	10.0	60.0	157	4:48	754
	22.0	121	67	9.5	57.0	152	5:03	768
	21.0	113	63	8.9	53.4	145	5:23	782
1800(2)	17.0	66	37	5.7	34.2	109	8:25	918

ALTITUDE 5000' MSL

RPM	MANIFOLD PRESSURE INCHES Hg	BRAKE HORSE POWER	PERCENT BRAKE HORSE POWER	GALLONS HOUR	POUNDS HOUR	TRUE AIR-SPEED (1)	ENDURANCE HR:MIN.	RANGE STATUTE MILES
2600	24.5	156	87	12.9	77.4	185	3:43	688
	24.0	152	84	12.5	75.0	182	3:50	699
	23.0	144	80	11.8	70.8	177	4:04	720
	22.0	136	76	11.1	66.6	170	4:19	734
2500	24.5	153	85	12.4	74.4	183	3:52	708
	24.0	149	83	12.1	72.6	180	3:58	715
	23.0	141	78	11.4	68.4	175	4:13	737
	22.0	133	74	10.7	64.2	168	4:29	754
2400	24.5	149	83	11.9	71.4	180	4:02	725
	24.0	145	81	11.5	69.0	178	4:10	742
	23.0	138	77	10.9	65.4	172	4:24	757
	22.0	130	72	10.2	61.2	166	4:42	780
2300	24.0	141	78	11.2	67.2	175	4:17	751
	23.0	133	74	10.5	63.0	168	4:34	768
	22.0	126	70	9.9	59.4	163	4:51	791
	21.0	118	66	9.3	55.8	157	5:10	810
1800 (2)	16.9	69	38	5.9	35.6	113	8:08	920

ALTITUDE 7500' MSL

RPM	MANIFOLD PRESSURE INCHES Hg	BRAKE HORSE POWER	PERCENT BRAKE HORSE POWER	GALLONS HOUR	POUNDS HOUR	TRUE AIR-SPEED (1)	ENDURANCE HR:MIN.	RANGE STATUTE MILES
2600	22.5	145	81	11.8	70.8	184	4:04	749
	22.0	140	78	11.5	69.0	180	4:10	751
	21.0	132	73	10.8	64.8	173	4:27	768
	20.0	124	69	10.2	61.2	167	4:42	787
2500	22.5	142	79	11.4	68.4	182	4:13	766
	22.0	137	76	11.0	66.0	177	4:22	772
	21.0	129	72	10.4	62.4	171	4:37	790
	20.0	121	67	9.8	58.8	164	4:54	804
2400	22.5	138	77	10.8	64.8	178	4:27	790
	22.0	134	74	10.6	63.6	175	4:32	793
	21.0	126	70	9.9	59.4	169	4:51	820
	20.0	118	66	9.3	55.8	161	5:10	831
2300	22.5	134	74	10.6	63.6	175	4:32	793
	22.0	130	72	10.2	61.2	172	4:42	810
	21.0	122	68	9.6	57.6	165	5:00	825
	20.0	114	63	9.0	54.0	158	5:20	842
1800 (2)	16.8	72	40	6.0	36.0	117	8:00	936

ALTITUDE 10,000' MSL

RPM	MANIFOLD PRESSURE INCHES Hg	BRAKE HORSE POWER	PERCENT BRAKE HORSE POWER	GALLONS HOUR	POUNDS HOUR	(1) TRUE AIR-SPEED	ENDURANCE HR:MIN.	RANGE STATUTE MILES
2600	20.25	130	72	10.6	63.6	178	4:32	806
	19.0	120	67	9.9	59.4	168	4:51	815
	18.0	112	62	9.3	55.8	161	5:10	831
	17.0	103	57	8.7	52.2	151	5:31	834
2500	20.25	128	71	10.3	61.8	176	4:40	820
	19.0	118	66	9.5	57.0	166	5:03	838
	18.0	109	61	9.0	54.0	158	5:20	842
	17.0	101	56	8.4	50.4	150	5:43	856
2400	20.25	124	69	9.8	58.8	171	4:54	838
	19.0	115	64	9.1	54.6	164	5:16	864
	18.0	107	59	8.5	51.0	156	5:39	881
	17.0	98	54	8.0	48.0	146	6:00	876
2300	20.25	120	67	9.4	56.4	168	5:06	858
	19.0	111	62	8.8	52.8	159	5:27	867
	18.0	103	57	8.2	49.2	151	5:51	883
	17.0	96	53	7.8	46.8	144	6:09	886
1800 (2)	16.5	74	41	6.15	36.9	122	7:48	952

ALTITUDE 15,000' MSL

RPM	MANIFOLD PRESSURE INCHES Hg	BRAKE HORSE POWER	PERCENT BRAKE HORSE POWER	GALLONS HOUR	POUNDS HOUR	(1) TRUE AIR-SPEED	ENDURANCE HR:MIN.	RANGE STATUTE MILES
2600	16.5	106	59	8.9	53.4	161	5:23	868
2500	16.5	104	58	8.6	51.6	158	5:35	882
2400	16.5	102	57	8.2	49.2	156	5:51	913
2300	16.5	99	55	7.9	47.4	153	6:05	930
1800 (2)	16.5	80	44	6.5	39.0	131	7:23	967

(1) TRUE AIR SPEED ± 3 PERCENT
(2) MAXIMUM RANGE

EACH 100 LB.CHANGE IN AIRPLANE WEIGHT WILL REDUCE OR INCREASE TAS BY 1.2 MPH

PART V OPERATION LIMITATIONS

The information in PART V of this manual does not apply to 1962 and 1963 models but does apply to 1964 aircraft. Refer to the airplane flight manual and instrument markings for 1962 and 1963 airplanes.

OPERATE THIS AIRCRAFT ONLY – ① after reading owners manual ② with owners manual on board ③ after you are fully qualified & understand all of the aircraft operating characteristics & limitations

MARK 21

OWNERS MANUAL

Congratulations

Thank you for choosing a Mooney.

The wisdom of your selection of a Mooney Mark 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 Mark 21.

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

Welcome to the rapidly growing family of Mooney owners.

MOONEY AIRCRAFT, INC.
LOUIS SCHREINER FIELD • KERRVILLE, TEXAS

1965
MARK 21
OWNER'S MANUAL

TABLE OF CONTENTS

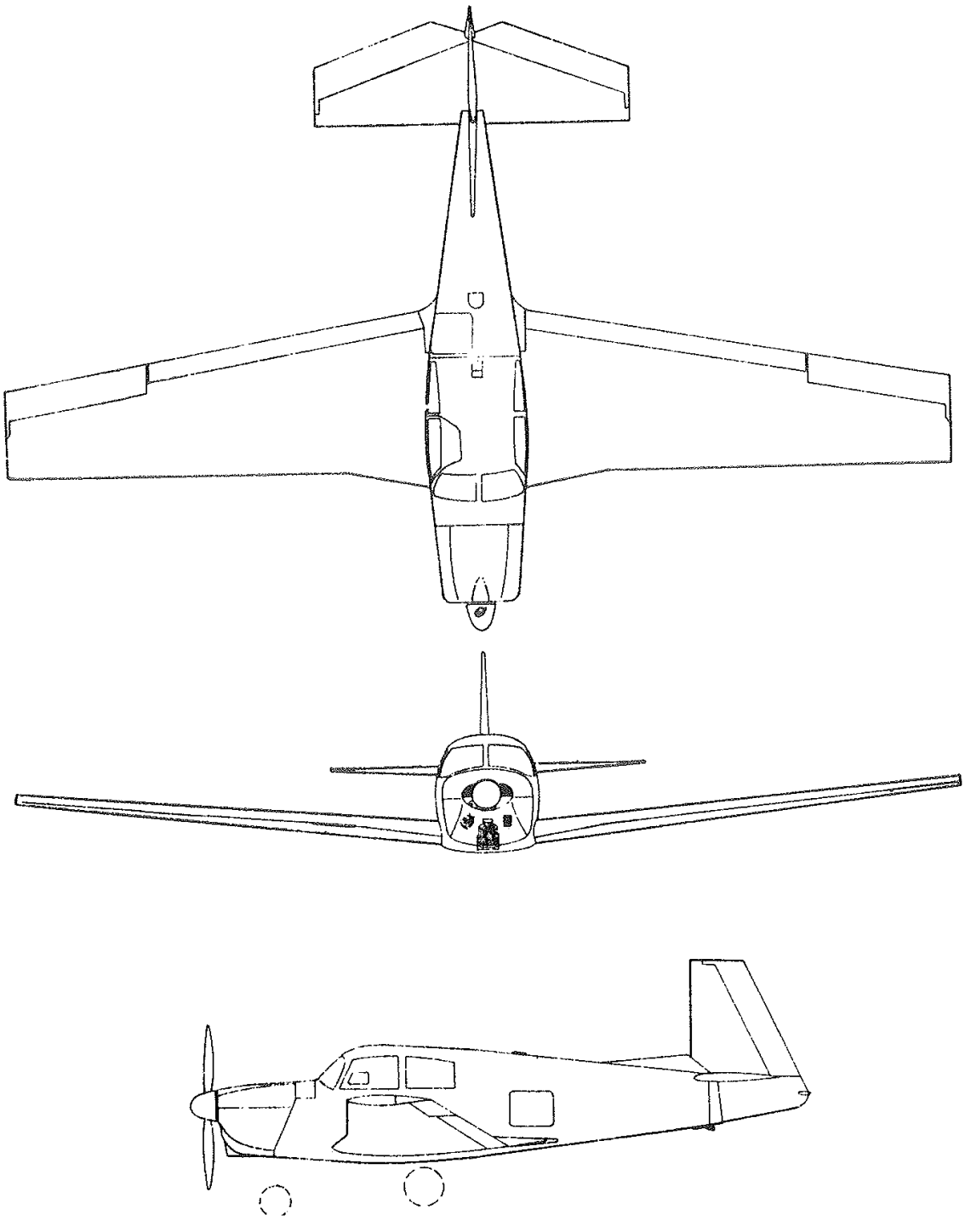
PART I DESCRIPTION AND OPERATION OF COMPONENTS

PART II FLIGHT PROCEDURES

PART III SERVICE AND MAINTENANCE

PART IV PERFORMANCE DATA

PART V OPERATING LIMITATIONS



PART I

DESCRIPTION AND OPERATION OF COMPONENTS

GENERAL

The Mark 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. There are no tricky or complex operational characteristics requiring unusual or extreme piloting skill. This section will describe some of the components of the Mark 21 and operating details.

PROPELLER

The Mark 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 or decrease 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.

ENGINE

The Mark 21 is powered by the Lycoming 180 hp O-360-A1D four cylinder engine. This engine uses 91/98 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.

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. The Mark 21 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 flap.

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. See Part III for type of oil used and time between oil changes.

An oil temperature thermostat, set for 180 F°, is located in the oil reservoir to assure warm oil for all operations. An oil cooler is mounted on the lower left side of the cowling to prevent the oil from overheating. An oil filter mounted on the firewall is available as optional equipment.

ENGINE IGNITION

The Mark 21 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 shower of sparks to each cylinder after the piston has reached top dead center on the compression stroke. The engine starts sooner and easier because of this system.

FUEL SYSTEM

Fuel is contained in two integral sealed sections in the front part of each wing root. Each tank will hold 26 gallons of gasoline. These 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, 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 light-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 carburetor. The electric boost pump is turned on for take-off and landing to provide fuel pressure if the engine driven pump malfunctions.

WARNING: Under no circumstances should aviation fuel of a lower grade than 91/98 octane be used. Aviation fuels may distinguished by their color: 80 octane is red, 91 octane is blue, and 100 octane is green. If 91/98 octane is not available, 100/130 octane gasoline may be used.

THE ELECTRICAL SYSTEM

The Mark 21 electrical system is provided with a 50 amp 12 volt generator and a 35 amp-hour battery which is located on the forward left side of the firewall. 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 and bank (if installed)
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. These lights are controlled by a rheostat located on the headliner near the lights. 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. The cabin light, located on the headliner near the center of the cabin, can be used to illuminate the panel if the instrument lights malfunction.

Electrical Load Meter

The electrical load meter in the engine instrument cluster shows the amperage being produced by the generator. This instrument is not directly associated with the battery circuit and, therefore, will not directly indicate if the battery is charging or discharging. In normal flight, the amperage reading will be

proportional to the electrical power required to run the radios. lights. etc. and charge the battery. When all accessories are turned off, any amperage reading on the meter will be that which is charging the battery.

The Electrical Panel

The electrical panel is divided into two parts:

a. The electrical toggle switches which are on the lower left side of the pilot's panel and which 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
   3. An optional equipment switch
   4. The pitot heat (if installed)
   5. The rotating beacon (if installed)
   6. The navigation lights
   7. The landing light

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

AIRFRAME

The structure of the Mark 21 is of conventional all-metal design. The cabin section consists of tubular steel structure covered with aluminum sheet metal. The firewall is 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 monocoque design. The seat design features contoured sheet metal construction.

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 of the Mark 21 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).

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. The action of the system may be monitored visually by watching the movement of the indicator through the glass in the floorboard aft of the nose wheel well. A limit switch will stop the gear in its retracted position 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. 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 gear should be down and locked.

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, see gear visual indicator.
   DO NOT RETRACT GEAR IN FLIGHT WITH MANUAL HAND CRANK.

FLIGHT CONTROLS

The ailerons, elevators, and rudder of the Mark 21 operates 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.

THE MOONEY POSITIVE CONTROL SYSTEM

The Mooney Positive Control (PC) system provides a high degree of roll stability by pneumatic inputs to the rudder and aileron systems. This system is operating whenever the engine is running. The engine vacuum pump provides the pneumatic power required. 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 "Roll Trim" knob provides an aileron trim function. Clockwise rotation allows trim to the right; counterclockwise rotation allows trim 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 on the gyro horizon), the PC system will automatically become inoperative. However, it should be noted that this system 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 PC system does not have any electronic requirements and, therefore, it will operate completely independently of the electrical system.

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.

THE 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 as 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 brake 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 as 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.

VACUUM SYSTEM

The vacuum requirements of the Mark 21 are supplied by an engine driven vacuum pump. The output of the pump is controlled by a regulator which maintains vacuum between 4.50 and 5.00 inches of Mercury. The red indicator lights on the artificial horizon will indicate if the vacuum is below 4.05 inches of Mercury or above 5.20 inches of Mercury. These lights may be tested by pressing the test switch located to the left of the artificial horizon.

To dim these lights during night flight, turn the lens housings clockwise. The vacuum system powers the artificial horizon, the directional gyro, the Mooney Positive Control system, and the automatic retractable step. A vacuum servo will raise the step when the engine is started and sufficient vacuum is produced. A spring will pull the step down when the engine is stopped and vacuum is relieved.

BRAKES

The Mark 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. Copilots brakes are available as optional equipment.

HEATING AND VENTILATION SYSTEMS

The Lower Heat and Vent System

Cabin heat is obtained from a muff which surrounds the engine exhaust manifold. 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 tem-

perature. From the junction box, air is ducted to the pilot and copilot's feet, windshield defroster, rear passengers' feet, and to the baggage compartment.

Deflectors are provided on the pilot and copilot outlets which can be used to direct the air flow in the desired direction or to provide individual volume controls. When these deflectors are in the neutral or "off" position, the air flow is forced to the windshield defrosters and to the aft outlets.

The 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 counter-clockwise to open (extend) the scoop to obtain ram air. To minimize drag, open the scoop only enough to obtain sufficient air flow at all 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.

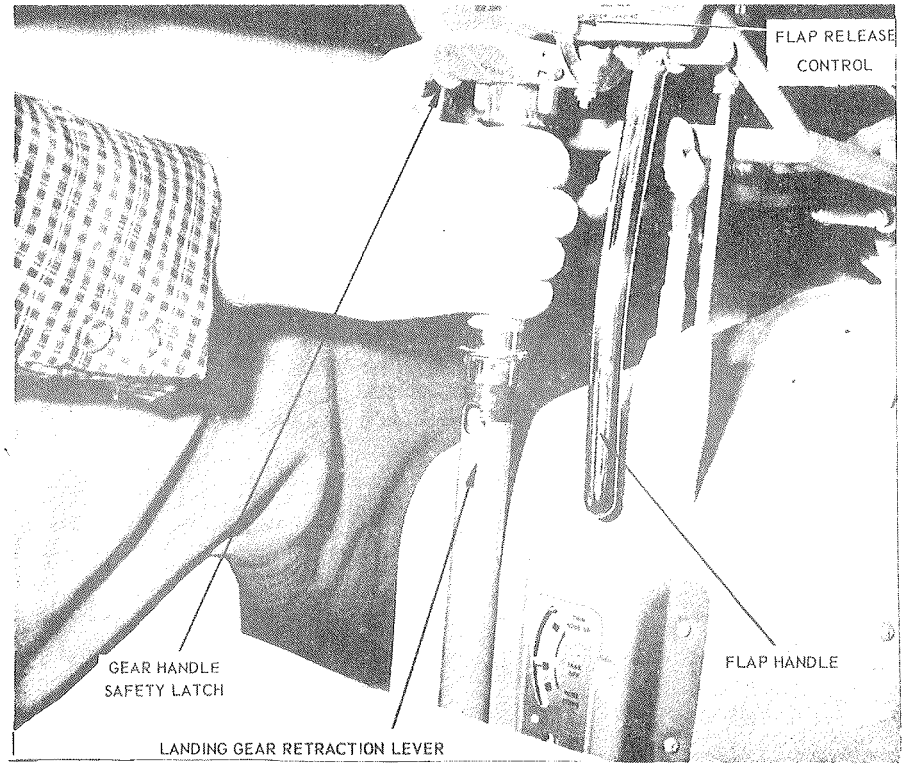
Left Side Air Scoop

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 a 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 – MARK 21



GEAR AND FLAP HANDLES

PART II

FLIGHT PROCEDURES

GENERAL

This section will describe recommended flight procedures necessary for the proper operation of your Mark 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 AND BALANCE

The aircraft weight and center of gravity location can be determined from the information and examples shown in the weight and balance data provided with the airplane. Refer to the latest FAA Form 337 for the corrected weight data if the airplane has been altered since leaving the factory.

The maximum allowable take-off weight of the Mark 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. For example, a loading consisting of full fuel, 120 pounds baggage (maximum allowable), pilot, and two rear passengers could result in a C.G. location exceeding the rearward limit. Moving a rear passenger to the right front seat would eliminate this condition.

The hat rack area aft of the main baggage compartment is intended for light objects.
WARNING: This 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. Carburetor heat control (OFF) position.
5. Cowl flaps open.
6. Mixture control full forward (rich).
7. Propeller control full forward (high rpm).
8. Master switch on (green gear indicator light, "Low Vacuum" warning light, and the electric turn and bank indicator should come on).
9. Turn boost pump on and note fuel pressure indication.
10. Pump the throttle twice to prime the engine.
11. Set the throttle approximately 1/4" open.
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".

COLD WEATHER AND MANUAL STARTING

In extremely cold weather, it may be necessary to provide additional fuel priming to the engine by pumping the throttle three or four times. It may be necessary to preheat the engine and engine oil prior to starting.

NOTE: If oil pressure is not indicated on engine gage within 30 seconds, stop engine immediately and determine 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 procedures:

1. As the engine is "propped," hold the magneto switch in the "start" position to operate the starter vibrator and furnish a retarded spark to the engine.
   WARNING: Do not push the magneto switch. This engages the starter.
2. When the engine starts, release the switch to the "Both" position.

TAXIING AND GROUND OPERATION

The nose gear of the Mark 21 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 Lycoming O-360-A1D is an air pressure cooled engine that 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. Operate the engine on the ground only with the propeller in high rpm setting (control forward).
3. Keep mixture "Full Rich" (control forward).
4. 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 electrical load meter for indication (at 1200 rpm or greater, operation of any electrical equipment should give an 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 and bank indicator 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 (see indicator).
5. Check cowl flaps open.
6. Set wing flaps to take-off setting (see indicator).
7. Turn on boost pump.
8. Check magnetos at 1700 RPM for smooth operation and maximum drop of 125 RPM.

   NOTE: If one magneto runs rough, turn the switch back to the "both" position and reduce the power to 800 RPM. Allow the engine to run for a minute and then slowly increase the power to 2200 RPM and recheck the magnetos. This operation will usually burn out the carbon deposits and allow the magnetos to check properly.
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.

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 at about 65-75 mph airspeed. When the Mark 21 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 Mark 21 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 Mark 21 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 approximately 105 IAS. The speed for maximum angle of climb (obstacle clearance) is about 80 mph IAS. Recommended power setting for climbing is 2500 rpm and 25 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.

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 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. If the optional exhaust gas temperature indicator is installed, the mixture is determined as follows: For best economy, lean the mixture by pulling the control out until the indicator shows a peak (maximum) temperature and starts to decrease. Continue leaning until the temperature drops 25° F. minimum (one mark on the gauge) from the peak.

   To obtain a best power (maximum airspeed) setting, lean to peak temperature and then enrich mixture (push control forward) 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 account for the slight lag in the EGT instrument.

   NOTE: In selecting a cruise rpm, it is recommended that the engine not be operated for cruise purposes within the range of 2150 to 2300 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. When cruising at altitudes below approximately 8,000 feet, 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.

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 panel 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 malfuncti

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.

CARBURETOR HEAT

Carburetor heat should be applied when power is reduced for descent or landing. Full carburetor heat should be used rather than partial (which may raise the carburetor air temperature to icing level) unless a carburetor air temperature indicator is used.

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. Carburetor heat.
5. Landing gear down (lower at 120 mph or less).
   NOTE: Warning horn will sound 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 stall warning horn will blow 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 Mark 21 sits lower to the ground than most aircraft.

2. The Mark 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 all 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 approach for landing, the airplane should be in trim down to the flare-out.

IMPORTANT

UNDER NO CIRCUMSTANCES SHOULD YOU 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 AND MAY CAUSE THE AIRCRAFT TO PORPOISE.

You know you have made a good landing when you can touch down gently on the main gear only, holding the nose wheel clear of the runway and then allowing it to touch down smoothly. This is the conventional, safe procedure for tricycle-gear aircraft.

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 eliminate 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 "Customer Service Manager", Mooney Aircraft, Inc., Kerrville, Texas.

GROUND HANDLING

A small hand tow bar is provided with the aircraft which fits into the nose gear lower structure to facilitate maneuvering the airplane by hand. Towing the airplane with another vehicle is not recommended as damage to the gear structure could result if the steering limits were exceeded. 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 screw 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 blade to have a certain amount of end-play. This is a result of manufacturing tolerance 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. Increase the propeller control to the "high RPM" position. The RPM should go to 2700.
2. Reduce the manifold pressure control 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 takeoff or climb out, it may be caused by air in the system or foreign matter in the governor passages.

ENGINE

Use 91/98 or 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 air filter should be removed and cleaned every 25 hours. or more often if unusually dusty conditions are encountered.

The engine oil should be drained and replaced and the oil screens cleaned every 50 flight hours. Lycoming recommends the use of ashless dispersant type oil for the following outside air temperatures:

Above 40° F. (4° C.)	SAE 50
Below 40° F. (4° C.)	SAE 30
Below 10° F. (–12° C.)	SAE 20

Enco E80 and Aero Shell W are approved types. 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 of the Mark 21 is located on the forward left side of the firewall and is easily accessible through the access panel on the left engine cowling.

CARE OF INTERIOR

Normal cleaning methods may be used for routine cleaning of the Mark 21 interior. The fabric on the seats and side panels may be cleaned with any spray-on type dry cleaner. The vinyl plastic and Royalite plastic used on the seats, side panels and headliner may be cleaned with a damp cloth or soap and water. Do not use alcohol on Royalite plastic.

CARE OF EXTERIOR

The acrylic enamel paint used on the Mark 21 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 Mark 21, do not use detergents. Do not use a combination cleaner and wax on the exterior.

WINDOWS

The plexiglas windows of the Mark 21 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 Mark 21. 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.

The tire pressure (nose and main) 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. Lubricants should not be used since they tend to collect dirt and may increase friction in cold weather.

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. Owners Manual (or sheet containing aircraft operating limitations)
4. Weight and Balance Data (including equipment list)

SERVICE LETTERS AND BULLETINS

Service letters and bulletins are available only on subscription 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 AND 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°	745	1290	895	97	1030	1760	695	97
	59°	620	1075	1000	100	815	1395	800	100
	20°	520	900	1110	103	660	1130	910	103
2500'	90°	900	1560	795	95	1345	2305	595	95
	50°	745	1290	900	98	1030	1760	700	98
	10°	615	1065	1010	100	805	1380	810	100
5000'	80°	1125	1955	700	93	1910	3275	500	93
	41°	900	1560	795	95	1340	2300	595	95
	0°	740	1280	910	98	1000	1715	710	98

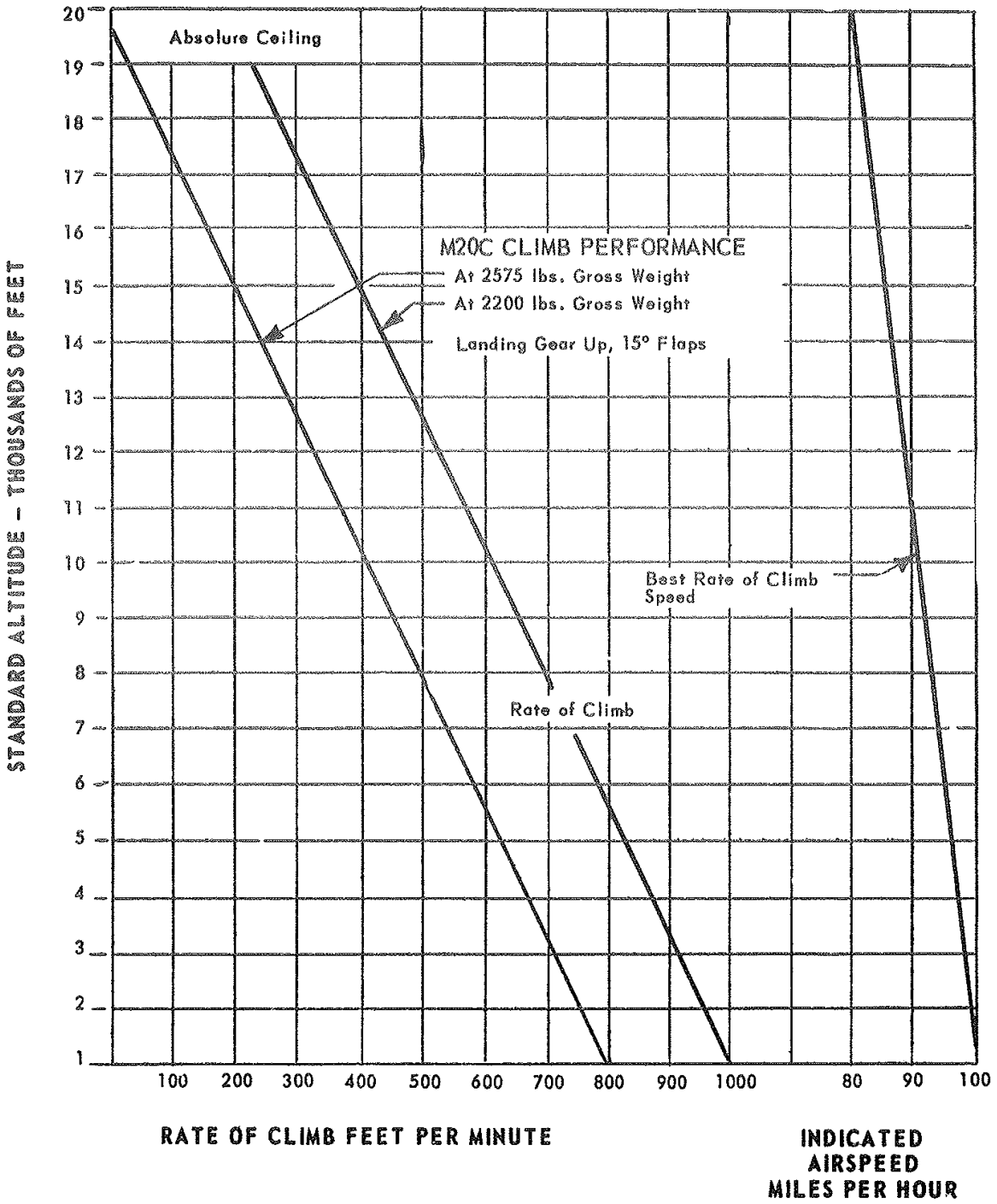
TAKE OFF CONFIGURATION:

* 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



CRUISE & RANGE DATA

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

ALTITUDE 2500' MSL

R.P.M.	M.P. IN.HG.	B.H.P.	% B.H.P.	GAL. HOUR	LBS. HOUR	TRUE AIR SPEED	ENDUR. HR:MIN.	RANGE Statute MILES
2600	27.0	170	95	14.4	86.4	185	3:37	667
	26.0	162	90	13.4	80.4	180	3:53	697
	25.0	155	86	12.8	76.8	175	4:04	710
	24.0	147	82	12.0	72.0	170	4:20	736
2500	26.0	159	88	13.1	78.6	178	3:58	705
	25.0	151	84	12.3	73.8	174	4:13	735
	24.0	144	80	11.6	69.6	168	4:29	752
	23.0	136	76	11.0	66.0	163	4:32	770
2400	25.0	148	82	11.7	70.2	171	4:26	759
	24.0	140	78	11.0	66.0	166	4:43	784
	23.0	132	73	10.4	62.4	160	5:00	800
	22.0	125	70	9.8	58.8	154	5:19	817
2300	24.0	136	76	10.7	64.2	163	4:52	792
	23.0	128	71	10.0	60.0	157	5:12	816
	22.0	121	67	9.5	57.0	152	5:28	831
	21.0	113	63	8.9	53.4	145	5:50	847
1800*	17.0	66	37	5.7	34.2	109	9:07	994

* MAXIMUM RANGE
ACCURACY OF DATA IS ± 3%
EACH 100 LBS. CHANGE IN AIRPLANE WEIGHT
WILL AFFECT TAS BY 1.2 MPH.

FIGURE 3A

CRUISE & RANGE DATA

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

ALTITUDE 5000' MSL

R.P.M.	M.P. IN.HG.	B.H.P.	% B.H.P.	GAL./HOUR	LBS./HOUR	TRUE AIR SPEED	ENDUR. HR:MIN.	RANGE Statute MILES
2600	24.5	156	87	12.9	77.4	185	4:02	745
	24.0	152	84	12.5	75.0	182	4:10	757
	23.0	144	80	11.8	70.8	177	4:25	779
	22.0	136	76	11.1	66.6	170	4:41	795
2500	24.5	153	85	12.4	74.4	183	4:11	765
	24.0	149	83	12.1	72.6	180	4:18	774
	23.0	141	78	11.4	68.4	175	4:34	798
	22.0	133	74	10.7	64.2	168	4:52	816
2400	24.5	149	83	11.9	71.4	180	4:22	785
	24.0	145	81	11.5	69.0	178	4:31	803
	23.0	138	77	10.9	65.4	172	4:46	820
	22.0	130	72	10.2	61.2	166	5:05	844
2300	24.0	141	78	11.2	67.2	175	4:39	813
	23.0	133	74	10.5	63.0	168	4:57	831
	22.0	126	70	9.9	59.4	163	5:15	856
	21.0	118	66	9.3	55.8	157	5:35	877
1800*	16.9	69	38	5.9	35.6	113	8:49	996

* MAXIMUM RANGE
ACCURACY OF DATA IS ± 3%
EACH 100 LBS. CHANGE IN AIRPLANE WEIGHT
WILL AFFECT TAS BY 1.2 MPH.

FIGURE 3B

CRUISE & RANGE DATA

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

ALTITUDE 7500' MSL

R.P.M.	M.P. IN.HG.	B.H.P.	% B.H.P.	GAL./HOUR	LBS./HOUR	TRUE AIR SPEED	ENDUR. HR:MIN.	RANGE Statute MILES
2600	22.5	145	81	11.8	70.8	184	4:25	811
	22.0	140	78	11.5	69.0	180	4:31	813
	21.0	132	73	10.8	64.8	173	4:49	831
	20.0	124	69	10.2	61.2	167	5:06	852
2500	22.5	142	79	11.4	68.4	182	4:34	829
	22.0	137	76	11.0	66.0	177	4:43	836
	21.0	129	72	10.4	62.4	171	5:00	855
	20.0	121	67	9.8	58.8	164	5:19	870
2400	22.5	138	77	10.8	64.3	178	4:49	855
	22.0	134	74	10.6	63.6	175	4:55	859
	21.0	126	70	9.9	59.4	169	5:15	888
	20.0	118	66	9.3	55.8	161	5:35	900
2300	22.5	134	74	10.6	63.6	175	4:55	859
	22.0	130	72	10.2	61.2	172	5:06	877
	21.0	122	68	9.6	57.6	165	5:25	893
	20.0	114	63	9.0	54.0	158	5:46	912
1800*	16.8	72	40	6.0	36.0	117	8:40	1013

* MAXIMUM RANGE
ACCURACY OF DATA IS ± 3%
EACH 100 LBS. CHANGE IN AIRPLANE WEIGHT WILL AFFECT TAS BY 1.2 MPH.

FIGURE 3C

CRUISE & RANGE DATA

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

ALTITUDE 10,000' MSL

R.P.M.	M.P. IN.HG.	B.H.P.	% B.H.P.	GAL./HOUR	LBS./HOUR	TRUE AIR SPEED	ENDUR. HR:MIN.	RANGE Statute MILES
2600	20.25	130	72	10.6	63.6	178	4:55	873
	19.0	120	67	9.9	59.4	168	5:15	882
	18.0	112	62	9.3	55.8	161	5:35	900
	17.0	103	57	8.7	52.2	151	5:59	903
2500	20.25	128	71	10.3	61.8	176	5:03	888
	19.0	118	66	9.5	57.0	166	5:28	907
	18.0	109	61	9.0	54.0	158	5:46	912
	17.0	101	56	8.4	50.4	150	6:11	927
2400	20.25	124	69	9.8	58.8	171	5:19	907
	19.0	115	64	9.1	54.6	164	5:43	935
	18.0	107	59	8.5	51.0	156	6:07	954
	17.0	98	54	8.0	48.0	146	6:30	948
2300	20.25	120	67	9.4	56.4	168	5:32	929
	19.0	111	62	8.8	52.8	159	5:54	939
	18.0	103	57	8.2	49.2	151	6:20	956
	17.0	96	53	7.8	46.8	144	6:40	959
1800*	16.6	74	41	6.15	36.9	122	8:27	1031

* MAXIMUM RANGE
ACCURACY OF DATA IS ± 3%
EACH 100 LBS. CHANGE IN AIRPLANE WEIGHT WILL AFFECT TAS BY 1.2 MPH.

FIGURE 3D

CRUISE & RANGE DATA

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

ALTITUDE 15,000' MSL

R.P.M.	M.P. IN.HG.	B.H.P.	% B.H.P.	GAL./HOUR	LBS./HOUR	TRUE AIR SPEED	ENDUR. HR:MIN.	RANGE Statute MILES
2600	16.5	106	59	8.9	53.4	161	5:50	940
2500	16.5	104	58	8.6	51.6	158	6:02	955
2400	16.5	102	57	8.2	49.2	156	6:20	989
2300	16.5	99	55	7.9	47.4	153	6:35	1007
1800*	16.5	80	44	6.5	39.0	131	7:59	1047

* MAXIMUM RANGE
ACCURACY OF DATA IS ± 3%
EACH 100 LBS. CHANGE IN AIRPLANE WEIGHT WILL AFFECT TAS BY 1.2 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

SPEED FOR MAXIMUM $\frac{LIFT}{DRAG}$ (MAX. RANGE & GLIDE)

The speed at which the M20C is most efficient (i.e. the Ratio of Lift to Drag is at a Maximum) is 105 MPH INDICATED AIRSPEED, Gear Up & Flaps Up. Flying at this airspeed will give maximum range or minimum glide angle, under zero wind conditions.

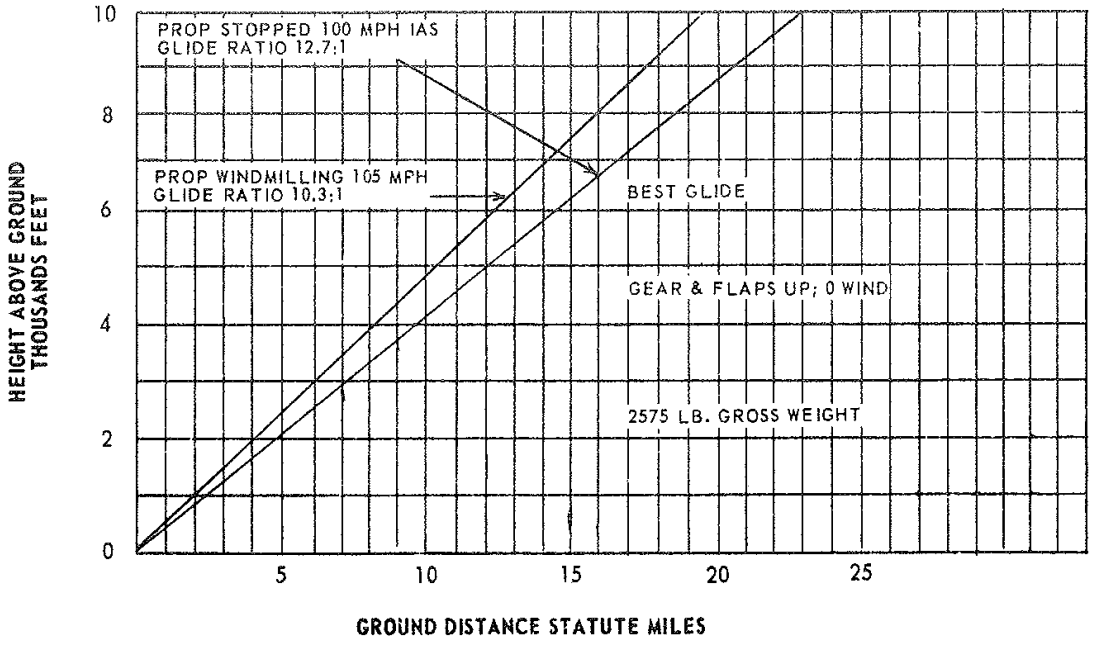
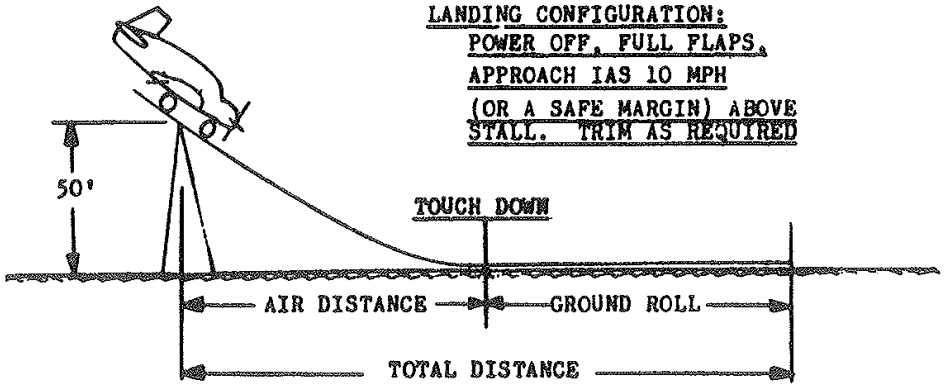


FIGURE 6

LANDING DATA



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

MARK 21 (M20C) – OPERATING LIMITATIONS

AIRSPEED LIMITATIONS

The following are the certificated calibrated air speeds for your Mooney Mark 21.

Maximum (Glide or dive–smooth air)	189 MPH (Red Line)
Caution Range (Level flight or climb–smooth air)	150-189 MPH (Yellow Arc)
Normal Range (Level flight or climb)	70-150 MPH (Green Arc)
*Maximum Maneuvering Speed	132 MPH
Maximum Gear Operating Speed	120 MPH
Maximum Gear Extended Speed	120 MPH
Flap Operating Range	63-100 MPH (White Arc)

*The maximum speed at which you can use abrupt full control travel without danger of exceeding the design load factor.

ENGINE OPERATING LIMITATIONS

Power and Speed	180 HP at 2700 RPM

ENGINE INSTRUMENT MARKINGS

Oil Temperature	
Radial Red Line (Maximum)	245 Degrees F.
Green Arc (Operating Range)	100-225 Degrees F.
Oil Pressure	
Radial Red Line (Minimum Idling)	25 PSI
Radial Red Line (Maximum)	100 PSI
Green Arc (Operating Range)	60-90 PSI
Yellow Arc (Idling Range)	25-60 PSI
Yellow Arc (Starting & Warm-Up Range)	90-100 PSI
Cylinder Head Temperature	
Radial Red Line (Maximum)	500 Degrees F.
Green Arc (Operating Range)	350-450 Degrees F.

Tachometer	
Radial Red Line (Rated)	2700 RPM
Green Arc—Narrow (Rated Operating Range)	2300-2700 RPM
Green Arc—Wide (Recommended Operating Range)	2300-2500 RPM
Red Arc—Narrow (No Continuous Operating in this Range)	2000-2250 RPM
Fuel Pressure	
Radial Red Line (Minimum)	0.5 PSI
Radial Red Line (Maximum)	6.0 PSI
Green Line—Wide (Desired Range)	2.5-3.5 PSI
Green Arc—Narrow (Normal Operating Range)	0.5-6.0 PSI