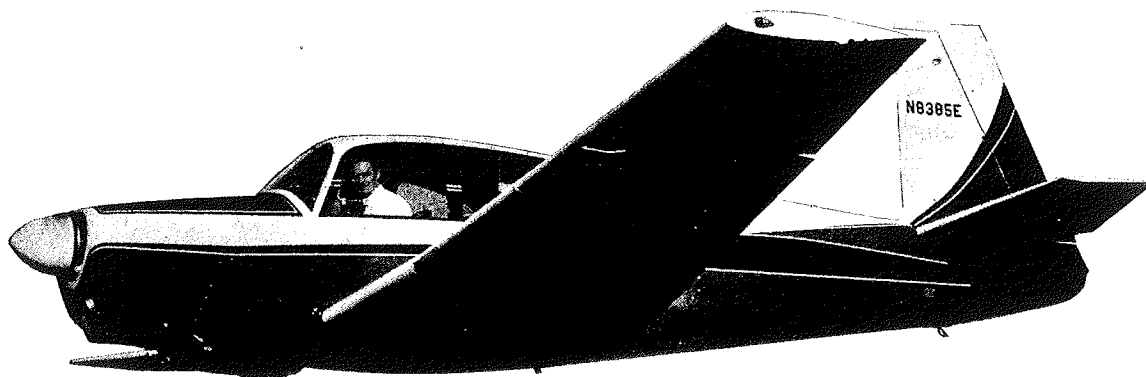


Welcome Aboard!



Mooney Mark 20A OWNER'S MANUAL

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

INTRODUCTION

The realm of flight can be introduced to the airman no more glamorously, nor luxuriously, than in the all-new, high-performance Mooney Mark 20A. Years of design experience and know-how have embodied in this new airplane the best combination of performance, safety, and economy; presenting to the Mooney pilot the key to the world's aerial kingdom.

Outwardly, the sleek, new Mark 20A presents a picture of symmetrical beauty, poised to slash through the air at its master's command, effortlessly and smoothly.

Inwardly, the Mark 20A represents a marvel of craftsmanship and design, expertly built to provide thousands of miles of pleasurable, swift travel at an amazingly low cost.

Here, we are sure, you will be interested in taking a look at how and of what the new Mark 20A is made. You will be pleased to learn of this airplane's fine construction and, perhaps, surprised at the superior quality of the materials used in an airplane of this price category. But then you will begin to see why Mooney proudly proclaims to the world that the Mark 20A is the World's Most Efficient Aircraft.

THE MOONEY MARK 20A PILOT'S HANDBOOK

Table of Contents

	Page
PART I The 1960 Mooney Mark 20A	1
The Mark 20A engine	2
The oil system	2
The engine fuel system	2
The engine accessories	3
The Mark 20A propeller	3
Operation	3
Governor	3
Preflight inspection	4
Hunting or surging	4
The Mark 20A fuselage	4
The cabin section	4
The tail cone section	5
The Mark 20A wing	5
The laminar-flow wing	5
The landing gear	6
Construction	6
Operation	6
The Mark 20A - miscellaneous installations	7
The instrument panel	7
The control system	8
The electrical system	8
The fuel system	9
The brake system	10
The Mark 20A - miscellaneous accessories	11
The manually operated step	11
The overhead vent system	11
The forward vent system	11
The heater and defroster system	11
The flap system	12
The instrument lights	12
The trim system	12
The cowl flaps	13
PART II The Mooney Mark 20A Flight Procedures	13
Starting procedures	13
Preflight inspection	13
Loading passengers	13
Starting the engine	14
Normal	14
Cold weather	15

Table of contents (continued)

Taxiing procedures	15
Run-up procedures	16
Take-off procedures	16
Normal	16
Normal climb	17
Short field	18
High altitude climb	18
Cruise procedures	18
Level-off	18
Performance cruise	20
Normal cruise	21
Maximum endurance cruise	22
Let-down	22
Landing procedures	23
Pre-landing check	23
Normal approach	23
Normal landing	23
Short field landing	24
Stopping the engine	24
Unloading passengers	24

PART I
THE 1960 MOONEY MARK 20A

In the following pages we would like to remove the cowlings and inspection plates on the Mark 20A and observe some of the more technical features of this plane. This will provide a better understanding of the airplane and will enable you, as the pilot and owner, to obtain the maximum in efficiency and performance.

The Mark 20A Engine

The Mark 20A is powered by the Lycoming O-360 A1A, high-compression engine. It is rated at 180 HP and uses dynafocal engine mounts to reduce the transmission of vibration to the cabin. The Lycoming O-360 A1A engine is FAA approved for a 750-hour normal overhaul life. However, with a mechanic's approval it may be flown to 1125 hours before overhaul becomes necessary. This engine is equipped with shielded ignition and spark plugs to eliminate radio noises.

Oil System

The Lycoming O-360 A1A engine has a pressure-type, wet sump lubrication system. It has an 8-quart capacity but will operate safely with as little as two quarts. 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.

NOTE

Lycoming recommends the use of the following grade oil for outside air temperatures:

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

The Mark 20A is equipped with an oil cooler, which mounts on the lower left section of the front cowl. Stratoflex hoses, triple-lined for extra safety, feed the oil from the oil reservoir to the cooler, then back to the reservoir.

Engine Fuel System

Fuel for the engine is fed to the float-type carburetor by an engine-driven, diaphragm-type fuel pump mounted on the accessory section of the engine. The Lycoming O-360 A1A engine is designed for 91-96 octane aviation grade fuel. However, 100-130 octane aviation grade fuel is preferable if available, because of its lower lead content.

WARNING

Under no circumstances should aviation fuel of a lower grade than 91-96 octane be used in this engine. Aviation fuels may be distinguished by their color. Remember that 80 octane is RED, 91 octane is BLUE, 100 octane is GREEN.

Accessories

The Lycoming O-360 A1A engine is equipped with the following accessories:

- Generator - Delco-Remy 35 ampere output
- Starter - Delco-Remy 12 volt type
- Magnetos - Bendix Scintilla (left magneto is equipped with an impulse coupler)
- Fuel Pump - AC Diaphragm type
- Carburetor - Marvel MA 4-5 float type
- Spark Plugs - AC SR-88D or Champion REM-40E
- Oil Cooler - Harrison
- Battery - Rebat 33 ampere

The Mark 20A Propeller

The Mark 20A utilizes a McCauley Constant Speed propeller. The blades have a high aspect ratio and a diameter of 74 inches. They are constructed of aluminum alloy and are anodized, as well as painted, for protection. Operation of this propeller is completely automatic. Once the desired propeller speed is established by the pilot, the blades automatically change their pitch to maintain a constant engine speed.

The hub of the propeller contains a completely sealed, pitch actuating unit. All materials of this unit have been specifically chosen for their resistance to wear and are fully protected against weathering. Grease and oil seals are made of synthetic rubber of high durability. All aluminum alloy parts are anodized. All steel parts are suitably plated. The blade actuating pins are chrome-plated, not only for protection, but to provide low friction and wear-resistant surfaces for better operation. Other steel members are cadmium plated.

Propeller Operation

The McCauley propeller utilizes engine oil pressure to change from low to high pitch. The oil comes from the engine lubrication system. However, since the propeller's oil pressure requirements are greater than the engine's, the oil pressure is boosted by a geared pump in the Woodward governor before it is delivered to the propeller. A strong spring, aided by the blade's centrifugal force, changes the pitch of the propeller from high to low pitch. This force is always present in the propeller and is counter-balanced by the oil pressure.

The Propeller Governor

The Woodward propeller governor, which is mounted on the accessory section of the engine, controls the speed of the propeller and the engine by decreasing the oil pressure when the RPM is too high. The extra oil pressure overcomes the force of the spring and the centrifugal force and changes the propeller pitch so that it takes a larger "bite" and thus slows down.

Pre-Flight Inspection

Before each flight the propeller blades should be checked for any nicks, cracks, or signs of other damage.

{NOTE}

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.

Hunting or Surging

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 climbout, it may be caused by air in the system or foreign matter in the governor passages. If, after the system has been purged, surging persists, the condition may be cured by adjusting the carburetor.

The Mark 20A Fuselage

During production the fuselage is constructed in two separate units; the forward or cabin section, and the tail cone section.

The Cabin Section

The forward section of the fuselage is composed of a truss-type welded steel frame covered with aluminum skin. It is separated from the engine compartment by a heavy stainless steel firewall. Generous use of sound-deadening lead tape and fiber glass sound proofing makes the cabin "whisper quiet". 3/16 inch tinted glass on the side windows and 1/4 inch

tinted glass on the front windshield add greater comfort and safety. Fiber glass window frames are painted to harmonize with the decor of luxurious interior fabrics. Cabin seats are constructed of welded steel frames using "no sag" springs overlaid with poly-foam rubber cushions and covered with expensive and tastefully chosen fabrics for maximum comfort and beauty.

The cabin door is stamped from heat-treated aluminum and has a three-way, positive locking latch, and is tightly sealed so that there are no air leaks. A heavy piano-type hinge is used to secure the door to the fuselage. The three-way latch mechanism has a safety latch, a lock pin, and a latch hook to hold the door positively and securely in place. A heavy chrome-plated steel door handle actuates the latching mechanism.

The Fuselage Tail Cone Section

The tail section is of monocoque construction. Aluminum skin, dipped in zinc-chromate primer for protection against corrosion, is riveted to heat-treated aluminum bulkheads to form the tail cone section. Extruded aluminum stringers add longitudinal strength to the tail cone.

An access opening is located on the left side of the tail cone section of the fuselage for easier access to the tail cone for purposes of inspection and installation of radio power packs.

The Mark 20A Wing

The Laminar-Flow Wing

The Mark 20A uses a laminar-flow wing. To get the smooth flow of air required for efficiency, a laminar-flow wing must have a smooth surface. Mooney chose Sitka Spruce and plywood for the construction of the wing in order to attain this smooth surface most economically. Because Sitka Spruce, weight for weight, has greater strength than metal, Mooney has gained an additional bonus in safety. Almost 15,000 pounds were loaded on the wing in tests of the structural integrity of the wing. The wing tips were deflected by this weight as much as twenty-four inches from their normal position, but there was no deformation or cracking! You can rest assured that the Mark 20A is among the safest aircraft flying.

The Mark 20A wing uses a single main spar of box-type construction. There are twenty-two laminations of Sitka Spruce through the center section of this spar. A "torsion box" forms the structural portion of the wing and consists of that portion of the wing from the main spar forward to the leading edge of the wing.

When the woodwork is completed, the entire wing is submerged in a vat of synthetic sealant. It is soaked there until the wood is thoroughly impregnated with this sealant. The sealant is toxic to any form of life, and also tends to preserve the wood indefinitely.

The wing is then covered with fabric. The primary purpose of this fabric is to provide a base for the paint. However, it also provides another protective covering over the wing. These are just a few of the reasons why Mooney warrants its wing for the life of the aircraft.

The Mark 20A Landing Gear

The Mark 20A landing gear is unique in that it is manually retracted by the pilot. Gear-assist springs in the wings, aided by a bungee-type spring in the fuselage, make the manual operation of the gear quite simple.

Gear Construction

The landing gear is constructed of heavy, chrome molybdenum tubular steel, heat-treated for greater strength and resistance to wear. Neoprene rubber discs of great resiliency absorb the shock of normal taxiing and landing. The Cleveland wheels are made of magnesium castings and the six-ply tires are made by Goodyear. The main gear has a nine-foot tread, which makes taxiing a simple operation. Because of the wide gear-tread and the aircraft's low center of gravity, taxiing or landing in strong cross-winds presents no problem, even to the novice pilot. The attaching points of the main gear are in metal bushings embedded in mahogany blocks, mounted in the main spar. The nose wheel is mounted to the cabin's tubular-steel frame instead of to the engine mount. Tire pressures for the tires are as follows:

Nose wheel tire.	.24 to 30 pounds
Main wheel tires	.24 to 30 pounds

Gear Operation

To retract the gear, slide the gear handle from the down-lock detent and move the handle rapidly to the floor between the seats. Slide the gear handle into the up-lock detent and the operation is complete. The more rapid the movement of the gear handle, the easier it is to retract the gear. The gear retracts easiest at low airspeeds as air pressure on the gear fairing doors helps push it up.

To lower the gear, slide the gear handle from the up-lock detent and move the handle forward to the instrument panel. Slide the gear handle into the down-lock detent and check the gear warning light for a gear-down indication (green light).

[NOTE]

Your aircraft is equipped with the safest retractable mechanism available. It is just as safe as the operator of the aircraft since its proper operation is completely dependent on the pilot. If you have not flown a retractable gear airplane before, you should be acquainted with proper procedures of any aircraft with retractable gears. If you will follow the following safety procedures, you will not experience an expensive unwanted gear retraction.

1. On entering the aircraft, be sure the gear handle is properly locked in the up position. Do not use the gear retracting handle as an assist when moving your seat to a forward position. Use the diagonal airframe tubular structure just to the left of the gear handle under the instrument panel.
2. After turning on the master switch, be sure your green light indicates down and locked before proceeding with your check list.
3. If you are operating from muddy fields or under slush ice conditions, be sure your landing gear mechanism is free of all foreign matter before taking off. Ice or mud can be thrown upon the retraction mechanism and freeze solid either with the wheels extended or retracted and make it impossible to operate the landing gear. This situation can occur on any retractable aircraft almost regardless of size or operating mechanism. If during take-off, you notice an unusual force required to operate the gear, immediately return it to the down and lock position and land and investigate.
4. On take-off, do not touch the handle preparatory to retracting the main gear until you have at least 80 miles per hour indicated air speed.
5. Make a practice of checking your landing gear position for down and lock condition on final approach.

The maximum speed for operation of the gear is 120 mph.

The Mark 20A - Miscellaneous Installations

The Instrument Panel

The instrument panel has been scientifically designed to provide functional location of all flight, radio, and engine instrument groupings.

All flight instruments are grouped on a shock-mounted panel directly in front of the pilot. They are located in such a manner as to provide maximum efficiency for the instrument cross-check, a most important item for good IFR flying.

The radio panel is located in the center of the instrument panel and has sufficient room for two modern radios. A sub-radio panel is located on the far right side of the panel, should a third radio be desired. All of the engine instruments are grouped on the co-pilot's panel. A brief glance tells the whole story on engine operation, since all the engine instruments are in one location.

The electrical panel is divided into two parts. The electrical toggle switches are grouped on the left lower side of the pilot's panel. They control (1) the fuel gauge selector, (2) the fuel boost pump, (3) the landing light, (4) the navigation lights, (5) the electrical turn and bank, (6) the instrument panel lights. The breaker switches, or fuses, are of the push-to-reset type and are located on the lower right side of the co-pilot's panel.

The push-pull controls are located on the lower right side of the pilot's panel. These operate (7) the parking brakes, (8) the cabin heat, (9) the cold air, (10) the carburetor heat control. Notice that the carburetor heat control is located just to the left of the throttle (11). Since the carburetor heat is used just prior to reduction of the throttle, it is in the most convenient place for simple operation. This is characteristic of the entire instrument panel layout. A thorough scrutiny of the instrument panel will reveal that it was designed for pilot efficiency and maximum safety.

The Controls

The control system for the Mark 20A requires very little maintenance and provides superior control-feel because torque tubes, rather than the conventional cable system, are used to actuate the controls. The fact that this control system provides unsurpassed control pressure and response through the elimination of slack in the system, and the fact that it provides a more durable and lower maintenance system is one of the reasons why the Mark 20A has attained such popularity in such a short period of time. HEIM Bearings are used throughout the control system. These bearings are permanently lubricated and require no maintenance.

The control wheel is designed to give maximum visibility to the instrument panel and to provide just the right control feel. Because of the differential travel of the ailerons, very little rudder is needed in flight to coordinate turns. This makes in-flight coordination in the Mark 20A quite simple and easy.

The Electrical System

The Mark 20A uses a 12 volt electrical system. A thirty-five amp, heavy-duty generator provides plenty of current so that, even if a high electrical load is placed on the system by multiple radios, a rotating beacon, and navigation lights, etc., the heavy-duty, thirty-three amp battery will remain at full charge.

The battery is located on the forward left-hand side of the fire-wall. It is sufficiently close to the engine so that there is very little voltage drop and more electric power is available for cold weather starting. Since it is located in the engine compartment, engine heat tends to keep the battery warm for best performance.

{IMPORTANT}

The battery should be serviced every thirty days or every twenty-five hours of flight, whichever comes first.

Breaker switches, designed to relieve the electrical system of any overloads, are located on the lower right hand side of the co-pilot's instrument panel. If a circuit breaker pops out continuously, its circuit is overloaded and should be checked for a short.

The master switch control for the electrical system is located at the top right hand side of the radio instrument panel. The electrical system operates all of the electrical accessories of the Mark 20A listed below:

1. Radios
2. Engine Starter
3. Engine Generator
4. Navigation Lights
5. Landing Lights
6. Rotating Beacon (if installed)
7. Heated Pitot Tube (if installed)
8. Electric Turn and Bank Indicator (if installed)
9. Electric Auto Pilot (if installed)
10. Fuel Gauges
11. Fuel Boost Pump
12. Stall Warning Horn

{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 fail.

The Fuel System

The Mark 20A has a 49 gallon fuel capacity, using three aluminum fuel tanks. The two main tanks are located on the forward section of the wing near the root and hold 17.5 gallons each. The rear, or auxiliary fuel tank is located in the wing center section under the rear seat. Its capacity is 14.0 gallons.

Aluminum fuel lines feed the fuel from each fuel tank to a 3-way, positive-setting selector valve on the floor beneath the pilot's seat. The selector valve is made by Republic Products and uses a teflon core, which not only

provides greater resistance to wear, but also eliminates the tendency to freeze up that is prevalent in brass valves. The selector valve feeds fuel from one of the fuel tanks at a time and also has an "off" position for extended periods of storage or for emergency use.

Fuel is then routed from the fuel selector, through the Bendix boost pump, up to the gascolator, or sediment bowl, by aluminum fuel lines. From the gascolator it passes through the fire wall to the engine-driven pump and from there to the carburetor.

For normal operation the engine-driven fuel pump has adequate capacity to pump fuel from the fuel tanks to the carburetor; but to insure an adequate supply of fuel for take-off and landing, and to preclude engine fuel pump failure, it is recommended that the electric fuel-boost pump be used for these operations.

|IMPORTANT|

Check to be sure that fuel selector is on one of the main fuel tanks prior to take-off, because fuel will not pump from the rear tank when the aircraft is in a nose-high attitude.

There are four flush-type quick drains located in the fuel system; one at the lowest point of each fuel tank, and one beneath the fuel selector. Use drain cup to test for water or sediment after each re-fueling.

|REMEMBER|

If the fuel in the drain cup is RED, DO NOT FLY THE AIRPLANE until the fuel cells have been drained and refilled with a fuel of 91 or 100 octane rating!

The Brake System

The Mark 20A uses Cleveland Disc-type hydraulic brakes. Each main gear is equipped with a disc-brake and each brake is actuated individually by brake pedals located on the pilot's rudder pedals. The brake disc is bolted to the inner rim of the wheel instead of being held in place by brake clips. The brake linings are held in place by three rivets and can easily be replaced. The brake disc, itself, is exposed to the air for extra cooling.

The hydraulic reservoir is located on the cabin side of the fire wall, just aft of the battery. It is easily accessible by removing the left-side access panel, just forward of the pilot's windshield.

|NOTE|

The Mark 20A's brakes have synthetic seals which require a petroleum-base brake fluid. Texaco A Aircraft hydraulic fluid is recommended. However, should it become necessary to add brake fluid to the reservoir, be sure to use a brake fluid which conforms to Military Specifications 0-5606A. This brake fluid is RED in color.

The brake master cylinders are located under the left-hand side of the fuselage and are easily accessible by removing the access cover.

The Mark 20A - Miscellaneous Accessories

The Manually Operated Step

A manually retracted step is provided to make it easier to enter the cabin. The step is constructed of heavy-gauge, welded steel, and is chrome-plated for better appearance and protection.

The step retraction crank is located on the left side panel by the pilot's left knee. Two and one-half turns of the crank in a clockwise direction retract the step fully into the wing-root fairing. Rotating the crank in a counter-clockwise direction lowers the step.

NOTE

Failure to retract the step will result in the loss of 5 mph cruising speed.

The Overhead Vent System

Four individual airline-type adjustable vents are located in the center of the cabin roof to provide fresh air for each passenger. Air is forced through a retractable scoop in the top of the fuselage when it is opened by turning the overhead control for the vent system 180° in a clockwise direction. Each passenger may adjust the desired amount of air by turning his individual vent clockwise for more air and counter-clockwise for less air, and may adjust the direction of air by swiveling the vent.

The Forward Vent System

Two vents under the instrument panel provide a second source of fresh air to the cabin. When the cold air control is pulled to the "on" position, fresh air is forced through a scoop on the side of the fuselage into a mixing box and then into the vent tubes under the instrument panel. Deflectors force the air either downward under the pilot and co-pilot's feet or upward as may be desired.

The Heater and Defroster System

Cabin heat is supplied by a heater muff which transmits air heated by conduction from the engine exhaust manifold. The hot air is piped to the cabin air mixing box where it is then directed through the pilot's and co-pilot's air vent system.

To operate the heater, pull the heat control to the "on" position. Adjustment of the air deflector will force the warm air downward toward the floor or upward as desired. When the air deflector is in the neutral position, air is forced into the window defroster system.

The Flaps

The flaps span 70% of the wing trailing edge. They are primarily drag flaps, but do also give a slight increase in lift when in the "down" position. The flap handle is located on the right side of the gear handle and has three positions: The "up" position when the handle is full forward, the "take-off" position when the handle is in the middle notch, and the "down" position when the handle is in the full back position.

To actuate the flaps pull the flap handle downward until the lock pin is clear of the notch and then pull the handle to the desired position and lock by pushing the lock pin into the notch.

NOTE

Do not actuate the flaps above 100 mph indicated air speed.

The Instrument Lights

Two instrument lights are located on the forward, center overhead panel. They are manually adjustable to provide a beam of light anywhere on the instrument panel. Screw adjustments on the rear side of each light are provided to focus the beam of light for smaller or greater surface coverage. A rheostat control is located to the right of the lights and when turned clockwise dims the lights, then when turned counter-clockwise brightens the instrument lights.

The Trim System

The Mark 20A uses a unique trim system. The entire tail empennage moves when the trim wheel is actuated. The tail with the trim can be adjusted to the "full-forward" position (nose-low) and in the "full-rearward" position (nose-high). The use of this system of trimming eliminates the drag of the standard trim tab. It also keeps the vertical stabilizer perpendicular to the line of flight at all angles of attack and keeps the horizontal stabilizer lined up with the line of flight. Not only is this system more efficient, but it also gives more positive rudder and elevator control right through the stalling speed range (nose-high). Rolling the trim wheel in a rearward direction increases the back pressure on the elevator controls through the assistance of elevator bungees.

The Cowl Flaps

The cowl flap control is located under the instrument panel, just beneath the throttle. As a general rule, it should be used whenever you have a high power setting and a low airspeed, or when the cylinder head temperature is above 450°F in level flight.

Normally, cowl flaps are used for climb-out. In the wintertime the cylinder head temperature may run low, even during climb-out. Should this occur, it would be advisable to climb with the cowl flaps closed.

NOTE For best cooling during the summer, climb with the cowl flaps open and 120 mph IAS.

PART II

THE MCONEY MARK 20A FLIGHT PROCEDURES

Starting Procedures

Preflight Inspection

A thorough pre-flight inspection is a necessity for safe operation of any aircraft. Use the following check list as a guide to insure that your Mark 20A is ready to fly:

1. Check all switches off.
2. Check the propeller blades for nicks or cracks.
3. Check the oil level to six quarts or above.
4. Inspect the cowling for loose screws.
5. Inspect the tires for proper inflation.
6. Inspect the carburetor air filter for cleanliness.
7. Using the fuel cup, drain the fuel sump on the left forward bottom of the fuselage.
8. Check the left tank and the rear tank for fuel level.
9. Check the left aileron for proper travel and smooth operation.
10. Inspect the left flap.
11. Check the horizontal stabilizer for end play.
12. Inspect the elevator and rudder hinges.
13. Inspect the right flap.
14. Inspect the right aileron for proper travel and smooth operation.
15. Check the right fuel tank for fuel level.

Loading Passengers

For easiest loading of passengers, use the following procedures. With both front seats all the way to the rear, the pilot should climb into the left front seat first. Placing his right hand on the steel cross bar under the instrument panel and his left hand on the seat adjustment lever beneath the left front seat, slide the seat forward to a comfortable position.

{NOTE}

The further forward the pilot sits, the better his visibility will be over the nose and over the leading edge of the wing.

When the pilot is comfortably seated with his seat properly adjusted, he should then slide the right front seat all the way forward and allow his two rear-seat passengers to enter. After they are seated, the pilot

should slide the right front seat back to the last notch and, while holding the control wheel full-forward, allow his front-seat passenger to enter. When the last passenger is seated, he should slide the right front seat forward to a comfortable position.

To close the door, grasp the door pull strap and press the door in tightly against the seal.

[NOTE]

Do not slam the door. Slamming the door is likely to damage the latching mechanism and put the door out of adjustment.

Holding the door tight against the seal, rotate the door handle full-forward until the latch locks into position.

Starting the Engine

There are five pre-starting items to cover below the instrument panel. They are as follows:

1. Adjust the trim to "take-off" position.
2. Place the fuel selector on the "left" or "right" main tank.
3. Roll the step to the "up" position.
4. Pull the cowl flaps to the "open" position.
5. Place the flaps in the "take-off" position.

Now, going to the lower left side of the pilot's panel:

6. Place the main fuel-gauge switch on the tank corresponding to the tank on which the fuel selector is placed.
7. Place the electric fuel boost pump switch to the "on" position.
8. Check all other electrical switches to the "off" position.
9. Set the parking brake by pulling brake control and simultaneously depressing the brake pedals. For greater braking pressure, repeat this procedure.
10. Check the cabin heater, cabin vent, and carburetor heat controls in the "off" position.
11. Check the throttle in the "closed" position.
12. Check the propeller control in the "full increase" RPM position (full-forward).
13. Check all breaker switches "closed".
14. Check all radios in the "off" position.
15. Push the mixture control to the "full rich" position.
16. Call "clear" and turn the mag switch to the "both" position with left hand.
17. Pull the master switch to the "on" position.
18. With your right hand, depress the throttle button and push the throttle to the "full open" position twice.

19. Set throttle approximately 1/4" open.
20. Turn magneto switch to the "start" position.

[WARNING]

In order to pull the throttle back, it is necessary to keep the throttle button depressed with your thumb.

21. After the engine starts, adjust the throttle for 800 RPM and check the engine oil pressure.

Starting in Cold Temperatures

For cold weather starting (when temperatures drop below 32°F), add the following procedure to the starting procedures:

- 17A. Prior to step 17 above, pump the throttle three or four times prior to engaging the starter. (This forces raw fuel into the intake manifold and primes the engine.)

For extreme cold weather starting (temperatures 15°F) add the following procedures to the starting procedures:

- 17B. Prior to step 17 above, prime the engine by pumping the throttle six to eight times.
- 17C. After priming the engine, check the magneto and master switches in the "off" position, and then manually pull the propeller through at least four revolutions. (This sucks the raw fuel from the intake manifold into the compression chamber so that less battery energy is needed for starting.) After pulling the propeller through, place the magneto and master switches in the "on" position once again and continue with the starting procedures listed above, starting with Item 17.

Taxiing Procedures

Any tricycle gear aircraft is easy to taxi. The Mark 20A is particularly easy to taxi for several reasons:

1. It has a nine-foot tread between main gears.
2. It has an exceptionally low center of gravity.
3. It has direct linkage from the rudder pedal to the nose wheel. This gives positive control with a minimum of rudder movement.

For these reasons, ground operation of the Mark 20A is simple. Cross winds have very little effect on the Mark 20A while taxiing.

IMPORTANT

A word of caution - The propeller of the Mark 20A has eleven inches ground clearance. It is recommended that minimum power be used for starting to taxi on sod or gravel fields. Too much power will cause the prop blast to suck up stones and thus nick the propeller. It is a good idea to use the vernier operation of the throttle only for taxiing. This will help to avoid inadvertent use of excessive power.

Run-Up Procedures

When in the run-up position (on gravel fields, it is recommended that the run-up be made while taxiing to avoid nicking the propeller), make the run-up in the following manner:

1. Adjust the RPM to 1700.
2. Check the ammeter for positive charge.
3. Check the magnetos for smooth operation and maximum drop-off of 100 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 1700 RPM and re-check the magnetos. This operation will usually burn out the carbon deposits and allow the magnetos to check properly.

4. Exercise the propeller 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 "high RPM" (full-in) position.
5. Pull the carburetor heat control to the "hot" position and check the tachometer for approximately 50 to 100 RPM drop. Push the carburetor heat control to the "cold" position.
6. Check the cylinder head temperature. If it reads 250°F or more, the engine is warm enough for take-off.

NOTE

Lycoming recommends a maximum ground run of four minutes in cold weather and two minutes in temperatures above 70°F.

Normal Take-Off

After the run-up procedures have been completed, line the Mark 20A up with the runway. Move your feet to the lower part of the brake pedals

and away from the brakes. Twist the throttle vernier sufficiently to increase the RPM above idle and then squeeze the throttle button and smoothly apply full throttle. Maintain directional control by application of pressures on the rudder pedals rather than movements. Allow the aircraft to accelerate to between 65 and 75 mph. When the aircraft has attained this speed, smoothly apply elevator back pressure to lift it from the runway.

[NOTE]

When back elevator pressure is applied, the nose wheel will lift from the ground and shortly thereafter, the aircraft will break ground. As the nose wheel lifts from the ground, increase right rudder pressure to provide the torque control that the nose wheel can no longer give.

When the Mark 20A 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 20A to lift above the horizon during take-off. After some practice, you will find that you can make your smoothest takeoffs 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 20A is airborne and under good control, perform the following procedures:

1. Retract the gear (see landing gear operation).
2. Reduce the propeller RPM to 2550-2600.
3. Retract the flaps (if used).
4. Establish climb-out attitude.
5. Turn fuel boost switch to "off" position. (Check fuel pressure).

Normal Climb

Initial climb-out can be made at an indicated speed of 96 mph (minimum cooling speed) until leaving the traffic pattern. For best results in the climb after leaving traffic, it is recommended that 115-120 mph be used. This climb attitude will give excellent forward visibility and an efficient rate-of-climb.

When the throttle is in the "full open" position, an automatic enrichment valve opens in the carburetor to give extra fuel for cooling the engine. The automatic enrichment valve is provided so that it is possible to climb out with the throttle in the "full open" position. However, if you desire to climb at a lower power setting, it is recommended that you use 25 inches of manifold pressure and 2500 RPM.

Short Field Take-Off

If it should become necessary to make a short field or high altitude field take-off, the following procedures are recommended:

1. Roll the trim tab back until the indicator is half way between the "normal take-off" position and the "full back" position.
2. Place the flaps in the "full up" position.
3. Hold the brakes and increase the throttle to the "full open" position.

!CAUTION!

If on a gravel strip, eliminate this procedure unless absolutely necessary.

4. Release the brakes and allow the aircraft to accelerate to 60 mph.
5. Upon reaching 60 mph, extend full flaps and simultaneously add sufficient elevator back pressure to pull the aircraft smoothly from the ground.
6. When airborne, retract the gear.
7. For maximum angle of climb to clear an obstacle, use one notch of flaps and climb at 70 to 80 mph IAS.
8. When clear of the obstacle, allow the airspeed to increase to 90 mph and retract the flaps to the "full up" position.
9. Reduce the RPM for normal climb-out and establish a normal climb.

High Altitude Climb

On a hot day and with a heavily loaded airplane, maximum altitude can be attained by trimming the aircraft for a 120-125 mph climb. The wing's efficiency is at its best within this speed range, and the Mark 20A will climb at altitudes where most other airplanes in its category will not.

Cruise Procedures

Level Off Procedures

In order to accelerate to cruising speed, it is recommended that you allow the aircraft to climb 200 feet above cruising altitude prior to beginning the level off. Use the following level off procedure:

1. Close the cowl flaps.
2. Trim the nose downward to the level flight altitude.

!NOTE!

As the nose drops the aircraft will lose the extra 200 feet and thus will accelerate more rapidly to cruise speed.

3. Reduce the manifold pressure and RPM to desired cruise setting.
4. Lean the mixture for smooth operation (reference Lycoming Operators Manual, page 32-33).
5. Retrim to maintain altitude.

Cruise Charts

The following cruise charts are provided to enable you to choose the altitudes and power settings which will give the best performance. Please keep in mind the following information:

1. When the throttle is in the "full in" position, the automatic enrichment valve in the carburetor is open. The power settings in the normal cruise and performance cruise charts include the symbol "FT". "FT" indicates Full Throttle, but retarded sufficiently to close the automatic enrichment valve. (See Level-Off Procedures, page 18.)
2. The Indicated Airspeed column in the normal cruise and performance cruise charts contains a low and a high speed because the indicated airspeed varies with the outside air temperature. The lower indicated airspeeds will be prevalent during the summertime operation, and the higher indications will be prevalent during the wintertime operation.
3. The "Range" column in all three charts does not take into consideration the extra fuel used for take-off and climb-out. At 100% power the engine will consume as much as 16.2 gph. The average fuel consumption in a climb from sea level to 10,000 feet will be approximately 14.0 gph. If it takes 15 minutes to climb to 10,000 feet, then the engine will have consumed 3.5 gallons of fuel. Assuming that 0.5 gallons of fuel were used for taxi and run-up, 45 gallons of fuel will then remain for cruise.

Referring to the "Fuel Consumption" column for your power setting, the remaining range in hours may be determined by dividing the fuel consumption per hour into 45 gallons.

PERFORMANCE CRUISE CHART

Altitudes	Power RPM	Settings Manifold Pressure	% Power	Fuel Cons.	Indicated Airspeed** S. -W.	True Airspeed	Range (No Reserve) With Aux. Tank***
1,000	2450	24"	77	10.7	160-168mph	168 mph	4 Hrs. 36 Min.
2,000	2450	24"	78	10.9	160-168	171	4 Hrs. 30 Min.
3,000	2450	24"	78	11.0	160-167	173	4 Hrs. 28 Min.
4,000	2450	24"	79	11.1	160-167	175	4 Hrs. 24 Min.
5,000	2450	24"	81	11.3	159-165	176	4 Hrs. 20 Min.
6,000	2450	FT*	78	11.0	157-164	179	4 Hrs. 28 Min.
7,000	2450	FT	78	10.9	155-160	177	4 Hrs. 30 Min.
8,000	2450	FT	72	10.1	150-155	175	4 Hrs. 51 Min.
9,000	2450	FT	70	9.8	145-150	173	5 Hrs. 00 Min.
10,000	2450	FT	67	9.3	142-146	171	5 Hrs. 18 Min.

Above fuel consumption figures are based on rich mixture--fuel consumption may be reduced by proper leaning.

* See Paragraph 1, Page 19

** See Paragraph 2, Page 19

*** See Paragraph 3, Page 19

S. = Summer

W. = Winter

NORMAL CRUISE CHART

Altitude	Power RPM	Settings Manifold Pressure	% Power	Fuel Cons.	Indicated Airspeed** S. W.	True Airspeed	Range (No Reserve) With Aux. Tank***
1,000	2300	23	70	9.8	152-163 mph	160 mph	5 Hrs. 00 Min.
2,000	2300	23	71	9.8	152-163	163	5 Hrs. 00 Min.
3,000	2300	23	71	9.8	152-162	165	5 Hrs. 00 Min.
4,000	2300	23	72	9.9	152-162	167	4 Hrs. 57 Min.
5,000	2300	23	73	10.0	151-160	170	4 Hrs. 54 Min.
6,000	2300	23	73	10.1	151-160	171	4 Hrs. 51 Min.
7,000	2300	FT*	74	10.2	150-159	174	4 Hrs. 48 Min.
8,000	2300	FT	69	9.6	148-152	172	5 Hrs. 06 Min.
9,000	2300	FT	67	9.3	143-148	170	5 Hrs. 18 Min.
10,000	2300	FT	64	8.9	139-143	169	5 Hrs. 30 Min.
11,000	2300	FT	63	8.7	138-142	169	5 Hrs. 36 Min.
12,000	2300	FT	62	8.5	137-142	168	5 Hrs. 48 Min.

Above fuel consumption figures are based on rich mixture--fuel consumption may be reduced by proper leaning.

* See Paragraph 1, Page 19

** See Paragraph 2, Page 19

*** See Paragraph 3, Page 19

S. = Summer

W. = Winter

Maximum Endurance Cruise

There may be times when you will wish to get maximum distance with your fuel supply. To do this, climb your Mark 20A to an altitude between 9,000 and 13,000 feet. This is the most efficient altitude range for fuel economy and speed. Refer to the endurance cruise chart below for proper power settings. Establish the power settings as follows:

1. Reduce the RPM to 2200.
2. Adjust the manifold pressure to maintain 120 mph (Mark 20A's most efficient airspeed). Ordinarily, 16.5 inches of manifold pressure is sufficient to maintain 120 indicated airspeed. However, this setting may vary slightly depending upon whether or not the aircraft is loaded or light.
3. Lean the mixture by moving the mixture control smoothly (and not too slowly) toward the lean position and noting the tachometer for a slight increase and then drop-off of RPM. Push the mixture control toward the "rich" position, again observing the tachometer for the slight surge in RPM. The mixture is properly leaned when:
 - A. Further leaning causes rough engine operation.
 - B. The cylinder head temperature is at 450°F or below.

ENDURANCE CRUISE CHART

Altitude	Power RPM	Setting Manifold Pressure	% Power	Fuel Cons.	Indicated Airspeed	True Airspeed	Range (No Reserve) With Aux. Tank
9,000	2200	16.5	45	6.3	120 mph	140 mph	7 Hrs. 48 Min.
10,000	2200	16.5	45	6.3	120	143	7 Hrs. 48 Min.
11,000	2200	16.5	45	6.3	120	146	7 Hrs. 48 Min.
12,000	2200	16.5	46	6.4	120	148	7 Hrs. 42 Min.
13,000	2200	16.5	48	6.5	120	151	7 Hrs. 36 Min.

Above fuel consumption figures are based on rich mixture--fuel consumption may be reduced by proper leaning.

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

Prelanding Check

The prelanding check is normally performed while on the downwind leg. However, it may be made at the pilot's discretion prior to landing. The following prelanding check is recommended:

"Gumps" Check

1. GAS selector on fuller main tank. (Fuel boost pump in the "on" position.)
2. UNDERCARRIAGE down and locked. (The maximum gear lowering speed is 120 IAS.)
3. MIXTURE in the "full rich" position.
4. PROPELLER control in the "increase RPM" position.
5. SAFETY belts fastened.

Normal Approach

It is recommended that the base leg be flown at 90 mph. Upon turning final (or sooner if necessary) extend full flaps.

[NOTE]

Do not extend flaps above 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 80 mph. The addition of a slight amount of power will flatten out the glide considerably. Use your power as needed.

Normal Landing

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

1. The Mark 20A sits lower to the ground than most aircraft.
2. The Mark 20A requires very little altitude to make a transition from a glide to a touch-down attitude. A slight addition of back pressure is sufficient to stop the rate-of-descent.

Most Mark 20A pilots use full flaps on all landings because of the added visibility over the nose that it affords. The best landings are made when the trim tab is rolled well back and the aircraft is held off the ground as long as possible. As the Mark 20A decelerates, it becomes nose heavy. A corresponding increase of back pressure throughout the deceleration period is then necessary to hold the Mark 20A off the ground. 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 ground for a few hundred feet of the landing roll.

Short Field Approach and Landing

If it should become necessary that you make a landing in a very short field, make your approach as follows: After making your pre-landing check, extend your base leg slightly so that you can make a power approach. If the terrain permits, use a low, power-approach to the field with full flaps and the trim tab rolled well back. Use a safe approach speed for the aircraft loading and to compensate for air turbulence. This speed should range from 65 mph in smooth air to 75 mph in high turbulence. Remember, the higher your speed, the sooner you will have to cut your power in order to hit a spot of intended landing. At 65 mph the aircraft will settle in within fifty feet or so after the power is cut. By hard application of brakes, it is possible to stop within 400 to 600 feet from the point of touchdown.

!CAUTION!

Do not attempt a short field approach and landing until you have sufficient time and experience in the Mark 20A to know its best approach speeds.

Stopping the Engine

Stopping the Engine

Stop the engine in the following manner:

1. Idle the engine at 1,000 to 1,200 RPM.
2. Pull the mixture control to the "idle cutoff" position.
3. As the engine stops firing, twist 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.
5. Place the flaps in the "down" position. (When the flaps are down, they are less likely to be stepped upon.)
6. Roll the step to the "down" position.

Unloading the Mark 20A

For best results in unloading your passengers, use the following sequence:

1. Unload the right front seat by sliding the seat back to the last notch and allowing your right front seat passenger to step out. Hold the control wheel forward to give him more room.
2. Now slide the right front seat all the way forward and allow the two rear passengers to debark.
3. Then slide both front seats all the way back and, placing your right hand on the back of the right front seat and placing your right foot on the right side floor, step toward the door and out of the cabin.
4. Close the door and latch it.

Happy Landing....

Mooney Aircraft, Inc.
Kerrville, Texas