MOONEY 252

Run fast, run lean—and watch your weight

BY THOMAS A. HORNE

THE Mooney Aircraft Corporation began life in 1948 by producing quaint, minimal airplanes called the M-18 series, better known to most as either the "Mite" or the "Wee Scotsman." The first M-18s were really more ultralight than

PHOTOGRAPHY BY ART DAVIS

airplane: single-seat, wood construction, an empty weight of less than 450 pounds and powered by a four-cylinder, 25-horsepower, liquid-cooled Crosley automobile engine. A belt drive (consisting of four steel cables) provided a 2:1 reduction of engine rpm to turn the propeller. For all its crudity, the airplane is remarkably efficient. Its maximum speed is 87 knots (100 mph), cruise speed 74 knots (85 mph) and initial rate of climb more than 400 fpm. Not bad for 25 hp. The M-18s also had some advanced touches, among them retractable landing gear and an ingenious "Simpi-fly" system that adjusted pitch trim whenever the flaps were lowered. This system was previously used in the Culver Model V, a pre-World War II lightplane manufactured by the Culver Aircraft Corporation. Not surprising, since Albert W. Mooney was Culver's vice president for engineering prior to establishing his own company.

Things have changed considerably over the years. And yet, they have not. Mr. Mooney's early goals and convictions have become company tradition. The goals were always to extract the maximum amount of speed from the minimum amount of horsepower and to try to keep the design simple as well as contemporary. By expanding on the M-18 concept—and with continual powerplant and aerodynamic improvements—the company appears to have taken, in stages, its basic M-20 airframe to its ultimate in performance capability. The Mooney 252 represents perhaps the culmination of the company's concept of a piston single.

The 252 may represent the culmination of Mooney's concept of a single-engine, piston-powered four-place aircraft.

Wing-tip lighting includes highly visible recognition lights and strobes (above), plus rear-facing white position light.

Introduced in 1986, the 252 (its official designation is the M20K, the same as its predecessor, the Mooney 231) was welcomed with a torrent of justified praise. The 231 is plagued by engine overheating. The 252 eliminates this with the help of its larger cooling air inlets (90 square inches in area versus the 231's 62 square inches), a separate engine induction air inlet (the 231 received its induction air from a portion of the right engine cooling air inlet), a single, more efficient cowl flap and, last but certainly not least, an intercooler capable of reducing induction air temperatures anywhere from 27 to 38 degrees Celsius, depending on altitude and power setting. The intercooler, essentially a radiator with a frontal area of some 42 square inches, serves the vital purpose of lowering the very high temperature of the air after it leaves the 252's turbocharger and before it enters the cylinders. By reducing these temperatures, intercoolers allow engines to maintain their maximum rated horsepowers at higher ambient temperatures and higher altitudes while simultaneously sparing them the destructive effects that elevated engine temperatures can bring.

The 252 brought other important improvements. In addition to tuned intake and exhaust manifolds, an automatic, variably controllable turbocharger wastegate replaces the 231's fixed wastegate design. The advantage is that the 252's wastegate system incorporates a control unit that automatically maintains the selected manifold pressure. The control unit also permits full-throttle takeoffs in the 252. The control unit is designed to accommodate a maximum of 36 inches of manifold pressure—the 252's throttle setting for takeoff. While pilots should always be on guard for an overboost during takeoff and initial climb-out—especially when colder temperatures prevail—the 252 eliminates the need to fiddle with the throttle setting during the takeoff roll. The 231's fixed wastegate requires constant monitoring and adjustment of manifold pressure, not just during takeoff, but whenever propeller rpm, mixture setting, airspeed, temperature or other variables are changed. The 252's automatically controlled turbocharger makes throttle settings pretty much a set-and-forget proposition.

And then there are the aerodynamic refinements, including inboard main gear doors that fully enclose the wheels when retracted, new wing root fairings and low-drag, anti-icing NACA ducts for engine induction air and fuel vents.

Together with the engine changes, these modifications add up to a maximum speed advantage of some 20 mph (17 knots) over the 231. The designations 252 and 231, by the way, are examples of Mooney's way of referring to their airplanes' maximum speeds in miles per hour.

AOPA Pilot recently leased a Mooney 252 from the company's Kerrville, Texas, headquarters. Our experiences included operations under both VFR and IFR meteorological conditions, at altitudes from 3,000 to 27,000 feet msl, at temperatures nearly always from 10 to 20 degrees Celsius above standard and with cruise settings of 78.6-percent power—the maximum recommended cruise setting. We recorded enough flying time (some 50 hours) to learn the airplane's strengths and weaknesses and to learn that there are more of the former than the latter.

Price

N252AQ is typical in that it is equipped with many of the more popular options. (Base price on the invoice was $135,900.) Instead of the standard King avionics package (consisting of two KX-155 nav/coms, KR-87 automatic direction finder [ADF], KT-76A Mode A non-altitude-encoding transponder and KN-64 distance measuring equipment [DME]), there is a King KNS-80 navigation receiver capable of storing four frequencies and having area navigation and distance measuring equipment features, a King KFC-150 autopilot with altitude hold, flight director and slaved horizontal situation indicator, and a KI-22 slaved ADF. The cost of these options came to $42,555.

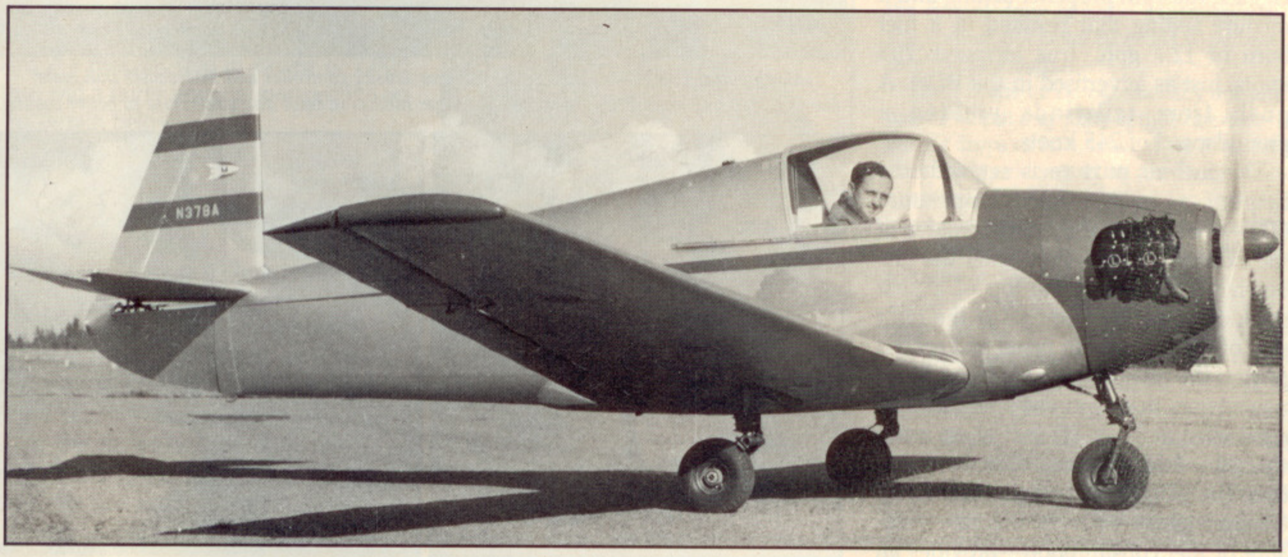
A standby vacuum system is standard equipment in all 252s.

Other options included a second alternator ($4,775), Terra blind encoder ($925), oxygen system ($3,635), B. F. Goodrich propeller anti-ice ($3,430) and Precise Flight speed brakes ($3,975). Add the other options, such as wing-tip recognition lights, auxiliary power plug, access step and the special edition decor group (this includes vertically adjustable front seats with lumbar support and center arm rests), and the total price of the airplane is $199,085.

This figure seems high, but there are a range of other options that can push the total price closer to $300,000. Loran, weather radar, 3M Stormscope, altitude preselect, vertical speed select and an in-flight telephone and air conditioning (new for 1987) may also be ordered.

Mooney recently announced a new, reduced price for standardized, IFR-equipped 252s. The price—$155,000—includes the standard King package mentioned above and represents a $40,000 cut from earlier standard-equipped prices. Incidentally, the new standard price does not include an oxygen system, which rather negates the purpose of having an airplane capable of flying at Flight Level 280.

While a Mooney 252 can be very pricey, bear in mind that price is relative.



The M-18 Mooney Mite was the sapling that eventually grew to become a family tree. Originally powered by a Crosley automobile engine and later a Lycoming, the diminutive single-seater featured such advanced concepts as automatic pitch trim with flap deployment, retractable gear and Al Mooney efficiency.

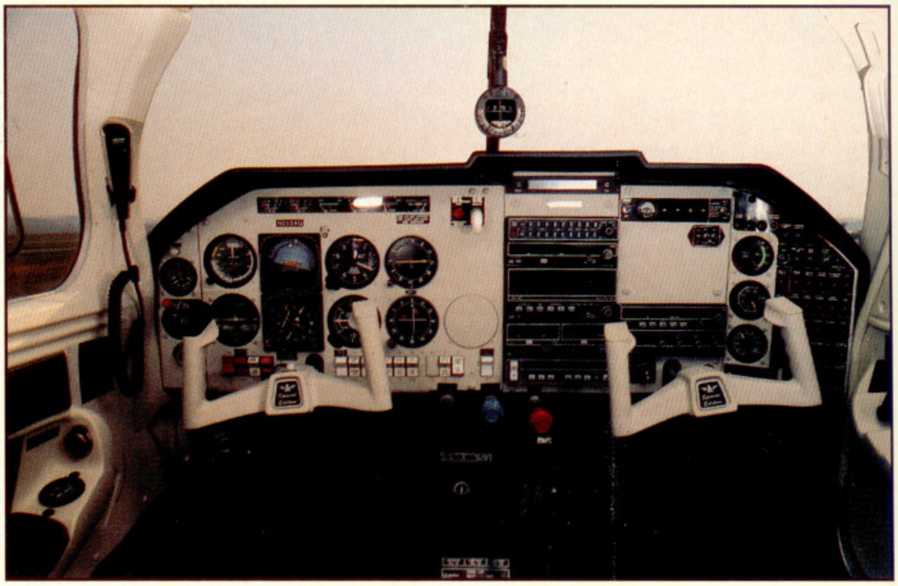
Where else can you buy 200-knot-plus performance in such an efficient package? If you are in the market for a new airplane, there are few alternatives. The Piper Malibu is capable of 215 KTAS, but its pressurization and six seats, among other factors, make it nearly double the price of a well-equipped 252. Used Cessna 210s and Pressurized 210s offer greater useful loads but guzzle fuel at up to six more gallons per hour and, at optimum cruise power settings, generally fly at true airspeeds 10 to 20 knots slower. And while certain used airplanes may offer the speed of the 252, it would be difficult to find one certificated to fly as high, or that has the safety and capability that the 252's redundant electrical and vacuum systems represent.

Performance

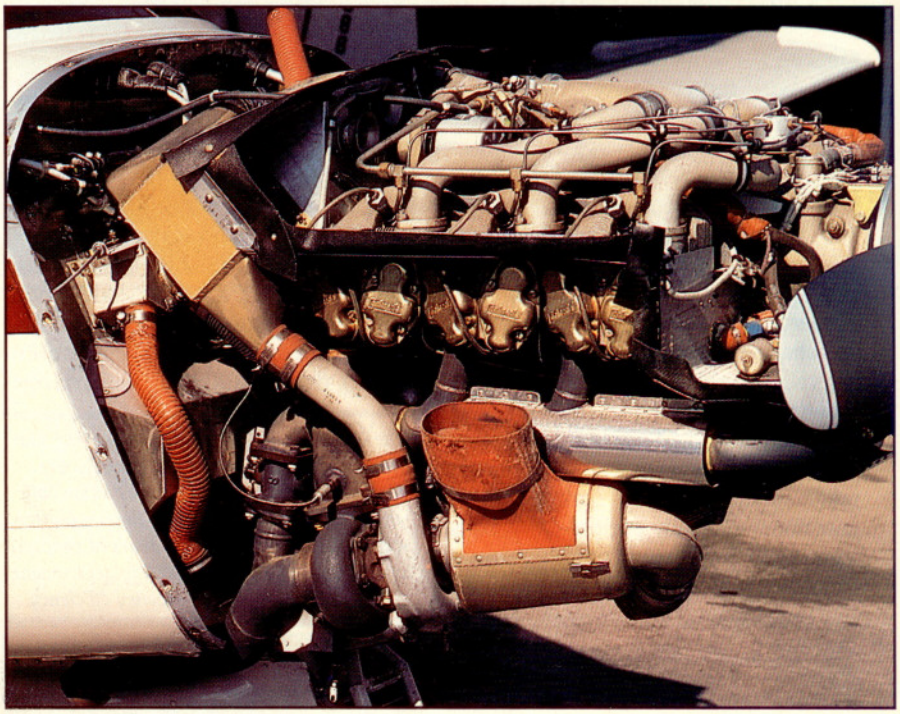
The most uncanny thing about the Mooney 252's performance is its close adherence to figures published in the pilot's operating handbook. To cite an example, a flight from Las Vegas, Nevada, to Hutchinson, Kansas, was conducted at FL270. Outside air temperature was −30 degrees Celsius, about 10 degrees warmer than standard conditions at that altitude. The power was set at 78.6 percent, which under those conditions required a manifold pressure of 29.3 in Hg, a 2,400-rpm propeller setting and a mixture setting that resulted in a fuel burn of 12.7 gph. True airspeed: 205 knots, just as advertised in the POH. A push from tailwinds yielded a groundspeed of 245 knots.

We recorded enough flying time in the 252 to discover its strengths outnumber its weaknesses.

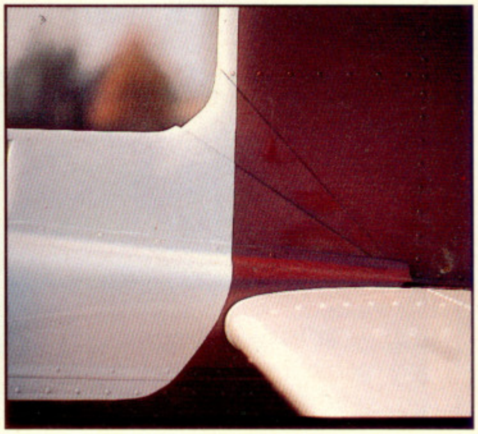
The fuel-air mixture is set with the help of a turbine inlet temperature (TIT—a measure of the temperature of the exhaust gases as they enter the turbocharger) gauge at the top of a neat stack of power instruments at the right side of the instrument panel and canted toward the pilot for easy visibility. Mooney advises that all cruise operations be conducted at peak TIT but at no more than the 1,650-degree-Fahrenheit redline. The SDI/Hoskins digital fuel flow/totalizer gauge—a very accurate measure of fuel consumption—provides an



Clean panel layout incorporates optional avionics stack. Engine and fuel quantity gauges are strategically placed for easy scanning. Flap and cowl switches are located on pedestal.



Continental TSIO-360-MB1 engine features density controller and intercooler that make overboosting and overheating non-issues. Larger intakes in cowl also contribute to better cooling.



extra level of accuracy in the leaning process, not to mention peace of mind on long trips that may require operations near minimum legal fuel reserves.

There is a down side to the 252's high-altitude capabilities. On eastbound legs it is very nice indeed to be able to climb high and take advantage of strong tailwinds, but oxygen masks can be cumbersome and intrusive, and the microphone in the pilot's mask is little help in maintaining clear communications with air traffic control.

In the face of strong headwinds, the 252's turbocharging might as well not exist. Our trip west to Las Vegas for AOPA's annual convention and industry exhibit found us flying over Kansas at 3,000 feet to avoid the strongest headwinds. Even so, our groundspeeds were in the 135-knot neighborhood; our range suffered as a consequence, and our low altitude prevented us from receiving many VOR stations.

The Precise Flight speed brakes make compliance with ATC's frequent dive-bomber clearances into terminal areas and to final approach fixes less frantic for the pilot and easier on the engine, too. To minimize the danger of shock cooling to sensitive engine components, Mooney recommends a descent power setting of 20-in manifold pressure and 2,200 rpm. The speed brakes, actuated by a button on the control yoke, may be deployed at any speed up to Vne and allow this power setting to maintain warmer engine temperatures during the steepest descent profiles. For a maximum performance descent, deploy the speed brakes, reduce power to the recommended values, slow the airplane to its Vlo of 140 KIAS, extend the gear, then pitch the nose over to an attitude that maintains the Vle of 165 KIAS (about 20 degrees nose-down). The result is a descent rate in excess of 2,000 fpm and a fairly unusual perspective on the terrain below.

Handling

Like all Mooneys, the 252 uses rubber sleeves as main landing gear shock absorbers. This is good, because the maintenance associated with oleopneumatic shock absorbers is obviated. Bad, because the airplane tends to hop and skip during the takeoff run and landing roll. The main gear have a relatively narrow track, and the relatively short distance from the nosewheel to the main gear contributes to a porpoising effect on landings that are a tad too fast.

Some good advice: Stay sharp on crosswind takeoff and landing techniques (Mooney recommends half flaps for landings with crosswind components greater than 12 knots), and learn to consistently plan normal approaches so as to arrive over the threshold at no more than 60 knots using full flaps (Mooney recommends a final approach speed of 75 KIAS for normal landings, 69 KIAS for short-field landings). Too much speed causes an excessive amount of floating. As with any airplane, the 252's quirks can be easily overcome with proper training and practice.

A strong nose-up pitching moment occurs when flaps are retracted, something to anticipate upon the initial, post-takeoff flap retraction and during go-arounds. Similarly, the nose pitches down with flap extension, requiring hefty amounts of nose-up trim. The Mite's "Simpi-fly" might help here, but the yoke-mounted pitch trim switch acts very quickly to adjust the entire tail assembly to compensate for any untoward control forces. Unfortunately, there is no

POWER TO SPARE

The 252's dual alternator system provides redundant sources of electrical power without the complexity and pilot work load common to other such installations. The two alternators operate in parallel, which is to say that their circuitry and associated components operate independently of each other. For example, each alternator has its own on-off switch, voltage regulator, over-voltage indicator, circuit breaker and field circuit breaker.

Perhaps the greatest confusion about this system's operation concerns the nomenclature of the alternators. Alternator number two is designated the primary alternator—even though it is belt-driven. Why? It rotates some 40-percent faster than the number one alternator, which is a gear-driven unit mounted on the engine accessory pad. This faster speed means that the number two alternator picks up almost all the electrical load of the airplane, particularly at idle power settings. As engine power is increased through approximately 1,700 to 2,000 rpm, the number one alternator begins to raise its power level, helping the other alternator to share the electrical load.

Electrical loads are displayed on a gauge that shows the output of each alternator and the load or voltage imposed on the airplane's

Combination gauge displays output of each alternator as well as the load or voltage on the airplane's single electrical bus.

single electrical bus. This bus loadmeter serves a dual function: It shows the electrical load on the bus and system voltage. A button at the top of this combination gauge makes it easy to check the condition of the battery. Push the button and the bus loadmeter's needle should deflect to the 24-volt (engine not running) or 28-volt (engine running, alternators on) position. A lower reading means that the battery is either in need of a charge (engine not running) or is in the process of discharging (engine running, alternators on). The latter case is likely to be accompanied by a blinking red "High-Low Volts" indication on the annunciator panel.

Should an alternator fail, the pilot is not really required to do anything. (Although each charging system can be fully isolated by pulling the appropriate circuit breakers.) The system is self-isolating in that the operating alternator will automatically meet the electrical demands of the airplane. The bad alternator's loadmeter will read 0, the functioning alternator's will indicate the percentage of its total rated output.

We tested the alternators' ability to meet various electrical loads and found them both up to the task. With *all* electrical equipment turned on (this included high-load items such as propeller anti-ice and pitot heat, as well as the current draw of radio transmissions), a single alternator never exceeded 90 percent of its maximum output.

There is one quirk. Occasionally one alternator's output may jump at the same time the other's drops to zero, while there is no other confirming evidence of an alternator failure. Reason: The output of the 252's voltage regulators is supposed to be permanently set at 28 volts, but slight differences may exist in their adjustment. Testing a single alternator's load, subtle load spikes and other gremlins can cause the two alternators to "fight" for the electrical load, causing it to flip from one alternator to another. Most times, however, the loadmeters showed that the two alternators were sharing the load. Not understanding this quirk, however, can cause the pilot some consternation, especially when flying in night instrument meteorological conditions.—*TAH* rudder trim, which is a real disappointment during those climbs to altitude.

Service difficulties

A survey of M20K (this includes both the 231 and 252) service difficulty reports recorded from 1982 to 1987 showed that our problems with N252AQ closely approximated some of those experienced in the fleet at large. The KFC-150 autopilot occasionally hunted in pitch when engaged in the altitude-hold mode; this was noted in one other 252's King autopilot. That particular defect was traced to a loose pitch trim cable, but the cause of our random pitch excursions remains a mystery.

Interesting. An airworthiness directive on the 1986 Mooney 252 (AD 85-25-2) requires the modification of servo motors in the KFC-200, KFC-150, KAP-150 and KAP-100 autopilots.

The only other airworthiness directives affecting the 252 series is AD 84-26-2, which requires that the paper induction air filters be replaced every 500 hours, and AD 77-12-6, which requires that the propeller "y" blades and clamps on certain Hartzell propellers be replaced with newly approved parts.

The only major problems we experienced were with the alternators. The service difficulty reports mention a total of 18 failures of the Prestolite ALX9425B alternators used in the 231 and only one of the higher capacity, Teledyne Continental 24-volt, 70-ampere/hour alter-

MOONEY 252 HITS AND MISSES

Hits

1) Panel lighting is superior. In addition to internal lights for each flight and navigation instrument, there are small panel floodlights. The intensity of both can be controlled by means of a rheostat. The brightness of the map light under the pilot's control yoke and the light that illuminates the oxygen pressure gauge can similarly be adjusted. High and low levels of indirect overhead lighting may also be selected.

2) Organization and presentation of instruments. The annunciator lights, engine, fuel and outside air temperature gauges are mounted directly beneath the glareshield, in plain view.

3) The optional wing-tip recognition lights. Extremely bright, and a very intelligent collision avoidance tool. Whenever we were called as traffic, other pilots had no problem picking us out.

4) The inflatable lumbar support system. Together with the center armrest, the vertical and angular seat adjustments, it makes all the difference in the world on those five-hour-plus trips the 252 is capable of performing.

5) The ease of cold starts. The 70-ampere-hour alternators and 24-volt battery make the engine turn with enthusiasm. Assuming that proper priming has been performed and all components are properly maintained, the engine should start on the first try.

6) Engine temperatures always in the green. In spite of operations in 90-degree Fahrenheit ambient temperatures, cylinder head and oil temperature indications never rose higher than the middle of their green arcs.

7) The vernier throttle control, which makes fine-tuning of manifold pressure a very low-work-load task.

8) The honest performance figures.

9) The speed brakes. Quick descents without shock cooling, but much more important is their effect in minimizing the excessive pretouchdown float for which Mooneys are so well known.

Misses

1) For those more than six feet tall and/or 200 pounds, the cockpit can be crowded.

2) The optional windshield defrost blower should be made standard. For pilots trying to clear windshield ice, the flow of heated air from the standard defroster system is inadequate, both in volume and temperature. A defroster is no substitute for properly configured and certificated windshield anti-ice protection, but in a pinch it is all you have.

3) When the front seats are adjusted for occupants with long legs, legroom in the rear seats is very tight. Otherwise, the rear seats are very comfortable.

4) Loading must be done very carefully, because it can be easy to load the airplane to an over-gross-weight condition. With full fuel, N252AQ has a useful load of only 388.4 pounds, making it a two-person-and-light-baggage airplane on long flights.

5) Because the 252 (and all Mooneys, for that matter) is so slippery, those new to the airplane may find it a challenge to slow it down in preparation for instrument approaches. Here is an example of what worked for us in a descent from 12,000 feet to an ILS with an final approach fix altitude of 3,000 feet:

- Manifold pressure to 22 in Hg, propeller to 2,200 rpm and speed brakes out for a descent at 170 KIAS and 1,500 fpm.
- Prior to levelling at 3,000 feet, speed brakes were retracted. While being vectored to intercept the final approach course, landing gear were left retracted, power was reduced to 20 in Hg and the propeller was left at 2,200 rpm. This resulted in 120 KIAS.
- Approaching glideslope intercept, power was reduced to 17 in manifold pressure with the propeller still at 2,200 rpm. This produced 110 KIAS—the maximum speed for flap extension—and flaps were positioned at the Takeoff (10-degrees deflection) position.
- At glideslope intercept, the landing gear were extended. Pitching down to follow the glideslope, power was left at 17 in manifold pressure. Airspeed was 100 KIAS. Descent rate was 500 fpm.
- With the runway in sight, power was slowly reduced, propeller rpm advanced, flaps extended an additional amount and speed brakes deployed just prior to touchdown, which came at approximately 55 KIAS.

6) The Mooney's slim fuselage and window design do not optimize visibility outside the cockpit.

7) Ingress and egress can be difficult for taller individuals.

8) There is a lack of storage space for charts, approach plates and other such equipment. This leaves the floor, or a back seat, to serve as storage. A related problem surfaced with the use of our portable intercom. Picture this: The intercom box is on the floor in front of the right seat, and its spaghetti-mess of wires runs across the cabin. During one landing, nose-up trim was applied. The trim wheel grabbed a few cords and began reeling in the box. The trim wheel seized. Suggestion: built-in intercoms, with jack installations at both front seat positions.

9) Absence of rudder trim. —TAH

Optional factory-installed Precise Flight speedbrakes facilitate dive-bomber descents at cruise power settings to avoid shock cooling and are useful for making no-float landings.

nators used in the 252 (see "Power to Spare," p. 45). Most of the Prestolite failures were due to cracks in the casing or base assembly and sheared drive gears. The one Teledyne Continental alternator problem was not really a failure at all: Its cooling air hose attach fitting broke off, exactly as happened to one of the cooling air hoses on N252AQ's alternators. While not a serious problem, an alternator deprived of a source of adequate cooling may well experience a curtailed service life. Mooney has redesigned the attach fitting out of tougher ABS plastic, and Mooney dealers will perform a retrofit to older aircraft at no charge.

Another problem occurred when our number two—and primary, in spite of its being belt driven—alternator apparently short-circuited due to a broken field wire's touching a part of the airframe. A clumsy attempt at field repair by inexperienced mechanics only compounded the problem. The rewiring job succeeded in short-circuiting the alternator one more time. Luckily, the alternator itself was spared. The problem was remedied by more painstaking troubleshooting (which destroyed one of the airplane's two independent voltage regulators; cost: $212) and a more professional rewiring job.

Another noteworthy item: The magnetic compass was swung with all electrical components on, as per standard procedure. When one of our alternators failed, the magnetic compass showed a consistent, −15-degree error in all points of the compass. We trusted the flux-gate compass, which agreed with every runway heading we tested, but this experience was a subtle reminder of some of the traps that await those who have occasion to rely on a 252's—or any airplane's—alternator redundancy. This would also hold true for the vast preponderance of single-engine airplanes that have a single alternator. Rather than find out under partial-panel, instrument meteorological condition circumstances, it is best to check the effect of an alternator outage on compass error by turning off any alternator or alternators during the pre-takeoff runup.

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It is difficult to find fault with the Mooney 252. For all its slipperiness and control response, the airplane is a surprisingly stable platform for instrument flying. The standby vacuum system as standard equipment is proof that not only does Mooney listen to the concerns

Barn-door cowl flap is electrically actuated and infinitely variable from fully open (above), for climb, to completely closed (below).

Dual vacuum pumps are standard on the 252. Annunciator warns of low vacuum pressure. Rocker switch activates standby pump.

of its customers, but is aware of one of the most serious challenges to the safety of single-engine IFR operations.

The availability of options such as weather radar, 3M Stormscope and propeller anti-ice allows owners and operators the kind of operational flexibility they deserve from an airplane of this caliber. Based on our experiences with the airplane, we would strongly suggest that Mooney continue to expand the 252's operational envelope and margin of safety by pursuing their rumored talks with the individuals marketing the TKS "weeping wing" anti-ice/deice system (see "Winter Thaw," p. 59).

Another new development that can only further advance the safety and proficiency of Mooney pilots is FlightSafety International's recent agreement to provide pilot initial training for purchasers of new Mooneys (see "Continuing Education," November *Pilot*, p. 34). It is a logical step in improving the quality of Mooney's products. With the 252, it may be very difficult to improve on the airplane's performance and design. By extension, that leaves only the human element to further refine. It is a measure that has almost universal consensus and represents a goal that would certainly meet with Mr. Mooney's approval. □

Mooney M20K 252
Base price: $135,900
Price as tested: $210,860
AOPA Pilot Operations/Equipment
Category: IFR*

Specifications

Powerplant	Teledyne Continental Motors TSIO-360-MB1 210 bhp @ 36 in Hg/2,700 rpm
Recommended TBO	1,800 hr
Propeller	McCauley, constant-speed two-blade, 74-in diameter
Length	25 ft 5 in
Height	8 ft 4 in
Wingspan	36 ft 1 in
Wing area	174.7 sq ft
Wing loading	16.6 lb/sq ft
Power loading	13.8 lb/hp
Seats	4
Cabin length	9 ft 6 in
Cabin width	3 ft 7.5 in
Cabin height	3 ft 8.5 in
Basic operating weight	1,830 lb
Empty weight, as tested	2,058 lb
Maximum weight	2,900 lb
Useful load	1,100 lb
Useful load, as tested	842 lb
Useful load w/full fuel	646.4 lb
Useful load w/full fuel, as tested	388.4 lb
Fuel capacity	471.6 lb (453.6 lb usable) 78.6 gal (75.6 gal usable)
Oil capacity	8 qt
Baggage capacity	120 lb, 17 cu ft
Hat rack	10 lb, 2.6 cu ft

Performance

Takeoff distance, ground roll	1,200 ft
Takeoff distance over 50-ft obstacle	2,000 ft
Max demonstrated crosswind component	12 kt
Rate of climb, sea level	1,080 fpm
Max level speed, 24,000 ft	219 kt
Cruise speed/endurance w/45-min reserve (fuel consumption) @ 78.6% power	
28,000 ft	202 kt/4.9 hr (76.2 pph/12.7 gph)
12,000 ft	176 kt/5.9 hr (76.2 pph/12.7 gph)
Max operating altitude	28,000 ft
Critical altitude	23,000 ft
Landing distance over 50-ft obstacle	2,280 ft
Landing distance, ground roll	1,080 ft
Limiting and Recommended Airspeeds	
Vx (best angle of climb)	71 KIAS
Vy (best rate of climb)	96 KIAS
Va (design maneuvering)	118 KIAS
Vfe (max flap extended)	112 KIAS
Vle (max gear extended)	140 KIAS
Vlo (max gear operating)	
Extend	140 KIAS
Retract	107 KIAS
Vno (max structural cruising)	174 KIAS
Vne (never exceed)	196 KIAS
Vs1 (stall, clean)	61 KIAS
Vso (stall, landing configuration)	56 KIAS

All specifications based on manufacturer's calculations. All performance figures based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted.

**Operations/Equipment Categories are defined in June* Pilot, *p. 98.*