MOONEY 201

Lopresti has been at it again: a few tweaks, a few more knots.

BY MARK M. LACAGNINA

continued

Mooney Aircraft Corporation is a small company with limited resources. It cannot depend on financial infusions from its parent, Republic Steel. The steel industry, after all, is about as healthy as the general aviation industry. Mooney knows that its survival against competition from larger lightplane manufacturers with more diversified product lines depends upon its ability to produce better products.

It should come as little surprise to anyone familiar with Mooney's airplanes that the company actually has improved its market share significantly during one of the industry's toughest periods. In 1982, about one of every five pilots who purchased a new, single-engine retractable airplane chose a Mooney. The company believes that 1983 results will show an improved ratio of one in four.

Mooney's success in these tough times can be attributed to some old-fashioned business principles: attention to detail and dedication to quality.

For most pilots, an airplane's speed always has been the primary factor in purchase decisions. Nowadays, pilots want an airplane that can derive maximum performance from every expensive gallon of aviation fuel. Performance and efficiency are Mooney's hallmarks. The naturally aspirated M20J/201 and the turbosupercharged M20K/231 offer a lot more bang for the buck than their competitors.

The M20J, for instance, is 10 to 15 knots faster and about two gallons per hour more efficient than similarly powered, four-seat retractables such as the Cessna Skylane and the Piper Arrow. The Mooney is competitive in terms of range and payload, also. Maximum ranges with IFR reserves at 8,000 feet and 65-percent power are: 900 nm for the M20J; 935 nm, Skylane RG; and 845 nm, Arrow. The M20J's maximum payload is 685 pounds, compared with the Skylane's 793 pounds and the Arrow's 681 pounds.

In addition, the airplane's speed and fuel efficiency stack up well against more powerful, six-seat singles. At 8,000 feet and 75-percent power, the M20J cruises at 169 knots while burning about 11 gph. The naturally aspirated Cessna 210 Centurion and the Beech A36 Bonanza both cruise at about 166 knots and burn about 15 gph, while the Piper Saratoga SP cruises at 157 knots and burns 18 gph.

This performance is a product of evolutionary rather than revolutionary design changes. Shortly after Republic Steel acquired the struggling company in 1973, LeRoy (Roy) Lopresti, a member of the team that created the very fast and efficient Grumman/Gulfstream Tiger, was hired to breathe new life into an airplane design that had undergone few substantial changes since leaving Al Mooney's drawing boards in the early 1950s.

The traditional approach, a bigger engine, was rejected. Instead, Lopresti focused his attention on methods of reducing drag on Mooney's best seller, the M20F Executive.

According to Lopresti, up to 20 percent of the total drag produced by an airplane can be contributed by problems with airflow within the engine cowling—and the Executive's cowling was creating plenty of problems. Therefore, he designed a tighter cowl with an induction inlet 70 percent smaller than the Executive's. Airflow distribution was improved, and larger cowl flaps were provided to ensure ad-

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equate engine cooling. These tweaks, alone, added seven knots. Other changes included: a recontoured windshield; inboard doors that fully enclose the main landing gear when retracted; flap gap seals; flap hinge fairings; a flush plastic cover for the recessed landing light; a trailing exhaust pipe; a smaller, underwing probe for the outside air temperature gauge; relocation of the previously externally mounted oil cooler; more use of flush-rivets; and replacement of the Executive's Hartzell propeller with a more efficient unit from McCauley.

Attention to detail resulted in an airplane that is 19 knots faster than its predecessor. The new airplane was designated the M20J, and the name Executive was replaced with a number: 201. This is Lopresti's signature—top speed of the M20J is 201 mph.

Further aerodynamic refinement was in store for 1981: sculptured fiberglass wing tips, which reduce parasitic drag and improve the airplane's roll response. The wing tips initially were introduced with the turbocharged M20K in late 1978.

A close inspection of this year's M20J reveals a number of tweaks by Lopresti and fellow Mooney engineers Rocky Peters and Warren Hamilton. Taken one by one, the changes appear insignificant. Together, they reflect a substantial effort.

Slight reductions in parasite drag have been achieved with redesigned nose-gear doors; a smooth, one-piece belly skin; a tailcone fairing; a blade antenna; redesigned engine-access doors; and elimination of an air-induction port and a cabin vent.

The nose-gear doors used to leave up to a quarter-inch gap when closed. They have been reshaped and fitted with an overlapping Teflon seal.

The new belly skin is made of foam sandwiched in fiberglass and is about eight feet long and three feet wide. It is held in place by 38 quarter-turn fasteners and can be removed in about one minute to expose fuel lines, control systems, fuel selector and landing-gear actuator, according to Mooney. It replaces eight access panels that had 175 screws, and it houses an internal marker-beacon antenna.

The blade antenna replaces the "towel bar" that wraps around the front of the vertical stabilizer on previous Mooneys. The blades house the glideslope antenna, which used to be mounted on the tube that runs from the top of the panel to the cabin roof, and provide for better reception, Mooney said.

The hinges on the oil-access doors of both models, as well as on the turbocharger access door in the M20K, have been moved from outside to inside the engine cowl.

A fresh-air port and a cabin vent used to appear both on the left and right sides of the fuselage. The left-side port and vent have been eliminated. The eyeball outlet near the pilot's left knee now feeds from the right-side port.

Due to these drag-reducing changes, the 1984 Mooneys are faster than their predecessors—but how much faster has not yet been documented. Lopresti believes the airplanes may have picked up between two and three knots. (And, no, the 201 and 231 will not be renamed the 204 and 234.)

The 1984 airplanes have internally lighted rather than post-lighted instruments; new lap belts and shoulder harnesses with smaller buckles and latches; more accurate oil-pressure and fuel-pressure transducers; and a Mitchell quartz-controlled clock, rather than

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a Davtron unit. To make more room for the circuit-breaker panel, the manifold pressure gauge has been reduced from three to two inches. It is now the same size as the other engine gauges.

A standby vacuum system with an electric motor in the tail now is available as an option.

In addition, the M20K has a new engine and alternate air system. The Teledyne Continental TSIO-360-GB has been updated to a TSIO-360-LB1B with new cylinders, pistons and rods, a larger throttle body, larger induction tubes and other improvements. The M20K is the first production airplane to use the new engine. The alternate air door has been moved to a different location within the engine cowl, where the airflow is cooler. The new alternate air system operates automatically as well as manually. The previous system was solely manual. (A detailed report on the 1984 Mooney M20K will appear in a future issue of *Pilot*.)

The *Pilot* staff flew a 1984 M20J on a two-week lease from Mooney Aircraft. Our evaluation airplane, N5726M, is well-equipped for IFR flight operations. Base price of the airplane is $77,950, a nine percent increase from 1983. Mooney's operational group—which comprises about 23 separate items, including an alternate static air source, basic flight instruments, antennas, cabin speakers, emergency locator transmitter, engine gauges, a fuel-flow/totalizer system with memory, heated pitot, radio cooling blower and strobe lights—adds $8,200 to the base price. N5726M also is equipped with such options as: a King Silver Crown avionics package ($20,085); a digital King KT 79 transponder ($1,675 in exchange for the analogue KT 76A); a 3M WX-10 Stormscope ($9,200); a King KFC 150 flight director/autopilot system ($14,555); a nav radio selector switch for the autopilot and horizontal situation indicator ($1,200); an encoding altimeter ($1,375); and an electrically heated propeller deice system ($1,300). The bottom line of the suggested retail price list for N5726M is $138,525.

There is only one other item in Mooney's copious options list that I would like to have in an M20J: a standby vacuum system ($1,850 and 12 pounds).

As equipped, N5726M is not a fill-the-seats, fill-the-tanks airplane; 196 pounds of accessories and options bring its empty weight to 1,867 pounds. With a gross weight of 2,740, its 873-pound useful load allows for four, 170-pound people, 20 pounds of baggage and 173 pounds (28.8 gallons) of fuel—enough for about two hours of flying with reserves.

Preflight of an M20J is fairly straightforward. The fuel selector is drained first by pulling a gascolator ring on the floor in front of the pilot's seat while sequencing the selector between the left and right tanks. The tanks each hold 32 gallons of usable fuel and have external sight gauges to aid refueling.

Taxiing on a cluttered ramp requires consideration because the M20J has a rather wide minimum turning radius of 41 feet and long wings, with a span of a little more than 36 feet. Towing limits are narrow: The nose gear can be pivoted only up to 14 degrees either side of center. The mechanism can be damaged if this limit is exceeded.

THE LTV DEAL

Mooney Aircraft has changed hands several times since the company was formed by Al and Art Mooney in the late 1920s. The company, which currently is a subsidiary of Republic Steel, may soon change hands once again.

The new owner may be LTV Corporation of Dallas, which has proposed to acquire Republic Steel. LTV was formed in 1961 through the merger of Chance Vought and Ling-Temco Electronics. One subsidiary of LTV is Jones & Laughlin of Pittsburgh, the nation's third largest steelmaker. (Republic is the fifth largest.)

Another LTV subsidiary is LTV Aerospace, a company that produces missiles and components for Rockwell International's B-1B bomber. LTV Aerospace previously produced components for NASA spacecraft, the Boeing 747, McDonnell Douglas DC-10 and the Lockheed C-130 and P-3. The company also built the A-7 family of fighter aircraft.

The proposed acquisition of Republic Steel by LTV Corporation still must be voted upon by stockholders of both corporations and then be approved by the Securities and Exchange Commission. The proposal also may draw the scrutiny of the Justice Department.

If it goes through, the deal could be a good thing for Mooney Aircraft, because LTV already has considerable experience in the aerospace industry and may be able to provide the financing that would enable Mooney to proceed more quickly in its development of the pressurized Model 301. (The 301 currently is undergoing flutter and stress analysis; initial deliveries are scheduled for 1986.)

However, the merger of LTV and Republic could leave Mooney Aircraft looking for a new owner: LTV has a reputation for absorbing steelmakers and then spinning off the subsidiaries. —*MML*

Normal takeoffs are made with 15 degrees of flap. During my initial checkout in N5726M, Gene Oakes, supervisor of Mooney's delivery center, recommended that I raise the flaps as soon as the gear is fully retracted during initial climb. This serves to dampen attitude changes: The nose pitches up when the gear are retracted and down when the flaps are raised.

During initial climb from Mooney's Kerrville, Texas, headquarters on a relatively cool day, N5726M climbed at 1,100 fpm at 88 knots, the airspeed for best rate of climb. Passing through 4,000 feet with cruise climb settings of 26 inches, 2,600 rpm and 100 knots, the M20J ascended at 700 fpm.

When the air is clear of moisture and dust, a ram air control allows induction air to bypass the air filter. At full throttle, this contributes an extra one-half to one inch of manifold pressure. A ram air warning light in the annunciator panel activates when the gear are lowered to remind the pilot to deselect the ram air feature. The ram-air control in N5726M would not stay shut. We would like to see Mooney incorporate a friction lock on the control.

My longest flight in N5726M was a 744-nm leg between Kerrville and Nashville. With a little help from a tailwind, the M20J made the trip in 4.3 hours. Cruising at 70-percent power at 7,000 feet, true airspeed was 165 knots and fuel flow was about 10.3 gph. The pilot's operating handbook indicates the M20J could have been leaned to 9.9 gph without sacrificing airspeed, but I chose to be conservative with the new airplane.

During the flight, I noticed small particles accumulating on the windshield. I attributed the smudges to debris from several huge fires ablaze in Texas and Arkansas. After landing, I found the smudges actually were grease that was being thrown out of the front of the cowl. An airframe and powerplant mechanic traced the grime to propeller governor seals that had not yet seated properly. He said the problem was common with brand-new airplanes (N5726M had been flown only about 15 hours when I left Kerrville) and that it should clear up shortly. He was right.

According to Mooney's measurements, the M20J's cabin is wider than many single-engine retractables. The cabin, however, is quite cozy. The sports car analogy is appropriate: You don't sit in a Mooney, you wear it. *Pilot* staffers of various shapes and sizes flew the M20J and reported being very comfortable. One rear-seat passenger, though, complained about the narrow armrests and paucity of leg room with a tall person in front.

The flight controls are push/pull and torque tubes, rather than cables and pulleys. The controls feel rather stiff, especially at speed. The aileron- and rudder-control systems are interconnected, which allows the pilot to make minor heading changes with his feet while using his hands to fold a chart or copy an ATC instruction. The rudder is sensitive and cannot be trimmed manually. During level, unaccelerated flight, N5726M tended to yaw slightly to the left; but I found that I could keep the ball in the turn coordinator centered merely by resting the sole of my right shoe on the rudder pedal. The elevators have no trim tabs. As on a Lockheed JetStar, the entire empennage pivots around hinge points to trim the airplane.

The laminar-flow wings shed lift reluctantly and, then, all at once. The M20J tends to fall off on a wing during a stall.

The airplane descends with reluctance. Clean and with power reduced just enough to keep the engine gauges within their green arcs, the airplane descends at about 500 fpm with the airspeed well into the yellow arc. The only way to comply with an ATC request for expedited descent is to slow below 132 knots and lower the landing gear. With sufficient power to keep the engine warm, the M20J descends between 1,000 and 1,700 fpm at airspeeds between 115 and 130 knots.

Airspeed control during approach and landing is important. The airplane can build up speed very quickly. Target speed on final, at gross weight and full flaps, is 71 knots. If brought in a bit too fast, it will float a long way down

Mooney M20J/201

Base price $77,950

Price as tested $138,525

AOPA Pilot Operations/Equipment Category*:

Cross-country $100,870 to $104,175

IFR $126,520 to $146,735

Specifications

Powerplant	Avco Lycoming IO-360-A3B6D, 200 hp @ 2,700 rpm
Recommended TBO	1,800 hr
Propeller	McCauley, 2-blade, constant-speed, 74 in
Length	24 ft 8 in
Height	8 ft 4 in
Wingspan	36 ft 1 in
Wing area	167 sq ft
Wing loading	16.4 lb/sq ft
Power loading	13.7 lb/hp
Seats	4
Cabin length	9 ft 6 in
Cabin width	3 ft 7.5 in
Cabin height	3 ft 8.5 in
Empty weight	1,671 lb
Empty weight, as tested	1,867 lb
Gross weight	2,740 lb
Max useful load	1,069 lb
Useful load, as tested	873 lb
Payload w/full fuel	685 lb
Payload w/full fuel, as tested	489 lb
Max takeoff weight	2,740 lb
Max landing weight	2,740 lb
Fuel capacity, std	399 lb (384 lb usable) 66.5 gal (64 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	850 ft
Takeoff distance over 50-ft obst	1,770 ft
Max demonstrated crosswind component	11 kt
Rate of climb, sea level	1,025 fpm
Cruise speed/Endurance (fuel consumption)	
@75% power, best economy	
4,000 ft	162 KTAS/5.1 hr (63 pph/10.5 gph)
8,000 ft	168 KTAS/4.9 hr (64.8 pph/10.8 gph)
@65% power, best economy	
6,000 ft	154 KTAS/5.9 hr (55.2 pph/9.2 gph)
10,000 ft	160 KTAS/5.7 hr (56.4 pph/9.4 gph)
@55% power, best economy	
8,000 ft	144 KTAS/7.0 hr (46.8 pph/7.8 gph)
12,000 ft	149 KTAS/6.7 hr (48.6 pph/8.1 gph)
Service ceiling	18,800 ft
Landing distance over 50-ft obst	1,988 ft
Landing distance, ground roll	920 ft

Limiting and Recommended Airspeeds

Vx (Best angle of climb)	69 KIAS
Vy (Best rate of climb)	88 KIAS
Va (Design maneuvering)	116 KIAS
Vfe (Max flap extended)	115 KIAS
Vle (Max gear extended)	132 KIAS
Vlo (Max gear operating)	
Extend	132 KIAS
Retract	107 KIAS
Vno (Max structural cruising)	176 KIAS
Vne (Never exceed)	198 KIAS
Vr (Rotation)	63 KIAS
Vs1 (Stall clean)	63 KIAS
Vso (Stall in landing configuration)	55 KIAS

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

**Operations/Equipment Categories are defined in June 1983 Pilot, p. 96. The prices reflect the costs for equipment recommended to operate in the listed categories.*

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the runway. Even at the target airspeed, the M20J tends to jitter around on its tires while airspeed decays. Raising the flaps as soon as the main gear contact the runway plants the airplane firmly and enhances braking action. There is little chance of flicking the wrong switch: The flap selector is a small tab on the lower right side of the control column; the gear selector is a round knob high on the panel.

Only a few airworthiness directives have been issued on the M20J. The major directives, issued in 1978 and 1979, called for inspections of the airplane's magnetos and fuel system. At press time, Mooney and Plessey Dynamics, manufacturer of a gear actuating system used for the first time by Mooney last year, were working together to solve a problem that affects about 90 M20Js and Ks built during 1983. The problem can prevent the gear from being extended either electrically or manually and has been a factor in two recent incidents. Mooney has advised owners of the affected airplanes either to avoid flying their airplanes or to operate them under 132 knots with the gear down until a fix is available.

About eight months ago, Mooney initiated a time-sharing program for prospective buyers who cannot afford individual ownership of a new airplane. The program, in essence, helps the arrangement of co-ownerships. According to marketing director Jeff Conrad, more than 1,000 people have registered for the program and are now being introduced to each other. "We have sold at least two airplanes under the program, so we know it works," Conrad said.

The M20J's cruise speed of 169 knots and its fuel burn of only 11 gph is attractive, to say the least, in this age of tight money and expensive fuel. Several years ago, *Pilot* observed that Mooney Aircraft cleared a path other manufacturers would follow in the 1980s. They did not, and the path now appears more of a gap. While the others have been repainting their inventories and awaiting better fortune in the wake of an economic turnaround, Mooney steadfastly has been applying its energy to what it does best: making a simple, fast airplane go even faster on not an ounce more fuel. □

SPOTTER'S GUIDE

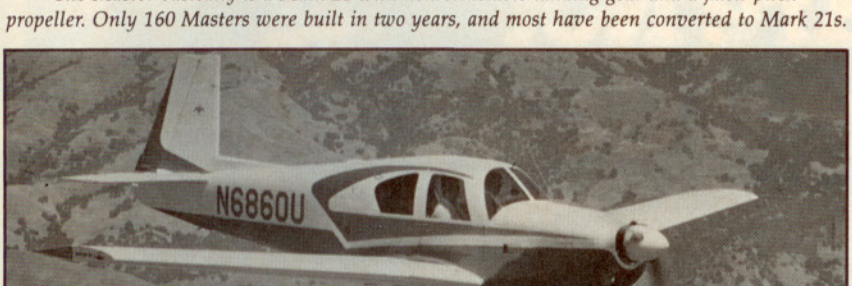
Al Mooney began work on the four-seat M20 Mark 20 in 1952. The prototype had a 145-hp Continental engine, but the M20 went into production in 1955 with a 150-hp Lycoming. The wing spar and tail structures of the M20 are made of bonded and laminated aircraft spruce.

In 1958, the 150-hp Lycoming O-320 was replaced with a 180-hp O-360. The airplane was renamed the M20A Mark 20A. The engine change boosted cruise speed from 143 to 156 knots.

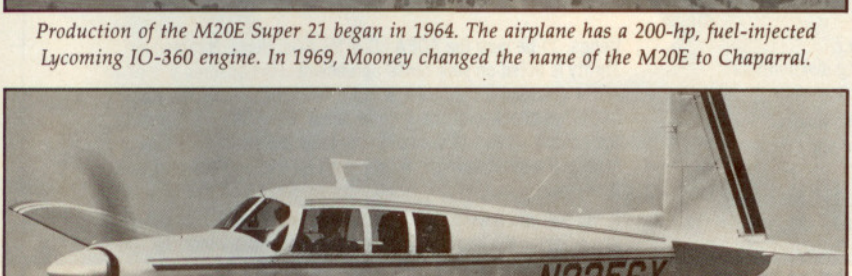
Ralph Harmon converted Al Mooney's 20th design into an all-metal airplane. The M20B Mark 21 was put into production in 1961. Gross weight remained at 2,450 pounds, but the metal components increased the empty weight of the M20B from 1,417 to 1,527 pounds.

Introduced in 1962, the M20C Mark 21 has a gross weight of 2,575 pounds. Mooney produced more than 1,600 Mark 21s before changing the name to Ranger in 1968. The Ranger differs from the Mark 21 in having fixed cowl flaps, a nonretractable boarding step and no dorsal fin. The M20G Statesman also was introduced in 1968. It is similar to the Ranger but has a 10-inch longer cabin. In two years of production, only about 190 Mooney M20Gs were built.

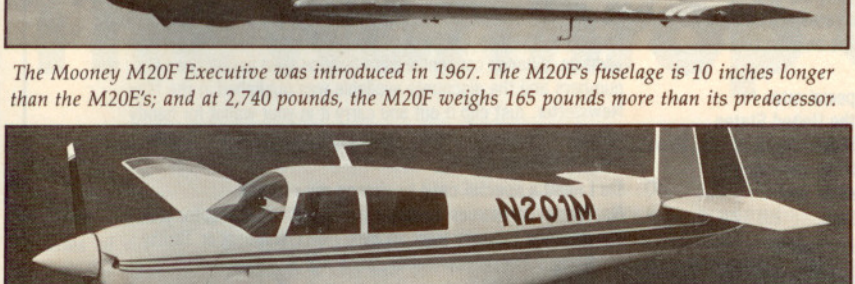
In 1963, Mooney answered dealers' requests for a training aircraft with the M20D Master. The Master basically is a Mark 21 with nonretractable landing gear and a fixed-pitch propeller. Only 160 Masters were built in two years, and most have been converted to Mark 21s.



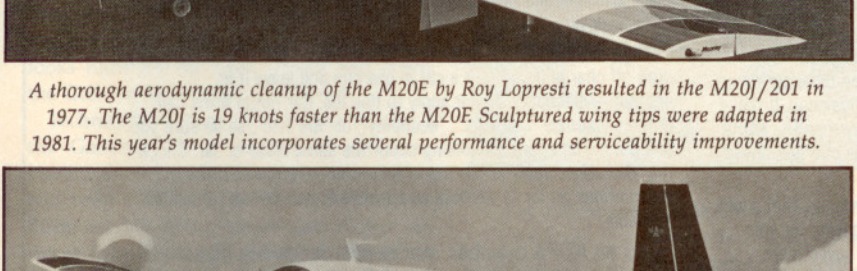
Production of the M20E Super 21 began in 1964. The airplane has a 200-hp, fuel-injected Lycoming IO-360 engine. In 1969, Mooney changed the name of the M20E to Chaparral.



The Mooney M20F Executive was introduced in 1967. The M20F's fuselage is 10 inches longer than the M20E's; and at 2,740 pounds, the M20F weighs 165 pounds more than its predecessor.



A thorough aerodynamic cleanup of the M20E by Roy Lopresti resulted in the M20J/201 in 1977. The M20J is 19 knots faster than the M20F. Sculptured wing tips were adapted in 1981. This year's model incorporates several performance and serviceability improvements.



The turbosupercharged M20K/231 was introduced in late 1978. Powered by a 210-hp Continental TSIO-360 engine, the M20K's maximum operating altitude is 24,000 feet. Among the changes incorporated in the 1984 M20K are a highly modified engine and an optional stand-by generator.