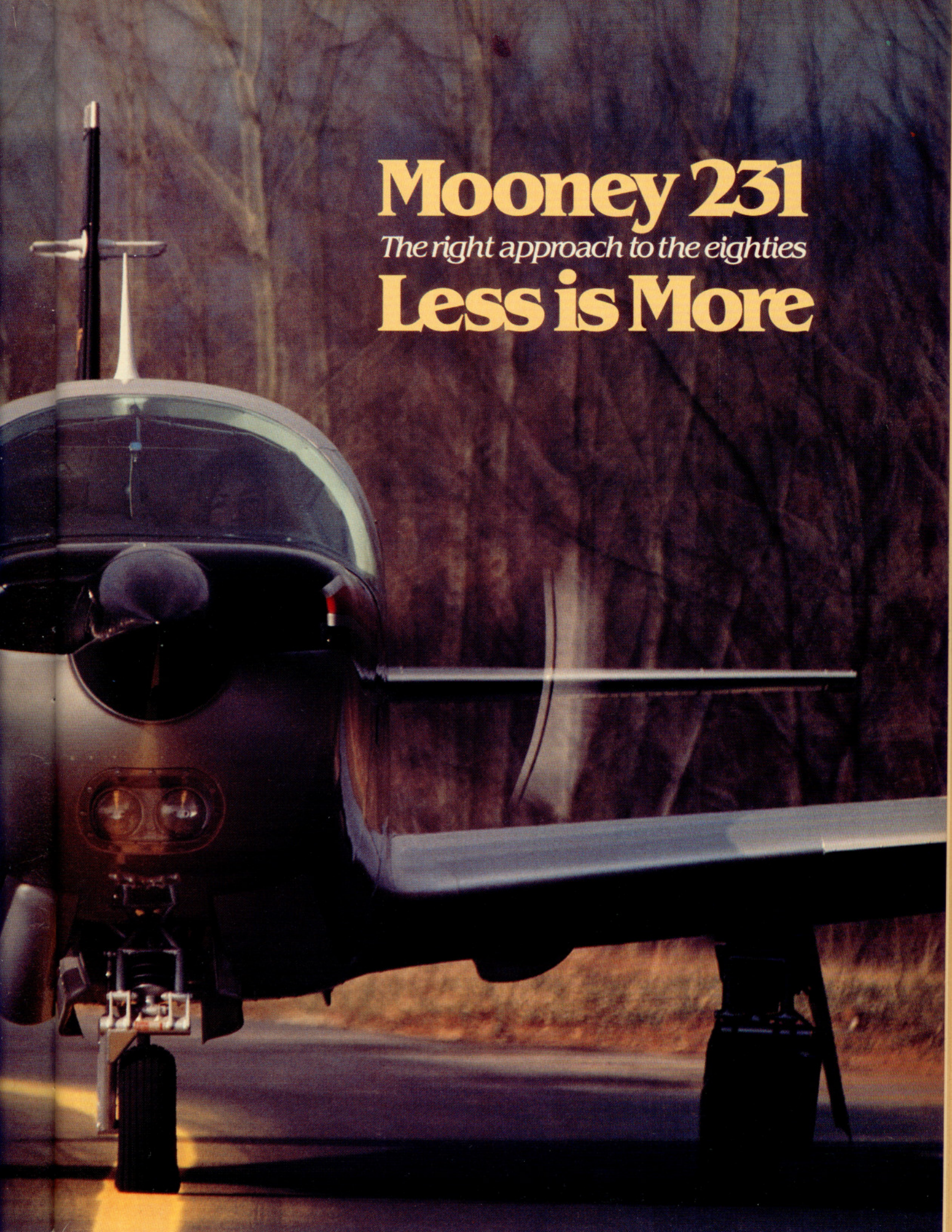

Mooney 231
The right approach to the eighties
Less is More

Mooney 231

The 231 shows that efficiency need not be spartan. Inside space is comparable to other four place retractables. Luxury options include metallic paint (right) and leather interior (below).

The American/Grumman/Gulfstream and Mooney product lines have one thing in common: a man. More specifically, an engineer named L. P. (Roy) Lopresti. If he had run an independent design company, it probably would have been called something like Gofaster, Inc. That's precisely what Lopresti, who is now vice president of research and development at Mooney Aircraft, has been doing for the past few years.

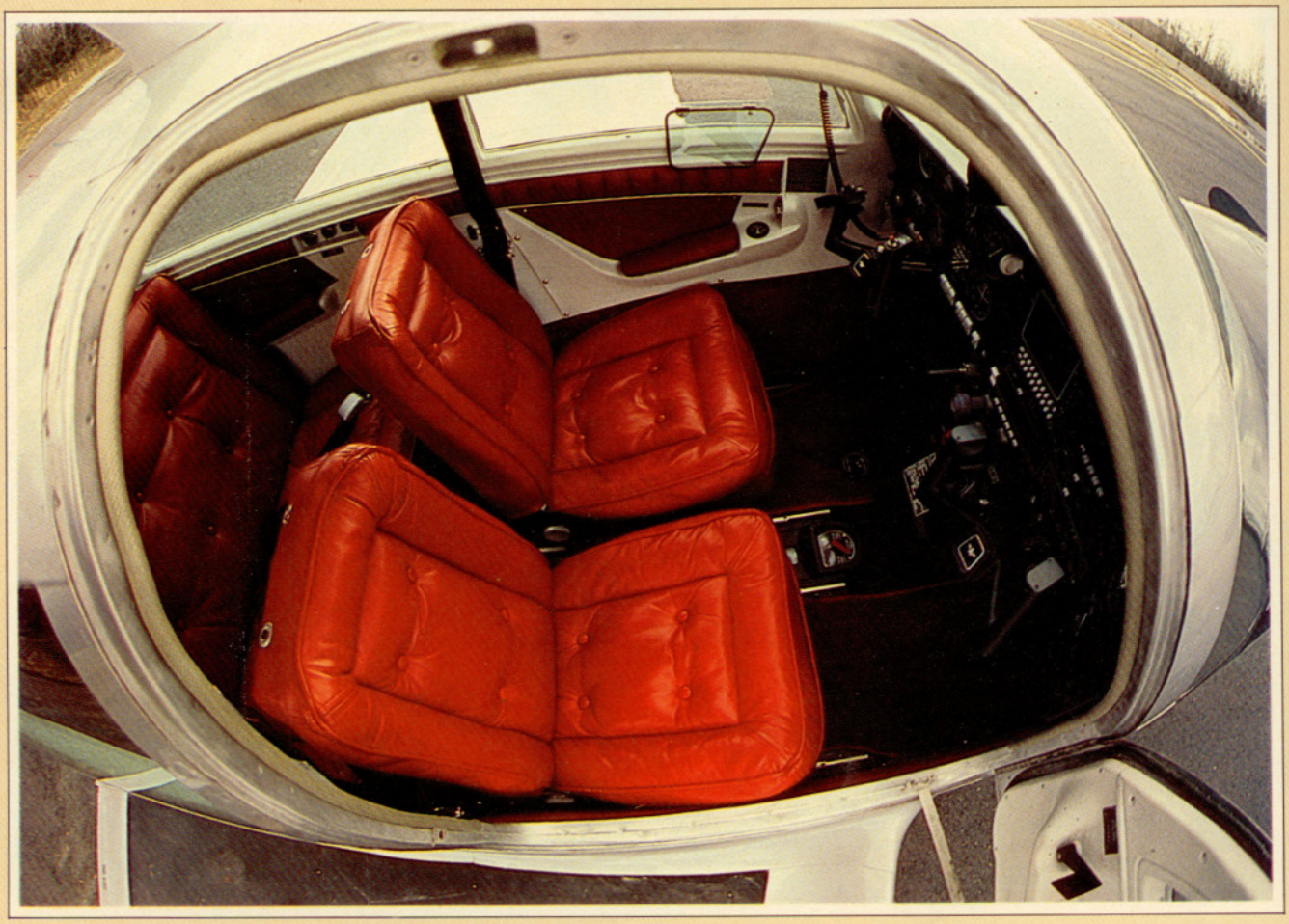
The four-place AA-5A Cheetah and AA-5B Tiger single-engine designs, which are being transferred to Northern Ireland as a result of the purchase of all unsold units by International Transport and Earthmoving Company Ltd., were the first light aircraft to get Lopresti's fine tuning. They ended up faster and more efficient than many of their retractable competitors. His first full treatment for Mooney was the Model 201 (see *Pilot*, January 1977). Last April we reported on the turbosupercharged Model 231, which added another dimension to the always efficient Mooney Mark 20 series.

A great deal of that article was devoted to the many small changes made to the airframe that further improved what was already the most efficient single-engine airframe sold. The turbosupercharged engine was the icing on the cake, adding more flexibility of operation for pilots who needed it.

Whether pilots needed it or just got excited about it, Model 231 sales passed those of the 201 almost immediately. The 231 was introduced in late 1978. Eighteen were delivered that year, compared to 361 Model 201's. Last year 264 Model 231's were delivered; 201 deliveries fell to 175. The company claims that even more of both would have been sold if the factory could have built them. (Original production scheduling called for 480 units for the year.)

Production plans for 1980 again have been set for 480 units: 288 Model 231's and 192 Model 201's. That's pretty good for a small, two-product company that had been written-off a few years ago after bankruptcy was followed by an unsuccessful series of rescue attempts by several companies. It's even better when one considers Mooney's limited production capability and network of only 50 dealers in the lower 48 states and Puerto Rico.

What many observers have found most exciting, however, is that the



original performance increase, which was derived from the old Executive (the Model 201), was developed within very strict and modest budget limitations. In turn, its success provided much of the development capital for the Model 231. Sure, the company is owned by Republic Steel, so one would assume budgets to be generous if not enormous. But Mooney had to prove its ability to survive before Republic would provide much funding beyond what was essential to keep the doors open. And research and development hasn't been the only division of Mooney (or any other firm) requiring funds; the competition among departments can be fierce. By any measurement, Mooney has to be considered a success.

We think that in achieving it as they have—by demonstrating the ability to increase performance efficiently—the company has pointed the way to go in the future. Energy availability and cost alone may end the perennial single- versus twin-engine argument for most pilots, except for those with practically no operating-budget limitations.

This year, Mooney has joined Beech, Cessna and Piper in offering additional weather protection on its single-engine aircraft (although at this writing Piper has not yet certificated the known icing package for the Saratoga SP and Turbo Saratoga SP). Electric propeller deicing and RCA's digital Weather Scout I single-engine radar are now available options on the Mooney aircraft.

While this doesn't make the 231 a go-anytime airplane, the two options do provide weather avoidance capability—an electronic eye in the soup—as well as protection for the key element, the propulsion system, should one encounter unanticipated icing conditions. To be able to fly during forecast icing, a full-protection system certificated for known icing is required. And there are conditions in which even the best equipped airplane shouldn't go. However, the electric propeller system extends the airplane's capability and the pilot's options during chance encounters.

The first *Pilot* evaluation flights of a 231 occurred last winter during a series of cold, wet IFR systems. More time was logged IFR than VFR, and there were several times when unforecast icing conditions were encountered. During one such flight, we were convinced that the extra $5250 in base price between the 201 and 231 was well worth it. Ice existed virtually everywhere, except where it was forecast. We requested altitude changes and information several times, attempting to stop the accumulation. The greatest concern was getting an unbalanced load on the propeller. Any ice on a propeller can be bad, since performance on most aircraft is degraded far faster than with airframe ice. An imbalance literally can shake the propeller and engine so badly that the prop can fail, or the engine can be torn from the mounts so quickly that catastrophic failure can occur before an alert pilot can shut down the engine.

Bless that turbo! We climbed through 17,000 feet before we stopped taking on ice. Pilots of aircraft below us were in serious trouble—two twins reported that they were unable to climb and that they were too low already to have any hope of descending to get out of the icing conditions. It was one of those days when the only hope was to go up—'way up.

How much easier an electric propeller deicing system (or alcohol) would have made the flight that day, because there was still the problem of getting down, and none of the ice on the airplane had sublimated. Air traffiic control was busy with requests from many pilots. We couldn't get

any useful information about what was going on at the lower altitudes at our destination, and the weather system was worse than forecast.

For every time a pilot runs into conditions that weren't forecast, there are a great many times when a flight is delayed or canceled because weather beyond the pilot's or equipment's capability is forecast, or there's a chance that it will be present. Such are usually the times when the actual conditions can't be determined because there are no pilot reports available. You have to question and judge without help. Go or no-go. If only I had radar. Or, if only there were some limited anti-icing or deicing capability to provide a way out if the "chance of" becomes reality.

For pilots who regularly use an airplane for transportation, such aids can be worth more than two engines or genuine leather seats or something else that's nice. Selecting or outfitting a plane becomes an options game.

This year's 231 is, more than ever, a small, slick, efficient flying platform to which one adds options.

It would take a lot of looking to find many basic changes in the 1980 Model 231 over a 1978 or '79. There have been a few minor changes. The glare shield has a visible change: a bump in the center to accommodate the radar display tube. The shield also has been changed to reduce vibration (which was an annoying rattle at full power) and to improve durability. The fresh-air intake system has a new flow modulation valve in the overhead that improves the control and volume of fresh air to each individual vent.

For pilots who regularly use the altitude capability of the 231, a 76 cubic foot, built-in oxygen system is available. The still-available portable system provides the option of taking it along or flying below 12,500 feet, but when you take it, it lies on the rear seat or the floor. The new system has one outlet in the left armrest for the pilot (the pressure-quantity gauge replaces the ashtray) and three in the left rear-seat armrest. It provides good duration, even with four on board at altitude.

Our evaluation aircraft, N231GV,

Flight director-autopilot systems such as King's KFC200 (above and right) add airline sophistication to light singles. The KFC200 includes a go-around mode to retrim the aircraft to proper altitude.

is almost identical in appearance to N231M, which we flew last year. The silver base color is still a matter of debate among colleagues and acquaintances. Some like it, some can't stand it. It is striking and distinctive, and the line crew at our base airport voted it the best looking airplane last year. With the exception of the new options, the basic equipment of the two are quite similar, too. King avionics include a KNS80 navigation system and a KFC200 flight director-autopilot. 231M had a mixture of digital and analogue avionics; 231GV is all digital. Among other things, the latest King equipment saves a lot of panel space. Even with the radar in the center stack, 231GV has room left over for more equipment.

The Mooney is usually talked of as a small package, but the available option systems don't just fit in well. They provide state-of-the-art capability that many airliners don't offer.

It's well arranged, too. In fact, about the only thing we would like to see added is a vernier throttle to make fine adjustments, which the fixed wastegate turbo system requires, easier to make.

The only immediately visible exterior difference on the new model is the black radar window or antenna cover on the right wing leading edge. It's a neat fit. The only bulge is on the lower wing surface. We speculated about whether or not the altered leading-edge radius would result in any change in stall characteristics. The factory said that there was no observable difference with the radar and without it. However, our stall series with 231GV resulted in a right wing drop in every configuration. It can't be called a sharp break or even a break, but the right wing did consistently quit flying before the left. It should present no problem, however. The aircraft is fully controllable throughout the stall and recovery is conventional and quick.

In all other respects, 231GV flies and performs just like all the other (five so far) 231's we have flown. Performance variations as a result of the propeller boots and the radar installation are minimal. Cruise speed is reduced by less than two knots and climb rate by about 20 feet. Above critical altitude (the altitude above which maximum manifold pressure of 40 inches cannot be maintained), the minimum climb speed is 91 knots to ensure proper cooling air flow. Unless you are a test pilot, the changes in performance aren't discernible.

Continuous use of the propeller deicing system along with maximum electrical load (all avionics, pitot heat and landing light) requires careful monitoring of the electrical system. The alternator could be overloaded and the battery discharged, particularly at lower rpm settings. The red voltage-warning light on the annunciator panel will flash under those circumstances.

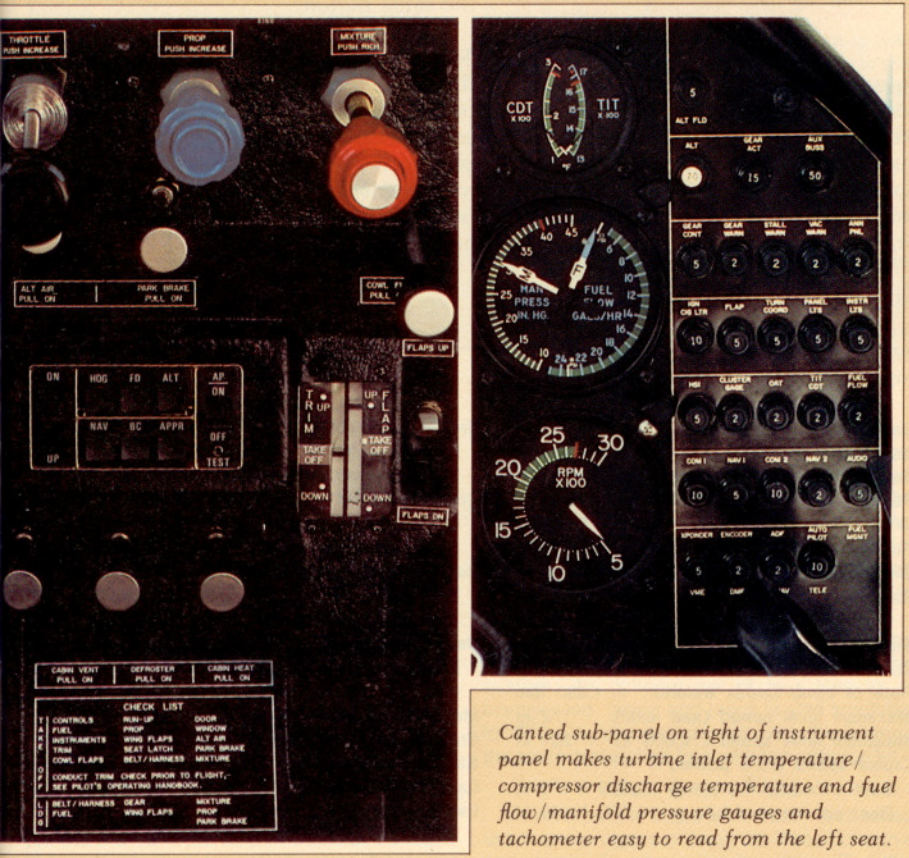
Aside from the higher initial and operating costs that such systems add to aircraft, operators also must pay higher costs in terms of planning, operating technique and systems knowledge.

The Teledyne Continental TSIO-360-GB-1 engine supplied to Mooney has had its recommended time between overhaul (TBO) raised from 1400 to 1800 hours. But the turbosupercharger or the core or the whole works will be in the shop long before that if great care is not taken in operating it. This means more than avoiding throttle jockeying. Great care—and time—should be taken in starting, including thorough preheating in low temperatures; monitoring and ensuring proper operating temperatures from start to shutdown; careful power management, including leaning; and adhering to the five minute cool-down period after landing before shutdown. Religiously.

continued

Mooney 231

Cathode ray tubes (the radar, left) and light-emitting diodes help make light singles more nearly all-weather aircraft. The built-in oxygen system gauge (above) replaces the pilot's ashtray.



Canted sub-panel on right of instrument panel makes turbine inlet temperature/compressor discharge temperature and fuel flow/manifold pressure gauges and tachometer easy to read from the left seat.

Mooney 231

One also has to trade capability for payload. 231GV's 202 pounds of options mean payload with full fuel is 446 pounds. That's two FAA-standard adults plus 106 pounds of other things. Or it requires trading payload for range. More than 70 pounds of the addition to empty weight is from the oxygen system (37.2), radar (26.8) and deicing (6.9) units.

It is by far the most expensive Mooney we ever have flown: $105,770. As of April 1, a similarly equipped 231 will cost an additional $1525. The base price of $57,775 will increase to $59,000 and the operational group of necessary options (gyros, strobes, ELT, engine instruments, boost pump and other basic equipment) will go from $5000 to $5300. That's 12% higher than the basic 231 price a year ago, not quite the same as the basic inflation rise in the same period.

Forgetting optional avionics, Mooney offers 11 basic Bendix, Collins or King radio packages; 10 different EdoAire Mitchell or King autopilot-flight director packages; plus such additional aids as fuel management computers. The 231 can be as simply or sophisticatedly fitted out as a pilot could want.

Buyers seem to be going for the

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Mooney M20K 231

Basic price $57,775 As tested $105,770

Specifications

Engine	Teledyne Continental TSIO-360-GB-1 210 hp @ 2,700 rpm TBO 1,800 hr
Propeller	McCauley constant speed, 74-in. dia.
Wing span	36 ft 1 in
Length	25 ft 5 in
Height	8 ft 3 in
Wing area	174.8 sq ft
Wing loading	16.6 lb/sq ft
Power loading	13.8 lb/hp
Passengers and crew	4
Cabin length	114 in.
Cabin width	43.5 in
Cabin height	44.5 in
Basic empty weight	1,800 lb
Equipped empty weight (as tested)	2,002 lb
Useful load (basic aircraft)	1,100 lb
Useful load (as tested)	898 lb
Payload with full fuel (basic aircraft)	662 lb
Payload with full fuel (as tested)	446 lb
Gross weight	2,900 lb
Fuel capacity (standard)	80 gal (73 usable)
Oil capacity	8 qt
Baggage capacity	120 lb (17 cu ft)

Performance

Takeoff distance (ground roll)	1,200 ft
Takeoff over 50 ft	1,600 ft
Rate of climb (gross weight)	1,080 fpm
Maximum level speed (sea level)	172 kt
Maximum level speed (16,000 ft)	201 kt
Cruise speed (75% power)	
Best economy mixture @ 10,000 ft	170 kt
Best economy mixture @ 24,000 ft	192 kt
Cruise speed (65% power)	
Best economy mixture @ 10,000 ft	160 kt
Best economy mixture @ 24,000 ft	179 kt
Cruise speed (55% power)	
Best economy mixture @ 10,000 ft	147 kt
Best economy mixture @ 24,000 ft	162 kt
Range at 75% cruise (with 45-min reserve)	
Best economy mixture @ 10,000 ft	928 nm
Best economy mixture @ 24,000 ft	950 nm
Range at 65% cruise (with 45-min reserve)	
Best economy mixture @ 10,000 ft	975 nm
Best economy mixture @ 24,000 ft	987 nm
Maximum operating altitude	24,000 ft
Stall speed (clean)	62 kt
Stall speed (gear and flaps down)	57 kt
Landing distance (ground roll)	1,190 ft
Landing over 50 ft	2,250

high-capability options with most 231's. Every aircraft we have flown so far has had the King flight director and full-house avionics packages (some including a telephone). The factory has told us that more than 90% are being fitted with the $875 propeller deicing option, most with the $2500 built-in oxygen system and about 20% with the $8575 radar.

Most of us are easily spoiled, and once such luxuries are used, they quickly become necessities. The good news is that they are available on an increasing number of high-performance singles. We're pleased to see the capability available in the 231. For pilots and operators who need to fly as frequently as possible, the high initial cost of a fully equipped 231 doesn't hurt as much when one starts calculating operating costs over a few hundred hours of operation per year.

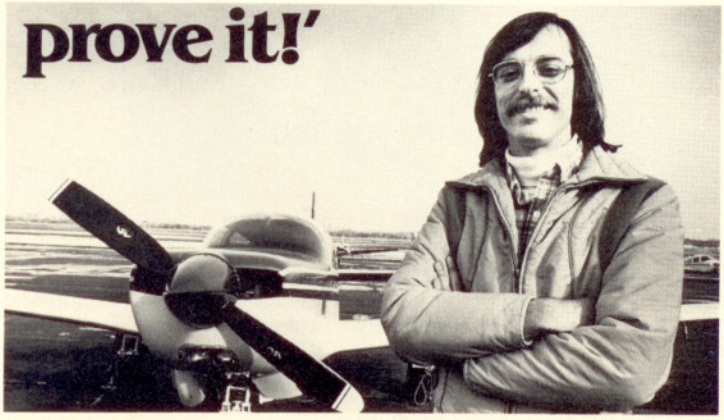
A cruise speed of 165 knots at below-oxygen altitudes and 180 knots in the middle altitudes with more than 900 nautical mile range plus full IFR reserves looks good.

When one factors in maintenance costs for a single versus a twin, it looks even better. And when you add on fuel costs, to get this kind of performance at an average fuel burn of less than 13 gph, it looks increasingly like the way to go.

We think Mooney cleared a path other manufacturers will follow for the high cost, fuel scarce 80's—EGT

Mooney 231

'If it's so fast— prove it!'



"Actually, it was sort of a hangar challenge," said Alan Gerharter, explaining what spurred him to use a Mooney 231 to smash a coast-to-coast speed record held by a Cessna T210.

Gerharter (AOPA 425928), chief flight instructor and a charter pilot for Logan and Reavis Air, Inc., of Medford, Ore., said, "I was flying this fast airplane [a 231] and was aware it was making record times everywhere I went. I had to listen to some of the mechanics and customers talk about how fast the 210 was. I came to thinking that we might be able to take the record and change everybody's outlook a little bit.

"One of the mechanics . . . said if we were so sure the airplane was that fast, perhaps we should take the record and, then, talk about it. So we did."

Gerharter, who previously had flown 210's for a Cessna dealer, says his company uses the 231 for charter flights of longer stage lengths. "We can make it to Portland, 200 miles block-to-block, in less than an hour and one half. And we can do it on very little gas—far less than you could drive it in. Here in Oregon, the roads definitely do not go in a straight line. You'd probably drive twice the distance, dodging deer and highway patrol along the way."

Gerharter prepared for the trip by taking a physiological low-pressure course at Beale Air Force Base and by plotting a painstaking great circle route between San Francisco and Washington, D.C., with a 21-waypoint area navigation course. The aircraft chosen for the attempt was N231LR, one of Logan and Reavis's charter planes. The aircraft was one of the first 231's delivered by Mooney and doesn't have a built-in oxygen system. However, with assistance from friends and fellow employees, Gerharter replaced the right-front seat with two oxygen tanks. He also fitted the plane with a 10-minute backup supply of oxygen that would be used if an emergency descent became necessary. Two, 25-gal. fuel tanks were mounted onto the back seats, bringing the usable supply to about 122 gal. In addition, Gerharter removed the step leading to the right wing. "I think it may have added a mile an hour or so," he said.

With a jet stream forecast at altitude, Gerharter took off from San Francisco International Airport at 6:49 a.m. on Jan. 7. The 27-year-old ATP climbed rapidly to get above a broken ceiling over central California. Except for the need to wind around cloud tops near Denver that built up above his altitude of 25,000 feet, the weather was clear.

However, about an hour and a half after takeoff, a malfunctioning alternator began to plague the Mooney's navigation equipment. "I had intermittent DME failure, so my RNAV was thrown out the window [figuratively]," Gerharter said. "It was back to very basic navigation: compass and clock. I just dug out the en route charts and did some very quick research, picking VOR's and ADF's along the route. I also had a little problem with the autopilot: It would not hold altitude. So, I hand-flew it."

At 25,000 feet, Gerharter used 28 inches and 2700 rpm, which yielded about 75% power. With tailwinds as high as 129 mph, the Mooney averaged 302 mph during the flight and burned only 103 gal. of avgas.

Gerharter landed at Washington National Airport eight hours, four minutes and 25 seconds after takeoff, breaking a record of 11 hours, seven minutes and 48 seconds set by Malvern Gross in a Cessna T210 on Jan. 1, 1977.

"We did the flight in about 72% of the time the Cessna 210 did and on about 62% of the gas," Gerharter said. "If that's a three-year progress report, I think things are looking very good, considering general aviation doesn't use a lot of gas in the first place."

Gerharter was 25 minutes ahead of schedule on landing at Washington, and only Malvern Gross was there to greet him. They were discussing the flight over coffee when the television and radio crews showed up.

At press time, Gerharter was preparing to send documentation for the flight to the Federation Aeronautique Internationale. When approved, the flight will enter the record books for both speed and economy in Class C1C, piston-powered aircraft between 2200 and 3858 pounds.

While he has no firm plans for another such attempt, Gerharter said, "I'd like to make another trip; this time, at 35% power and 22,000 feet to see how much fuel it would use.

"I think it is interesting to see other pilots attempting to set economy records," he said. "I think it's a trend, and I hope it continues"—MML