MOONEY TLS
POWER PLAY

More cubes and a tube

BY MARK R. TWOMBLY

Mooney Aircraft has come a long way since 1961. That was the year of the 180-horsepower B model, the first all-metal Mooney. From then on, Mooney gained a reputation for building airplanes that make the most of modest horsepower. Size, weight, and a long, clean wing were the major contributors to the B model's cruise efficiency, and so they have been on every model since. But scrupulous attention to drag reduction has over the

PHOTOGRAPHY BY MIKE FIZER

years enabled Mooney to eke additional knots out of the same basic airframe without injecting big doses of fuel-thirsty horsepower.

Mooney's latest model, however, represents a significant philosophical departure from the company's traditional emphasis on aerodynamics rather than raw power. The M20M or TLS (Turbo Lycoming Sabre), which debuted in 1989, is of the school that believes there is no substitute for horsepower. A turbocharged 270-hp Lycoming propels the airplane to 25,000 feet and 220 knots and even a tad faster as we found out while evaluating a brand-new TLS over several weeks.

Mooney has made three important changes to the TLS since *AOPA Pilot* first reported on the airplane (see "Mean Machine," July 1989 *Pilot*). The first is a different engine mount to reduce vibration. The big Lycoming still has the shakes but not as bad as before.

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Second, gross weight has been increased by 168 pounds; maximum takeoff weight now is 3,368 pounds. The only structural change required was removal of flap gap seals to stay below the 61-knot stall limit.

Before the gross weight change, a fully equipped TLS was limited in payload. The airplane we flew, N1091A, had just about every option on Mooney's list. After filling the tanks, we had about 450 pounds to allocate to people and bags. Less optional equipment or, in the case of N1091A, reducing the fuel load by 10 gallons would allow three FAA-size adults to board.

The third change to the TLS was to the instrument panel. Mooney has certified the Bendix/King EHSI (electronic horizontal situation indicator) 40 in the airplane. It, along with a Bendix/King KLN 88 Loran Navigation System, elevates what already was a sophisticated panel to the major leagues. The EHSI 40 avionics package adds 30 pounds and $30,000 to a TLS over an electromechanical system, but 40 percent of TLS customers order it.

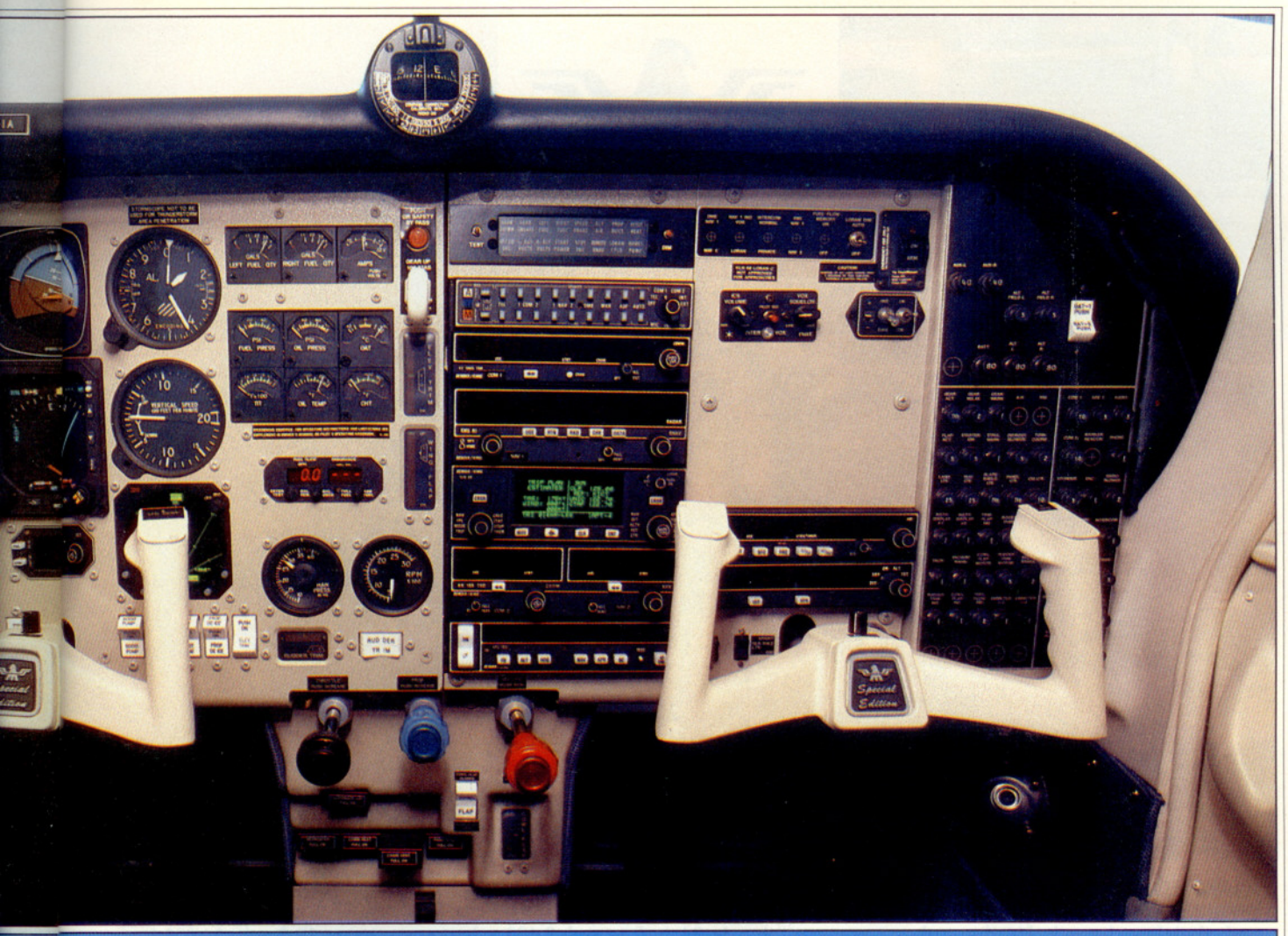
The 4-inch EHSI 40 is one-stop-shopping navigation. Everything necessary for position guidance is presented on the color Sony Trinitron display: loran, RNAV, VOR, ADF, glideslope, localizer, moving map with airport and navaid identifiers, groundspeed, distance, time-to-station, and digital display of heading and course or desired track. A primary nav course pointer and two secondary nav bearing pointers are simultaneously displayed—the pilot monitors three separate nav sensors at once.

All of the control buttons and knobs border the display. The pilot can select a traditional 360-degree HSI display for enroute navigation, then on an approach switch to Arc mode to view an expanded-scale 85-degree compass sector. Or the screen can be wiped clean of any navaid information for a simple 360-degree compass rose display. If the TLS were available with weather radar (it is not), the EHSI 40 also could serve as the radar display.

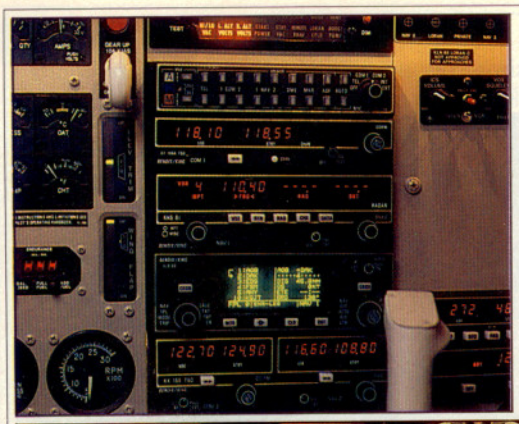
The EHSI 40 needs a companion flight management system to realize its full potential. A Bendix/King KLN 88 loran fulfills that role in the TLS. Program a multileg flight plan in the loran, and the route is depicted as a moving map on the EHSI 40. Airports and navaids are displayed and identified on the screen at selectable ranges from 5 to 1,000 nautical miles. The KLN 88 in N1091A was certified for enroute and terminal IFR navigation.

Does a TLS owner need an electronic HSI? Mooney tells customers who ask that, if they can afford it, they should get it because it represents the highest level of navigation and display capability for single-engine aircraft. Forty percent of TLS buyers get it.

The TLS's six-cylinder TIO-540-AF1A engine is based on Lycoming's venerable 250-hp normally aspirated, parallel valve IO-540-series engine. An AiResearch turbocharger allows for maximum power almost all the way up to the airplane's 25,000-foot maximum operating altitude. Induction air passes




Mooney TLS



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through an intercooler to lower its temperature after it has been compressed, and therefore heated, by the turbocharging system.

The engine is not made to work terribly hard, even at full throttle. Power setting limits are a relatively conservative 38 inches manifold pressure and 2,575 rpm. (By comparison, the Lycoming TIO-540 in the Malibu Mirage is rated at 350 hp at 42 inches manifold pressure.) You can fire-wall the prop and throttle controls on takeoff and leave them there until leveling off at altitude. The pilot's operating handbook recommends full-rich mixture for full-power climbs, but during our check-out with Mooney, we were told the mixture can safely be leaned to 1,500 degrees Fahrenheit turbine inlet temperature. Doing so knocks 2 gallons per hour off the full-rich fuel flow of 30 gph.

Engine temperatures never were a problem during our flights, all of which took place in sweltering heat. The cooling air inlets in the nosebowl are the largest of any Mooney, as are the electrically actuated cowl flaps. At cruise-climb power, we could close the cowl flaps halfway and still see temperatures stay below the redlines.

The recommended cruise-climb power setting is 34 inches and 2,400 rpm. When leaned to 1,500° TIT in climb, fuel flow settled on 24 gph. It really is a cruise climb, too. The POH recommends 120 knots in the climb, but per Mooney's advice, we targeted 140 KIAS, which yielded a 650-fpm ascent. The combination of fast forward speed and good climb rate is one of the great advantages of the TLS's power.

Maximum continuous cruise power setting is the same as cruise climb: 34 inches and 2,400 rpm, or 88-percent power when leaned to peak TIT. Below about 12,000 feet, the airspeed indicator winds up to 160 knots. At best power (1,650° TIT), it struggles up another 4 knots or so, but it hardly seems worth the extra 3 gph in fuel flow. Above 22,000 feet and 32 inches, however, best-power mixture is required.

On a couple of occasions while flying at the flight levels at max power, we had to keep the cowl flaps open slightly to keep the cylinder head temperature in the green, but that was with an outside air temperature more than 20° Celsius warmer than standard.

Fuel flow at maximum cruise power ranged from 17.9 gph (9,500 feet and best economy) to 19.7 gph (24,000 feet, best power). Those numbers are distressingly high to anyone familiar with the typical frugality of a Mooney, but the payoff is superlative speed. We recorded true airspeeds of 191 knots at 9,500 feet and 221 KTAS at FL 240. It just doesn't get much better than that in a piston-powered single.

The TLS can be flown at more sedate power settings, of course. We sampled a range of throttle and prop settings at various altitudes. For example, at 9,500 feet and 65-percent power—27 inches and 2,200 rpm (the bottom of the green arc on the tachometer), true airspeed worked out to be 166 knots at 13.7 gph. At 16,500 feet with the throttle pulled back to 24 inches and 12 gph (57-percent power), we ambled along at 165 KTAS. Up at FL240, 65-percent power produced 206 KTAS. Flying at 65 percent instead of max cruise adds more than an hour to endurance, but the big Lycoming vibrates more at lower rpm settings. It doesn't seem to want to loaf.

In fact, after only a few hours in the airplane, it became apparent that, unless

the trip calls for maximum range, the only way to go is to put the pedal to the metal. Once you've tasted 220 knots plus, it's tough to accept less.

The TLS carries 89 gallons of usable fuel in two wet wing tanks. If, like me, you'd find it tough to back off the throttle during climb and cruise, count on about four hours endurance plus an hour's reserve if flying at 12,500 feet in standard conditions, or 3.5 hours at 25,000 feet. At 55-percent power, you'll be able to fly for 6.5 hours down low and 5.5 up high.

Unless you're westbound in the winter, high and fast is the way to fly in the TLS. You're above most of the weather and traffic, and you go farther in less total time because true airspeeds are much higher at altitude. With a robust winter wind at his back, an eastbound TLS driver in go-fast mode and breathing oxygen might see a groundspeed in excess of 300 knots.

On a flight from Frederick, Maryland, back to Mooney's delivery and service center at San Antonio International, we picked our altitudes according to the weather because winds were relatively benign. The first leg was flown at 10,000 feet. The weather was fine, and we didn't feel like breathing oxygen. An isolated area of weather and building haze sent us to 12,000 until our fuel stop in little Holly Springs, Mississippi, south of Memphis.

Immediately after departing Holly Springs, we faced towering thunderstorms. The controller suggested an end run to the east, but after a few minutes, that route appeared to deteriorate, according to the Stormscope, so we turned west, donned oxygen masks, and climbed. That put us above the lower clouds and haze. Now we had the big picture and could easily circumnavigate the storms.

North of Houston, we received a string of traffic calls. One was for a DC–9 at 11 o'clock, opposite direction, FL250—1,000 feet above us. It loomed into view and passed by. I waved and wondered if the pilot of the jet was surprised to meet a little Mooney sharing his high-altitude airspace. I wondered, too, if his airplane was as well-equipped as the Mooney.

Speed brakes are standard on the TLS, and well they should be on an airplane that flies so high and fast. It doesn't take much of a descent rate to push the airspeed up past the 174-knot Vno and into the yellow arc. The speed brakes are pneumatically actuated by punching a button on the left horn of the pilot's yoke. The devices add to drag rather than spoiling lift, so there are no limitations on their use in any phase of flight, even takeoff.

It doesn't take long to figure out lots of

ways to use the speed brakes to best advantage: scrub off 15 knots of airspeed in turbulent air, or add 700 fpm to the descent rate. They are useful, too, for slowing to the 140-knot gear-extension speed. With gear extended, the airplane can be accelerated to 165 KIAS. High on approach? Pop the speed brakes. Too fast after flaring? Pop the speed brakes.

Our evaluation airplane was equipped with the optional Bendix/King K500 package that, among other items, includes the EHSI 40 and KLN 88, KNS 81 RNAV and KN 63 DME, KX 155 nav/com, and KY 196 com. The package lists for $58,750. Other options on N1091A included a KAS 297B altitude preselect ($4,180), KFC 150 flight control system ($18,850), and 3M WX-1000+ Stormscope ($9,950). Add in deluxe leather interior and stand-by vacuum system ($2,200), dual brakes ($825), and an electric deice system for the three-blade McCauley propeller ($3,535), and you have a fast, high-flying single that lacks only radar and wing and tail deice to tackle almost every weather challenge Mother Nature has.

List price of N1091A was $297,180. That seems a staggering number for a Mooney, but consider that more than $112,000—38 percent of the price—is in optional equipment.

The notion of a hairy-chested Mooney has been well-received. The TLS accounts for about 40 percent of Mooney's sales in 1990. Just as the 252 eclipsed the 231, the TLS may lay 252 production to rest. More than any other manufacturer of light singles, Mooney has weathered the decade-long slump in sales of new aircraft by adopting a lean and mean posture. Just look at the two mainstays of Mooney's current product line, the MSE and the TLS. One's lean, the other's mean. □

Mooney M20M TLS
Base price: $184,900
Price, as tested: $297,180

Specifications

Powerplant	Textron Lycoming TIO-540-AF1A, 270 hp
Recommended TBO	2,000 hr
Propeller	McCauley, three-blade, constant-speed
Length	26.75 ft
Height	8.33 ft
Wingspan	36.1 ft
Wing area	174.8 sq ft
Wing loading	19.3 lb/sq ft
Power loading	12.47 lb/hp
Seats	4
Cabin length	10.5 ft
Cabin width	3.6 ft
Cabin height	3.7 ft
Empty weight	2,012 lb
Empty weight, as tested	2,386 lb
Gross weight	3,368 lb
Useful load	1,356 lb
Useful load, as tested	982 lb
Payload w/full fuel	822 lb
Payload w/full fuel, as tested	448 lb
Max takeoff weight	3,368 lb
Max landing weight	3,200 lb
Fuel capacity, std	95 gal (89 gal usable) 570 lb (534 lb usable)
Oil capacity	10 qt
Baggage capacity	120 lb, 20.9 cu ft

Performance

Takeoff distance, ground roll	1,000 ft
Takeoff distance over 50-ft obstacle	2,200 ft
Max demonstrated crosswind component	13 kt
Rate of climb, sea level	1,010 fpm
Max level speed, sea level	168 kt
Max level speed, 25,000 ft	214 kt
Cruise speed/endurance w/45-min rsv, std fuel (fuel consumption)	
@ max cruise power, best-power mixture	223 kt/3.5 hr
25,000 ft	(123 pph/20.9 gph)
@ intermediate power, best economy	202 kt/4.33 hr
19,000 ft	(99.6 pph/16.6 gph)
Max operating altitude	25,000 ft
Landing distance over 50-ft obstacle	2,500 ft
Landing distance, ground roll	1,200 ft

Limiting and Recommended Airspeeds

Vx (best angle of climb)	85 KIAS
Vy (best rate of climb)	105 KIAS
Va (design maneuvering)	127 KIAS
Vfe (max flap extended)	110 KIAS
Vle (max gear extended)	165 KIAS
Vlo (max gear operating)	
Extend	140 KIAS
Retract	106 KIAS
Vno (max structural cruising)	174 KIAS
Vne (never exceed)	195 KIAS
Vr (rotation)	66 KIAS
V_{s_1} (stall, clean)	66.5 KIAS
Vso (stall, in landing configuration)	59 KIAS

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted. For more information, contact: Mooney Aircraft Corporation, 8901 Wetmore Road, San Antonio, Texas 78216; telephone 824-2727. □