MOONEY • TLS

FAST FORWARD

Refining Mooney's performance king

BY MARK R. TWOMBLY

If you think Mooney and think parsimonious performance, you'd be 50 percent correct. Half of the new airplanes Mooney Aircraft Corporation delivers are lean-machine MSEs, but half are no-comprises-performance mean-machine TLSs. ■ The M20M TLS, introduced four years ago, represented the biggest departure from Mooney's traditional efficient-performance approach to aircraft design since the pressurized Mooney Mustang of 1967 through 1970. The TLS isn't so different from previous Mooneys on the outside—the airframe is based on the 1-foot-longer fuselage introduced in 1988 on the short-lived M20L Mooney Porsche. It's what's underneath the cowling that makes the difference. The tur-

PHOTOGRAPHY BY MIKE FIZER

Mooney packs a lot of punch in the TLS panel. Sophisticated electronics include a Bendix/King EFIS (below the altitude indicator), GPS, and Digital Sky color moving-map display (below the audio panel; detail at lower right). Rear seats recline fully and fold for bulky cargo storage.

bocharged and intercooled 270-horsepower Textron Lycoming TIO-540-AF1A engine is the most powerful put in a production Mooney since the Mustang. The official specification calls for 214 KTAS at the TLS's 25,000-foot maximum operating altitude, but that is a conservative figure; 220 knots is achievable at lower weights and ideal conditions. The engine must be fed about 19 gallons per hour to crank out the 240 hp necessary to achieve those speeds, but achieve them it will.

In my mind, the TLS also is the best-looking Mooney ever. The stretched nose, long fuselage, and extended rear side windows are in perfect proportion, and the three-blade propeller and large, flared cooling inlets have the look of aggressive performance.

The engine is a version of Lycoming's parallel-valve 540-cubic-inch opposed six. Lycoming installs a single AiResearch turbocharger plus intercooler and rates the engine for maximum power at 38 inches manifold pressure and 2,575 rpm. A variable density controller in the turbocharger system guards against manifold pressure overboosting at full throttle settings while enabling the engine to deliver its full 270 hp up to 21,000 feet.

The 21,000-foot critical altitude (the highest altitude at which maximum continuous power can be achieved) is one reason the TLS achieves such high true airspeeds. At 25,000 feet, as high as you can legally fly in the airplane, it's still possible to pull maximum cruise power: 34 inches and 2,400 rpm, which is 89-percent power.

Other nice features of the big Lycoming aside from the power are automatic boost pump activation when the throttle control is slid in to the stop and no limitation on use of maximum power in the climb. Leave the power controls where they are after takeoff if need be, and devote full attention to more important matters.

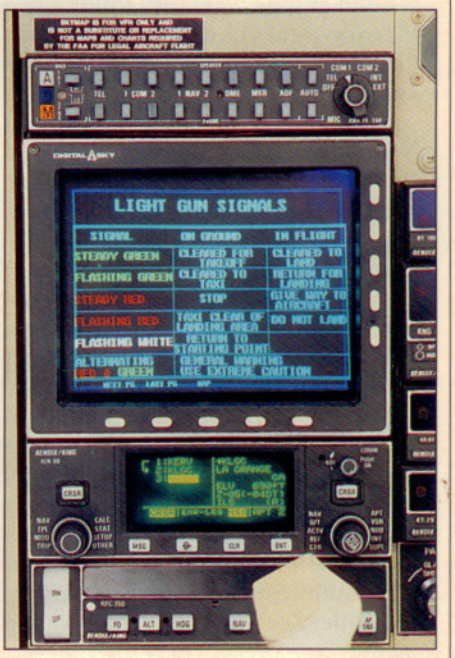
The intercooler and large cowl flaps keep engine temperatures cool enough to allow cowl flaps to be par-

tially closed in climb, depending on ambient conditions.

Mooney has made some improvements to the TLS over its four-year existence. One of the first was a 168-pound gross weight increase, to 3,368 pounds for takeoff. That makes for a useful load in the 975-pound range, depending on optional installed equipment. The TLS wet wing tanks hold a total of 89 gallons usable fuel, so filling the tanks leaves about 450 pounds for people and bags. If the trip calls for more payload and less range and endurance, wing-mounted fuel-quantity gauges make it pretty easy to accurately pump in partial fuel.

Mooney also has refined the panel, adding a Bendix/King 4-inch-square electronic flight information system as an option. A complete avionics package with EFIS lists for $71,000 installed. About a dozen TLSs have been delivered with Digital Sky color Skymap displays dominating the panels. The device takes position information from a GPS or loran and blends it with an extensive database to electronically depict a moving map. A wealth of airport and flight-planning information can be displayed and manipulated using buttons arrayed around the screen's border. Adding the Digital Skymap bumps the top-of-the-line avionics package price to $83,455.

The latest TLS innovation is a TKS anti-icing package. The British-designed TKS system uses a glycol-based solution to keep in-flight airframe ice from forming on wing and tail leading edges. The fluid is pumped through



porous titanium leading edges bonded to wing and tail. The fluid flows across wing and tail surfaces, lowering the freezing point of any moisture or precipitation the airplane encounters. Even with the TKS system installed (a $28,000-plus option), the TLS is not approved for flight in icing conditions. Mooney also offers electrically heated prop boots for the TLS.

The TLS now carries a two-year warranty on airframe, avionics, and engine. Lycoming initiated the extended engine warranty following a factory-paid fix of problem valve guides on earlier TLS engines. The engine has a 2,000-hour TBO.

At Mooney's invitation, I borrowed N40JE, the factory's specially prepared fortieth-anniversary demonstrator (since sold to a customer) for a round-robin flight from Atlanta to the Mooney factory in Kerrville, Texas. I picked up the red, white, and gold-striped TLS, the 161st made, from Dirk Vander Zee, one of the Mooney Direct salesmen who make up the factory's U.S. retail sales force. He set me up with a sandwich, full tanks, and a flight plan from Georgia's Callaway (La Grange) Airport, where his office is located, direct to an NDB in Louisiana to avoid a restricted area, then a slight turn southwest direct to Kerrville.

Vander Zee puts in a lot of traveling time in new Mooneys and has learned how to get the most from them. He climbs the TLS at 100-percent power and 120 knots indicated to achieve a 1,000-feet-per-minute climb rate at just over 27 gph. For my flight, I chose a more sedate 89-percent-power setting, which reduced fuel flow to 24 gallons an hour and about 550 fpm at 130 KIAS. Electric rudder trim is standard and, with those sustained climbs, a welcome feature. Some 20 minutes after departing La Grange, I leveled off at 16,500 feet, closed the cowl flaps, trimmed the empennage, and began leaning the mixture.

TKS anti-ice fluid is dispensed through porous titanium leading edges.

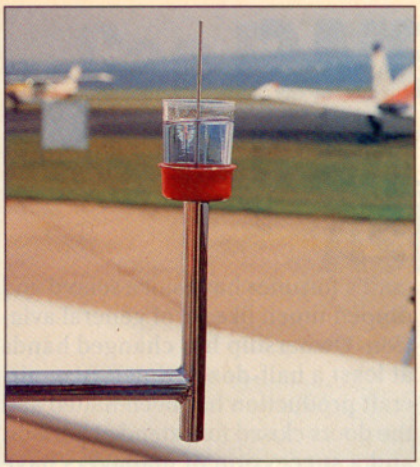
At 16,500 feet, true airspeed worked out to be 209 knots—9 knots better than book.

It was apparent that some adjustment was needed in the mechanism that controls the automatic activation of the boost pump. The pump would not shut off unless the throttle was reduced to about 33 inches. Curiously, fuel flow with the pump on was about a gallon an hour lower than with the pump off.

The airspeed indicator settled down at 158 knots; true airspeed worked out to be 209 knots—9 knots better than the performance charts promised—on 19.1 gph. Pedal to the metal seems the only way to go in the TLS. At 16,500 feet, I was able to fly VFR direct in smooth air and with a nudge of a tailwind above other piston traffic and below the turbines, comfortably breathing oxygen through a nasal cannula.

You have to take the TLS up into the flight levels to achieve the fastest true airspeeds, but it's still quick at non-oxygen altitudes. The book calls for 188 knots true airspeed at 10,000 feet and maximum cruise power. Based on what I saw up higher, it's probably a little faster than that.

The ground was only dimly visible through haze, and there certainly wasn't much traffic around, so I busied myself looking over the panel. It was stuffed with Bendix/King avionics, including a KLN 90 GPS, KFC 150 autopilot with flight director, KAS 297B Vertical Speed and Altitude Selector, KNS 81 RNAV, a second nav radio and pair of coms, digital-display fuel flow and quantity indicator, BFG Series 1000+ Stormscope, and NAT AA80 four-place intercom with a Bose active-noise-canceling headset interface. It all



Handy towbar-mounted fuel tester avoids crawling on the ramp. Annunciator panel (below) maintains vigilance over the systems.

looked very impressive set in a cream-colored metal panel. The matching leather upholstery featured a Fortieth Anniversary Mooney stylized eagle logo embroidered in the headrests. The logo also appeared on the vertical fin.

The panel looks even better at night. Instruments are internally lighted, and eyebrow-mounted floodlights bathe the scene in soft, warm light. It's beautiful.

List price on a TLS is $241,100. The options on N40JE, which did not include EFIS or TKS, took the list price of the airplane to $334,420.

With time to nitpick, I fashioned a list of TLS darts and laurels. Topping the accolades is, of course, performance; the numbers speak for themselves—as do the looks.

Avionics and other options, with the exception of radar, are available to help the airplane realize all of its capability. Though optional, Precise Flight speed brakes are must-have equipment. They add tremendous flexibility for controlling descent rate and speed. Without them, getting down from altitude would be difficult in the extreme.

The Mooney mechanical gear position indicator is beautifully simple and useful. The TLS is comfortable, with enough leg- and headroom for those of at least average height. Front seats adjust vertically, and all seats recline. The rear seats also fold forward to open up the entire rear cabin for bulky cargo. Oxygen ports for all four seats are within easy reach overhead, and recessed lights illuminate the cabin well for night loading and unloading. Cabin noise level can be reduced considerably by closing the fresh-air vents (no problem in the chilly air up high). The baggage area is generously sized although limited to 120 pounds, and the hat rack is convenient for stowing light items.

On the other hand, wing and cowl flap switches and indicators could be positioned more logically and conveniently; the door seal leaks and thus shrieks; and despite changing the engine mount early in the program, the engine still has a mild dose of the shakes. More fuel capacity and higher gross weight would increase utility.

At precisely 3 hours 39 minutes after the mains lifted off of the runway at La Grange, they touched down at Kerrville. I was seven minutes late on the flight plan, thanks to a slow, shallow descent through bumpy Texas hill country thermals. An hour's reserve fuel sloshed in the tanks as I taxied up to the factory. The flight was an instructive example of the practicality of the TLS's performance. I departed the Atlanta area at midday and still arrived in Kerrville—a 740-nm trip—with sufficient time to do business.

The next morning, I reversed the route. The weather hadn't changed a bit, which meant I had a slight headwind at 17,500 feet. The flight to La Grange took just over four hours, which is about as long as you'd want to stretch it in a TLS. The airplane was serviced, and Vander Zee and I headed east, then northeast around the Atlanta Terminal Control Area. A photo session starring N40JE was scheduled for the next morning in Frederick, Maryland.

At 23,000 feet, we could clearly see the line of thunderstorms that had spawned a convective sigmet. If we had had to fly low in the soupy haze that completely obscured the ground, we couldn't have tracked the storms visually. As it was, we deviated east to avoid the weather and enjoyed the distant light show framed by a setting sun. The storms added perhaps 50 miles to our flight—a trifle of an imposition when you are dispatching the distances at 218 KTAS. □

Mooney M20M TLS
Base price: $241,100
Price, as tested: $334,420

Specifications

Powerplant	Textron Lycoming TIO-540-AF1A, 270 hp
Recommended TBO	2,000 hr
Propeller	McCauley three-blade, constant-speed, 75-in diameter
Length	26.75 ft
Height	8.33 ft
Wingspan	36.1 ft
Wing area	174.8 sq ft
Wing loading	19.26 lb/sq ft
Power loading	11.85 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	2.388 lb
Gross weight	3,368 lb
Useful load	1,356 lb
Useful load, as tested	980 lb
Payload w/full fuel	822 lb
Payload w/full fuel, as tested	446 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/fuel consumption/endurance w/45-min rsv, std fuel	
@ 89% power, best power mixture	
25,000 ft	214 KTAS/20.5 gph/3.7 hr
10,000 ft	188 KTAS/20.4 gph/3.7 hr
@ 60% power, best power mixture	
25,000 ft	187 KTAS/13.3 gph/4.8 hr
10,000 ft	168 KTAS/12.8 gph/5.25 hr
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

V_X (best angle of climb)	85 KIAS
V_Y (best rate of climb)	105 KIAS
V_A (design maneuvering)	127 KIAS
V_{FE} (max flap extended)	110 KIAS
V_{LE} (max gear extended)	165 KIAS
V_{LO} (max gear operating)	
Extend	140 KIAS
Retract	106 KIAS
V_{NO} (max structural cruising)	174 KIAS
V_{NE} (never exceed)	195 KIAS
V_{S1} (stall, clean)	66.5 KIAS
V_{SO} (stall, in landing configuration)	59 KIAS

For more information, contact Mooney Aircraft Corporation, Post Office Box 72, Louis Schreiner Airport, Kerrville, Texas 78029-0072; 512/896-8181; fax 512/896-8180.

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.

TURNING 40 *IN TEXAS*

Celebrating four decades of building Mooneys in Kerrville

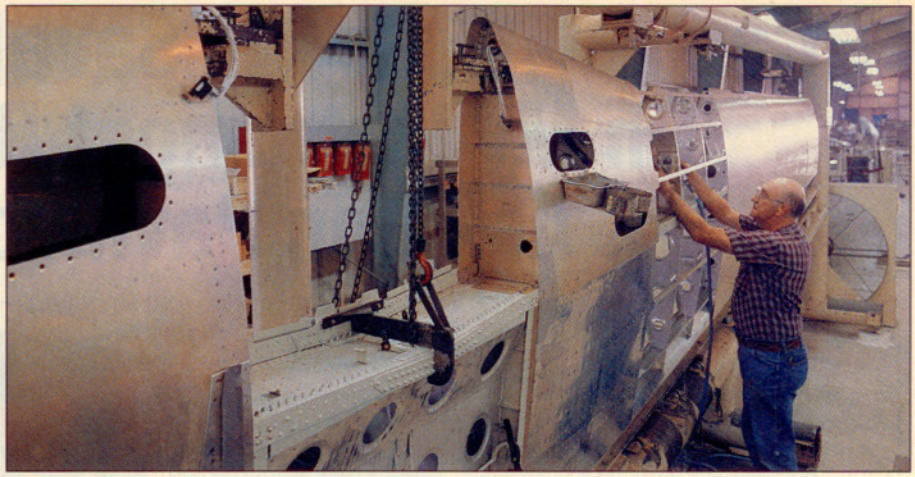
Mooney Aircraft Corporation was born 47 years ago in Wichita, with the goal of developing and producing a new, sporty single-place airplane, the M–18 Mooney Mite. The Mooney brothers, Al and Art, had long experience in designing and building various airplanes, ranging from the 1926 Eaglerock M–1 to the 1939 M–12 Culver Cadet. But after a few years, it became clear that Mooney's Wichita airstrip was going to be gobbled up by a new military base. The company went looking for a new home and found it in sleepy little Kerrville, Texas.

The enthusiastic west Texas hill country town offered Al Mooney and financial-backer Pappy Yankey a 99-year, $1 lease on some property at the airport. Mooney moved to Kerrville early in 1953, and Al Mooney began work on his four-place design, the M–20. The prototype flew on September 3, 1953, launching four decades of producing more than 10 different versions of that prescient design.

Al Mooney lost control of the company after Yankey died in December 1953. He stayed on under new owners Norm Hoffman and Hal Rachal long enough to finish development and certification of the M–20. Mooney Aircraft's fortunes have since soared and dipped much like all of general aviation. Ownership has changed hands at least a half-dozen times, new-aircraft production has been halted and the doors closed for extended periods, and a succession of managers have circulated through Mooney's jumbled collection of quonset hut and conventional metal buildings bunched together on the northwest side of the airport.

Mooney Chief Executive Officer Jacques Esculier was imported from France but has adopted Texas. Below, the TLS (foreground) and MSE.

Mooney now is privately owned, principally by two Frenchmen, aviation businessman Alexandre Couvelaire and wealthy investor Michel Seydoux. The indefatigable Couvelaire launched an ambitious program several years ago to introduce at least one new-model Mooney every year for five years. Couvelaire believed general aviation was overdue for a turnaround and felt that some activity and excitement from manufacturers would hasten the process. The TLS was the last of the five (others were



Mooneys still are made the old-fashioned way, with welded-steel-tube cabin structure and carrythrough spar. Al Mooney's original quonset hut shop still is in use, but assembly takes place in a cavernous hangar.

the M20J 205, the Lean Machine, the Mooney Porsche, and the Advanced Trainer System).

Despite Couvelaire's passion, the market did not rebound, and the cost of bringing the new models to market nearly toppled the company.

Stability has since returned to Mooney. Couvelaire appointed a young French engineer and pilot, Jacques Esculier, as chief executive officer, and he appears to have done an admirable job reigning in costs while expanding Mooney's subcontract manufacturing. Building parts for other aerospace manufacturers, including Bell Helicopter, Boeing, and Lockheed, helps Mooney absorb overhead costs and keep the work force active and productive. Subcontract manufacturing accounts for nearly a quarter of Mooney's revenues now; Esculier would like the figure to be 33 percent. Mooney employed 410 people when Esculier arrived. That declined to 216 in 1991 but has since risen to 285.

Production of new Mooneys—TLS and MSE combined—stands at an average of six a month. It was twice that in 1991 (and more than ten times the present production rate in 1966 when 764 were built), but the company has learned to make a living at the present activity level. Esculier, infectiously upbeat, believes that as the large fleet of used aircraft gradually wears, the demand for new will rise, and Mooney will be there to attract its share. He is expanding the international dealer network to take advantage of a blossoming need for general aviation transportation in developing areas of the world. In the United States, the disruption of changing from a sales structure based on independent retail dealers to one of factory-direct sales is largely over, according to Esculier. Cost savings realized through direct sales is being passed on to customers, he said.

Much has changed at Mooney-Kerrville over the years, but much has stayed the same. The airplanes still are put together the old-fashioned way, by bolting a long, sturdy wing and carrythrough spar to a welded-steel-tube cabin structure, aluminum monocoque aft fuselage, and a trimmable empennage. The cabin structure has grown 22 inches longer but only an inch wider. The wing design is virtually identical to the original M–20 wing, save for the tips and some minor beefing up in later versions. Power has increased by two-thirds, and today's Mooneys are far more aerodynamically refined, faster, more capable, and more attractive. But 40 years of history hasn't diluted a direct lineage from the first M–20 to the latest one on the line.

—Mark R. Twombly