Maule
M-7-235C Orion

Upgraded Maule continues the tradition of rugged utility and value, but remains beset with irksome failings in detail design. By **Bob Grimstead.**
Photography by the author

MAULE AIR'S FAMILY of rugged, four- and five-seat working aeroplanes has been renowned for years. More macho than mild, utilitarian rather than sophisticated, Maules have good field performance and a fair cruise speed. More importantly, they are good value.

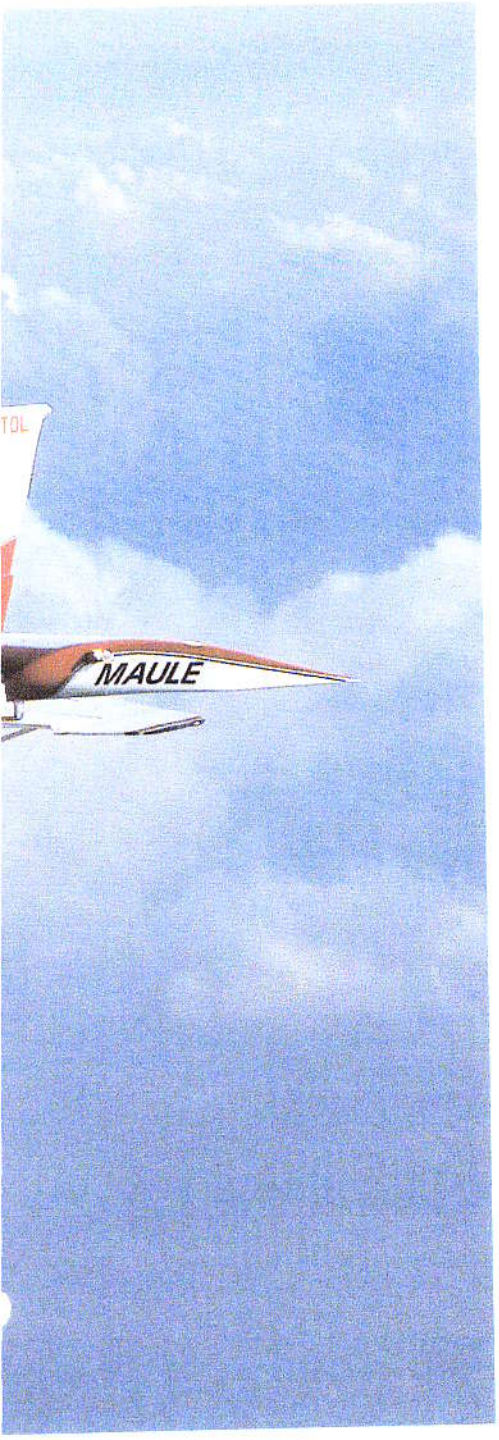
Like Cessna and Piper, the company continually strives to modernise its elderly designs, although the greater antiquity of Maule's basic airframe (originally derived from Piper's venerable Pacer) makes their task more difficult. Nevertheless, in recent years they have made a valiant job of updating and improving their products; they have beaten both Cessna and Piper by introducing a jet-fuel powered diesel model to complement their long-established turboprop.

The most significant improvement since they fitted a nosewheel to most of their models a decade ago (see *Pilot*, October 1991) is the introduction among their tailwheel types of an optional low-drag, low-maintenance, wide-track, spring-aluminium main landing-gear, an alternative to the original 'oleos' (actually coil springs in oil-filled dampers).

All seventeen models in the Maule inventory (more if you include the less common engine options) use the same basic airframe. The plethora of designators starts with a basic choice of either a four- (MX-7) or a five-seat (M-7) cabin. Both fuselages have the same external dimensions, but the M-7's 250 lb cargo compartment is extended aft by five inches to allow installation of a removable, 28-inch-wide fifth seat and a third window either side. The rear cabin roof is also raised by three inches.

Conventional tailwheel or tricycle (T) landing-gear can be specified, then the numeral specifies 160, 180, 235 or 260 hp Lycoming piston or 420 hp Rolls-Royce turbine engines. Alternatively, six-cylinder Polish Franklins or 220 hp Continentals can be substituted for the Lycomings. An A suffix denotes a fixed-pitch propeller. Naturally, either amphibious or straight water-only floats are also available. Tailwheel models equipped with the new, wide gear-legs carry the C suffix, previously applicable to examples with a cargo door, which now comes as standard.

The lengthened 'universal' 32 ft 11 in wing is currently used on all models except the turboprops, which have an even longer 33 ft 8 in span. The dependable high-lift USA 35B (Piper Cub) aerofoil has been retained throughout. Flap deflections are 24°, 40° and 48° on the tailwheel models, 24° and 40° on the nose-draggers, and I was glad to see that actuation remains manual, using a slim lever



between the front seats.

Modern Maules also have a 7° reflex (upward) flap setting to reduce cruise drag. All come well-equipped, with dual controls and brakes, vernier engine controls, four-place intercom, basic instrumentation, radios and a sixty-amp alternator. Unfortunately, the company's list of 'standard equipment' lapses into silliness when including trivia like circuit breakers, seats and door locks, all of which should be taken for granted.

Normal fuel capacity comprises four wing tanks (two inboard, two outboard) totalling 73 usg. A bigger, 85 gallon tankage is available, and is standard on the thirstier turbine models. The engine uses fuel directly from the inner tanks; these are topped up from the outer auxiliaries by manually-controlled electric pumps. Nowadays, the single fuel vents left and right each have a check valve, to prevent losing the top few gallons by siphoning—an annoying feature on earlier models. When parking on sloping ground, your fuel still drains from the high wing into the low one if the fuel cock is selected to *Both* or *Off*.

A long list of options includes dual puck brakes, transparent lower-door panels and/or forward side-kick panels, two sizes of roof skylight (complete with roller blind) and a vertical (downward) camera port. Special interior appointments include leather upholstery in a variety of styles, or the super-comfortable Oregon Aero contoured seat cushions. An assortment of avionics packages is available, including Strikefinder, moving map GPS, CD player, airborne cellphone and a choice of autopilots; 28-volt electrics can be specified.

The welded 4130 chrome-moly steel tube fuselage is still covered in Ceconite Dacron fabric, but the structure has been beefed up at the landing gear attachments by welding three tubes concentrically inside one another, allowing a maximum weight increase from 2,300 to 2,500 lb. Dual tailplane struts can be fitted, although these are primarily intended for use with either of the two glider- or banner-tow kits, or floats.

An optional aerodynamic embellishment incorporates Micro Aerodynamics vortex generators on the wings and under the tail. These are of dubious benefit. Maule quotes a seven per cent (four knots) stall speed reduction when clean, but only a slight improvement with the flaps extended, when you really need it.

On the other hand, among the standard refinements progressively incorporated over the last decade are a couple of really important ones. Fifteen years ago Maule paintwork was the worst in the industry, but nowadays their urethane finishes rank among the best. And proper corrosion proofing is at last applied throughout, including a fully powder-coated primary fuselage structure, sealed, internally oiled struts, and internally pre-primed wings, flaps and ailerons.

The current rudder has a broader chord, although the twelve-knot maximum demonstrated crosswind has not changed. The strut cuffs are now moulded from flexible PVC, so they conform better to the wing's underside. Transparent, adhesive tape gap-seals have been fitted between the elevator and tailplane. I know from retrofitting these to my aeroplanes that they significantly improve pitch control and stability, especially at low speed, while reducing trim tab deflection, and therefore in-flight trim drag. Identical rudder gap-seals would confer similar benefits and might enable Maule to junk their odd, yaw-stability-boosting mechanical interconnection between ailerons and rudder tab.

Cosmetic, practical and detailed improvements include stainless steel doorway kick-plates, three-point inertia-reel harnesses for all occupants, a swing-out opening window for the pilot, and useful map pockets in the front doors. A second opening window on the right is an option. Closed cell D-tube door sealing-strips replace the old foam tape, helping to stop those trademark Maule draughts. Single-piece door skins do the same, and add rigidity. The rear bench seat, always ➤

The Maule factory

A VISITING PILOT recently said of the Maule plant: "Nothing changed there since the beginning of time... I never saw another factory where everybody had the same name."

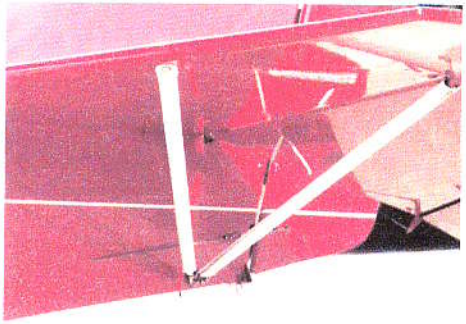
He has a point. No fewer than nine of the company's hundred or so employees are family members, encompassing four generations, for Maule Air just celebrated sixty years of existence. The firm started by manufacturing Belford (BD) Maule's 'Hummer' mechanical aircraft engine starter, moved on to tailwheels, had a brief diversion with TV antennas and associated ironmongery, then developed a non-destructive fabric tester.

In 1957, BD Maule remodelled a Piper Pacer, covering its wings with sheet aluminium and fitting a more powerful engine. To this day the original, round-tailed, Continental O-300-engined BD-4 demonstrator languishes in a forgotten corner, on flat tyres and under a layer of dust. That BD-4 developed directly into the family of aircraft the company still produces.

In 1968, the Maule operation decamped to a disused military airfield at Moultrie, in the heart of southern Georgia farmland. Their main production facility occupies three large hangars totalling 175,000 square feet in the corner of semi-deserted Spence Field. Into one end of the first hangar come lengths of 4130 steel tube and sheets of aluminium. The fuselages are still welded in the original 1950s jig.

Out of the second hangar roll around seventy completed airframes per year. Calculated by numbers of aircraft sold annually, Maule is among the top ten lightplane producers in the world. A few components are made by local subcontractors, but most parts are fabricated and assembled on-site. A third hangar holds completed airframes ready for delivery, while a smaller building houses development projects.

Among the rejected airframe parts lies a Polish-registered Maule which was rolled into a ball on landing—the aeroplane was a total, mud-encrusted wreck—except, and of great reassurance to all Maule owners, the cabin was not only completely intact, but precisely retained its cubed shape. It seems all four occupants simply stepped out, quite unharmed. The owner videoed the remains before returning the lot to the manufacturer as a tribute to the type's survivability.



***Above:* four doors give good cabin access. Fuselage structure is powder-coated chromoly tube. *Left, from top:* twin tailplane struts originally designed for floatplane, now a popular landplane option; improved, flexible PVC strut end-cuffs; glider/banner tow-hook.**

fairly easy to remove, now has its right fitting secured by pip-pins, making that little job twice as quick. Best of all, owners are no longer stuck with the awful, dated, crinkle-finish black instrument panel. Your dials can now be mounted in more tasteful tones of Mist (buff) or Lowes Grey.

At last the company has published some proper performance figures, including mtow and landing distances over a fifty-foot obstacle. But they still do not state the climb rate or stall speed at full weight, choosing instead to quote these at 'light weight'. This of course is both useless for comparison with other types, and quite irrelevant to a long-range four/five-seater, so presumably the numbers look poor compared with, say a Cessna 172.

Both Maule's publicity handouts and their website are informative and comprehensive. Unfortunately their owners' handbooks are still laughably slim, near-useless, 24-page volumes containing only limitations, rudimentary check-lists, and some weight-and-balance information. They do not include a single recommended power setting, let alone take-off, cruise or landing performance, or fuel consumption figures. In their new spirit of self-improvement, Maule Air would do well to read and emulate a Cessna, Piper or Commander POH.

To summarise, little enhancements abound, but Maules still lack a small number of big improvements which I believe would make a significant difference to both performance and appearance.

A flying truck

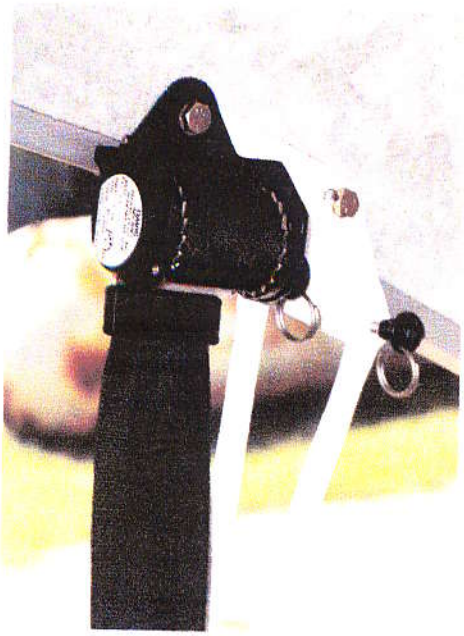
The model I came to fly was the M-7-235C Orion i.e. the wide-track, spring-gear-legged, five-seat tailwheeler with a 235 hp Lycoming O-540. Two versions of this engine are available, the fuel-injected -W1A5 and this $8,000 cheaper, carburettor-equipped -B4B5. They produce the same power, but the latter does so at a higher 2,750 rpm (as opposed to 2,400) and has an STC for using mogas in the USA.

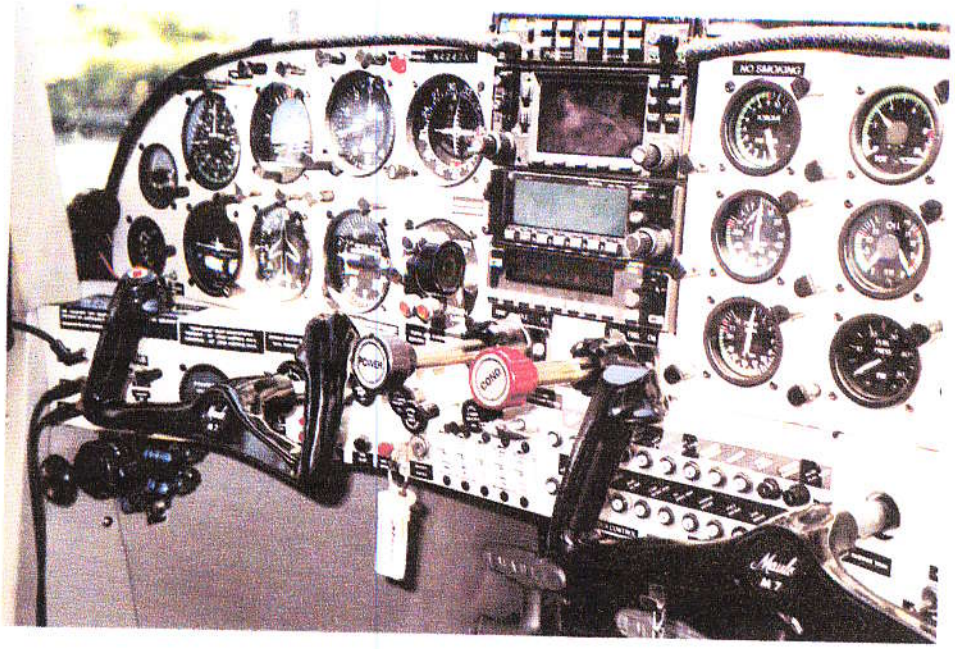
The Orion's wide main legs make the short-coupled aeroplane look the tough and rugged beast it is. Squatting on its haunches like a pit-bull spoiling for a fight, its long snout sniffs the sky in anticipation. You can tell at a glance this aircraft means business. Four doors give good cabin access, although squirming into the front seats still requires some suppleness. Remove the rear seat (just five minutes work) and you have a flying truck capable of hauling 450 lb. Take off the two rear doors and it becomes a brilliant camera platform.

Both the gear legs' slim profile and their near eight-foot track were very evident. Larger 8.00 x 6.00 wheels were fitted, rather than the now-standard 7.00 x 6.00 units (the biggest available wheels are 8.50 x 6.00). All allow use of a longer, more efficient, 81-inch propeller, although this example had the quieter, 78-inch, three-blade Hartzell. Other fitted options included dual tail struts, lifting shackles, vortex generators, a second landing light, transparent lower front door panels, a JPI EDM-700 engine analyser, a moving map GPS, a Garmin Air Cell in-flight phone and a PS CD player.

Those light grey or fawn panels transform the Maule cockpit into a light and airy place, and its cabin, while not over-roomy, is comfortably sized for four or five occupants. But this high level of equipment combined with the heavy engine and the 44 lb greater weight of its solid legs rather limits payload. Ray Maule and myself plus 22 usg of fuel (half-full main tanks) took us to 2,250 lb, or ninety per cent of maximum weight. Four mixed-sex adults could have loaded only fifteen gallons (sufficient for barely an hour to empty tanks) and no baggage. Alternatively, full tanks would have allowed a mere 340-pound payload, or just me and a teenager. So the fifth seat was superfluous.

Starting was dead simple, and those wide, stiff gear-legs gave a firm but comfortable ride, with no waddle, even on Spence Field's cracked old concrete. The disc brakes were





smooth and progressive, and the new tailwheel's steering was significantly better than the worn units I am used to, staying engaged at rudder angles up to 20°. So the Orion's ground-handling was both easy and completely predictable, and noticeably better than its forebears. The broad nose is fairly intrusive so, while we could see everything to our left, objects less than eighty feet distant on the right were rather obscured. The easy solution was of course to swing the nose from side to side.

Run up was normal, and we chose not to use flap on this hard surface, although 24° or 40° may be used for short-field work.

Our take-off was every bit as exhilarating as I had anticipated. The temperature was a sultry 28°C, and I was cautious about opening the throttle too fast, but our roll was still under 250 metres, and we lifted off at just 55 mph. Thanks to the wide track, I had absolutely no problem keeping straight. Climbing at 90 mph (max weight V_y is 93 mph) gave us an indicated 1,200 fpm on the VSI. This turned out to be 1,130 fpm by stopwatch, or rather less than the quoted 1,500 fpm at an unspecified 'light weight'. Thanks to the rudder trim (a T-handle which applies a spring bias to the right rudder cable) the ball stayed centred, and both pitch and yaw stabilities tested positive in the climb.

At 5,000 feet I selected the reflex flaps, and set a guessed (there are no book figures) 75 per cent cruise power of 24 inches and 2,400 rpm. This returned an indicated 141 mph in a 67°F OAT, equating to 152 mph TAS, again somewhat slower than Maule's quoted 75 per cent power speed of 160 mph. Pitch stability was good, yaw stability was very good, and roll stability was neutral, the aeroplane tending to stay at a set bank angle and continue turning. Reducing power to 21 inches and 2,200 rpm we got 122 mph IAS at 6,000 feet and 65°F giving a TAS of 127 mph. ➤

***Left:* improvements include inertia reel harnesses. *Above:* light grey or fawn instrument panels transform the hitherto dingy Maule cockpit.**

Diesel, jet... and floats

IN A PROJECT outbuilding, a Maule fuselage, bearing the new type number M-9, bears a French SMA MR 20 A5 diesel engine on its nose. This compact, air-cooled, four-cylinder, four-stroke, 305 cubic-inch (4.5 litre) turbocharged, intercooled, 230 hp powerplant has a target TBO of 3,000 hours, and is the first of several diesel aero-engines to be certificated. What we saw was a hollow mock-up, suspended in Dyna-Focal mounts, and being tailored to fit the airframe.

Using a Bosch truck fuel-injection unit, the SMA should burn around 7 gph, with a 0.35 lb per horsepower specific fuel consumption at its 200 hp continuous rating. The basic units weighs 235 lb, which is likely to increase to around 400 lb when fitted and equipped with ancillaries. The SMA will drive a three-blade, constant-speed propeller and will probably have single-lever electronic control.

That diesel Maule has since flown, although certification is still some way off. Like Socata and Cirrus, Maule hopes to get into production later this year. Ray Maule has also been approached by the German Zoche diesel company, and says he would be happy to investigate that powerplant, once it is certificated and in production. With the Europe-wide demise of leaded avgas probably less than a year away, engines running happily on kerosene (jet fuel), as most diesels can, are bound to be in great demand, even with its $200,000 price tag.

While the diesel Maule is still under development, the company has made another kerosene-powered model for years. All Maules have good take-off performance, but for a truly blistering climb you need their 420 hp Rolls-Royce-engined M-7-420 turboprop.

As a follow-on to our visit with the Maule factory, Ray arranged a flight in a new M-7-420 on amphibious floats, recently acquired by local resident Jeb Barrow. Jeb picked us up at nearby Griffin Airport, showed us around his brand-new, Cub-yellow machine, then helped us scale the heights to its cabin.

Jeb fired up the engine quickly and easily. Apart from our lofty viewpoint, the more substantial engine control knobs, and a whiff of burnt avtur from its exhaust, the aeroplane seemed the same as any other Maule. But the difference was instantly noticeable on take-off. Opening the throttle produced a neck-breaking surge, followed by a laughably short run and a rip-snorting 3,000 fpm climb-out.

Settling into a 140 mph low-level cruise, Jeb whisked us to his father's nearby lakeside home, landed on the confined pool just by the house, and taxied up to the jetty. Here we were treated to traditional Georgia hospitality. After making a couple of take-offs and landings for my camera, Jeb and his amphibious rocket then zoomed off into the distance, showing how kerosene can further transform what is already a potent performer.

Above: **solid aluminium gear legs weigh 44 lb more than originals, but confer wider track. Nosewheel Maules have gained in popularity.**

We sank, wings level

The long wing reduced our roll rate a bit compared to older models, but it still only took a respectable 2½ seconds to roll from 45° of bank one way to the other. With diagonal bracing tubes criss-crossing its windscreen and a sight-line behind the leading-edge, vision into turns has always been a Maule problem, but you get used to it. Downward visibility is of course peerless, and the current, straight-cut wingtips do enable you to see both horizons in the cruise.

The Orion's stalling manners were as predictable as those of its predecessors. With reflex flap still set, the intermittent horn started at 70 mph IAS, but the stall came much slower, at 57 mph. With flap zero, the horn began beeping at 62 and the innocuous stall happened at 55. The limit speed for positive flap angles is 95 mph, so with 24° set the horn sounded at 59 mph, followed by the nose dropping away straight ahead at fifty. With flap forty, after the horn's warning at 53 mph, I needed a strong heave to stall us at 49 with the nose just on the horizon and 500 fpm of sink indicated on the VSI.

With 48° of flap I found that, at our forward C of G, there was just not enough up elevator for me to pull us into a full stall, although the significant drag caused a quicker deceleration. I had to be satisfied with seeing the airspeed back at 48 mph as we sank, wings-level, at 600 fpm. Of course the ever-optimistic manual quotes a forty mph full-flap stall at that 'light weight'.

Opening the throttle and returning the flap to 40°, I found I needed lots of right rudder, and a firm push to counteract the strong pitch-up. This became even more noticeable as I retracted the flaps to 24°, although it was not difficult to trim out. I wondered if Maule Air had considered an electric elevator trim to supplement the manual wheel, down between our seats.

Spence Field's only operational runway was both narrow and out of wind, so Ray suggested we transit to Moultrie's municipal airport for my first landings. He recommended a 65 mph approach, five knots less than I would have flown in an earlier, shorter-winged, smaller-flapped model, and a great deal slower than I would fly any Cessna. Despite our reduced speed, roll control remained good provided I used plenty of co-ordinating rudder. Again I ran out of nose-up trim on short final, but we were very close to the forward C of G limit. Nearing the ground I needed a heavy pull to get our nose up for a proper three-pointer, and I had to keep some power (1,300 rpm or so) to retain enough elevator authority for a proper flare. We touched down after only the briefest of floats at around fifty mph.

Maules are very much at home on grass or gravel runways, but I have never found them particularly easy to land on a hard surface (nosewheel-only pilots need not even apply). Nevertheless, the Orion's enlarged rudder made it noticeably easier to push off the drift accurately, and it seemed much less prone to directional waywardness. As in earlier Maules, it is best to drop your right hand from the throttle on touchdown to dump the flaps and prevent a bouncy short-period porpoise that

Performance counts

FOR A COMPANY whose motto is 'It's performance that counts'—and for an organisation making great strides in refining its products—I was surprised by a few potential improvements Maule had *not* made. I believe their exhausts, wheel fairings and engine cowlings are in dire need of updating.

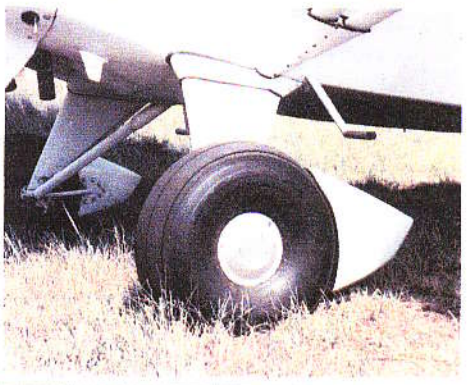
Maule's current exhausts are apparently derived, with minimal changes, from the old small-diameter, one-and-three-eighth-inch system designed forty years ago for the lower capacity Continental O-300 engines in early Maules. Take a look at an old Cessna 170's exhaust, and you will see the similarity.

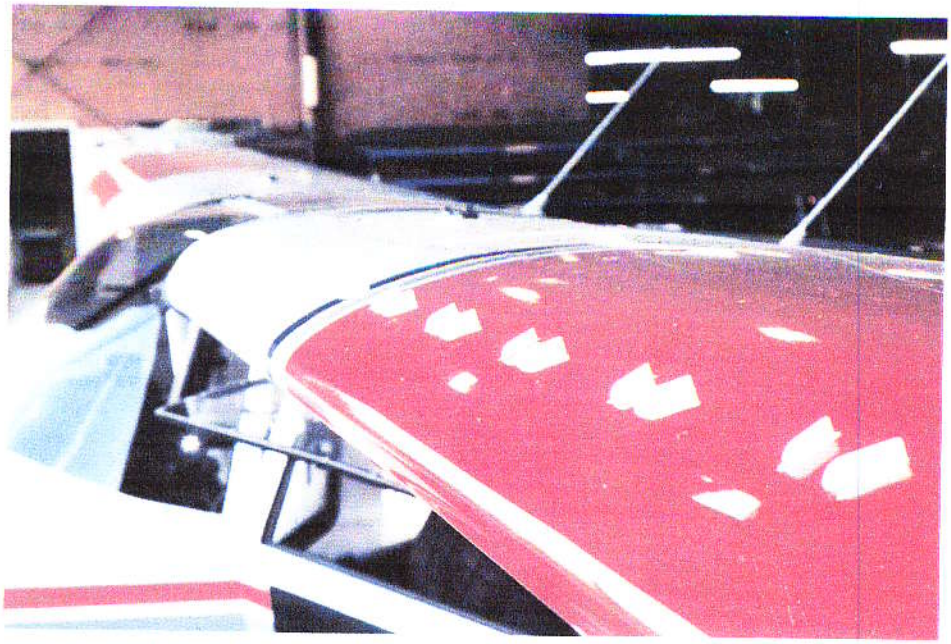
To use these with modern, one-and-five-eighth Lycoming exhaust ports, a stepped adapter reduces the pipes' area to less than two thirds, a couple of inches from the cylinder heads. (Worse, the simple slip-joints between the two continually leak hot, poisonous gases into the engine compartment.)

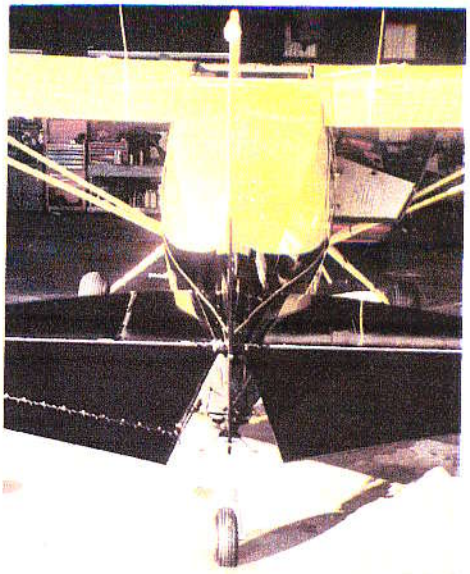
Stepping down the pipe diameter by a third has two effects. It must restrict gas flow (and, therefore, power) at full throttle. And it means the whole skinny system is weaker than it would be if the larger pipe was used throughout. Maule exhausts have a notoriously limited life—both the company and their British distributor are aware of customer dissatisfaction. Here is an opportunity for Maule Air to make a useful improvement that should also boost performance.

Secondly, although neat, bolt-on, after-body wheel fairings are offered as an option, their only size fits the little 5.00 x 6.00 wheels, which are no longer used, and small enough to need no drag reduction. No fairings are available for the bigger 6.00 x 6.00, the standard 7.00 x 6.00 or the 8.5 x 6.00 tundra tyres (which have twice the cross-section, and so four times the drag of the smaller ones).

The company suggests their small speed fairings can be trimmed and fiddled to fit, but they remain too tiny, and do not fair properly into the bigger wheels. Maule should supply







Left: **Micro Dynamics leading-edge vortex generators—another (pricey) option.**
Above: **elevator gap seals enhance pitch stability.**

can sometimes develop. Thereafter the new landing gear's wide track and predictable steering made it much easier to keep straight than its predecessors.

Reducing flap by one notch and retrimming, I carefully advanced the throttle for a touch-and-go. Expecting to have to concentrate on directional control, I was amazed when the aeroplane simply zoomed straight off the deck. After a couple more circuits I quickly got the feel for this competent machine, making better touchdowns from each approach. Carefully braking to a full-stop, our final landing roll took under 300 metres.

I very much enjoyed flying the M-7-235C, and thought its new legs a great improvement on the old landing-gear, making it much more stable and manageable on the ground, and suitable for a low-hours tailwheel pilot. I also appreciated the many refinements Maule have incorporated over recent years, especially in their lighter, airier cabin.

But, unless super-STOL performance was vital to an operation, my personal choice would be for the lower-powered MX-7-180AC Sportplane. This 180 hp variant combines a shorter cabin with a lighter, 180 hp Lycoming, a fixed-pitch prop and this excellent spring gear. With a $30,000 lower price tag and reduced maintenance and running costs, it still has plenty of get-up-and-go, with only slightly lower speeds than the bigger-engined or constant-speed prop versions. Meanwhile its lighter empty weight allows a greater payload, and the reduced fuel consumption confers either a greater full-tanks range or further payload improvements.

Maules definitely represent value for money and, despite a few remaining shortcomings, the entire family has improved tremendously over recent years. Nevertheless, it is evident these aircraft are still aimed more at the cost-conscious than the luxury market.

So, if you want a more sophisticated (although honestly not much more modern) four-seater, you might choose a Cessna or Piper. But for less money you get improved utility, better field performance and a certain rugged style with a new-look Maule. As with all aircraft, you pays your money and you takes your choice.

Me? I bought a Maule!

larger fairings. They claim there is little demand, but I suspect this is just because the size is wrong. Reducing the drag of those big boots must increase cruise speeds.

Finally, look closely at those bulky, blunt cowlings. Now compare them with the latest offerings from Piper, Cirrus, Lancair, Diamond, Mooney or indeed any other modern manufacturer. Not only are Maule's cowlings wider and deeper than they need be, but they are Mack-truck ugly. Look at those unnecessarily thick lips, and that draggy, inch-high step behind the spinner. Why is it there? Any drag within the propeller's diameter is more important than other parasite drag because it experiences a higher local airspeed in the propwash.

My guess is that these cowls came from a mould made around a plaster plug. That heavy, wet plaster made the engine sag in its rubber mounts so, while the prototype top cowl probably fitted the spinner beautifully, after the plaster was chipped away the engine rose back to its original position and the cowlings no longer fair into the spinner.

Drag conqueror Curt LoPresti is designing cowlings for Maule's diesel. While he is there, they should get him to glance at their old piston-engine cowlings. When he stops laughing they might get him to design new ones for improved cooling and reduced drag. It would be little more than a week's work for one man to make a tighter, neater, more aerodynamically-efficient cowling plug.

When Maule redesign their exhaust system they can tuck it more snugly under the engine, and then make nice, new, sexy cowlings. Reshaped cowlings will give a sleeker appearance and improved sales. Then why not incorporate drag-reducing cowl flaps?

After all, 'It's performance that counts!'

Maule M-7-235C Orion

Dimensions	
Wing span	32 ft 11 in
Wing area	165.6 sq ft
Length	23 ft 6 in
Height	6 ft 4 in
Cabin width (max)	42 in
Seating	4/5
Weights & loadings	
Equipped empty	1,720 lb
Max take-off weight	2,500 lb
Max baggage	250 lb
Standard fuel	60.8 imp gal
Max fuel	70.8 imp gal
Max wing loading	15.1 lb/sq ft
Max power loading	10.6 lb/hp
Load factors	+3.8/-1.5g
Performance	
Sea level V_{ne}	158 kt
75% cruise	139 kt
Take-off run	182 m
Landing distance	152 m
Service ceiling	20,000 ft

Engine: One six-cylinder, horizontally opposed, normally aspirated Lycoming O-540-B4B5 producing 235hp at 2,750rpm. TBO 2,000 hrs.

Propeller: Hartzell HC-C2YR-1BF, 78-inch diameter, three-bladed, all-metal constant-speed propeller.

Manufacturer: Maule Air Inc, 2099 Georgia Highway 133 South, Moultrie, Georgia 31768, USA, tel: 00 1 229 985 2045, fax: 00 1 229 890 2402, web: *www.mauleairinc.com*

UK Distributor: Aeromarine, Mariner's House, Hamble, Southampton, tel: 02380 456256, fax: 02380 453010, web: *www.nauticatuk.co.uk*

Price: Featured aircraft $175,329.