A FLIGHT TEST EVALUATION OF THE SUPER XIMANGO MOTORGLIDER

by Richard H. Johnson

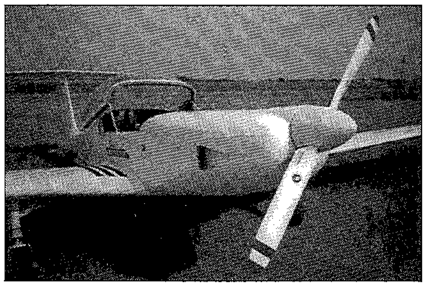
PHOTOGRAPHY BY RICHARD THORNTON

Lead Page Photo: Rene Fournier's RF-10, built in Brazil and now with a Rotax 912A, is a "lovely little motorglider" full of novel features and with good cross-country performance whether under power or soaring.

INTRODUCTION

The AMT-200 Super Ximango (pronounced Zh-mahn-go) is a well made and relatively new Brazilian side-by-side two-seated motorglider that is becoming popular with self launching sailplane and light motor plane proponents worldwide. AMT stands for the AEROMOT - AERONAVES E MOTORES S.A. factory located near Porto Alegre, Brazil. Constructed from modern epoxy, fiberglass and carbon fiber materials, it is powered by the well proven and FAA certified 80 hp Rotax 912A liquid cooled 4 cylinder 4 cycle aircraft engine that is mounted conventionally in the fuselage nose, driving a 1.70 meter (67 in) diameter 3 position Hoffmann propeller. To reduce the motorglider's 17.47 meter (57.3 ft) overall wing span during ground operations and storage, the wing outer panels are designed to be folded upward and rest upon the upper surface of the inner wing panels. Only one person is needed to accomplish that, and the only tool required is a screw driver. The aileron portion of the wing is included in the folding, and the aileron control system cleverly disconnects and reconnects automatically when the wing outer panels are folded and unfolded, as they should. The airbrakes are located somewhat inboard from the wing fold joints; thus their operation is not affected by the folding When folded the AMT-200's wing span is reduced to 10.15 meters (33.3 ft), thus allowing safe movement on narrow taxiways and economical hangarage. An earlier model is the AMT-100 Ximango which is similar to the AMT-200, but powered by a Limbach L2000 E01 4 cycle engine driving a slightly smaller 1.60 meter (63 in) diameter 3 position Hoffmann propeller. Figure 1 shows a 3-view outline of the new AMT-200 Super Ximango motorglider.

When Denis Michaud of Nederland, Colorado, offered to bring his new AMT-200 to Caddo Mills for testing, I quickly accepted his kind offer. His motorglider is serial number 47, and it was constructed during the latter part of 1995. It was then flown by a ferry pilot all the way from the AEROMOT factory in Brazil to Daytona Beach, Florida, where the U.S. Distributor Chuck Cheeseman and his two partners reside. Last winter, Denis took delivery of his new motorglider in Florida and flew it to its new home in Colorado.



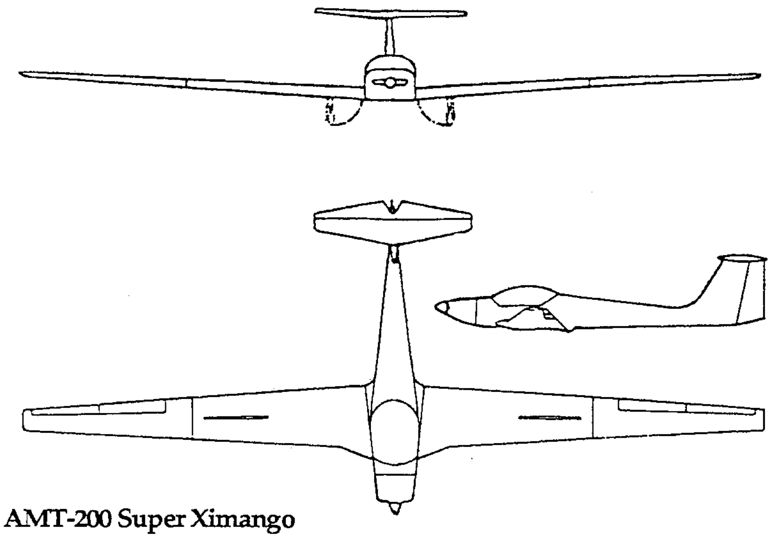
Propeller in unfeathered starting position, well supported open canopy provides good access to cockpit.

AMT-200 cockpit features a large baggage compartment on shelf behind seats, dual canopy latches on bulkhead in front of instrument panel.

AIRSPEED SYSTEM CALIBRATION

The following February, Denis agreed to stop by Caddo Mills for flight testing of his AMT-200 while on his way to the National Soaring Convention at Huntsville, Alabama. We first checked for leaks (found none) and then calibrated its airspeed system, both on the ground

5.00 by 4 inch main landing wheel with hydraulic disc brake. Gear retraction is accomplished manually by cockpit center console mounted lever.



AMT-200 Super Ximango

Dimensions	
Length	8.05 m
Height	1.93 m
Wing span	17.47 m
Wing span folded	10.15 m
Wing area	18.7 m^2
Weights & loadings	
MTOW	850 kg
Empty weight	605 kg
Useful load	245 kg
Max fuel	90 liters
Performance	
Max cruise	205 km/h
Econ cruise	180 km/h
Stall	72 km/h
Climb	3 m/s
Max speed	245 km/h
Fuel	14 l/h
Max load	+5.3/-2.65g
Take-off run to 15m	323 m
Glide ratio	30:1
Min sink rate	0.96 m/sec
Range	1,400 km
Max endurance	6 hr 30

Engine: Rotax 912 A producing 81 hp.
Propeller: Two-blade three-position Hoffman HO-V62R/170FA, 67 inches diameter, geared to 2.27:1.
Manufacturer: Aeromot Industria Mecanico-Metalurgica Ltda, Caixa Postal 8031, 90201-970 Porto Alegre, RS, Brazil. Tel: 00-55-51-371-1344, fax: 1355.
U.S. Distributor: Ximango U.S. Inc., 222 Cessna Blvd., Daytona Beach, FL 32124. Tel/FAX: 904-760-4072.
Price: $108,000 f.a.f. Brazil

FIGURE 1.

and later in flight. The flight portion was done in gliding flight with the propeller feathered, using our standard Kiel tube and trailing static bomb method. Those test data are shown in Figure 2 as system error

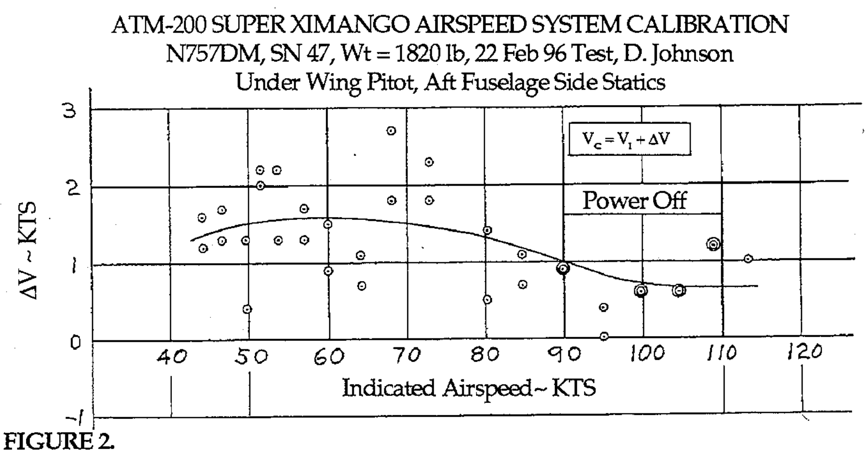


FIGURE 2.

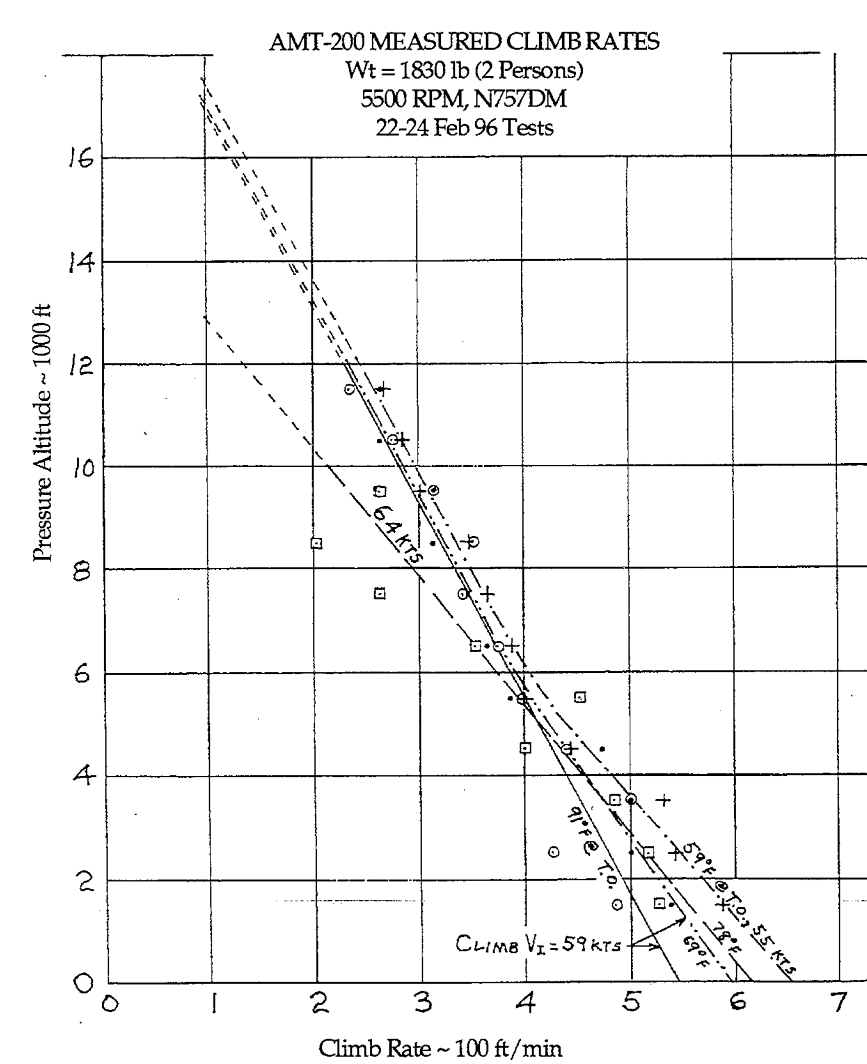


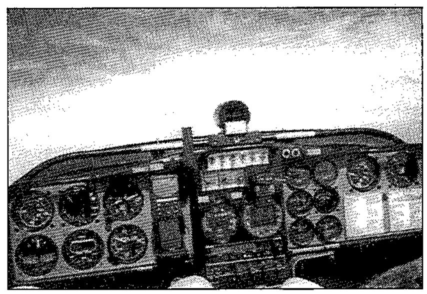
FIGURE 3.

versus indicated airspeed. Less than 2 kts of error was shown over our 44 to 113 kt test range, and that is quite a good system. That calibration was performed "power off" only because the gliding configuration was of most interest for our glide performance testing which was to follow. The "power on" airspeed system errors are apt to be larger, and a function of the power setting because the static ports are located on the fuselage sides within the propeller's high velocity slipstream. We did not make any "power on" airspeed system calibrations.

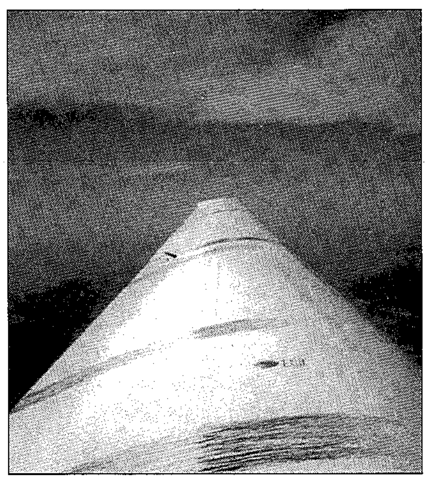
CLIMB RATE TESTING

The AMT-200's Rotax 912 engine was utilized to climb from the surface up to 12,000 feet MSL on 4 occasions to gain the altitude needed for the still air "power off" sink rate measurement tests. During those long climbs we recorded the motorglider's ascent rates as we climbed at various steady airspeeds. Two of the climbs were performed at the Flight Handbook recommended 59 kt indicated airspeed, and one each were made at 55 and 64 kts to evaluate differences. The first test was per-

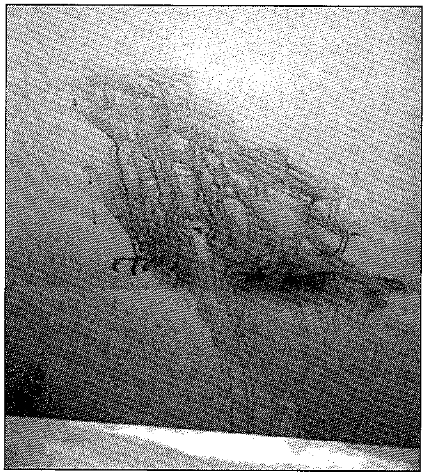
Steerable pneumatic tail wheel swivels 360 degrees when restraining pin is removed.



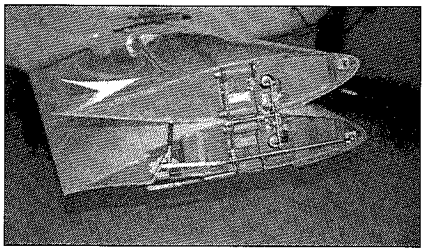
AMT-200 instrument panel during engine "on" climb. Author in left seat.



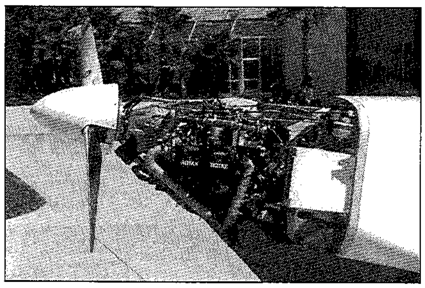
Oil flows on top of AMT-200's left wing during 60 kt climbing flight indicate low drag laminar flow aft to about .5 chord, followed by normal transition to turbulent airflow.



Post flight oil flow pattern on AMT-200's lower wing surface also indicates laminar flow back to about mid-chord, with possible a small separation bubble before transition to turbulent airflow. Turbulent light area near center was caused by protruding wing jack point lug.



Wing-folding mechanism is a Fournier trademark of simplicity: the aileron controls remain connected and the folding operation involves merely lifting the wingtip up and laying it over on itself.



Two-piece engine cowling is removed using 1/4-turn Camlock fasteners. Underneath, Aeromot's noted high quality shows up in the installation of the Rotax 912A and its systems.

formed during a relatively warm 91 degree F afternoon, and naturally the lower level climb rates were a bit lower than those measured during the following two more normal days. Those climb rate versus altitude measured data are presented in Figure 3. We did not have an oxygen system onboard, therefore we limited our climbs to 12,000 ft.

Although the air was not as still as we would have liked during any of

ATM-200 N757DM POLAR TEST DATA
As Delivered Condition, Power Off

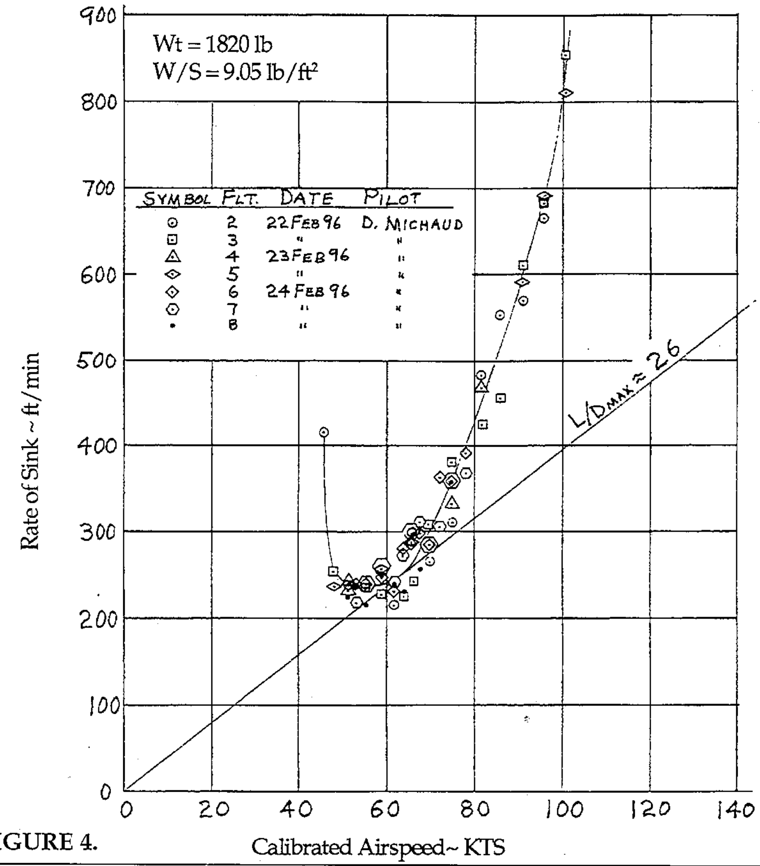


FIGURE 4.

ATM-200 N757DM POLAR TEST DATA
With Added Smoothing and Sealing, Power Off

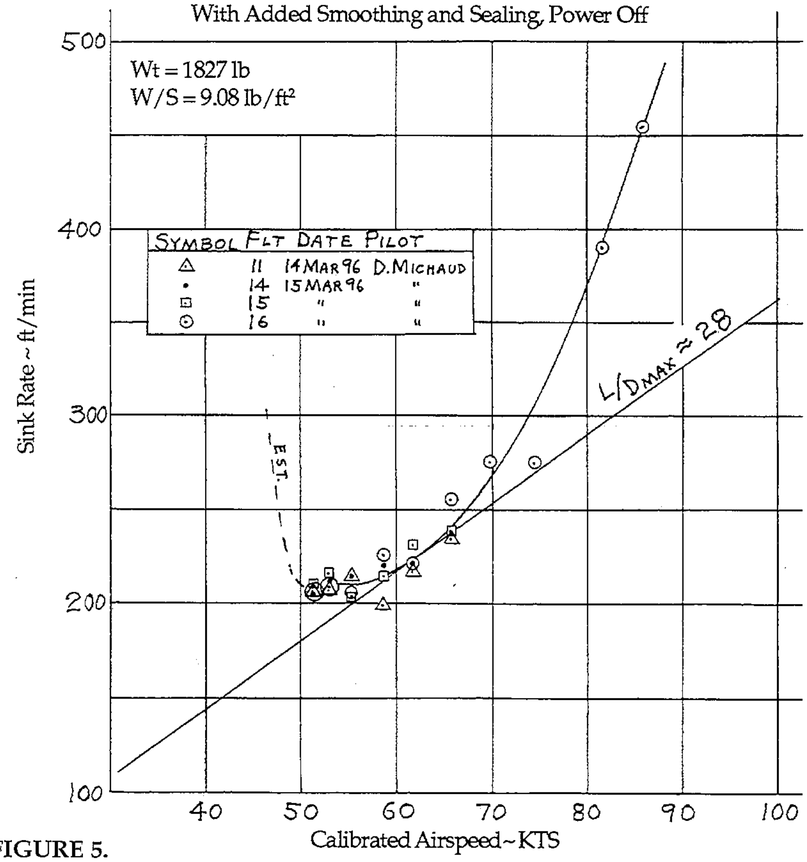


FIGURE 5.

the climb rate test days, it appears that the Handbook recommended 59 kt climb airspeed is indeed near optimum. Engine cooling and operational considerations were no doubt factors included in the factory's 59 kt climb airspeed recommendation. The AMT-200's sea level standard 59 degree F day climb rate at our 1830 lb 2 place test weight appears to be about 650 ft/min. Even at 12,000 feet the climb rate test data showed about 230 ft/min. An extrapolation of the rate of climb data above that altitude indicates a 100 ft/min service ceiling of about 17,000 ft, assuming the engine continued to run as well as it had during our 12,000 ft test climbs. Our Rotax 912A engine was equipped with an automatic mixture control system, and that was apparent from its continued good climb performance to our 12,000 foot maximum test level.

SINK RATE TESTING

After the high climbs the engine was idled for a short period, then shutdown and the propeller feathered by its cockpit lever operated cable system. After that, steady airspeeds were flown and timed over 500 ft descent intervals to obtain the sink rate versus calibrated airspeed data needed to define the AMT-200's glide polar. Those test data were corrected to standard day sea level conditions by the method described in Reference A, and they are shown plotted in Figure 4. A minimum sink rate of about 238 ft/min was shown at 55 kts, and a maximum L/D of about 26 was indicated at 63 kts CAS. Because the motorglider was on its way to the SSA National Convention at Huntsville, Alabama, we had only a few days to complete our initial testing. Unfortunately, the upper air winds continued to blow at about 35 kts, and that introduced some additional scatter to the sink rate test data. Our test motorglider was in as delivered condition, and it needed some additional air sealing and fitting of its airbrakes and landing gear doors.

After the Convention our test AMT-200 was flown back to Florida for some aerodynamic cleanup. After that was accomplished, additional sink rate testing was performed there. Fortunately, during the 14th and 15th of March the upper air winds there fully met our less than 15 kt criteria. Denis was then able to perform additional sink rate testing with good results. His measurements showed lowered sink rates, and there was considerably less scatter in the sink rate data than that which we had encountered with the earlier Caddo Mills test data. Those new test data are shown plotted in Figure 5. There the AMT-200's minimum sink rate appears to be reduced to about 210 ft/min at 52 kts, and its L/D max improved to about 28 at 62 kts. That performance level is quite adequate for this type of motorglider, especially considering its easy and reliable engine restarting performance.

GENERAL CHARACTERISTICS

Although the AMT-200's wing center portion houses its retractable landing gear and is semi-permanently attached to the fuselage, the well designed wing outer panel folding system makes it compact enough to fit into ordinary airplane hangars and tie-down spaces. The wing airfoil is reported to be an early NACA 64(3)618 section that was developed in the USA during the 1940's. It is still a good laminar airfoil, though it lacks some of the refinements of the later German sailplane laminar airfoils. Our oil flow test at 60 kts indicated low drag laminar flow was achieved back to about 50% chord at most locations on both the top and bottom wing surfaces, and that is relatively good airflow. Wing chordwise wave gage measurements showed an average waviness of about .006 in (.15 mm) peak-to-peak values on both the top and bottom surfaces. That is fairly good, but additional smoothing would likely increase the flight performance further.

The side-by-side cockpit seating is comfortable, and good visibility is provided for both occupants. The one piece canopy has excellent optics. When opening, it is well supported by a track at its aft end center and rigid pivot links attached to each side of the canopy side rail forward ends. The canopy pivots up and slides aft about 3 feet when full open, thereby providing good access to the cockpit. All of the controls are both easy to reach and to operate. The main landing gear wheels are of the 5.00 x 4 (14 in OD) size and they appear to be adequately sized for normal airport operations. They are equipped with hydraulic disc brakes that operate simultaneously only. The tail wheel is connected to the

DEREK PIGGOTT ON THE SUPER XIMANGO

as first appeared in *Pilot* magazine,
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"In aviation, what looks right usually performs well – and the Ximango is no exception. It is an impressive-looking machine with its wide track undercarriage, long, clean engine cowling and elegant wings, somewhat like a Mustang fighter.

This is a machine capable of taking two people some 700 miles, cruising economically at 110 mph. With the propeller feathered it has a glide ratio of over 30:1 and, most important, a practial circling speed for thermaling of fifty knots. This gives it a great advantage as a soaring machine over the other fiberglass side-by-side motoergliders which, apart from the Stemme S10, have difficulty thermaling because their turning radius is so large."

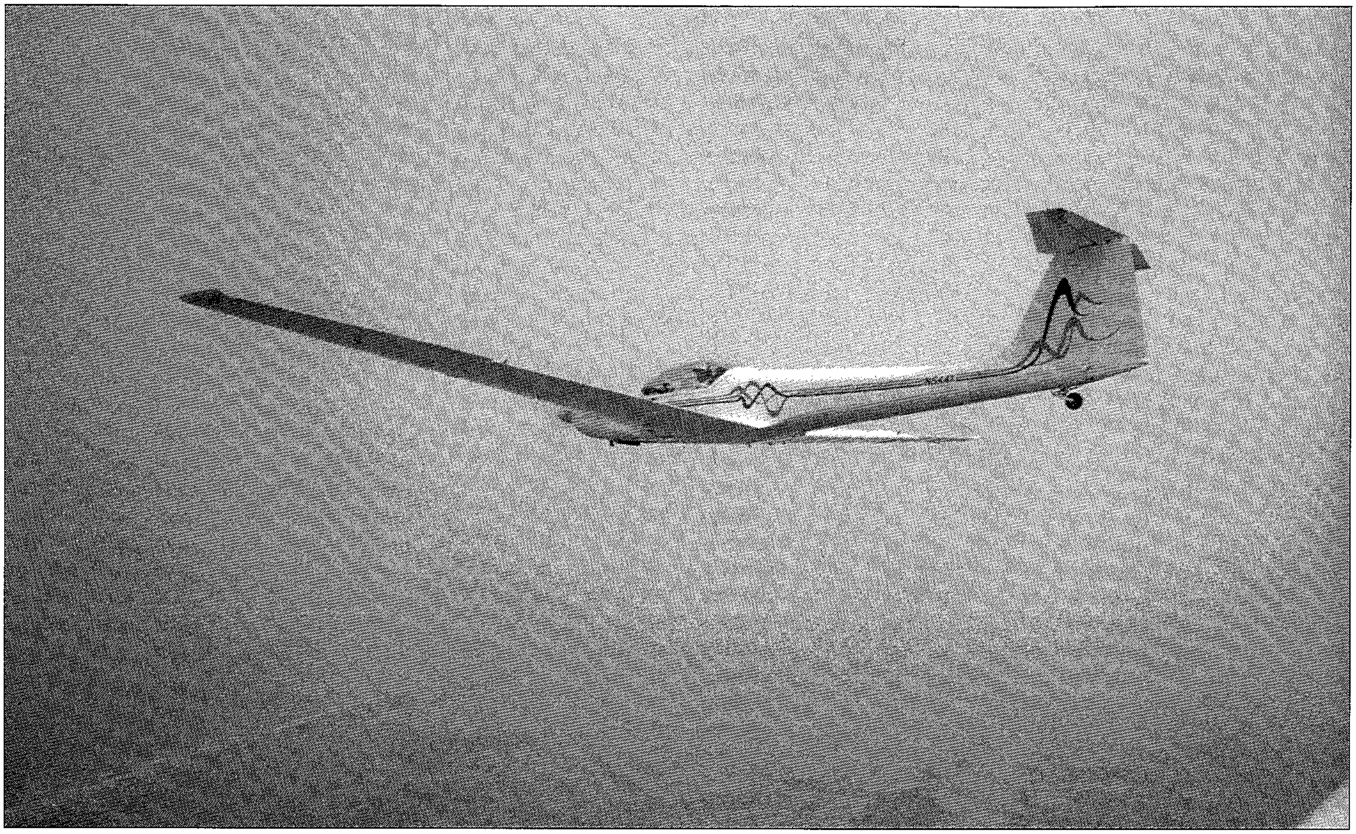
"With the engine off and propeller feathered, quite steep thermaling turns are possible at fifty knots, and slower in really smooth conditions. The circling performance is impressive, and we had no difficulty in using the rather weak thermals and moving from cloud to cloud."

"The Ximango is full of novel features, like all of Rene Fournier's designs."

"Special safety features are the very wide track undercarriage, the super powerful airbrakes (you don't have to use full airbrake, but it's there if you get into a problem and need to get down in a hurry), the fuel tanks in the wings for reduced hazard in a crash, the five-point safety harnesses for both pilots and, most important, the ample power to provide more than adequate performance."

"Summing up, I liked it and would recommend flying it if you fancy a soaring machine with a good cross-country performancde both under power or gliding. Top marks to Rene Fournier and the Brazilian team for producing such a lovely little motorglider."

Editor's Note: Derek Piggott, well-known British soaring pilot, instructor and author, conducted an FTE of the Super Ximango, at the controls of the first machine to reach the U.K., G-RFIO. The full text of his findings was published in the October, 1995, issue of *Pilot* magazine, adapted here with permission.



Super Ximango N544X aloft over the Daytona Beach coastline while returning to Spruce Creek.

rudder by springs, thereby providing directional control for ground operations. For ground movements after engine shut down, a locking pin in the tail wheel pivot can be removed, permitting full swiveling of the tail wheel for easy maneuvering into parking places and hangars.

The flight controls are well balanced and comfortable to operate. At 55 kts thermaling airspeed, 45 degree to 45 degree rolls could be performed in about 5.8 seconds. 45 kts was the lowest airspeed that we could maintain steady level flight at our near full gross weight of 1820 lbs. The stall characteristics were relatively gentle, with little tendency roll off into a spin. Standard 11.6 gallon fuel tanks are located in each inboard panel wing leading edge, providing a total of 23.2 gallons of fuel. We did not attempt to measure the AMT-200's level flight cruise performance, but the factory claim of 3.7 gallons per hour fuel flow when cruising at 110 kts appears possible. The ability to perform long range cross-country flights at reasonable airspeeds and outstanding fuel economy is an attractive feature for this motorglider. I only had time to perform a few minutes of power off thermaling, but the AMT-200 appeared to accomplish that quite well.

Another attractive feature for the AMT-200 is its apparently high engine reliability and claimed durability. Its liquid cooled 4 cycle 4 cylinder dual ignition Rotax 912A engine is a fully certified aircraft engine, and it sets a new standard for motor gliders. It will be interesting to see if the recommended 1200 hour TBO will actually be achieved in motorglider operation where the engine is often operated at high power settings, then shut down in a cold atmosphere for subsequent gliding flight. The Rotax 912A proponents believe that its liquid cooled cylinder heads will reduce the thermal shock problem sufficiently that long engine life will be attained. Another attractive feature of this engine is that its carburetor air is preheated by flow over the engine, thereby eliminating the need for a separate carburetor air heating system. A manually operated choke is provided to assist in cold starting. The basic price of the new AMT-200 is about $110,000 delivered in Florida. While that may seem like a lot of money, have you priced a new light plane recently?

Thanks go to Denis Michaud for bringing his new Super Ximango to Caddo Mills for flight testing, and for performing the bulk of the flight testing pilotage. Also, to Ximango U.S.'s Chuck Cheeseman and partners for their assistance with the second portion of the flight testing performed at their base in Tampa, Florida.

REFERENCE

A. "Sailplane Performance Flight Test Methods," R.H. Johnson, *Soaring* Magazine, May, 1989.

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