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PHOTOGRAPHY BY THE AUTHOR

Soar like a sea gull

Gliding the Hoffman H 36 Dimona motor glider on summer's thermals

BY MICHAEL L. STOCKHILL

British writer L. J. K. Setright nailed it years ago when he responded to a question about how he would use Earth's last gallon of gasoline. Setright, an astute and complex automotive journalist, wouldn't choose to squander that last hit off OPEC's pumps by firing up a Ferrari or charging the batteries on something like a Honda Insight. Rather, he said he'd burn it off in a motor glider, in one last climb, mingling chance and skill for, hopefully, a lengthy soaring flight.

A *motor glider,* Setright? One of them flying flivvers—rare as frog's hair in this country? Yeah. Quirky as they are, motorgliders have virtues. How does a roomy cockpit for two, outstanding visibility, 100-knot cruise speed, and 600-mile range on about 4 gallons per hour strike you? Or perhaps this is the clincher: In calm conditions, the typical touring motor glider, with its engine off and propeller feathered, can glide more than 50 miles from 10,000 feet agl. Toss in some thermal activity, and you can trade a gallon or so of gas for several hours of soaring. Try doing that in a generic small airplane.

Recently, I bought a Hoffman H 36 Dimona to see if a motor glider can truly fold its wings in a flash, soar like a sea gull, and perform in cruise like the world's most efficient airplanes. As a low-time glider pilot with plenty of airplane time, I expected the Dimona to function adequately as an airplane. But could it really measure up as a sailplane? Because of its powerplant's weight, with the associated

PHOTOGRAPHY BY THE AUTHOR

propeller, fuel supply and system, instrumentation, and substantial landing gear, it was very clear that the Dimona gives up about 450 pounds to most unpowered two-seat sailplanes. That weight translates into an increased sink rate. Does that make the Dimona—as one friend sniped—just for pilots who can't fly their Cessna 150s because they blew their medical? Let's see....

While having a high-aspect-ratio wing with a span of 52.5 feet is a clear virtue for soaring performance, it's a challenge when looking for hangar space. Most owners need to take advantage of the straightforward folding-wing design: With its wings folded against the fuselage, the Dimona's footprint is reduced to 31 feet long and 7 feet wide.

There's a roomy feel to the cockpit, if only because of the vast canopy bubble.

As with many early tailwheel airplanes, a three-point takeoff is the prescribed technique. Be forewarned: Crosswinds with the Dimona are quite challenging.

Once the wings are mated to the fuselage (a 20-minute chore), preflight is mostly typical, with particular emphasis on establishing proper control travel and continuity. Boarding the Dimona is accomplished by first stepping onto the landing-gear leg, using the glareshield handholds, straddling the control stick with both feet, and letting yourself down into the comfortable reclined seats.

Nothing is new on start-up, until you search for a fuel primer. Pull the choke instead, and then push the starter button. Like Volkswagen engines everywhere, the Limbach derivative starts easily.

While taxiing, it is necessary to remain highly aware of the vast wingspan. With its long tail arm, the Dimona tracks well while taxiing, and with its wide, stiff landing gear, winds and gusts are hardly noticed. As there is no differential braking, turns on the ground require some planning.

Runup is neither complex nor daunting. Although the engine is carbureted, there is no carburetor heat system to check; while ignition is by magneto, the single magneto installation requires no check—if the engine started and continues to run smoothly, the magneto is functioning.

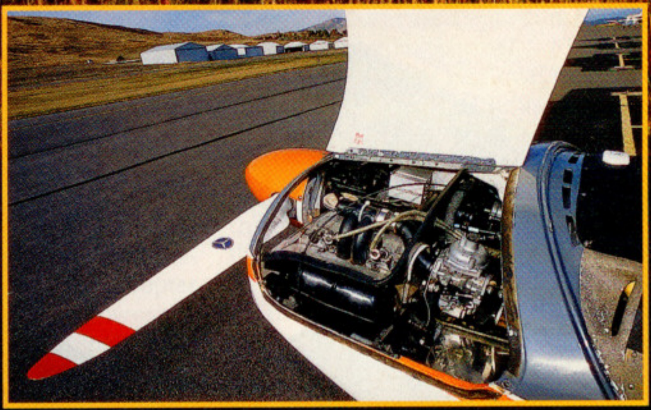
Once oil temperature is sufficient, the engine is throttled up for a full-power static rpm check. Rpm is then reduced to 2,000, and the large D-handle on the instrument panel is pulled out an inch or two, which allows the two-blade, all-mechanical Hoffman propeller to shift to cruise position for a drop of a few hundred rpm. Resetting takeoff pitch requires reducing rpm to about 1,000 rpm, pulling the D-handle again for a 200-to 300-rpm rise, and then again checking static rpm, assuring that the propeller blades have returned to flat pitch.

As with many early tailwheel airplanes, a three-point takeoff is the prescribed technique. Be forewarned: Crosswinds with the Dimona are quite challenging. Acceleration is satisfying, especially after you discover that the engine, which nominally produces 80 horsepower at 3,400 rpm, only puts out 50 horsepower or so in the 2,500-to-2,800-rpm actual operating range.

As the motor glider accelerates through 20 knots, directional control becomes very sensitive because of the positive tailwheel linkage. Left in a three-point attitude for takeoff, the Dimona lifts off at about 40 knots after using about half the ground roll of a Cessna 150. Somewhere in the takeoff roll, it is likely that the Dimona will drift to the right of the centerline. Not surprising as the Limbach's direction of rotation is opposite that of Continentals and Lycomings, with p-factor and heavy feet creating a yaw to the right rather than to the left.

After liftoff, the Dimona quickly accelerates through its 43-knot minimum-sink speed and the engine revs to about 2,800 rpm. The magic number for this aircraft is 51 knots: the best-rate-of-climb speed, approach speed, and the best-glide speed.

With motor gliders, unlike most general aviation airplanes, successfully returning to land on the runway after the loss of power shortly after takeoff is a realistic option. With the Dimona, a course reversal to land on the departure runway can be readily accom-



Under the cowling is an 80-horsepower Limbach L-2000 engine (a Volkswagen derivative).

Is it soarable?

The first aviator to aspire to bolting an engine onto a sailplane probably had that notion while trying to track down a pilot and towplane. While that soul remains nameless, Harry Perl and Ted Nelson were certainly among the first to act on that dream, when they laid down the Nelson Hummingbird's swing-pylon design in 1949. Now largely a product of Europe, motor gliders are a compromise driven by a dearth of small certificated powerplants and Europe's expensive gasoline.

Motor gliders may be loosely classified into three categories: sailplanes with sustainer engines; self-launching sailplanes; and touring motor gliders that function as soarable airplanes—such as the Hoffman Dimona featured here.

The utility of the sustainer configuration—where a towplane or winch must still be used for launch—seems somewhat specious, seemingly just a waypoint until the available horsepower from small engines was increased to the point where self-launching was possible. The sole sustainer-engine motor glider in current production is the Schempp-Hirth Ventus-2T, whose promotional material advocates that the sustainer engine is there to avoid the risk and inconvenience of off-field landings as well as to offer adequate range and power for activities such as exploratory wave flights.

Today, the typical self-launching sailplane follows the Hummingbird's layout, incorporating a retractable pylon-mounted propeller and two-stroke Rotax engine combination that pivots into the aft fuselage of a composite high-performance sailplane. *Self-launching* pretty much means just that: No need for a towplane, and sufficient performance to avoid off-field landings. Most such designs would be highly taxed by any attempt at continuous operation on cross-country flights; they really aren't refined enough to be used as a substitute for an airplane. The splendid soaring performance of nearly all of the modern swing-pylon designs suffers inordinately when the assembly fails to stow or the engine fails to restart in flight. Glide ratios of 12-to-1 or 14-to-1 are the norm then—a matter of compelling interest during in-flight planning.

Most of the dominant European sailplane manufacturers offer adaptations of their production sailplanes with retractable engine/propeller installations. There also have been jet-powered motor gliders such as the Caproni A-21SJ, and the current Stemme, a two-seat side-by-side configuration with a folding propeller in the nose, is a good example.

A new generation of manufacturers is building unpowered and self-launching sailplanes in the 12-to-15-meter range. Seemingly escaping the mainline manufacturers' traditional approach of reworking and refining older designs, the new manufacturers are shedding pounds and wetted area as they build smaller and lighter sailplanes with performance that matches that of many larger sailplanes of the past decade. While they don't attain the extreme

performance of modern competitive sailplanes, these lighter-weight sailplanes are easier to tow, much more manageable to assemble and disassemble, and potentially easier on the pocketbook.

In what may be the wave of the future, Alisport is offering the unique 13kw (17-horsepower) electric-motor-powered Silent-AE1. Its smooth, silent electric motor should attract anyone who has ever messed with the cranky two-cycle engines with belt-driven reduction drives of most self-launchers.

Unlike the self-launching sailplane, whose typically temperamental power section has the same relationship to soaring as a chairlift has to skiing, the contemporary touring motor glider is expected to function as a viable airplane with soaring capability. The most common iterations of this design school, such as the Dimona and Grob 109, were children of the 1980s. It is a largely neglected configuration today, compared to the relative proliferation of self-launching sailplanes.

Almost always of composite construction, the contemporary touring motor glider (the Diamond Katana Extreme and Aeromot Ximango are currently in production) usually has a Limbach or Rotax four-stroke engine of 80 to 115 horsepower mounted in the nose, a wingspan of more than 50 feet, side-by-side seating for two, and a feathering propeller to reduce drag while soaring. Unlike self-launching sailplanes, these aircraft are rarely trailered from place to place, and have wings that fold for storage. Most boast of cruising speeds of about 100 knots while burning less than four gallons of fuel per hour, as well as having reasonable soaring performance when their engines are shut down and their propellers are feathered.

It is important to understand that many motor gliders—self-launchers or otherwise—are imported and sold with experimental certification, a classification that may impose constraints upon geographic areas of activity or types of authorized use.

A medical is not required for flying either sailplanes or motor gliders. Pilots with only glider ratings are required to get a motorglider endorsement from an appropriately authorized glider instructor prior to motor glider solo. Certificated airplane pilots are required to acquire a glider rating as well as a motor glider endorsement before soloing motor gliders.

Perhaps the best information source regarding motor gliders, current manufacturers, and motor glider training is the Auxiliary-powered Sailplane Association at 9541 Virginia Avenue South, Bloomington, Minnesota 55438 (www.motorglider.org). One of the most active listings of used sailplanes and motor gliders is sponsored by Wings & Wheels, a soaring-products supplier (716/763-3213; www.wingsandwheels.com). And the nonprofit Soaring Society of America (505/392-1177; www.ssa.org) is always willing to share a wealth of information regarding soaring activities. —*MLS*

Visibility in the Dimona is excellent—its bubble canopy provides a window to the world. With its wings folded against the fuselage, the Dimona shrinks to 7 feet wide.

plished from 400 feet agl, even if the propeller is left windmilling.

Climb might seem lethargic to Learjet pilots, but it is clearly superior to a Cessna 150. Usually, at 1,000 feet agl or so, the Dimona can be pitched over to level flight, accelerated to 60 knots, and the propeller shifted to cruise-pitch position.

Changing propeller pitch in flight is performed similarly to the ground check: The rpm is reduced to 2,000, and the D-handle is pulled out an inch or two until the rpm drops and then released. Flying the Dimona with the propeller in cruise position is much like driving a manual-transmission automobile in overdrive. After shifting to high pitch, the nose is lowered and the motor glider is accelerated to about 65 to 70 knots in order for the rpm to increase into the power band where it can climb again.

Transitioning from climb to cruise is a bit of a balancing act. Marginally powered airplanes and motor gliders with high-pitch propellers typically need finesse in accelerating to and maintaining their optimum cruise speed. Book (and actual) cruise speed at 75 percent is 98 knots. Fly sloppily, however, and the speed is just as likely to settle in the 80-to-83-knot range.

In cruise, the Dimona's already-excellent climb visibility becomes astonishing, more like a Robinson R22 helicopter than an airplane. There is a downside. On hot sunny days, the vast canopy bubble provides scant relief from the heat.

Stalls, as with most sailplanes (which are routinely flown very close to the edge while thermalling), are benign: a non-event, at a blistering 38 knots. Spins and aerobatics are prohibited. Flown in a long cruise descent on a calm day, the Dimona is clearly aerodynamically clean; it feels swift, stable, and safe, suggesting that it could cruise much faster if 80 horses were actually on the team.

Comfortable and efficient when used as an airplane, the Dimona has quite another side. With its 27:1 glide ratio with the propeller feathered, it has the potential to be a usable sailplane. But the question is begged: Is the Dimona's relatively high 3-feet-per-second (fps) sink rate an acceptable compromise?

Understand that sailplane performance is largely measured by three parameters: minimum sink rate, optimum glide ratio, and the ability to penetrate. Effectively, a sailplane is always in a descent (except while on tow or during a "stick-thermal"). To climb, the sailplane must be flown in an air mass that is rising at a rate greater than the sailplane's minimum sink rate.

If thermals are rising at 3 fps, and the sailplane is descending at 3 fps, the net effect is called *zero sink*, where altitude—if you are very good—can be maintained indefinitely. To further understand the significance of minimum sink rate, it's worth recognizing that in a 4-fps thermal, a sailplane with a 2-fps minimum sink rate (like that of many contemporary sailplanes) has twice the effective rate of climb as one with a 3-fps minimum sink rate.

When thermalling in the Dimona, I reduce power to about zero thrust or idle, and let the engine cool while I evaluate the soaring conditions. When I am comfortable, I bring the throttle to idle, turn off the magneto switch, and pull the propeller-pitch handle all the way out to feathered position and then twist it slightly counterclockwise to lock it. After an hour or two of Dimona experience, the feathered propeller effectively disappears from your horizon, and the ungainly appearing main landing gear cannot be seen from the cockpit without leaning far forward. It doesn't take too long to forget that you aren't in a "real" sailplane.

If I need a relight, it's simple: magneto switch on, throttle cracked, propeller unfeathered. A touch of the starter button is usually required to start the propeller turning. The engine windmill-starts in a 70-knot dive.

A typical flight in the prevailing conditions where I live requires one relight before I have worked far enough west to get consistent lift. Then it is a matter of concentration to continue climbing to 10,000 or 12,000 feet. After an hour or two of playing, I'll break off and head back home. From that altitude, arriving a couple thousand feet above the airport from 20 or 30 miles out is a piece of cake.

I often close the cockpit window vents at altitude for a significant reduction in cockpit noise. Then the residual slipstream sounds, at 72 dBA—the same as my van at an identical "indicated airspeed."

Somewhere during approach, I restart the engine. It wouldn't be smart if I had to do a go-around and hadn't bothered to have the engine running.

Mostly, I hope for a wind straight down the runway. Crosswinds are the Dimona's nemesis.

Motor gliders are typically flown on approach like unpowered sailplanes. I enter on downwind at low power setting, "shift down" to flat pitch on the propeller, turn on the boost pump, bring the throttle to idle, slow and trim for 51 knots airspeed, then start using the spoilers opposite the point I wish to land. The spoilers (air brakes) may be used in a manner similar to the throttle on a powered airplane: Start half-deployed, modulating them to adjust for the desired glidepath.

Landings, says the book, should all be three-point. None seem to be graceful because of the stiff landing gear. Best success seems to come from touchdown with about half-spoiler deployment, which reduces the tendency to float, and not chasing the flare with the spoilers.

Mostly, I hope for a wind straight down the runway. Crosswinds are the Dimona's nemesis. Since the tailwheel is directly coupled to the rudder, any crosswind correction at tailwheel touchdown results in the motor glider heading in whatever direction the rudder is displaced. The solution voiced by a former Dimona owner was to carry lots of gas: If faced with landing in a crosswind, fly someplace where you can land with the wind in your face.

While the Dimona's sink rate does compromise climb performance, I found that motor gliders are a good tool for learning soaring. They simply provide an opportunity unavailable to the unpowered-sailplane pilot to leave the vicinity of the airport to search for lift and to experiment with technique without inordinate concern for getting to a place for a suitable landing.

I have no doubt now that I'll sign on with Setright when it comes time to burn my last gallon of petrol. I'd hope that my gallon was Setright's larger British gallon rather than our domestic measure, so, perhaps, I could squeeze in two flights. Perhaps I'd opt for a Stemme S10–VT instead of my Dimona, for virtually uncompromised soaring performance. After all, if what I was burning was truly the world's last gallon, I could probably afford a Stemme then, as both variants would only be good for bonfires after I was finished. AOPA

i Links to additional information about motor gliders may be found on AOPA Online (www.aopa.org/pilot/links.shtml).

Michael L. Stockhill, AOPA 1122590, *of Polson, Montana, is a retired investigator for the NTSB. He owns both the Dimona motor glider and a Piper Aztec.*

SPECSHEET

Hoffman H 36 Dimona
Price as tested: $40,000 to $60,000

Specifications

Powerplant	Limbach L-2000 EBI, 80 hp @ 3,400 rpm
Recommended TBO	850 hr
Propeller	Hoffman two-blade, three-position
Length	22 ft 6 in
Height	5 ft 9 in
Wingspan	52 ft 6 in
Wing area	164 sq ft
Wing loading	10.24 lb/sq ft
Power loading	21 lb/hp
Seats	2
Cabin length	44 in
Cabin width	43 in
Cabin height	36 in
Basic empty weight	1,236 lb
Max gross weight	1,698 lb
Max useful load	462 lb
Max payload w/ full fuel	336 lb
Fuel capacity	22 gal
Oil capacity	3 qt
Baggage capacity	27 lb

Performance

Takeoff distance, ground roll	679 ft
Takeoff distance, over 50-ft obstacle	1,184 ft
Rate of climb, sea level	532 fpm
Max level speed, sea level	113 kt
Maneuvering speed	95 kt
Cruise speed/endurance w/45 min rsv, std fuel (fuel consumption), 5,000 ft	
@75% power	97 kt, 5.5 hr (3.95 gph)
Demonstrated ceiling	18,045 ft
Landing distance, ground roll	643 ft
Landing distance, over 50-ft obstacle	1,228 ft

Limiting and Recommended Airspeeds

V_X (best angle of climb)	46 kt
V_Y (best rate of climb)	51 kt
V_{NO} (max structural cruising)	103 kt
V_{NE} (never exceed)	
Sea level	149 kt
20,000 ft	119 kt
V_{S1} (stall, clean)	38 kt
V_{SO} (stall, in landing configuration)	38 kt

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. Data is not available for demonstrated crosswind component.