

Getting Smarter, With a Silent Twist



JOCHEN EWALD FLIES THE NEW, MORE POWERFUL ECOFLY 'SMART' ENGINE IN AN FK-9, AND ALSO TESTS THE IMPROVED SILENCE, NOW CALLED 'TWISTER' AND POWERED BY A JABIRU ENGINE.

When DaimlerChrysler launched the more powerful M 160/1 engine for its 'smart' roadster car, Otto Funk of Ecofly was keen to be among the first customers so he could convert it for aviation use. He had previously modified the standard 55hp 'smart' engine for his B&F FK-9 Mk.2 microlight (*Today's Pilot*, August 2002) but he felt the new 82hp version (which weighs about the same as the other) could be suitable for other types of light aircraft and motorgliders. Once again Otto's venerable FK-9 Mk.2 served as a testbed. This early example had been used by his flying school at Speyer, Germany, and so had several thousand hours on the clock - proving, says Otto, that a well-designed and maintained microlight can last as long as a 'real aircraft'. Externally there are few visible differences from the 55hp installation.

Only the 'shark gills' on the side of the cowling suggest that there is something new beneath. And on removing the cowling, the engine itself appears little changed, although the peripherals are now well sorted, and great care has been taken to optimise cooling airflow. The turbocharger's compressed air cooler gets its air directly through the port front opening; the starboard opening feeding air to the engine's electronic control unit. Airflow through the upper halves of these intakes, and two NACA inlets on the upper surface of the cowling, provide general cooling to the entire engine compartment. The oil system no longer has a separate cooler; heat is transferred to the liquid cooling system. The vertically-mounted exhaust is also new, significantly lighter than that on the car system Otto used in his first 'smart' installation, and it

incorporates a catalytic converter. Though it saves some valuable weight, the exhaust system on the M 160/1 still appears to produce less noise than that of the ubiquitous Rotax 912S, and has no problem meeting strict German noise restrictions. Nothing has changed in the cockpit. The 'smart-MIP' instrument still serves, and not only monitors engine data, but also logs it. The throttle (connected to a potentiometer - there is no mechanical linkage) is the only engine control.

IN THE AIR

Master switch ON, ignition ON, press the starter button (I wonder why Otto has not yet installed a standard car-type key-actuated rotary ignition?) and the compact turbocharged three-cylinder engine springs to life. It seems to run slightly rougher than the 55hp unit, but when I flew it, the M 160/1 had fewer than 40 hours logged, and DaimlerChrysler had not completed fine-tuning the rubber damping blocks on the engine mounts.

ABOVE: Only shark-like cooling gills on the side of the cowling (above 'smart' logo) suggest that Otto Funk's venerable D-MCFK now has more power.

The M 160/1 is fitted with an automatic centrifugal clutch and toothed belt reduction drive, so the Warp Drive propeller does not start not turning until the engine has been throttled up to about 1,300rpm. The automatic cooling system keeps the inner cooling circuit closed until operational temperatures are reached, so the gauges are already 'in the green' while taxiing to the runway. Once a certain temperature is reached the outer circuit opens, and as long as power is not reduced so much that the propeller stops, the engine will not overheat during, long waits at the holding point.

With first stage of flap set, I taxi onto the runway and open the throttle. Acceleration is really fast, requiring significant right rudder to keep straight after raising the nosewheel. I remember Otto's warning not to lift off before 43kts indicated, or the engine's strong torque might surprise you with more rolling moment than the rather weak ailerons can overcome.

Immediately after take-off I have to raise the FK-9's nose steeply upwards to prevent the speed rising above the optimum of 51kts. Power is set at 4,350rpm and 1.9bar manifold pressure, which equates to 68hp. The 100hp Rotax 912S does not deliver the same power until it reaches 4,900rpm - the maximum that fixed propellers will usually deliver in most microlight installations.

The result is a climb rate at least as impressive as that of a 912S-powered FK-9, on less power. In almost zero-wind conditions, I reach 750ft by the time I pass the end of Speyer's runway. During this full-throttle climb, the MIP's fuel flow indicator shows 4.6gph, clearly less than a Rotax at full power. Two minutes and 40 seconds later, I reach 3,300ft, and there's

no reduction in climb rate with altitude, the next step to 6,600ft taking just 2:45! Engine temperatures remain pegged in the centre of the green arcs throughout the high-power climb. As when driving a car, 'smart' pilots have no need to think about reducing power or leaning, the engine does it by itself. Cruising at full throttle close to the

ACCELERATION IS REALLY FAST!

maximum 6,000rpm (which the engine will not exceed even if the throttle is not retarded), I soon reach the FK-9 Mk.2's 97kts VNE. Throttling back to 5,500rpm, IAS is still 89kts, and fuel flow 3.3gph. Cruising comfortably at 78kts, the engine turns smoothly at 3,900rpm and consumes only 1.9gph.

A final comparison between the Ecofly 'smart' M 160/1 and the Rotax 912S (which is less environmentally friendly, having no catalyst) shows that it outperforms the Rotax at all

rpm below 5,350. But the Rotax has one advantage: its installed weight is some 11 lbs less than that of the 'smart', enabling it to be used in microlights that are close to the legal weight limits.

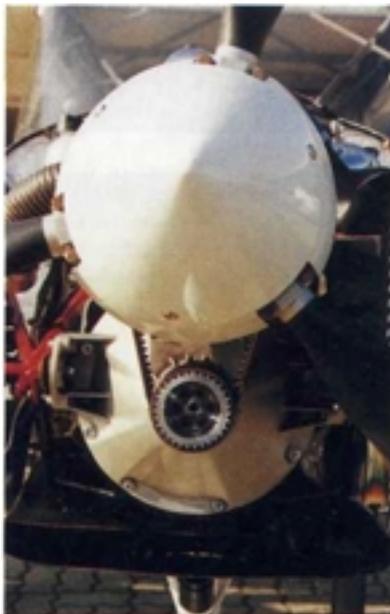
The first microlight going into series production with the new 'smart' engine is the B&F FK-9 Mk.4, the latest, modernised and faster successor of the version I flew. But its power and efficiency makes the M 160/1 very attractive for VLAs and motorgliders, so Otto Funk is also preparing for JAR certification of the engine. Ecofly is only offering it as a complete 'firewall forward' installation. Otto says he will not sell 'raw' engines to do-it-yourselfers, whose efforts might damage his reputation.

And he is waiting to start work on an aero conversion of an even more powerful 'smart' engine. German car tuning and performance specialist BRABUS GmbH has developed a 101hp version, which Ecofly will offer as soon as factory tests are completed,

RIGHT The centrifugal force clutch and toothed belt reduction drive results in a high thrust line.

FAR RIGHT The electronic control unit is mounted in an aluminium box below the engine on the starboard side.

BELOW The shark-like gills at the left side of the cowling are air outlets.



| ECOFLY/DAIMLERCHRYSLER M 160/1 'SMART' | |
|---|-------------------------|
| TYPE | |
| Turbocharged three-cylinder four-stroke, water-cooled, with dual ignition | |
| CAPACITY | 42.7cu in 700cc |
| MAX POWER OUTPUT | 82hp 61.4kW |
| MAX RPM | 6,000 |
| MAX TORQUE | 110Nm at 2,200-5,350rpm |
| DRIVE | |
| Belt drive, reduction 2,1:1, with centrifugal clutch | |
| Propeller (as tested) | |
| Warp Drive three-blade fixed-pitch | |
| MANUFACTURER | |
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