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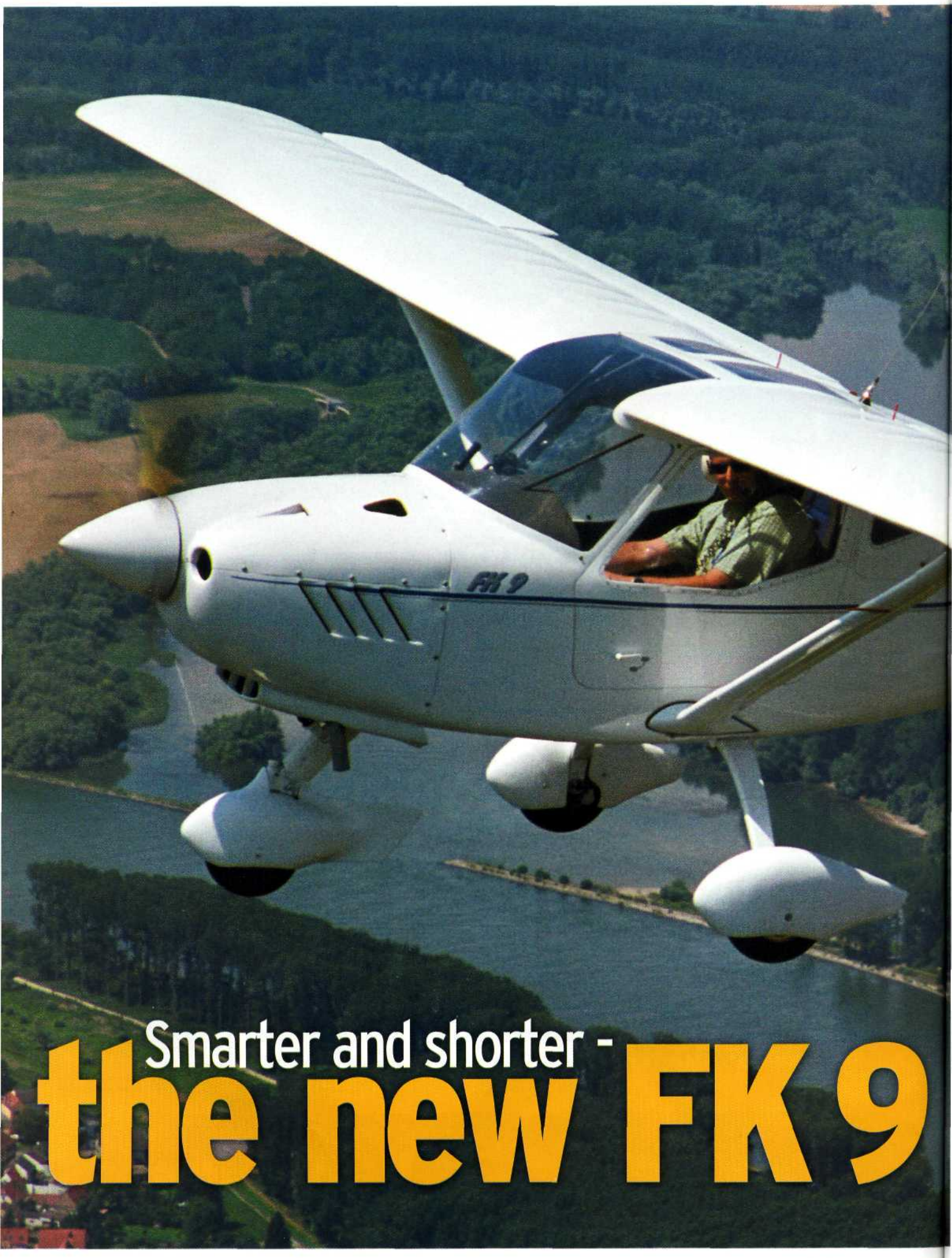


Smarter and shorter - the new FK 9

The FK 9 is seen here above the Rhine near Speyer. (All Jochen Ewald)

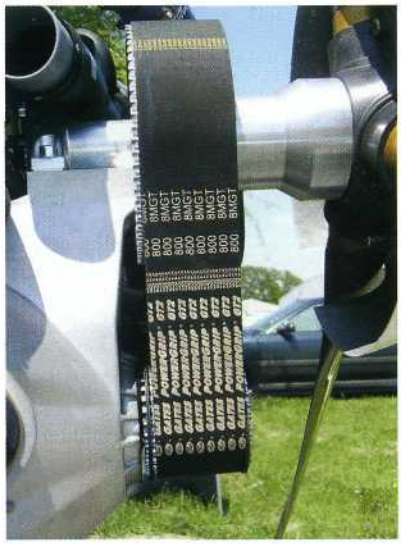
CONTINUOUS IMPROVEMENTS AND MODIFICATIONS TO THE B&F FK 9 HAVE MADE A GOOD AIRCRAFT EVEN BETTER. JOCHEN EWALD VISITED SPEYER AIRFIELD, HOME OF B&F TO TEST THE LATEST VERSION

Although I first flew an FK 9 several years ago, when the aircraft's designer Otto Funk invited me to Speyer airfield to flight test the latest version, I immediately accepted as I was curious to see just how much the new aircraft differed from earlier models. The aircraft I flew was actually a Mark 3, which Otto Funk modified a to test the changes that will go into production on the new B&F aircraft in early 2006.

Some of the first things I noticed were that the 'Mark 4' has a wider, fibreglass shell-covered steel tube fuselage and re-positioned controls. I also noted that the wingspan has been reduced by 60cm and that 'Fowler' type flaps have been installed (to keep the required stalling speed within limits). A brand-new 102hp Ecofly 'Smart' engine has also replaced the Rotax engine fitted to earlier models.

This new powerplant is based on the 82hp engine of the Smart Roadster, but at 698cc has a swept volume 100cc greater than the earlier 55/72hp versions. It has been developed by Daimler-Chrysler following a request from the 'Brabus' car-tuning factory, which wanted to offer a more powerful version of the roadster, A bigger turbocharger has helped increase the power, while internal modifications make this increased power possible without reducing reliability - an important point where aero-engines are concerned,

It is equipped with an Ecofly 2:1 •



FAR LEFT: TO check the engine, the cowling has to be removed, which requires opening several 'Camlock' screws.

LEFT The engine uses a 2.1:1 belt drive reduction system.

FAR LEFT: The smooth cowling of the Smart engine suits the shape of the FK 9's fuselage.

LEFT: The smaller, lighter silencer still fulfils the stringent German certification noise requirements, although it has no catalytic converter installed.

toothed belt reduction drive, and produces 102hp at 5,600rpm, while the maximum torque of 130Nm is delivered between 2,500 and 5,300rpm. This is a very wide range and eminently suitable for driving propellers efficiently. Furthermore, the fact that this engine delivers its maximum power at 5,600rpm, while its maximum allowable rpm is 5,800 (continuous) and 6,000 (30 seconds only) prevents aircraft with fixed-pitch propellers from over-revving at high speeds.

Other significant advantages are that this three-cylinder in-line engine is equipped with electronic fuel injection and electronic dual ignition, and the whole system is 'self-protecting'. This means that the engine automatically reduces power in case any important values (such as rpm, oil or coolant temperatures) exceed their permitted range. Should this electronic system fail there is also an 'emergency control program', to which the engine control then switches. In this mode, the maximum available power is reduced, but it permits you to continue the flight safely.

As already mentioned, the new FK 9 features a reduced wingspan and a new 'Fowler' type flap system. This increases the wing area, which lowers the stalling speed to less than the 35kts required for certification in the microlight category. The aircraft is stressed for a MAUW of 520kg, so it can also be built it as an 'Experimental' from a kit or certified in the new FAA LSA category. When the wingspan was reduced the angle of incidence was increased by 2.5°. This not only improved the take-off and landing performance but also enhanced forward visibility.

Next year's 'Short Wing' serial production will be based on the 'Mark 4', available with either a nosewheel or tailwheel undercarriage. The pre-production example I flew was just a bit heavier and less roomy and comfortable.

To check the engine, the cowling has to be removed, which requires opening several 'Camlock' screws. While the earlier Ecofly Smart engines were equipped with the original Daimler-Chrysler catalytic converter exhaust system, this is not fitted to the FK 9.

Otto Funk decided to abandon the idea of selling the most ecological and quiet aircraft engine due to the attitude of the German Govern-

FAR LEFT: The installation of the Ecofly Smart engine is very neat.

LEFT: The radiator beneath the engine will be increased in size to make the aircraft suitable for aerotowing at slow speeds and high ambient temperatures.

RIGHT **The tow hook installation on the taildragger makes aerotowing gliders up to 650kg possible with the 100 and 102hp engines.**

ment. The installation of a catalytic converter causes extra weight, so he asked for an increase in the microlight MAUW for catalyst-equipped aircraft (similar to the one granted to BRS-equipped aircraft), but the government refused to oblige. So, to achieve a sensible and competitive payload, the original Daimler-Chrysler catalytic converter/silencer system has been replaced by a simple lightweight silencer. This easily meets the stringent German noise emission requirements, although it is not as quiet as the original Daimler-Chrysler system had been. Of course it also produces more pollution (but still a lot less than conventional aircraft engines).

The upwards-opening door is held open by a gas strut and provides good access. While this modified Mark 3 still has the centrally-hinged control sticks, which are bent backwards, the new version will have shorter, straight sticks at the front end of the seat. Not only will the new control sticks reduce the risk of loose items on the floor or the passenger's feet blocking aileron control, but they will avoid also the 'G' effects that come with all bent-backwards sticks (basically, the increasing weight of the pilot's hand under 'G' load causes even more 'G' loads by pulling the stick backwards).

After turning on the main switch I first crosschecked the fuel indication in the 'Smart MIP' instrument with the transparent hose to the right of the right-hand backrest. (If the aircraft has been refuelled, it needs to be reset.) Ignition on, throttle idle, press the starter button and the engine springs to life immediately. No need for choke or primer - it's all done automatically by the electronics.

THE CONTROL HARMONY IS EXCELLENT, EVEN AT LOW SPEED

It's a rather unusual feeling to sit in an aircraft with the engine running and the prop not turning, but this is normal with the Ecofly Smart engine. This is because it is fitted with a centrifugal clutch, which engages the transmission at about 1,800rpm. It runs extremely smoothly, and the dual circuit cooling system lets it warm up quickly while taxiing towards the runway. Although there is a dual ignition system, there is only one ignition switch. The system is self-testing and gives a warning via the red lamp besides the starter button and flashing indications in the 'Smart-MIP' engine control instrument if anything is not as it should be.

I flew the aircraft solo, so I had a take-off weight of approximately 405kg with my 80kg and 35 litres of fuel aboard. The CG was about neutral. Due to the 'hand-made' modifications, this aircraft has an empty weight of 300kg, and the MTOW of 472.5kg (in Germany, for BRS-equipped microlights) would have permitted taking only a lightweight passenger with me. The empty weight of the production version will be significantly lighter.

For take-off, I left the flap lever in its

MIDDLE **The baggage bay behind the headrests can be loaded from outside through this window.**

BELOW **The right hatch covers the fuel tank opening, the left one the BRS.**

This is the 'Mark 4' taildragger version, powered by a Rotax 912S engine.

I tried the full throttle maximum level speed and reached 111kts with the engine at 5,200rpm with a fuel flow of 18.5lit/h.

'0' position, which means a slightly negative camber.for the Wortmann airfoil. The acceleration is so rapid that a positive flap setting is not really needed to shorten the ground run, and in this position you also get better aileron control in crosswind conditions. With the stick only slightly back, the nosewheel lifted early, and a bit of right rudder compensated for the engine and propeller torque.

After a short ground roll I accelerated to the optimal climbing speed of 60kts, where it climbed at a very steep angle. Although the forward visibility has been improved by the new angle of incidence, the deck angle is so steep that the cowling is still well above the horizon. Climbing at full throttle, the engine revved at 4,850rpm, and I reached 3,000ft above Speyer airfield in only two and a half minutes, although it was a really hot day, nudging 32°C on the ground. Under these conditions the 1,200ft/min is really impressive, and I hope Otto will soon install a tow hook on this aircraft to aerotow gliders.

At full throttle, the turbocharger delivered a manifold pressure of 2.2 bar and kept the climb rate constant, even at higher altitudes; while the fuel flow indicator in the 'Smart MIP' instrument showed a fuel consumption of 19.5lit/h. At 3,000ft, the coolant temperature reached its 'yellow arc', and the temperature indication in the Smart MIP started flashing. Otto told me that the cooling system is not yet optimised, and that when the system is adjusted, even long climbs in hot weather conditions and aerotowing will cause no problems.

To cool the engine down a bit, 1 tried the full throttle maximum level speed and reached 111kts with the engine at 5,200rpm. This is well below the maximum allowable rpm; the fuel flow was 18,5lit/h. Throttling back to 4,600rpm, I reached a comfortable cruising speed of 92kts for a fuel flow of 10.6lit/h, while a further reduction to very economic 4,000rpm produced an 81kts cruise with 8.2lit/h fuel consumption. Pretty good numbers, bearing in mind that the FK 9 'Short wing' is a strutted high-wing aircraft with fixed tricycle undercarriage!

BELOW LEFT: The tail surface area has been increased on the 'Mark 4'.

BELOW :The new slotted 'Fowler' type flaps have helped lower the stall speed.

I measured a 45° roll-rate of around three seconds at 57kts, which makes the aircraft a lot more lively than its 'long wing' predecessor.

The stall characteristics are very gentle. With the engine running at idle and the flaps up, buffeting occurred at 45kts, with a stall at 42kts. With the flaps set to T, buffeting started at 40kts, and I reached a minimum speed of 37kts before the nose dropped. With the flaps set to '2', the stick started feeling 'soft' at 36kts, buffeting began at 34kts and the aircraft entered a very stable stall at 32kts with the stick held fully back. Doing the same at full throttle and flaps up (which required a lot of right rudder close to the stall), the indicated speeds were about four knots slower. With full flap, the nose pointed so high up that the speed indication dropped down to 'unreadable values'.

There are significant trim changes produced by setting full throttle, as the angle at which the engine will be mounted has not yet been optimised. For example, during my flight, full throttle caused a 'nose up' movement and speed reduction. Conversely, changing the flap setting at low speeds caused almost no trim changes. The control harmony is excellent, even at low speed, and I measured a 45° roll-rate of around three seconds at 57kts, which makes the aircraft a lot more lively than its 'long wing' predecessor. The higher wing loading makes the 'Short Wing' easier to land than its predecessor. I approached at 50kts and flap setting '2', and found that the new wing makes the FK 9 less sensitive to gusts and crosswinds, and also very easy to sideslip. Sideslipping requires a slight stick-forward movement. With the Ecofly Smart engine running at idle, its propeller produces less drag than directly connected propellers, but the approach angle is still steep enough.

The modifications implemented to the FK 9 Mark 3 are real improvements which upgrade this old, reliable model significantly, making it suitable for flying schools and clubs as well as

FK 9 MK 4 'SHORT WING'

As tested with a 102hp engine and a MAUW of 450kg. The aircraft can be certified in the LSA & Experimental categories with a MAUW of 520kg and can be powered by engines between 80hp to 102hp.

DIMENSIONS		
LENGTH	5.85m	19ft 2in
HEIGHT	2.15m	7 ft 0 in
WING SPAN	9.25m	30ft 4in
WING AREA	10.72m2	115 sq.ft
WEIGHTS AND LOADINGS		
EMPTY WEIGHT	260kg	573 lb (without BRS)
MAX AUW	450kg	992lb
USEFUL LOAD	190kg	419lb
WING LOADING	42kg/m2	8.6lb/sq ft
POWER LOADING	6kg/kW	9.7 lb/hp
FUEL CAPACITY	feOlit	13 Imp gal
BAGGAGE CAPACITY	10kg	22lb
PERFORMANCE		
VNE	124kts	230km/h
CRUISE	lllkts	205km/h
STALL	34kts	63km/h
CLIMB RATE	l,400ft/min	7m/sec

ENGINE

Ecofly Smart M160/1 three-cylinder in-line, turbocharged, liquid-cooled, producing 102hp (75kW) at 5/600rpm

PROPELLER

Warp Drive/DUC composite three-blade fixed pitch

MANUFACTURER

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D-67346 Speyer / Germany
Tel: +49-6232-72076, Fax: 49-6232-72078
Email: info@fk-leichtflugzeuge.de, Web: www.fk-lightplanes.com

RIGHT: The 'Mark 4' has a roomier cockpit and adjustable backrests.

RIGHT: This panel carries the main switch, ignition switch, starter button, warning lamps and fuses. Lights next to the ASI, indicate the selected flap setting, the recommended approach speeds are immediately adjacent.

FAR RIGHT: The Smart MIP not only shows all required engine data, but also acts as a logbook and reminder for engine maintenance.

for private owners. The 2006 'Short Wing' will feature the more roomy and comfortable fuselage of the 'Mark 4', and should enter production in spring 2006. It will be available with either a nosewheel or tailwheel undercarriage (I prefer the tailwheel version, as it is lighter and aerodynamically superior), while engine options will include the ubiquitous 80hp Rotax 912 and 100hp 912S, as well as the 82hp and 102hp Ecofly Smart engines. B&F also offers kits for homebuilders and a ready-to-fly LSA version for the American market. Both these versions have an increased MAUW of 520kg.

For training or touring, the 80/82hp engines are more than adequate, while equipped with a more powerful engine it makes an excellent tug for gliders weighing up to 650kg. Furthermore, the Ecofly Smart engines are quieter and more economical; the wide torque range makes the propeller more efficient, while the turbocharger ensures that the engine continues to produce maximum power at altitude.

I PREFER THE TAILWHEEL VERSION

The 102hp Smart engine also appears highly suitable as a replacement for those in other light aircraft in the 100hp range, and Ecofly offers 'firewall forwards' solutions for such aircraft. EASA engine certification for these categories is intended during the near future. Indeed, a 102hp engine has already been installed in a Katana at the Diamond aircraft factory in Austria and will soon start its flight tests.

Throttling back to 4,600rpm produced a comfortable cruising speed of 92kts for a fuel flow of 10.6lit/h. A further reduction to 4,000rpm produced an 81kts cruise with very economic 8.2lit/h fuel consumption.