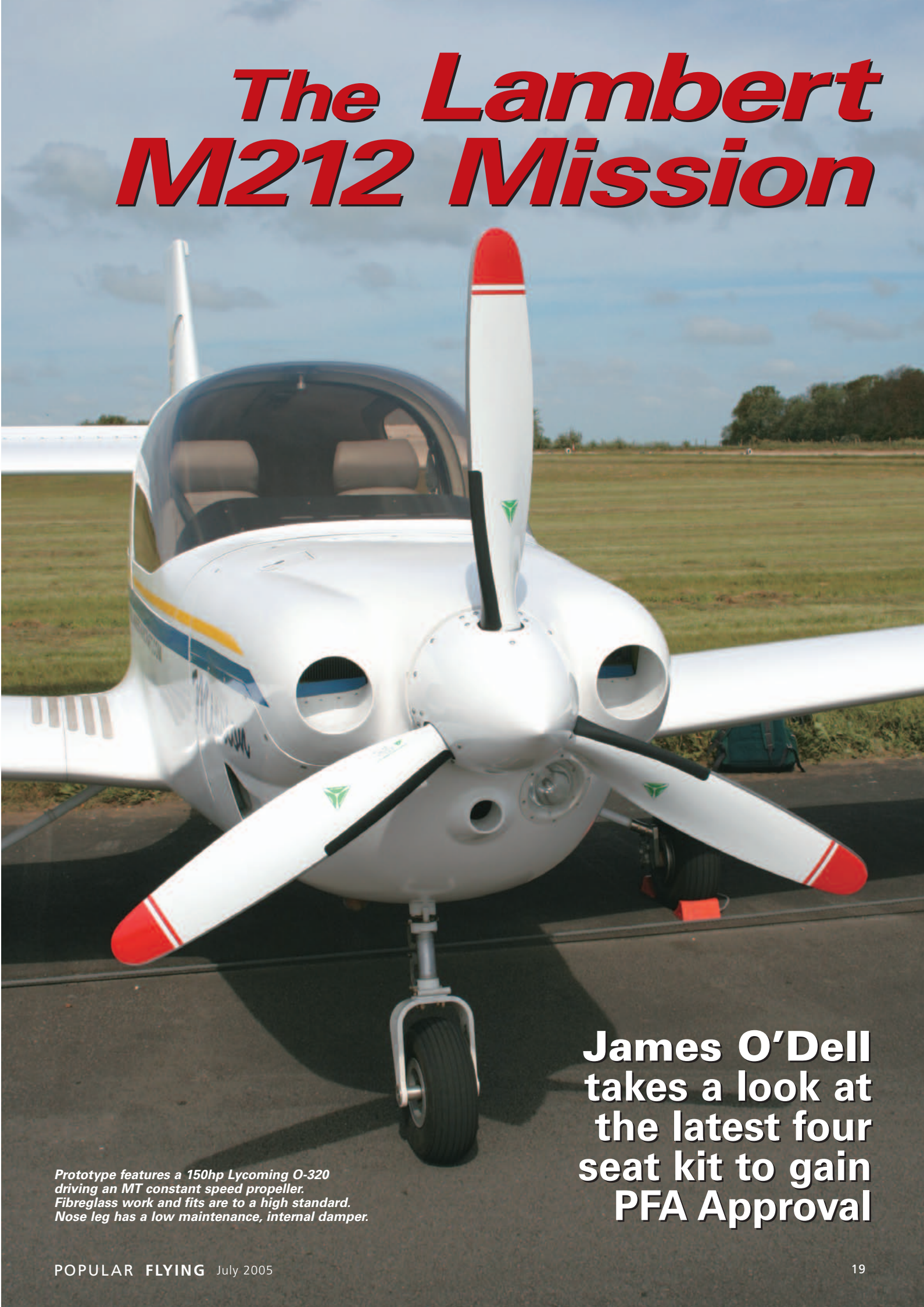
The Lambert M212 Mission



James O'Dell takes a look at the latest four seat kit to gain PFA Approval

Prototype features a 150hp Lycoming O-320 driving an MT constant speed propeller. Fibreglass work and fits are to a high standard. Nose leg has a low maintenance, internal damper.

After a somewhat slow start, the PFA four seat category has recently received a significant boost to its fortunes, with no less than two, all new composite designs being cleared by PFA Engineering in the past nine months.

ST Aviation's Jabiru J400 (PF January 05) stole a march on the opposition when it was approved in late 2004 and has now sold 25 examples, six of which are flying. Like its two seat siblings, the J400 follows the trend of a very compact airframe powered by an engine of modest power output, and delivers a competent 2 + 2 machine for a very competitive price.

The new challenger though is a different machine altogether, and will appeal to a market for whom the diminutive J400 does not necessarily fill the bill. The Lambert Mission M212 conforms to 'old school' light aircraft convention, it is a full size four seat machine, an imposing aircraft that does not look out of place on an apron full of Cirrus SR20s and Diamond DA40s. With its 150hp Lycoming and tricycle undercarriage, the low time PPL will find transition to type very straightforward, with not a hint that this new aeroplane is anything but a highly professional, factory built competitor to what he has flown in the past. Compared to the Jabiru, it is a different horse for a different course.

Lambert Aircraft Engineering is based at Wevelgem airfield in Belgium, and consists principally of brothers Filip and Steven Lambert, the former an aeronautical engineer, and the latter a mechanical technician. Together they have produced the prototype G- XFLY, and the necessary tooling and jigs to put the aircraft into 'kit' production. But we are jumping ahead of the story, which really begins when Filip's ambitions to become a commercial pilot were dashed by a worldwide downturn in demand following the first Gulf War in 1991.

Having learned to fly on outdated aircraft, Filip decided that if he couldn't be a commercial pilot, then he would embark on a career in aeronautical engineering and do something about what he saw as the parlous state of light aircraft design. He enrolled as a student at Cranfield University in 1992, and from the start was working on his ideal light aircraft design, the M212 - M for what it was to him, a mission to design a new aircraft, 2 because it was to be a two seat aircraft, and 12 because it would be powered by a 120hp engine. From the start Filip envisaged a series of aircraft developed from the initial two seater, through 2 + 2 to a full four seater, but his initial idea was to build a two seat machine that would be certifiable through the PFA. It was fortuitous that while at Cranfield, Filip met fellow student John Tempest, with whom he would work closely in the years ahead.

By chance, the Royal Aeronautical Society launched a design competition in 1993, so Filip entered his already completed design concept, and won! This actually presented him with a problem - he would now have to progress the design through to completion, something none of the other entrants ever did.

It speaks volumes for Filip's and Steven's commitment and tenacity when you consider that for the next twelve years they worked towards building the prototype without any public funding. They both did part time work, Filip some teaching, and Steven some garage work, to make ends meet, and their father helped fund materials and components for the aircraft. They were very fortunate to find a local engineering company who let them have free space in its factory because they were intrigued by the concept of designing a

Man with a mission, designer, Filip Lambert, offers scale to the M212, which is a full size four seater.

new light aircraft. They even let Steven use their lathes and milling machines out of work hours so that he could fabricate parts.

From the outset, PFA Engineering were involved in approval of design issues, a system that meant that no blind alleys were followed, and hence no hard found money wasted. Once PFA Engineering were able to process four seaters, and with the 450kg category spawning a multitude of lightweight, high performance two seat machines, the decision was taken to build the Mission as a full four seater.

Construction is of all composite, with glass/poly foam sandwich skins being used extensively. Carbon fibre is used in high stress areas such as wing spar caps.

Stepping up onto the quite high wing-walk is aided by a fuselage mounted step, but the absence of a hand hold can make it rather awkward for the less agile. Handles will be available with production kits for those wishing to install them. The forward hinging canopy allows excellent entry into the spacious cabin, which is a full 44 inches wide at the front seats, and 49 inches high. The cockpit has a spacious, airy feel about it, and with air vents to front and rear passengers, it should be possible to keep its environment comfortable throughout the year. Individual front seats, trimmed in grey leather in the prototype, are adjustable fore and aft, and for backrest rake, and also hinge forward for access to the rear, where ample leg room is provided. A baggage compartment will be situated behind the rear seats on production kits, but in the prototype a 120L fuel tank takes the space. Twin wet wing tanks of 140L each will feature on production models, removing all fuel from the cabin and giving even the 180hp powered models an endurance of over seven hours at 75% power.

Another change will be an increase in all up weight to 2500lbs (1130kg), the limiting factor on the prototype, which is rated at 2095 lbs (950 kg) take off and 1984lbs (900 kg) landing weight, being the main gear legs. At 2500lbs the aircraft will have a useful load of 430kg (950lbs). The new, stronger Cessna type gear has already been designed and approved. The nose leg

The leather seats and inertia reel belts of the prototype are indicative of the high kit trim levels available. Options from conventional basic VFR to full glass panels are available.

contains an internal hydraulic damper unit, similar to that used successfully by Grob for many years. It is virtually maintenance free and inexpensive to replace.

Wingspan is 32ft 2in (9.8m) giving an area of 129 sq.ft (12.00 sq.m). Mass balanced ailerons are controlled by push-pull rods, and slotted flaps, which can be set at anything from 0 to 40 degrees down, are electrically operated. The all flying stabiliser with anti-balance trim tab, and the rudder are cable operated

A three blade, electrically operated constant speed MT propeller is fitted to the O-320, along with a full Gomolzig silencing system. To further aid noise reduction, the propeller restricts the engine to 2500rpm, which derates it to 140hp, rather than the 150 or 160hp that is typically available with a standard installation. However, this set up does make the aircraft very user friendly, and able to comply with the strict German noise limits. For those with less of a social conscience, a standard C172M exhaust will fit under the cowl.

The 180hp Lycoming O-360 is an obvious alternative engine, and will be one of the firewall forward options. So too will the 135hp Thielert Diesel, though to be fair, it hasn't exactly proved itself to be a trouble free installation as yet. I asked about the Wilksch, and Filip commented that once the four cylinder 160hp unit is up and running, and known to be a reliable unit, he will consider it.

G-XFLY has a comprehensive VFR panel, with conventional instruments. Though the main wiring loom forms part of the airframe kit, customers can specify whatever they wish as far as panel technology goes, and a production prototype which is currently under construction, will feature a glass cockpit. Whatever the builder decides, access to the rear of the instrument panel is provided by a large removable panel in the coaming, a very useful maintenance feature.

G-XFLY has featured at a number of PFA Rallies over the past ten years, and members will have seen it last year in a complete but unflown condition. It flew for the first time just a few days after the Rally, in the hands of Cranfield University test pilot, Roger Bailey. Test flying has now been completed save for spin testing, which will take place once a second aircraft is flying. This is because some less than aesthetic changes need to be made to 'LY to accommodate a spin recovery parachute, and to make the canopy jettison able. It is also the reason that the prototype does not currently feature the planned inflatable canopy seal, which will increase cabin comfort and almost certainly add a few knots to the cruise speed (the current installation leaks, thus causing drag).

As the weather at Turweston was very blustery when I met Filip to discuss the Mission, I was unable to take a test flight. In any case I am no test pilot, so I have selected statistics and a few remarks from Roger's many flights carried out during an extensive test schedule.

Initial tests showed that the all flying stabiliser lacked feel and was over-balanced. The production cure will be to move the pivot line forward a little, but the problem was solved on 'LY by increasing the chord of the anti-balance tab.

Performance tests undertaken at the current maximum all up weight of 900kg yielded a sea level conditions speed of

The M212 taxis in at Friedrichshafen. The high seating position allows an excellent view from the cockpit, but does not compromise headroom.

105kts at 75% power. It is anticipated that with wheel spats and canopy seal fitted, this will rise to around 115kts. Since the flight testing, Filip has flown the aircraft from Belgium to the Friedrichshafen and the air data computer showed a IAS of 104kts, which equates to a TAS of 110 kts at 60% power at FL 055.

With the 180hp O-360 installed, a 75% cruise of 135knots at 8000ft is envisaged.

The following is Roger's assessment of take-off and climb performance, stalling speeds, and landing performance:

The aircraft was lined up on the threshold of runway 22 at Cranfield. The pressure altitude was minus 110 ft, temperature 4 degrees C, and the surface wind was westerly at less than 5 knots. Full power (28" MAP/2350 RPM) was set before brake release. The takeoff run was normal and the aircraft was rotated for takeoff at 60 KIAS. The aircraft lifted off at 65 KIAS as it passed the IFR touchdown markers on the runway. After flight the take-off roll was determined to be 325 metres. The screen height of 50 ft (15 m) was achieved just before intersection "C" at an estimated 550 m from brake release. The speed at this point was 70 KIAS.

The climb test was started from 500 ft pressure altitude and a speed of 75 KIAS was used with full throttle set. The aircraft was climbed for 3.5 minutes at which point the cloud base was reached and the test abandoned. The pressure altitude at this point was 2900 ft. The time from 500 ft to 1500 ft was 1min 25secs – (705 ft/min). The average pressure rate of climb over the 3.5 minutes was 685 ft/min. The engine behaviour was satisfactory and it showed no tendency to overheat. It was possible to trim stick free at the climb speed.

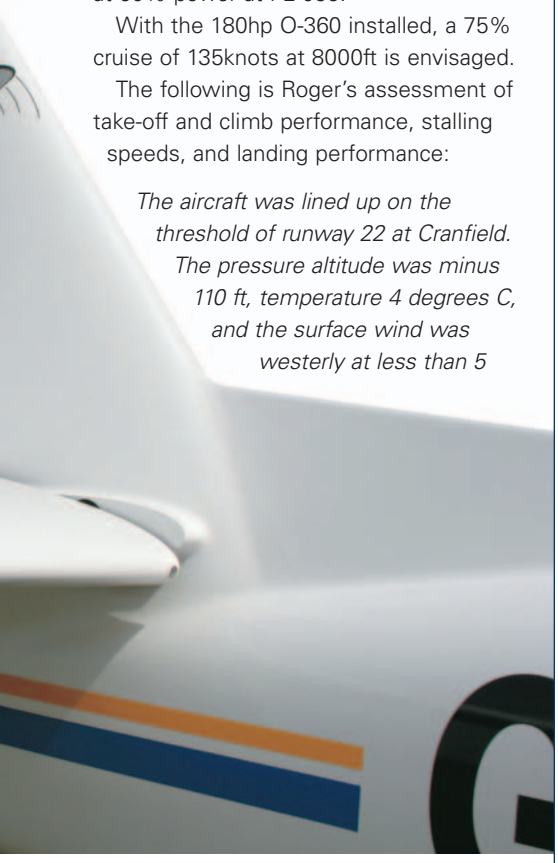
Tests to determine the stall speed were made with the flaps retracted and with the flaps fully extended. With the flaps retracted the aircraft was trimmed at 80 KIAS with the power at idle. As speed was reduced the control response in all three axes was normal. There was no noticeable stall warning. As the stall was reached, moderate buffet occurred just before the nose-drop/g-break. The stall speed was 55 KIAS. There was no wing drop unless the stick was held fully back, in which case the left wing dropped approximately 30 degrees. Recovery was immediate on moving the stick forward and no unintuitive control movements were necessary for recovery.

With the flaps down the approach to the stall was similar and the stall occurred at 52 KIAS. ***(Ed's. note. Corrected airspeeds have subsequently been established as 3 - 4 kts lower).***

A landing approach was made at 70 KIAS and the throttle was closed over the threshold at approximately 20 ft. The flare to touchdown was easy to judge and the de-rotation and roll-out was easy. The landing roll was estimated by reference to runway markings. The ground roll was 250 m and the landing distance from 50 ft (15m) was estimated to be 600m. Two more take-offs and landings were made on this sortie, takeoff ground roll in both cases was 312 m; landing ground rolls were 240 m and 250 m respectively.

(Ed's note. The numbers for take-off and landing are those recommended for use when planning a flight from a short field. With practised short field techniques, it is possible to make appreciable improvements in both take off and landing performance.)

A range of tests has shown longitudinal, lateral and directional stability as being in accordance with JAR-VLA requirements, the aircraft flying straight with the slip ball centred with feet off the rudder



The aircraft features an all flying stabilator which gives it a good cg range, particularly important in a four seat aircraft.

The fuselage step greatly aids access to the wing-walk. The less energetic would also find a grab handle useful. Note also Cessna style gear legs, which will be uprated in production aircraft.

The large forward hinging canopy allows good cockpit access. An inflatable seal will add to passenger comfort on production kits.

pedals. Likewise, it flies wings level, and straight and level, stick free. Roll rate is around 50 degrees/sec. at cruise speed, and remains very acceptable even at approach speeds.

All in all then the Mission M212 looks and behaves like a solid, traditional four seat aeroplane, to which it owes more in its execution than it does to current trends in kitplane design. It is modern in appearance, offering high levels of sophistication and comfort, and it gives one the feeling of it being solid and dependable, something those of us more traditionalist minded types fail to garner from some of the rather petite, minimalist designs of today. It is to that traditional market which I think the Mission will have the greatest appeal.

In order to ensure high quality builds, Mission M212 customers will spend around four weeks, typically in two sessions, at the Wevelgem facility assembling their wings, fuselage and empennage using factory jigs and benefiting from staff supervision. No wet lay-ups are involved in this process. They will then leave with a completed airframe which requires only assembly and fitting out. This is Option 1 and costs €60K (£41K) excl. VAT.

Next comes the firewall forward package, and as an example, an O-320 with constant speed prop, and Gomolzig exhaust costs €33,500 (£23K), or with fixed prop and C172M exhaust €25,500 (£17,500). The Thielert diesel package with c/s prop comes out at €39K (£20,500). For those who wish to source their own engines and accessories, individual items are available separately, and should customers decide they would like the assistance of factory staff to installation of firewall forward packages, then that can be arranged.

As mentioned earlier, the range of options for instrumentation and avionics is extensive and will be tailored to customers' needs. Anything from a single instrument to a complete system, including factory assembly, is possible.

Finally comes trim and painting. Two factory trim packages are available at €4,500 (£3K), but again individual tastes can be catered for. The factory can also paint the aircraft if required.

A customer wishing to build an all new machine to the level of the factory demonstrator can expect to spend around €110K (£75K).

With the design now finalised and approved, plans are to commence kit production and produce the first batch of ten airframes. First customer factory build sessions will be programmed to start in October of this year.

The M212 will be exhibited at Flying For Fun in July, and will be flown in the Saturday afternoon 'Fly-by' sequence, as well as being available for potential customer flights in the early evenings.

Lambert Aircraft will also be showing an all new, factory built design, the M106, with which it will be entering the microlight market. Of conventional, fabric covered steel tube, alloy wing construction, and featuring a new, four stroke four cylinder engine, this machine is a radical departure from the M212. It does however, take the company back to its initial plan to produce a range of aircraft to cater for a broader market. The two seat microlight will possibly be developed later into a Group A aircraft.

The Lambert Mission M212 has had a relatively long gestation but it is a credit to Filip and Steven's hard work and personal sacrifice to see the job through to completion. It is a worthy addition to the four seat kit marketplace and I wish them well for the future.

Check out Lambert Aircraft's web site at www.lambert-aircraft.com. Tel: 0032 431626. See them on Stand 135 at Flying For Fun. ■