

# The Engineer's Aeroplane

Lambert's M108 rides like a big tourer yet handles like a Cub, has a huge range and is very nicely (and speedily) built under an LAA approved Build Assist Programme

Words Philip Whiteman Photos Keith Wilson



**T**his is my second bite at flight-testing the Mission M108, following a demonstration flight with designer Filip Lambert that left a very positive impression of almost every aspect of the aircraft but had me puzzling over why I had made something of a fist of flying in formation with the camera ship. Rather detuned by not being able to hold station, I'd found little to fault in the somewhat curtailed general handling assessment that followed – indeed, the little two-seater felt notably stable and 'solid', and it was easy to land on Goodwood's long grass

runways – so I was left wondering whether it was me or simply something odd about what otherwise appeared to be an especially nice aeroplane.

Today I am back in the aircraft with owner and builder, professional engineer Steve Kember, who has been both kind and patient in allowing me to have another go. The first customer and someone who had never built an aircraft before, Steve is perhaps the ideal person to have tested Lambert's build assist programme, which involves three sessions, each lasting a week at the company's base at Wevelgem Airfield in Belgium.

"It was very intensive and full-on, but I enjoyed it and actually ended up spending a little longer there, not because it was needed but because I wanted to," says Steve. Even if he'd been over there for twice the advertised time, Steve would have spent a fraction of the time even a 'quick-build' RV kit would require – this build assist thing is magic for those who want to get on and fly!


Lambert Aircraft had constructed a number of M106 450kg European ultralights before concentrating on the similar-looking M108, designed to be a Light Sport Aircraft and kitplane. Thus the



factory is able to offer prospective builders expert assistance and the use of specialist tools and jigs, greatly improving the speed and quality of production. Indeed, trimmed in grey leather and beautifully finished and painted, Steve's aeroplane puts many factory-built aircraft in the shade.

Reflecting his intended... er, mission, Steve's aircraft is kitted out for Day VFR flying. (A factory instrument flying panel has been designed and exhibited, and designer Filip Lambert intends to complete an Instrument Rating in the M108, no doubt with proving and development work in mind.) Steve's panel is based around a

TL Elektronik Integra primary flight display (PFD), which provides the flight and engine instruments, and a Garmin 795 linked to the Trig radio and transponder that provides the GPS moving-map nav information and more, including the electronic checklist. Amid all the glass cockpit stuff, one personal foible that lends a touch of individuality to G-STPK is Steve's Russian aircraft clock, located at the right-hand end of the panel. The one other 'steam gauge' set alongside the PFD is actually nothing of the sort, being a neat electronic stand-by combined ASI, altimeter and VSI from LX – a super bit of kit.

Lambert used the Belgian-made ULPower UL260i engine in the M106 but has gone over to the ultra reliable and highly-regarded (if rather expensive) Rotax 912iS for the M108. The 912iS is fitted with dual electronic engine control units operating the fuel injection and ignition systems independently. If this is more information than you feel you need to know as a pilot, these 'lanes', as Rotax rather oddly calls them, can be treated simply as left and right magnetos. Indeed, they are tested by moving the utterly conventional 'ignition key' to positions marked 'R' or 'L', corresponding to Lanes A and B. 

**Right: test aircraft panel fit – standby combined ASI & altimeter, TL Integra PFD, Trig radio and transponder, and Garmin 795 MFD – is brilliant for Day VFR ops. The very comfortable, adjustable leather trimmed seats are standard items**

For those who are not familiar with Rotax engines, the two slightly ‘different’ things you have to do are hand-rotating the propeller until the dry-sump tank gurgles so that the oil level can be checked correctly prior to start-up, and observing an RPM limit until the oil has warmed up. However, like almost every other Rotax-engined ultralight or VLA out there, the threshold oil temperature is programmed into the Mission’s PFD and there’s visual warning to give you the cue when it’s OK to open up the engine.

Steve takes a careful, engineer’s approach to his flying and is well prepared for this flight – so he’d run and checked the engine, and filled the tanks before I’d arrived at Headcorn, where he currently bases the aircraft. Thus we are soon engaged in one further 912iS foible: holding the revs at 2,700 for five seconds for the Engine Management System to release alternator B to the aircraft electrical system and to engage alternator A to supply power to the Rotax ECUs before performing the power checks at 4,000rpm, testing those dual lanes on the ‘mag switch’ (lights coming on to indicate which one is inactive). It is all made even simpler than it sounds by virtue of that ready electronic checklist displayed on the Garmin 795.

The brakes are hand operated, the lever being positioned between the seats. For parking, a knob conveniently positioned for the left-seated pilot in command is pulled while the brakes are held on – not so easy to do from the right-hand seat. As with many other ultralights, the ‘parking brake’ is simply a valve that holds hydraulic pressure in the brake lines – a system that seems to work very well. When taxiing, the aircraft is steered on the nosewheel, which is linked to the rudder pedals. There’s no differential braking, but nor do you need it – so effective is the steering that the M108 can be turned pretty much around one wheel. The single, hand-operated master cylinder represents a light and simple solution to providing both occupants with brakes.

### Performance to spare

Any slight doubts I have about the combined effects of my weight and full fuel (Steve’s aeroplane is fitted with the optional 110 litre long range tanks) are



dispelled the moment we open up. The M108 accelerates briskly, gets off the ground quickly and climbs strongly, even without making any special effort to extract the best performance – I note 800 fpm-plus on the Integra display, which suggests Lambert’s book figure of 950fpm is an honest one.

The first time I flew Papa Kilo, in designer Filip Lambert’s company I had plunged straight into close formation for the air-to-air photos that appear alongside this piece – and found unusual difficulty in holding station, yawing towards and away from the camera ship. Filip nailed it very nicely when I handed over to him and my subsequent efforts were better, leaving me wondering if it was me or the aeroplane. Formation flying is not part of normal operation, but it does have a way of rapidly revealing any shortcoming in plane



or pilot. With a bit of stick time, I found the Mission easier to place but the experience left me with a niggling feeling that something wasn’t quite right. Otherwise it seemed to have pleasant handling characteristics, including the kind of ‘non event’ stall you’d expect from a J3 Cub.

Today, second time round, we are free to concentrate on normal operation, as we have no air-to-air photography to worry about. Away from the demands of flying in formation the immediate impression is one of a light, ‘just so’ control response and solid stability. The only thing I note as we climb out is the need to hold on a little bit of right rudder pressure to keep the slip indicator centred – but the force required is very light and Steve confesses that it is something he has been doing without even realising it.

So far so good, but I have been told that since Steve built ‘PK the M108’s ailerons have been changed as a result of the Light Aircraft Association’s test pilot reporting that the existing degree of adverse yaw did not lend itself to instrument flying, approval for which is being sought by Lambert Aircraft. I wonder if this might have been a factor in our formation flying difficulties: adverse yaw is caused by the down-going aileron producing more drag than the up-going one, and manifests itself in the nose tending to swing in the

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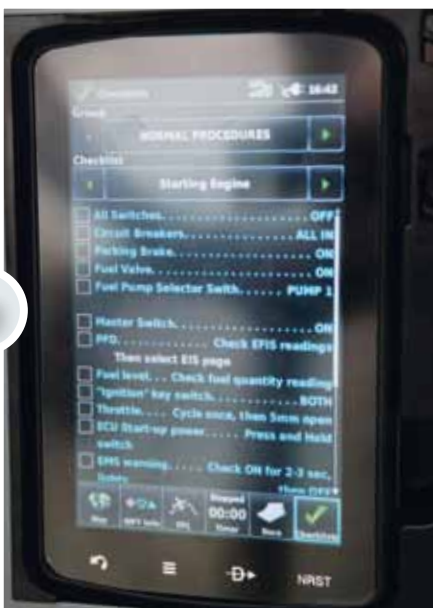
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**1** 100hp Rotax 912iS offers impressive reliability and fuel economy

**2** Some luggage compartment! More of a hold, really – and the folding seat backs allow ready access

**3** Plunger throttle and identical knobs for a couple of the minor controls; cabin air and cabin heat

**4** Overhead flap control gets in the way when pulled down, but offers good leverage and intuitive operation

**5** Nicely engineered all-metal fuel selector, hand-operated brake- (blue knob) and mechanical trim levers

**6** We appreciated the eyeball fresh-air vents and simple 'mag switch' operation of engine electronics

**7** Other aircraft designers ought to take a look at Lambert's simple and effective door latches

**8** Garmin's electronic checklist makes operation about as simple as it can be...

**9** ...and their electronic VFR approach charts ensure you have all the essential information to hand



opposite direction to applied roll. Filip Lambert says the fix was to alter the geometry to give differential aileron movement, the down travel being reduced to minus twelve degrees and the up travel increased to plus twenty. (Steve has been offered a new set of wings but says he finds no problem with the aircraft as it is.)

Adverse yaw is not something you encounter in trainers and certified aircraft

today. Most of them have had it so thoroughly engineered out of them that it is hard to demonstrate even a trace of the phenomenon, which generally manifests itself as the nose trailing the roll movement when turning, feet off the rudder pedals. However when I try this trick in Steve's aeroplane, applying left or right stick, with my feet off the rudder pedals, the M108's nose doesn't merely lag but actually

wanders in the opposite direction. I think we have just discovered why 'PK is a bit tricky to fly in formation – even if the issue is academic now that Lambert has come up with a fix. In any case Steve, who clearly is a good old fashioned stick-and-rudder man, has simply been flying around the problem, coordinating turns on the Mission's nice, light rudder without even realising he's doing it. ➔



### **Ideal behaviour**

One test of stability is to put the aeroplane into a side-slip and release the rudder pressure: if there is sufficient fin area, it should yaw into the slip, and this the M108 does. When aileron and rudder input are relaxed, the aircraft recovers to wings-level and ball in the middle, which is ideal behaviour, especially for an aircraft you might want to side-slip into short strips.

Applying rudder with the stick free causes the aircraft to bank nicely in the direction of yaw – another good characteristic, and one that is required of certified aircraft. It should never happen, but if the ailerons were to stop working, it is essential to be able to lift a wing or turn

on rudder alone.

Indeed, the M108 generally feels like a very well sorted aircraft, an impression reinforced by the 'big aeroplane' ride it manages to deliver, despite its low mass. Today we are bimbly around at an economical eighty knots or so, reined well in from the claimed 85kt at 60% power and 90 at 75%. Filip assures me the aircraft will maintain 100kt TAS at FL55 and still return 13.5 litres per hour. No wonder the long-range tanks (a popular option) allow nearly 700nm with 20min reserve.

For those used to typical club aeroplanes, the Mission's light and powerful controls

will come as a pleasant surprise. However, elevator forces are particularly light and take a little getting used to. Properly trimmed (the mechanical trim lever is nicely engineered and very quick and precise) the M108 will zip along hands-free in level flight, almost as if it were on rails. However, it is very easy to nudge the stick forward or back without realising you are leaning on it, and I find my altitude keeping is all over the shop.

To be sure that this is not a problem, I slow down to fly a couple of pretend approaches at altitude. These demonstrate that the stick forces, although they are light, are nevertheless sufficient to provide



## CALLED M FOR...

When the Lambert brothers were looking to name Filip's first design it occurred to them that there were altogether too many aircraft with L designations – all those Lockeds and Luscombes etc. "So we looked at the next letter in the alphabet," says Filip. After what seems to have been a fairly brief consideration of possible M-names, Filip came up with 'Mission', simply because it sounded purposeful and not for any other reason.

The first M plane was going to be a two-seater powered by a 120hp engine and Lambert called it the M212: 2 for two seats and 12 for 120hp. This logic went out the window when the M212 became a four-seater powered by a 150hp O-320 (see *Pilot* July 2005 for Bob Grimstead's flight test).

When the company turned to manufacturing an ultralight that slotted in below the M212, Lambert logic suggested a series designation that was lower than two and a model number that was lower than twelve but left margin for further developments – so was christened the M106. The M108 is of course a development of the M106 – "and that's how sophisticated our marketing is," Filip Lambert concludes with a smile.

good feel at the lower end of the speed range – you are not going to have any difficulty in controlling speed in the circuit, which can be a problem with aeroplanes that have unduly light elevators.

The flaps are operated by a big overhead lever that pivots downwards. It latches into position and, like all good mechanical systems, can be operated swiftly and purely by feel – big advantages when operating from short fields. There is very little trim change with flap travel, which also makes things easier and safer during a tricky arrival. I am told that the heavy-ish pull becomes even more so should you attempt to lower the flaps above the placard limiting speed – another useful tactile cue!

Steve has surprised me by saying that he would be happy to operate the M108 from a 350 metre strip – the kind of runway length you usually associate with microlights. Returning to Headcorn, he takes the controls and proves the point by demonstrating a normal landing – not one that involves dragging the thing over the threshold nose-high at low speed with lots of power – that has us down gently and stopped by the second runway marker. By Steve's calculation this represents a total distance of approximately 130m; very impressive.

### **Distinguished by...**

Filip Lambert had told me that his

intention was "to bring factory-built quality to the homebuilt environment". I would say that with the Mission M108 he has succeeded in doing just this. While Steve Kember of course put together much of G-STPK, the beautifully welded fuselage frame was factory made in Belgium, the trim and fittings are all Lambert items, and finish of the whole aircraft is a reflection of the company's high standards.

However, while the Mission M108 is nicely engineered, generally very nice to fly and is well suited to operating from farm strips (not least by virtue of having folding wings) you have to ask what further distinguishes it from all the other sons of Avid and Kitfox out there – there

## SPECIFICATION

**LAMBERT MISSION M108**  
WITH OPTIONS AS FLOWN **£72K INC VAT**

### ■ DIMENSIONS

Wingspan	9.57m
Length	6.10m
Height	2.25m

### ■ WEIGHTS AND LOADINGS

Empty weight	360-375kg
Max takeoff weight	600kg
Useful load	225-240kg
Fuel capacity (std)	78 lit
Baggage capacity	40kg

### ■ PERFORMANCE

Vne	116kt
Cruise, 75% power	95kt
Economy cruise, 60%	85kt
Stall clean	41kt
Stall, full flap	38kt
Climb	950fpm
Take off distance (over 50ft)	275m
Landing distance (over 50ft)	320m
Range (std, 20min reserve)	450nm

### ■ ENGINE AND PROPELLER

100hp Rotax 912iS driving a three-blade Duc Flash ground-adjustable propeller

### ■ MANUFACTURER

Lambert Aircraft Engineering bvba,  
Hangar 59, Wevelgem Airfield,  
B-8560 Wevelgem, Belgium  
email: [info@lambert-aircraft.com](mailto:info@lambert-aircraft.com)  
web: [lambert-aircraft.com](http://lambert-aircraft.com)

UK sales & support  
tel: 03300 500 108,  
email: [UKsales@lambert-aircraft.com](mailto:UKsales@lambert-aircraft.com)



# G-STPK

appears to be lots of competition in the market. Here, Steve Kember provides much of the answer: "I was looking for an aircraft that would carry a good load, have good range and operate from the kind of small airfields and strips I like visiting". Certainly the M108 will lift a decent weight and offers a vast hold, extending back down the fuselage behind the seats, but wouldn't an RV do the job? "This was to be my first project and I wanted something that would not take too long and that I could be certain of completing – rather too many aeroplanes are not finished by the

people who started building them!" There are people out there who, shall we say, offer various degrees of support in building kitplanes – but Steve wanted to work with an operation that was well organised and formally recognised, which rather narrowed the field. What swung it for Lambert Aircraft was the combination of – in Steve's opinion – excellent factory support and, in the M108, an aircraft that can carry a far more substantial load than its obvious competitors can manage. Steve was also impressed with the way Lambert Aircraft will see the build right

through to the aircraft being signed off. "Don't under estimate the work involved in getting the paperwork done," he cautions. Included in the build assist programme are: weighing; certification of instruments and avionics; propeller balancing; paperwork for Permit application; flight testing (inclusive of fuel, insurance and landing fees); two days familiarisation training with a qualified instructor and two years warranty on the complete aircraft.

Filip Lambert is seeking to further distinguish the M108 by getting it approved





for IMC and Night operation. I had wondered if, in common with several other non-certified types being considered for approval by the LAA, the M108's elevator might be a bit too light for instrument flying, and Filip confirms that this is something Lambert Aircraft is working on. At the same time, they are seeking to increase the maximum all-up weight by fifty or sixty kilogrammes which will offset the increased empty weight of the IMC model and be a useful benefit for the Day VFR version.

Filip Lambert is not one to let the grass grow beneath his feet. At Flyer Live

Lambert Aircraft again exhibited the hand-controls the company is developing in conjunction with Aerobility, the Blackbushe-based charity that provides flight experiences and training for disabled people.

Reaching the final stage of development and due to be available early next year is a taildragger variant. While this will make the M108 a 'real aeroplane' in some pilots' eyes – and we are certainly looking forward to testing it – it must be said that the tricycle undercarriage Mission is well suited to short fields and grass runways,

and taking away the mass and drag of the nosewheel is not expected to make any great difference to the aeroplane's already impressive performance.

The Mission M108 was a good aeroplane from the start. Now that the minor handling foibles have been addressed, it is on its way to becoming an excellent one. We understand that aircraft number eight is under construction and ten or so M108s have been sold. With IMC/Night and taildragger versions on the way, if you excuse the pun, we expect to see quite a few more Missions being flown. ■