The Lambert brothers' Spacious Mission

This four-seat, award-winning tourer will also be available as a kit.

Words by ***Bob Grimstead*** *Photos by* ***James Grimstead.***

FILIP AND STEVEN Lambert are young men with a mission. Knowing most high-performance lightplanes get their speed by having minimal frontal area, they felt that, using modern technology, it should be possible to make a light aircraft with both swiftness and interior roominess. As Filip says, "Human height increases by half-an-inch every ten years. Aeroplanes have not kept up. Current lightplanes were designed fifty years ago, so now they're cramped. And, if you design for Mr Average, by definition you instantly lose half your potential customers. We designed for big men!"

So, they set to work crafting a safe and spacious four-seat aircraft with good performance and easy handling. Filip studied aeronautical engineering at Cranfield College of Aeronautics (now Cranfield University). This aeroplane (or, rather, family of aeroplanes) started as his postgraduate master's research thesis and promptly won the RAeS Light Aircraft Design competition. At last year's PFA Rally, it was awarded the Tiger Club Cup for best original design.

After ten years of hard work, including extensive structural and wind-tunnel testing, their Mission 200, still in the final stages of development, will be Europe's first certificated, kit-built four-seater. The prototype Mission 100, which I flew for this test, is restricted to two occupants. Only one other four-seater has so far been approved by the PFA: the smaller and more cramped (albeit slightly faster) Australian Jabiru J400 featured in October 2003 *Pilot*.

The Mission 100 is the first of a family of models, including bigger-engined, diesel and retractable-gear versions. Some were originally planned as two-seaters, but Filip feels that market is now saturated, so he is concentrating on their design's strength: spaciousness.

We met the Mission at Turweston on a blustery May day, just after it obtained the unrestricted Permit to Fly. I am delighted to report that, thanks to Filip's skill and ingenuity, apart from a small and half-anticipated enlargement of its anti-balance tab, the Mission passed all structural (to 8.55g) and handling tests 'straight out of the box'. So it conforms to FAR and JAR 23, demonstrating flight test compliance within just 35 flight hours… with the exception of spinning trials, which will be conducted on the second airframe; these seem unlikely to pose a problem, with the relatively massive fuselage, light wings, excellent rudder authority and high-set tailplane.

G-XFLY is not a true prototype, but rather the first production machine, its all-composite airframe formed in moulds they have already painstakingly created. With purposeful lines and a good surface finish, it is an impressive aircraft, sitting 9 ft 6 in high, and slightly nose-down, on long, tapering, wide-track main legs. Its structure is mostly glass fibre, with carbon fibre stiffening in appropriate areas, like the main spar, fuselage longerons and rollover cage.

Its gracefully tapering wings use a modern (albeit subtly modified) NASA Natural Laminar Flow NLF 0416 aerofoil. Optimised for the Mission's operating range, this sophisticated, almost supercritical-looking section combines benign low-speed handling with good cruise performance. Remarkably, the wings are entirely devoid of fences or any other artificial aid, although they do have five degrees of dihedral and two of washout. They are designed for easy construction and are removable for winter storage. They have distinctive, elegantly curved wingtips to reduce drag and keep vortices away from the differential balanced ailerons, making them nicely effective right down to the stall.

Long, electric slotted-flaps with offset hinges occupy the remainder of the trailing-edges, currently deploying to 40°, although this is subject to revision. At the rear, a big, high-set, all-moving tailplane (stabilator, if you will) with anti-balance tab is set in a large swept fin with a neat dorsal fillet and a big, balanced rudder.

The main gear legs are simple, tapering, tubular steel springs, and as yet unfaired, while the nose-leg is a lightweight gas strut supported on the engine bearers, and deliberately kept short. Together with the wing's chosen incidence, this ensures the aircraft will not fly until positively rotated, making it almost impossible to land nosewheel first—probably the most common lightplane accident. Nevertheless, there is plenty of propeller clearance, even for a longer, two-bladed prop.

The current three-bladed, electric, constant-speed MT propeller is turned by a 150 hp Lycoming O-320 E2D, whose power is limited to 2,500 rpm for German noise legislation, reducing thrust to 142 hp. The sleek and spacious two-piece cowlings will also take the larger, 180 hp O-360, and it is clear much work has gone into minimising cooling drag. The four exhausts feed into a transverse muffler, from which the gases then flow into a second silencer, still within the cowls, before exiting though a short, low-drag stub. This results in a particularly quiet engine, both inside and out.

This airframe has a single, 118-litre, rear-fuselage fuel tank, but subsequent machines will have twin wing-tanks, totalling up to 280 litres. An electronic fuel management system is envisaged, with automatic transfer

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1 | The Mission's cockpit is light and airy, neat and tidy, with plenty of room on its wide panel. Production versions will have EFIS screens, electronic engine monitors and GPS moving map displays.

2 | Graceful tapering wings are removable. Distinctive, elegantly curved wingtips reduce drag and keep vortices away from the ailerons.

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3 | Sleek and spacious two-piece cowlings will also take the larger, 180 hp O-360. Much work has gone into minimising cooling drag. Landing light is long-life Xenon.

4 | Long, electric, slotted-flaps with offset hinges occupy the remainder of the trailing-edges.

5 | Proposed hinge fairings will reduce drag.

6 | Main gear legs are simple, tapering tubular steel springs, as yet unfaired, while the nose-leg is a lightweight gas strut, deliberately kept short to make it almost impossible to land nosewheel first, but still giving plenty of prop clearance.

and balancing.

Entry is by climbing onto non-slip walkways on both the 28-inch high wings via well-placed nineteen-inch steps that also incorporate jacking points. Regrettably there were no fuselage-side handles to help with the ascent, although Filip says these will be provided with all kits. A minor criticism is the difficulty of locating those forward-set steps with your feet for egress. The canopy is opened by a locking, flush-mounted latch on its upper centreline, hinging forward and allowing occupants merely to step down into the cabin. The front seat backrests tilt forward, enabling the rear-seaters also to step straight down into their own footwell, turn and be seated.

That forward-hinging canopy is enormous, and was not easy to hold up against the 25-knot wind, despite its dual gas struts. You could never open it facing downwind, or you would be off across the tarmac like a clipper ship under full canvas. That said, the transparency is superb; I could not find a single optical blemish, and the proposed inflatable seals should make it very quiet. Once seated, as Filip lowered it, I instinctively ducked. He laughed, demonstrating that, even when closed, I had space for a clenched fist above my head, and plenty of clearance at the sides. Now that's roomy! And we could leave our headsets on the coaming, something you cannot do in many production tourers.

There is plenty of lateral and longitudinal space too, with no less than 43 inches of shoulder room. When my friend and I sampled the comfortable, 41-inch-wide rear seats, we had four inches of knee space, and plenty of foot-, elbow- and headroom, plus a good view through the aft windows. Above were individual air vents, LED lights and a speaker. The heating and ventilation system is well-thought-out and nicely constructed, with each occupant having his own hot or cool air outlet, so you could spend a long time in here without discomfort. Behind us was a 30 x 16 x 16-inch luggage shelf, which will extend to the floor on production models, and be accessed by folding forward the rear seat-backs.

The pilots are similarly favoured, with grey, leather-covered, Dynafoam upholstered seats that slide fore-and-aft and recline, lap/diagonal inertia-reel harnesses, adjustable rudder pedals, and proper control columns, rather than nasty yokes. The slightly tall, low-friction, centreline-pivoted sticks will be replaced in production models by twin, individual, floor-mounted units. They operate the ailerons through push-pull rods, and the stabiliser via cables.

The Mission's cockpit is light and airy, neat and tidy, with plenty of room on its wide panel for all possible flight and engine instruments and avionics, although production versions will normally use EFIS screens, electronic engine monitors and GPS moving map displays. Consequently, a second alternator will replace the ever-troublesome vacuum pump. A neat double-row of sixteen annunciator lights tops the panel, warning of malfunctions like a popped circuit breaker or low voltage, fuel or oil pressure, as well as forgotten items like the pitot heat or fuel pump. This is a thoroughly good idea, modern, and rather more advanced than on many similar types.

A long centre console holds, from front to rear, the main electric and ignition switches, nicely placed quadrant throttle and mixture levers, the electric flap selector with its eight position LEDs, carb-heat slider, fuel selector and gauge, and pitch trimwheel. This operates a non-reversible screw-jack, and so is a little stiff, although nicely geared. Much thought has clearly gone into the details, including the positioning. The whole circuit-breaker box, spanning the gap between instrument panel and console, can be removed for maintenance.

When those twin tanks are fitted, I would prefer to see the fuel selector point at the gauge for the tank selected, and for the ignition switch to be obstructed by the selector when off, but these things come with development. At least there is little chance of pulling the mixture in mistake for carb heat. The park brake knob is below the panel on the far left.

The Mission's airframe has already been tested to 1,085 kg (2,400 lb), but production models will have the slightly higher maximum gross weight of 1,135 kg (2,500 lb), giving a payload around 420 kg (920 lb). This prototype's empty weight is 715 kg, but its temporary undercarriage only supports 950 kg for take-off, allowing only 235 kg (two 85 kg people and 91 litres of fuel). Just like bigger aircraft, it also has a maximum landing weight, in this case 900 kg. We chose to fly within that most limiting figure, so the two of us could carry fifty litres of fuel.

Admirable authority

Starting was easy as a car, and taxying presented few problems. You sit so high, the forward view is almost unsurpassed. Steering is through 50° in either direction, but via springs, so exhibits a slight delay. Furthermore, despite the nose-leg's prominent rake, it is reluctant to centre after a tight turn, but the tiniest dab of brake soon sorts that. This steering arc is greater than needed, so will be reduced to 40° each way. The suspension was very comfortable, and the brakes worked well.

The only pre-take-off check of note is cycling the electric VP prop, controlled by two switches and a rotating knob on a black sub-panel high on the dashboard. Control is intuitive; the only checks being an rpm change when selected and a green light indicating fine pitch for take-off.

Lining up and opening the throttle resulted in fair acceleration, with some right rudder pressure needed to keep straight (although much of that may have been because of the strong crosswind). As briefed, I held about half left aileron to keep our wings level, and rotated firmly at sixty knots. Because the nose sits so low on the deck, it has to be lifted through several degrees to achieve aviation, but we broke ground cleanly at around seventy knots after perhaps 350 metres, and it was easy enough to yaw into wind to maintain the centreline.

Both the take-off and climb performance were about average for this size of aircraft, although the 700 fpm climb was clearly constrained by the O-320's artificial rpm limit. Climb performance is proportional to the excess power over that required to maintain level flight, and presumably UK owners could use the full 150 hp to improve the max weight climb to perhaps 800 fpm. Lightweight, drag-reducing fairings will help, but the obvious route to a blistering climb is to fit the world's most popular engine, Lycoming's barely heavier 180 hp O-360, already fitted to the Cessna 172, Archer and most kitplanes. Pushing up through the bumps at 27 inches manifold pressure and 2,500 rpm and 75 knots, Filip told me that, during performance testing, all engine and system temperatures remained well within limits, even during the rigorous five-minute, full-power, full-flap climb.

Wrestling with low-level turbulence while turning onto the noise abatement heading, I quickly became aware of the controls' effectiveness. They are nicely harmonised, with ailerons, elevator and rudder all needing similar pressures, and only reasonably small movements, to keep the aircraft on an even keel. The next thing I noticed was the visibility, which is nothing short of superb. Finally I perceived the comparatively low noise level. I already knew I would like this aeroplane.

Levelling, we set 75 per cent power (24 inches and 2,300 rpm) to achieve 107 knots IAS (112 knots TAS) with a fuel burn of ten usg. Reducing to 21.5 inches and 2,300 rpm (sixty per cent) still gave us 100 knots TAS and just 7.5 usg. Filip confidently predicts up to twelve knots improvement on these speeds once they have fitted the gear, wing-root, aileron and flap-hinge fairings, inflatable canopy seal, spats and a cowling outlet plate—which seems reasonable.

The Mission is designed for a V_{nc} of 183 knots. Ground vibration test and flutter analysis showed the aircraft to be flutter free to 280 knots. The maximum test flying speed has initially been limited to 160 kt. So the current red line is 0.9 of that, 144 knots. Filip plans to raise this to 165 knots, and possibly the full 183 kt, following further flight testing.

In slightly calmer air, I was able to investigate the handling more thoroughly. Stability in pitch and yaw were positive both ways, both in the full power climb

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and in level flight, but the aeroplane was reluctant to recover to wings level from a sideslip when the rudder pressure was released. This is a known problem, which will be fixed by increasing dihedral one degree (a simple matter of slightly shifting the wing attachment bolt holes). Meanwhile a bungee in the aileron circuit is a temporary expedient.

Despite not using Frise ailerons, the Mission displays only a little adverse yaw (although still too much for Filip, who will increase the up-going aileron's deflection from 20° to 25°) and it has a fair roll rate for its class of about 50° per second. I certainly had no problems positioning it for air-to-air photographs. Indeed, I was still enjoying flying it after an hour-long photo sortie. The only oddity I did discern was a slightly greater than expected fore-and-aft stick movement (although far from heavy pressures) in steep turns. All-flying tailplanes can be funny things. Some are sensitive, with precision pitch control. Others can be less precise. This one seemed a little low on effectiveness in its mid-range, but pilots who have flown few types probably wouldn't notice it, particularly if they were familiar with PA-28s. Connoisseurs of superior handling might like to see a little development in this area.

Otherwise the handling is fine, and the Mission is certainly an easy aircraft to fly. Internal comfort, space, noise, vibration, smell, warmth and ventilation are all excellent, and the visibility is truly superb, particularly in turns. Your eyes are only just behind the leading-edge, so the downward view is good, too.

Clean stalls exhibited a very gentle pitch down at 54 knots (the POH says 55) with very little warning buffet, but no sign of a wing-drop. Extending the flaps just below their 84-knot limit initially resulted in a slight pitch-up and a speed reduction to sixty knots, and then, as they continued extending, the nose dropped and the speed rose back to seventy, the approach speed. This is a neat characteristic. Our full flap stall came at 49 knots (against the book's 52), again with only a gentle nose nod, but after quite a strong pull force. The height loss was perhaps 250 feet. There was still very little buffet until in the stall proper, but the Lamberts will fit an artificial stall-warner to address this issue.

The ailerons remained effective right down to the break, so I tried a few turning stalls, and then some with increasing amounts of power, until we were waffling around the sky at significantly below fifty knots with full flap, full power and quite large bank angles. The aeroplane showed absolutely no tendency to depart, while its nose was so high, and the stick so far back, you'd have to be dead not to recognize the situation. This benign behaviour was Filip's goal, so he must be very pleased.

While the current single 40° flap setting only reduces the Mission's stall speed by three knots, the flaps do induce plenty of drag, evinced by a significant change in our glide angle with them extended. Some experimentation and development might result in a changed maximum deflection or slightly shifted hinges, to further reduce the flap-down stall speeds while retaining that useful drag. And there is no prohibition on sideslipping with flaps extended, allowing a further useful increase in glide angle.

The Mission's normal circuit speed is eighty knots, using 20 inches and 2,500 rpm. Although designed to cope with crosswinds up to 25 knots, its maximum demonstrated crosswind to date was twelve knots. 'Our' wind was twenty gusting thirty knots and swinging from 30° to 80° off runway heading, but after a single demonstration by him, Filip said he was happy for me to land his aeroplane. Like so many other

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7 | Thanks to the Mission's admirable control authority, Bob used less than half the available control travel for landing, despite a gusting thirty-knot crosswind.

8 | Entry is by climbing onto non-slip walkways on both wings. The front seat backrests tilt forward, enabling the rear-seaters to step down into their own footwell, turn and be seated. Forward-hinging canopy is enormous and the transparency is superb, but it was not easy to hold up against the 25-knot wind, despite dual gas struts.

9 | Standard analogue panel for this first prototype. Glass cockpit will be an option on future models.

lightplanes, its normal approach speed is seventy knots, but I added ten more for the gusts, and still had some difficulty accurately controlling speed on final, although I suspect that was more the wind than the aeroplane.

In the event, the landing was a doddle, needing very little effort. Thanks to that admirable control authority, I used less than half the available travel in any axis, despite the difficult conditions, which would likely have bested a Cherokee. The flare was easy and after a short float we made a wheel-squeaking, nose-high, main gear touchdown. Keen to pin it on the ground, I lowered the nosewheel a little too promptly, but was grateful for its good directional control. We made perhaps a 450-metre rollout, with a minimum of braking.

Okay, so the Mission's handling may not be perfect, but it really is very good, and the aircraft is undoubtedly easy to fly. After all, Filip was happy to let me land his priceless prototype in a howling, blustery crosswind, something that speaks volumes for his justifiable confidence in its controllability. And the handling does comply with FAR 23, something that unfortunately cannot be said for a great many kitplanes (because the U.S. Experimental system has no handling requirements).

I was impressed, especially considering the Mission's newness. Filip wants people to understand their aircraft are not 'kitplanes' but rather, a family of comfortable and easy-to-fly touring aeroplanes that just happen to be available in kit form. Historically some kitplane makers have knocked together a basic aircraft and promptly started selling kits, letting their customers do all the time-consuming development work. Not the Lamberts. With the help of Finbar Colson, their PFA inspector, test pilot Roger 'Dodge' Bailey, and the PFA's chief engineer, Francis Donaldson, among others, they very nearly have a completely sorted aeroplane, and it is this they will offer to amateur builders.

They quote an assembly time of around 1,000 man-hours (less if you choose quick-build options) with no wet lay-ups, seven very comprehensive sub-kits and a choice of factory-assisted 'standard', or 'a la carte' DIY construction. So, if you want a four-seater designed and tested to production aircraft standards, but costing considerably less to buy and run, and don't mind assembling it yourself (and particularly if you are a big guy) this could be the aeroplane for you.

Given the Lamberts' youth, expertise and energy, I expect to see many more examples in flight soon. Mission complete! ■

SPECIFICATION

Lambert Mission M212-200

Dimensions	
Wingspan	32 ft 2 in/9.8 m
Wing area	129 sq ft/12 sq m
Length	24 ft 3 in/7.4m
Height	9 ft 6 in/2.9 m
Cabin width	44 in/112 cm
Cabin height	49 in/125 cm
Seating	4 adults
Weights & loadings	
Equipped empty	1,576 lb/715 kg
Max take-off weight	2,500 lb/1,134 kg
Max baggage	7 cu ft
Fuel, standard	30.8 imp gal/160 l
Fuel, optional	61.6 imp gal/280 l
Max wing loading	15.2 lb/sq ft
Max power loading	13.1 lb/hp
Load factors	+3.8/-1.9g
Performance	
Vne	183 kt
Max MSL level speed	135 kt
75% cruise (8,000 ft)	131 kt
60% cruise (8,000 ft)	118 kt
Stall, full flap	53 kt
Take-off run	315 m
Take-off to 50 ft	550 m
Landing from 50 ft	600 m
Landing run	250 m
Climb rate	700 fpm
Maximum operating altitude	12,000 ft
Max range (45 min reserve)	680 nm

Engine & propeller

One normally-aspirated, four-cylinder, horizontally-opposed Lycoming O-320 E2D, producing 150 hp at 2,700rpm. TBO 2,000 hrs. *Propeller*: MT Propeller MTV-18C-175/17d 69-inch diameter, three-bladed, wood and composite, constant-speed.

Manufacturer

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Price

M212-200, without engine, instruments or avionics: 59,900 euro plus VAT.

Pros: superb, easy to fly, spacious, fairly quiet, 4-seat kitplane.

Cons: still in final stages of development.