

FIRST LOOK FLIGHT **EXCLUSIVE**
DA50 Magnum

Diamond DA50 Magnum



Diamond's first DA50 airframe flew with a 350hp Continental. High fuel prices have delayed that program, but the Austrian company is working on a comfortable and economic 145kt-plus tourer that will be powered by the latest in Jet A1-fuelled engines. Ian Seager flies the prototype.

Diamond's Chief Pilot, Soeren Pedersen, sat down, said hello and then started to tell me about the DA50 Magnum we were about to fly from Diamond's base at Wiener Neustadt.

"It's a prototype, a development aeroplane, and although we've done a fair amount of testing you should be aware that it's not yet a certified airframe. There are no back seats, no interior trim and we haven't finished integrating some of the systems, so the G1000 will probably flag up a few spurious warnings. Flying in it is probably not covered by your life insurance. Please don't pull the emergency door release, unless it is to get out in an emergency."

That all seemed fair enough. I was not overly concerned by the lack of interior comfort, was sure that Diamond knew more than I did about building composite aeroplanes, and decided that thinking of my homeless family living on the streets in the case



of an unlikely and untimely demise would only distract me from the task in hand.

Diamond first revealed the DA50 at Friedrichshafen in the spring of 2007. The model announced was the DA50 SuperStar. Powered by a FADEC-controlled 350hp twin turbocharged Continental engine, it promised high cruise speeds, five seats, partial pressurisation and an optional BRS. There was no doubt that it was designed to compete at the very top of the piston-single market – even the headline on the brochure read 'Above Cirrus Clouds'. The SuperStar flew just 11 months after work started on the design, and from what we hear, performance was excellent.

However, the increasing cost of avgas combined with a relatively high fuel burn meant that the corporate foot was taken off that particular pedal for a while, and the project now remains in slow development mode behind the more pressing

matter of getting Diamond's new Austro engine into production DA42s (see **FLYER** January 2009) and DA40s.

Still, Christian Dries, Diamond's owner, is not a man who likes to sit still. In fact, I'm not even sure that he knows how to. Despite dealing with a new engine in the D-Jet, the trauma of losing your main European engine supplier, running a factory in Canada, a new factory in China, producing a new diesel engine, establishing a new diesel engine factory and countless certification tasks, he decided to look at a lower-powered version of the DA50 fitted with the 170hp Austro Engine too.

Prototype presence

OE-VLS is the development airframe that Soeren had spoken about earlier. There's no mistaking its heritage – the fuselage is very Diamond. It looks like the development team took a DA40, softened

the composite structure, plugged in a foot pump somewhere and inflated it. It isn't out of proportion and does make the DA40 look a little small; it has, what the Americans would call, a certain amount of ramp presence. While the fuselage is new, the wings are from the DA42, although obviously without the engines (hey, a three-engine special might be kind of interesting); the structure, in order to keep weight down, is made from carbon fibre. Apart from the flight-test pitot probe, there's not much that suggests prototype, at least from the outside.

Open the door and things are a little different. There are a couple of seats, seat-belts, a couple of control columns, an instrument panel dominated by a Garmin G1000, a distinctly non-aviation-like T-handle throttle, acres of naked carbon fibre, emergency egress handles and the remnants of various flight test instrumentation. ▶





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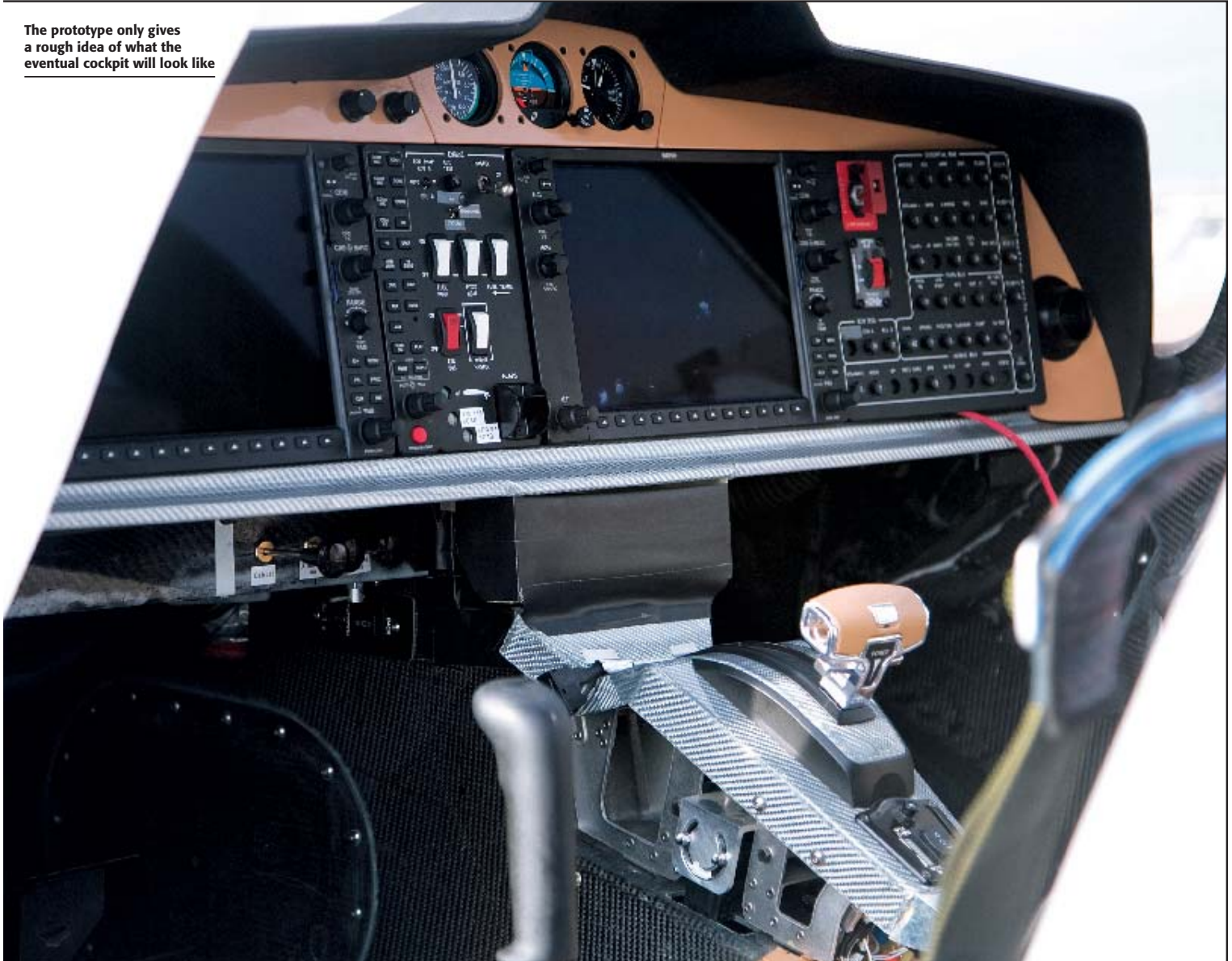


DA50 Magnum retains the three-bladed MT composite prop that is used on the DA40tdi and DA42

The start sequence is pretty straightforward. Master on (via the key rather than a rocker switch), then wait until the G1000 fires up (this shows that the battery has enough juice to start the Primary Flight Display (PFD), and once done enables the pilot to check voltages). Once the PFD is up and running, switch on the engine master, check the throttle position, turn the key to the start position and after a single blade goes past the window, the AE300 starts and settles quickly into a low rpm rumble with very little vibration. Once the temps are up and the AHRS (Attitude and Heading Reference System) has found its references, we head for the runway; steering is by differential braking, standard fit, at least on Diamond's singles. Production AE300s will benefit from the one-button engine check enjoyed by the Centurions, but for today we are back to switching ECUs (Electronic Control Units) in and out manually.

Lined up, and with 52 gallons of Jet A1 on board, we take the first stage of flaps and don't so much rush down the runway as make steady progress towards the 70kt rotate speed. The Magnum isn't TB9-like in the amount of runway that it needs, but it's no Maule either. At full power the 170hp AE300 uses 9.4usg, or just under 36lt

The prototype only gives a rough idea of what the eventual cockpit will look like





'Inflated' fuselage mated to DA42 wings

Engine tales

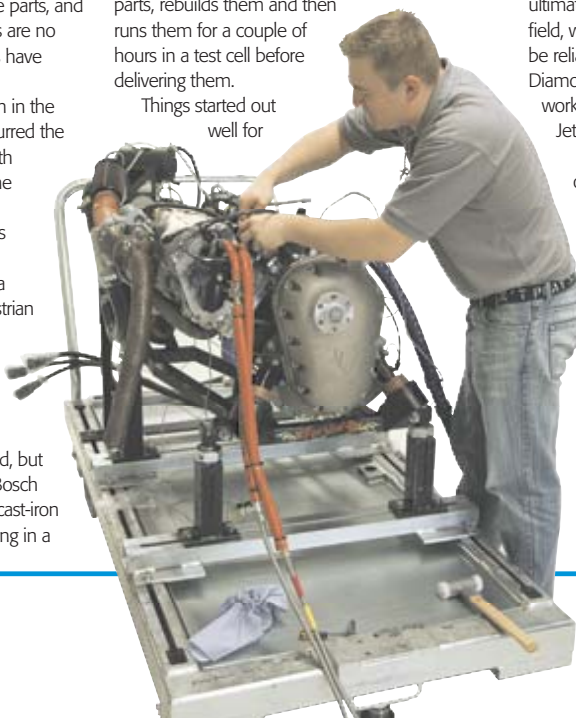
THERE MAY HAVE been a time when the relationship between Christian Dries and Frank Thielert was a good one – that is no longer the case, and I suspect that both have now altered their Christmas card lists. According to Diamond, there were some reliability issues (particularly with the 1.7 litre engine), some performance issues and some less than positive publicity in the German financial press concerning Thielert's corporate governance. With both Dries and Thielert having strong characters it was, to many observers, inevitable that the end would come sooner rather than later. Unluckily for Diamond (not to mention owners of other Thielert-powered aeroplanes) Thielert went into administration earlier this year, and although it is now easy to buy spare parts, and even entire engines, previous warranties are no longer being honoured, and parts prices have increased significantly.

For Diamond though, the breakdown in the corporate and personal relationships spurred the desire to find an alternative engine – with nothing obvious either available or on the horizon, and with the Thielert issues still occupying a lot of time, the decision was taken to build their own, and Austro Engines was born. The new facility, just a few hundred yards from Diamond's Austrian factory, is now home to both Diamond's Rotary engine and the AE300, Diamond's replacement for Thielert's Centurion. The AE300 has been developed from the same Mercedes-Benz engine that Thielert used, but this time in conjunction with MB Tech, Bosch and Hor Technologies. The original MB cast-iron cylinder block has been retained (resulting in a

heavier engine), but the turbocharger has been replaced with a bigger unit and repositioned. The Bosch-developed ECU uses fewer lines of code, and according to Austro Engines, meets the same certification requirements (and has been certified by the same specialists) as the software in an Airbus. The gearbox, (the ratio is 1.69) has been produced by Hor Technologies and incorporates a torsional vibration damper. One of the most striking features when looking at an AE300 engine is the electrical harness. This looks as if it has been designed and built to survive a nuclear strike, with the connectors looking fit for guided munitions.

Austro Engines currently buys in complete MB engines, strips them of unwanted parts, rebuilds them and then runs them for a couple of hours in a test cell before delivering them.

Things started out well for



Jet A1-fuelled piston engines; the Thielert units promised long TBRs (Time Between Replacement), good fuel consumption and ease of operation. Their success, however, was not universal, and while many private owners enjoyed the experience, at least initially, many fleet operators struggled, and there are now quite a few Thielert-powered aircraft grounded while their owners wait to see what options present themselves, either with the AE300 engine or with however buys Thielert from the administrators.

To say that Diamond has a huge amount riding on the success of this engine would be a gross understatement. It has chosen its partners well and spent heavily on the Austro Engines facility, but ultimately the engine will have to prove itself in the field, where it will have to perform as advertised, be reliable, well supported and cost-effective. Diamond not only has to prove that its engine works, but it has to rehabilitate the character of Jet A1 piston engines.

As part of that strategy it is planning to offer a power-by-the-hour scheme that will cover all engine maintenance (apart from consumables such as oil and filters) and that will include engine or component replacement when necessary. The details of the scheme have yet to be finalised, but it will offer fleet operators and owners alike an accurate way to budget for engine costs, and will prevent unexpected calls for large sums of money.

Post-production AE300 being prepared prior to running in one of the test cells





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of Jet A1 an hour, but 100% power is limited to five minutes of continuous operation. The airspace heading out of the area keeps us initially down to 1,500ft, so no point in running at 'full rental power' on a flight to nowhere in particular. The software readout giving percentage power in this particular aeroplane has not been fully set up, so power calculations are done by reference to fuel flow. This means that once clear of the airspace, we climb at about 8.5usg (32lt), which gives us just under 950fpm and equates to something like the maximum continuous power of 90%.

These figures are simply indicators at the moment – they don't do a great deal more than demonstrate the performance that we might expect from the Magnum. Diamond's test flight and certification team haven't even started on working the performance numbers yet – that's usually one of the last things done in any test programme as so much can and often does change as a result of other tests.

Unless I need the max rate of climb for a good reason, I much prefer a cruise climb. The pitch angle is less, usually giving a better view ahead, and the airspeed is inevitably higher, increasing the flow of cooling air, although the liquid-cooled AE300 shows no propensity to run hot or cold, regardless of the power setting or airspeed. Even with a reduced pitch angle and a higher airspeed, one thing that is noticeable with the DA50 is the amount of rudder needed to keep in balance. The Magnum prototype, like the production DA40, has no rudder trim – perhaps this is a cost issue, perhaps the Austrians have legs of steel, but a rudder trim would, in my opinion, be a good thing.

Predictions promising

The DA50 shares the fuel system with the DA40, which is to say that the engine feeds from the left tank, the pilot switching on a pump to transfer fuel from the right fuel tank in order to balance the fuel. Sharing the wing with the DA42 means that the tanks are quite a way outboard, although there's a chance that they may get moved during certification. Taking a quick look at some cruise numbers as we climb up, an economy cruise at 8,000ft delivers 138kt TAS burning just under 23lt, while at FL100 a quick speed check indicates that with 7usg (26.5lt) equating to 75% power, the DA50 will manage 145kt TAS.

With nothing in the back in terms of seats and test equipment, we are right on the current forward C of G limit, which as far as I'm concerned is a good thing when playing around with slow flight, stalls and general handling. Although a prototype, Víctor Lima Sierra is aerodynamically conforming and behaves very much like a slightly bigger DA40. At slow speed and in the stall, the ailerons remain fully effective; pull the nose up to the 'this is stupid' degrees of pitch and despite abusing the ailerons, there's still no nasty departure; fly level and roll on some decent bank then pull to the back stop and you'll end up with an aeroplane that just continues to nod and turn for as long as you hold it there.

When flown straight and level in the cruise, the Magnum behaves as a long-distance VFR or IFR

tourer should, relaxing and without a propensity to head off on a heading of its own choice as soon as you turn your head. Engine handling is even easier – the throttle tells the ECU what you want and then, within the design parameters, it's delivered. The prop, which incidentally is the same three-bladed MT unit that you'll find on the DA42 or DA40Tdi, is controlled through the ECU via a traditional mechanical governor and is limited to 2,300rpm. Combine the easy engine handling with the flying qualities and you've got a great package.

Of course, when it comes to flying a prototype, particularly this early in the programme, it's a case of making predictions rather than reaching conclusions, so here goes...

I have little doubt that the DA50, powered by the AE300 engine, will provide an extremely comfortable, economical European touring aeroplane. It handles well, probably better than the DA40, is extremely benign and will no doubt continue to contribute to Diamond's excellent safety record.

In terms of performance, I imagine that its final numbers will be similar to the DA40 fitted with the 135hp Centurion. The Magnum will be much, much bigger inside. However, once the DA40 gets 170hp, which it will next year, it will outperform the DA50, presenting buyers with an interesting choice. The sensible decision for most would be to go for comfort, but speed is an extremely seductive attribute for an aeroplane. After all, who doesn't want to cruise faster?

There are inevitably some unknowns. The AE300 weighs about 50kg more than the Centurion, so the DA40 may have reduced load, or perhaps, like the DA42NG, it will have an increased mauw.

Then there's the price. A decently-equipped DA40tdi costs in the region of 300,000, with a DA42 in the region of 500,000. This leaves a seemingly obvious gap in the middle – but perhaps that is being a little bit too simplistic.

The bottom line, for now at least, is that it looks like Diamond is on track to deliver a spacious, four-seat fuselage with a proven and benign wing, powered by the latest in Jet A1 fuelled engines. If nothing major changes between now and certification, predicted for late 2009 or early 2010, the Magnum should deliver not only comfort and economy but you'll be able to enjoy both at an economy cruise of about 140kt. ■

TECH SPEC

Diamond DA50 Magnum



■ DIMENSIONS

Wingspan 11.68m/38ft 4in
Length 8.93/29ft 4in
Height 2.69m/8ft 8in

■ WEIGHTS & LOADINGS*

Empty weight TBD
Max take-off weight 1,480kg/3,256lb
Fuel capacity TBD
Useful load TBD

■ PERFORMANCE*

Cruise, 75% 145kt
Rate of climb, S/L 950fpm*

■ ENGINE & PROPELLER

Austro Engine AE300 2.0 litre turbocharged Jet A1/
diesel fuelled unit delivering 170hp driving a
three-blade MTV-6-R/203 constant speed propeller

■ SEATING

Four

■ CONTACT

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Pivoting flight test pitot probe provides pilots with accurate speed indications

