FLIGHT TEST: DIAMOND'S DA62 GLITTERS

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Diamond Aircraft is set to make its debut at the National Business Aviation Association convention in Las Vegas, where it will be promoting its all-new **DA62** diesel piston twin as a platform for corporate and charter operations. First deliveries, to European customers, will be followed soon by the first US aircraft – serial number 10, which is the machine that will be on show at NBAA. This will then remain in North America to be used as a customer demonstrator by Diamond Aircraft Industries Canada.

Chief executive Christian Dries says the Austrian airframer anticipates a high take-up from private, corporate and commercial operators – and he is eager to secure a slice of the nascent US short-haul air-taxi market. To appeal to those customers, the US market is being targeted with a seven-seat variant compared with the five-seater, tailored for Europe and shown at AERO Friedrichshafen in April.

To take the measure of this largest model in the airframer's 10-strong family of propeller-driven aircraft, I travelled for Flight International to Diamond’s headquarters in Wiener Neustadt to evaluate the production standard seven-seater. My evaluation had two objectives: if the DA62 upgrades are significantly substantial and advanced to merit its definition as a new aircraft type;

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and does the DA62 have the potential to genuinely be a success in the air-taxi role?

The new DA62 construction remains all carbon-fibre (providing +26G crash protection before any structural deformation starts to occur) and is based on the smaller DA42 shape but with a wider (by 14cm), longer (by 63cm) and deeper fuselage shell now equipped with 7 seats (in a 2/3/2 seating configuration), at a Max Take Off Weight (MTOW) of 2,300kg as the standard variant, and which is deliberately based on an ‘airborne mini-van’ concept. Additionally, an optional variant comes with five seats (in a 2/3 seating configuration) but with an increased baggage space in the rear of the cabin, in place of the rear row of seats, and at a MTOW of 1,999kg, to take advantage of lower aviation charges. Some 50% of planned sales of the DA62 are expected to be in North America, and the configuration of both DA62 variants has generated significant interest in the air-taxi market. Both DA62 variants share the same fuselage shell, wings, diesel engines (Austro Engine AE330) and external dimensions.

The DA62 has just received its European Aviation Safety Agency (EASA) CS 23 (Normal, Utility and Commercial Aircraft) certification. The company is now working towards US validation. The aircraft is certified for single-pilot operation.

For the fully equipped 2,300kg MTOW DA62 variant (air-conditioning remains as an additional option), the fly-away price is $1.150 million, at current EUR/USD exchange rates.

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The all carbonfibre DA62 is based on the smaller DA42, only with a wider, longer, deeper fuselage shell

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TECHNICAL SPECIFICATIONS

The DA62 is unpressurised but has a certified ceiling of 20,000ft, when used with the fitted personal oxygen system, and a single engine ceiling of 13,000ft. The max speed at 14,000ft (best cruise altitude) with max continuous power (95%) is 198kts true air speed (TAS). Max range is 1,285nm with a total fuel capacity (Jet A-1 or similar grade) of 326l/85 US gal. Diamond has advanced plans to increase the DA62 fuel capacity to 120 US gals using a wet wing design rather than the present integral aluminium wing tanks.

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Take-off ground roll (ISA conditions, sea level) is 480m/1,574ft and landing ground roll (ISA conditions, sea level) is 390m/1,280ft. Basic Empty Weight is 1,570kg giving a max useful load (fuel and passengers) of 730kg. With a typical load of six passengers (at average weight 80kg), the available fuel load would be 250kg (312l/82 US gal) and which would still be very close to max capacity.

The max demonstrated crosswind is 25kts. Max positive g limit is +3.8g. Gear limiting speeds are 205 KIAS (kts indicated air speed) gear DOWN and 162 KIAS gear UP. Speed never exceed (Vne) is 205 KIAS. Typical rotate speed (Vr) is 75 KIAS with flap TAKE-OFF (first position). Single engine safety speed (V2) at MTOW is 87 KIAS flap UP, gear UP. Typical approach speed (Vapp) is 85 KIAS into a landing flare of 80 KIAS with flap LAND (second position).

A weather/ground mapping radar is fitted at the nose and gaseous oxygen tanks (for the personal oxygen system) are contained within the forward fuselage storage area. The aircraft is certified for flight into known icing retaining the TKS system and delivering the TKS fluid through wing, horizontal and vertical stabiliser leading edge panels. Winglet extensions are now wider and less swept up into the vertical than the DA42. The DA62 has been fitted with wider, lower pressure tyres to improve its ground handling on semi-prepared surfaces (typically grass). The AE330 engines retain FADEC using single power levers controlling percentage power and with auto-feathering of the propellers in the event of engine failure or pilot commanded shutdown.

The aircraft retains the Garmin G1000 (2 screen) digital integrated flight deck but with it now supporting vertical navigation (VNAV) and vertical auto-pilot guidance, Automatic Dependent Surveillance-Broadcast (ADS-B) out, Wide Area Augmentation System (WAAS) type navigation, Satellite Based Approach Systems (SBAS) for guided landings at surveyed but austere airstrips, a fully integrated auto-pilot (Garmin GFC 700) incorporating a fully integrated flight director (FD) and annunciated flight modes shown on the primary flight display (PFD). Previous analogue standby flight instruments mounted above the G1000 screens, in the cockpit glareshield area of the DA42, have now been combined into two small electronic standby instruments and mounted centrally between the G1000 screens.

The PFD also now displays surrounding terrain using a Synthetic Vision System (SVS) coupled with enhanced ground proximity warning system (EGPWS); a Flight Path Vector (FPV) symbol; and an improved traffic collision avoidance system (TCAS) display in a 3D type presentation. A take off and go-around (TOGA) button is now located within the face of the left hand power lever handle. The aircraft also now features an advanced Envelope Stability and Protection (ESP) system to prevent the aircraft entering a stall (under speed protection, or USP), exceeding Vne (over speed protection, or OSP) or an over-bank condition.

All of the above avionic upgrades now deliver an advanced cockpit to the DA62 pilot, equivalent, in virtually all aspects, to a modern airliner or business jet.

EVALUATION

My safety pilot for the evaluation was Ingmar Mayerbuch, head of flight test at Diamond. The aircraft was the company DA62 demonstrator (at production standard), registration OE-FSB, fuel 18/18 US gal (36 US gal total), at an approximate all up weight (AUW) of 1,750kg The flight was made from Wiener Neustadt (LOAN) with airfield weather: +27C outside air temperature (OAT), nil cloud, wind calm and airfield pressure 1012hp (QNH). I would fly the complete evaluation from the left hand seat with Ingmar assisting with the radio and local ATC.

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The higher roofline extends the curved gull-wing door windows, significantly improving visibility sideways and upwards

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First impressions approaching the aircraft, finished overall in grey and silver colours, were of the absolutely beautiful smoothness of the aerodynamic surfaces and the complex blended shapes that carbon-fibre construction allows, especially the fuselage shell. Two large gull-wing doors, in place of the forward hinged clamshell canopy of the DA42, now allow entry to either pilot seat from that aircraft side. A very large single door on the left-hand side allows passenger entry to the middle and rear rows of seats and with the middle row seat backs folding forward to ease access to the rear. The seats were all beautifully contoured and very generously dimensioned. Rear baggage space was generous.

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The complete cabin was finished in hand stitched black leather. It gave me the immediate impression of a luxury saloon car. Single ‘stick’ control columns and single power levers are retained and the cockpit had a wonderfully uncluttered, modern and calm working environment.

The pilot seat backs can be adjusted in rake but there is no vertical seat adjustment. Rudder pedal adjustment (fore/aft) remains electric. The removal of the glareshield-mounted analogue standby instruments has allowed the glareshield to be lowered by several centimetres and the re-profiled cut outs at the glareshield corners have together improved forward and downwards field of view (FOV) significantly. The higher roofline of the DA62 allows the curved gull wing door windows to extend further above the pilot’s head and this again improves sideways and upwards FOV significantly.

The gull-wing door configuration means that the wide, central overhead supporting structure now houses seat specific air vents, spot lighting and individual oxygen connection points. A wide armrest is now fitted between the forward seats and the individual ‘mic-tel’ headset connections for pilots and passengers have all been rationalised and simplified.

Engine controls are simply fuel pump and engine master for each engine. Engine start is now by individual engine button rather than key (once the ‘GLOW’ caption has extinguished in the PFD warning window). Start and engine stabilisation was instant. The FADEC engine control unit (ECU) has also been simplified into ECU A/AUTO/ECU B.

The G1000 programming was rapid post start (although the Garmin still requires familiarisation if not used previously). Ground handling was felt to be virtually unchanged from the DA42 with extremely tight turns possible about the braked inner main wheel and using differential engine power.

With power levers slammed from idle, take off acceleration (with flap TAKE OFF) was brisk and with 75 KIAS rotate reached within 15sec of brake release. Levelling at 2,000ft, max continuous power (MCP) gave approximately 165 KIAS. Above MCP (95% power), the engine power indicator tapes turn from white to amber to indicate a 5min, pilot-observed, time limit. Engine handling throughout the sortie was excellent with instant power response, linear power delivery to power lever movement and the automatic and accurate limiting of power at 100%, with no power overswing. Even with the noise cancelling headsets removed, the cabin was quiet in the cruise.

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Single stick control columns and power levers help make for an uncluttered, calm cockpit

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Climbing to 10,000ft (no ac oxygen system was installed in OE-FSB for the evaluation) in the manoeuvring area to the south-west of Wiener Neustadt, OAT 8C, 75/75% power gave 159 KIAS/188 TAS and 15 US gal per hour (total) fuel flow. 65/65% power gave 146 KIAS/174 TAS and 13 US gal per hour (total) fuel flow.

Stalling, in clean configuration, gave an aural stall warning at 78 KIAS, distinct airframe buffet at 70 KIAS and nose drop at 68 KIAS. In landing configuration (gear DOWN, flap LAND) the same reference speeds were 65/62/61 KIAS in the same sequence. The outer wing section of each wing of the DA62 now features five vortex generators at the leading edge. Stalling in all configurations was totally benign, distinct at the g-break and without any wing drop. Ailerons remained fully

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effective in roll, post stall, even with the control column held fully back.

Static longitudinal stability away from trim (up to +/- 30 KIAS) was positive but was not overly high (max 3kg of held force) and the electric pitch trim was rapid and precise in negating out of trim forces. At 160 KIAS a descending wind up turn (WUT) to an estimated +3.5g showed no hint of wing rock or wing buffet. A shallow dive to 205 KIAS (Vne) showed that the controls had stiffened up moderately but the aircraft remained perfectly controllable in pitch and roll and with no associated aerodynamic buffeting.

Laterally, the aircraft rolled at approximately 35deg/sec (similar to the DA42). Dutch roll was positively damped within two cycles but was instantly stopped with the selection of the yaw damper. The aircraft rolled positively and immediately with rudder application and in the same direction as the applied rudder. Spiral stability was convergent. Rudder ramp inputs at 90-100 KIAS in landing configuration (gear DOWN, flap LAND) showed that heading changes of up to 20-25deg could be generated rapidly and with ease, with the wings held level, for a kick-off drift manoeuvre to cope with a 25kt demonstrated crosswind limit.

Single-engine configuration was achieved simply by bringing the selected power lever to idle and turning the corresponding engine master switch to OFF. The engine was automatically shut down with a feathered prop within three seconds and without any significant transient yaw. Minimum control speed air (Vmca) flap UP was 76 KIAS. Gear DOWN foot forces at Vmca were high at (approx) 40-50 kg but lightened immediately upon selection of gear UP. Minimum climb speed single engine (V2) gear UP, flap UP, was 86 KIAS with foot forces now reduced to approximately 15kg, or to zero with half rudder trim selected. An in-flight windmilling engine restart at 115 KIAS required simply to put the engine master switch to ON. A fully functioning engine and propeller were then available for pilot power input after just 3sec. The single engine handling characteristics of the DA62 will inspire confidence in any future pilot and were an enhancing safety feature of the aircraft, especially in single pilot, commercial operations.

The ESP (when selected ON via the Garmin system page) system is active with the auto-pilot (AP) OFF. With AP OFF, a backwards stick force (pitch up) is introduced as the aircraft nears Vne; or, if exceeding 45deg angle of bank (AOB) an opposite lateral stick force is introduced until the AOB becomes 30deg or less. With AP ON, the OSP function pitched the aircraft up to maintain just less than Vne (205 KIAS) and the USP function lowered the nose automatically to maintain the aircraft’s airspeed just above the stall warning speed, holding the aircraft at 76 KIAS clean and took priority over altitude capture/altitude hold. The ESP system and the OSP/USP functions are independent Garmin features that have been combined by Diamond into one integrated package and were another enhancing safety design attribute of the new aircraft.

The fully integrated AP functioned extremely well although the mode selection buttons (on the left hand side panel of the right hand G1000 screen) are quite small. The PFD mode annunciations (Lateral – AP/YD – Vertical/Speed), the flight director (FD) and the flight path vector (FPV) were easy to interpret and provided the pilot with an excellent man-machine interface. The SVS, set as background on the PFD, was highly accurate in its depiction of forward terrain and, when deliberately flying towards adjacent mountain peaks to trigger the EGPWS, clearly showed the pilot the best escape direction with the forward mountains now individually coloured red or amber depending on their relative altitudes and danger to the aircraft.

Three tight visual circuits with roller landings completed my evaluation, with a Vapp of 83 KIAS and a touchdown Vref of 75 KIAS. The circuits were an absolute delight to fly. The final landing (the aircraft has no anti-skid) used approximately 400m of runway distance, with moderate braking.

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Sortie duration was 1hr 10min, using just 14gal of fuel.

CONCLUSION

The DA62 is both an outstanding modern aircraft and a ‘standout’ modern business tool.

The aircraft combines excellent flyability in all flight regimes, including safe single engine flight following engine failure or commanded pilot shutdown. Its advanced avionic systems and its carbon-fibre construction grant it the highest contemporary levels of survivability even when operated single pilot. Its short field performance and its luxurious, roomy cabin with up to seven seats, give it unmatched usability for both commercial and private operators. Its affordability, both in terms of its purchase price vs its seat/cargo capability and the economy of its ultra-low running costs, are unmatched in its class.

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Collins: short-field performance and luxurious, roomy cabin mean "unmatched usability"

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In 2004, I wrote for Flight International that the DA42 “…sets a new benchmark in European general aviation”. In 2015, it is abundantly clear to me that the new DA62 now steps up to an entirely new operating level deserving its designation as a new aircraft type and one that has the potential to revolutionise both the commercial air taxi and the family touring aircraft marketplace with a truly incredible combination of economy, performance, safety, avionic sophistication, range and payload.

I believe the DA62 to be the one real aircraft that I have evaluated in my test pilot career that could really work and be commercially successful as an air taxi: single-pilot operation; twin engine safety

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to meet regulatory requirements; the latest avionics to fly safely within complex airspace or land on austere airstrips using SBAS type approaches; the ability to fly into known icing; real room and load capability for up to six passengers; high levels of passenger comfort; and real room for passenger baggage. Commercial performance would probably be best over a max journey range to destination of around 400 miles/2hr in cruise, which would need just 60 US gal (220l) of JET A-1 for the return trip, costing no more than $250.

It is clearly evident to me why the DA62 has generated such interest. I predict that the DA62 will be an unqualified and worldwide commercial success.

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