UNDER THE SKIN

Airbus Military's airlifter has several things in common with its commercial siblings, sharing dimensions and composites technology that were pioneered for airliners

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Structurally, the A400M presents perhaps the best example of a classic European design combining the basic utility and straightforward strength of a conventional aluminium monocoque fuselage with the advanced composite primary wing structure pioneered by the Airbus commercial line.

To provide the maximum internal volume to meet the European Staff Requirement, the cross-section is non-circular and derived from two distinctly different arcs. The upper arc effectively is based on the standard Airbus widebody 5.65m (222in) fuselage diameter, while the much wider lower arc is designed to provide an almost flat bottom for the fuselage and allow for a 4m-wide cargo floor. The two arcs are faired together to present a plump, pumpkin-like cross-section offering an internal height of 3.85m and an overall cargo hold volume of 356m^3 (12,580ft^3).

"The design began with the cargo box. We built a minimum fuselage shape around it, which was not circular," says A400M design integration vice-president Jean-Jacques Cuny. "When we did that we realised the upper diameter was only a few centimetres less than the cross-section of the A330/A340. So we decided to set the diameter to the same amount for commonality. Not a single frame is the same, but by sharing similar dimensions we can use many of the same parts of the manufacturing and assembly process such as the stretch-forming tools and panel-carrying trolleys."

The fuselage comes together as four main structural elements, including the nose section; forward fuselage barrel; centre fuselage with an upper section cutout for the wing to fuselage join; and the aft fuselage section with a large cutout for the 5.4 x 4m cargo ramp and its associated 8.1m-long rear cargo door.

Aluminium is used for the primary fuselage structure, including the skins, stringers, frames and floor beams, which are strengthened to withstand the heavy local loads of the cargo bay. Titanium alloys are used for the remaining high-load areas such as the wing-to-fuselage join, undercarriage mounting and windscreen. The only significant composite structures found in the fuselage are the large fairings around the wing and main undercarriage.

Aeromedical mission

The fuselage is designed to maintain an 8,000ft pressure altitude when flying at 37,000ft, and a 9,000ft pressure altitude when flying at 40,000ft. The structure is also capable of maintaining zero-feet cabin altitude up to 19,400ft for medevac operations, for which the A400M is designed to take up to 66 NATO standard stretchers. These will be mounted on a support structure attached to tie-down rings in the cargo floor. There will also be seating for 28 medical personnel on adjacent troop seats, while eight stretchers are provided as standard and can be stored on board.

Four passenger doors are built into the fuselage, two forward of the right-hand exit for emergency use only, and two aft that are for paratroop dropping. Two emergency exit hatches are also located in the roof of the flightdeck area and the cargo section, both of which allow access to the upper wing surface.

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The commodious cargo bay is designed to accommodate up to 116 fully equipped paratroops seated in four rows. The two centre rows, each seating 30, are removable to open space for the main-deck cargo, while permanent sidewall-mounted fold-away seating for 28 is provided on either side. Four static lines are arranged down the length of the cabin to provide for paratroop dropping or, in the case of the main ramp, cargo parachute loads. Two electric winches are fitted to recover the parachute deployment bags and even parachutists who are still attached to the static line.

The cargo deck can carry nine 463L-standard (2.74 x 22.4m) military pallets, for which a fully integrated pallet/roller/restraint system will be installed in the floor. An optional kit for 3.17m-wide civil pallets can also be installed using the existing tie-down rings for support. An autonomous cargo handling system is also installed and uses power from a heavy-duty winch