

A400M: systems

a higher level of tolerance to battle damage, and to build in the same levels of system robustness established for civil certification, the FCS has dissimilar flight control power sources for the rudder, ailerons and elevators.

The rudder is actuated by two electrical back-up hydraulic actuators (EBHA), each powered by one hydraulic and one electrical system. The actuation of the ailerons and elevators, in contrast, is provided by an electrically powered electro-hydrostatic actuator and a conventional hydraulically powered actuator.

The spoilers, five of which are mounted per wing, are powered by one hydraulic system that is arranged so that it provides symmetrical spoiler actuation on each wing. Flaps and tailplane trim are powered by two hydraulic circuits. "Once again we have adopted the A380 architecture and even the same actuators to reduce risk," says Llamazares, who adds that system suppliers include Moog and Liebherr.

Electrical power

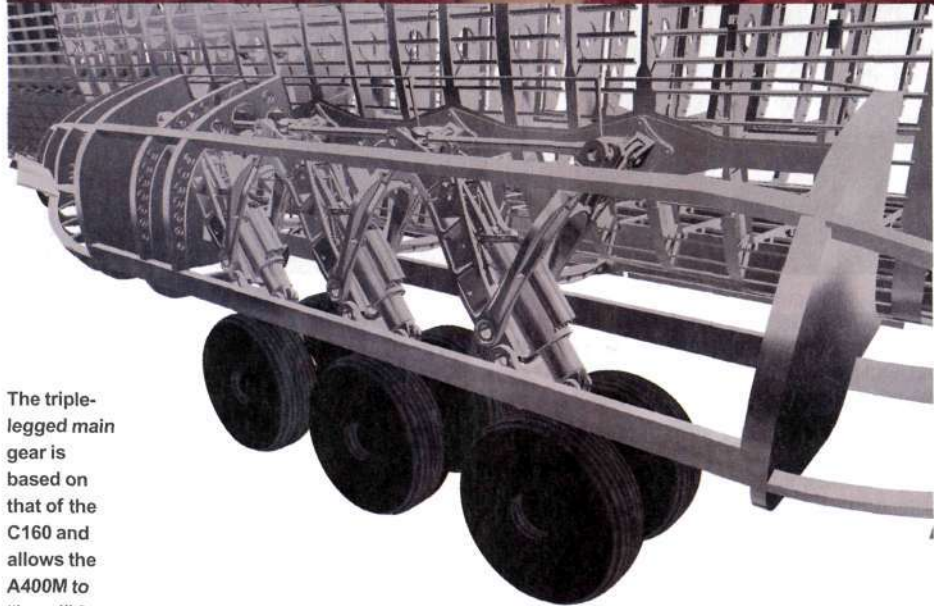
Electrical power generation, important to all fly-by-wire aircraft, receives particular attention on the A400M with its widely differing civil and military systems. The broad power frequency needs in the 300-400Hz-plus range drove AMC to the use of variable-frequency generators (VFG) as the system of choice for AC power. One VFG will be attached to each engine, providing four separate sources of a nominal 75kVA. Additional AC power will come from a three-phase 90kVA generator on the auxiliary power unit (APU), a similar generator on the ram air turbine (RAT), and an emergency battery that feeds a static inverter.

Llamazares also describes the choice of the VFG as a "novel" successor to the similarly configured A380, which "broke the existing monopoly" by being configured with the VFG architecture. "The A400M is a kind of follow-on to that decision, but the main influence was the fact we would have to qualify a wide range of power demands."

DC power is provided by three 300A battery charger rectifier units (BCRU) and a single transformer rectifier unit (TRU). Two of the BCRUs feed the DC main bus bars and the third supplies the flight essential bus bar. The TRU provides power to the APU starting system.

The relatively large wing of the A400M provides ample room for a fuel system comprising three tanks per wing and a large centre wing-box tank. Overall capacity, not including the production-line provisioned 3,000 litre (790USgal) cargo hold tank, is 60,000 litres.

"This was based on the operational needs of several of the customers," says Llamazares, who adds that the final layout



The triple-geared main gear is based on that of the C160 and allows the A400M to "kneel" for better loading

of parts of the pipe routing for the system is "still being refined".

AMC has opted for simplicity where possible, and the fuel system is a classic example of this, having basic management procedures and two fuel burn sequences for logistic and tactical missions. The system is

also adaptable to the aircraft's expected role both as a receiver and in-flight tanker. As a receiver, the aircraft is provisioned with a removable in-flight refuelling probe mounted in the crown above the flight-deck. As a tanker, the fuel system is provisioned for wing-mounted refuelling pods as