



carefree handling, including at high AoA. Pilot training demands an aircraft with high energy and good manoeuvrability, as well as complex mission and systems handling in such environments. Higher safety levels are also required, he adds.

These requirements drive the design, says Eligio Trombetta, deputy programme director and systems engineering manager, although upgrading old designs with new avionics can allow the instructors to teach systems and mission management, "which Aermacchi has implemented on the MB339", he adds.

Using FBW on existing, conventionally designed aircraft "would be a big effort with a limited return, as the aerodynamics won't allow more performance", says Trombetta.

Safety is also driving the need for a new design. "The requirements are increasing all the time.... In Italy it is one catastrophic failure every 1 million hours. This is our national requirement and also in the

Eurotrainer requirements," says Trombetta. Aermacchi signed a deal with the Italian defence ministry in March for the latter to certificate the M346. The Italian defence ministry is also the lead organisation in the 13-nation Eurotraining programme.

## Safety standards

This less than  $1 \times 10^{-6}$  failure rate designed into the M346 is better than that for any existing military aircraft, according to Trombetta. For certification, Aermacchi is using a combination of historical data with military and commercial aircraft certification guidelines.

Trombetta says Aermacchi conducted a hazard analysis early in the design at the aircraft, system and equipment level. The company also performs regular critical function analysis of all software and holds periodical safety review boards. Achieving high safety standards has a knock-on effect on aircraft costs – the higher the safety

level, the fewer attrition airframes are needed, believes Aermacchi.

Trombetta says the safety requirement "drives the architecture and functional choices of hardware and software design". The safety criterion is a key driver for twin engines, he adds.

Aermacchi's M346 design targets are:

- Transonic aerodynamic configuration with a variable camber wing providing a wide flight envelope;
- twin-engined configuration for energy and safety;
- FBW for safety and flight quality;
- "fighter-like" cockpit and digital avionics;
- high reliability and reduced maintenance for low operational costs.

Life-cycle costs are viewed as crucial, with Aermacchi striving for costs no higher than those of its current products or of its competitors.

High reliability reduces maintenance, and therefore costs, says Trombetta. To



The M346 is the latest in a line of Aermacchi advanced trainers dating back to the MB326