structure from the beginning, and the designer must therefore prevent those cracks becoming critical during the aircraft’s life. To test this, a durability test airframe is subjected to two fatigue lifetimes before cracks are introduced deliberately and the airframe is then put through another test lifetime to see if these cracks become critical.

Durability is also a major feature of the Garrett F109 turbofan, the first Air Force powerplant to be developed under the engine structural integrity programme, an approach to design, manufacture, and test intended to extend engine life and reduce maintenance. The F109 is designed to match the T-46’s airframe longevity, with a hot-section life of 9,000hr and a cold-section life of 18,000hr.

The F109 uses the core of Garrett’s established TPE331 turboprop (military designation T76), and began life in 1979 as the TFE76 private-venture turbofan derivative of that engine, with a fan scaled from that of the larger TFE731. The T-46’s F109-GA-100 is a two-spool turbofan with a bypass ratio of 5:1, a thrust of 1,330lb for a dry weight of less than 400lb, and a specific fuel consumption (s.f.c.) of 0-392lb/hr/lb thrust. The engine has a contingency rating of 105 per cent for single-engine operations. The F109 has a built-in test, data recording, and trend monitoring.

Engine exertions

Garrett’s F109 is the first engine to pass accelerated mission testing before being cleared for flight. By the time engines had been delivered to Fairchild in January, an F109 had completed 325 accelerated mission cycles, equivalent to 453hr in service, and more than 3,900 idle-max-idle throttle transients. After completing this test, the engine achieved its specified 1,330lb thrust without significant changes in s.f.c. or temperature, says Garrett.

Both airframe and engine are covered by manufacturers’ warranties to limit Air Force repair burden. Fairchild will guarantee its T-46 airframe for 10,000hr or ten years, while Garrett will guarantee its F109 turbofan for 1,000hr or two years.

An 18-month flight-test programme is scheduled to get under way in late April or early May with the flight of the first of two development T-46s from Edwards Air Force Base, California. The US Air Force has ordered an initial batch of ten aircraft, worth $58 million, for delivery from April 1986. The T-46, however, will not officially enter service until January 1988.

The US Air Force expects to train some 50,000 pilots on the T-46 over its 25-year life. As currently envisaged, the T-46 will be used for some 75hr of the 175hr Air Training Command syllabus, as a direct replacement for the T-37. This could increase to 85hr, however, if the Air Force decides to stream pilots after graduation from the T-46 into separate fast-jet and tanker/transport/bomber tracks, as is currently under consideration.

A student will come to the T-46 after 25hr screening training on the T-41 (Cessna 172), and will graduate from it to the supersonic T-38 to complete his 175hr flying training to wings standard (this is scheduled to increase to 189hr by later this decade to reduce wastage at squadron level).

In addition to 75hr on the T-46 itself, the student will receive 30-35hr training in the simulator. Reflectone is to update 44 T-37 simulators by fitting T-46 cockpits to existing motion systems and installing new computers. Meanwhile, computer-generated-image visual systems are to be introduced across the fleet. The first T-46 simulators are to be operational by September 1987 at Laughlin Air Force Base, Texas, for instructor conversion in preparation for the start of T-46 flying training early in 1988. There will be eight T-46 simulators at each of five training bases, plus four at Randolph AFB, Texas, the instructor training base.

Production of 650 aircraft for the US Air Force will continue into 1992, and will peak at 12 a month in 1989. There is capacity to increase production beyond this, to 20 a month, to meet export orders, says Fairchild. The AT-46A is the export version of the T-46, suitable for basic and advanced flying training, weapons training, forward air control, and light attack. Changes to the T-46 are minimal, and are limited to the addition of four underwing pylons, plumbing for fuel tanks, wiring for weapons, a cockpit armament control panel, and an optical sight for headup display.

Hardpoints for the pylons are designed into the T-46 wing structure. The AT-46 will carry payloads in excess of 1,500lb including bombs, rocket and machinegun pods, fuel tanks, and reconnaissance pods. Stores carriage will limit fatigue life to 10,000-12,000hr and manoeuvre capability to 5.5g in heavy configuration.

Under current planning the US Air Force will bail the first production T-46 back to Fairchild for an AT-46 weapons-clearance flight-test programme beginning in 1986. The Air Force would also supply some support in the shape of flight-test instrumentation and ground test equipment. Potential AT-46 customers will have an opportunity to fly the T-46, however, perhaps as early as June or July this year.

Fairchild built a full-scale mockup of its trainer design, and later reworked it as the FRC 225 full spectrum trainer, now the AT-46, an armed export version of the T-46