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ALF502: plugging the turbofan gap
RICHARD WHITAKE R reports from CONNECTICUT Cutaway by FRANK MUNGER

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VCO LYCOMING is gradually in-
> creasing the production rate of
its ALF502 light, high bypass-ratio
turbofan, and has delivered 107 en-
gines for its two applications—the BAe 146 feederliner and the Canadair Challenger business aircraft. Although Avco has won some notoriety over its difficulty in meeting 502 schedules, both versions are certificated and the company is reorganising its produc-tion to produce 12 engines a month by the summer.
The ALF502 is based on Avco's T55 core, more than 3,500 of which have been produced for the Chinook, Bell 214, and industrial and marine appli-cations. The ALF502R-3 is take-off rated at 6,7001b for the BAe 146, and the ALF502L uses an extra inter-mediate-pressure compressor stage to increase the thrust to 7,5001b for the Challenger. This places the engine neatly between the Garrett ATF3, which produces just over 5,0001b, and the General Electric TF34, which clocks up 8,6501b.

T55 cores represent only 35 per cent of Avco's turbine activities. The T53 and LT101 account for 15 per cent each, and the M-l tank engine takes up about 25 per cent of Avco's efforts. The rest of its activities include re-search. The addition of the ALF502 to the range has put a lot of pressure on Avco, both in development— especially of the gearbox—and in production.

To relieve things at Avco's Strat-ford, Connecticut, factory, the com-pany has transferred all production of the LT101 series to Williamsport, Pennsylvania, home of Avco's piston-engine work. A new factory at Greer, South Carolina, should begin to pro-duce ALF502 blades and discs in May. Finally, Avco has obtained second-source suppliers for many components, freeing its own machines

for the more difficult parts. This ap-proach gives Avco considerable flexi-bility, since it can dispense with some of the subcontractors when demand is not so great.
Avco has also increased the number of employees at Stratford from 2,700 in 1978 to more than 5,000— this is no easy task, since the numer-ous high-technology companies in the area tend to soak up the skilled labour. There is also the problem of taking employees away from local component subcontractors.
The main points about the ALF502 are that its high bypass-ratio gives good fuel consumption and low noise, and its modular construction makes for good maintainability. There are four modules—fan, accessory gearbox, gas producer, and combustor turbine. Each module is balanced before leav-ing the factory, so the modules are interchangeable directly. This means that a hot end, for example, can be

removed and then replaced immedi-ately by a hot end from stores without balancing.
Two men need 2-2hr to replace a combustor/turbine module, and l-8hr to replace an accessory gearbox module. Both operations can be done without removing the engine. Fan and gas-producer module changes are done in the shop, but up to five op-posite pairs of fan blades (out of 40 blades) may be replaced on the air-craft without balancing. Up to ten compressor blades may be replaced if their replacements are within weight limits. In fact, Avco claims that all maintenance can be done in the hangar, except for compressor dis-mantling, which needs complex bal-ancing gear.
One factor in the ALF502's main-tainability is that it is fairly small, so the modules are relatively lightweight, especially for an aircraft such as the 146, which might have been powered

ALF502 history
THE AJLF502 is the commercial version of the YF102, which flew in a test-bed in 1972 and powered the Northrop A-9A contender for the US Air Force's AX competi-tion, eventually won by the A-10. The first civil application for the turbofan was the ill-fated Dassault Falcon 30 30-seat transport. This made more than 100 flights in 1974-74. and was powered by the 6,5001b AEF502D flat-rated to 5,5001b.

Hawker Siddeley selected the 6,5001b ALF502H for its HS.146 in 1973, but the project was postponed for market reasons. The aircraft was resurrected by British Aero-space in 1978, and the BAe 146

now uses the AI.F502K-3, which has a slightly higher rating, 6,7001b.
Meanwhile. Canadair had
selected the 7,5001b AI.F502L for its Challenger business aircraft, de-rived from Bill Lear"s LearStar (hence the L designation). The Challenger made its maiden flight on November 8, 1978, and the BAe 146 flew for the first time on September 3, 1981. The ALF502L was certificated in February 1980, while the ALF502R received its FAA approval in January 1981. The
only other aircraft to fly with this
engine is Nasa's Quiet, Short Haul
Research Aircraft, a modified Buf-
falo which still flies with the
YF102s from the A-9A.

FLIGHT International, 30 January 1982 237