The major new-engine project debuts is the SNECMA M88 military turbofan for the TF34-TA engine for the Tornado. It is shown in outline only against an An 9K50 (15,870 lb) for comparison. Weight is 1,900 lb compared with 3,490 lb, length 143 in. (234 in); diameter is apparently comparable.

Pressure ratio is said to be 22 to 1, bypass ratio 0.6, and turbine inlet temperature 1,600 K. SNECMA has been advised by MTU that the engine is not compatible with the new fighter project TFK90 or with the German Government's massive commitment to the RB199. According to German sources at the show, the M88 will give France independence in future fighter exports but will add a third engine to the RB199 and GE F404 ten years later.

The move seems to be away from low-BPR combat engines towards 1 to 1.2 for fuel economy. The "leaky" turbine idea, in TurboUnion's view, is going out with the single-mission fighter.

The General Electric 404 appears to have inlet guide- vanes with variable trailing edges plus, possibly, variable blades in the first three stages of the HP compressor.

A two-spool variant of the RB199 has been floated as a study for the Dornier TKF project (smaller than MBB's) but Turbo-Union is unlikely to move away from the three-spool concept and is satisfied with the RB199's core size. Surge problems with the Tornado at high altitude are acknowledged but are said to occur only in flight conditions for which the IDS Tornado and its engine were not designed. In Turbo-Union's opinion no reduction in overall core size is envisaged.

The design of the RB199's inlets in such conditions is also a matter for debate between the airframe and engine manufacturers.

Pratt & Whitney has published an unprecedented press release on the evidently convalescent "stagnation-stall" problems of the F100 engine ("Goodbye stagnation: America's finest fighter engine outgrows a childhood ailment"). Three mods have been flight-tested on an F-15 retaining one standard engine: (1) electronic engine control adjusted to open the reheat nozzle after a mislight, reducing back-pressure on the fan; (2) fuel-flow to the reheat adjusted to reduce fuel in the event of a surge; (3) extension of the compressor inlet, moving the splitter nearer the fan.

Congress is still funding USAF development of the B-1 tested General Electric F101X as a fallback combat engine, the whole programme being limited to three test engines for economy.

Volvo Flygmotor is showing the 1042 development of the Garrett TFET31. Possible applications include a new development of the Northrop F-5 and a re-engined Dassault-Breguet-Dornier Alpha Jet for the US Navy's VTX competition. A twin-engined version of the British Aerospace BAe Hawk is also mentioned, though more vaguely. There is apparently now a chance that the Swedish Government will allow the Saab-Scanda A36 (smaller B3LA) to be revived.

Flygmotor says that the 1042 fills a modern-engine gap missed by the big engine companies. A development engine will run in August as a 50/50 co-operative fit—Flygmotor's reheat system and Garrett's experience combined with Garrett's commercial-market expertise. Flygmotor is responsible for the fan and gearbox; bypass ratio is reduced from 2-7 to 0-75 for an overall pressure ratio of 19 to 1. Three models are planned: the -5 of 3,630 lb; the -6 of 4,200 lb; and the -7 with reheat of 6,800 lb. Weights are respectively 800, 855 and 1,200 lb.

New from Pratt & Whitney Canada is a projected turboprop in the 1,600 h.p. class designated AD8604. It could be for de Havilland's Dash X, with a 1983 target date. A PT6 is said to have run to 13,000 hr, with only condition-monitoring.

Now virtually certain to be selected for the WG.34 Sea King Replacement (SKR), the Rolls-Royce Turbomeca RTM321 turboshift is designed to match and improve on the GE T700, which is incidentally being acquired for the SKR test vehicles and prototypes. A formal go-ahead is expected in three months and the engine will first run in 1981.

RTM321 is a single-shaft free turbine. It has three transonic axial compressor stages with two variable stators, a centrifugal compressor, reverse-flow combustor and two-stage gas generator turbine. The two-stage output turbine drives an output shaft passing through the compressor to emerge at the front of the engine at about 20,000 r.p.m. without a reduction gear. The 2 min power is 1,750 h.p. and continuous power is 1,500 h.p., though a typical three-engined cruise setting will be 1,050 h.p. with an s.f.c. of 0-51 lb/s.h.p. Weight with oil system, torque meter and fittings is to be 390 lb. A rear drive and reduction gear are optional.

Rolls-Royce expects the RTM321 to have better acceleration than the Gem, which goes from zero to nearly 90 per cent power in 1 sec. The RTM321 will also have digital electronic control and pulse probe r.p.m. sensors which will eliminate most of the heavy mechanical sensors and controls of today's engines. Main control parameter is power turbine r.p.m., which must remain constant, but the controller also monitors temperature and over-fuelling. Droop tolerances will be set tight so that the three engines share the load accurately. The electronic fuel-control system is by Smiths Industries and Dowty (DSIC). The RTM321 is, of course, modular.

The MTM380 is to run at the end of this year and is destined for the MBB/Aerospatiale HAC/PAH-2 anti-tank helicopter. MTU and Turbomeca are working to produce a simple, low-cost engine with emphasis on good fuel consumption at partial powers.