

Rolls-Royce V/STOL composite propulsion concept, this could mean substantial future business for the company and an influx of widespread lift-jet operating experience, so far lacking in European V/STOL development.

In December the German Ministry of Defence signed a contract with Rolls-Royce and MAN-Turbo for development of the RB.193 vectored thrust turbofan to power the VFW VAK-191B V/STOL strike fighter. Development of the engine will be undertaken jointly by Rolls-Royce and MAN, with Bristol Siddeley participating in part of the Rolls-Royce manufacturing programme. The contract is worth more than £8 million to Rolls-Royce.

The RB.193 incorporates four thrust-

totype GAM Dassault Mirage III-V, in which eight lift jets provided the total lift thrust necessary. First flight of a second aircraft—the Dornier Do31—is imminent, this German tactical V/STOL transport having four RB.162-32s in each of two pods.

Hover rigs for the Do31 and VAK-191B have been built, incorporating RB.108 lift jets.

Of Rolls-Royce's quartet of traditional engines—the Conway, Dart, Tyne and Avon—the Conway R.Co12 has earned the distinction of being the world's most reliable aero engine. Powering the Boeing 707s and Douglas DC-8s of eight international airlines, it has averaged an unscheduled removal rate of one per 9,000hr over the

for Dart occurred with the announcement by Fairchild in February 1965 of their intention to lay down a line of 30 of the new FH-227 powered by the Dart 523-7 of 2,230 e.s.h.p. A further variant, the FH-227A with the Dart RDa.10, has also been proposed.

Meanwhile the Dart continues in production for numerous of its earlier applications, including the Handley Page Herald, Hawker Siddeley 748, Fokker Friendship, NAMC YS-11, Grumman Gulfstream and Hawker Siddeley Andover, the first production model of which flew in July 1965. Dart engines have now accumulated the astronomical figure of more than 33 million hours' flying. Highest Dart t.b.o. which has been approved to date is 6,000hr.

The Tyne turboprop is in production for the Breguet Atlantic and Transall C-160 by a European consortium comprising Hispano-Suiza, Fabrique Nationale, MAN-Turbo and Rolls-Royce. Orders have been placed by France and Germany for 62 Atlantics and over 100 C-160s. In its civil applications, the Vickers Vanguard and Canadair CL-44, the Tyne has attained a t.b.o. of 4,100hr.

The Avon, in airline service powering the Hawker Siddeley Comet and Sud-Aviation Caravelle, has attained a t.b.o. of 4,100hr. In military operation, too, the engine continues in service, powering many hundred fighters, bombers and naval aircraft.

Work continues on the Gazelle turbo-shaft. The 1,450 s.h.p. one-hour rated NGA.13 was to have been up-rated to the NGA.18 of 1,540 s.h.p., but further development indicated that even higher powers could be attained with little more modification. This led to the NGA.22 of 1,790 s.h.p. one-hour rating. In the Westland Wessex HAS Mk 3 the NGA.22's output is torque-limited to 1,600 s.h.p., which rating the engine maintains up to ISA + 18°C. Modification kits to NGA.22 standard are being supplied to both the Royal Navy and the Royal Australian Navy. Meanwhile, further improved versions of Gazelle are being considered to meet future RN requirements.

In the light aircraft engine field, Rolls-Royce Motor Car Division at Crewe is licensed to manufacture the 95, 100 and 145 b.h.p. models from the Continental range of piston engines. All other models in this American series are also available through Rolls-Royce.

ROLLASON

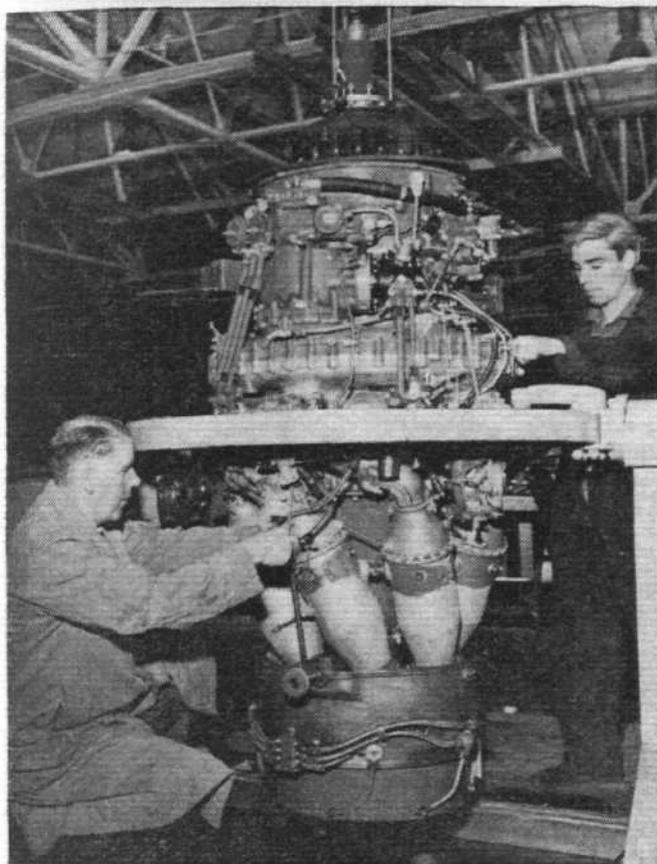
Rollason Aircraft and Engines, Croydon, Surrey.

Rollason continues to manufacture and supply the 45 b.h.p. Ardem 4 C02 light piston engine with full ARB clearance (see Ardem). In addition the company operates an overhaul and engine exchange scheme for Ardem and all types of Continental, Lycoming and Bristol Siddeley Gipsy piston engines rated up to 200 b.h.p.

ROVER

Rover Gas Turbines, Solihull, Warwick.

Rover's aero experience is almost entirely in the provision of auxiliary airborne power plants (AAPP) for RAF Hawker Siddeley Vulcan and Argosy aircraft. These are based on the company's 1S/60 single-shaft turboshaft of 60 h.p. and over 200 are now operating as AAPPs and have completed more than 50,000hr in service. The unit in the Argosy has a t.b.o. of 600hr, and that in the Vulcan starts and provides services at altitudes up to 35,000ft. A new free-turbine turboshaft, the 25/150A of 145 h.p., has been developed which is available—in conjunction with Rotax and Lucas—as a bleed air unit for starting or



Rolls-Royce Dart RDa.10/1 single-shaft turboprop. Two-stage centrifugal compressor with double-sided impellers. Seven straight-through-flow combustion chambers. Three-stage axial turbine. Rating, 3,025 e.s.h.p. Weight, 1,377lb. Diameter, 37.9in

vectoring nozzles of similar concept to those on the Bristol Siddeley Pegasus and BS.100 turbofans, and is understood to be in the 10,000 to 12,000lb thrust bracket. Flight testing of the VAK-191B is planned for 1968 and the aircraft should be operational by 1971-72.

Rolls-Royce's earlier submission for the 191B was the RB.153 turbofan, jointly developed by MAN-Turbo and the British company for the VJ-101D. Rated at 6,850lb thrust, and some 70 per cent higher with reheat, this engine first ran in November 1963, since when a number of experimental units have been tested both at Derby and by MAN at Munich. For the VJ-101D the German company developed a switch-in form of thrust deflector, fitted in the exhaust system between the engine and its reheat unit. Switched-in, the deflector directed the exhaust vertically downwards through the aircraft centre of gravity. Swivelling nozzles enabled the thrust to be vectored 15° either side of the vertical.

Both the 191B and the 101D specified RB.162 lift jets to provide supplementary lift-thrust—two 162-32s in the 191B and five 162-32s in the 101D, each lift jet providing 5,500lb thrust. Only aircraft so far to fly with the RB.162 has been the pro-

past three years, with an in-flight shut-down rate of less than one per 30,000hr. Time-between-overhaul has now reached an achieved figure of 7,500hr, with an intermediate shop check.

The R.Co42 (Mk 540) in BOAC's VC10s raised its t.b.o. from a declared 1,200hr in April 1964 to 4,000hr 19 months later—a world record rate of t.b.o. growth. The R.Co43 (Mk 550) in the Super VC10 entered service with BOAC in April 1965 and has already attained a t.b.o. of 1,800hr.

Unique among the world's turbine engines by virtue of its long production life, power growth, diversity of application and outstanding reliability, the Dart turboprop continues in production at as high a rate as ever. Most significant event for the Dart in 1964-65 has been Convair's programme for re-engining existing 240/340/440-series aircraft with the RDa.10 of 3,025 e.s.h.p. The new turbine-powered variant, designated the Convair 600, offers valuable performance increases and the appeal of turbine propulsion for a kit of parts costing £165,000 ex-works.

The first 600-240 and 600-440 have flown, and four airlines have already placed orders for Dart-Convair conversions.

A second extension to the future market