AERO ENGINES 1956 . . .

of approximately 11,000 lb (a prototype S.O. 9000 has exceeded Mach 1 on one barrel). Thrust and duration of firing are controllable. The company are also developing slightly different motors for the Dassault 550 and S.E. Durandal delta-wing fighters. These motors will run on acid/JP-4.

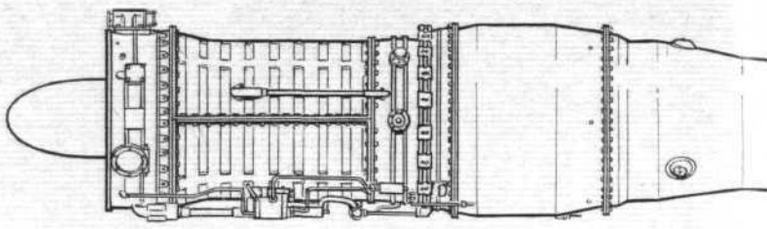
S.N.E.C.M.A. *Société Nationale d'Etude et de Construction de Moteurs d'Aviation, 150, Boulevard Haussmann, Paris 8e.* As the official French engine company (founded on Gnôme-Rhône) this extensive organization is heavily engaged in several aspects of aircraft propulsion. Last year, S.N.E.C.M.A. completed ten years of existence as a nationalized concern. The headquarters are in the centre of Paris; the chief engineering facilities are at Suresnes (project and design-planning and prototype manufacture), Melun-Villaroche (bench testing and flight development), Kellermann (engine production, technical direction and sales), Billancourt (piston-engine production), and Gennevilliers (an extensive foundry specializing in light-alloy parts). In March the formation of an Atomic Department was announced, at Suresnes, for investigating aircraft nuclear-propulsion. Total payroll exceeds 9,500.

In addition to the development of the engines described below, S.N.E.C.M.A. is conducting an extensive programme into v.t.o. aircraft, which, beginning with free-flight trials of pulse-jet vehicles, has now been extended to include the "Flying Atar," consisting of a turbojet free to rotate about all axes and stabilized by vanes within the propelling nozzle. Another development concerns the variation of propelling-nozzle area by aerodynamic means, and the development of thrust reversers using concentric gutters into which a proportion of the jet is deflected by means of a centrally disposed air-injector. S.N.E.C.M.A. thrust-reverse licences have been granted to Bristol Aircraft, Ltd., and Aerojet-General (U.S.A.).

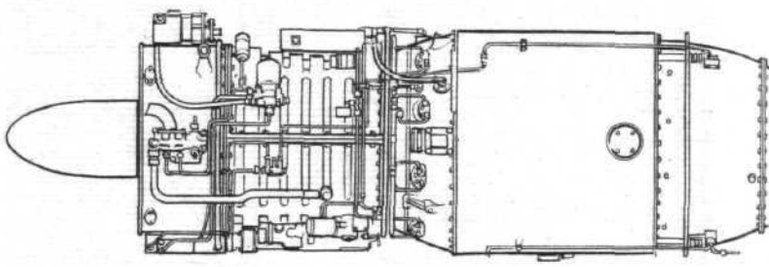
Atar. This engine remains the most important aircraft powerplant of Continental European design. Its genesis lay in B.M.W. work during World War 2; the first prototypes were completed by 1948 and established a rating of 3,740 lb. Early production engines were fitted with a sliding tailpipe "bullet" to control propelling-nozzle area, and such engines were used in some Ouragans (at 5,280 lb thrust) and all Mystère IIs (at 6,270 lb).

In the Atar 101 D-1 a change was made to eyelid shutters for the same purpose; this engine was rated at 6,615 lb and had 20 per cent better pressure ratio and 16 per cent greater airflow than the prototype. Afterburning trials of engines based on the 101 D (designated 101 F) began in the winter of 1952-3, the rating being finally set at 8,370 lb. The 101 F passed a 150-hr test in April last year. Fuel is injected from radial pipes and the flame is held by a pair of circular gutters; upper and lower nozzle eyelids are actuated by pneumatic rams.

The major versions of Atar at present in production are the 101 E and its afterburning derivative 101 G. In the E-series an extra stage was added to the compressor (to a total of eight), the first-stage blades being made of steel, and the governed speed was raised to 8,400 r.p.m. Large numbers of 101 E3s are being made for Vautours, at a rating of 7,702 lb. Even larger numbers of 101 G2 afterburning engines, rated at 9,700 lb, are needed for Super Mystères and other high-speed aircraft. All aspects of the operation of the Atar up to the G-series have been thoroughly explored. Handling is good under all conditions and on all standard military fuels, and life and reliability are very satisfactory, largely owing to the inherent ruggedness of the design.



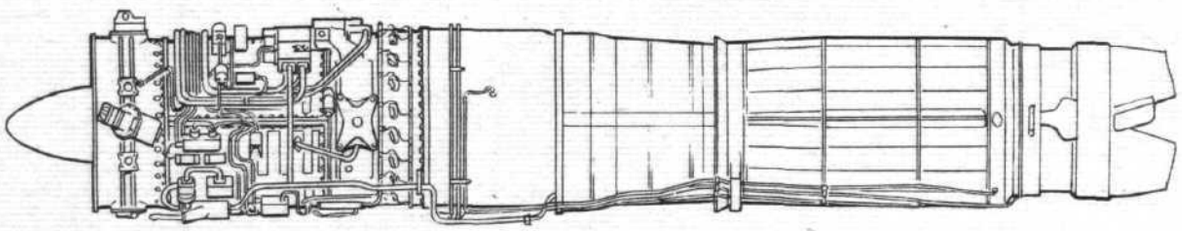
S.N.E.C.M.A. Atar 8. Turbojet. Nine-stage compressor, annular combustion chamber and (probably) two-stage turbine. Diameter, 36.2in; length, about 130in as shown; dry weight, about 2,100 lb; mass flow, about 140 lb/sec; pressure ratio, about 7:1; maximum thrust, 9,255 lb at 8,400 r.p.m. with s.f.c. of about 0.93.



S.N.E.C.M.A. R.105 Vesta. Single-shaft turbojet. Seven-stage compressor, annular combustion chamber with ten burners and single-stage turbine. Diameter, 26.8in; length as shown, 78.7in; dry weight, 639 lb; mass flow, about 50 lb/sec; pressure ratio, about 5.5:1; maximum thrust, 3,085 lb, type tested, at 11,000 r.p.m. with s.f.c. of 0.99. An afterburning version of the Vesta has been developed.

It is known that an 8,150-lb rating could be obtained from an improved unit of 101 E geometry, but such an engine has been overtaken by a new model termed Atar 8 (model-numbers will be used in place of letters in future). In the 8, major redesign has increased both mass flow and pressure ratio, and it is expected that the initial rating will be no less than 9,250 lb, for the same diameter and less weight than the E. The opportunity has also been taken to clean up the outside of the engine and relocate accessories in compact groups.

Vesta. The prototype R.105 Vesta first ran in December 1954, at the preliminary rating of 2,645 lb. The unit was prepared to meet the same French Air Ministry specification as were the Hispano-Suiza R.800 and Turboméca Gabizo (and it appears that the last-named engine has won the contract). Features of note are the ten fuel injectors served by rigid pipes; the two igniters fed from a high-energy box above the compressor casing; the manner in which a single, fabricated case extends over the combustion system and turbine; the hollow rear-



S.N.E.C.M.A. Atar 101 F-2. Turbojet with afterburner. Seven-stage compressor, *annular combustion chamber and single-stage turbine; afterburner to reheat to* about 1,900 deg K. Overall diameter 36.2in; length, 227.8in; dry weight, 2,557 lb; mass flow, 110-112 lb/sec; pressure ratio, 4.52:1; maximum thrust, 8,370 lb at 8,300 r.p.m. with s.f.c. of 2.0 (without afterburning, about 6,500 lb with s.f.c. of 1.02).

S.N.E.C.M.A.: production Atar 101-E3 for Vautour.