

steer R.511, and has cruciforms of delta wings and tail controls. Propulsion is by a two-stage solid internal motor, and the "autodirecteur" in the nose can be either an IR seeker or a semi-active radar head. Aft of this package, which is a product of SAT and has a hemispherical nose, comes the conventional warhead and the proximity fuze (the four axial aeriels for which were deleted from the exhibition missile). Next follow the autopilot, the electric batteries, upper and lower cable fairings (falsified on the exhibit) and the motor. Wings and fins are made like those of an aeroplane, and one pair of wings have ailerons to hold roll to a prescribed level. Matra emphasize that IR and radar versions are of equal importance, and state that trials at Colomb-Béchar have so far been very encouraging. All firings have so far been from Canberras and Vautours, but launchings from the Mirage III will shortly begin.

**Nord** Having delivered more than 60,000 missiles by last January 1, Nord are now in production with five distinct families of weapon. SS.10 is used by nine countries; SS.11 and AS.11 is in volume production both for inventory use and to form the first stage in training pilots to use the supersonic missiles; SS/AS.12 is completing development and is used with wire guidance up to 230kt launch speed (land forces and helicopters) and with radio at up to the maximum of 320kt (Alize); AA/AS.20 is widely used by Vautours, Super Mystères, G.91s and other aircraft; and the big AS.30 is perfectly suited to the Mirage III and should find a wide market. AS.30 is also well adapted to the F-104G, but is too heavy for the G.91. At present it is only an Armée de l'Air weapon, but talks are being held with the Aéronavale for possible issue to Etendard quadrons.

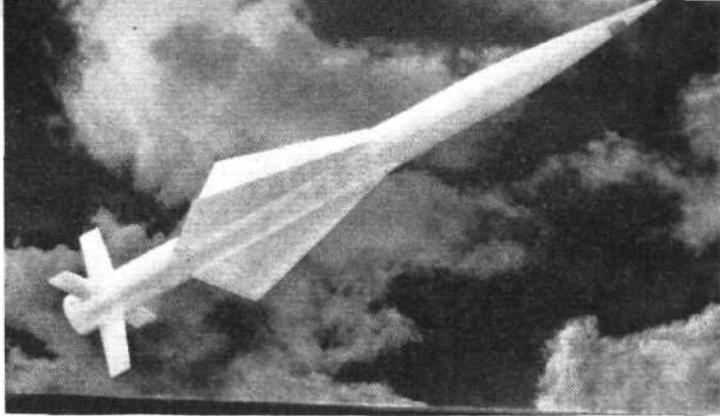
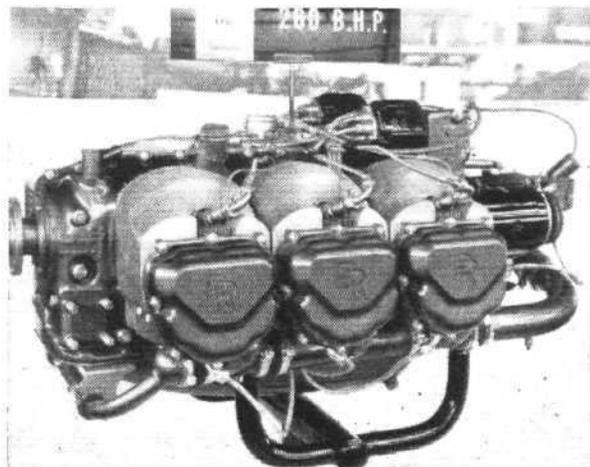
**Postal rockets** Painted blue and yellow, two examples of the French "mail-delivery" rockets recently tested at Colomb-Béchar are on view outdoors. One, labelled "C.06," has a tandem boost motor; the other, "B.07," is without boost. These rockets are launched at 75° elevation on a fixed trajectory.

**Red Top** It is not often that a major British development is unveiled at Paris, but this has happened in the case of the new air-to-air missile by de Havilland Aircraft (formerly de Havilland Propellers). Its ancestry from Firestreak is obvious, but closer inspection reveals certain marked differences which suggest a radical redistribution of internal equipment. In their officially cleared statement, D.H. relate how increasing bomber performance is making it much more difficult to achieve a hit under the most adverse conditions, and explain how the introduction of new techniques has led to this new missile with "greatly enhanced capabilities." In fact, although much of the existing Firestreak—including the basic aerodynamic configuration and the infra-red homing head and guidance system—has been retained, the effectiveness of Red Top is probably outstanding, and should represent a greater advance on the earlier weapon than external appearance suggests.

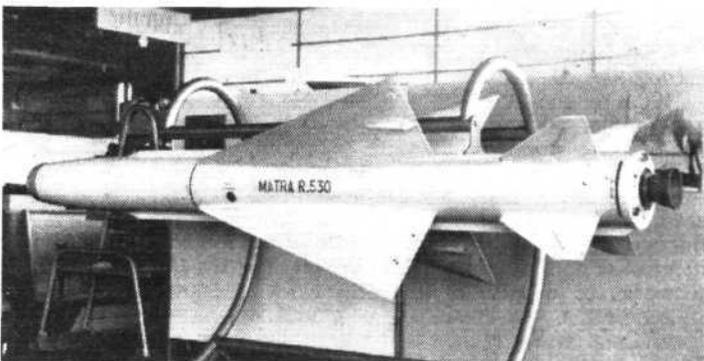
The first feature that strikes the eye is the increased size of the wings and control fins, which have substantially increased span and tapered outer portions to give better flight behaviour, particularly at extreme altitude. The wing span is now about 36in, compared with 29.4in for Firestreak. Body diameter remains 8.75in, but the forward portion does not taper; instead, the cylindrical shape is maintained all the way forward to the nose, which is composed of eight optically flat glass panels covering the seeker head. The fairings which cover the control wires of Firestreak are absent, suggesting that the complete control system is repackaged at the rear. A logical deduction would be that the warhead has been moved to the front, especially in view of the probable bigger motor and the additional internal volume made available at the front of the missile. No fuzing windows could be seen on the Red Top exhibited. One is left to wonder whether Red Top follows a collision-course trajectory—which would be obvious to assume—and whether it can carry a nuclear warhead.

It was announced last week that de Havilland have started to collaborate with the Soc Matra in the fields of guided weapons and electronics, and Matra are to produce the British company's Acorn automatic checkout and recording equipment. In view of Matra's R.530 missile (q.v.), which in one form is a radar-guided weapon, it would be logical to expect the two companies to share their experience in producing a standard air-to-air missile for NATO, available in both IR and radar forms. After talking with both companies it became clear that this is, in fact, quite a possibility, with obvious advantages to the

Although Rolls-Royce have not yet actually begun to manufacture Continental piston engines, this 260 h.p. example of the flat-six IO-470 has "R-R" valve covers



Short Seacat 2 in model form



Matra R.530 for the Armée de l'Air

customer. The D.H. IR guidance is almost certainly the more highly developed of the two heat-homing systems, but de Havilland have no experience with radar guidance.

**Saab GW systems** While purchasing such foreign missiles as Bloodhound, Sidewinder and Falcon for service, the Swedes are by no means allowing their own technology to rusticate. Even in the air-to-air field they have maintained an extensive design and development programme, which could well lead to a very advanced weapon. Design of such missiles is handled by the government's Robotbyran, but industry is brought in on the manufacturing side and Saab are exhibiting various items from the control system of one air-to-air project. Included is a pair of RM23 rate gyros, an RM24 two-axis accelerometer, an air-data compensator feeding Mach number and altitude to a YX9 amplifier, load-factor and angle-of-incidence limiters and an output to two PH11 hydraulic servos. Saab also show the XA82 electro-pneumatic control system of the earlier Robot 304 air-to-surface missile, now in service with A-32A squadrons.

It is appropriate to note that the Saab-35 family of Draken interceptors has recently been extended by the introduction of the Hughes Falcon missile. The variants so far divulged are: J-35A, in service with Rb-324 Sidewinders; J-35B, with collision-course fire control and Rb-324; J35C trainer; J-35D, with RB.146 engine; J-35E reconnaissance version; and J-35F, with a new collision-course system and a mixed clutch of Rb-327 (radar-guided Falcon GAR-3A) and Rb-328 (IR Falcon GAR-4).

**Short Seacat 2** This private-venture development of Seacat Mk 1 has hitherto been a well-kept secret, and even now all the company are prepared to do is display an accurate model without comment. One of the models appears to be about life-size, the length and span being some 78in and 20in respectively (corresponding figures for Seacat 1 are 58in and 26in). The most obvious difference between the two Seacats is that Mk 2 is designed for a much higher performance, with supersonic speed and obviously greater range. It is logical, in view of this, for the aerodynamic configuration to be completely changed (see illustration), the second-generation weapon having a circular-section body carrying four fixed wings of acute taper and low aspect ratio, and four rear control fins. Again the propulsion appears to be a two-stage solid internal motor. Shorts are allowed to state that a lot of Seacat 1 equipment is embodied in the new weapon system, and probably most of the changes are confined to the missile itself. Doubtless a Tigercat 2 could also be produced, and models show new Tigercat 1 launchers. Another model illustrates a ship installation of Seacat 1 matched with an entirely new radar from NV Hollandse Signaalapparaten.

**US "Space and Peace"** Inside a big geodesic dome, the US armed forces, NASA and other organizations are displaying an impressive array of pictures, models and actual hardware which indelibly underline America's solid achievements in space. The visitor first encounters an exhibit aimed at selling the idea of M3 airliners, numerous suggested configurations being superimposed on a world map with M3 travel times ("air times only") given for all major routes. There follow such attractions as: Tiros, the weather satellite; Dyna-Soar; space capsules, carried in many Thor and Atlas missiles to provide basic data; the actual Discoverer 14 capsule, snatched in mid-air last August 19; nuclear ramjet development (see *Tory*—page 744); SNAP nuclear power generators 1A, 2, 3 and 4; Excelsior balloon-jumps for bio-physical research; protective and environmental clothing; boost-glide vehicles; a complete Discoverer spacecraft; extensive displays of microelectronics, molecular electronics, hi-temp components (1,000hr at 500°C seems to be the usual design figure), the National Company's atomic (cesium-ion) clock, which measures time to within 1sec in 1,271 years for many space purposes; models of large boosters; advanced propulsion systems; and Cdr Shepard's Mercury capsule.