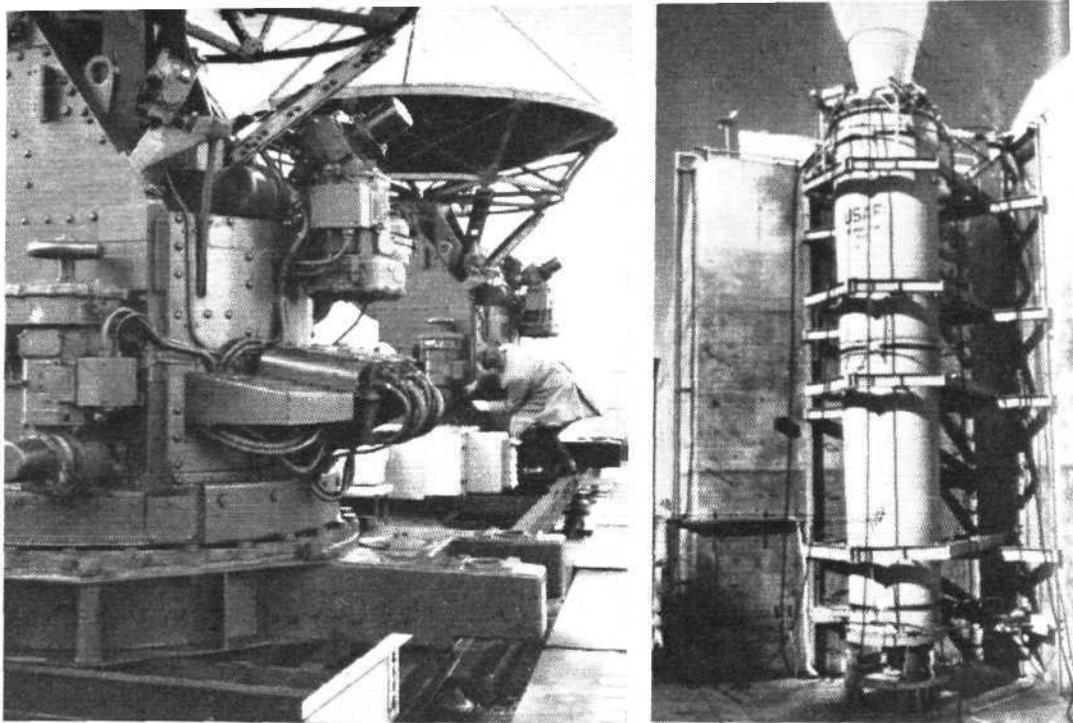


Missiles and Spaceflight . . .

(Left) EMI Electronics Ltd claim to supply "telemetry equipment for use in every missile manufactured in the United Kingdom." The photograph shows cable connections being checked on mountings of EMI high-gain tracking aerials at the RAE missile range at Aberporth

(Right) News is given below of the successful static firing of this 500,000lb-thrust solid motor by United Technology Corporation



VIGILANT'S TWO WARHEADS

Brief details may now be given of the two types of warhead which have been developed for the Vigilant anti-tank guided weapon, now being put into large-scale production by BAC at Stevenage. The need to minimize weight in this one-man weapon system ruled out the squash type of head, and accordingly Vickers have developed an extremely effective hollow-charge head which they describe as having "very nearly optimum lethality for a hollow-charge warhead." As shown in the cutaway drawing published in *Flight* for July 27, this head has a diameter of 5in (appreciably more than the missile body diameter), and a weight no less than 36 per cent of the missile gross weight. It is this head which is being fitted to current production for the British Army.

In order to provide an exportable warhead, unrestricted by the inclusion of British Government design information, Vickers have reached an agreement with the Swiss firm of Constructions Mécanique du Leman, SA, established by the renowned French engineer Edgar Brandt during World War II. The CML plant near Geneva is extremely modern and well equipped, and their staff has considerable experience in this field. They are associated with the Belgium Mecar company, who will be responsible for production. The new "Energia" head, which has a diameter of 5in and has been designed to British standards of safety, has been produced in only 11 months, and its price is competitive. The fuze, which is highly sensitive, can operate at strike angles of "well over 70°"—presumably from

normal. Twenty complete heads are now undergoing flight trials in Britain. The Energia head will be specified for all Vigilant missiles sold overseas.

RELIABLE CANBERRA DRONES

Canberra U.10 target drone aircraft, which were converted for pilotless flight by Short Brothers & Harland Ltd, are being used by the Royal Australian Air Force in missile trials at Woomera and by the Royal Navy in similar tests off Malta. More than 30 flights have been made from these bases at altitudes ranging from 50,000 to 54,000ft, and in every case the complex guidance and control systems aboard the aircraft have functioned perfectly. As a result, not one target has been lost because of failures occurring in its equipment. With other types of unmanned targets, say the company, roughly one aircraft in 15 is lost through equipment failure.

The U.10 was developed by Shorts for unmanned, "out-of-sight" operation in high-altitude guided-weapons tests. The company believe it to be the only large target aircraft in the world which can operate at heights greater than 50,000ft. This capability is a particularly valuable feature, as the U.10 is representative of the size of aircraft with which defensive missiles would have to deal. The U.10 also has an advantage in terms of endurance, for it is unique in that it can remain airborne long enough to permit three or even four separate firings during one flight.

On December 4 AEI announced that they had "just handed over another tactical control radar to the Royal Air Force." These powerful, three-dimensional radars were developed in conjunction with RRE, Malvern, as the initial stage of the Bloodhound SAGW system.

Aerojet-General have produced a liquid-propellant motor "about as large as a human thumb," developed for attitude control of spacecraft. Thrust is variable between 0.1lb and 0.01lb, and the propellants—hypergolic nitrogen tetroxide and hydrazine—are loaded by hypodermic needle.

On December 9 a Nike Zeus was fired at a very flat launch angle from Point Arguello down the Pacific Missile Range. This must have subjected the missile to unprecedented dynamic pressures, although the chief purpose of the test is said to have been to study the limits of the guidance and tracking radars. Another successful firing took place on December 14.

A booklet entitled *Die Blue Streak Rakete*, published by Rudolf Brock of Munich, gives some quantitative particulars of the proposed third stage to be developed by Germany. Prime contractor is named as Bölkow, and data include: overall length, including engine chambers, 6,300mm (248in); length of tank bay, 1,981mm (78in); length of probable payload compartment, 3,962mm (156in); diameter, 1,372mm (54in); gross weight, with 90kg (198lb) payload, 2,286kg (5,040lb); propellants, 1,950kg (4,299lb); burnout velocity, 27,350 to 38,600km/hr (approx. 17,000 to 24,000 m.p.h.).

It was announced by the US Defense Department on December 13 that the plan for a mobile Minuteman ICBM has been abandoned. As described in several past issues, it was originally intended that 600 missiles would be deployed, 450 in silos and 150 on special trains each carrying five. No clear reason has been given for the fact that the mobile concept has waned in popularity during 1961 after some \$100m (£35.7m) had been spent on it. In announcing the cancellation it is suggested that "900 instead of 600" fixed-base Minuteman missiles may be bought, although—as noted above—the original figure was 450.

According to the *Sunday Telegraph*, "A Skybolt test missile has been successfully launched from a Vulcan bomber for the first time. The launching was over the West Freugh range in the north of Scotland."

It is reported that the NATO Council of Ministers, meeting in Paris on December 14, discussed the problems of the multilateral control of nuclear strategic missiles. The West German foreign minister is said to have supported the US offer of such missiles for NATO use.

United Technology Corporation have conducted a successful static firing on their largest segmented solid motor so far built. The prototype was built under USAF contract and assembled at Morgan Hill, near Sunnyvale, Cal. The complete motor weighed 140,000lb and the four segments stood 40ft high, the thrust chamber pointing vertically upwards. When it was fired on December 9, the mean thrust was of the order of 500,000lb.

General Dynamics/Pomona, prime contractor for the US Army's Mauler mobile surface-to-air weapon system, has awarded de Havilland Aircraft of Canada a \$1.7m contract for development of an infra-red acquisition unit. We believe this to be the first missile development contract placed in Canada by a non-Canadian customer. Previously DH Canada had established a Guided Missile Division for work in various programmes which did not come to fruition.

New details of Entac have been released by the French Government, whose Atelier de Construction de Puteaux makes the anti-tank weapon in an all-Government operation. Each round weighs 26.4lb, has a span of 17in and length of 32in. Two warhead types are available, the specialized armour-piercing shaped charge being claimed to be the "most powerful" such head in service. Range limits are 1,300 and 6,600ft and flight speed 190 m.p.h. Control is effected via a bulky, 28.6lb box mounted on a stand and carrying a binocular sight. Entac, bought by the armies of France, Belgium and the United States, is a cheaper missile than Vigilant (now in inventory production for the British Army), but it has much more severe operational limitations.