SWISS GUIDED MISSILE

A Revealing Description of the Oerlikon Ground-to-Air Guided Missile Type 54

WHEN one reflects upon the amount of information available upon British developments in the sphere of guided weapons, it comes as something of a shock to be able to publish a quite comprehensive description of a modern guided missile, together with its associated ground equipment.

The weapon concerned is the Type 54 anti-aircraft missile developed by the Oerlikon Company of Zurich, Switzerland. Its development has proceeded for several years past and the equipment is now at the stage at which it can be regarded as ready for service—an extraordinary achievement for a private company in a small country. The missile itself has cruciform delta wings which produce the lift forces necessary for following the required flightpath. At the rear, four smaller cruciform fins are fitted, used for steering purposes after burn-out (i.e., the point at which the missile's tanks run dry). During powered flight, steering is accomplished by a combined gas jet/rudder mechanism, as described later. The propulsion unit has a single chamber, fed with fuming nitric acid and kerosine. The overall length of the missile is about 6 metres (19ft 8in), the maximum diameter approximately 40 cm (15¾in), and the take-off weight approximately 350 kg (771 lb).

According to the makers' description, the fuselage is wound in light alloy and glued with a metal bonding adhesive [this implies a wrapped-sheet form of manufacture]. The wings, which are of sandwich construction, are displaceable in a fore-and-aft direction to compensate for changes in the centre of gravity position and lift force. The propellants are fed by compressed nitrogen, initially at 300 atmospheres, and are ignited by an injection of triethylamine and xylidine; the thrust is 1,000 kg (2,205 lb), the duration of thrust 30 sec, and the total consumption 11 lb/sec. Burn-out altitude is approximately 9 km (nearly 30,000ft) although the missile can be steered to an altitude of 15 km (over 49,000ft).

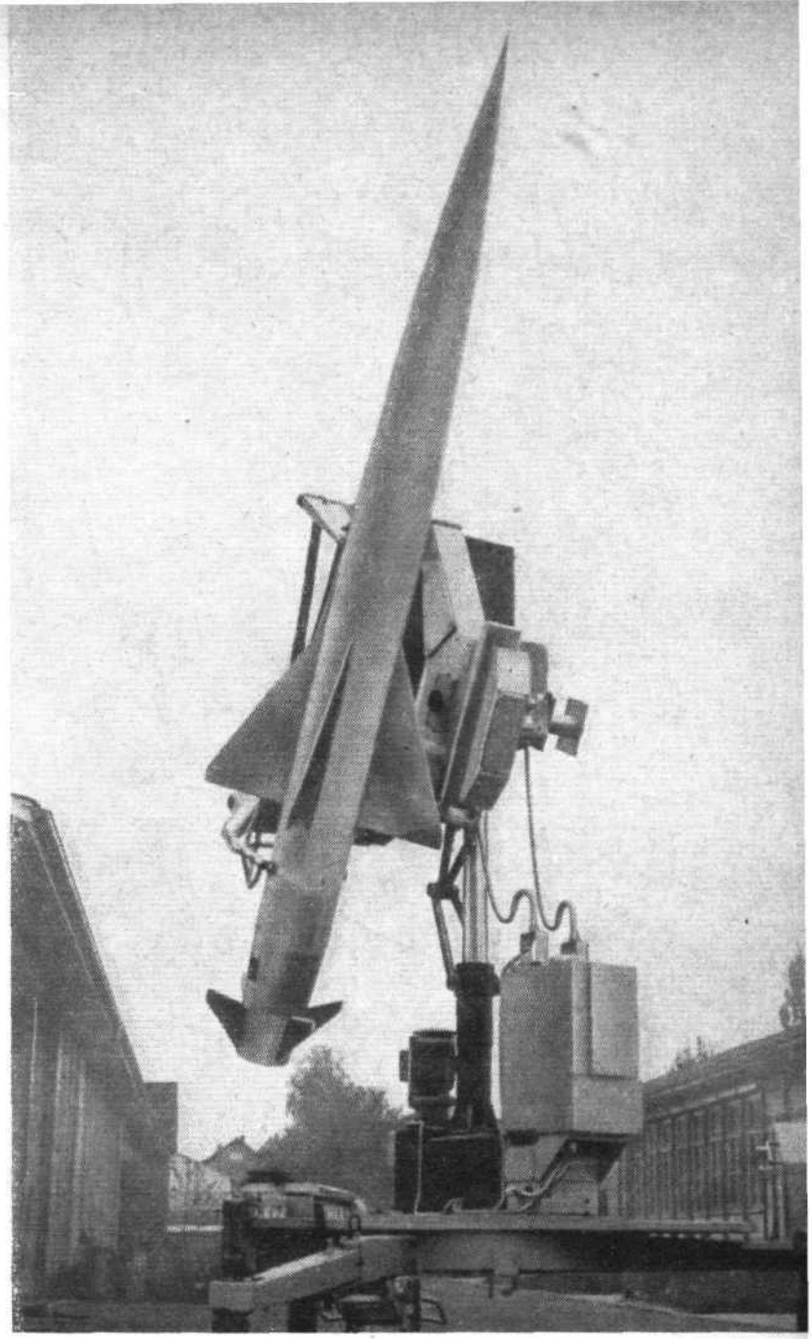
Before continuing with the description of the missile, an outline must be given of the type of guidance system employed. The Oerlikon missile is a beam rider, that is to say, it automatically searches, during the entire duration of its flight, the centre of a radio beam which is continuously directed towards the target. Thus the missile is guided to its target even when the latter carries out evasive manœuvres.

The advantage of the beam-riding system (say Oerlikon) lies in its simplicity. Without any supplementary ground equipment this system permits guidance of several missiles up the same beam on to a target or on to a zone of targets. One of the greatest problems in the determination of anti-aircraft ballistics, namely, the lead (or aim-off), is entirely eliminated, since the missile flies continuously within the guiding beam and therefore always endeavours to intercept its target.

A diagram on page 8 shows the trajectories which would be followed by a number of missiles launched at regular intervals from the same battery and all guided along the same beam towards the same target. The diagram assumes, of course, that the target maintains a straight and level flight-path.

Another diagram shows the ground organization required to control the operation of a guided missile group; this layout is standard and applies to either an army or an air force.

The group is composed of a central command post and three firing batteries. The former is equipped with a putter-on radar equipment, and each battery has its own radar tracker. The battery tracking equipment is also provided with a telescope so that, under suitable conditions, a target can be tracked optically. It is presupposed that early warning of the approach of enemy aircraft can be provided up to a distance of approximately 300 km (187 miles) by a network of long-range radar stations. In the absence of such a network the sky would be continuously scanned by the group putter-on radar set, which has a range of 100 to 200 km (62 to 124 miles). Targets located by the group putter-on radar are transmitted to the individual batteries by the group command post and are then tracked by means of the battery radar tracker



Standing on its twin launcher, the Oerlikon Type 54 missile presents a fearsome aspect. The maximum Mach number is 1.35.

which, in turn, controls the beam transmitter and the missile launcher.

The information transmitted to the battery tracking team consists of the azimuth (α) and distance (r). The tracker then scans in a limited elevation zone (denoted by the symbol λ) and reports back to the group command post as soon as it has located the target. The transmission of this information from the group to the battery tracker and *vice versa* is effected *via* a parallax computor, whereby the parallax distance between the group putter-on radar and the battery tracker may amount to 15 km (over nine miles).

There is a centralized computor unit, shown in one of the accompanying illustrations. Centralized within this unit are the following items: a parallax computor between the putter-on radar and the battery radar tracker; a co-ordinate transformer for the target searching movements of the battery tracker; a parallax computor between the battery tracker and the beam transmitter (maximum parallax 800m or roughly half a mile); a computor to compensate for the displacement of the missile relative to the centre of the beam, resulting from beam movement; and a computor between the transmitter and the launcher. The latter equipment is a co-ordinate transformer which determines the amount of lead required at launching and also makes allowances for the angle of attack of the missile to be added to the basic angle of elevation.

Another illustration shows the beam transmitter, which, like all the other ground facilities of the missile group, is mounted on a wheeled chassis. The transmitter is equipped with an aerial system providing for coarse and fine beams, the two aerials being arranged coaxially and driven by the same motor. The coarse beam has an included angle of 20 deg and serves to "catch" the missile after the launching and to guide it towards the fine beam. The latter has an included angle of 3 deg and is used to direct the missile on to the target.