TARTAR

United States Navy.

Type: Beam-riding missile system for installation aboard relatively small surface vessels.

DURING the past three years the technology of solid propellants has permitted the attainment of much higher specific impulse. The resulting extension in missile range and performance which such motors can facilitate has assisted the U.S. Navy to produce Tartar, a miniaturized Terrier which can do all that the larger and earlier missile can do.

Tartar is reported to be a single-stage missile, weighing a bare 950 lb at firing. Guidance is effected by a beam-riding system, for which Sperry received a $27.5m BuOrd contract in July (in respect of ship's radar) and Ford Instrument a $14m contract at the same time (for the Mk 118 computer). These units are lighter and smaller than the shipborne portions of the Terrier system. Maximum slant range is likely to be about 15 miles, so that one Tartar frigate or destroyer could protect a wide area. The missile is scheduled to be in service by 1960, and pilot-line production by Convair at Pomona, Cal., is stated to have caught up after an earlier "slippage." Output seems, in fact, to be restricted by the Navy's inability to finance the ship-conversion programmes as fast as it would like to.

Tartar: dimensions somewhat less than those of Terrier (without booster); firing weight, probably about 950 lb; burn-out speed, probably at least Mach 3; maximum slant range, at least 15 miles.

TERRIER

United States Navy and Marine Corps (soon to be issued to the navy of Italy and possibly to other NATO nations); the missile is designated SAM-N-7.

Type: Beam-riding missile for firing from larger surface ships. Drawing: p. 890.

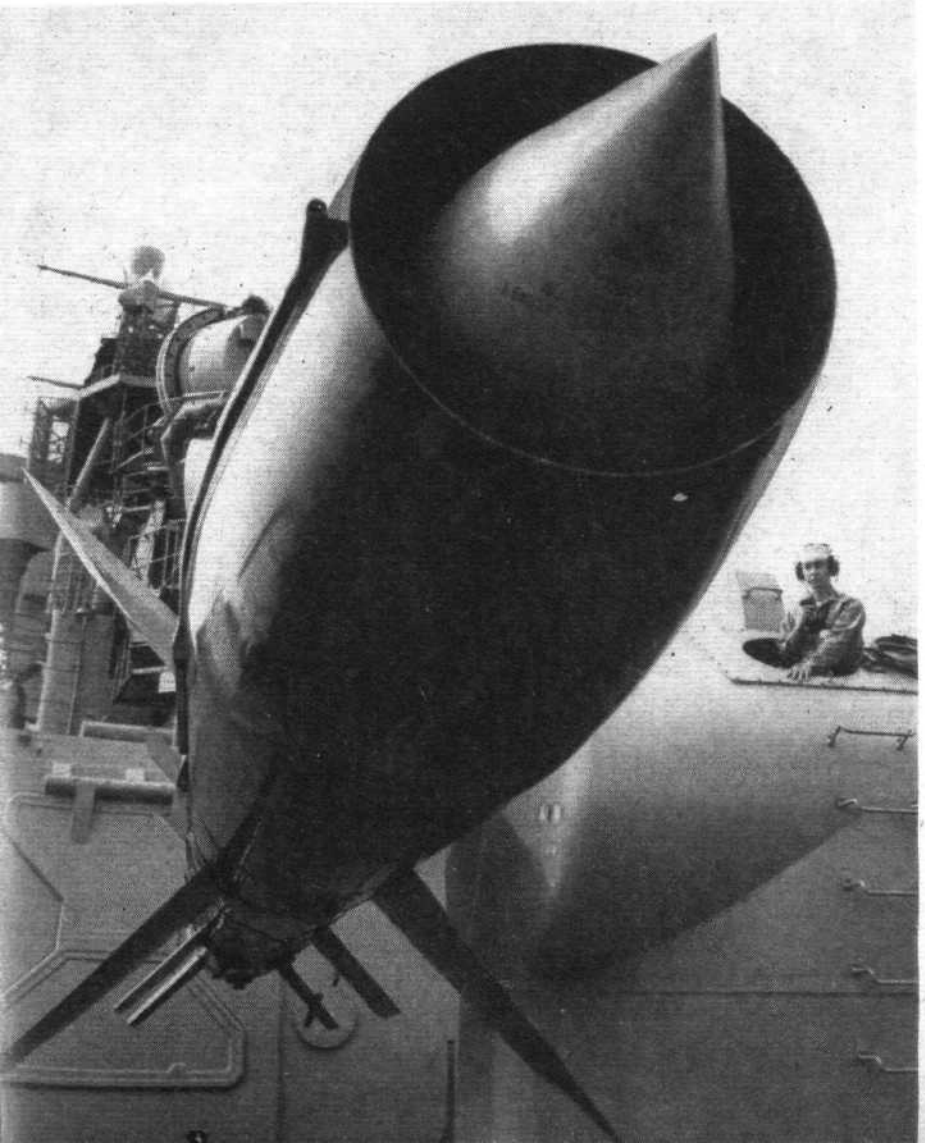
HISTORY and details of this familiar weapon system were contained in our 1957 review issue. The missile itself, made at Pomona, Cal., in a new plant operated for the Navy Bureau of Ordnance by Convair, is one of the smallest surface-to-air missiles. Powered by a tandem solid booster, and incorporating an internal solid sustainer, it has a fixed cruciform of rear fins and is controlled by the cruciform of pivoting wings. It carries a high-explosive warhead and has beam-riding guidance by Sperry and Reeves (ship's radar), Ford Instrument division of Sperry-Rand and Western Electric. Automatic handling by Baker-Raulang feeds the Northern Ordnance twin launcher.

Several thousand rounds have been delivered on schedule, and production of Terrier is tailing off; cost per round seems to be running at about $40,000. Several ships are armed with Terrier, the total programme involving 22 ships due for commissioning by the end of 1961. The Marine Corps has a land-based version, the components of which are being "integrated" by Vitro and Universal Match.

Now in production is the Terrier II, in which a sustainer of higher specific impulse and a slightly larger airframe result in much increased range (reported to be 20 miles) and permit the incorporation of terminal homing guidance. The latter is very valuable, in that it relieves the ship of the necessity of carrying quite such bulky and weighty radar as that needed by Terrier I, and thus Terrier II could be installed on ships of rather smaller size.

Terrier I: length, 14ft 9in (26ft 5in with booster); body diameter, 13in; wing span, 47in; firing weight, 1,100 lb (about 2,300 lb with booster); burn-out speed, about Mach 2.5; maximum slant range, 10 miles.

The nuclear Talos differs from h.e. rounds in having no semi-active homing system. It can be distinguished by the fact that no aerials and sensing tubes mar the circumference of the intake



THUNDERBIRD

British Army and (evaluation) Royal Air Force; the weapon system bears the code name of Red Shoes.

Type: Semi-active homing surface-to-air missile for mobile or fixed units. Drawing: p. 891.

DESIGNED and developed by The English Electric group of companies, Thunderbird is now one of the most refined anti-aircraft missile systems in the world. Many hundreds of test vehicles have been fired both from the R.A.E. range at Aberporth and from the W.R.E. at Woomera. Airborne targets have been engaged successfully many times during the past three years.

Like the majority of British guided weapons of its generation, Thunderbird Mk 1 has a cruciform of fixed wings and a rear cruciform of control fins. The light-alloy body has an ogival nose of dielectric material and a boat-type tail. Thunderbird test vehicles were fitted with liquid-propellant sustainers, but the production missile has a solid sustainer, which undoubtedly has a high specific impulse and probably gives a range at least as good as that originally obtained with the liquid motor. Four wrap-around boost motors are used to provide the acceleration needed for zero-length launching at a high angle of elevation.

Rounds are delivered from the plant at Stevenage, Herts, in sprung cradles in rigid metal containers, in which they may be stored for years in all climates. After being unpacked, the missile bodies are mounted on railed trollies in a field assembly and test point (F.A.T.P.), and the airborne radar and warhead are attached. The guidance is energized by a powerful "lamp set" on the ground, usually the B.T.H. Sting Ray, which illuminates the target with a pencil radar beam. Reflections from the target are picked up by the receiver dish in the nose of the missile and converted into signals which govern the hydraulic circuits of the controls. The radar receiver is checked on a go/no-go basis in the F.A.T.P. by a simulated target injector.

Wings and control fins clip on in a few minutes, and the boost motors are the last major items to be added. The round is then transferred to its launcher-loading trolley and towed to the launcher. The loading trolley is so designed as to permit the missile to slide off on rails and directly on to the launching base, which can be in a fixed emplacement or mounted on road wheels. Thunderbird can operate in a variety of electronic environments, but in the United Kingdom targets are automatically detected, tracked and assigned to intercepters or missiles. The Thunderbird is probably locked on before it leaves the launcher.

In view of the fact that it is to be standard equipment with Army formations throughout the world the entire missile system has been made exceptionally simple to service. Maintenance by replacement is the principle adopted, and minor and major units can be unplugged and replaced in a matter of moments; even the airframe can be taken apart without special tools in a very short time. Apart from the elimination of fairings at the wing roots the production round strongly resembles the early Red Shoes test vehicles.

It is worth noting that the increasing specific impulse of solid sustainers is, in American weapons at least, outstripping the ability of ground radar to provide effective guidance over the whole range available, and modified versions of the Thunderbird system may be in prospect. A fully-active version, however, seems unlikely. Acceptance trials are believed to be taking place now, and delivery to user batteries should soon start. It is not known what branch of the R.A.F. will employ the weapon but an order was placed by the M.o.S. on behalf of that service 15 months ago.

Thunderbird Mk 1: overall length (with or without boosts), 21ft; wing span, 64in; body diameter, 21in; firing weight, probably about 2,200 lb (more than 4,000 lb with boosts); burn-out speed, probably over Mach 2; maximum slant range, probably well over 20 miles.