

# BOMARC

## Boeing's Long-range A.A. Missile

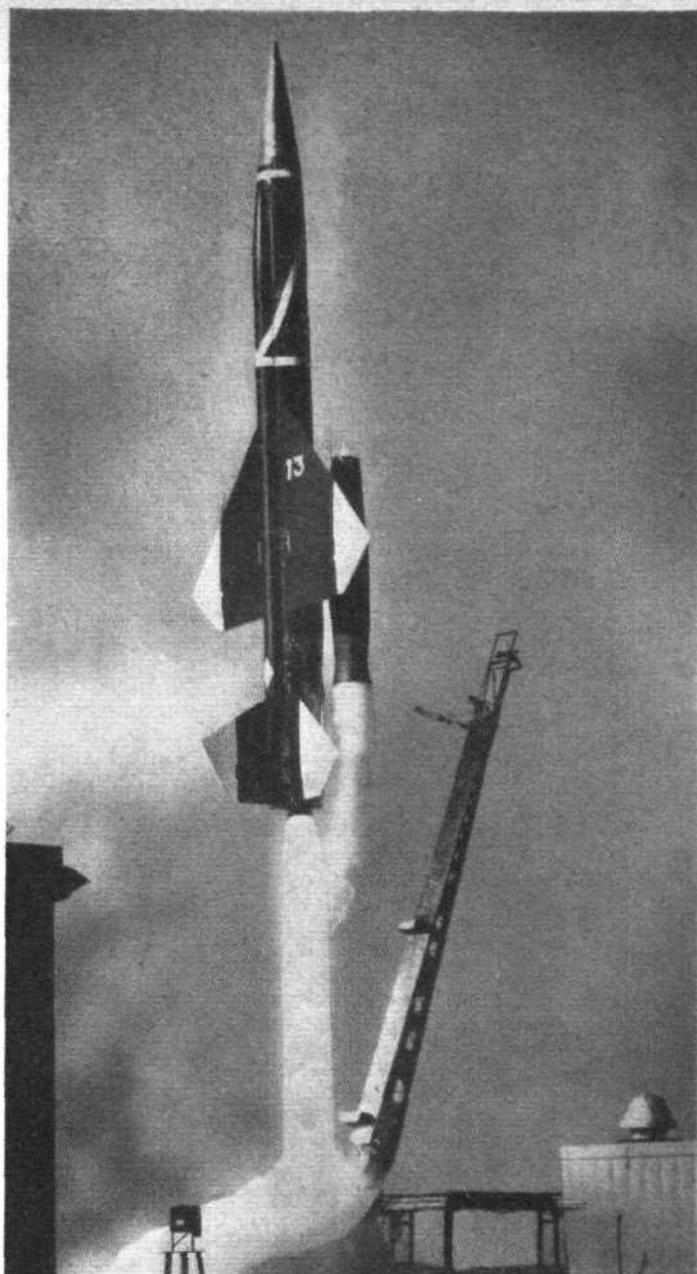
**L**AST week the Boeing Airplane Company were permitted to release the first actual photographs of the Bomarc surface-to-air missile. The release coincided with the announcement by the U.S. Air Force of a \$7,109,195 (£2.55m) initial production order.

The curious name of the weapon stems from Boeing plus Michigan Aeronautical Research Centre. Basic data were obtained from the Ground to Air Pilotless Aircraft (GAPA) vehicles, each about 15ft long and powered by ramjets, of which 112 were launched, reaching speeds of the order of 1,500 m.p.h. From these experiments stemmed a weapon-system study, designated F-99, for a pilotless interceptor for the U.S.A.F. in which Boeing co-operated with the University of Michigan.

Flight trials of early XF-99 vehicles began in 1952 and later tests were conducted on vehicles with improved configuration and equipped with guidance and control, auxiliary systems and, finally, warhead. The Bomarc weapon system was redesignated IM-99 (interceptor missile). Development of the electronic guidance was assisted by simulated IM-99 nose sections, pressurized by nitrogen and cooled by ammonia, fitted to a T-33 and a B-57, the pilot of these aircraft cutting out the guidance and breaking away from the collision course as the target was neared.

Bomarc is of striking appearance. The 47ft circular-section body—10ft longer than a Sabre—houses kerosine tanks, guidance and nuclear (or H.E.) warhead, together with all accessory systems. Propulsion is obtained by two pylon-mounted RJ43 ramjets, each of 28in diameter. Initial boost is provided by a liquid-propellant rocket motor with a single gimbal-mounted chamber which can be pivoted to provide control at low airspeeds before the aerodynamic surfaces can take effect.

*Development IM-99 Bomarcs are finished in glossy black and bright orange. Right, a Bomarc leaves its launcher (the supporting arm has been pulled clear) at Patrick A.F.B., kerosine vapour issuing from its unlit ramjets. Below, asbestos-suited men prepare another for launching; the rocket-propellant tanks are seen being filled.*



tion during the steep, supersonic climb and level cruise up to 80,000 or 85,000ft. Several high-flying drone targets have been destroyed by Bomarc far out over the Atlantic.

It is of interest to compare the U.S.A.F. weapon with the Bristol Bloodhound. The latter is smaller, and so cannot defend quite so great an area, but should be at least as effective an interceptor against any contemporary target. The Boeing weapon will be issued to Air Defense Command, and will arm bases (not airfields) where "its range capabilities may be fully utilized."

The following are companies involved in the Bomarc programme (which is 70 per cent subcontracted): prime contractor, Boeing (assembly of missiles at the main Seattle plant, Pilotless Aircraft Division); cruise propulsion, Marquardt; boost propulsion, Aerojet-General; guidance and control, Westinghouse Air Arm Division; ground control gear, Westinghouse Electronics Division; ground-support and test gear, Farnsworth Division of I.T. and T.; airborne electronic intelligence, Lear (LearCal and Grand Rapids Divisions); nose of missile, Pastushin (glass fibre, leaves radar beams undistorted).

**Boeing IM-99 Bomarc** (Ground-launched pilotless interceptor powered by two Marquardt RJ43 ramjets): Span, 18ft 2in; overall length, 47ft; firing weight, 15,000 lb; cruise Mach number, approximately 2.5 (1,650 m.p.h.); extreme range, 250 to 280 miles.

### MICROWAVE LINKS FOR A.T.C. RADARS

**A** CONTRACT worth over \$3m has been placed by the C.A.A. with the Collins Radio Company for microwave link installations designed to transmit radar information from aerial sites to traffic control centres. This is the second largest contract ever placed by C.A.A., being exceeded only by the \$9m order for long-range radar placed last November.

Some 16 relay towers are involved, six of them in one 200-mile run between Houston and San Antonio, Texas. Other links will bring in signals from the U.S.A.F. radar at Lackland to San Antonio and from the U.S. Navy radar near Atlantic City to the New York centre.

Other locations for the relays will include Boston, Pittsburgh, Cleveland, Atlanta, El Paso, Fort Worth, Miami, New Orleans, Detroit, Kansas City, St. Louis, Denver, Los Angeles, Oakland, Phoenix, Salt Lake City, Seattle and Spokane.



The latter comprise slabs, pivoted at some 40 per cent chord, mounted on the ends of the wings and in the positions of tailplane and rudder. Actuation is by body-mounted jacks driving torque tubes—which, in the case of the movable wing tips, pass right through the three-per-cent wing. It will be observed that the Bomarc manoeuvres by twist-and-steer, i.e., it banks before turning.

Test firings of the complete IM-99 system have been carried out from Patrick A.F.B. since the beginning of last year, and in recent months results have been outstandingly good. As a picture above shows, the launch is vertical. When the airspeed is great enough the rocket cuts out and the twin ramjets provide propul-