

MISSILES 1969 . . .

GREAT BRITAIN

Blue Steel This rocket-powered stand-off bomb, with thermonuclear warhead, continues to equip the Vulcans of Nos. 27, 83 and 617 Squadrons at Scampton. It can be launched at high or low level.

Hellcat Intended for pylon mounting on each side of the fuselage of the Royal Navy's Wasp and Wessex 5 helicopters, Hellcat is an air-to-surface version of Seacat (page 794) for use against fast patrol boats, hovercraft, assault craft and surfaced submarines. It is fired and controlled through a radio link by an operator sitting in the co-pilot's position, with the sighting head projecting through the cabin roof.

Martel Photographs released at Farnborough showed how well the development trials of this Anglo/French air-to-surface missile are progressing. One series of pictures showed the TV-guided version (AJ.168) passing through the centre of a 10ft diameter target circle after launch from a Sea Vixen. This version follows a pre-programmed course immediately after launch, but completes its flight to the target under the control of an operator in the launch aircraft. A direct visual picture of the target, transmitted by the Martel's Marconi TV system to a high-brightness monitor in the cockpit, is used as a reference by the operator who steers the missile by means of a miniature joystick control. The launch aircraft need not approach within "tens of miles" of the target and can turn for home once the missile has been launched. The all-weather AS.37 anti-radar version homes automatically on to the enemy surface radars. All versions can operate in an ECM environment and will be carried by Nimrods, Phantoms and Buccaneers of the British services, Mirage IIIs of the French air force, Jaguars and other aircraft.

ISRAEL

Concrete Digger Used to put Arab airfields out of action in the June 1967 war, this rocket-boosted bomb was developed and produced in Israel after initial design studies by Matra. It is believed to be based on a standard bomb containing a 365lb explosive charge. A rocket assembly replaces the original tail-fins, consisting of four rearward-firing and four forward-firing solid-propellant motors wrapped around a parachute compartment. After release from a low-flying aircraft, the bomb is slowed by the forward-firing retro-rockets and then put into a nose-down attitude by the parachute. It is finally boosted to a speed of about 525ft/sec by the rearward-firing rockets, which burn away the parachute. The Concrete Digger is carried by Vautour and Mirage aircraft of the Israel air force.

SWEDEN

Robot Rb 04 This all-weather anti-shiping missile has been standard armament on A 32A Lansens of the Swedish Air Force for nearly ten years and is considered to be outstandingly effective. The original Rb 04C version is currently being replaced by the Rb 04D with improved performance. The AJ 37 Viggen will carry three of the further improved Rb 04E. All versions utilise a high-efficiency homing system and have a warhead equivalent to half their launch weight.

Robot Rb 05A Developed by Saab as primary armament of their Sk 60 and Viggen combat aircraft, the Rb 05A is a supersonic line-of-sight weapon for use against land or sea targets. The initial version lacks the all-weather capability of the Rb 04, being manually guided, but a homing version is being studied. The Rb 05A can be launched at any aircraft speed between Mach 0.4 and Mach 1.4 and is sufficiently manoeuvrable and accurate to be used against offset targets.

USA

AGM-79A Blue Eye This air-to-surface weapon is in competition with the AGM-80A Viper for a USAF contract as a Bullpup replacement. It is externally similar to the latest version of Bullpup and uses the same pre-packaged liquid-propellant engine, but has a new guidance system evolved by Martin Marietta's Orlando Division. This is based on an area-correlation scanning device in which a vidicon supplies optical data to the guidance system. The warhead is detonated at a predetermined height by a radar altimeter. Firing trials were scheduled to start this year.

AGM-12 Bullpup At least four versions of this combat-proven air-to-surface missile continue in production for the US services; the AGM-12B serves also with many NATO forces, including the RAF and RN. All are manually guided along a line-of-sight by keeping tracking flares on the missile aligned on the target. Only the USAF's AGM-12D can carry a nuclear warhead.

AGM-53A Condor With a TV guidance system and range of up to 40 miles, Condor is probably comparable to the AJ.168 version of Martel. It is being developed by North American Rockwell's Columbus Division, with motors by Thiokol, to equip A-6A Intruders and A-7 Corsair IIs of the USN. A conventional warhead is fitted.

AGM-28B Hound Dog This thermonuclear air-to-surface cruise missile is now regarded primarily as a defence-suppression aid, to enable SAC's B-52 bombers to penetrate to targets with other weapons. About 400 remain available.

AGM-65A Maverick Last July Hughes received a \$95 million fixed-price incentive contract covering development, test and evaluation of this TV-guided weapon over a three-year period, with options for follow-on production of 17,000 missiles. Intended for use against pinpoint targets such as tanks and columns of vehicles, Maverick is self-homing. The pilot simply selects his target on a high-brightness monitor, locks the missile guidance on to it and fires the round. Launch aircraft will include USAF versions of the F-111, A-7 and F-4.

ADM-20B Quail This unique ECM decoy remains in service with B-52 wings although production ended long ago. Its purpose is to fly predetermined patterns through enemy airspace after launch from the B-52, saturating the defences by giving a radar response identical with that of its huge "mother-ship." Quails pack into the bomb-bay in clutches of two, with their wings folded.

AGM-45A Shrike Much improved since its early operational use in Vietnam, Shrike continues in production for radar suppression. It is designed to home on enemy radar transmitters over a range of about ten miles and is fitted with a high-explosive warhead.

AGM-69A SRAM One of the most important missiles under development in the USA, SRAM (short range attack missile) will arm the FB-111, B-52 and the future AMSA. Despite its comparatively small size, it will be capable of penetrating advanced defence systems, carrying a nuclear warhead. Boeing's \$142.3 million development contract has been followed by initial production go-ahead. Major sub-contractors include Lockheed Propulsion Company for the restartable solid-propellant pulse-rocket motor, Kearfott for the guidance subsystem, Litton for the B-52 inertial measurement unit, North American Rockwell Autonetics Division for the FB-111/B-52 aeroplane computer, Sylvania for the B-52 radiating site target acquisition system and Unidynamics for the missile safe-arm-fuse subsystem.

Standard ARM Based on the propulsion system of the US Navy's Standard SAM, this anti-radiation weapon is intended to provide a major improvement in range and effectiveness by comparison with Shrike. The initial version uses a Shrike passive homing head produced by Texas Instruments, but an improved seeker head is being developed by Maxson Electronics, and IBM and Bendix are working on improved avionics systems to give later models better target selection and more effective operation against target countermeasures. Standard ARM is expected to become operational on USAF F-105s and USN A-6As during the current fiscal year.

AGM-80A Viper This air-to-surface attack missile, by Chrysler, is in competition with the Martin Marietta AGM-79A Blue Eye. Like the latter, its external appearance is similar to that of Bullpup and it uses a Bullpup propulsion system; but its two-degree-of-freedom inertial guidance system is new. The warhead is designed to be detonated at a predetermined height by a radar altimeter.

Walleye Being unpowered, Walleye cannot offer true stand-off capability, but the US Navy has called it the most effective and accurate air-to-surface conventional weapon ever developed. After focussing the missile's TV eye on target the pilot releases Walleye and can then turn for home as the weapon homes automatically on whatever its eye is locked on to. A ram-air turbine provides electrical and hydraulic power for the guidance system. Production is continuing.

USSR

Kangaroo Shots of this jet-fighter-size stand-off weapon leaving a Tu-20 (Bear) bomber, in an official Soviet film, not only suggests that it remains in service but have revealed the shape of the vertical tail surfaces at last. Kangaroo is about 50ft long, turbojet powered and primitive in concept. Its chances of penetrating an advanced defence system would appear small.

Kennel Another of the Soviet Union's aeroplane-configuration weapons, Kennel resembles a miniature, pilotless MiG-15. It is turbojet-powered, with a span of about 16ft, length of around 28ft and a nose radome which may house a homing system of the kind fitted to Styx. Kennel is in service on Tu-16 (Badger) bombers in the Soviet Union, Indonesia and Egypt. Variants include a new rocket-powered air-to-surface version with the radome enlarged to full body diameter and the surface-to-surface Samlet (page 790).

Kipper Although little has been seen of this 31ft long anti-shiping weapon since it was displayed under the belly of Tu-16s in 1961, the reason to believe that it may still be operational. It looks like a smaller and less refined counterpart of the American Hound Dog.

Kitchen Potentially the most important and effective Soviet stand-off missile, Kitchen appears to be about 36ft long, with stubby delta wings and cruciform tail surfaces. The bulge under its belly could be an air intake; more likely it is a radome, as it would be logical to expect this missile to be rocket-powered. All Tu-22 (Blinder) bombers seen in last year's Domodedovo fly-past either carried Kitchen or had provision for it.