

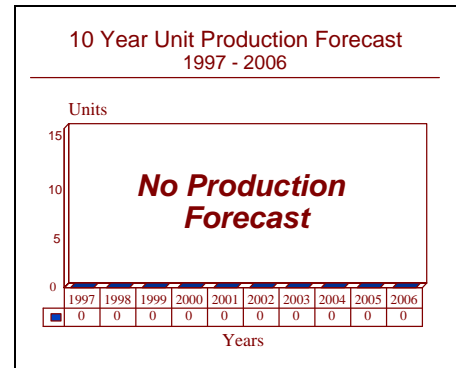
ARCHIVED REPORT

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ASB-19(V) ARBS - Archived 12/98

Outlook

- In service
- Upgrade of optical domes accomplished
- Activity relates to spares/maintenance of Harrier II in this decade



Orientation

Description. Laser spot/TV tracker bombing system; also known as ARBS (Angle Rate Bombing System).

Status. In active service.

Sponsor

US Navy
 Naval Air Systems Command
 Jefferson Plaza Bldg. 1
 Washington, DC 20361-0001
 USA
 Tel: +1 202 692 2260

Total Produced. An estimated 608 units were produced.

Application. Provides bomb aiming capability for the A-4M, AV-8B, GR. Mk 5, GR. Mk 7, and EAV-8B.

Price Range. Approximately US\$220,000 in 1988 dollars, based on contract activity.

Contractor

Hughes Electronics Corp
 (Recently acquired by Raytheon Co)
 Missile Systems Co
 PO Box 11337
 Tucson, Arizona (AZ) 85734
 USA
 Tel: +1 602 794 3000

Technical Data

Characteristics	Metric	US
Volume:	73.66 cm ³	29 in ³
Weight:	58.11 kg	128 lb
Scan Coverage:		
Elevation	+10° to -70°	
Azimuth	+/-35°	

Design Specifications. As used on the A-4M, the ASB-19 is made up of a Dual Mode Laser/TV Tracker (DMT) designed by Hughes, a System/4 Pi Model SP-1 general-purpose digital computer built by IBM Systems Federal Sector Division under US Navy contract, and a control subsystem.

Total weight is approximately 58 kg. The ARBS operates in conjunction with existing cockpit controls and aircraft sensors. Steering information is supplied to the pilot by a Marconi AVQ-24 HUD.

As used in the AV-8B/GR. Mk 5, the ARBS's DMT was furnished by Hughes to the integrator, McDonnell Douglas, who linked it to the aircraft's onboard mission computer. The ASB-19's data and video imagery, steering data, and controls are integrated into the head-up display, the multipurpose video display and the forward control set.

The main element of the system is the DMT. It is a modified Hughes STALOC II TV tracker with TV camera, sharing a common optical element with a laser spot tracker detector on a three-gimbal stabilized platform. Further DMT elements include tracking filter electronics, an output signal converter, power supplies, and control logic.

Operational Characteristics. Upon locking on a target, the tracker provides the aircraft-to-target line-of-

sight angle and angle rate to the Weapon Delivery Computer (WDC). When combined with true airspeed and altitude (from the air data computer), this information is processed by the WDC, yielding the weapon delivery solution. The pilot's HUD displays the generated target position, weapon release, and azimuth steering information.

After head-up TV acquisition, the cockpit TV monitor shows the pilot a magnified image of the target. The pilot can then use a hand control to slew the tracker gate to a new track point or to a nearby alternative target. Automatic or manual weapon release in both laser and optical tracking modes is possible. Weapon characteristics and rack type for ordnance being carried on a particular mission can be entered into the weapon delivery computer via a weapon data insert panel. The WDC memory stores all the necessary ballistic parameters for all weapons.

The ARBS provides automatic tracking of ground targets plus first-pass automatic day/night acquisition of laser-designated targets, supplying a valuable nighttime bombing capability. The ASB-19(V) can deliver weapons from any altitude or airspeed combination. Its accuracy allows for successful first-pass weapon delivery or provides the necessary information on the HUD for second attacks against hardened targets.

Variants/Upgrades

There are three known variants of the ASB-19(V): the ASB-19(V)1, ASB-19(V)2, and ASB-19(V)3. Hughes originally offered the ASB-19(V) in pod form for external mounting to other fighter platforms such as the F-4 series. The ASB-19(V)3 is the latest version of the

ASB-19(V), featuring a new heat exchanger that is modular in design. Information regarding the differences between the others is unavailable, and these are presumed to be somewhat minimal.

Program Review

Background. Intended to provide greater close air support and interdiction mission accuracy against both fixed and moving targets, the ASB-19(V) Angle Rate Bombing System was designed by Hughes Aircraft Co for US Marine Corps aircraft.

Beginning with the A-4M and continuing with the AV-8B, the ASB-19(V) has proven itself to be a highly accurate, extremely reliable weapon aiming and delivery system.

During its initial tests, the system underwent 95 hours of flight time and over 130 hours equipment operation time without a system failure. Program officials rated the mean time between failures (MTBF) of the system

at about 250 hours, and proceeded to strive toward 295 hours. Even the 250-hour MTBF is 50 hours above the minimum time set by program officials.

Most of the testing was performed with A-4M-mounted systems, but even better reliability has been achieved with the AV-8B, with which the ARBS began service in the fall of 1985.

While Hughes suspended shipments of the ARBS in early August 1984 (primarily because of production line shortcomings for the ASB-19(V) and various missiles), deliveries were resumed in March 1985 and subsequently surpassed scheduled levels despite the slowdown.

Accuracy goals were also met during testing. The system was found to be 50 percent more accurate than its operational requirements. A-4M aircraft delivered varied ordnance loads, including inert and live 250 lb and 500 lb bombs, 2.75 folding-fin rockets and 5-inch Zuni rockets. Walleye and Shrike missiles as well as laser-guided bombs can also be delivered by the system.

Marine A-4M pilots achieved concentrated bomb hits 50 percent to 75 percent closer to targets than pilots using non-ARBS-equipped aircraft and manual methods. In 1987, Marine AV-8B aircraft equipped with the ARBS achieved a 90 percent first-hit rate for the first time.

The most recent contract activity dates back to 1989, when Hughes received a US\$4.8 million increment of funds for 45 ASB-19(V)3 ARBS (43 for the US Marine

Corps, two for the UK) for contract number N00019-87-C-0130 in January, and an additional US\$11.5 million modification to definitize a letter contract for the same.

Gulf War. Despite the harsh desert environment, the ARBS performed well during the Gulf War, with the US Marines deploying its Harriers in interdiction and close air support missions in Kuwait. The lack of a dedicated night attack capability, however, limited the Marine Harriers to daytime missions.

During Operation Desert Storm, the Marines lost six Harriers to combat actions, mostly to shoulder-fired, heat (IR)-seeking missiles. The Marines have fielded a variant of the AV-8B configured with the GEC AAR-51 navigation FLIR, night vision goggle (NVG) compatible cockpit, and with NVGs for the pilot.

Funding

In FY96, the material used for the optical domes of the ARBS carried aboard the AV-8B Harrier was upgraded from glass to spinel, improving MTBF. The work was funded in the DoD RDT&E project titled Materials Processing Technology, under the Materials and Electronic Technology program (PE#0602712E). A total of US\$32 million was allocated to the many items listed under "structural materials and devices" in FY96.

Recent Contracts

No recent contracts identified.

Timetable

1965	Exploratory development began
1970	Concept feasibility demonstrated
1975	Hughes/IBM selected to produce nine pre-production models
1979	Full production contract awarded for 92 aircraft sets (US\$48 million)
1982	Deliveries began for A-4M retrofits
1984	Deliveries began for installations onboard AV-8Bs
1984	UK ordered 60 ARBS for GR.5
1986	Production rate of 11 per month achieved
1993	Production completed for USMC/RAF Harriers

Worldwide Distribution

About 80 US Marine Corps A-4M Skyhawk light attack planes were equipped with the ASB-19(V), beginning in the early 1980s. Subsequently, the ASB-19(V) was selected for the Marines' AV-8B Harrier II and by the Royal Air Force for its GR.5/7. The Spanish navy's EAV-8Bs are also equipped with the system. Additional foreign sales to at least one unidentified user – perhaps a small quantity for Italy's AV-8B fleet – may have occurred.

Forecast Rationale

The most recent activity in the ARBS program consisted of an upgrade to the optical domes in 1996. The material was changed from glass to spinel, contributing to an improved MTBF in an AV-8B application.

Production of the ASB-19(V) has been completed for the AV-8B Harrier II series and the RAF GR.7/T.10, with the final deliveries made in 1993. In FY91, the US Marine Corps received funding for procurement of its final 24 AV-8B Harrier II aircraft. These 24 Harriers, though, were equipped with the Hughes APG-65 multimode radar instead of the ASB-19(V).

Final new production of the AV-8B concluded in 1995. As part of a remanufacture program, a total of 76 Marine Corps AV-8Bs will be upgraded to the Harrier II Plus configuration, with night attack capability and the APG-65 radar.

With the availability of the APG-65 and its successor, the APG-73, any future Harrier II foreign military sales will be based on the radar-equipped variants; ASB-19(V) activity will be limited to spares support for existing systems. Thus the ASB-19's role is to continue supporting the Harrier II program for the remainder of the decade.

Ten-Year Outlook

No production is forecast; this report will likely be dropped next year.

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