

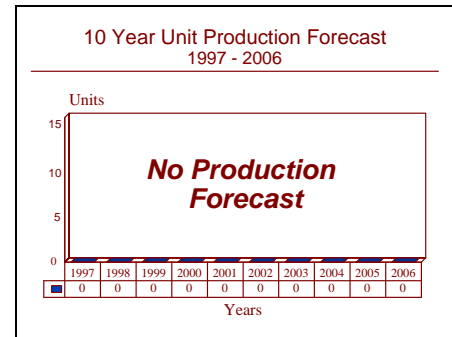
# ARCHIVED REPORT

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## VAST (USM-247/USM-470(V)) - Archived 5/98

### Outlook

- Production complete
- Spares support continues



### Orientation

**Description.** Versatile Avionics Shop Tester (VAST).

**Sponsor**

US Navy  
Naval Air Systems Command  
Washington, DC

**Contractors**

Harris Corp  
Government Support Systems Division  
Syosset, NY  
(Prime: Development/production)

**Status.** Production complete, spares support continues.

**Total Produced.** 150 USM-247 systems and about 40 USM-470(V) systems produced through 1992.

**Application.** Electronic test of aircraft avionics. Aircraft include F-14, F/A-18, E-2C, S-3A, SH-60B LAMPS Mk III, A-7E and A-6E.

**Price Range.** N/A.

### Technical Data

**Design Features.** The USM-247, also known as the Versatile Avionics Shop Tester (VAST), was developed and produced by Harris Corp. VAST is an automated, general purpose, computer-controlled network of avionics testing devices to be used primarily in intermediate maintenance shops at shore installations and onboard aircraft carriers. It is used to diagnose faults in avionic components which have been removed from aircraft.

VAST provides a "building block" system in which a set of general-purpose stimulus and measurement instruments are configured by a digital control system for a variety of test programs under the control of a central computer, but allowing for operator input. (The set of 55 building blocks in the original system included 17 signal generators, 16 response monitors, six power supplies, four test point switches, and 12 miscellaneous amplifiers, standards, etc.) A Data Transfer Unit (DTU) provides operator/machine interface via standard ASCII keyboard and select switch

for manual, semi-automatic, or automatic modes. The building blocks are arranged in two stimulus and measurement sections, and a computer/memory complex completes the stationary part of the test station — a 14-rack unit about 6.5 ft high and 32 ft long.

The Unit Under Test (UUT) is placed on a cart. VAST/UUT interface is provided by a Test Program Set (TPS) made up of a tape containing test routines, an interconnecting device with connecting cables, and instructions for the VAST operator. The test routines for a typical UUT include first-level end-to-end measurements to determine whether the UUT is malfunctioning, second-level modular isolation tests, and third-level tests to isolate the fault to the piece or part. VAST units contain three levels of automatic fault detection: Auto-Check, Self-Check and Self-Test. All USM-247 building blocks are set up, tested and repaired in the same manner as avionic Weapon Replacement Assemblies (WRAs).

For avionics manufacturers, specifications for VAST compatibility are contained in Naval Air Systems

Command (NAVAIR) Avionic Requirements AR-8, AR-9 and AR-10. Integration is provided by the test programs that are part of the TPS; these programs are written in VAST Interface Test Application Language (VITAL), a simple version of Abbreviated Test Language for Avionic Systems (ATLAS).

The initial objective of supporting 85 percent of the Navy's avionics systems was revised when it proved impractical to include existing systems within the scope of VAST. Efforts were refocused on new systems only; however, the achievement of VAST compatibility with all avionics systems became difficult again, due to the nature of the parameters involved in certain systems (such as inertial, infrared, optical, EW, and high-power radar). A family of module testers was developed to meet these special requirements. Nevertheless, VAST became the principal testing vehicle for high-density, state-of-the-art avionics in more than 250 WRAs and 500 Shop Replaceable Assemblies (SRAs) on four current aircraft: F-14, E-2C, S-3A/B and A-7E.

## Variants/Upgrades

**MINI-VAST USM-470(V).** The USM-470(V)1, a six-rack modification, was developed to support the F/A-18 and is also known as the MINI-VAST. The five-rack USM-470(V)2 is called Tailored MINI-VAST and

supports the SH-60B LAMPS helicopter. Development of the USM-470(V)1 and USM-470(V)2 was started in 1980 and 1981 respectively. These systems are smaller and more specialized than the USM-247.

## Program Review

**Background.** The seed that grew into VAST was planted in 1959, when the Chief of Naval Operations wrote a letter expressing his grave concern over the increasing use of Special Support Equipment (SSE) aboard aircraft carriers citing escalating costs, increasing space devoted to intermediate-level avionics maintenance shops, and the growing number of highly skilled technicians needed to man these shops.

In 1960, PRD Electronics (now the Government Support Systems Division of Harris), one of 14 companies responding to an RFP, won a contract to analyze and evaluate support requirements for avionic systems of present and future Navy aircraft. The key recommendations of this study, Project Naval Avionics Support Equipment Appraisal (NAVSEA), were: (1) design avionics equipment for a high degree of maintainability, providing adequate and accessible test points for Automatic Test Equipment (ATE); (2) develop a general-purpose, computer-controlled automatic test system which can be adapted to changing requirements and which requires a lower level of technical skill to operate; and (3) increase use of Built-In Test Equipment (BITE) in WRAs.

In 1965, PRD won a contract to develop the system. The first prototype (USM-335) was designed for use on the Self-Contained Navigation System (SCNS), a part of the Integrated Helicopter Avionics System (IHAS) on Marine

CH-46 and CH-53 helicopters. Cutbacks in IHAS and cancellation of the Marine support requirements led to reconfiguration of the initial seven USM-335 systems for support of A-6 avionics. When production of the USM-247 system began in 1969, it was essentially a second-generation system, benefiting from the USM-335 experience.

Despite this, the period immediately following acceptance of the first operational system in 1970 and the first carrier deployment in 1973 was marred with problems and criticism for VAST. Congress spotlighted cost overruns, late deliveries and failure to meet the initial ambitious objectives, while the Fluke Task Force attacked the concept of a massive systems approach to avionics maintenance. The GAO cited Test Program Set (TPS) inadequacies, training deficiencies, inefficient utilization

and over-ordering (because of failure to project learning-curve effects) compounded by less-than-expected avionics reliability and inadequate weapon system spares support.

Nevertheless, the Navy stayed with the system, corrected all the problems they could, improved its management of the system, and began developing the ATE family of module testers necessary to meet objectives outside the limits of VAST. Development of MINI-VAST and Tailored MINI-VAST in 1980 and 1981 took some pressure off VAST, as did development of the USM-484 HTS (Hybrid Test Station), which tests more than 900 SRAs and 17 WRAs on the F/A-18, LAMPS Mk III, S-3B, A-4M, F-14A/D, AV-8B, EA-6B, and A-6E. Nearly 100 HTS units have been ordered and purchased since 1983.

## Funding

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No current funding identified.

## Recent Contracts

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<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Harris	10.2	Jan 1995 - FFP for repair/overhaul, modification and reporting efforts in support of VAST, mini VAST, hybrid test sets (HTS) and tailored mini-VAST systems. Completion date: Feb 1997 (N00383-95-D-0003G)

## Timetable

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1964	Feasibility model development initiated.
1965	Development contract awarded. Feasibility testing began.
1966	Prototype model (USM-335) delivered for testing.
1968	Development model accepted. Production contract for VAST (USM-247) issued.
1970	First operational model accepted.
FY73	First carrier deployment, USS <i>Kitty Hawk</i> .
1974	VAST characteristics tests complete.
1980	Mini-VAST (USM-470(V)1) funded.
1981	Tailored Mini-VAST (USM-470(V)2) funded.
1984	First production systems entered service.
1992	Completion of USM-470(V) production.
1997	Spares, upgrade, and repair support continues.

## Worldwide Distribution

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The USM-247 and USM-470(V) avionics test systems are exclusive to the US Navy. The systems are installed at Naval Air Stations, Naval Aircraft Rework Facilities and on all operational aircraft carriers.

## Forecast Rationale

VAST has been a very successful program during its 20-plus years of service. Procurement of the USM-247 was completed at approximately 150 test stations in place for support of S-3, E-2, and F-14 avionics. Production of the USM-470(V)1 and the USM-470(V)2 was completed in 1992.

All contract work involving VAST and Mini-VAST should be concluded this year (1997). No further contract activity is anticipated.

Lockheed Sanders is developing the Navy's next generation of ATE, the Consolidated Automated Support System (CASS). CASS will initially support F-14D avionics, F/A-18 electro-optics, and JTIDS systems. NAVAIR plans to expand CASS capabilities to include ATE support for all Navy electronics applications. CASS is scheduled to replace all avionics ATE, including VAST, with new technology that is more reliable, modular, and flexible to meet future Navy needs in keeping with a recent push to standardize ATE throughout the armed forces.

## Ten-Year Outlook

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Production for VAST is complete. Its successor program, CASS, will become fully operational by the end of the decade. Any VAST-related activity in the interim will focus on upgrading and spares support for the USM-247 and USM-470(V).

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