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U. S. GENERAL ACCOUNTING OFFICE

STAFF STUDY

[VERSATILE AVIONICS SHOP TEST] (VAST)<sup>e</sup>

SYSTEM AN/USM-247(V)

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DEPARTMENT OF THE NAVY

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## ABBREVIATIONS

GAO	General Accounting Office
VAST	Versatile Avionics Shop Test
SAR	Selected Acquisition Report
BIS	Board of Inspection and Survey

VERSATILE AVIONICS SHOP TEST (VAST)

SYSTEM AN/USM-247(V)

SYSTEM DESCRIPTION AND STATUS

The Versatile Avionics Shop Test (VAST) System AN/USM-247(V) is a general purpose, automatic test system for diagnostic fault isolation and performance verification of selected avionics at the intermediate and depot maintenance levels. The VAST-247 systems are to be installed aboard aircraft carriers and at shore sites to support selected avionics of the F-14A, E-2C, and S-3A aircraft. It is expected to eliminate the need for a variety of special support equipment and to reduce the number of avionic technicians currently required.

The major subsystems of VAST are the test station, computer, and data transfer unit. The interface between the VAST hardware and the avionics to be tested is supplied by the test program set. Each unique item of avionics to be tested by the system requires a test program set. PRD Electronics, Inc., is the contractor for the VAST hardware. The test program sets are developed by the aircraft manufacturers--the Grumman Aerospace Corporation for the F-14A and E-2C and the Lockheed Aircraft Corporation for the S-3A.

The VAST-247 is in the production and deployment phase of the acquisition process. At the time of our review, 23 of the 83 VAST systems planned to be acquired had been delivered and distributed in the following manner 16 to aircraft manufacturers, one to the U.S S. Kitty Hawk for a technical evaluation of VAST with avionics of operating A-7E aircraft, two

to Navy shore installations, and four remain at the contractor's plant for use in developing test program sets for self-maintenance of the system.

The VAST-247 program has recently undergone two reviews by the Office of the Secretary of Defense, (1) a review of VAST management conducted in September 1972, the minutes and conclusions of which have not been published, and (2) an assessment and analysis in the area of cost and operational effectiveness which had not been completed as of October 1972. At January 1973, the results of these reviews were not available.

A resume of the program history was included in our initial study of February 1971. This study describes the status of the program at June 30, 1972, and discusses the major accomplishments and changes that have occurred in the program during the year ended June 30, 1972.

#### COMING EVENTS

During 1973 several major events are scheduled.

--First operational employment of the VAST for the F-14A in February 1973 and for the E-2C in June 1973.

--Interface of all program test sets developed for the VAST.

--Completion of technical evaluation at sea and ashore.

--Completion of OSD review analysis.

#### COST

At June 30, 1972, the estimated cost of the VAST-247 program had increased from the \$312 million development estimate of April 1968 to the current \$435.4 million. VAST-247 experienced a decrease of \$8.3 million since June 30, 1971 and a reduction of three in the number of systems to

be procured. Previous staff studies discussed the increases prior to that time.

The net \$8.3 million decrease in the estimated cost of the VAST-247 program is primarily the result of a \$11.9 million decrease resulting from a deletion of VAST support requirements for three test stations and a \$3.6 million increase in fiscal year 1972 spare requirements.

The VAST program costs do not include the aircraft manufacturer's costs associated with the development and integration of test program sets. At June 30, 1972, these costs were estimated at \$263.4 million. This amount is shown as a footnote in the June 30, 1972, SAR and is an increase of \$70.5 million over the \$192.9 million figure reported by the Navy in September 1971.

The increase of \$70.5 million in the aircraft manufacturer's costs for developing and integrating the test program sets is due to the inclusion of previously omitted nonrecurring and R&D costs and the cost of test program sets for some previously omitted S-3A avionics assemblies.

In addition, the VAST program costs do not include \$14.4 million for replenishment spares. The Office of the Secretary of Defense (OSD) latest guidance on SAR preparation deleted the requirement for reporting these costs.

#### Allowance for Escalation

At June 30, 1972, the allowance for escalation was \$71.9 million for the program, an increase of \$1.9 million since the June 30, 1971 estimate of \$70 million. The increase is a net result of a \$5 million decrease in fiscal year 1973 to 1975 VAST escalation and an increase of \$6.9 million in escalation related to the cost of component parts.

PROGRAM FUNDING

The following chart shows the funding status of VAST-247 as of June 30, 1972 (in millions).

	<u>Appropriated</u>	<u>Reprogramming</u>	<u>Current Program</u>	<u>Obligated</u>	<u>Expenditure</u>
RDT&E	\$ 8.0	\$(1.5)	\$ 6.5	\$ 4.7	\$ 3.0
Production	<u>323.8</u>	<u>4.2</u>	<u>328.0</u>	<u>258.5</u>	<u>160.1</u>
Total	<u>\$331.8</u>	<u>\$ 2.7</u>	<u>\$334.5</u>	<u>\$263.2</u>	<u>\$163.1</u>

CONTRACT DATA

The Navy has four principal contracts on this program. They are with PRD Electronics, Incorporated, Suosset, Long Island, New York. The contracts are cost-plus-incentive-fee and all but one have been definitized. The four contracts account for 46 of the planned acquisition of 83 systems.

The undefinitized contract was awarded to PRD Electronics for 16 VAST systems in December 1971. The limitation of Government liability on this letter contract initially was \$25.5 million which was to be definitized by June 1972. As of June 30, 1972, the limitation of Government liability had increased to \$51.0 million and the contract had not been definitized. A Navy official informed us that the letter contract had not been definitized as planned due to the lack of support for subcontractors' cost data. Definitization is expected by mid-January 1973.

As of June 30, 1972 there was 304 definitized and undefinitized changes to VAST contracts valued at approximately \$150.6 million.

## PERFORMANCE

The operational technical characteristics estimates for the VAST-247 system did not change during fiscal year 1972 with the exception of one, mean-time-between-failure of the computer station. At June 30, 1972, the current estimate for this characteristic improved by 200 hours on the basis of demonstrated performance. However, the estimate still remains 50 hours below the approved program requirement.

At June 30, 1972, demonstrated performance data based on preliminary performance of delivered VAST test stations show that the time between failure has been less than either the current or the approved program estimates. Project office officials, however, have reported that these preliminary data are subject to revision pending final test and evaluation results.

Full operational performance of the VAST has not been demonstrated. As an interim evaluation measure, the Navy is conducting a test and evaluation of the system in an at-sea environment with a sample of the A-7E aircraft's avionics. The at-sea evaluation is scheduled to be completed in December 1972. A technical evaluation of VAST is also being conducted at a shore-based test center and is scheduled for completion in the last half of calendar year 1972. The technical evaluations will not be completed prior to the F-14A and E-2C Board of Inspection and Survey Trials scheduled for the first half of calendar year 1973.

### Possible VAST Problems

For the past several years the Navy had planned for the installation of three identical and complete VAST stations ~~on board an aircraft carrier~~ to support three types of aircraft, the F-14A, S-3A, and the E-2C. The Navy, in October 1972, changed the installation plan to include a new configuration to take advantage of a more optimal configuration of stations and thereby increase capability at a relatively small increase in cost. The new configuration is one full VAST station with three partial or "tailored" VAST stations aboard the carriers. The Navy stated that the new configuration (1) is capable of handling a significantly greater work load than the initial configuration, (2) requires the same amount of space as the old configuration, and (3) costs about \$100,000 more per aircraft carrier. Moreover, the Navy officials stated that the increased work load capability will be useful, especially if additional systems such as the A-7E or the AWG-9 fire control system of the F-14A, are designated for VAST support.

A potential problem area involves test time. Navy officials informed us that VAST is capable of testing only one avionic assembly at a time (sequential testing) while groups of Peculiar Ground Support Equipment or non-VAST equipment can test several (six to eight) concurrently. Accordingly, the overall VAST test time could be greater than that of Peculiar Ground Support Equipment and depending upon the magnitude of avionics experiencing problems it could cause delays in testing.



The Navy commented that this area has received extensive analysis and all current data tends to support the adequacy of VAST to handle the avionics work flow.

#### MILESTONES

As of June 30, 1971, shore-site test and evaluation was scheduled to begin in December 1971 although it did not actually begin until May 1972. The 5 month delay was caused by revisions to the delivery schedule necessitated by retrofit of delivered systems. In addition, test and evaluation on board the U.S.S. Kitty Hawk was scheduled to begin in January 1972 but did not begin until March 1972. This slippage was due to a delay in the sailing date of the U.S.S. Kitty Hawk. The sailing delay caused the VAST's first operational employment--using the A-7E on board the U.S.S. Kitty Hawk--to also slip to March 1972.

At June 30, 1972, the VAST technical data package was scheduled to be available in September 1972. This represented a 9-month slippage during the year ended June 30, 1972. The delay resulted from problems and delays experienced in VAST development requiring additional equipment design refinements in accordance with new baseline specifications. Project office officials informed us that further delays will occur due to the VAST development problems. As of November 1972 the technical data package was expected, by the Navy, to be completed in December 1972.

VAST is scheduled to be operational at the time of the Navy's Board of Inspection and Survey acceptance trials in February 1973 for the F-14A; June 1973 for the E-2C; and October 1973 for the S-3A. This schedule represents a 2 month slippage for the F-14A and 1 month for the E-2C from those dates reported at June 30, 1971. The slippages resulted from changes to scheduled aircraft Board of Inspection and Survey trial dates. In addition, the VAST software development for the F-14A and the E-2C have experienced delay. The Navy stated that, at the current rate of development, it does not appear that either aircraft will be supported by VAST at planned levels during Board of Inspection and Survey trials.

The Navy commented that the F-14A and the E-2C will be supported by VAST during BIS trials to the extent that test program sets are available. The Navy estimates that 80 percent of the test program sets for VAST supported weapons replaceable assemblies (WRAs) will be available for the F-14A and about 30 percent of the sets for VAST supported WRAs will be available for the E-2C. The remainder of the support of the two aircraft systems planned to be supported by VAST will be provided during BIS by contractor technicians and factory test equipment.

#### RELATIONSHIP TO OTHER SYSTEMS

The Navy is developing the VAST to support the F-14A, E-2C, and the S-3A aircrafts. A Navy official states that because of successful VAST

support of the A-7E during testing, the A-7E is being considered as a fourth VAST-supportable aircraft.

SELECTED ACQUISITION REPORTING

Our review of the SAR disclosed that the same matters commented on in two of our previous staff studies still exist. A VAST project official informed us that the changes suggested were not incorporated into the SAR because of time constraints and the many levels of review necessary to make changes. Problems noted in the June 30, 1972, SAR are discussed below.

- The explanations of changes in cost are not directed to the underlying causes.
- Specific reasons for cost increases during the year could not be arrived at without a detailed review
- Performance characteristics established in the SAR do not provide the type of information to indicate or track the full performance capability of the VAST. The performance characteristics section does not include information such as percentage of availability of the VAST, physical characteristics (weight, height), number of operators, accuracy of VAST testing, increased reliability resulting from VAST testing.
- The schedule milestones section presented in the SAR does not indicate the logical progression of the VAST system. This section does not include typical progress indicators such as initial operational capability, fleet delivery, approval for service use, etc.

--The current estimate for initial operational employment of VAST reflect the scheduled aircraft BIS dates. If the BIS date slips, this in turn appears as a slippage in the VAST SAR. This type of information does not measure VAST progress.

#### MATTERS FOR CONSIDERATION

The development of the VAST is significant because of its cost and its impact on three major aircraft programs--the F-14A, E-2C, and S-3A. Basically, the current VAST program and its ability to interface with the aircraft programs has not been demonstrated. Navy officials informed us that no provisions have been made to provide backup test equipment to support the three new aircraft. If VAST should experience serious compatibility problems with the aircraft's avionic systems it could impact on the readiness of all or any one of the three new Navy aircraft.

#### SCOPE

The primary basis for the information in this study was the June 30, 1972, status report for VAST. We obtained additional information by reviewing plans, correspondence and other reports, and by interviewing Navy officials. We did not make detailed analyses or audits of the basic data supporting program documents.

#### AGENCY COMMENTS

A draft of this study was reviewed by Navy officials associated with the management of this program and comments were coordinated at the Headquarters level. The Navy's comments are incorporated as appropriate. As far as we know there are no residual differences in fact.