

NATIONAL AIRSPACE SYSTEM (NAS)



Air Force ACAT IC Program

Total Number of Systems:	106 DAAS 96 DASR 222 VCSS 1 MAMS
Total Program Cost (TY\$):	\$1021M
Average Unit Cost (TY\$):	\$11M
Full-rate production:	2QFY01

Prime Contractor

Raytheon (Radar/Automation)
Litton Denro (Voice Switches)
Raytheon (Airspace Scheduling)

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The National Airspace System (NAS) program will replace three types of Air Traffic Control and Landing System (ATCAL) equipment used to support Air Traffic Control's radar approach control mission. NAS includes voice switches, approach control and control tower automation, and airport surveillance radars. The NAS program modernizes radar, voice networks, and automation functions within the air traffic control and landing systems at 92 DoD sites. The NAS program also includes the Military Airspace Management System (MAMS), an off-line, one-of-a-kind web site-based special use airspace scheduling and utilization tracking system accessed via the Internet.

NAS modernization will enhance *precision engagement* through *technological innovations* that will allow DoD to keep pace with state-of-the-art digital radar approach control equipment and improve scheduling of special use airspace to ensure wartime readiness. NAS modernization supports the *Joint Vision 2020* mandate of *interoperability*, especially in terms of communications and information sharing with the Federal Aviation Administration (FAA). *Information superiority* will be realized when DoD and FAA users have the necessary information capabilities to achieve their operational objectives.

BACKGROUND INFORMATION

The ATCALS equipment to be replaced has limited interoperability and excessive cost growth for operations and support. The FAA has undertaken a massive upgrade of the nation's air traffic control system infrastructure by replacing analog systems with state-of-the-art digital technology. Most DoD systems are currently analog and will not easily or economically interface with the new-generation FAA equipment. Without the added capability, DoD will be unable to continue providing efficient and reliable service to all air traffic system users, military or civilian. Furthermore, DoD NAS cost and operational effectiveness analyses indicate that DoD will experience excessive operations and support costs if the DoD air traffic control equipment is not replaced. When fully fielded, the DoD NAS program upgrade will include the following four programs:

- Voice Communications Switching System (VCSS) performs all control functions needed for air traffic control communications, including radio, intercom, and telephone access. VCSS provides an interface to analog switch and distribution systems and interfaces with legal voice recorders.
- DoD Advanced Automation System (DAAS) will receive and process primary and secondary radar data, flight plan information, weather, airport environmental data, and administrative information (such as Notices to Airmen) required for operation of the local air traffic control facility.
- Digital Airport Surveillance Radar (DASR) consists of integrated primary and secondary radar sub-systems and will provide highly accurate target data to the local air traffic control facilities. The DASR's digital data output is compatible with the FAA's radar network and the DAAS. The DASR will have improved target detection and accuracy, clutter rejection, aircraft identification accuracy, altitude data, and weather capability.
- Military Airspace Management System (MAMS) will provide the ability to efficiently schedule, track, and document utilization of special use airspace in a non real-time manner, as well as interoperate with the FAA. Scheduling agencies will access the MAMS central web site using their existing desktop computers with Internet access. MAMS is not used as a real-time scheduling or airspace control tool; there are no safety of flight issues associated with MAMS.

The FAA is the lead organization for VCSS and DAAS testing, with the Air Force serving as DoD lead for DASR testing and sole test agency for MAMS. DoD is working with the FAA through an interagency agreement for all VCSS, DAAS, and DASR test activities.

VCSS DoD Multi-Service Operational Testing and Evaluation (MOT&E) occurred throughout 1999. The VCSS was found to be operationally effective; however, VCSS was rated not operationally suitable because of interrelated parts reliability, maintainability, depot-level support, spares provisioning, and technical documentation issues. DOT&E reviewed corrective actions taken after MOT&E and found those actions adequate to rectify the suitability shortcomings. The corrective actions, along with the high level of operational availability, inherent redundancy in the system, and demonstrated ability of the radar approach control and control tower to perform their operational missions, led DOT&E to the conclusion

that VCSS was operationally suitable. The full-rate production decision was executed in November 1999.

TEST & EVALUATION ACTIVITY

The MAMS test readiness review for acceptance testing was held in February 2000. Windows NT Service Pack 6a was successfully loaded and tested by Raytheon as part of their engineering tests. Acceptance testing of MAMS began later in February 2000. The contract modification to extend the current period of performance through the end of September 2000 was completed in February 2000.

DAAS and DASR developmental testing and evaluation were completed in early October 1999. One Category 1 deficiency was found for DAAS and no Category 1 deficiencies were found for DASR. Based on favorable developmental test findings, both DAAS and DASR proceeded to combined developmental and operational testing.

DAAS and DASR underwent combined developmental and operational testing from October 1999-January 2000 at Eglin AFB to examine system specifications and compliance with user-validated requirements in the Operational Requirements Document. Dedicated flight checks were flown and analyzed to ensure that detection, coverage, accuracy, and resolution requirements were objectively quantified. As the lead tester for DoD, AFOTEC published findings for the testing in separate operational assessment reports. Based on demonstrated DAAS functionality, the DAAS report supported an LRIP decision in January 2000. An LRIP quantity of up to 20 DAAS systems was approved by the Air Force. After follow-up verification of fixes to DASR deficiencies, an LRIP quantity of up to 20 DASR systems was approved by the Air Force in February 2000. FAA purchases of identical equipment are made through the agency's own procurement channels, although on the same contract award.

The DAAS and DASR operational assessment reports documented additional deficiencies, some of which needed to be resolved before the start of MOT&E and others that needed to be resolved before full fielding of the systems. DAAS deficiencies concerned training, record and playback functionality, system flight plan capabilities, aircraft handoff processing, false targets, false weather, security vulnerabilities, and system adaption and certification issues. DASR deficiencies included sub-clutter visibility, weather processing, radar coverage and probability of detection, false tracks and plots, azimuth accuracy and resolution, logistics support, training, and spares. The program office embarked on a plan to address the DAAS and DASR documented deficiencies. The DAAS and the DASR began regression testing in April 2000 at Eglin AFB. In June 2000, all deficiencies critical to multi-Service operational testing were either verified as fixed or downgraded in their severity. The Air Force deemed DAAS and DASR ready to proceed to MOT&E.

DAAS and DASR began parallel multi-Service operational testing at Eglin AFB in June 2000. Joint testing of both systems was required because the majority of existing analog equipment will not interface with the newer digital hardware. AFOTEC is conducting the task-based evaluation of DAAS and DASR, and will determine the DAAS and DASR mission-level utility. Additionally, requirements that were not fully assessed during the combined developmental and operational test period are being re-examined. The results of the MOT&E will support the NAS Milestone III decision, focusing on full-rate production of DAAS and DASR.

DOT&E most recently visited Eglin AFB during DAAS and DASR MOT&E in September. A number of outstanding system issues precluded the successful completion of MOT&E. For example, controllers reported that an excessive amount of false primary plots were being displayed from the DASR

during Emergency Service Level operations on all terminal controller workstations. Controllers stated the problem was worse when heavy clouds or rain were in the radar area. The Eglin controllers decommissioned the DAAS Emergency Service Level operation in September.

As a result of documented DAAS and DASR deficiencies, on October 3 AFOTEC agreed to stop DAAS/DASR MOT&E to allow the Air Force to make changes in the software that drives the digital radar and automation systems. The Air Force believes the time out is the best option for the NAS program and protects the ability of the Air Force to ensure the DAAS and DASR are effective and suitable when ultimately fielded. A total of 15 Category 1 deficiencies were reported, six associated with the DAAS and nine associated with the DASR. The Eglin controllers believe the DAAS and DASR are safe for operational use and will continue using them during the MOT&E temporary halt. Representatives from the NAS Program Office and AFOTEC will be working out the details of the test delay and a plan of action. DOT&E is committed to staying actively engaged in the process.

TEST & EVALUATION ASSESSMENT

DOT&E and AFOTEC share concerns with the planning considerations for the approach chosen for the MOT&E temporary halt. The NAS Program Office and AFOTEC needs to track closely Raytheon's development of fixes to deficiencies to ensure the rigor normally associated with developmental testing incorporated in the process. AFOTEC is developing re-entry criteria for the MOT&E. All Category 1 safety of flight deficiencies, and user-defined mission critical 2 deficiencies must be demonstrated as fixed before MOT&E resumes.

The oversight community will work with AFOTEC, the NAS Program Office, and users, to determine the rules of engagement for the test time out. It is tentatively planned that a member of the test team will remain on site at Eglin AFB for the duration of the developmental test period to observe fixes. AFOTEC will request a configuration audit prior to turning the DAAS and DASR over to the NAS Program Office and Raytheon for fixes and prior to receiving the systems back for continued MOT&E. AFOTEC has also suggested a notional 30-day period, following the implementation of system fixes and before MOT&E resumes, to allow the users time to develop confidence in the improved DAAS and DASR systems. The scope of involvement from the developmental testers has yet to be determined, along with many of the details of the action plan.

CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED

It is acknowledged that the FAA's operational testing programs differ in scope and format from that of DoD's. Recognizing that, the OSD test community must continue to ensure robust independent testing of DoD-unique requirements while using the FAA test data as appropriate.

The key for continued success of the NAS program is for all agencies to continue good communications and to keep pace with the changing DAAS and DASR issues. Through consistent involvement with the NAS program, DOT&E has provided measurable contributed to shaping the entire NAS test process. DOT&E will remain fully engaged in the test process at this time, during the temporary halt to the DAAS and DASR MOT&E, and as the plan of action is being developed.