

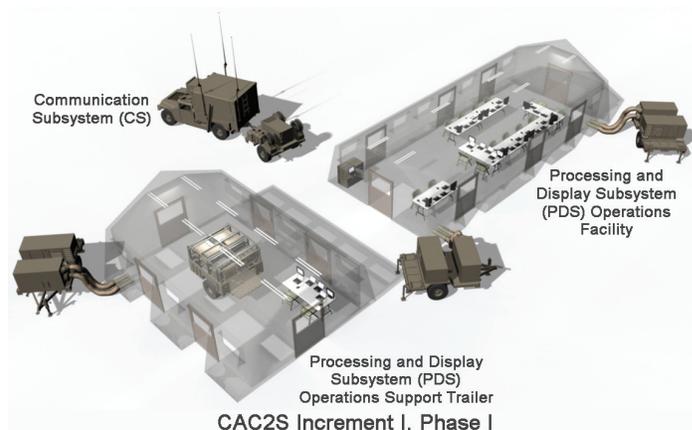
Common Aviation Command and Control System (CAC2S)

Executive Summary

- The Marine Corps restructured the Common Aviation Command and Control System (CAC2S) program in 2008 and divided Increment I into a two-phased approach. This report is on CAC2S Increment I, Phase 1 only.
- The Marine Corps Operational Test and Evaluation Activity (MCOTEA) conducted a CAC2S Phase 1 operational assessment in August 2010 to support the program's Phase 1 Milestone C acquisition decision in November 2010. The program finished developmental testing in December 2010 and MCOTEA conducted IOT&E in April 2011.
- DOT&E assessed the CAC2S Phase 1 IOT&E was not adequate due to limitations that arose during test execution. Many important measures of operational capability could not be adequately assessed because of test venue limitations and insufficient data collection. This prevented DOT&E from conducting a full assessment of the CAC2S operational effectiveness and suitability in accordance with the CAC2S Phase 1 requirements and DOT&E-approved test plan.
- The CAC2S Phase 1 demonstrated an operational capability to support the Direct Air Support Center (DASC) mission, with limitations, in an environment of low to medium operational tempo and during periods of six to eight hours. Test data were not sufficient to determine operational capability for supporting the Tactical Air Operations Center (TAOC) mission or overall operational effectiveness.
- CAC2S Phase 1 demonstrated a capability to be sustained during short, non-continuous operations. Test data were not sufficient to fully assess reliability, availability, or maintainability measures or determine overall operational suitability.
- While the IOT&E had significant test adequacy limitations, it did reveal several effectiveness and suitability deficiencies. Additional operational testing is required to assess the overall operational effectiveness and suitability of the CAC2S, Increment I, Phase 1.

System

- CAC2S will provide Marine Corps operators with the ability to share mission-critical voice, video, sensor, and command and control (C2) data and information in order to integrate aviation and ground combat planning and operations in support of the Marine Air-Ground Task Force (MAGTF).
- CAC2S will consist of tactical shelters, software, and common hardware. The hardware components are expeditionary, common, modular, and scalable, and may be freestanding, mounted in transit cases, or rack-mounted in shelters and/or general purpose tents that are transported by organic tactical mobility assets.



- CAC2S Increment I is comprised of three functional subsystems, to be delivered in two phases.
 - Phase 1
 - Processing and Display Subsystem (PDS) – Provides the operational command post and functionality to support mission planning, decision-making, and execution tools for all aspects of Marine Aviation. The PDS includes an operations support trailer and operations facility.
 - Communication Subsystem (CS) – Provides the capability to interface with internal and external communication assets and the means to control their operation.
 - Phase 2
 - Sensor Data Subsystem (SDS) – Provides an open architecture interface capable of integrating emerging active and passive sensor technology for organic and non-organic sensors of the Marine Air Command Control System (MACCS).
- CAC2S Increment I, Phase 1 will include the PDS and CS to establish the baseline DASC aviation command and control system for the Marine Air Support Squadron and augment the current TAOC mission capability for the Marine Air Control Squadron. Phase 2 will be enhanced by the SDS and should meet remaining MACCS aviation battle management C2 requirements.

Mission

- The MAGTF commander will employ CAC2S to integrate Marine Corps aviation into joint and combined air/ground operations in support of Operational Maneuver-from-the-Sea, Sustained Operations Ashore, and other expeditionary operations. The CAC2S will support the MAGTF C2 concept

and will provide an expeditionary and common joint air command and control capability.

- The MAGTF commander will use CAC2S Phase 1 to execute command and control of assigned assets afloat and ashore in joint, allied, or coalition operational environments and to provide a display of a common, non-real-time, and near-real-time integrated tactical picture. The picture will facilitate the control of friendly assets and the engagement of threat aircraft and missiles and have access to theater and national intelligence sources from a single, multi-function C2 node.

Major Contractors

- Phase 1
 - Government Integrator: Naval Surface Warfare Center – Crane, Indiana
 - Component Contractor: Raytheon-Solipsys – Fulton, Maryland
 - Component Contractor: General Dynamics – Scottsdale, Arizona
- Phase 2
 - Contract Award planned for 3QFY12

Activity

- The Marine Corps restructured the CAC2S program in 2008 and divided Increment I into two phases.
- MCOTEA conducted a dedicated CAC2S Phase 1 operational assessment in August 2010 that only assessed the DASC element operating the CAC2S; it did not assess the system employment in a TAOC configuration.
- The operational assessment results supported the Milestone C decision in November 2010 for acquisition and production of five Limited Deployment Units to support the IOT&E.
- The Marine Corps completed developmental testing of CAC2S Phase 1 in December 2010.
- DOT&E approved the CAC2S Phase 1 Test and Evaluation Master Plan and the MCOTEA IOT&E test plan in March 2011.
- In April 2011, MCOTEA conducted the IOT&E. The IOT&E was executed during the Weapons and Tactics Instructors' course live-flight exercise at Yuma, Arizona, to assess the capability of CAC2S in supporting the DASC and TAOC missions.
- MCOTEA reported the CAC2S as operationally effective, suitable, and survivable for the DASC mission. In addition, they reported that test execution was not sufficient to determine CAC2S's ability to effectively support the TAOC mission.
- DOT&E reported the IOT&E was not adequate to determine operational effectiveness or suitability for CAC2S Phase 1 and recommended additional operational testing to fully assess the system. DOT&E assessed that CAC2S was capable of supporting the DASC mission.
- In September 2011, the Assistant Secretary of the Navy (ASN), Research, Development, and Acquisition (RDA), as the Milestone Decision Authority, led the Full Deployment Decision Review and approved initial fielding of the CAC2S Phase 1 to the Marine Corps Communications Electronics School in 1QFY12. The program was directed to update ASN(RDA) prior to fielding the first operational unit in 2QFY12.
- The Marine Corps is required to execute additional operating hours on the system and collect reliability data to improve the mean time between critical failure threshold confidence level from 40 percent reported by MCOTEA, to 80 percent.

The CAC2S program manager must report the results of this effort to the Milestone Decision Authority prior to fielding the CAC2S to the first operational unit.

- The Marine Corps is also required to provide a schedule and plan for conducting further system testing, to evaluate the required system capabilities that were not assessed during IOT&E, and to verify corrections to system deficiencies highlighted during IOT&E, and recommended by DOT&E.

Assessment

- Based on the August 2011 operational assessment results, DOT&E recommended the Marine Corps complete the following:
 - Perform a risk assessment to determine if the system would meet the reliability requirement during IOT&E.
 - Conduct additional testing prior to IOT&E to gain further reliability data and to assess the system capability to support the TAOC mission.
 - Conduct additional testing prior to IOT&E to correct deficiencies and verify system capabilities to include the Advanced Field Artillery Tactical Data System interface, the Joint Range Extension Application Protocol A/B/C interface, and the system's capacity to process 2,000 near-real time tracks.
- The developmental testing conducted just prior to IOT&E did not have sufficient hours to characterize the risk in meeting the reliability requirement during IOT&E. MCOTEA and DOT&E assessed the risk to meeting reliability during IOT&E as high. The Marine Corps did not test the operational capability of the CAC2S Phase 1 with the TAOC until IOT&E and no critical system deficiencies were reported following developmental testing that prevented the program from approving the system ready for IOT&E.
- DOT&E assessed the IOT&E was not adequate due to limitations that arose during test execution. Many important measures of operational capability could not be adequately assessed because of test venue limitations and insufficient data collection. This prevented DOT&E from conducting a full assessment of the CAC2S operational effectiveness and suitability in accordance with the CAC2S Phase 1 requirements and the DOT&E-approved test plan. Several

of the same discrepancies noted during the August 2010 operational assessment were also identified during the IOT&E.

- The CAC2S Phase 1 demonstrated an operational capability to support the DASC mission, with limitations, in an environment of low to medium operational tempo and during relatively short periods of six to eight hours. DASC operators maintain radio communications with aircraft, joint service agencies, and higher headquarters, and use a graphic representation of the battlespace provided by CAC2S, called a Common Tactical Picture (CTP), in order to control aircraft and support the MAGTF. Testing was not adequate to determine whether CAC2S can provide users with an accurate and timely CTP. Test data were not sufficient to determine CAC2S operational capability to support the TAOC mission.
- CAC2S Phase 1 demonstrated a capability to be sustained during short, non-continuous operations. Test data were not sufficient to fully assess reliability, availability, maintainability measures, or to determine overall operational suitability.
- While the IOT&E had significant test adequacy limitations, it did reveal several effectiveness and suitability deficiencies. Major deficiencies included the system's inability to process and correctly display mission-critical information in the required military standard format (MIL STD 2525) and to automatically display gun target lines, which are lines connecting the point of origin of a fire mission to the target. In addition, the system documentation, to include training and technical publications, were not representative of the production system. To mitigate the system deficiencies, DASC operators employed manual workarounds to meet mission requirements.
- The following additional system deficiencies found during IOT&E should have been found in developmental testing:
 - Ability to receive data via Joint Range Extension Application Protocol A and B and provide an accurate and timely air picture from these sources
 - Ability to interface with Theater Battle Management Core System and access web-based applications via the system hyperlink functionality
 - Ability of net time server to synchronize time with the GPS through the CAC2S Defense Advanced GPS Receiver
- Additional operational testing is required to adequately assess the overall operational effectiveness and suitability of the CAC2S, Increment 1, Phase 1.

Recommendations

- Status of Previous Recommendations. The Marine Corps addressed one of the three previous FY10 recommendations when they completed the CAC2S Phase 1 Test and Evaluation Master Plan in March 2011. The following recommendations were not addressed.
 - The Marine Corps should conduct an additional event prior to IOT&E to test the operational functionality, integration, and employment of the CAC2S with both the DASC and TAOC.
 - The Marine Corps should plan and resource an alternate IOT&E test venue and the live exercise test venue should provide the requisite environment to fully execute IOT&E.
- FY11 Recommendations. The Marine Corps should conduct additional operational testing in accordance with the recommendations described below in order to demonstrate those capabilities not evaluated in an operational environment during IOT&E, to verify corrections of discovered deficiencies, and to fully assess CAC2S Phase 1 operational effectiveness and suitability.

Capabilities Requiring Operational Test

- Support the TAOC mission.
- Provide an accurate and timely fused CTP display of friendly, enemy, and neutral information on any workstation.
- Integrate and display automated Advanced Field Artillery Tactical Data System and Global Command and Control System data.
- Process near-real-time data for 2,000 (threshold) or 4,000 (objective) air, land, surface, and space tracks under realistic operational conditions and verify there is no degradation in system performance or impact to operator workload.
- Support continuous operations during DASC displacement to a new operating location.
- Receive data via Joint Range Extension Application Protocol A and B and provide an accurate and timely air picture from these sources.
- Reliability, maintainability, and availability under realistic operating conditions, in particular, long-term continuous operations. The test should include adequate system operating hours to resolve the reliability requirement of 90 percent with mean time between operational mission failure of 228 hours for 24-hour operations.

NAVY PROGRAMS