Air Operations Center – Weapon System (AOC-WS)

Executive Summary

- The Air Operations Center – Weapon System (AOC-WS) 10.1 is a system-of-systems that contains numerous third-party software applications, including the Global Command and Control System – Joint (GCCS-J), Theater Battle Management Core Systems – Force Level (TBMCS-FL), Master Air Attack Plan Toolkit (MAAPTK), and Joint Automated Deep Operations Coordination System (JADOCS).
- The Air Force tests AOC-WS 10.1 during a three-phase Recurring Event (RE) test cycle, which includes event-based test periods primarily focused on software upgrades. The software upgrades and associated test event are designated using similar terms; for example, AOC-WS 10.1 RE11 is the software upgrade tested during RE11.
    - Phase 1 developmental testing is conducted at the Combined Air Operations Center – Experimental (CAOC-X) at Langley AFB, Virginia.
    - Phase 2 operational testing is conducted to assess effectiveness at CAOC-X.
    - Phase 3 operational testing is conducted at a fielded site to assess suitability.
- In March 2013, the Air Force delivered its final report on RE11 that included the results of Phase 3 operational testing at 613 AOC, Hickam AFB, Hawaii.
- RE11 results demonstrated operators can successfully execute all critical missions and produce threshold or larger-sized target lists and Air Tasking Orders on schedule, although significant workarounds are required to avoid errors in products due to the existing Category 1 (CAT I) deficiencies. AOC-WS 10.1 RE11 provided a significant improvement to AOCs both in internal functionality and in interoperability with Combatant Commands.
- AOC-WS 10.1 RE11, based on RE11 Phase 3 testing, was not operationally suitable. It could not be built, configured, or maintained adequately at an operational site. Additionally, the RE11 training schedule did not prepare operators across multiple AOC divisions to complete tasks using AOC-WS 10.1 RE11, and it did not provide system administrators sufficient instruction in maintenance and troubleshooting of an operational system.
- Air Combat Command (ACC) conducted a thorough analysis of the AOC-WS 10.1 RE11 outstanding CAT I deficiencies and decided to accept the risk of fielding it to meet critical operational needs, while maintaining the expectation that the AOC-WS Program Office will fix those deficiencies in an expeditious manner.
- In August 2013, the Air Force conducted Phase 2 operational testing of AOC-WS 10.1 RE12 at CAOC-X, Langley AFB, Virginia. The test demonstrated that AOC-WS 10.1 RE12 enables operators to successfully execute all critical missions and meet threshold requirements. AOC-WS 10.1 RE12

is proceeding to Phase 3 of operational testing during November to December 2013 at 612 AOC, Davis-Monthan AFB, Arizona, for an assessment of operational suitability.

System

- The AOC-WS is the senior command and control element of the U.S. Air Force's Theater Air Control System and provides operational-level command and control of air, space, and cyberspace operations, as well as joint and combined air, space, and cyberspace operations. Capabilities include command and control of joint theater air and missile defense; time-sensitive targeting; and Intelligence, Surveillance, and Reconnaissance management.
- The AOC-WS 10.1 (AN/USQ-163 Falconer) is a system-of-systems that contains numerous third-party-developed software applications and commercial off-the-shelf products. Each third-party system integrated into the AOC-WS provides its own programmatic documentation.
- The AOC-WS consists of:
    - Commercial off-the-shelf hardware
    - Separate third-party software applications GCCS-J, TBMCS-FL, MAAPTK, and JADOCS, from which the AOC-WS draws its capabilities
    - Additional third-party systems that accept, process, correlate, and fuse command and control data from multiple sources and share them through multiple communications systems
- AOC-WS 10.1 operates on several different local area networks (LANs), including Secret Internet Protocol Router Network, Joint Worldwide Intelligence Communications System, and a coalition LAN, when required. The LANs connect the core operating system and primary applications to joint and coalition partners supporting the applicable area of operation. Users

can access web-based applications through the Defense Information Systems Network.
- The Air Force tests AOC-WS 10.1 software upgrades during REs. The Air Force refers to each software upgrade by the event during which it was tested. For example, AOC-WS 10.1 RE11 is the software upgrade tested during RE11.
- The future AOC-WS 10.2 delivers a modernized, integrated, and automated approach to AOC-WS operations.

Mission
The Commander, Air Force Forces, or the Joint/Combined Forces Air Component Commander use the AOC-WS to exercise control of joint (or combined) air forces including planning, directing, and assessing air, space, and cyberspace operations to meet operational objectives and guidance. An operational AOC is fundamental in enabling centralized command and decentralized execution of a theater air campaign.

Major Contractors
- AOC-WS 10.1 Production Center: Jacobs Technology Inc., Engineering and Technology Acquisition Support Services – Hampton, Virginia
- AOC-WS 10.2 Modernization: Northrop Grumman – Hampton, Virginia

Activity
- The Air Force uses a three-phase RE test cycle for major AOC-WS 10.1 upgrades, along with lower-level testing events to sustain interoperability and Information Assurance (IA), and to provide low-risk upgrades to third-party systems as required.
  - Phase 1 developmental testing is conducted at CAOC-X, Langley AFB, Virginia.
  - Phase 2 operational testing is conducted to assess effectiveness at CAOC-X.
  - Phase 3 operational testing is conducted at a fielded site to assess suitability.
- The Air Force completed its report on RE11 in March 2013, which included results from Phase 3 testing at 613 AOC, Hickam AFB, Hawaii, from July through September 2012. This testing focused on the ability of the install team to correctly upgrade and configure the AOC from legacy AOC-WS 10.1 RE10 to AOC-WS 10.1 RE11 and perform backup and recovery actions on AOC-WS 10.1 RE11.
- DOT&E observed and reported on RE11 testing, both at CAOC-X and at 613 AOC. The data from this phase of testing form the basis for DOT&E's assessment of AOC-WS 10.1 RE11's operational suitability.
- The Air Force conducted operational testing of AOC-WS 10.1 RE12 in August 2013. AOC-WS 10.1 RE12 incorporated Defense Information Systems Agency upgrades to GCCS-J, updates to other third-party applications, and improvements to the system cybersecurity posture.
- The Air Force conducted all RE11 and RE12 testing in accordance with the DOT&E-approved test plans.

Assessment
- The Air Force adequately tested AOC-WS 10.1 RE11 through a combination of developmental and operational testing; however, there were significant known limitations to IA and Reliability, Availability, and Maintainability (RAM) data collection. The DOT&E-approved test plan anticipated the lack of RAM data, so the Air Force adopted a mitigation strategy in which they will collect and provide the required data from fielded sites, allowing DOT&E to refine the assessment results based on the ongoing analysis.
- Following the completion of Phase 3 testing at 613 AOC, ACC conducted a thorough analysis of the 12 outstanding CAT I Urgent deficiencies and decided to accept the risk of fielding AOC-WS 10.1 RE11 to meet critical operational needs, while maintaining the expectation that the AOC-WS Program Office will fix unresolved CAT I deficiencies in an expeditious manner. Of the 12 CAT I deficiencies, 4 affected operational effectiveness, 7 affected operational suitability (2 were subsequently closed), and 1 affected IA.
- AOC-WS 10.1 RE11 has the capability to produce the primary products necessary to meet the established AOC battle rhythm at threshold levels. AOC-WS 10.1 RE11 demonstrated interoperability with other mission-critical systems and provides a significant improvement to AOCs in both internal functionality as well as the ability to interoperate with respective Combatant Commands. However, significant workarounds are required to avoid errors in products due to the existing CAT I deficiencies.
- AOC-WS 10.1 RE11 is not operationally suitable. Phase 3 testing showed that the system could not be built, configured, or maintained adequately at an operational site. All seven suitability-related CAT I deficiencies describe inadequacies in documentation of required plans and procedures for fielding and maintaining the system. Additionally, the RE11 training schedule did not prepare operators across multiple AOC divisions to complete tasks using AOC-WS 10.1 RE11, and it did not provide system administrators sufficient instruction in maintenance and troubleshooting of the operational system.
- The AOC-WS 10.1 RE11 test article and associated documentation that entered OT&E was the direct output of the developmental test-fix-test cycle. Time constraints precluded entering OT&E with a "clean rebuild" of the test article and a cohesive consolidation of the documentation that incorporated all the supplements (software and configuration modifications) used to "fix" the previously discovered problems.

- AOC-WS 10.1 RE11 has a valid "Authority to Operate" through November 2015. AOC-WS 10.1 RE11 has yet to be assessed completely for IA. Since AOC-WS 10.1 RE12 and recurring periodic software patches have significantly improved the cybersecurity posture of the system, the Air Force should complete IA testing on AOC-WS 10.1 RE12 by a representative, emulated adversary (a DoD cyber Red Team) in an operationally realistic environment, preferably during a major command post exercise.
- The duration and nature of RE11 test events provided insufficient time to allow DOT&E to accurately assess RAM under operationally realistic system usage. Additional data must be collected at operational sites to assess the effects of RAM on AOC mission operations.
- Phase 2 of RE12 testing successfully validated the closure of 11 of the 12 open CAT I deficiencies planned for remediation and demonstrated the ability of AOC-WS 10.1 RE12 to execute all critical missions and produce threshold or larger-sized target lists and Air Tasking Orders on schedule.
- The 605th Test and Evaluation Squadron recommended the Air Force proceed to field AOC-WS 10.1 RE12. This fielding will occur during Phase 3 testing (November to December 2013) at the first operational site, 612 AOC, Davis-Monthan AFB, Arizona. Phase 3 will assess operational suitability, contingent upon resolving the twelfth CAT I deficiency related to executing the build process without needing to rely on extensive high-level help desk support. This CAT I deficiency was successfully resolved with a successful regression build (rebuilding the entire AOC-WS software increment from a clean system, rather than on top of an existing software increment) at the 46th Test Squadron prior to proceeding to Phase 3 testing.
- The AOC-WS 10.1 RE12 test article and associated documentation that entered OT&E was also the direct output of the developmental test-fix-test cycle. Extended developmental test and evaluation efforts ensured that this test article was based on a "clean rebuild" of the AOC-WS 10.1 RE11 baseline first followed by the AOC-WS 10.1 RE12 build, consistent with the plan for fielding to operational sites.
- The key to successful testing and fielding of AOC-WS 10.1 RE11 and AOC-WS 10.1 RE12 continues to be closer collaboration between the AOC-WS Program Office and the Defense Information Systems Agency to increase the likelihood that GCCS-J meets the operational needs of the AOCs. AOC-WS tester involvement in GCCS-J testing continues to identify critical problems early for corrective action.

Recommendations
- Status of Previous Recommendations. The Air Force has made progress to adequately address previous recommendations. Over the past year, the Air Force has increased its efforts with the two long-term FY11 recommendations (below), and this engagement needs to continue. Additionally, the Joint Staff has not yet responded to the FY12 recommendation for a systems integration group for command and control systems.
  1. Coordinate with third-party programs to ensure that critical AOC-WS third-party systems (such as GCCS-J) have testable requirements that meet AOC-WS requirements. The requirements should be vetted within the appropriate user and program communities for schedule and funding priority.
  2. Ensure the AOC-WS users and test community continue to actively participate in GCCS-J developmental and operational testing and collaborate to develop a capability to adequately test GCCS-J to AOC-WS threshold stress levels.
- FY13 Recommendations. The Air Force should:
  1. Continue to improve the process of build documentation, production, and validation to include assessing the utility of conducting regression builds following Phase 2 testing at CAOC-X prior to conducting subsequent builds. Conduct an assessment of operational risk to the AOC warfighting mission using DoD cyber Red Teams in an operationally realistic environment (at an operational AOC where AOC-WS 10.1 RE12 is fielded), consistent with DOT&E IA procedures.
  2. Require operational AOC sites to collect and report all significant RAM data to the Program Office, assess the data for needed system improvements, and report on RAM improvement efforts monthly to the Configuration Review Board. DOT&E will continue to review RAM data periodically and adjust our findings in accordance with this analysis.