

Aerosol and Vapor Chemical Agent Detector (AVCAD)



In April 2023, DOT&E published an operational assessment (OA) report that states, the Aerosol and Vapor Chemical Agent Detector (AVCAD) demonstrated the ability to detect chemical agents during testing, but in most cases did not meet detection requirements. AVCAD provides a new capability to detect aerosol agents that is not possible using the currently fielded Joint Chemical Agent Detector. AVCAD demonstrated reliability is substantially below the required level. The program office must mitigate several vulnerabilities to be survivable in contested cyberspace. DOT&E approved the Milestone C (MS C) Test and Evaluation Master Plan (TEMP) in June 2023, which requires additional development and operational testing on low-rate initial production systems to address deficiencies reported in the DOT&E OA.

SYSTEM DESCRIPTION

The AVCAD is an aerosol and vapor chemical warfare agent (CWA) and non-traditional agent detector. The Joint Services, without the Air Force, plan to employ AVCAD as a handheld detector; a fixed-site monitoring device; and on manned vehicles, ships, and aircraft to detect and alert personnel to the presence of chemical warfare agents and support force-protection decisions. The AVCAD is designed to be powered by shore power, battery, or by the platform on which it is integrated.

MISSION

Joint Warfighters equipped with the AVCAD will employ the system to detect chemical warfare agents and non-traditional agents in aerosol and vapor physical states; alert personnel in the event of a chemical attack; and support post-attack reconnaissance, surveillance, and decontamination across the full range of military operations.

PROGRAM

AVCAD is a joint Acquisition Category III program which was authorized in June 2023 to enter the production and deployment phase. AVCAD provides a new capability to detect aerosol agents that is not possible using the currently fielded Joint Chemical Agent Detector. DOT&E approved the MS C TEMP to support the

low-rate initial production decision in June 2023. The production and deployment phase of testing will begin in December 2023. The full-rate production decision is targeted for February 2025.

» MAJOR CONTRACTOR

- Smiths Detection, Inc. – Edgewood, Maryland

TEST ADEQUACY

DOT&E published an OA in April 2023. This assessment was based on a series of test events, as reported in the FY22 annual report, to include developmental test (DT), an OA, chamber testing, a DT Soldier Touch Point, and combined DT/operational test (OT) in FY22. Operational and chamber testing was conducted in accordance with DOT&E-approved plans. DOT&E observed all operational events. There were four different hardware and software configuration changes preventing a full dataset on the last configuration. Full retesting on the last configuration did not occur because it was known that the Materiel Developer wanted to continue to implement more changes such as software algorithm updates, hardware updates, and preventative maintenance updates. DOT&E supported the decision to enter the production and deployment phase of testing under the condition that regression testing on software and testing of hardware changes be performed on the production-representative version. Ship shock deficiencies

were addressed, but still need to be re-tested. DOT&E coordinated with Service operational test agencies on the scope and scale of retesting detailed in the DOT&E-approved MS C TEMP.

PERFORMANCE

» EFFECTIVENESS

AVCAD demonstrated the ability to detect and identify aerosol and vapor CWAs, but in most cases, the system did not meet detection requirements. AVCAD detected CWAs at higher concentrations than required in the Capability Development Document. Performance results for aerosol agents varied significantly between systems with the same software and hardware configuration. AVCAD did not meet its false alarm rate requirement during the OA and demonstrated a propensity to false alarm in various operationally relevant environments.

AVCAD must overcome several challenges to be operationally effective. AVCAD demonstrated the ability to detect chemical agents, but in most cases, the system did not meet detection requirements. During chamber testing, AVCAD demonstrated the capability to detect agents in a majority of environmental conditions tested, including aerosolized agents that cannot be detected by the currently fielded system. However, AVCAD detected chemical agent at the required level in only 22 percent of the test cases. Despite this increased capability, the AVCAD would not provide sufficient early

warning time for unprotected forces. AVCAD detection performance varied significantly by individual detector. Early in testing, the AVCAD false alarm rate was meeting requirements in a variety of environments but did not meet the requirement after a software version change. The Materiel Developer expects this to be fixed for the next round of testing.

» **SUITABILITY**

AVCAD must overcome several challenges to be operationally suitable. AVCAD reliability was well below the required levels in all environments tested and did not improve during engineering and manufacturing development testing. AVCAD usability needs improvement due to reliability and communication challenges. AVCAD Operator training and the system technical manual should be updated to include step-by-step troubleshooting and maintenance instructions. The Air Force dropped out of the program because the reliability levels for their mission were insufficient. As noted in the FY22 Annual Report, the Joint Requirements Office was going to revisit the operational requirements after the Air Force left the program. This is currently ongoing.

» **SURVIVABILITY**

Testing identified AVCAD cyber vulnerabilities in electromagnetic environments and are detailed in the classified annex of the AVCAD OA, dated April 2023.

RECOMMENDATIONS

Joint Product Manager for Chemical, Biological, Radiological, and Nuclear Sensors should:

1. Improve the AVCAD probability of detection.
2. Reduce the AVCAD propensity to false alarm.
3. Improve AVCAD operational reliability, system-to-system variation, and usability.
4. Improve AVCAD technical manuals to aid in trouble shooting.
5. Mitigate the identified cyber vulnerabilities.
6. Continue to work with the Joint Requirements Office and the Services to reassess the operational performance and reliability requirements due to the Air Force departure from the program.