Joint Chemical Agent Detector (JCAD)

The Joint Chemical Agent Detector (JCAD) is a hand-held device intended to automatically detect, identify, quantify, and warn users of the presence of nerve, blister, and blood chemical agents. JCAD will be fastened to the operator's load-bearing equipment or mounted on a ground vehicle, aircraft, or ship. JCAD is used as a mobile and fixed-site monitor, as well as a quick-responding survey instrument. JCAD's ability to detect extremely low levels of agent concentration will be used in shelter and aircraft operations. The system operates as a stand-alone detector, as part of a small local network of other JCAD units, or can interface with the Joint Warning and Reporting Network as part of a larger network of biological and chemical detectors.

JCAD's hardware consists of the main detector unit (DU); an accessory for extending the limit of the DU (named the Preconcentrator); and an interface cradle that connects the DU with external power, external alarms, and other DUs to form a local network. All Services will use one basic DU configuration. JCAD will replace or augment existing Service-unique chemical agent detectors.

The Air Force is JCAD's lead Service material developer, while the Army is the lead Service developmental and operational tester and evaluator. A combined Milestone I/II decision in December 1997 allowed JCAD to enter into Engineering and Manufacturing Development (EMD). Phase I of the EMD contract was awarded to BAE Systems in February 1998 and the Phase II contract option was exercised in April 1999. DOT&E placed JCAD on oversight in January 2000.

DOT&E approved the updated Operational Requirements Document in March 2002. Due to problems in the development of the Preconcentrator accessory, there will be a separate Milestone C review and IOT&E for the UD and accessory unit. The current schedule calls for the DU Milestone C in June 2004 and IOT&E beginning in 2QFY05. The Preconcentrator accessory scheduling is still in formulation. The Test and Evaluation Master Plan is currently being staffed through the Services.

TEST & EVALUATION ACTIVITY

During FY03, several portions of the JCAD's Production Qualification Test (PQT) program were completed and the program office prepared for the live agent portion of PQT. The Army completed both cold region and tropical region operation and storage testing, and the contractor modified the JCAD's design based on the lessons learned. In addition, the program office and contractor executed several field tests to better characterize the JCAD's false alarm rate. Portions of this testing may have to be repeated due to extensive software revisions to JCAD's DU.

Operation Iraqi Freedom, limited the number of Service personnel available to conduct the scheduled Limited User Test. This test was intended to provide the developers with more operational effectiveness and mission impact insights for reliability, availability, and maintainability data in advance of the IOT&E. To gather additional data in these areas, the program office enhanced and lengthened the cold region and tropical region developmental testing. In addition, the program office approved a Field Simulant Test program to be conducted during FY04 in parallel with the PQT live agent chamber testing.

Joint Chemical Agent Detector is a hand-held device intended to automatically detect, identify, quantify, and warn users of the presence of chemical agents that will detect extremely low levels of agent concentration.

TEST & EVALUATION ASSESSMENT

DOT&E, the Air Force Operational Test and Evaluation Center, and the Navy Operational Test and Evaluation Force have all expressed to the program office the concern that the planned developmental testing will be insufficient to adequately evaluate the JCAD's effectiveness and

suitability for aircraft operations. These issues include aircraft integration, operations under reduced atmospheric pressure conditions, agent detection, power requirements, aircraft employment concepts, training, and system logistics. The PQT plan provides for a robust set of agent and interferent (ie fog, smoke, blowing dust, etc.) challenges to the JCAD, including weapons-grade agent testing. Preliminary PQT data indicate that the JCAD is experiencing problems in detecting chemical agents at extremely low concentration levels. This must be corrected for JCAD to be operationally effective in aircraft, shelter, and other operations that require undiminished visual acuity.

Developmental test results indicate the JCAD has an unacceptably high false alarm rate, particularly when exposed to insect repellent and Aqueous Film Forming Foam (AFFF). AFFF is commonly used as a fire extinguishing agent on Navy ships, as well as in Air Force aircraft fire bottles, hangars, runways, and ramps. Recent developmental testing appears to establish a correlation between aircraft in-flight pressure changes and false alarms. The contractor is attempting to resolve the false alarm issue by refining the JCAD's DU detection algorithm. Additional field testing is scheduled for FY04 to determine the success in addressing this issue.

The JCAD's Preconcentrator accessory unit experienced software and hardware problems. The unit performs erratically in high and low temperatures and causes the DU to go into failure mode when the unit is removed from, and then reinserted into, the interface cradle. Glass shards from the interior of the Preconcentrator can enter the DU and interfere with its detection of chemical agents. DU live agent PQT continues while the contractor develops and implements a solution for the Preconcentrator problems. Once the Preconcentrator is fixed, the program office will have to conduct live agent regression testing and additional operational testing on the Preconcentrator-equipped DU.

The contractor examination of JCAD units previously used in developmental testing indicates that the surface acoustic wave (SAW) array service life will be approximately 1,100 hours of operation, which is considerably less than previous estimates. The program office will add a PQT service life subtest to better estimate service life. The contractor assessment also indicates that the SAW array might have to be replaced once the unit has been exposed to chemical agents more than eighty times. This would have a negative impact on several projected Service uses for the JCAD, including screening of vehicles and personnel during decontamination operations. It would also place a burden on Service logistics and maintenance systems. The contractor is exploring ways of allowing the JCAD's operator or unit maintenance personnel to more easily replace the detector array without requiring depot-level maintenance.

From the aspect of JCAD response, agent-simulant correlation testing has identified Triethyl Phosphate (TEP) as the most desirable simulant. The Navy determined that TEP is not currently safe for use on ships and a different simulant is required.