

# Next Generation Chemical Detector (NGCD)

## Executive Summary

- The Services and National Guard Bureau intend for the Next Generation Chemical Detector (NGCD) program to provide chemical detection and identification systems to detect and identify chemical warfare agents (CWA), non-traditional agents, and toxic industrial chemicals (TIC) in various physical states to support force protection decisions, situational awareness, and battle management decisions.
- The Services conducted Early Operational Assessments of prototype systems to assess the potential contribution of the NGCD detection and identification technologies in various operational mission scenarios to inform operational requirements and entry into the Milestone B Engineering Manufacturing Development phase of the acquisition program.
- The NGCD prototype systems demonstrated poor performance in the areas of detection, automated algorithm identification, reliability, and operator usability.
- In October 2017, the program manager made the decision to extend the Technology Maturation and Risk Reduction phase of the NGCD Increment 2 acquisition program based on the poor demonstrated technical and operational performance.

## System

- The NGCD program consists of four increments of capability to detect and identify CWA, non-traditional agents, and TIC hazards in different physical states in support of the Joint Forces and the National Guard Bureau Civil Support Teams.
- The Services and the National Guard Bureau intend for:
  - NGCD Increment 1 to detect CWA and TIC in aerosol and vapor form, and alert personnel to an attack to support post-attack actions, such as reconnaissance, surveillance, and decontamination operations.
  - NGCD Increment 2 to detect and identify CWA and non-traditional agents in liquid and solid states to characterize threats on various surfaces to support hazard warning, force protection, situational awareness, and battle management decisions.
  - NGCD Increment 3 to collect samples, transfer the samples to a chemical analysis capability, and analyze and characterize the sample to determine the presence of target chemicals.
  - NGCD Increment 4 to be a wearable detector to alert personnel to the presence of chemical vapors and explosive atmospheres that present an immediate hazard. The Increment 4 program will be initiated upon completion of research and development efforts.

## Mission

Commanders of Joint Forces and the National Guard Bureau Weapons of Mass Destruction Civil Support Teams intend to employ the NGCD systems to detect, characterize, and identify

## Next Generation Chemical Detector Competitive Prototype Systems

### Increment 1



Chemring

Signature Science

Smiths Detection/908 Devices

### Increment 2



Chemimage – Short Wave IR Hyperspectral Imaging (HIS) Liquid Crystal Tuneable Filter (LCTF) Variant

Chemimage – Short Wave IR Hyperspectral Imaging

FLIR - Long Wave IR Hyperspectral Imaging / Raman

Chemring

### Increment 3



Bruker

Chemring

FLIR - Forward Looking Infrared IR - Infrared

chemical hazards in order for the force to take protective measures and mitigating actions to continue military operations.

## Major Contractors

- NGCD Increment 1:
  - Smiths Detection, Inc. – Edgewood, Maryland
  - Chemring Sensors and Electronic Systems, Inc. – Charlotte, North Carolina
  - Signature Science, LLC – Austin, Texas
- NGCD Increment 2:
  - Smiths Detection, Inc. – Edgewood, Maryland
  - Chemring Sensors and Electronic Systems, Inc. – Charlotte, North Carolina
  - Nomadics, Inc. – Stillwater, Oklahoma
  - ChemImage Bio Threat, LLC – Pittsburgh, Pennsylvania
- NGCD Increment 3:
  - Bruker Detection Corporation – Billerica, Massachusetts
  - Chemring Sensors and Electronic Systems, Inc. – Charlotte, North Carolina
  - Battelle Memorial Institute – Columbus, Ohio

## Activity

- The Army Operational Test Command conducted a Multi-Service Early Operational Assessment of the NGCD at Fort Hood, Texas, from October 24-27, 2016.
- The Navy's Operational Test and Evaluation Force conducted an Early Operational Assessment of the NGCD aboard the USS *Bataan* (LDH 5) in port at the Naval Station Norfolk, Virginia, from November 14-17, 2016.
- The Early Operational Assessments were conducted in accordance with the DOT&E-approved test plan.
- The Edgewood Chemical and Biological Center conducted Final Prototype Testing of the NGCD Increment 1 from 4QFY16 through 1QFY17 in Edgewood, Maryland.
- The Edgewood Chemical and Biological Center conducted Final Prototype Testing of the NGCD Increment 3 from 1QFY17 to 2QFY17.
- In October 2017, the program manager extended the Technology Maturation and Risk Reduction phase of the NGCD Increment 2 program based on the poor technical and operational performance demonstrated.

## Assessment

### NGCD Increment 1

- The NGCD Increment 1 prototype systems demonstrated detection performance that was many orders of magnitude short of the operational requirement for some agents during prototype agent testing. The false alarm rate of the detectors could not be assessed due to poor detector sensitivity.

- The demonstrated vapor detection capability for traditional chemical agents was generally worse than, and in one case no better than, that of the currently fielded Joint Chemical Agent Detector.
- Prototype system reliability was poor and hindered the ability to collect planned test data in some instances.
- The size and weight of the prototype systems reduced operators' ability to effectively employ the systems during some missions.

### NGCD Increment 3

- Prototype systems were able to identify chemical agents at or near the required limit of identification or sensitivity for liquids and solids.
- The systems experienced significant false identification of chemical agents in samples.
- Prototype system reliability was poor during the Early Operational Assessment.

## Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY17 Recommendations. The program manager should:
  1. Conduct additional technology development to improve detection and identification performance and plan false detection testing in concert with agent testing.
  2. Implement a reliability growth program and continuously assess progress.