Mobile Chemical Agent Detector (MCAD)

The Ideal Solution for Standoff, Mobile Chemical Detection Capability

Northrop Grumman's Mobile Chemical Agent Detector (MCAD) meets customer requirements for standoff mobile chemical detection, whether for homeland security or military operations.

The MCAD detects chemical warfare agents and toxic industrial chemicals within a 5 kilometer radius, providing operators true standoff detection capability. This passive, infrared, standoff chemical detector uses proven pattern recognition algorithms to detect the standard library of chemical warfare agents and toxic industrial chemicals; it also has the ability to discriminate between natural and manmade interferents. MCAD does not emit any interrogating signal, resulting in a detector unit that is low-power, untraceable at a distance, and eye-safe.

MCAD detectors can be networked, allowing operators to detect and track the specific location of a threat cloud, while determining the direction and size. Detection and identification data is displayed on a user-friendly display. The MCAD can be wirelessly controlled, and connected with wide-area communications networks. Successful testing on land, air, and seaborne platforms is a testimony to MCAD's ruggedness utilizing well-established technology.

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MCAD Overview

Operational Overview

The MCAD is composed of four Line Replaceable Units (LRUs):

- Sensor
- Scanner
- Ruggedized Laptop
- Communications/Power Assembly (CPA)

MCAD features a pan-and-tilt scanner/sensor assembly so that operators can engage a given azimuth and elevation, and scan a desired Field of Regard (FOR). Operators can use pre-programmed scanning patterns, user-defined patterns, or control the MCAD manually. MCAD automatically locates itself on a map using a sensor-embedded GPS. A Digital Magnetic Compass (DMC) integrated into the CPA is used to automatically orient the sensor on the map.

A computer integrated into the sensor, which automatically self-calibrates, contains the detection algorithm software and executes limited sensor control, reducing the amount of data sent from the sensor.

The military-hardened CPA produces 24V of power and acts as a relay point for Ethernet communications from the Sensor and contains both serial and Ethernet connections.

The militarized laptop contains the user interface software, graphical user interface (GUI), and is used as the primary controller to monitor the performance of the MCAD system. The laptop stores and displays detection information, and can automatically send reports to an external network. The user interface software automatically reports Built-In-Test (BIT) errors and their severity. The MCAD can also be operated remotely using WiFi.

Detection Overview

The MCAD operates in the 7-12 µm region of the electromagnetic spectrum –the region considered to be the best spectral region to use for standoff chemical detection, as the 7-12 µm infrared region contains a significant amount of information related to the chemical environment.

Every environment contains naturally-occurring infrared radiation. This radiation interacts with the atmosphere and vapor clouds of interest, by emitting or absorbing radiation at specific wavelengths. A passive, eye-safe Fourier Transform Infrared (FTIR) spectrometer measures these wavelengths, which are subsequently compared to a known library of chemical agents . Unlike laser systems and some hyper spectral imaging systems, a FTIR simultaneously monitors the entire spectral region. Operators can use pre-programmed scanning patterns, user-defined patterns, or control the MCAD manually. Custom scan patterns can easily be created.

MCAD is designed to integrate information from multiple sensors. A single detector produces sufficient data to create a directional display. Triangulation of data from multiple MCAD sensors may be used to determine cloud location, size, shape, and direction of cloud movement. Upon detection, the MCAD alerts operators with an audible and/or visual alarm.

Specifications

Scanning pattern:	360°; 26°/sec max azimuth rate; +/- 200° max azimuth extent; +/- 90° max elevation extent
Size (sensor):	22.25 x 13.94 x 7.72 in (565 x 354 x 196 mm)
Weight:	Sensor: 32 lbs (14.5 Kg) Scanner: 44 lbs (20 Kg) System Electronics: 20 lbs (9.1 Kg)
Power:	10 - 32 V DC 110 - 220 V AC 250 Watts without heaters 550 Watts with heaters
Environmental Operating Temperatures:	49°C to -32°C (120°F to -26°F)
Storage Temperatures:	71°C to -40°C (160°F to -40°F)
Humidity:	Up to 100%
Salt, Sand, Dust, Heavy Rain:	Methods 509.3, 510.3 (Procedures II and I), and 506.3 (Procedure I)
Shock:	MIL-STD-810F (Ground Vehicle)
EMI/EMC:	MIL-STD-461/462

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