DEFENSE & SECURITY

CAE MAD-XR

Magnetic Anomaly Detection-Extended Role

CAE is the world leader in the design, manufacture, and integration of digital magnetic anomaly detection (MAD) systems. The company has been designing MAD systems for over 40 years and has delivered over 2,000 MAD systems and equipment to military forces around the world. Most of these systems have been installed on antisubmarine warfare (ASW) aircraft, including both fixed and rotary-wing aircraft, and used primarily for the detection of submarines. With the changing state of warfare, however, there are potentially new applications in the use of MAD technology.

CAE ASQ-252(V) MAD-XR

The latest CAE MAD system is called ASQ-252(V) MAD-XR (Magnetic Anomaly Detection-Extended Role) and is significantly more compact than previous MAD systems. CAE MAD-XR is a MAD sensor with reduced size, weight, and power requirements allowing the MAD system to be extended to smaller platforms such as unmanned aerial systems (UASs), helicopters and small fixedwing aircraft. The CAE MAD-XR prototype was successfully flown in 2013 and its performance matched that of the much larger CAE ASQ-508 MAD system. Following flight testing the MAD-XR was refined to ensure optimal design for production.

CAE ASQ-252(V) MAD-XR functionalities

The MAD-XR system consists of highly sensitive magnetometers, which are designed to sense changes in the earth's magnetic field due to metallic objects in the vicinity. Typically, the MAD-XR system is mounted in the tail area of an aircraft to minimize magnetic interference. The range of the system varies but will generally detect anomalies at approximately 1,200 metres. When the system detects a magnetic anomaly, an audio alert signals the crew and the display provides contact and range information.

CAE developed software provides data related to submarine location in the form of lateral and vertical separation (left/right indication) at the closest point of approach (CPA). This algorithm opens the route for recommended tactical flight path to optimize target localization and detection. The inclusion of high bandwidth frequency to digital conversion provides better detection due to reduced background noise in higher frequencies as well as potential classification on the signature of the submarine.

CAE ASQ-252(V) MAD-XR is a passive sensor

Other sensors cannot detect MAD-XR's operation. It is also relatively short range, affording greater accuracy in localization and cannot be jammed. In certain situations, the sensor complements ASW tools such as active and passive acoustics; in others, it has inherent advantages. For instance, CAE's advanced signal processing makes MAD-XR very effective in shallow water whereas sonar is challenged by current, tide, and thermal variation of water layers, and is subject to false acoustic returns due to the reverberation of sound from multipath signals.

Benefits of CAE ASQ-252(V) MAD-XR

- A valuable tool in the ASW toolkit
- Accurate localization sensor
- Low SWaP (Size Weight and Power)
- Capable of onboard installation
- Manned and unmanned platform capable
- Passive sensor / cannot be jammed
- Highly performant in shallow water
- Continuous compensation
- Enhanced Detection
- Change Detection

Shallow water operations

The CAE MAD-XR product is fully effective in shallow water as it uses noise-reduction techniques, such as adaptive filtering, which greatly reduces the amount of geological noise presented to the operator and the automatic detector. Flight tests have confirmed that CAE MAD-XR operates well in high geological noise conditions.

Change Detection in shallow water

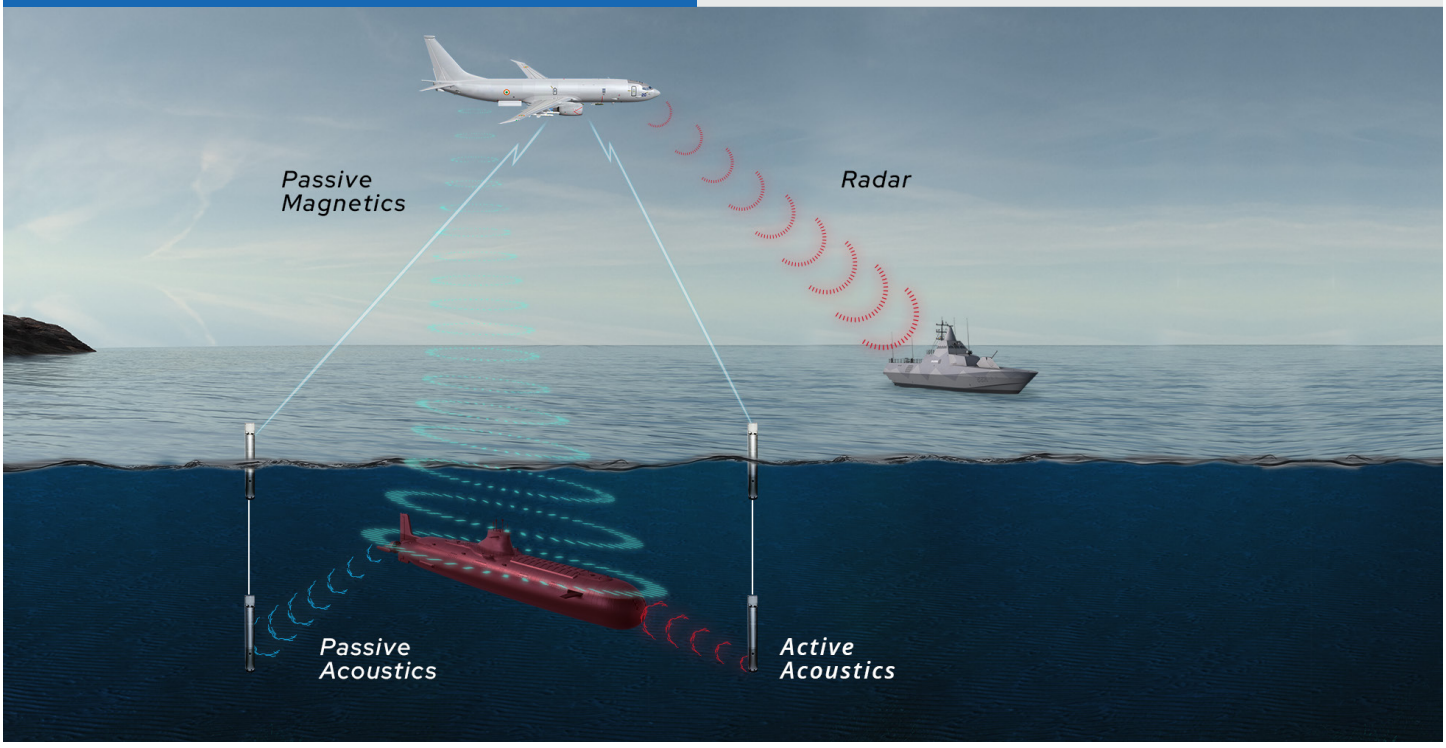
To further increase the effectiveness of MAD-XR in shallow water, as an option, it is possible to map the natural magnetic field due to geological formations in a given operations area. This mapped data is then used by MAD-XR software to predict the contribution from the geology and eliminate it from the measurement, effectively performing a full environmental change detection to isolate anomalies from newly present sources, such as submarines. The geomagnetic mapping is ideally done ahead of time, but it can be done during operations in a previously unmapped area. This feature is currently in development and will be offered as an upgrade option.

CAE ASQ-252(V) MAD-XR

Parameter	ASQ-252(V)
Weight	Approx. 2.7 kg
Sensor Size	15 cm (diam) x 24 cm Interface unit: 16 cm x 13 cm x 3.2 cm
Power	28V DC - 35W Typical - 75W max
Interface	Ethernet or RS-422

CAE MAD-XR applications

- Anti-submarine warfare
- Land-based surveillance and detection
- Target recognition when mounted on ground vehicle or UAV
- Detection of metallic objects through walls, underground, or in dense forest canopies
- Para-military and civil applications such as drug trafficking, power line monitoring, tunnel detection and magnetic surveys.



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