RAVEN Surface Ship Electronic Countermeasures System

The Lockheed Martin Canada RAVEN System solution provides modern, effective on-board RF Electronic Countermeasures (ECM) through a wide range of jamming techniques. Deception, noise and self-synchronizing angle deception using cross-polarization combine to deny the exploitation of the electromagnetic spectrum by hostile forces. RAVEN provides 360° Anti-Ship Missile Defence (ASMD) self-protection for all naval platforms and is highly scalable. RAVEN consists of a set of steerable mid/high band antennas (6 to 18 GHz) with an option for low and/or very high band frequency coverage.

RAVEN builds upon the RAMSES (Reprogrammable Advanced Multimode Shipboard Electronic Countermeasures System) capabilities in service today with the Royal Canadian Navy through the introduction of modern technologies providing an open architecture that enables the RAVEN design to evolve more quickly to modern threats.

Unlike traditional radar jammers, RAVEN uses sophisticated RF and PRI prediction technology that is capable of producing both down-range and up-range false targets to a multitude of modern radar systems using complex PRI and RF agility patterns. RAVEN incorporates proven, leading edge, receiver technology to produce advanced deception and obscuration countermeasure waveforms against a variety of radar systems and radar-guided missile seekers.

RAVEN incorporates System on Chip (SoC) technology for the application of special mode techniques, soft-kill assessment, and antenna stabilization and control. The SoC design is highly modular and easily adaptable to various antenna assemblies and ship stabilization interfaces.

**FEATURES AND BENEFITS**

- **Predictive DRFM-based ECM Receiver**
- **Prediction-Based ECM**
- **Coherent / Non-coherent ECM**
- **Self-Synchronizing Angle Deception**

**TECHNIQUES GENERATOR**

RAVEN is capable of performing both coherent and non-coherent radar countermeasures. The non-coherent channel is capable of AM and FM techniques with an instantaneous bandwidth of 1 GHz. The noise channel is constructed around a direct digital synthesizer for extremely fast and accurate signal generation of transponder style techniques. Noise techniques can be set on with 1 MHz resolution and sweep bandwidths selected with 1 MHz resolution. The coherent jamming channel is implemented using a Digital RF Memory (DRFM). The DRFM is constructed around a 10-bit quantization ADC and DAC for low spurious responses. The DRFM memory depth is 1ms which allows use with wide pulse widths (i.e. pulse compression radars). The DRFM has an instantaneous bandwidth of 2 GHz and the centre frequency can be set on with 1 MHz resolution.

**Up-range deception in addition to current down-range deception**
- **Selective / Surgical Countermeasures**
- **Digital capture and re-creation with no signal degradation**
- **Proven, fielded Coherent (DRFM) / Non-coherent (Noise) ECM**
- **Deception / Obscuration**
- **Unlimited programmable technique combinations**
- **Integration with other mechanically steered antennas**
- **System-On-Chip Technology and Scalable Architecture**
- **Small footprint and light weight enabling the potential deployment of the system to a smaller platform such as a USV**
- **Low cost of ownership with no ITAR**

**ERP:**

<table>
<thead>
<tr>
<th>JAM TO SIGNAL RATIO:</th>
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<td>High Power threats typically +30 dB</td>
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<tr>
<td>Low Probability of Intercept (LPI) typically +75 dB</td>
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**AZIMUTH COVERAGE:**

360°

**ELEVATION COVERAGE:**

-30° to +60°
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POLARIZATION
RAVEN is designed to detect, intercept and respond to signals with the following polarizations:

- **Linear** [coverage between Vertical and Horizontal]
- **Slant 45**
- **Circular** [right-hand]
- **Circular** [left-hand]
- **Elliptical** [right-hand]
- **Elliptical** [left-hand]

TECHNIQUE TYPES:

**COHERENT**
- Multiple false targets-main and side lobe
- RGPO, RGPI
- Spot, Barrage, Swept, Barrage / spot noise
- APRM
- RBM
- CRBM
- Sub-pulse masking
- Constant gain or power
- Inverse gain
- AM and Swept AM

**NON-COHERENT**
- Multiple false targets-main and side lobe
- RGPO, RGPI
- APRM
- Spot, Barrage, Swept, Barrage / spot noise
- Constant gain or power
- Inverse gain
- AM and Swept AM

**ANGULAR DECEPTION**
- Cross Polarization using Configurable Positional Waveforms (scripted, adaptive, etc.)

THREATS
RAVEN is able to intercept and generate signals to counter the following threat types:

- **Missile Seekers**
- **Surveillance and targeting Radars**
- **Acquisition Radars**

**MULTIPLE THREATS**
RAVEN provides the capability to JAM up to eight time-shared threats simultaneously within the coverage volume.

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