Electronic Warfare Technologies for Navy and Marine Corps Aircraft

ONR Program Code 31

October 2012

At a Glance

What is it?

- CounterMeasures against advanced InfraRed seekers (CMIR), CounterMeasures against MilliMeter Wave guidance (CMMMW), Multi-Function Capabilities for Missile Warning Sensors (MFCMWS), and Hostile Fire Suppression (HFS) are examples of Future Naval Capabilities (FNC) projects sponsored by the Office of Naval Research (ONR).

How does it work?

- CMIR and CMMMW use advances in laser-based Directed InfraRed CounterMeasures, spectrally balanced and kinematic infrared decoys, and solid-state millimeter wave power amplifiers to disrupt and/or deceive precision guided missiles and munitions that are attacking the aircraft, causing the weapons to miss their targets. MFCMWS uses new technology multi-color Mid-Wave InfraRed (MWIR) sensors to improve the situational awareness of rotor-wing aircraft for Hostile Fire Indication (HFI) and navigation in reduced visibility. HFS will use advances in eye-safe lasers to provide nonlethal shooter suppression.

What will it accomplish?

- New EW technologies will ensure the survivability of aircraft, provide increased threat awareness, and counter enemy RF-based systems and support operations against asymmetric threats.

Point of Contact

Dr. Peter Craig
peter.craig@navy.mil

OVERVIEW

- CMIR will coordinate on-board and off-board IR countermeasures into a robust jamming system.
- CMMMW will develop solid state mmW power amplifiers and a multi-port power combiner to achieve the required total radiated power levels necessary to jam mmW guidance systems from a small decoy form factor.
- MFCMWS will provide signal processing and algorithm development for on-the-move HFI and optical flow-based passive navigation monitoring.
- HFS will provide a nonlethal effective, low-cost and low weight hostile fire suppression capability for rotary wing airfcraft.

CMIR will utilize laser-based DIRCM techniques (jam codes, algorithms, advanced modeling and simulation methodologies) and technologies (multi-band MWIR laser, compact pointer/tracker) from previous ONR and FNC efforts as a baseline for developing techniques for coordinated use of laser-based jamming and off-board decoys.

CMIR and **CMMMW** will provide self-protection against Man Portable Air Defense Systems and other Surface to Air Missiles and Air to Air Missiles that are high priority threats to tactical aircraft.

MFCMWS addresses both of the leading contributors to helicopter losses in Afghanistan and Iraq by providing accurate and timely warning and vector of hostile fire and improved safety and efficiency of landing in unprepared high obscuration landing zones. MFCMWS will expand on 2-color mid-wave infrared missile warning sensor and threat processor technologies. The passive navigation aids effort will leverage optical flow processing techniques developed to enable super resolution for the Photonics Mast program for Naval Sea Systems Command and investigations into brownout characterization and mitigation techniques funded by the Air Force Research Laboratory and DARPA.

HFS will utilize eye-safe lasers to provide effective nonlethal suppression against current and future nonguided threats to dazzle the weapon operator sufficiently to defeat the weapon engagement.

Research Challenges and Opportunities

- Technologies and techniques for countering advanced infrared seekers and mmW guidance systems using combined on-board jamming transmitters and off-board active decoys.
- Image processing algorithms and techniques to permit hostile fire indication and navigation aids in no-light/obscured visibility environments over 360 degree field of regard using passive MWIR-based missile warning systems.
- Develop and integrate tracking techniques to point closed loop eye-safe lasers to create dazzle effect in hostile shooters.