ONR Expeditionary Maneuver Warfare and Combating Terrorism Department

**Tactical Nighttime Wide Area Surveillance (TNWAS) System**

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**AT A GLANCE**

**WHAT IS IT?**
TNWAS will provide organic capability for day/night airborne persistent surveillance of a 3.8 km diameter area with the ability to stream live video clips to remote video terminals from a small unmanned aerial vehicle.

**HOW DOES IT WORK?**
- A stabilized optical system that can point to a specific geographic location images the area of persistence on a 6k X 6k (36 megapixel) infrared focal plane array.
- An airborne processor receives the data; stores it on a high-capacity solid-state hard drive; generates video chipouts of either live or stored data; geo-references and enhances the imagery; and compresses and disseminates the video streams via aircraft datalink.
- A ground station allows users to command the center of the area of persistence, as well as the location of the individual chipouts.

**WHAT WILL IT ACCOMPLISH?**
- Area of persistence of 3.8 km diameter at 8 hertz
- Effective ground sample distance of 0.55 meters
- Five independent video streams disseminated to remote video terminals
- Image quality of IR NIIRS 4.5
- Geo-location accuracy of less than 15 meters (CE90)
- Payload weight less than 35 pounds
- Video stream/image: MISB/MISP 5.5 and National Imagery Transmission Format compliant

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TNWAS is a Future Naval Capabilities program sponsored by ONR’s Fires science and technology thrust area.

The program is focused on reducing the size, weight, and power (SWaP) of wide-area surveillance payloads to be compatible with small unmanned aerial vehicles, bringing the payload to less than 35 pounds and fewer than 350 watts.

The program will address the lack of organic Marine Corps persistent surveillance on small tactical unmanned aircraft systems. The current electro-optic/infrared (IR) payloads on typical aircraft of this size include full-motion video systems that provide “soda straw” coverage. TNWAS will provide the ability to collect imagery of a large area (3.8 km diameter) from a single platform at a resolution sufficient to achieve IR National Imagery Interpretability Rating Scale (NIIRS) 4.5, with less than 15 meters CE90 geo-location accuracy.

Over the past year, the entire system has been designed to the commander level, including integration with the target platform. An 8k X 8k (64 megapixel) indium antimonide (InSb) IR focal plane array has been demonstrated as a risk-reduction effort. The ability to fit such a large-format array into the budgeted payload SWaP has required significant research into focal plane development to successfully increase the format and reduce the pixel pitch. Additionally, the MIMD architecture identified to perform the required image-processing tasks has been verified to support the timeline required for real-time operation.

Upcoming milestones: Testing the first 6k X 6k (36 megapixel) InSb IR focal plane array; testing the wide field of view optical system; and demonstrating full image processing suite on flight hardware

**Research Challenges and Opportunities:**
- Develop high-operability, large-format IR focal plane arrays in advanced integrated dewar cooler configurations
- Develop highly capable processing architectures with restrictive SWaP constraints
- Develop and miniaturize high-quality geo-referenced pointing and stabilization systems in highly constrained SWaP environments

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