COMPACT HIGH PERFORMANCE FULL-SPECTRUM HYPERSPECTRAL IMAGERS

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US ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND C5ISR Center

Hyperspectral imaging sensors have introduced new levels of performance capability in an effort to achieve increased intelligence, surveillance, and reconnaissance as well as improved target discrimination. The desire to bring this capability to the warfighter has made it necessary to decrease the overall Size, Weight, and Power (SWaP) of these systems while continuing to improve performance. Wavefront Research, Inc. (WRI), under a number of Small Business Innovative Research (SBIR) efforts, has made numerous advancements in the design of hyperspectral imagers that have improved both SWaP and performance of these sensors, reducing their overall size by as much as an order of magnitude, making them ideal for the integration of hyperspectral technology into un-manned areal platforms and man-portable applications.

TECHNOLOGY TRANSITION:

SBIR efforts have supported design advances made by WRI that have been integrated into a number of hyperspectral sensors that span various spectral bands ranging from the visible through long wave infrared. Initial SBIR funding efforts enabled the development of a novel spectrometer design that provides higher throughput and lower backgrounds in a significantly more compact layout. Additional SBIR efforts have enabled WRI to extend this technology towards the development of compact, high performance, full-spectrum hyperspectral sensors, including the development of additional supporting technologies such as common aperture afocal telescopes with focus capabilities, on-board radiometric and spectral calibration hardware, and a dual-focal plane array dewar.

WRI's next-generation full-spectrum hyperspectral imager, constructed under a recent Phase-III SBIR effort, includes several advancements over WRI's previous sensors, such as increased radiometric performance, increased spectral / spatial resolution, and a dual-field-of-view afocal telescope that provides the ability to image off-nadir targets from an airborne platform while maintaining resolution. This sensor is shown in its 16-inch support cube below and illustrates its compact size and form factor. Unlike other combined broad-spectrum sensors currently operating in the field, WRI's full-spectrum hyperspectral imagers provide fully co-registered spectral imagery over the entire full-spectrum waveband and does so with improved radiometric performance in a size and weight that is an order of magnitude smaller than comparable existing sensors. These high-performance compact full-spectrum hyperspectral sensors, made possible by the SBIR Program, are currently being planned for integration into a variety of platforms for use in the field.