



U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND

MANUFACTURING TECHNOLOGY SUCCESS STORY

Low Cost Miniaturized Shortwave Infrared Imagers

PROBLEM / OBJECTIVE

Legacy shortwave infrared (SWIR) cameras have remained relatively expensive, largely as a consequence of increased manufacturing costs resulting from the lack of modern semiconductor processing and manufacturing processes. The legacy manufacturing processes required smaller substrates and a considerable amount of touch labor to produce focal plane arrays (FPAs). Additionally, to improve image quality, legacy cameras use thermal electric coolers (TEC) to reduce dark current and provide thermal stability. Consequently, legacy SWIR cameras have issues with relatively high power consumption.

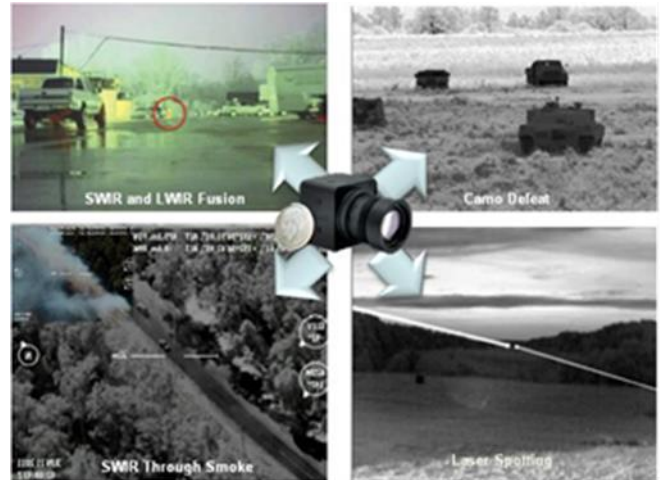
The objective of this ManTech project was to modernize the production of InGaAs FPAs by employing a wafer scale manufacturing process versus a die level process. The epitaxial layer material quality was significantly improved to reduce dark current and eliminate the necessity for a TEC. And digital signal processing was employed to reduce the SWIR sensor's read-out electronics read signal noise.

ACCOMPLISHMENTS / PAYOFF

The SWIR camera project substantially improved the ability to manufacture high quality InGaAs focal plane arrays for SWIR cameras. Accomplishments include:

- Production transition to 4-inch InP wafer processing, allowing for greater yield per run
- Reduced per unit cost with improved yield
- Significantly reduced dark current and noise, enabling higher sensitivity operation.

The SWIR camera provides advanced technology for the direct observation of tactical laser designations for improved targeting. The technology has transitioned to Program Manager Soldier Precision Targeting Devices Joint Effects Targeting System.



(Photo credit: U.S. Army)

This ManTech project supports the Army Futures Command Soldier Lethality modernization priority by significantly improving the Soldier's situational awareness in day, night, and obscured conditions.

The project reduced the Size, Weight, and Power + Cost (SWaP+C) of high sensitivity, uncooled SWIR cameras for Soldier systems. The new SWIR cameras offer positive identification at extended range and provide overmatch against conventional night vision goggles. Improving the FPA quality of InGaAs and reducing packaging requirements significantly improved SWIR camera manufacturability.

PARTICIPANTS

This project was executed by the Combat Capabilities Development Command (CCDC) - Command, Control, Communication, Computers, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) center in collaboration with industry partners.

CCDC C5ISR, Night Vision and Electronic Sensors Directorate, Fort Belvoir, VA

- Collins Aerospace, Princeton, NJ