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Advanced Sensors
Collaborative Technology Alliance

Dr. Dan Beekman
ARL Collaborative Alliance Manager

Mr. Steve Scalera
Consortium Manager, BAE Systems, IEWS
# Advanced Sensors Collaborative Technology Alliance

## Consortium Partners

- BAE SYSTEMS
- Northrop Grumman
- DRS Infrared
- Quantum Magnetics
- General Dynamics Robotic Sys
- U. New Mexico
- Clark-Atlanta
- MIT
- U. Maryland
- Georgia Tech
- U. Michigan
- U. Florida
- U. Mississippi
- U. Illinois – Chicago
- JPL

## Objectives

Technologies that increase sensor performance and utility, and techniques to combine many types of data to provide timely and meaningful information to the soldier. Affordable sensors that provide:

- Continuous situation awareness
- Rapid, precise detection and ID of camouflaged targets
- Environmental sensing for navigation and self-defense

## Technical Areas

- Microsensors
- Electro-Optic (EO) Smart Sensors
- Advanced Radio-Frequency (RF)
Advanced Sensors
Collaborative Technology Alliance

ARL CAM: Dr. Dan Beekman
BAE Systems CM: Mr. Steve Scalera

Microsensors
ARL: Nino Srour
BAE Systems: Mark Falco

EO Smart Sensors
ARL: Dr. Arnie Goldberg
BAE Systems: Dr. Parvez Uppal

Advanced RF Concepts
ARL: Ed Viveiros
BAE Systems: Dr. Norm Byer

- Multi-Target Detection, Classification, & Tracking
- Multi-sensor Fusion
- Autonomous Sensor Management
- System Performance & Analysis
- High Operating Temperature Infrared Detectors
- Innovative Components for Laser Radar
- Hyperspectral Imaging Components
- Automatic Target Recognition and Image Fusion
- Devices and Materials
- Electronically-Scanned Antennas
- Systems Study
- Performance & Analysis
Microsensors
“The Vision”

- Self-localizing and calibrating sensor fields
- Very low power signal processing techniques to provide high throughput computation at nodes
- Fusion of data, features and decisions for robust performance and greatly reduced false alarm rates
- Hierarchical network with intelligent control to preserve power, reduce communication bandwidth and remove operator overload
- Multi-sensor, multi-modal (imaging and non-imaging) low cost sensors for all weather performance
- Advanced algorithms for multi-target discrimination, tracking and identification of people and vehicles
**Objective:** Develop the theory, algorithms, and sensor improvements needed to realize an environment for the autonomous collection, processing, and control of information from networked heterogeneous microsensors to aid in the development of situational awareness and decision making for U.S Military and Homeland Defense applications.

**Challenges:**

- Robust *multi-sensor fusion* over constrained communications bandwidth networks
- Affordable *detection, classification and tracking* of multiple ground targets (people and vehicles) in high clutter environments
- *Automated / aided sensor network configuration and management* so that a wide area can be covered with minimum support from the warfighter
- *Analysis of networked microsensors* for the selection of sensor types and numbers, sensor improvements, architectures and low energy signal processing
**Objective:** Develop multifunction EO/IR components for next generation Army Systems, which will

- Allow exploitation of information in the full EO spectrum
- Allow rapid detection and identification of targets under all conditions

**Challenges:**

- High performance **higher operating temperature infrared detectors** to provide effective fire control in diverse battlefield conditions
- **Active/passive imagers** to afford highly integrated fire control in a compact form factor extending identification range and allowing the soldier to act first
- **Hyperspectral imaging** to afford target detection under low contrast and camouflage
- **High speed optical interconnects** for massive data transmission
- **Multi-modal algorithms** for remote surveillance & motion detection
Multifunction RF Systems

Vision - With a single system and antenna, perform target acquisition and tracking, high data rate communications, combat ID, weapons guidance and active protection functions.

Command Vehicle
- Active Protection
- Target Acquisition
- High Data Rate Comms
- Combat ID

UGV
- Active Protection
- Target Acquisition
- High Data Rate Comms
- Combat ID MMW

UAV's
- MTI/SAR Target Acquisition
- Wind profiles/remote sensing
- High Data Rate Comms
- Combat ID MMW

Weapons Platforms
- High Data Rate Comms
- Missile Command Guidance
- Dynamic Retargeting

Enhanced Lethality and Survivability through Multi-function RF
Objective: Provide enabling subsystem, component and systems studies for low cost multifunction 27-40 GHz RF systems that provide Future Combat Systems with longer range all-weather operation for radar, communication, combat identification, and electronic warfare/signals intelligence functions.

Challenges:

- Affordable **millimeter-wave Electronically Scanned Antennas** (ESAs)
- **Low-loss phase control elements**
- Efficient, high dynamic range **wide bandgap power devices** for transmit/receive modules
- Propagation and scattering studies and phenomenological data for **multistatic** RF systems
The Advanced Sensors CTA is Developing the Critical Technologies to Enable the Future Force to See First, Shoot First, & Finish Decisively