



# **SENSIAC**

## **(Military Sensing Information Analysis Center)**

### **for PEOs/PMs**

Nov 19, 2008  
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SENSIAC Director

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*Information for the Defense Community* 

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# SENSIAC

MILITARY SENSING INFORMATION ANALYSIS CENTER

★ *Information*

★ *Answers*

★ *Experts*

★ *Extended Research / Services*

★★★★★ *For The Military Sensing Community* ★★★★★

SENSIAC is a US Department of Defense Information Analysis Center chartered with the collection, processing and management, analysis, and dissemination of scientific and technical information in military sensing.

SENSIAC is sponsored, administratively managed, and partly funded by the Defense Technical Information Center (DTIC-AI) under contract HC1047-05-D-4000. The Contracting Officer's Representative is Dr. James Howe, Night Vision and Electronic Sensors Directorate (AMSRD-CER-NV-ST-SIP, 10221 Burbeck Road, Fort Belvoir, VA 22060-5806).

**A DTIC Funded DoD Information Analysis Center**



## When the Air Combat Command Needed Someone to Design Flare Patterns to Protect Aircraft During Airborne Refueling, THEY CALLED US.

- When the Air Mobility Command, Air Combat Command, PEO AMO, PM ASE, AFSOC and others want to protect US military Aircraft from MANPADS, they come to SENSIAC personnel led by Charlie Carstensen, and their aircraft join other aircraft flying safely with flare dispenser locations and flare patterns designed by our team: C-5B, C-130, C-17, A-10, F-16, HH-60, MH-53, C-26, AH-64



Charles  
Carstensen



# Who is SENSIAC and What Does it Do?

- Charter and organizations
- Basic Core Services you can receive
- Representative ongoing tasks
- Capability to support you and the deployed forces using your equipment
- Summary



# SENSIAC Charter Technologies



EO

EW/IRCM

**LASERS**

LASERS



# SENSIAC Technologies *(continued)*



Acoustics & Seismic

**Fusion/Net Centric Warfare**

Fusion/Net Centric Warfare



Chem-Bio



# The SENSIAC Team: Depth in Military Sensing Technologies

**JHU/APL**  
Acoustics, Radar,  
Laser,  
Small Sensors

**PENN State/ARL**  
Fusion  
Acoustics, EO/IR,  
Detectors/  
Materials,  
Radar

**UCF/CREOL**  
Photonics, Laser, IR  
Materials,  
Chem-Bio Sensing

**U of Arizona**  
Classic Optics,  
Opto Electronics,  
Nanotechnology

**GT/GTRI**  
EO/IR, Radar, Laser,  
Acoustic/Seismic,  
IRCM/EW,  
Nanotechnology,  
Photonics  
Devices

**SUNY-B/  
CUBRC**  
Fusion,  
Chem-Bio Sensing

**Utah State/  
SDL**  
Laser Radar  
Space Sensors,  
Hyperspectral  
Imaging

**RIT**  
Image  
Understanding,  
Image  
Processing,  
Fusion



# Four Key SENSIAC Attributes

- Team members with upwards of 60 years of history of solving DoD problems
- 10,000 knowledgeable, world-class, scientists and engineers
- Facilities and equipment not available elsewhere
- Not for profit institutes with the defense of the United States of America as our primary business



# SENSIAC Holds the Archives of Military Sensing through SECRET

Every project **MUST** start in the library. Starting anywhere other than the library wastes precious time and money.



I have exactly what you need and will get it to you ASAP.



**FREE** access to the Archives of Military Sensing is but a phone call or e-mail away. (404) 407-7385.

Information for the Defense Community 



# SENSIAC SMEs are not Just Experts, They are the *Right Experts*

- SENSIAC SMEs span not only sensing technology but program phases from basic research to production transition and life cycle support. They:
  - Know (often have invented) the latest technology
  - Know production transition from having been there on numerous programs
  - Are as comfortable with Accelerated Environmental Stress Screening, FRACAS, and Interface Control as with new Technology
  - Solve operational problems in theater
  - Perform technology Insertion
- Call SENSIAC to be put in contact with the person/team you need
  - **No charge of course!**

Joseph Borst  
Laser Threat Warning  
SME  
Consultant

Design Engineer on the first US  
Laser Threat Warning System – AVR-2

Team holds the patent on coherent detection of  
threat lasers

Program Manager AVR-2 Responsible for Full  
Scale Development and Production Transition  
Program manager for AVR-2A production and the  
development and production of the VVR-!  
Manager Tactical systems  
VP Tactical Systems  
Officer –US Army Special Operations Forces



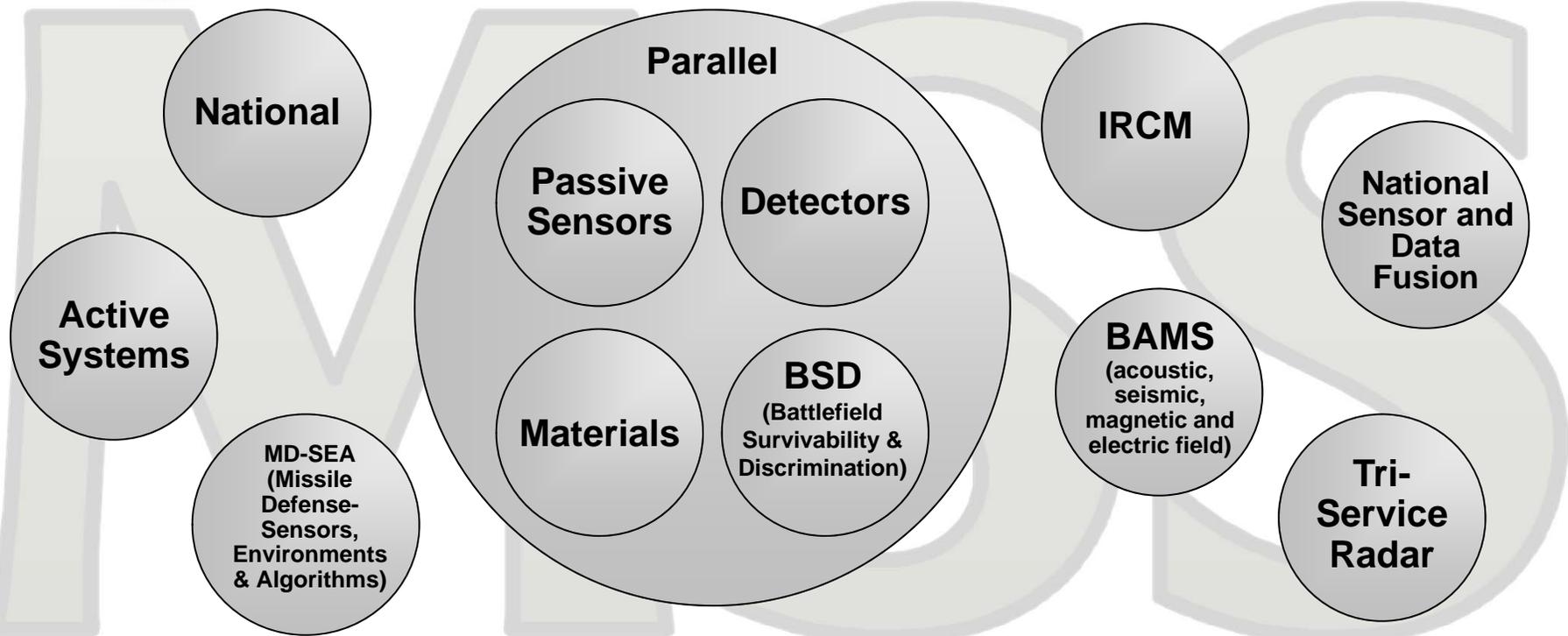
# Questions We Answer/ Information We Provide

- Are pulsed lasers (such as the quantum cascade laser) appropriate to test infrared focal plane arrays (with scene generators) with the same results as CW blackbody type sources?
- Please give me Information on underwater radiated noise levels of AZIPOD thrusters at various power and thrust levels
- I would like 5-10 subject experts on EO/IR sensors for use on ground vehicles.
- Are there any sensors currently in development or fielded that capture energy in the sodium or potassium atomic line emission band? Have these or any sensors in other bands been shown to detect emissions through layers of clouds?
- Is there a relative strength difference or preference in specifying a monocrystalline silicon window substrate as <100>, <111>, or other?
- How long are trace explosive residuals on the surface of artillery shells after manufacture
- How do I adjust my RWR to get rid of the noise?



# The Military Sensing Symposia (MSS):

*Where engineers and scientists go to talk about their sensing problems/triumphs*



**SENSIAC operates the Primary Venue For Classified Discussions On Military Sensors & Publishes the Most Complete Record Of Military Sensing R&D**



# SENSIAC Educational Program

- Unique military sensing continuing education program
  - Distribution C level and Classified
  - Addresses urban warfare, the GWOT, and other paradigm shifts
- Taught by senior experienced engineers/scientists at your location or ours

## Partial Course Listing

- Infrared Technology and Applications
- Military Laser Principles and Applications
- Hyperspectral Imaging
- EO/IR Polarimetric Imaging
- LIDAR Engineering
- Modeling Target Acquisition with Electro-Optical Imagers
- Infrared Countermeasures (S)
- Directed Infrared Countermeasures (S)
- Infrared/Visible Signature Suppression (S)
- Multisensor Data Fusion
- Image Fusion
- Automatic Target Recognition
- Fundamentals of Radar Signal Processing
- Fundamentals of SAR Signal Processing
- Space-Time Adaptive Processing: In Radar
- Basic RF Electronic Warfare Concepts
- Advanced RF Electronic Warfare Principles
- Introduction to MIL-STD-1553



## Sample Ongoing/Recent Projects

- FLIR Threat Analysis For PM NV/RSTA and PM FLIR
- Persistent Surveillance Sensor Band Analysis
- Simulation support to PM IRCM of Army PD ASE
- UAV SAR/GMTI Analyses
- Unmanned Systems Common Control (USCC)
- EP-X Top Down Function Analysis (TAT 81)
- Broad Area Maritime Surveillance (BAMS) Mission
- Control System Analysis (TAT 39)
- SENSIAC Puts Smart Cables on JDF C-130s



# Related Capabilities and Activities



# SENSIAC Team's Unparalleled Facilities and Equipment



Approaching \$2B/yr in Funded R&D

HCTInSB  
nitro3  
IR CVF  
FSS on hotplate

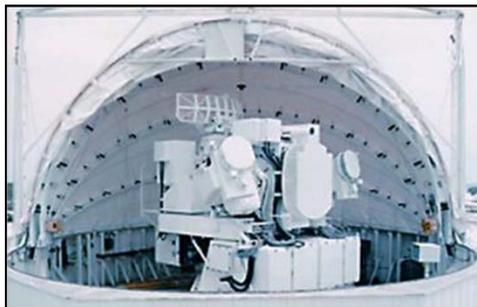


# Exploitation of Adversarial Sensors/Weapon Systems

- Our Personnel at GTRI exploit adversarial sensors and weapon systems
  - MANPADS/SAMs: virtually all pertinent threats of the past 30 years
  - Ground Systems: 20 year program of exploitation
    - Gen 1 through Gen 3 NV devices
    - Handheld and vehicle laser rangefinders and designators
    - Handheld and vehicle mounted thermal imagers
    - Fire control systems
    - Direct-view observation and weapon sights
  - Other battlefield equipment
  - IEDs



# These Threats ... were all Made in Atlanta, GA





# Design by Evolution

- GTRI is a pioneer in the use of Genetic Algorithms to “evolve” optimum Designs – Hold many basic patents
- SENSIAC uses this technology in many of its programs.
- Based on:
  - High fidelity physics models of the technology
  - Assignment of “genes” to each element of the design
  - Large Beowulf Clusters of hundreds of computers to iterate design mutations
  - Pick the best result and alter their genes iteratively
- Achieve 30% bandwidth on metamaterial conformal antennas where 1-2% is common

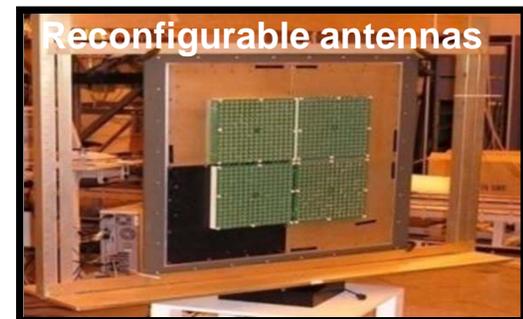
⇒ ***Provides Optimum Designs in Minimum Time***



**Flare Patterns**



**Operational Software**



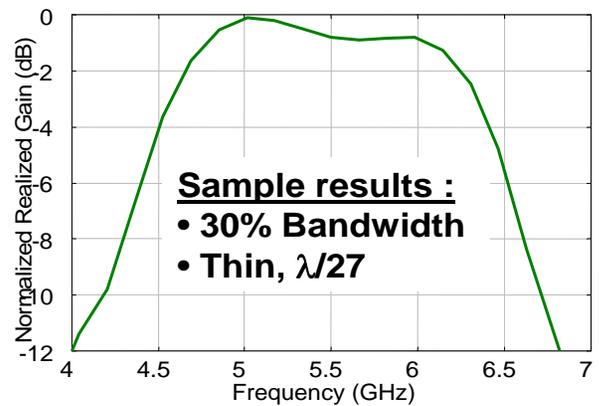
**Reconfigurable antennas**



# GTRI Genetically Developed Meta-material Antennas and Signature control

**Objective:**

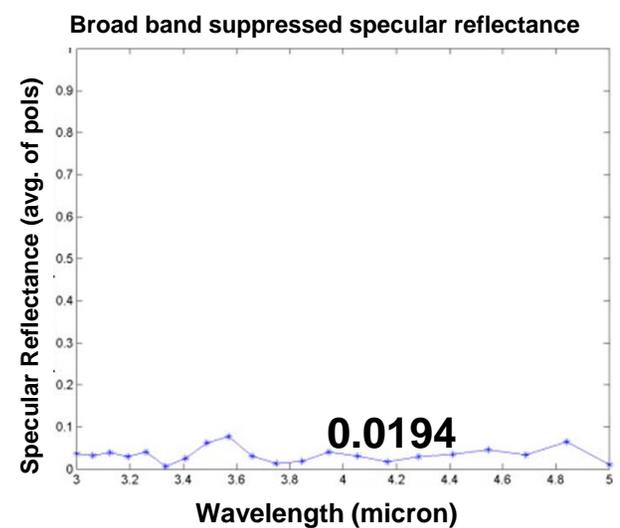
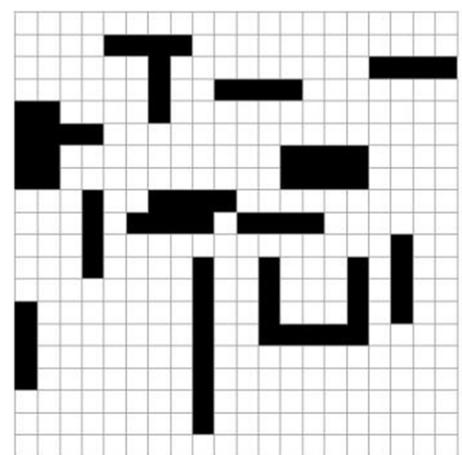
- Electrically thin ( $t \ll \lambda$ )
- Conformal
- Significant Bandwidths
- End-fire capable



## Fragmented Antennas

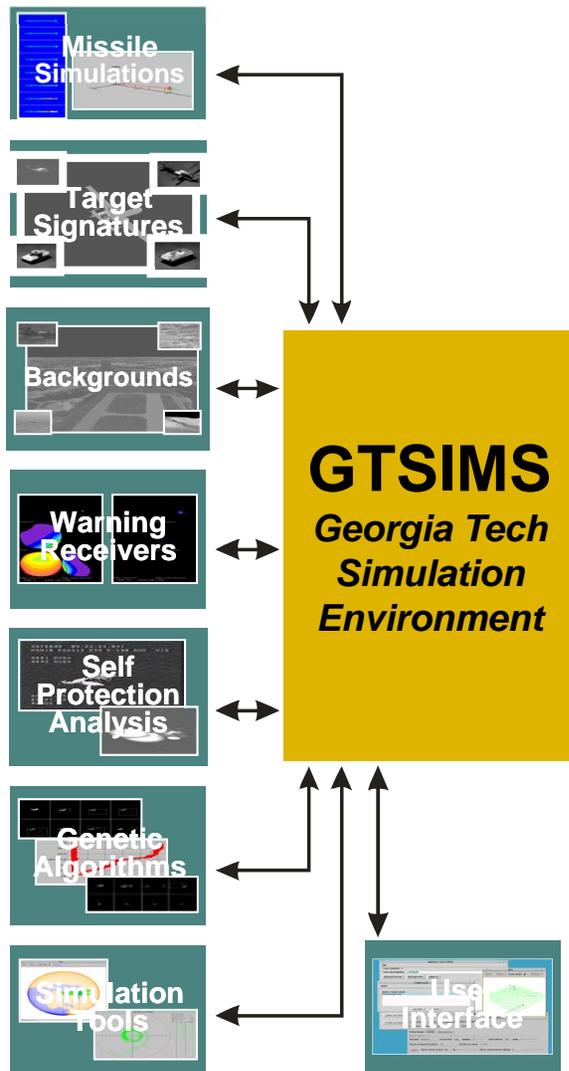
## Control of Surface Reflectance

## Cone of Silence at Normal Incidence – MWIR





# High Fidelity EO/IR Self Protection Engagement Simulation



Dr. Darrell Lamm,  
Dr. Albert Sheffer



# SENSIAC is a Unique Asset

- Quickly answer your toughest questions
- Provide you the most knowledgeable team to solve your problems, supported by virtually unlimited research grade equipment.
- Build/modify existing equipment or create new technologies to solve your pressing needs
- Provide you a focal point for connecting with over 9,000 scientists and engineers dedicated to military sensing.
- Get going now, using our simple but powerful TAT contracting process.



# Call Us

- **David Shumaker, SENSIAC Director**
  - (404) 407-7370 Office
  - (404) 520-1675 Blackberry – always with me
- **Ralph Teague, Chief Scientist & Inquiries Manager**
  - (404) 407-7385
  - (404) 273-4097
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  - (404) 407-7301
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