Solving Tomorrow’s ISR Problems:
Getting the Right Information to the Right People—Near Real Time

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ISR – A Critical Enabler

The Intelligence Process

The Decision Process

The Kill Chain

ISR Systems Are Critical in Enabling the Successful Execution of DoD’s Most Basic Processes
ISR – Today’s Problem

- New ISR sensors collect more information faster and at a higher fidelity, thereby creating larger data sets
- Number of ISR platforms have grown since 9/11 (e.g., drones up from 50 to 7,500)
- ISR sensors are tracking thousands of targets simultaneously
- Terabyte collections have become routine
- This data must be moved and analyzed to create actionable information

Swimming in Sensors – Drowning in Data

Source: COTS Journal July 2010
Tomorrow’s ISR Problem – The Rebalance

Past Emphasis

Permissive Airspace
Irregular Warfare
Specialized Sensors
Exquisite Technology

Emerging Emphasis

A2/AD
EW
Near Peer Adversary
Multi-Role Sensors
Affordable Technology

Emerging Priorities Create Challenges and Opportunities

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Sensing – Drivers of Future State

- **User Pull (More for Less)**
  - More range, resolution, accuracy, coverage and persistence
  - Less size, weight, power, cost, latency and workload

- **Technology Push**
  - Fine resolution motion imagery of large areas
  - SAR/MTI with fine resolution, continuous tracks, accurate geolocation and wide area surveillance
  - Advanced materials and meta-materials for optics and RF
  - Scalable processing architectures
  - Advanced algorithms
  - Wideband data links and networked communications

- **Changing Mission Objectives and Operating Environments**
Sensing – The “ISR” Options

OSINT

HUMINT

IMINT Radar
IMINT Optical
SIGINT
MASINT

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**Sensors – Future Capability Trends**

- **Optical (EO/IR/HSI/Laser)**
  - 2 Color “Hi Definition” IR
  - LADAR and 3D LADAR
  - TLA / Metricity
  - Enhanced Tracking Algorithms
  - IRST / ISR Convergence

- **RF (Radar)**
  - Scalable AESA
  - Digital Beamforming
  - Wide Band/Dual Band
  - Multi-Mode
  - Bistatic/Multistatic
  - Passive
  - EP Survivability
Sensors – Future Capability Trends

- **SIGINT**
  - Near-Vertical Directional Finding
  - SIGINT and Cyber alignment
  - Cross-correlation with other INTs
  - Network discovery

- **MASINT**
  - Vehicle detection and fingerprinting
  - Monitor chemical weapons production
  - Detect homemade explosives
  - Counter CC&D
  - Fusion with other sensors
Multi-Sensor Systems (Multi-INT)

- **System Integration** enables complimentary sensor modes and phenomenology to work together synergistically.

- **Modular Open System Architecture (MOSA)** provides “plug and play” versatility, rapid upgrade and technology insertion.

- On-board and off-board processing/exploitation/fusion of sensor products extracts information that provides situation awareness and decision support.

- **Resource management** optimizes sensor data collection.

Source: US Army Medium Altitude Multi-Int (MAMI) Conceptual Rail Configuration
Communications

SWA Conflicts – High Bandwidth

A2/AD Conflicts – Protected Links

Commercial GEO

WGS

Advanced EHF

Commercial SATCOM

Protected SATCOM

MOVING SENSOR DATA

Common Data Link

Ground Networks

Airborne MANET

Surrogate Satellites

Meeting the A2/AD Challenge

2010 → 2030
Communications – Future Capability Trends

- **Data Links – Networked Throughput**
  - MANET Ad-Hoc Networking
  - Phased Array Antennas
  - Multiple Simultaneous Links
  - High Data Rates
  - Suite-B Encryption
  - Laser Com

- **SATCOM – Protected Bandwidth**
  - Protected, Survivable and Secure
  - Reduction in Commercial BW
  - Tactical Protected SATCOM
  - New Modes for WGS
  - Phased Array Antennas
  - Suite B Encryption
So we get all this data to the right people, near real-time… Now what?

- Turn data into information for efficient dissemination
- Use tools and technology to efficiently:
  - Manage and process the data
  - Present information for analysis and conclusion
- Ensure that analysts are not managing data
- Improve multi-INT data fusion
- Minimize data transmissions
PED – Future Capability Trends

- **Mission Management / Tasking**
  - Man on the loop
  - Cross domain MM (satellite, UAV, other)

- **On-Board vs. Off-Board**
  - On-board triage and target entity/activity detection
  - Cross single domain (e.g., UAV) tip/cue

- **Predictive PED Cloud Computing**
  - Centralized, private clouds for the IC and DoD
  - Ability to correlate, fuse, identify and predict targets
PED – Future Capability Trends

- **Multi-source Fusion**
  - Cross sensor, and all source correlation and fusion of data sources at massive scales

- **Real-time Analytics**
  - Migration of forensic/batch analytics to operate on massive streams of data in motion

- **Dissemination to Edge**
  - Apps to the tactical edge user with background dynamic updates
The “Near Term” – Future of ISR

A2/AD will drive ISR requirements for the foreseeable future

- **Anti-Access (A2) – Distance**
  - Mission time requires higher reliability and graceful degradation
  - Distance requires improved sensor performance
  - Faster platforms will impact ISR integration – Thermo
  - Communication links
  - Increased range
  - More bandwidth
The “Near Term” – Future of ISR (Continued)

**Area Denial (AD) – Survivability**

- **LO sensor integration**
  - Conformal/distributed apertures
  - EO/IR windows

- **Sensor performance**
  - Range/Resolution
  - EP
  - Multi-Function

- **Connectivity**
  - LO arrays
  - Resilience (anti-jam) / Secure (encrypted)
  - LPD, LPI, LPE
Family of Systems Approach

All Elements of FoS Necessary for Counter A2/AD Success