MORS Workshop
Analytic Support for Maritime Domain Awareness and Counter-Piracy

Working Group 3
Maritime Domain Awareness in the International Littoral

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WG 3 Purpose

- The purpose of Working Group 3 is to explore and identify ways in which operational research and analysis can support the activities related to the generation and maintenance of MDA in international littoral areas

WG 3 Focus

- What are the questions that need to be answered by the analysis community related to MDA in International littoral zones and how do these issues differ from national MDA and open-ocean MDA?

- What types of analysis tools and models are required to help the operational community answer the operational questions?

Why this Breakdown?
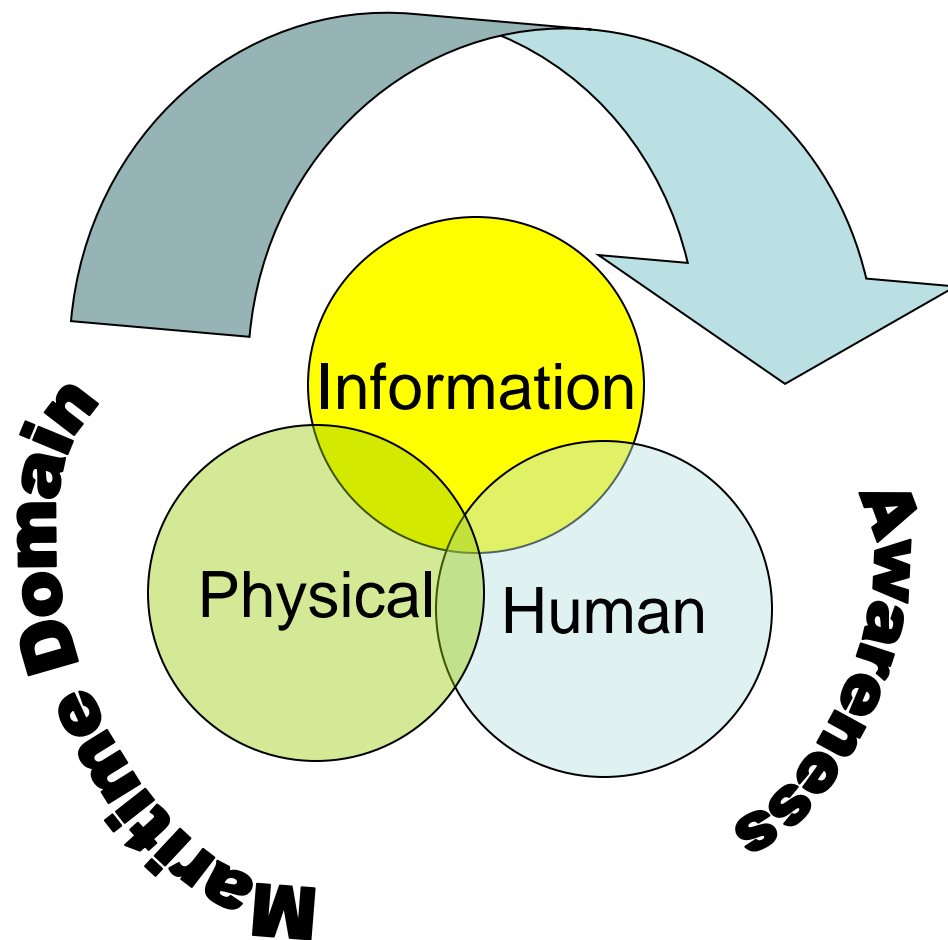
- **Physical**
  - Physical makeup of the maritime domain and how can we physically sense it
- **Information**
  - Together with effective sharing mechanisms
  - Leads to federated intelligence and knowledge bases upon which…
- **Human**
  - Effective understanding...
  - Teams and individuals

Session I
Tuesday, 27 Oct 1350-1745

- Focal Topic: Physical aspects of the maritime domain in international littoral areas

- Presentations:

1. LCol Rob Zellerer, DAR - The Contribution of Airborne Collection Platforms in Support of Maritime Domain Awareness

  Future A/C will be capable of collecting huge volumes of maritime, land and air information – where will it go??

2. Mr. Mark Stoddard, DRDC - Decision Aids to Support Surveillance Planning in the International Littoral: What are the critical attributes, constraints, and objectives that influence surveillance planning in the international littoral and how do we manage them in an evolving operating environment.

Canadian Maritime Air Capabilities for ISR

- Presentation by LCol Rob Zellerer
  - Air System of systems for ISR&C
  - Looking at North
  - Long range patrol, UAVs, helicopters and satellites
  - Matrix of capabilities and needs across various domains (air, land, sea)
  - Air assets globally –ie. Horn of Africa, Afghanistan
  - Getting the information and processing the information are different challenges
  - New sensor packaging getting ready to be fielded – will generate lots of data –what to do with it?

Canadian Maritime Air Capabilities for ISR (2)

- Long range capabilities
  - (OEMS) Live stream data
  - AIS
  - CMA (Canadian Multi-mission Aircraft)

- UAV capabilities
  - Remote data gathering
  - ISTAR and weather precision strike capabilities
  - JUSTAS
    - Phase 1 – land and overseas operations – 4 payloads
    - Phase 2 – move to MDA and Arctic awareness
    - Challenges: Northern commands, maritime, flight in non-seg airspace, etc.

Canadian Maritime Air Capabilities for ISR (3)

- Maritime Helicopters (28 new ones on the way)
  - Anti-sub capability
  - SAR
  - ESM kit
  - EO/IR kit
- Future should have
  - AIS
  - Multi-lin (16/22)
  - IFF mode
  - Enhanced ESM

Canadian Maritime Air Capabilities for ISR (4)

- Satellites
  - Polar Epsilon
  - Polar Epsilon 2 –cuing capability commercially

- Challenges
  - What to do with the data
  - Getting data to the right people in a timely manner
  - Is the data useful

Decision Aids to Support Maritime Surveillance

- **By Mark Stoddard**
- **Identify critical information requirements**
  - Types of decisions
  - Tools used (technology, medium)
  - Constraints (i.e. environmental, political, economical)
    - In the international littoral
      - Surveillance activities (frequency, restrictions, etc)
      - Decision aid must be able to address various objectives, new information, changes, timing, policy (and policy evolution)

Decision Aids to Support Maritime Surveillance (2)

- *Question regarding the definition of the littoral*
- Consider coastal objectives and many other factors to determine the asset distribution
  - Is it reasonable to consider expansion based on the new information? Needs decision aids
- Multi-period surveillance modeling is Mark's answer – need to know that surveillance assets, economics and consideration of more constraints
- Operating area attributes
  - Critical infrastructure, shipping lanes, maritime zones, commercial activity, historical considerations, season

Physical characteristics of the International littoral?

- **Geographic Definition**
  - **100nm inland to 200nm out** where many nations' (and their associated infrastructures) interests intersect outside of continental North America
  - We considered the continental shelf definition
  - We consider the Arctic to be part of the International littoral
- MDA (**need for awareness**)
  - Strategic national interests (CIP)
    - vessel, cargo, people, infrastructure
  - Economic, environmental, & safety concerns
  - Traffic density
  - Lack of in-house data, information, & knowledge
  - Potentially denied areas (anti-access areas)

What characterizes the International littoral?

- 3-dimensional view in which
  - Number and type of potential "things" increases (vessels and other assets)
  - Number and type of threats increases - Tactical risk tolerance level is lower than domestic
  - Overlapping international legal issues
- Information "clients" for the International littoral
  - Military, commerce, adversaries, & researchers
- Get information from
  - Law enforcement, intelligence, maritime assets, border security, commercial info, and other nations
  - Reliance on a third party (i.e. other country)
  - Constrained by host nations

Structure to think through: TCPED

- Tasking / Request for Information
  - We can ask others for information
  - We can provide information to others
  - Standing areas of interest/Spontaneous areas of interest
  - Prioritization considerations
  - Tactical/operational/strategic objectives
  - Broader than strictly military –Whole of Government and International Non-Government Organizations
- Collection
  - Need for in-situ collection (see list from need of awareness on definition slide)
    - Constraint: legal and policy and political considerations with nations sharing operations area
    - Constraint: Spatial/temporal considerations
  - More opportunities for threat identification (people & cargo)
  - Where do we find it?
  - How smart do the sensors need to be to minimize the processing to exploitation

Structure to think through: TCPED (2)

- Processing
  - Lots of data to process from many sources
  - Fewer resources to process in theater (necessitates reach back)
  - Incompatibilities of data formats (language)
  - Who is responsible for processing it?
- Exploitation (what do you do with it?) focus on the "SO WHAT?"
  - Quality of data concerns
  - Spatial/temporal constraints
  - Resource constraints
  - Optimization of system of systems (economizing as best we can)
- Dissemination of information
  - Various layers of information
    - Raw data versus processed data
    - Legal requirements
    - Memoranda of Agreements/Understanding
    - Rules of Engagement
  - Prioritization of need
  - Subscription

NOT the Google approach (SVEMS)

Session II
Wednesday, 28 Oct 0930-1200

- Focal Topic: What types of information are required to develop MDA in international littoral regions and how do we acquire it?

- Presentations

Dr. Swapan Sarkar, Booz Allen Hamilton - ISR Fusion Processor for Maritime Domain Awareness & Counter Piracy

> How do we effectively integrate MDA information produced by a variety of active, passive and intercept sensors & sources

Mr. Peter Mabson, exactEarth - Satellite AIS & International Littoral MDA

> Reception of AIS transmissions on polar-orbiting LEO microsats will provide a worldwide view of self-reporting vessels (but not a panacea)

Trustworthiness for various types of MDA information in the International littoral?

- Vessel /Platform information
  - Lloyd's of London databases
  - Other in-situ platforms
  - National databases
  - Open sources, Social networks
  - Info sources: AIS, LRIT, AMVER, OSWEX etc
  - In-situ sensors –radar, satellite, sonar
- People
  - Intel databases
  - Licensing authorities
  - Ship owners and operators
  - Manifest / Crew list /passenger list / Supercargo
  - Social networks

Trustworthiness for various types of MDA information in the International littoral?

- Cargo
  - Bill of Lading, licensing authorities, intel databases, shippers, sensors, self-reporting (Haz Goods), Social networks

- Maritime Infrastructure (Cables, oil platforms, fiber optics, hazards)
  - Ports, harbors, charts, maps, coastal states

- Environment (weather, ice bergs, other hazards)
  - Google Earth, weather channel, national weather services, Social networks

Information issues

- Information sharing
  - What information is needed?
  - Raw versus processed data
  - Classification levels
  - Vocabulary/definition/ontologies (semantic interoperability)
  - standard formats (syntactic interoperability)
- Linking data with user's intent (right information for good decisions)
- Timeliness of data—How quickly do you need to action the data?
  - User and context dependent
  - Immediate versus analytic or forensic use of data
- Data and information storage
  - Exponentially growing amounts
  - Scalable analysis methods?
  - Information and cognitive overload

When does info become more difficult to share?

- When data is processed, fused, analyzed
  - Government regulations
  - Processed data
  - Commercial concerns
  - Economic concerns (cost of piping)
  - Intelligence concerns
- Can we desensitize information for sharing?
- Don't make information classified just by putting it in a classified network
- Natural disasters and emergencies may lead to better data, information and knowledge sharing

Session III
Wednesday, 28 Oct 1330-1730

- Focal Topic: What are the human and organizational aspects that need to be considered in developing MDA in the international littoral?

- Presentations

Mr. Eduardo Danganan, NAVAIR - Regional Maritime Domain Awareness Capability (RMAC) Demonstration Results

  Experience developing and deploying a coastal MDA capability in areas with little or no existing MDA[2]

Human and Organizational (Additional Questions)

- Who needs MDA to accomplish their missions? (organizationally)
- Is this naturally a hierarchical or collaborative process?
  - The hierarchical nature of each stakeholders realm interferes with the amount and types of data that is acquired through the network
- Which aspects of MDA must be developed with the aid of a human?

- Which aspects of MDA can and should be automated?
- What are key tools and techniques to provide operators and analysts to allow them to do their jobs?
- Is it reasonable to expect countries to share their coastal MDA information?
- What organizations need to have a capability to generate and maintain MDA in the international littoral?

Who needs MDA? (Organizational)

- "Whoever has the C2"
- Whomever has a mandate, stake, or responsibility in the region
- Corporations with operations in the International littoral
- Growing group of nations wanting to protect themselves
- Ops centers (interdisciplinary and internal)
- State, Commerce, Defense, Homeland Security, Justice, Transportation departments
- International law enforcement
- Search and rescue centers
- Fisheries enforcement

Who needs MDA? Orgs (continued)

- Regional Information sharing groups exist
  - Baltic region
  - Straits of Malacca

Organizational capability for maintaining MDA?

- Host country and stakeholders
- Operations Centers (spring up like mushrooms)
- US – Coast Guard (DHS) & Navy (DoD) co-Lead
  - Vessels
  - People
  - Cargo
  - Infrastructure
  - Enterprise
- Canada
  - Vessels –Trinity and sister org for Canadian coast
  - People – intel community (non-military)
  - Cargo – Transport Canada or RCMP
  - Environment – Fisheries or local assets
- Australia's model seems to be a good one to follow
- Norway – cross-disciplinary responsibilities due to the small size of the country
- The hierarchical nature of many organizations interferes with the amount and types of data that is acquired through the network

WG 3 Focus

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Framing The Problem

- Decision Support (OR) considerations
  - Understand the decision maker's need and intent
  - OR technique used will depend upon where in the MDA network the decision problem is addressed
  - Tailor the solution to the needs of the decision maker
  - Understand the littoral issues across disciplines/nations
  - Provide feasible (not necessarily optimal) solutions
  - Applicable metrics

Employing OR

- Data Exploitation
  - Exploit data producing capabilities of new technology
  - Statistical analysis
  - Data mining, Meta-data
  - Knowledge integration
  - Anomaly/Pattern recognition
- Spatial/temporal analysis
  - Resource allocation
  - Scheduling
- Risk analysis
- Network analysis
  - Social networks
  - Transportation networks
  - Communication networks
- Modeling & simulation
  - Gaming/Exercising