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

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

Working Group 2
-- Blue Water Maritime Domain Awareness --

Chair – CAPT Douglas E. Otte, USN, Naval Postgraduate School

Co-Chairs –

Neil Carson, DRDC/CORA (NORAD)

CAPT Steve Bethke, USN, USNORTHCOM J-84

Kirk Michealson, Lockheed Martin Simulation, Training & Support

27-29 October 2009

WG 2 Purpose/Focus

- Purpose:
  - To explore and identify ways in which operational research and analysis can support the MDA mission within the context of the open ocean
  - To include
    - o Effective surveillance and identification processes,
    - o Improvements across the spectrum of C3, and
    - o Efficient use of limited resources to enhance
  - To address training and/or career profiles for MDA analysts of the future

WG 2 Goals

- Goals (Workshop Desired Outcome)
  1. Catalogue Operational "Blue Water" MDA problems e.g. operational effectiveness
  2. Identify current available OR&A tools and techniques for MDA analysis
  3. Identify best-practice methods of MDA analysis
  4. Summarize recent advances in modeling and simulation that can effect future MDA studies
  5. Develop an understanding of unique C3 requirements to enhance MDA
  6. Identify gaps in current OR&A capabilities in support of MDA
  7. Recommend:
     – Desirable skills of an OR&A MDA analyst and
     – Future OR&A approaches and capabilities required to solve identified problems

WG 2 Participants

CHAIR: Otte, Doug CAPT, USN	NPS
CO-CHAIR: Carson, Neil	DRDC CORA, NORAD NORTHCOM J84
CO-CHAIR: Michealson, Kirk	Lockheed Martin Simulation, Training & Support
Bourdon, Sean	DRDC CORA, DASOR
Breckenkamp, Ann	OPNAV N5 MDA (BAH)
Bryan, Derek	USPACOM J81
DiPalma, Bob	SECNAV
Emmel, Bill	NORAD NORTHCOM (BAH)
Francisco, Ben	EMS
Henderson, DeVere	JIMDA / IDA
Pelletier, Emile	DRDC CORA, SPORT
Porter, Gene	IDA
Ridgely, Julia	Prometheus Research
Sharkey, Steve CAPT, USN	NORTHCOM
Wind, Andrew	DRDC CORA, Maritime Forces Atlantic
Zimm, Alan	JHU/APL

WG 2 Approach: Day 1

- ## Working Session #1 – Operational Requirements for Blue Water MDA (Goals 1 & 5)

  - ### Presentations from the operational community

    - o *Demand for Maritime MOTR in Homeland Defense*; Gene Porter, IDA

    - o *Application of Analytic M&S to Support Development of the MDA JIC*; Derek Bryan, PACOM (J81)

WG 2 Approach: Day 2

- ## Working Session #2 – Metrics for MDA Assessment (Goals 2 & 3)

  - Presentations from both Ops and OR&A communities on metrics being used to assess Blue Water MDA
    - o *Overview of MDA Metrics*; Neil Carson, DRDC CORA (NORAD)

- ## Working Session #3 – OR&A Tools and Techniques (Goals 2,3 & 4)

  - Presentations from OR&A community on current tools and techniques being used
    - o *Assessing Reliability of Self-Reports*; Yvan Gauthier; DRDC CORA

WG 2 Approach: Day 3

- Working Session #4 – Synthesis of Operational Requirements and existing OR&A tools (Goals 6 & 7)
  - Presentations from OR&A community on current work in this area
    - *Technology & MDA*; Gregory H. vanBavel; DRDC CORA
    - *Relocating VOIs in MDA*; Andrew Wind; DRDC CORA

WG 2 Findings

Output 1: What are the questions that need to be answered by the analysis community in regards to MDA?

- How can Operations Research Analysis assist with the MDA data fusion problem?
  - Determining quality data?
  - Determining relevant data?
  - Sifting through clutter to determine anomalies?
- With the current capabilities, what are the alternative courses of actions (COAs) for unknowns and VOIs in the open ocean?
  - Are the COAs only querying, delaying, halting, and boarding?
  - What are the risks associated with these courses of actions?
  - How can decision making confidence be increased with the available data?
  - Do the available courses of actions / risks change with range?
  - Does risk decrease when time to react increases?
  - Can a COA development & evaluation tool / wizard be created to support responses?
- What future capabilities are needed to conduct open ocean MDA?
  - Where can capabilities be increased with the current assets / systems and by how much?
  - What is an optimum force mix to support MDA with acceptable risk?
- Qualitative or quantitative techniques?

WG 2 Findings

Output 2: What types of analysis and what tools/models are required to help the operational community answer the operational questions regarding MDA, and do they currently exist?

- Measures of Merit Recommendations
  - Must be clearly understood by the Decision Maker
  - Need to provide the "so what" with the metrics results
  - Must be implementable, understandable, relevant & actionable
  - Specific metrics are different depending on MDA mission
  - Can be collected automatically, manually with recorders, surveys
  - Value of measures can influence inter-agency & international policies
- Measures of Merit Examples
  - OPNAV's MDA CBA provided performance metrics related to MDA functions
    - o Metrics developed at the task level
  - MDA Joint Integration Concept (JIC) developed metrics mapped to it's capabilities, tasks, and functions, e.g.,
    - o Data: % complies with standards, % accurate, % integrated into common database
    - o Detection: % detected, % tracked, % categorized, % identified, % alerts valid, % non-emitting threat detected / identified
    - o Course of Action: % of time critical alerts correctly pushed to DM
    - o Collaboration: % organizations that can collaborate, % integrated with interagency and international partners
    - o Cognitive Awareness: "soft" analysis

WG 2 Findings

Output 2: What types of analysis and what tools/models are required to help the operational community answer the operational questions regarding MDA, and do they currently exist?

- Tools and Methods
  - Questions to Ask
    - What fidelity is needed?
    - What turn around time is desired?
    - Will the tool be developed for OR use only or for the operator?
  - Examples of Methods and Tools
    - Planning: Wargaming, experimentation
    - Exercises: Data collection, data analysis,
    - Data: Semi-automated fusion, data management, data sorting, cyber threat protection, knowledge repository
    - Detection: Optimization for sensor management
    - Course of Action: Campaign / mission analysis (JAS), asset allocation, tool wizard to determine effective COAs, optimize routing
    - Collaboration: Accessibility with other organizations, agencies, countries
    - Cognitive Awareness: Cognitive modeling with SMEs to improve decision making, human system integration
    - Uncertainty Analysis: Facilitating reasoning under uncertainty (Bayesian Methods)
  - Recommendations
    - Strive for consistency of tools from planning, through exercises to operations
    - When developing / updating existing tools, work with operators
      - Consider spiral development and / or analyst co-located with operator

WG 2 Findings

Output 3: What skill sets, agency representation, etc. should be part of an MDA analysis community? What type of forum is suitable to ensure that proposed initiatives to build an MDA analysis community do not fail?

- MDA Analysis Community
  - Data management / database expert
  - Operations analyst
  - Operator
  - Intel Analyst
  - Relationships with inter-agency and international partners
- Forum
  - Co-located
  - Collaboration capabilities
  - Data sharing capabilities

WG 2 Comments and Recommendations

- Need to establish strong relationships with other organizations, inter-agencies, and international partners *before conducting analysis*

- Need a common data standard / metadata where data from all sources (DoD, inter-agencies, international partners) can be integrated, fused, shared and analyzed

- Ensure the analyst understands what the Decision Maker is asking

- Ensure the measures / results are understandable to the Decision Maker and provide the "so what"

- When developing / updating tools
  - Work with intel analysts and operators
  - Consider consistency for use in planning, exercises, and operations

- Measures, tools and methods dependent on the MDA mission, region, and activity (i.e., CONOPS development, COA determination, etc.)

Longer-term Opportunities/Actions

- Need to build strong relationships with other organizations, agencies, and international partners **before conducting analysis**

- Need to develop the following tools

  - Semi-automated data fusion tool

  - Exploit layered operational displays for MDA

  - Course of Action Evaluation tool

    o Could start with DRDC CORA's VOI planning tool

  - Cognitive modeling tool to model expert decisions

    o Facilitate human interoperability

  - "Classification sanitizing" tool (to gain access to info)

WG 2 Summary

- Good discussions from a wide range of perspectives
  - Operator, engineer, academician, and analyst
  - NORTHCOM, PACOM, OPNAV, SECNAV, NPS
  - DRDC CORA (International)
  - Industry

- Data transformation into knowledge is the key
  - Need integrated, fused and quality data (data standards)
  - Need ability to share and collaborate with other organizations, agencies and international partners

- Need to understand what the Decision Maker is looking for – at all organization levels

Back-ups

Immediate Opportunities/Actions

- None

WG 2 Findings

Output 4a: What are the ways forward to identify and transform available and new data into actionable information that will allow deterring and thwarting pirate attacks?

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WG 2 Findings

Output 4b: How can we understand the current and projected costs of action and inaction in relation to anti-piracy operations?

- Piracy

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WG 2 Findings

Output 4c: What are the data fusion, modeling, and predictive methodologies that could provide actionable advantages to vessels that are potential targets of pirates?

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