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Maritime Domain Awareness
Risk Reduction Limited Objective Experiment

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13. ABSTRACT (Maximum 200 words.)

A risk reduction experiment was performed to identify and alleviate any risks to successful completion of the FAIRGAME test of MDA Spiral-1 systems. Identified risks and mitigation actions are reported.

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Executive Summary

The Spiral-1 Maritime Domain Awareness (MDA) Assessment Team of the Naval Postgraduate School (NPS) conducted a Technical Risk Reduction Limited Objective Experiment (TRRLOE) from 3 through 5 June 2008. The event took place in San Diego, California, at the Space and Naval Warfare Systems Center, (SPAWAR-SD), Building 606, Lab 140. The goals of this event were twofold.

1. Identify and recommend mitigation to risks to the successful execution of the FAIRGAME event scheduled for the week of 14 July 2008.

2. Continue to collect data to further assess MDA Spiral-1 technologies.

Our findings from the TRRLOE indicate that several, significant risks to FAIRGAME execution exist. For example:

- Database differences between the several operational nodes may make it difficult to identify ships for collaboration and handoff.

- Databases are routinely re-based with revised software versions making historical tracks less useful for FAIRGAME exercises.

- Comprehensive Maritime Awareness (CMA) user accounts must include "alert permissions" in order to manipulate and execute CMA alerts.

- Operators will be unfamiliar with how to use the suite of Spiral-1 systems in conjunction with the systems already in use. Training should include how to execute the planned FAIRGAME events.

- The events were CMA-centric and did not sufficiently exercise the specific capabilities provided by the other systems.

TRRLOE provided limited assessment of MDA Spiral-1 systems and their use. It was determined that

- Operators were able to complete assigned Requests for Information (RFIs) in times that were significantly shorter than normally required to obtain the types of information requested. This was a limited and perhaps non-representative sample size.
    - 1 min to determine when ship was built after White Cell request.
    - 2 min to identify cargo on a named ship.
    - 6 min to locate a ship, details on type and crew.
    - 7 min to determine person-of-interest was not on reported ship.

- Only limited training on the systems was provided, yet produced a reasonable degree of operator competence. Indications are that the systems are fairly easy to learn and use.

- CMA and FASTC2AP have some human-system interaction difficulties with the user interface.

- FASTC2AP alerts are difficult to configure and non-intuitive in terms of the results that will be produced. Some redesign is needed, preferably with consultation with watch-floor SMEs to determine what they need.

In summary, the effort revealed relevant and useful information concerning the risks and assessments of Spiral-1 technologies. More detailed risk and assessment identifications are discussed and analyzed within this report.

1.0 TRRLOE Background

The Technical Risk Reduction Limited Objective Experiment was conducted 3-5 Jun, 2008, at SPAWAR, San Diego, California, Lab 140.

The purpose of the TRRLOE was twofold:

Primary Purpose: To identify and thereby reduce the risk to the conduct of the FAIRGAME test event of Maritime Domain Awareness (MDA) Spiral-1 technologies, and

Secondary Purpose: To provide information for MDA assessment.

FAIRGAME plans to test MDA Spiral-1 technologies in a distributed operational environment that incorporates several operational nodes (PACFLT, NAVCENT, MIFCPAC, etc).

The TRRLOE laboratory event was run in two rooms. One room contained the White Cell which directed test activities. The second room contained three operators. They were situated so that they could either collaborate or operate independently. Communications between the White Cell and operators was via instant messenger.

The Spiral-1 technologies are listed below with no explanation of their purpose.

- CMA
- MAGNET
- FASTC2AP
- Data Sharing COI
- Google Earth
- Tripwire
- Global Trader
- LiNX
- E-MIO Wireless

TRRLOE tested six of the systems in a laboratory environment.

- CMA
- FASTC2AP
- Data Sharing COI
- Google-Earth

As much as possible, TRRLOE exercised the events that are planned for FAIRGAME. TRRLOE evaluations focused on:

- Evaluating risk factors to FAIRGAME success due to
    - Personnel training
    - System performance
    - Information / database availability
    - Test conduct

In spite of event structural differences, risk information was obtained for all of these categories.

This report contains:

- Descriptions of the FAIRGAME and TRRLOE events and reasons for differences
- TRRLOE test plan
- TRRLOE planned test conduct
- TRRLOE executed test conduct
- FAIRGAME risk reduction results
- MDA assessment results

2.0 Test Structure and Events

As a risk reduction test for FAIRGAME (FG), TRRLOE executed the FG events. This section lists those events as described in the 9 May, Rev 0.6, of the test SOP for FG. This is followed by descriptions of the TRRLOE events and reasons for the differences. Differences in structure were due to what was available for TRRLOE in the laboratory.

2.1 FAIRGAME Events

These events are from FAIRGAME 08-02: MDA Spiral One Test SOP, Rev .06, 9 May 2008.

EV01: OPS Tipper RFI
Description A Request for Information (RFI) is received by the operations watch from a supported command concerning a vessel. The watch officer will process the RFI (reject, answer locally, forward) by performing local analysis.
Activities The operations watch officer will process the RFI (reject, answer locally, forward) by performing local analysis and then either closing the request or forwarding the RFI to the next level of command for further analysis.
Inputs The RFIs will be initiated by a synthetic message from the white cell representing a request from an entity normally supported by the watch floor. Because each watch floor has theater-specific responsibilities, this will require three white cell-generated targets, one in the NAVCENT AOR, one in the PACFLT AOR, and one in the LANTFLT AOR.
Outputs The result of the watch floor process will be a message back to the supported activity (white cell) with an answer, plus potentially a message or data request from the watch floor to the next level of command requesting further information.

EV02: Intelligence Tipper RFI
Description A Request for Information (RFI) is received by the Intelligence watch from a supported command concerning a vessel. The watch officer will process the RFI (reject, answer locally, forward) by performing local analysis.
Activities The operations watch officer will process the RFI (reject, answer locally, forward) by performing local analysis and then either closing the request or forwarding the RFI to the next level of command for further analysis.
Inputs The RFIs will be initiated by a synthetic message from the white cell representing a request from an entity normally supported by the watch floor. Because each watch floor has theater-specific responsibilities, this will require three white cell-generated targets, one in the NAVCENT AOR, one in the PACFLT AOR, and one in the LANTFLT AOR. The white cell will also “seed” the TRIPWIRE database with a synthetic report implicating the vessel provided as a target to NAVCENT.
Outputs The result of the watch floor process will be a message back to the supported activity (white cell) with an answer, plus potentially a message or data request from the watch floor to the next level of command requesting further information.

EV03: AOR Movement
Description The activity commander's direct special attention be PAID by their watch teams to any targets moving from NAVCENT to PACFLT AORs based on classified indicators.
Activities The watch team should look for vessels transiting on or near the chop line between AORs. This will involve manual screening of vessels as well as setting up geographic boundaries for automatic alarms. It will also initiate coordination and collaboration among NAVCENT, PACFLT, NMIC, and MIFCPAC.
Inputs The white cell will generate a "message" from the activity commander directing the watch to place a high priority on any targets moving between NAVCENT and PACFLT AORs.
Outputs Output will be a report to the commander of any vessels in or near the chop line as well as a collaboration space now existing among the test activities.

EV04: VOI Addition
Description NMIC adds three new named vessels to the high-interest vessel list and requests any additional information available at the theater level. One vessel is in the NAVCENT AOR, moving toward the PACFLT AOR, two others are nonexistent, one in LANT and one in PAC.
Activities The watch conducts analysis of the new additions. Warning is promulgated among the players based on location and movement. Continuous tracking is initiated, and responsibility passes from NAVCENT to PACFLT. Nonexistent vessels trigger horizontal collaboration and RFI generation to next level of command.
Inputs Existing vessel to be chosen by the white cell based on an existing ship with the proper geographic location and movement. A message is generated by the white cell to the NMIC watch floor who should, in turn, notify the appropriate theater watches.
Outputs The output is a state change in which the new targets are added to the local VOI lists for watch floor prosecution.

EV05: MTAC Cueing
Description MTAC report indicates absconder debriefs indicate US East Coast human trafficking may involve three named ships.
Activities Collaboration among NMIC and MFICLANT results in identification and subsequent tracking of merchant ship off US East Coast.
Inputs White cell chooses an existing vessel, then creates synthetic MTAC report that is passed to the ICC and MFICs.
Outputs The vessel is added to VOI lists at NMIC and at MFICLANT.

EV06: Multivariate Query
Description The commander asks the watch for a list of all vessels in a specified geographic area with certain specified attributes.
Activities The watch must correlate information from multiple sources to answer the query.
Inputs White cell chooses a geographic area of interest, e.g., 100 NM around Malacca Strait for NAVCENT, around Hawaii for PACFLT, around Straits of Juan de Fuca for MFIC PAC, etc. In that area, the watch is asked to report all ships registered in one of three specified countries and carrying hazardous cargo.
Outputs A list of vessels fitting all criteria.

EV07: Cargo Container Query
Description A standard shipping container in transit is suspected of carrying something other than its designated cargo.
Activities The watch is asked to determine container history, current location, and future plan.
Inputs White cell provides a suitable container as a target for this activity.
Outputs A shipping history, current location, and shipping plan. Global Trader is expected to be the main contributing technology for gathering this information.

EV08: Data Provenance
Description The commander requests all available data on a target ship and specified that the source of each data element be reported with the data itself.
Activities The watch is asked to investigate a VOI but must report the source of all data.
Inputs White cell provides a target suitable to each participating activity.
Outputs A report is created and returned by the watch containing all relevant information as well as its source.

EV09: Contingent Geographic Alarms
Description The activity commanders request immediate notification of vessels with specified attributes penetrating certain geographic boundaries.
Activities The watch team will build boxes or fences around the target areas using automated tools such as CMA or FASTC2AP.
Inputs The white cell will provide geographic areas of interest to the "commander" appropriate to each activity.
Outputs Output will be automated alarms in place and operating. The completion of alarm box building is the event completion, not the triggering of the alarm by a real-world ship.

2.2 TRRLOE / FAIRGAME Structural Differences

Differences in systems, operational units, operators, training, and databases necessitated event modifications. This sub-section lists those differences and their effect.

Systems:

1. FAIRGAME will have the full suite of Spiral-1 systems, with the exception of EMIO. TRRLOE had available: CMA, FASTC2AP, Google Earth, and Data Sharing COI. TRRLOE did not have: LiNX, TRIPWIRE, or EMIO.

2. The TRRLOE database was provided by the NRL server. Each FAIRGAME operational node will have its own server and database.

3. For TRRLOE: MAGNET, Global Trader, Port and Coastal Surveillance, and AIS data were available only through CMA, such that only the limited data from them that was included in the CMA data build were available. FASTC2AP had only Volpe AIS data available.

4. The TRRLOE FASTC2AP was able to obtain data from only Volpe AIS. FAIRGAME will have all of the AIS feeds.

5. The TRRLOE laboratory CMA workstations, on laptop computers, crashed frequently during the morning of the first day. This problem was eliminated by installing revised video drivers (from the Dell website), and invoking increased system cache memory to be used for Java applets.

6. During FAIRGAME, operators will utilize Spiral-1 technologies as a suite of available capabilities, using the strengths of each as they see fit. It was not possible to determine which systems were the most efficient to use, or preferred by operators.

7. Because of database differences, there was limited ability to test use of different systems in conjunction with each other to accomplish a task. For instance, participants could not locate a ship on Google Earth then view it on CMA to acquire details and assess further. A ship located in one system would often not be found in another.

8. Database restrictions meant that TRRLOE events had to be configured to qualifying ships that were identified pre-event. FAIRGAME will identify ships in real-time.

9. Alerting and collaboration were not available on CMA.

Operational Units:

- FAIRGAME will utilize operational units at various organizations: MIFCPAC, NMIC, etc.
- TRRLOE was a lab test, with all operators in a single room, with a separate White Cell.

Because there was no operational higher command, the White Cell had to play that role. Also, handoff and/or collaboration between different watch floors could not be done.

Operators:

- FAIRGAME operators will be watch personnel at the various organizations.
- TRRLOE used an IS2 Optical Analyst and an IS3 Strike Analyst operating two CMAs and one LT Intelligence Analyst operating the other two systems (FASTC2AP and Google Earth).

The TRRLOE operators had a great deal of experience and had only positive impact on the test.

Training:

- FAIRGAME operational personnel will have extensive training by an official mobile training team.
- TRRLOE operators were trained on the day before the operation by trainers-in-training. The on-line training tools were not used for TRRLOE training.
- Additional training, as required, was given during TRRLOE execution.

Databases:

- FAIRGAME will utilize real-time data provided by each unit's servers.
- TRRLOE used mainly historical data provided by the NRL CMA server.

Not having common databases for the three systems meant that they could often not be used in conjunction with each other, e.g., one could not use FASTC2AP to locate a ship, or receive an alert, then use CMA to gather information on the ship.

2.3 Planned TRRLOE Events

Following are the events that were planned for TRRLOE.

Event-1 Obtain information on named ships
WC sends an RFI requesting all available information on two named ships. One of the ships will have complete information available, the second limited information. The named ships were:

CMA-1	CMA-2
Tocho Maru	Shiraoi Maru
Polynesia	Sagittarius Leader

Expected Operator Actions – The operator will search for information for each ship. RFI responses for both ships will be sent to the WC. For the ship with limited information, the operator will prepare and send an RFI to another command requesting that they search for the missing information. This secondary RFI will also be sent to the WC.

Event-2 Correlate ship and person-of-interest information
WC sends an RFI requesting information about a person of interest who is reported to be on a named ship. WC also forwards a simulated TRIPWIRE tipper concerning the person-of-interest. The RFI will request information about the person and the ship.

CMA-1	CMA-2
Ship: Shiraoi Maru	Ship: B W Prince
Person: Renato Lumandas	Person: Sang Li Tao

Expected Operator Actions – The operator will search for information on both the ship and the person. It will be found that the person is not on the named ship. The operator will send a response to the WC that includes information on both ships and on the person.

Event-3 Alert of ships crossing AOR boundary
WC sends an RFI requesting that ships transiting the Suez Canal within the last 24 hours or that will transit within the next 24 hours be identified. Information requested is ship identity, registry, cargo, and whether approaching or leaving the canal.
Expected Operator Actions – The operator will establish a geographic boundary that will be used to identify ships within their area of interest. Ships that qualify will be identified, their requested information searched for and obtained, and RFI response prepared and sent to the WC.

Event-4 VOI Addition, Sorting and tracking named vessels
WC names three vessels, requesting that tracking of them be established. One will be moving toward the NAVCENT/PACFLT boundary, the other two will be non-existent.

CMA-1&2

Ship-1: Catheryn Maru Ship-2: Patrick Angel Ship-3: YM Inception

Expected Operator Actions – Three new vessels are added to the VOI watch list. Both operators locate the existing ship. Operator in whose AOR ship is located will establish tracking and report location. Operators collaborate prior to handoff. Ship handoff and second operator establishes tracking and reports location. Operators prepare and forward RFI for ships that weren't located.

Event-5 Vessels in Proximity of Named Ship

WC issues an RFI to identify and report on vessels that have been in 20nm proximity to a named ship, within 200 nm of the US West Coast.

CMA-1: Symphony I

CMA-2: Shiraoi Maru

Expected Operator Actions – Each operator establishes their geographic boundaries, locate ships within the boundary. CMA, Google Earth, and FASTC2AP operators collaborate on locating ships. A report will be sent to WC providing identities of qualifying ships.

Event-6 Identify ships within a geographic area that are carrying hazardous cargo

WC send an RFI requesting identity of ships carrying hazardous materials, within the past month, specify a geographic area and request identity of ships and all available information.

Geographic Area CMA-1: 500nm off US coast, Los Angeles to San Francisco

CMA-2: 200nm around Singapore

Expected Operator Actions – Each operator establish their geographic boundaries, utilize advanced search to identify ship carrying hazardous cargo. A report will be sent to WC providing identities of qualifying ships.

Event-8 VOI information and its provenance

WC request all available information on a named ship, sources of the information, and assessment of information quality.

CMA-1 ship: BW Prince CMA-2: Tocho Maru

Expected Operator Actions – Search for the ship's information, record the information and its source, apply judgment on the validity of the information and report results to WC.

Event-9 Setting up alerts

Repeat the Event-6 request with the addition that automated alerts be set up for ships meeting the criteria.

Criteria: see Event-6

Expected Operator Actions – Establish the automated alerts, no reporting expected.

3.0 Test Conduct Philosophy and Execution

The primary purpose of TRRLOE was to reduce risk for the FAIRGAME MDA Spiral-1 systems assessment. This meant that the operators and the systems they used had to exercise the FG events in such a way as to uncover any problems that might be encountered in FG. The normal precautions one takes for an assessment event, most importantly to ensure reality of the operational environment, were not germane. Completeness of risk testing was of primary importance. Thus, the RR tests focused on determining requirements for, and impediments to, operators, systems, and databases to execute the FG events.

3.1 Test Conduct

Four principal circumstances dictated RR conduct:

- Only three of the Spiral-1 systems, and no base-line systems, were available.
- Standard Spiral-1 training for the operators was not available.
- The test was conducted in a laboratory.
- Historical databases had to be used.

Section 2 describes modifications to the test events that were due to these circumstances. This section describes how they affected test conduct.

Operational Organization Structure – The operators did not play as an organization with an AOR. Problems were mostly in the form of general RFIs that were posed to the two CMA operators. The FASTC2AP/Google Earth operator worked the problems as those systems allowed.

Real-Time Training – Sufficient training for the operators to become fully competent on their systems before RR start was not available. It was necessary to allow some limited assistance during the tests so that the operators could use the systems correctly and efficiently.

White Cell Operation – The White Cell initiated all events by sending an RFI to the operators. An operator would provide information and perhaps ask for clarification. Even when no clarification was requested, the White Cell would often ask for additional information. The White Cell was not *hands-off*, rather he interacted with the operators in such a way as to ensure they fully exercised their system's capabilities. This methodology was in conformance with normal MIFCPAC operations.

Communications – All communications between the White Cell and operators were via a Spark IM client installed on a laboratory XMPP server. During events when the operators needed to collaborate it was done face-to-face since the collaboration capability in CMA was not available.

Observer Conduct – Observers of tests/experiments normally remain in the background as much as possible so as not to distort results. A risk-reduction event is a special case since its primary purpose is to identify risk to another event, not to gather assessment data. It was important for RR that all events be executed and, in order for that to occur, some interaction between

operators, trainers, and observers was required. This interaction didn't affect assessment of system performance, human-system interaction, and operator acceptance/evaluation of the systems.

System Utilization – White Cell RFIs were sent to the two CMA operators. Since they had no suite of systems to use, they were limited to acquiring all information from CMA. No directions were sent directly to the FASTC2AP/Google Earth operator; he worked in conjunction with one of the CMA operators as was allowed by their respective databases (when the same ships were available). Almost all FASTC2AP use entailed testing of the various pre-set alert capabilities.

MDA Processes Quality and Execution Time – The above noted behaviors are compatible with a risk reduction event but do introduce artificiality. Capturing data that will lead to determination of the quality of operational activities and tasks, and the time required for their execution, requires a realistic operational environment. In a lab event of this type, only times associated with acquiring data from the systems could be determined.

There were 3 observers for this event: Doug MacKinnon (NPS), Sue Hutchins (NPS), and David Rousseau (SSC-SD). Gordon Schacher (NPS) performed exercise control duties for this event.

3.2 TRRLOE Real-Time Event Modifications

Some of the TRRLOE events were modified during test execution because of unforeseen circumstances. The following list those modifications and their reasons.

Event-1: No modifications.

Event-2: No modifications.

Event-3: The event had already been modified from FAIRGAME's original intent to observe ships transiting from one AOR to another. Because of the limited ship database, it was not possible to identify candidate ships. Thus, the event was modified to identify ships transiting into and from the Suez Canal. It was further simplified during the event to identify only ships that are in the canal.

Event-4: CMA collaboration capabilities were not available so the handoff portion of the event could not be done.

Event-5: 20 nm proximity was used to locate ships of interest. The search was then narrowed to identify ships with which there could have been a rendezvous.

Event-6: No change.

Event-7: FAIRGAME EV07 was not exercised because there was no container information in the TRRLOE laboratory system.

Event-8: No Change.

Event-9: Not exercised because the laboratory CMA system did not have authority to create alerts. The structures and capabilities of FASTC2AP alerts were tested, but not as an event.

3.3 Conduct Impact on Results

The following are the factors introduced by RR conduct and their impact on risk reduction results.

Operators and Training – The operators were experienced in intelligence watch operations but had minimal training on the systems. This allowed determination of training requirements but there was no ability to identify risk due to operator effects such as their system-use preference.

System Availability – The systems that were available had a complete test for usability and operator acceptance. There was no ability to test impact that operator preference for using Spiral-1vs using existing systems might have on FAIRGAME.

Database – The non-conventional databases that were available in the laboratory was a fortuitous circumstance. It allowed identification of database problems that could impact FG.

Organization Effects – Realistic operational environments were not utilized so no risk associated with organizations nor their processes could be tested.

As noted previously in this report, RR was not conducted as an assessment test. Even so, assessment results can be extracted. It will not be possible to assess operational performance, such as task execution times because of the unrealistic environment and test procedures. It will be possible to determine usability of the systems, operator acceptance and their evaluation of system impact on their activities, and training needs. Assessment results that could be determined are presented in Section 6.

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4.0 TRRLOE Observer and Survey Results

These results are based on extractions of data from:

- Observer logs
- Hot-wash-ups that were conducted with all personnel at the end of each day
- Surveys that were completed by the operators

The first two sources are summarized in Section 4.1.

These results are summaries obtained directly from the data sources, prior to detailed analysis. Analysis results are presented in Sections 5 and 6, risk reduction and MDA analysis results, respectively.

4.1 Observer Results

The following results are for CMA, except where noted.

Information Acquisition Times – Even though the systems were not used in an operational environment, the amount of time required to obtain information using them was representative. Very little time was required. E.g.,

- 1 min to determine when ship was built after White Cell request.
- 7 min to determine person-of-interest was not on reported ship.
- 2 min to identify cargo on a named ship.
- 10 min to locate a ship and identify its origin and arrival locations.
- 6 min to locate a ship, details on type and crew.

It is possible that these times are biased to shorter time because historical data was used for which the needed data was known to be present. Even so, these information acquisition times represent an improvement over existing procedures.

Operator Performance/Training – Operator training on the operations they were asked to perform with the systems was minimal. Within this context, the following observations can be made:

- They developed facility with the systems in a short period of time, usually after about ½ hour of working with a functionality.
- How the system applied to, or could be used for, the jobs with which they were familiar was clear. Difficulties they had were largely the result of system malfunction (due to lab environment).
- There were instances where an operator searched for a function or capability CMA did not have. This could be a training issue and/or represent functionalities that should be added.
- It is clear that two or three days of focused training on the Spiral-1 suite will result in fully competent operators.

Human-System Interaction – Note that the following HSI observations are based on operators who were not fully trained on the systems. More complete, operationally-based, training would alleviate some of the difficulties encountered. These observations apply to CMA unless otherwise noted.

- The layout of advanced search is cumbersome (layout and search parameters disappear when new search parameters are entered).
- The search information used when initiating a search cannot be seen when scrolling down in the display. This can result in losing track of overall search context. Operators requested a horizontal rather than vertical layout of information.
- Having political and AOR boundaries would aid the operator in setting up search areas.
- Searching for and acquiring information can involve many information elements. It would be useful to have a pre-structured notepad where the operator could enter information already obtained and build an information picture.
- Operators tend to develop personalized methods for information searches. It would be useful to have a means for capturing operator searches for reuse. This would be especially useful for categories in advanced search.
- Add 'cargo' to pull down search menu.
- FASTC2AP: The structure of the format used for setting up alerts is unclear and difficult to use.
- FASTC2AP: Add capability to make a polygon, a common shape required to conduct a search in the real world.
- Add feature to specify a point and a specified radius to establish a search area.
- Add feature to be able to enter a coordinate and then be able to set up a search area around it.
- Need better color coding along left-hand side for icons; make meaning of color explicit.
- Need better understanding of what pre-built searches do; user thought they were going to provide different information.
- Need ability to save an area when drawing a box/polygon with a specific name.
- Change hyper-graph: provide more detailed information (e.g., vessel name) and make it easier to read information
- Include the ability to draw a line to be able to search any track crossing a line rather than a box.

System Performance – Most system problems encountered were due to the lab environment and do not qualify as Spiral-1 system results. The following results are inherent to the systems, not the lab environment. These results are derived from limited tests of the systems and have not been validated.

- Partial match did not work as anticipated when searching for a ship name.
- Operators could not zoom in and draw a small geographical box around a VOI.
- Advanced search is difficult to use. Specifications can be lost when adding to search.
- Basic and advanced search need more defined categories, such as "hazmat" for cargo.
- It would be advantageous to be able to use distances when setting up searches.
- FASTC2AP: Three of the alerts (Course Proximity, Vessel Proximity, and Next Waypoint Feasible, require the SCONUM. Matching of ship name, position and SCONUM becomes classified. Since FASTC2AP will be fielded on CENTRIX, perhaps

the ship's Lloyd's or International Maritime Organization (IMO) number could be substituted for the currently required SCONUM.
- FASTC2AP: Boolean criteria alerts were difficult to set up and all conditions may not be available.
- FASTCAP: Needs capability to refine searches more by user: current searches are too broad.
- FASTCAP: Understanding the results of agents was difficult
- FASTCAP: Could not designate an agent to find ships that came within 200nm proximity of the west coast.
- FASTCAP: Flexible template relations were difficult to understand.
- FASTCAP: Interface was not intuitive to use.
- Need separate category to rate the age of the data – an important criteria on which operational tasking is built on. (There is a quality rating, but time lateness of data should be a separate category.)
- Make the factors that go into "quality" rating transparent to the user.
- Need a clear indicator to inform user when any database is down.
- GOOGLE EARTH: Latest position was easy to get, but the Volpe AIS data was limited and not useful for in-depth analysis.
- GOOGLE EARTH: Could search for the latest position, but not for track data.

4.2 Survey Results

Surveys were administered for each of the technologies involved in the TRRLOE in addition to demographics and training surveys. System specific survey questions were developed in addition to the general survey questions that appear in all three surveys. Surveys used for TRRLOE MDA technologies are included in Appendix A. The purpose of the surveys was to gather feedback from the users involved in the exercise to identify strengths and weaknesses of the MDA technologies. Topics included training effectiveness, system usability, suggestions for improvement, and features participants found particularly useful.

Demographics
Three users participated in the TRRLOE; two participants used the CMA technology and one used FASTC2AP and Google Earth systems throughout the experiment. Participants included an IS-3 Strike Analyst, an IS-2 Optical Analyst, and a LT Intelligence Analyst, currently attending the Naval Postgraduate School. The average service time for the participants was about five years and their level of experience in their current positions varied between intermediate and advanced.

Baseline Training Survey Results
All three system operators had no prior knowledge of Comprehensive Maritime Awareness (CMA) or FASTC2AP technologies, or their capabilities, prior to the training. All users received an instructional brief, and depending on the participant, some received hands-on training, a quick reference guide, and trainer interaction. Two users felt that the training materials were easy to understand given the amount of time allowed to complete the tasking, and the other felt that the material was not easy to sift through. Participants thought the preparation, instruction, and

training provided during TRRLOE for CMA and FASTC2AP was fairly productive, all users felt that there should have been more time allotted in order to adequately understand the processes and systems as a whole, in addition to working one-on-one with subject matter experts.

Regarding Google Earth, all users had prior knowledge of its capabilities. All users thought the instructional briefs and on-line tutorials were easy to understand and also agreed the training and instruction received prepared them for the tasks performed during TRRLOE.

Comprehensive Maritime Awareness (CMA)
Regarding the training materials provided, one user felt that for the limited time allotted, the materials made it fairly easy to complete the tasking while the other user felt that the training materials were not easy enough to navigate through and suggested an online version to improve the method of searching. One participant felt strongly about allowing more time during the exercise in order to adequately comprehend the material, while the other user's concern was to provide more one-on-one time with operators and subject-matter experts. One participant suggested that the system should have been fully developed beforehand to enable the participants to know what to focus on during the training and get the most out of the exercise along with more scenarios in order to practice on prior to the test evaluations. Although complications were experienced during the exercise, overall, the users felt satisfied with the training they received.

FASTC2AP
The FASTC2AP operator had approximately one hour of training on the system prior to the exercise, where he was first introduced to the technology. Two operators received training on the system in the form of an instructional brief which they both agreed was easy to understand. Participants agreed the training was effective, but it could have been longer, and suggested that more scenarios be added to the exercise in order to practice more before evaluations, and also requested more one-on-one time with operators.

GOOGLE EARTH
For the Google Earth application, all system operators had prior knowledge of the technology. Participants received an on-line tutorial in addition to an instructional briefing that they felt was easy to understand and use; the training was adequate for them to effectively utilize the technology. Due to the familiarity of the application, the users were satisfied with the training they received and felt that they could use Google Earth's technology effectively by the end of the exercise.

Comprehensive Maritime Awareness (CMA) Survey

Usability. Both CMA operators thought the technology was easy to learn and use, and the training produced basic knowledge of the system and its background. Both CMA users strongly agreed it was easy to develop and maintain situation awareness on a vessel of interest (VOI), especially once provided with a watch list that includes the names of the vessels. CMA operators emphasized that it was extremely easy to find relevant information on a VOI as long as one knew the name of the vessel; otherwise it would be difficult due to the hyper graph.

It was easy for CMA users to associate tipper/ Intel information with the correct VOI. CMA showed recent alerts on the vessel and made it easy to see the tippers. Operators maintained contact with the white cell (representing higher command) on chat. On day one, users found it difficult to cross reference tracks being used by operators on other systems due to the difficulty of looking at two units and not being able to compare them. However, on day two, CMA users agreed that the use of either FASTC2AP or Google Earth made it much easier to cross reference and pull up the necessary information to collaborate.

Suggestions for Improvement and Useful Features. Both CMA users experienced difficulties using the alerting system as well as the hyper graph. Participants noted that when searching on CMA using a partial search, the system did not always pull up all tracks containing a portion of the name. One user recommended adding a feature to provide the capability to use range and bearing from a point in a circle to form a search area. This user also suggested including the ability to use a line or border to search for any track crossing a line rather than a box as is done in the current system.

Another user noted that when attempting to save a box or area, the program would not warn the user when an existing file had the same file name, causing confusion when referring back to a basic search in the pull down menu, and finding two files with the same name. The user also suggested that the system should include a search pull down in the metadata section that allows for the search of cargo, making it easier to narrow down the hits. CMA users stated that the scenarios were realistic enough, and foresee the CMA system becoming a very useful tool for all AORs once incorporated. Participants thought conducting analysis on a VOI was easier and much faster when using CMA than with their previous system.

FASTC2AP

Usability. The participant felt that the program was difficult to learn resulting in the user having to try the agents multiple times in order to understand what each was providing in the way of results. On the second day the FASTC2AP operator stated it was fairly easy to create agents, however understanding the results was still difficult. This user was not able to utilize the online aid, nor did he know what the software “wizards” were. The FASTC2AP operator thought it was easy to compose agents, although the system could not provide the details required for some of the RFIs. This user found it very useful to build alerts in order to fill RFIs through the FASTC2AP alerting system. Since this exercise only looked at snapshot type problems, it was hard to maintain situation awareness on a VOI given that they did not track a VOI over a period of time. When collaborating with other operators during the scenario, the operator was able to cross reference some tracks, however CMA and FASTC2AP had access to different data, making it somewhat difficult.

Suggestions for Improvement and Useful Features. At one point this user wanted to find ships that came within 200 NM proximity of the west coast, and he was not able to designate an agent to carry out the task, suggesting that this capability should be added. This user also added that the flexible template’s relations were difficult to understand and suggested that the graphical user interface (GUI) be made more intuitive. Lastly, this participant suggested removing the ship

control number as a required field when using it on an unclassified network. Overall, the user viewed FASTC2AP as an effective VOI analysis tool with the correct data to support it.

GOOGLE EARTH

Usability. The user felt that this application was easy to learn, and use, finding no difficulty in using all of the features included in Google Earth. This user stated the system was a quick geospatial reference for developing awareness on a VOI as well as finding information on them. Conducting analysis on a VOI was easy, specifically for acquiring their last position; however the VOLPE AIS data was limited, and not useful for in-depth analysis or for providing tracking data. There was no embedded collaboration tool included, thus it was not possible to send information from Google Earth to other systems. However it was possible to look up vessels in other systems making it easier to cross reference tracks and information on VOI with other operators.

Suggestions for Improvement and Useful Features. The user found it useful as a platform for displaying data and not as a collaboration tool. Other than the missing information due to the difference in databases and the restrictions of the application, the user found the system to be very helpful throughout the exercise. The feature this participant found most helpful was the "find" option, providing an easy way to see if a VOI was in the data feed as well as finding basic information on the VOI.

5.0 FAIRGAME Risk Reduction Results

5.1 Identified Risks with Mitigations

1. Databases for CMA (Comprehensive Maritime Awareness) are developed by NRL and exported to the various operational nodes. These databases are AOR (Area of Responsibility) specific, so different AORs may not have the same ship tracks. This could impact track sharing, collaboration, and handoff events.

   Mitigation: Databases for CMA will need to be verified prior to FAIRGAME execution to ensure that same tracks can be viewed and manipulated. This will ensure that collaboration and VOI hand-off can occur.

2. NRL databases have been undergoing modifications and sometimes are re-based with software version installations.

   Mitigation: We had them "lock down" the database for TRRLOE so that it would be stable. (Lock down in the sense that there is not a restart that deletes past data.) This should be done for FAIRGAME so that available tracks remain through both the planning and execution phases of FAIRGAME.

3. Ships utilized for TRRLOE events were identified before the event. It was found that there were very few qualifying ships in the laboratory database. It took two days of work to obtain appropriate ships. This may have been due to the lab database being only about one week old and may not be a factor for FAIRGAME. Regardless, identifying appropriate ships was time consuming. The FAIRGAME plan is to identify ships to "play" in the events in real-time. This could be difficult to do.

   Mitigation: It is recommended that test runs be made before the event to determine if real-time ship selection will work.

4. The TRRLOE systems had problems with data ingests to CMA from both Global Trader and MAGNET. We do not know if this is only a laboratory systems problem or extends to fielded systems as well.

   Mitigation: FAIRGAME planners should do an inventory of exactly what data is being provided by and to the Spiral-1 system nodes to ensure that the various systems will have required data available for each event.

5. Setting up alerts in CMA requires that the operator have a higher level of permission than NRL gave to the TRRLOE Lab 140. The event requiring CMA alerts could not be run.

   Mitigation: The permission levels of the operational nodes should be checked to ensure that they are high enough to accomplish all FAIRGAME test events – especially alert building events.

6. FAIRGAME survey questions address performance of Spiral-1 technologies as-a-whole. The test is set up so that operators can use available systems as they wish; they will use both Spiral-1 and existing systems. It is possible that a particular Spiral-1 system may have no or little use while another may have significant use.

   Mitigation: In this situation, assessing the systems as-a-whole can produce skewed results. It is suggested that surveys be modified so that individual systems are addressed.

7. The scenario used for TRRLOE, which was based on the planned scenario for FAIRGAME, was CMA-centric.

   Mitigation: Ensure scenario events are included that will make use of the specific features provided by other MDA technologies.

8. Very little hands-on training was provided.

   Mitigation: Ensure training includes operationally–oriented examples of how to accomplish tasks with hands-on practice.

6.0 MDA Assessment Results

As noted above, because of the risk reduction format for TRRLOE, there was limited ability to obtain assessment results. Even so, worthwhile assessment results were obtained.

1. **Significant Reduction in Time Required to Access Information**. The TRRLOE operators were two experienced Information Specialists (IS) and one Intelligence Officer. IS comments revealed that use of CMA would significantly improve their ability to access required information. One IS commented, "Without CMA it can take anywhere between several hours to two days to build a picture on a VOI. First time used CMA was able to pull up the same info in a matter of minutes: cargo, who owns vessel, ship characteristics, and they agree across different sources." The significant reduction in access and fusion time could result in providing more time for higher-level analysis and for monitoring more vessels.

2. **System Operators Found MDA Systems Very Useful**. Even though use of the four Spiral-1 systems in conjunction could only be done in a limited way, the operators commented that these tools would be a useful for analysts, again speeding up their processes. CMA operators agreed it was easy to develop and maintain situation awareness on a VOI, especially if one knows the name of the vessel. "All the info is at your fingertips." It is a bit harder if there are a large number of vessels that requires searching information on each one. CMA operators strongly agreed it was easy to find relevant information on a VOI (although they did not like the hyper-graph format for displaying information). FASTCAP user thought alerts he built to fill RFIs were very useful.

3. **Change Alerts so SCONUM is Not** Required. FASTC2AP has a number of pre-defined alert functions. Their use requires an ONI-assigned SCONUM, which when combined with a ship's name and its position becomes classified. The SCONUM also may not be available to coalition forces. This makes these alerts of limited use and could cause future security concerns. It is recommended that the alerts be rewritten to require ship names only or the Lloyd's identification number.

Operational use of MDA Spiral-1 systems will be in conjunction with existing systems. It is expected that operators will develop preferences for how they use the systems, ways that are natural in concord with their experience and training. MDA information capture and assessment should determine these use methods as they evolve as an aid in developing CONOPS, TTP, and training. Such determinations were not made during TRRLOE.

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Appendices

A. Surveys

Two types of information were obtained from the participants. The first provides data collection via a User Log Sheet, shown for CMA only below. Its purpose is to log the information associated with vessels on which they are working. The second instrument is a survey to obtain system information and its use.

The following are the log sheets and surveys for CMA only. Systems logs and surveys are each tailored to specific systems, yet these CMA instruments are sufficient for this illustration. Much of the space provided for information/answers are removed to make them shorter for this document.

CMA User LOG SHEET

Please complete the table below as you engage in the scenario. List all Vessels of Interest (VOIs) you process and other tracks that you process.

VOI	What caused you to notice this Vessel?	Critical Info Obtained on VOI	Alerts on VOIs Received			
			Time Noticed	Start Time of Processing	End Time of Processing	Total Time for Processing

CMA User Survey
Comprehensive Maritime Awareness

Please select one response to each of the following items. Use the space below each item to furnish additional information about your responses.

1. **I have used CMA previously.**

   _____ **Yes** _____ **No**

   If yes**, please identify what exactly:** _____

2. **I had prior knowledge of this technology's capabilities.**

   _____ **Yes** _____ **No**

   If yes**, please explain:** _____

3. **CMA was easy to learn.**

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

   Please explain:_____

4. **CMA was easy to use.**

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

   Please explain: _____

5. **The online help was useful.**

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

   Please explain: _____

6. **It was easy to use all the features included in CMA.**

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

   Please explain those features that were **not easy** to use: _____

7. **CMA made it *easier* to do my job than with the current/ previous system I was/ am using.**

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

8. CMA made it *faster* to do my job than with the current/ previous system I am/ was using.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

9. I was able to develop awareness of VOIs faster with CMA.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

10. It was easy to find information on a vessel of interest.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

11. The alerting system in CMA was easy to understand.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

12. The alerting system in CMA was *useful* and *relevant*.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

13. It was easy to develop and maintain situation awareness on a vessel of interest.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

14. It was easy to find relevant information on a vessel of interest.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

15. It was easy to associate tipper/ intel information with the correct vessel of interest.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

16. It was easy to conduct analysis on a vessel of interest.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

17. It was easy to collaborate with others on a vessel of interest.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

18. It was easy to search and track a vessel of interest.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

19. I was able to process and maintain situation awareness on more VOIs than with my previous system.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

20. I was able to process and maintain situation awareness on more than one VOI at a time more easily than with my previous system.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

21. It was easy to cross reference tracks being processed by operators using other systems.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

22. Were there actions you wanted to perform with the system that you did not understand?
Yes _____ No _____
Please explain: _____

23. Were there actions you wanted to perform with the system that were not available?
Yes _____ No _____
Please explain: _____

24. Was there any conflicting information when you collaborated with users on other systems?
Yes _____ No _____
Please explain: _____

25. Was there any information confusion when you collaborated with users on other systems?
Yes _____ No _____
Please explain: _____

26. I could collaborate easily about the same information with operators using other systems.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
☐	☐	☐	☐	☐	☐

Please explain: _____

27. It was easy to cross reference information on VOIs with operators using other systems.
Yes _____ **No** _____
Please explain: _____

28. I could access and use the online help.
Yes _____ **No** _____
Please explain: _____

29. What features did you find to be helpful in performing your tasks?
Please explain how/ why each feature listed was helpful (be as specific as possible).

Feature Used	**Why was it helpful?**
_____	_____

30. Were there any features in CMA that you found difficult to use?
Please explain how/ why each feature listed was helpful (be as specific as possible).

Feature Used	**Why was it difficult to use?**
_____	_____

31. I view this as an effective collaboration tool.

Yes _____ No _____

Please explain: _____

32. What changes, if any, would you recommend to improve CMA?

_____

33. Was there any conflicting information when you collaborated with other system operators on a VOI, and what was it?

Yes No

Please explain: _____

34. Any other comments? _____

B. Observer Logs

Observer logs are used to record time-stamped events. They provide data which are analyzed to produce both quantitative and qualitative information. Below are the directions for the logs followed by the spreadsheet form.

TRRLOE Observer Log – Directions

The following explains the purpose for and use of the columns in the log.

MEL # Enter the # for the event that is underway when the observation is made.

Time Enter the time of the observation (not the time the observation is recorded).

Observation This is the data. It is what we will analyze. Enter anything you feel is pertinent for evaluating quality of performance or system. Especially important is context, such things as the operator is confused. Also record such things as the number of steps it takes to perform a task. Be sure to record the start and end times for tasks. Use more than one line for a single observation, if needed.

Check-Boxes Check all boxes that are appropriate for your observation. These checks will be used during analysis to sort the data. If no box is checked, the analyst will have to figure out to what the data applies (not good).

- CMA GE FCP Shorthand for the three systems being used. Check only one for a data entry.
- System Performance, Usability, Efficiency, Clarity These are for system evaluation.
- Information Availability, Quality Judgments about the information received, or produced by the operator.
- Operator Capability, SA, Knowledge Judgments about the operator.
- Timeliness, Accuracy These can apply to any of the observations.

Check-Box Rules The following apply to what can be checked for a single observation.

Only one system – Observations for more than one system require more than one entry.

Timeliness and *Accuracy* – Can be checked whenever appropriate, no restrictions.

System, Information, Observer – Only one of the three categories can be checked for an observation. However, more than one block in a category can be checked.

Archiving Instructions:

1. Open the spreadsheet from the "Logs Folder" in thumb-drive you have been provided.
2. Record your information from the day's observations on the spreadsheet.

3. File the spreadsheet using your initials and the observation day,
   E.g., GS-Observer Log-1.

You will archive your "Observer Evaluation of Activities" survey form in the same way.
E.g., GS-Activities Survey-1

When first archiving, also rename your folder with your initials, e.g., GS-Logs Folder.

TRRLOE Observer Log
The following is a compressed form of the log spreadsheet.

Observer_____ Day 1 2			Check Boxes for Data Sorting													
MEL #	Time	Observation (This is the data.)	CMA	GE	FCP	Syst Perform	Syst Usable	Syst Efficiency	Syst Use Clear	Info Avail	Info Quality	Oper Capable	Oper SA	Oper Knowl	Timeliness	Accuracy

C. Hot Wash-Up Comments

User Comments

1. CMA is a good tool because it reduces the time to get information.
2. CMA is a valuable asset due to the broad amount of information it provides in a short time. All information comes up in one location; don't have to look at so many windows as is currently done.
3. Would have been good if I had a better understanding up front of what it was supposed to do, i.e., is it replacing GCCS, or what?
4. Not getting a COP with MDA; are getting a set of tools.
5. Need more operationally-based training. Scenarios had MDA focused questions – use those as hands on training.
6. FastC2AP and Google Earth are good tools. FastC2AP needs capability to refine searches more by user; current searches are too broad. Need to be able to narrow searches.
7. Need better understanding of what the pre-built searches do. Need to be very clear on what each agent does. When tried to use them, thought it was going to provide different information.
8. Takes so long to do a search of Sealink. With CMA you have one place to go which saves a lot of time.
9. Time savings: Without CMA it can take two days to build a picture on a VOI. First time used CMA was able to pull up the same info in a matter of minutes: cargo, who owns vessel, ship characteristics, and they agree across different sources.
10. Some difficulty accomplishing tasks, e.g., search specific 500nm area. Huge region comes up with so many vessels. MIFCPAC subject-matter expert said it's a realistic request. But petty officer thought it would be better to make it a more focused request. (Indicated that is how she receives requests in explot, i.e., more specific.)
11. Usability issue: Search Metadata – cargo, 30 days in X area. Would be easier to have pull down menu include *cargo*.
12. When draw a box and tried to save as Singapore for basic search area, wound up with two boxes being saved (because had done this step twice). Add feature similar to MS Office where it asks 'Are you sure?' Or gives an opportunity to name to 'save as'.
13. FastC2AP flexible template page: have to name vessel looking at, have to formulate relationship, characteristics of search: ____, _____. And check add. (i.e., complicated)
14. Proximity Vessel – another set of input, have to enter time, range, refines search faster. GUI not intuitive to use.
15. Only get a rectangular box: can't get a polygon, which is a pretty common thing that would be needed to do a search in real world. This capability needs to be included in FastC2AP.
16. We only looked at snapshot type problems and did not look at VOIs over a period of time (in response to question asking whether it is easy to maintain awareness on a VOI).
17. FASTCAP and CMA have access to different data making it difficult to cross reference tracks.

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D. Master Events List

The following are the TRRLOE events as designed prior to execution. The table contains the FAIRGAME event number in column 1 and the Master Event List number in column 2. The last two columns indicate actions to be taken by the White Cell and the operators.

Note that not all FAIRGAME events are executed. Also, there is an extra event, EVxx, inserted.

TRRLOE Master Events List

FG #	MEL #	Description	WC	Oper
EV01	RR1.1	White Cell issue RFI referencing a particular vessel.	W	
	RR1.2	Acquire all available information about the ship.		O
	RR1.3	Locate the ship.		O
	RR1.4	Search for an alert for the ship.		O
	RR1.5	Analyze information obtained for completeness.		O
	RR1.6	Issue needed RFI to other organizations.		O
	RR1.7	Prepare RFI response.		O
	RR1.8	Distribute RFI response.		O
	RR1.9	White Cell evaluate RFI response and forwarded RFI.	W	
EV02	RR2.1	White Cell issue RFI referencing a person-of-interest and their ship.	W	
	RR2.2	WC sends pseudo-TRIPWIRE report about the person.	W	
	RR2.3	Search for information on the reported person.		O
	RR2.4	Acquire all available information about the ship.		O
	RR2.5	Acquire information about the person's ship.		O
	RR2.6	Locate both ships.		O
	RR2.7	Prepare RFI response.		O
	RR2.8	Distribute RFI response.		O
	RR2.9	White Cell evaluate RFI response.	W	O
EV03	RR3.1	Request alerts for ship movements across AOR boundary.	W	
	RR3.2	Build alert.		
	RR3.3	Establish collaboration between operators.		O
	RR3.4	Observe alert and inform collaboration partner.		O
	RR3.5	Confirm ship locations.		O
	RR3.6	Collaborate on ship locations.		O
	RR3.7	Track ships.		O
	RR3.8	Collaborate on reporting ships at boundary.		O
	RR3.9	Report ships approaching / crossing boundary.		O
EV04	RR4.1	WC sends 3 NMIC named VOI, requests tracking and reporing.	W	
	RR4.2	Vessels are added to the watch floor VOI list.		O
	RR4.3	Establish collaboration between operators.		O
	RR4.4	Operator collaboration on VOI addition.		O
	RR4.5	Establish cross-AOR coordination.		O
	RR4.6	Track ship.		O

	RR4.7	Initial tracking operator report position.		O
	RR4.8	Handoff ship.		O
	RR4.9	Second tracking operator report location.		O
	RR4.10	Issue RFI for non-located ships.		O
	RR4.11	White Cell evaluate forwarded RFI.	W	
EVxx	RR5.1	WC sends RFI to ID and report vessels in 20nm proximity to named ship.	W	
	RR5.2	Proximity alert set up.		O
	RR5.3	Vessels triggering alert identified.		O
	RR5.4	Proximity vessels reported to the WC.		O
EV06	RR6.1	Send RFI defining geographic area and ship attributes.	W	
	RR6.2	Search for ship information.		O
	RR6.3	Determine ship positions, correlate with area-of-interest.		O
	RR6.4	Fuse ship information and ID ships that meet criteria.		O
	RR6.5	Prepare list of conforming ships.		O
	RR6.6	Forward list of conforming ships to WC.		O
EV08	RR8.1	Specify ship and request ship information and its provenance.	W	
	RR8.2	Locate ship information.		O
	RR8.3	Prepare report on ship information, information sources, and quality.		O
	RR8.4	Distribute ship information.		O
EV09	RR9.1	Specify and forward ship attributes and geographic areas.	W	
	RR9.2	Develop alerts for areas-of-interest.		O
	RR9.3	Develop alert for ship that is known to be within Area of Interest.		O
	RR9.4	Determine location of ships that meet attributes.		O
	RR9.5	Observe correct alert functioning.		O

E. White Cell Directions

White Cell (WC) directions will be provided to 2 CMA operators and another person operating both FASTC2AP and Google Earth. The following directions specify tasks for CMA-1 and CMA-2. The third operator will execute tasks as appropriate for the capabilities of the systems.

Operator output products will be sent to the WC. The WC will evaluate these products for their quality using a provided questionnaire.

Event-1 Obtain information on named ships.
WC send an RFI requesting all available information on two named ships. One of the ships will have complete information available, the second limited information. The named ships are:

CMA-1	CMA-2
Tocho Maru	Shiraoi Maru
Polynesia	Sagittarius Leader

Expected Operator Actions – The operator will search for information for each ship. RFI responses for both ships will be sent to the WC. For the ship with limited information, the operator will prepare and send an RFI to another command requesting that they search for the missing information. This secondary RFI will also be sent to the WC.

Event-2 Correlate ship and person-of-interest information.
WC send an RFI requesting information about a person of interest who is reported to be on a named ship. WC also forward a simulated TRIPWIRE tipper concerning the person-of-interest. The RFI will request information about the person and the ship.

CMA-1	CMA-2
Ship: Shiraoi Maru	Ship: B W Prince
Person: Renato Lumandas	Person: Sang Li Tao

Expected Operator Actions – The operator will search for information on both the ship and the person. It will be found that the person is not on the named ship. The operator will send a response to the WC that includes information on both ships and on the person.

Event-3 Alert of ships crossing AOR boundary.
WC sends an RFI requesting that ships transiting the Suez Canal within the last 24 hours or that will transit within the next 24 hours be identified. Information requested is ship identity, registry, cargo, and whether approaching or leaving the canal.

Expected Operator Actions – The operator will establish a geographic boundary that will be used to identify ships within their area of interest. Ships that qualify will be identified, their requested information searched for and obtained, and RFI response prepared and sent to the WC.

Event-4 VOI Addition, Sorting and tracking named vessels.
WC names three vessels, requesting that tracking of them be established. One will be moving toward the NAVCENT/PACFLT boundary, the other two non-existent.

CMA-1&2
Ship-1: Catheryn Maru Ship-2: Patrick Angel Ship-3: YM Inception

Expected Operator Actions – Three new vessels are added to the VOI watch list. Both operators locate the existing ship. Operator in whose AOR ship is located establish tracking and report location. Operators collaborate prior to handoff. Ship handoff and second operator establishes tracking and reports location. Operators prepare and forward RFI for ships that weren't located.

Event-5 Vessels in Proximity of Named Ship
WC issues an RFI to identify and report on vessels that have been in 20nm proximity to a named ship, within 200 nm of the US West Coast.

CMA-1: Symphony I
CMA-2: Shiraoi Maru

Event-6 Identify ships within a geographic area that are carrying hazardous cargo.
WC send an RFI requesting identity of ships carrying hazardous materials, within the past month, specify a geographic area and request identity of ships and all available information.

Geographic Area CMA-1: 500nm off US coast, Los Angeles to San Francisco
CMA-2: 200nm around Singapore

Expected Operator Actions – Each operator establish their geographic boundaries, utilize advanced search to identify ship carrying hazardous cargo. A report will be sent to WC providing identities of qualifying ships.

Event-8 VOI information and its provenance.
WC request all available information on a named ship, sources of the information, and assessment of information quality.

CMA-1 ship: BW Prince CMA-2: Tocho Maru

Expected Operator Actions – Search for the ship's information, record the information and its source, apply judgment on the validity of the information and report results to WC.

Event-9 Setting up alerts.
Repeat the Event-6 request with the addition that automated alerts be set up for ships meeting the criteria.

Criteria: see Event-6

Expected Operator Actions – Establish the automated alerts, no reporting expected.

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