RAPID ENVIRONMENTAL ASSESSMENT - EMERGING REQUIREMENTS FOR MILITARY HYDROGRAPHY

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ABSTRACT

Expeditionary Warfare, Littoral Operations, Rapid Environmental Assessment (REA) - whatever term is employed a knowledge of the environment is critical to military success. Today, battlespace characterisation is an assessment activity with direct operational relevance for each of the Services. It is important to the planning and conduct of joint operations generally, and land and naval operations in particular. Knowing where ships can navigate safely, where amphibious landings can be conducted and how systems, weapons and sensors will be affected by prevailing environmental conditions - is a fundamental enabler for successful operations. In particular, environmental information in the littoral battlespace can be used to gain tactical advantage in amphibious operations, mine warfare and special operations missions.

Whilst maintaining responsibility for hydrographic surveys of its own waters the Royal Australian Navy's fleet of hydrographic ships and aircraft are now required to acquire Maritime Military Geospatial Information (M-MGI) for combat support. As such it has embarked on a comprehensive programme to enhance its ability to undertake REA and to produce and disseminate M-MGI. This paper[1] will describe these initiatives which include the investigation of emerging technologies including autonomous underwater vehicles and tactical airborne systems. It also discusses how these technologies might be employed to enhance routine hydrographic survey operations for nautical charting.

INTRODUCTION

The requirement for a knowledge of the environment was clearly demonstrated in the 2003 Iraq War where the Australian-led coalition Maritime Interception Force (MIF) relied heavily on both accumulated environmental data and Rapid Environmental Assessment (REA) generated by HMS ROEBUCK. This allowed HMAS ANZAC and other units of the MIF to conduct naval gunfire support to British forces operating in the Al Faw Peninsula area whilst underway in very shallow water, counter-mining operations, maritime interdiction and riverine patrol. The MIF Commander reported that this combination of data allowed informed judgements to be made on risk to Coalition assets and allowed assigned naval forces to confidently use the battlespace.[2]

The Australian Defence Force (ADF) has a responsibility to provide REA information as well as to receive it from others. As the ADF increasingly operates in coalition operations, interoperability will depend in part on the capacity to share a common and consistent understanding of the battlespace and a capacity to receive and process environmental information and assessment. REA will contribute to the operational safety and effectiveness of the ADF when operating either unilaterally or in a coalition.

Without an REA capability, ADF maritime assets could be placed at risk, as they would not be able to contribute to, or receive environmental information from, a coalition common operating picture. The activities associated with the direction, collection, analysis and dissemination of near real-time

environmental information, focused on locations of impending or current operations, comprise the capability for REA discussed in this paper.

THE PURPOSE OF REA

The character of the battlespace environment can often result in a 'go'/'no go' decision for any contemplated action. In particular, environmental information in the littoral battlespace can be used to gain tactical advantage in amphibious operations, mine warfare and special operations missions.

To successfully fight and win at sea, especially in the littoral, commanders at all levels need to have a common, current and reliable understanding of the available environmental information. There is a need to fuse environmental data from all available sources to continuously characterise the battlespace in which platforms and assets are operating and consolidate this into an overall environmental picture. An example of this is the Recognised Environmental Picture embedded in NATO doctrine for use in the planning and execution of amphibious operations as well as all other operations. Operational commanders and tactical commanders in particular, need this information in as near real-time as is possible.

REA can thus be characterised as a form of operational-level geospatial intelligence activity focused on the maritime environment. It is concerned with the collection and fusion of a wide range of data in unclassified and classified domains, and may involve overt and covert collection activity.

While topographical information is relatively constant, affected by meteorological and adversary activated variables, the marine environment remains more dynamic. This is because the combined effect of hydrographic, meteorologic and oceanographic variables can have a dramatic impact on operations. The littoral zone is particularly problematic especially where the underlying survey is incomplete. Shallow water, turbidity and variations, bottom type and beach gradient is perplexing for amphibious and mine warfare, particularly in depths of less that 10 m, and submarine operations. Successful mine warfare depends on current and detailed environmental information and there is a need to understand the properties of the environment down to the sediment and underlying rock at the base of the water column. For example, use of submerged electro-optical sensors for missions such as mine countermeasures operations will require a capacity to measure the inherent optical properties of the coastal ocean. Thus the littoral provides the most complex range of requirements and challenges for REA. A capability which can support littoral operations will also be capable of meeting needs in other maritime areas.

For REA, environmental measurements of interest can include:

- Hazards to navigation
- Swath bathymetry
- Acoustic imagery of the seafloor
- Seafloor types
- Geo-acoustic parameters and ocean sound speed profiles
- Marine biological elements and threats
- Bioluminescence
- Salinity

- Temperature
- Conductivity
- Wave heights and periods
- Ocean current direction and speed
- Water clarity and inherent optical properties of the ocean
- Ocean and atmospheric transmittance
- Wind information
- Barometric pressure, surface air temperature and relative humidity

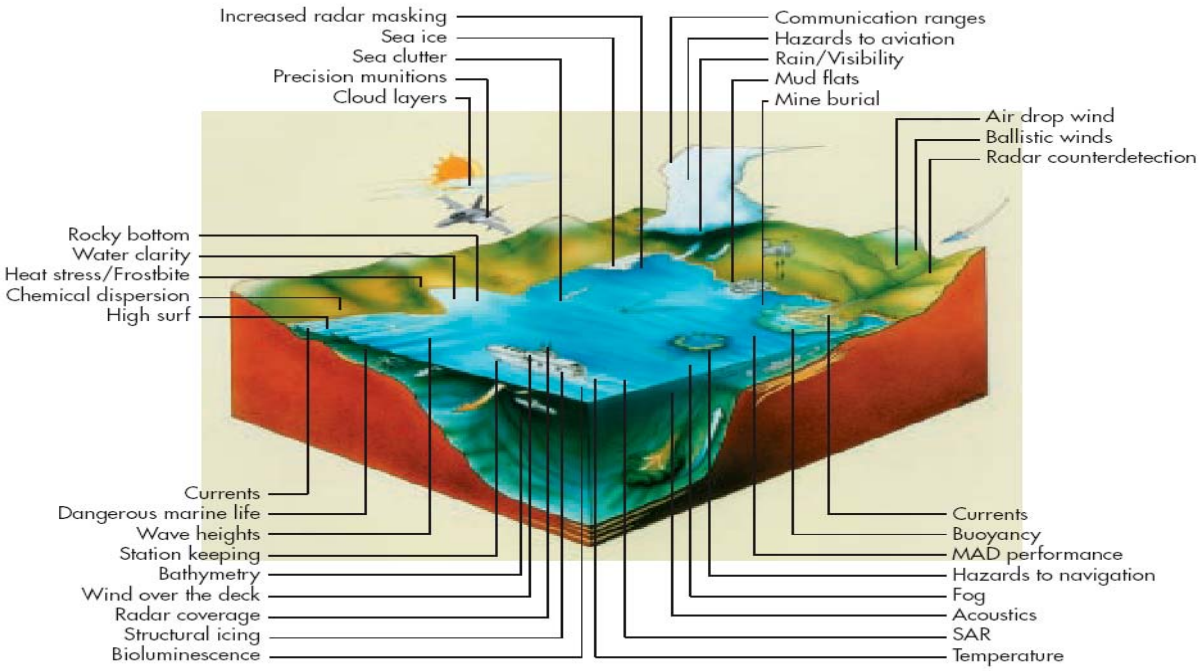

Figure 1: Aspects of the Maritime Battlespace Environment[3]

Within the Australian Exclusive Economic Zone it is the ADF's responsibility to maintain adequate data for REA.

Ideally collection and analysis of tactical oceanographic, hydrographic and other environmental data will occur well before the conduct of operations, and ongoing collection will support the establishment and maintenance of comprehensive baseline information. Where this is not possible, however, a capacity for rapid assessment must be available for activation. In these circumstances, environmental data must be collected and assessed before an operation can be reliably planned or proceed.

Particularly in circumstances where urgency is required, a capability for the rapid collection, assessment and dissemination of environmental information is required to enable the most effective utilisation of maritime and joint assets. Clearly, however, the more comprehensive the baseline information that exists, the more manageable the demand for additional collection will be.

Characterisation of the physical and environmental aspects of the battlespace, prior to and during operations, remains a fundamental activity for the ADF. In this context, the purpose of REA is to help shape the battlespace for own force strategic and operational advantage. REA is about providing environmental awareness for the commander, to complete his or her overall situational awareness.

REA offers a fundamental force enabling capability not provided through other means. It contributes to seizing the initiative through analysis, during the planning and conduct of military operations, of environmental effects on operations, manoeuvre and systems' performance. REA aims to place the right asset in the right place at the right time and thus achieve maximum military effect at least risk. In some circumstances, the ability to achieve this with short lead-times will be needed.

REA objectives include collection and assessment of the physical, meteorological and oceanographic properties of operating areas from the open ocean to proposed amphibious landing sites. There will be a need to fuse hydrographic data with other geospatial information, including topography of the immediate coastal area under consideration, to develop accurate geospatial models (eg: beach models). This will lead to development of seamless capability between Navy and the Army's existing capabilities for military geospatial intelligence and Rapid Terrain Visualisation.

Establishment of a capability for comprehensive maritime REA will:

- Increase our knowledge of the maritime battlespace
- Enable the concept of Comprehensive Manoeuvre, a central enabler of the Future Maritime Operational Concept
- Provide new knowledge for strategic and operational planning
- Act as a significant force multiplier by identifying new areas for strategic manoeuvre in the littoral
- Identify new sea control opportunities for the ADF
- Optimise over the horizon weapon employment
- Contribute to new opportunities in above water, below water, amphibious and mine warfare
- Exploit capability economies of scale and support value for money outcomes, particularly through networking existing dispersed and fragmented REA capabilities
- Enhance analysis of military options
- Assist Navy to optimise use of assets and resources to deliver maximum effect at least risk and cost
- Enhance safety of navigation

The ADF is currently seeking to establish a new capability to make comprehensive environmental data and information available to maritime and joint commanders and their staffs in a timely manner for the planning and execution of successful operations in the maritime and littoral environment.

STRATEGIC NEED

Wherever the ADF needs to go in operations, real-time or near real-time environmental information will be an essential enabler of tactical and operational decision-making.

Military deployments in the more complex strategic environment of the 21st century may be initiated at short notice, and may be undertaken over long distances and in a variety of operating environments, with widely varying availability of environmental information. ADF activities may incorporate maritime operations in highly variable littoral waters. Navy may be called upon to rapidly deploy to unfamiliar regions, to undertake activities across the spectrum of military operations, from crisis response, through interdiction, to humanitarian and peace support operations.

Establishment of appropriate maritime REA capabilities will be crucial to the capacity of the ADF to conduct the full spectrum of operations envisaged in the 2000 Australian Defence White Paper and in the 2003 Strategic Update. Joint operations in defence of Australia will include operations in the air and sea approaches to our north and in our own littoral. In addition, Australia's immediate region, covering parts of South-East Asia and the South-West Pacific, continues to be a likely area for ADF operations in support of our own interests and, potentially, as leader or a member of a coalition.

Maritime REA is a critical enabler for a wide range of ADF operations, and particularly for activities such as amphibious operations and mine warfare. Effective REA capabilities are also important enablers for peace operations, and other activities short of conflict, such as evacuation operations, delivery of civil disaster assistance and other forms of Defence Aid to the Civil Community. For example, the need for timely, accurate, environmental information was highlighted in the ADF's recent operations in Timor, the Solomon Islands and, more so, the Indonesian province of Aceh where the Royal Australian Navy (RAN) Hydrographic Service's Deployable Geospatial Survey Team was required to guide landing craft in support of relief operations.

Australia's defence and national security strategy is increasingly inter-linked with that of the United States. 'Defence 2000 - Our Future Defence Force' states that the Australia-United States relationship is based on an understanding that the two nations are important allies, key partners in regional security efforts and significant potential contributors to coalitions.[4] The 2003 Defence Update also canvassed the concept of Australia providing niche capabilities in support of US-led coalitions.[5] The capabilities that the US is likely to need from coalition partners such as Australia are increasingly likely to include maritime forces.

The current tendency for the ADF to operate in coalition and to be integrated into a US-led force, only if platforms and units have the appropriate technology fit, has been borne out in recent involvements in the Middle East. Without compatible and trusted REA capabilities, doctrine and procedures, Australian forces are less likely to be fully integrated into a US-led coalition. REA will play a key role in enabling the ADF to undertake coalition maritime operations with US forces.

The 2000 Defence White Paper notes that technological developments provide new imperatives to achieve closer integration and interoperability of capabilities and systems. In an era of high technology, network enabled warfare, effective joint and combined operations will increasingly depend on systems that can operate with an appropriate density of information in near real-time.[6] Wherever the ADF deploys, it must maintain the knowledge edge in respect of the physical environment, as well as for other environments.

In summary, Australia's strategic circumstances are increasingly likely to result in short-notice deployment of maritime forces to littoral areas where little or no recent geospatial and environmental information is available. In these circumstances there is a need to be able to rapidly direct, collect, analyse and disseminate this data. REA will aim to make environmental data and information available to commanders and their staffs in a timely manner for the planning and execution of successful maritime operations. In this sense, REA will also make important contributions to the ADF's wider intelligence, surveillance and reconnaissance capabilities.

NATURE OF THE REA CAPABILITY

REA comprises a number of related environmental sensing activities and analytical processes that can be combined in an iterative cycle to improve the commander's understanding of his operating environment. In this regard, REA operates as a 'system' of functions and capabilities. It relies upon the horizontal integration of a range of data resources and analytical capabilities across existing functions and stovepipes.

It is analogous to the environmental assessment elements that exist in current ADF doctrine around the Joint Intelligence Preparation of the Battlespace. In common with other capabilities in the intelligence, surveillance and reconnaissance domain, this cycle includes the four basic components outlined below.

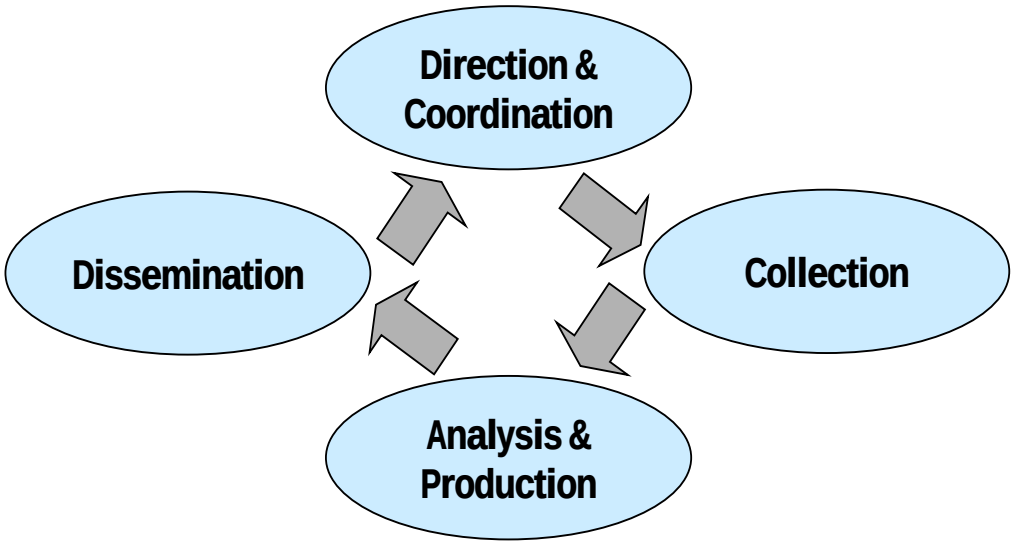

Figure 2: Generic elements in the REA cycle of activity

These components can interact in the REA context as follows:

Direction and Coordination

The REA capability must include core doctrine on maritime environmental assessment, and an organisational structure which provides a capacity to coordinate the development of the Recognised

Environmental Picture (REP) by tasking distributed data sources, collection assets and analytical or fusion resources as necessary.

Collection

An REA system must incorporate the structure and the capacity to both search existing data resources, and deliberately gather new or more current environmental data, by overt means where possible, and by covert means in denied areas. It will include a capacity for prioritising and managing collection.

Analysis and Production

An REA system will require timely analysis and fusion of multiple data sources, hosted in multiple locations, to provide a coherent and consistent view of the continuously evolving local environment.

Dissemination

The REA capability must support the passage of environmental data to naval units both ashore and afloat, and to other units as appropriate (e.g. deployed Special Operations personnel). The REA capability must include the capacity to draw upon the fused environmental data provided by the REA process to create and disseminate a REP that can be married with the Common Operating Picture for Navy and joint elements as appropriate.

This REA cycle is supported by a knowledge infrastructure incorporating both information management strategies and a networked set of data and IT resources.

REA, as envisaged for the ADF, relates as much to development of the overall conceptual architecture of this 'system', extending from environmental conditions, through detection and sensing, analysis, evaluation and dissemination to tactical and operational decision making, as it does to the various sensors, processors and information technology elements that make up that system. Importantly, REA, while concerned with hydrography, oceanography and meteorology, is primarily about the provision of information to the commander to contribute to the ADF gaining the knowledge edge.

For the planning and conduct of joint amphibious operations the Army's concepts of Manoeuvre Operations in the Littoral Environment and Entry from the Air and Sea have the effect of bringing tactical manoeuvre offshore. In such operations environmental information and assessment will be particularly important in terms of flexibility and speed of manoeuvre and the performance of platforms, sensors, weapons and systems.

The maritime environment to be covered by the proposed REA system extends from the air and sea column from sea floor to the outer atmosphere, and the range of environmental conditions which affect or influence manoeuvre in the air as well as on and under the sea.

These conditions have particular significance for mine warfare and amphibious operations, as well as for general maritime operations, weapon, sensor and information system performance. The full range of maritime environmental information covers both static geospatial information, such as water depth and topography, and dynamic information such as weather conditions, currents, salinity etc.

For mine warfare, collection, maintenance and dissemination of comprehensive, detailed and current environmental information helps to significantly reduce the capacity needed to locate, detect and classify mines.

In operations such as the ADF's recent peace support operations in East Timor and the Solomon Islands, as well as in enforcement operations in areas such as the Southern Ocean and off the north and north west of Australia, access to timely and accurate information - both static and dynamic - is crucial to the ADF's ability to ensure effective surveillance and timely response.

As REA seeks to horizontally integrate access to the full range of relevant environmental capabilities and information systems, it will need to develop linkages to information in both the unclassified and classified domains. Data structures and standards and interfaces will need to be harmonised across the range of systems which can contribute to environmental assessment.

GENERAL PERFORMANCE

The REA capability must:

- provide a system which will rapidly bring together all available environmental information,
- facilitate identification of information gaps in terms of location, accuracy, comprehensiveness or currency to enable the gathering of data where it is needed,
- enable the presentation of the information so that it is easily integrated into the overall operational picture for the planning and conduct of operations, and
- enable information to reach operational headquarters ashore and afloat, and in the operations planning spaces of ships at sea.

The littoral, in particular, is a challenging environment to characterise. The increased spatial variability of coastal waters over time requires direct observation, 'nowcast' and forecast of oceanographic, atmospheric and climatological conditions to provide the fidelity of environmental characterisation required for tactical planning and operations.

Ongoing quantification of aspects of the environment in advance of military operations allows the ADF to initialise models for environmental forecasting if military operations are undertaken. Real-time environmental data can serve as the foundation for near real-time characterisations of objective areas and can be used to provide constraints for these predictive models.

Collection

REA is likely to be most effectively achieved if it incorporates access to sensors able to collect direct observations in real-time. The US Naval Research Laboratory has stressed the importance of autonomous unmanned collection using real-time environmentally adaptive sensors.[8] REA will need access to a variety of collection means to assure adequate environmental assessment can be achieved against urgent requirements.

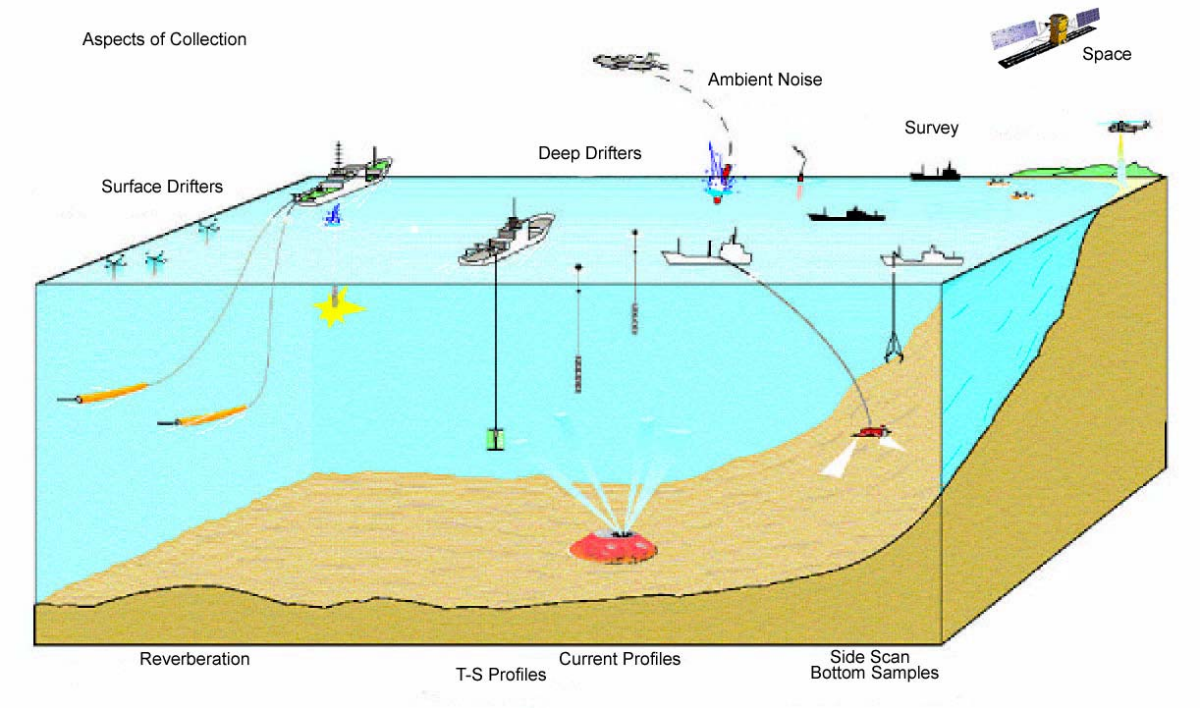

Figure 3: Collecting the Environmental Picture

As articulated earlier in the document, current strategic guidance indicates that the ADF must be capable of operating with coalition forces, particularly the USN. USN 2005 research plans related to real-time collection and analysis of environmental data include:

- Bioluminescence sensor efforts with emphasis on the needs of special forces
- Ocean sensors for use on Autonomous Underwater Vehicles
- Trial of a shipborne LIDAR system for near surface environmental characterisation
- Continuing work on upper ocean structures using hyperspectral data
- Ocean wave prediction, particularly shoaling waves, given that ocean waves constitute a key environmental process in the Area of Operations with the capacity to markedly impact operations

Analysis

Analysis of the data will involve both rapid fusion and more detailed analysis where time allows. Meteorological and oceanographic variables can be analysed and displayed in the same advanced GIS tools that are used for manipulating other forms of geospatial data and intelligence. This commonality should allow development of synergies among all of these functions.

Dissemination

Data servers within the Joint Command Support Environment, housing foundation geospatial and environmental information, will be available at fixed locations in Navy, and on board significant platforms. More time-sensitive or perishable data streams, products and verification data may be made available via a web/client server architecture, with individual naval elements determining

which service they wish to subscribe to. This will enable tailoring of the available dataset to the needs of the individual warfighter.

This concept is consistent with ADF moves toward network-centric warfare. Local databases will be frequently refreshed with perishable information to allow generation of fused products that can be continuously shared with configurable end-user client applications, thus achieving common situational awareness while providing tailored versions of the Recognised Environmental Picture for specialised requirements. Deployed users will have the capacity to add value by fusing new local data to existing background models.

CAPABILITY SYSTEM OPTIONS

Much of the data and information necessary for the development of a REA capability for any particular area of interest or operation already exists, but is currently situated in discrete organisational or information 'stovepipes'. The REA system will need to be able to seamlessly access that information regardless of source.

This means that the ADF will need the means to collect the requisite data immediately before, during and after an operation or potential operation. In many cases, these operational requirements are facilitated by the collection and maintenance of comprehensive baseline information. Meeting these needs will also involve capability options for sending data gathering units and people into harm's way, perhaps in a covert manner, and broadening the current airborne sensing capability.

Options

Today, the RAN has limited capability to coordinate required assessment activity, sample the environment, fuse real-time data with reference data, and disseminate a common environmental picture to naval elements. To overcome this capability gap the RAN is considering a range of options to improve and increase its REA capability; those of a hydrographic nature are outlined below.

Networking organic collection systems. For example, 12 RAN FFG and ANZAC class surface combatants are to be fitted with the Thales 'Petrel' forward looking mine and obstacle avoidance sonar. Petrel will also provide bathymetry to Zone of Confidence level B over a swath approximately 200 m wide in depths 5 to 150 m which could be significant for tasks such as route survey, albeit perhaps at the cost of distracting these ships from their primary role. This capability may also be extended to RAN hydrographic vessels. Other in-theatre combatants (submarines and surface ships) could also provide real-time oceanographic and meteorological data for analysis with limited equipment fit and modification.

Autonomous Underwater Vehicles (AUV). In many cases hydrographic and oceanographic data essential to the success of the mission is not currently available. Moreover, where a strategic or operational imperative exists, it may be operationally advantageous to collect data covertly. Currently, the ADF has no clandestine environmental data collection capability with the exception of divers or commando units. Technology has now afforded a rapid and accurate data collection capability in the form of AUV. These vehicles can be commanded from any number of existing RAN platforms, untethered they collect data covertly and signal to the mother ship once data collection has been completed.

AUV can collect bathymetric and a range of other environmental data, often employing commercial-off-the-shelf sensors. Technology has facilitated the use of a single vehicle for use in the REA, underwater warfare and mine warfare environments. The RAN is also looking at the deployment of AUV from hydrographic ships as a means of increasing their rate of effort. However, there remains significant development required in the following fields:

- deployment and recovery in high sea states,
- endurance - high speed and over the horizon,
- navigation accuracy - horizontal and vertical (particularly for hydrographic survey),
- communications - underwater and real time,
- specialist sensors,
- covert operations, and
- collision avoidance.

Development of collision avoidance capabilities is considered particularly important, including a level of on-board intelligence to enable the AUV to really operate autonomously in uncharted, shallow and potentially reef strewn waters.

Airborne Lidar Bathymetry (ALB). ALB sensors such as the RAN's Laser Airborne Depth Sounder (LADS) are an effective way of gathering large quantities of data quickly. After processing, the data can be quickly turned into charts for navigation and other purposes. However, current airborne laser sensors like LADS are limited in their capacity to deploy into warlike environments, have long processing lead times, and are non-portable. Non portable in this sense means that a large aircraft (in RAN LADS case, a Fokker F27) is required to carry it.

Advances in technology have enabled sensors of equal capability to LADS to be able of external pod mounting on rotary wing aircraft. These systems offer additional flexibility insofar as military helicopters would have the potential to conduct LADS tasking. However, noting the workload required of military helicopters and the need to minimise risk to life by removing personnel from the battlespace, options to fit ALB to Unmanned Aerial Vehicles (UAV), such as the Northrop Grumman 'FireScout', is also under consideration. Use of a rotary wing UAV would provide an organic ALB capability that could operate from any vessel with a flight deck. Such sensors and their processing systems must be portable, with the minimum reliance of platform interfaces - and therefore expensive integration - and include self contained processing systems capable of producing Additional Military Layer data ready for import into command systems.

Airborne Electromagnetic Bathymetry (AEMB). For several years the Australian Defence Science and Technology Organisation has been investigating AEMB as a means of obtaining bathymetry and, possibly, other environmental information on water column and sea floor characteristics. As a result of these experiments the RAN has decided to modify the design of the existing HoisTEM EM system used for mineral exploration to see if it is possible to adapt it to operate over the sea. The main focus of this trial will be on trying to improve the signal performance and stability when acquiring data.

The HoisTEM trial is expected to lead to a fully fledged AEMB Concept Technology Demonstrator with development aimed at:

- the ability to fly lower over the sea - this requires significant modification to the electronics to avoid saturation from the high EM response over seawater,
- confirming preliminary studies which indicate a bathymetric capability to 60 m (or more),
- improving horizontal and vertical accuracy and resolution, and
- develop software to rapidly process AEMB data.

AEMB has the advantage that it is not effected by turbidity or sea state and can be operated from a rotary wing platform.

Space Based. Geospatial information can be accessed through national organisations like the Australian Defence Imagery and Geospatial Organisation and Geoscience Australia utilising commercial satellites. Some limited satellite imagery may also be available commercially utilising satellites such as IKONOS, SPOT, LANDSAT etc. to inform the meteorological and oceanographic problem.

Deployable Geospatial Survey Team (DGST). The ADF may equip the DGST, Clearance and Reserve Diving Teams, and Army engineers with commercially available equipment to conduct shallow water surveys. A project currently underway will provide the ADF with the capability to deploy up to three tactical hydrographic survey systems, one of which will equip the DGST. This system will mirror that of a survey launch in comprising multibeam echosounder, sidescan sonar and singlebeam echosounder together with a data acquisition and processing package. Portable and self contained the DGST will be capable of rapid deployment and operation from any Navy ship or craft of opportunity.

Additional Military Layers (AML). The ADF is seeking to provide for the processing and dissemination of environmental data through the use of commercially available systems. The NATO nations have adopted AML - environmental information layered to provide the most relevant picture of the maritime battlespace for a particular operation. These have NATO agreed specifications and represent the entire maritime battlespace. The adoption of such a system will allow Navy to retain interoperability with likely coalition partners including the US. AMLs can also incorporate information provided by the intelligence community at appropriate levels of security classification.

Potentially, the AML could be delivered to ADF entities via the Joint Command Support Environment (JCSE). The current Warfighting Electronic Chart Display Information System (WECDIS) to be fitted to all RAN ships within the next three years also has the capacity to display AMLs.

Interoperability. Interoperability with other ADF entities, allies and likely coalition partners will be a key issue in the effective development of REA capability. Network centricity, especially in terms of ADF involvement is synonymous with value for money REA outcomes.

Considerations

Operational. The advent of very fast surface craft means that it is now possible to transport troops and equipment to the area of operations in a matter of days rather than weeks. In other words REA

must be just that - rapid. Data must be acquired in a timely manner to enable commanders to make decisions that will effect the deployment of their forces. In the case of AUV and UAV this will likely mean that a significant number of such platforms may be required to do the work and that they will have to operate in the area of operations simultaneously - which itself requires good management and appropriate data communications, processing and dissemination systems.

Hydrographic. The RAN is considering the employment of REA sensors, including AUV and UAV, for routine hydrographic surveys for nautical charting. There are a number of drivers behind this:

- Sensors deployed on AUV and AUV may already be used for hydrographic survey, e.g. commercial-off-the-shelf multibeam echosounders and ALB systems
- They offer an opportunity to increase a hydrographic ship's rate of effort - providing they really are autonomous - for a relatively small increase in equipment and personnel resources
- Operator skill levels can be maintained during routine hydrographic surveying to ensure the system is fully effective if called upon to undertake other operations at short notice

However, there are a number of significant issues and areas for development before these platforms could be employed for hydrographic survey; these include:

- deployment and recovery in high sea states,
- endurance - to avoid disrupting the mother ship's own operations,
- navigation accuracy - horizontal and vertical,
- autonomy - including on-board collision avoidance and intelligence, and
- operation of UAV in civilian airspace.

CONCLUSION

The ADF recognises that a knowledge of the environment, particularly the littoral battlespace, is critical to military success and is now required to acquire Maritime Military Geospatial Information for combat support. To meet this task the RAN has embarked on a comprehensive programme to enhance its ability to undertake REA and to produce and disseminate this information. This will be achieved through use of emerging technologies including autonomous underwater vehicles and tactical airborne systems. The RAN is also considering these technologies for routine hydrographic surveying to increase its rate of effort.

As the ADF increasingly operates in coalition operations, interoperability is essential to ensure a common and consistent understanding of the battlespace. REA will therefore contribute to the operational safety and effectiveness of the ADF when operating either unilaterally or in a coalition.

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