



RINA MARITIME INNOVATION COMMITTEE

Theme: OPERATIONS, MAINTENANANCE AND
TRAINING

Version: 1

Date: January 2019



Theme Title

This theme covers involves operational aspects of the life cycle of a maritime engineering system. This focusses on the aspects of platform Operations, Maintenance through the life of the platform and also Training related activities.

Objectives

- Key objectives and benefits addressed by the innovation theme are:
 - Increased efficiency of platform operations, considering transportation, transfer and operational performance of crew/users.
 - Reducing the through life cost of maintaining platforms
 - Increasing the availability of platforms and reducing downtime periods
 - Improving the quality and efficiency of training

Technology Priorities

Technologies that we believe will have the most significant impact on the marine industry

Technology	Technology Description
Marine Transportation Offshore	This includes marine transport vessels, offshore service vessels and offshore support vessels.
Whole Body Vibration	High speed marine craft motions reducing crew's abilities to perform tasks and can result in injury. This is especially of concern for military, rescue operations and leisure thrill rides. Technologies required to reduce the impact of WBV in these areas
Manned and Unmanned Operations	Increased use of automated systems onboard, removing the need for human action but still requiring human input. Unmanned operations now focussing on the operation of autonomous vehicles. – Unmanned air vehicle, unmanned surface vessels, unmanned underwater vessels, unmanned ground vehicles.
Decision Support Systems	This includes decision making in situations where there are conflicting criteria or the level of uncertainty in data is high. Improving situational awareness in high stress, large data environments.

Technology Priorities

Technologies that we believe will have the most significant impact on the marine industry

Technology	Technology Description
Augmented Reality	"Bring the ship to life in a new way by revealing data while it is in context. Potential for eliminating shipboard displays and fundamentally changing design and naval architecture approaches. AR delivers more information in an intuitive way – making every sailor more knowledgeable and capable" Use of CAD/VR tools.
Human Augmentation (physical)	
Self-Healing Systems	Self healing onboard power distribution systems. Self healing coatings". Self-healing composites
Mission Modularity	Mission modularity looks at the changing the in theatre capability of warships (and other ships), by re-rolling. Could be used for operational re-rolling commercial ships.
Launch and Recovery	Technologies required to facilitate recovering and launching unmanned systems ie UUV, USV, UAV, UGV for operations. Need to also look at recovery of UUV from USV.

Technology Priorities

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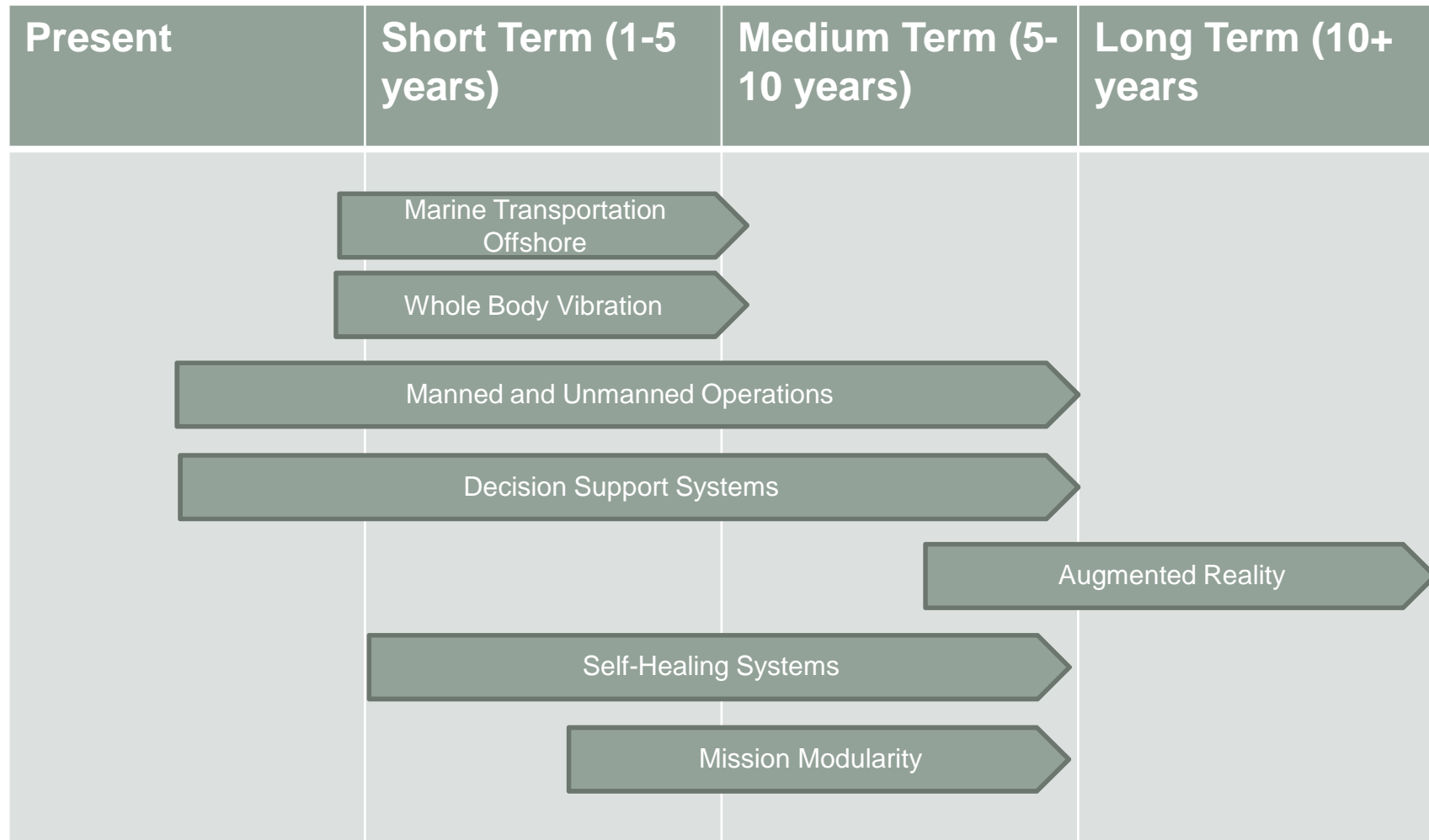
Technology	Technology Description
Sensors	<p>The integration of sensors will be a future capability, currently being looked at. Also the use of current onboard sensors for health management. I.e using data in the IPMS system.</p> <p>Also useful for 'live data' (e.g. using a traffic light system) so as to reduce slamming and potential for structural damage and/or injury. Even more relevant when suspension / shock mitigating seats are fitted and helm is 'disconnected' from the hull</p>
Communications Systems	<p>Particularly to unmanned systems needs to be addressed in short term. Technology required for unmanned systems in different environments and different ranges.</p>
Security Systems & Safety	<p>Probably higher now after recent Cyber attacks. Security of unmanned systems.</p> <p>This includes both software and hardware systems.</p>
Fully integrated monitoring systems	<p>Integrate the various platform systems and structure for example. Currently platform, structural and mission systems system systems monitored independently. Scope to fully integrate.</p> <p>To be able to undertake diagnostics and prognostics.</p>

Technology Priorities

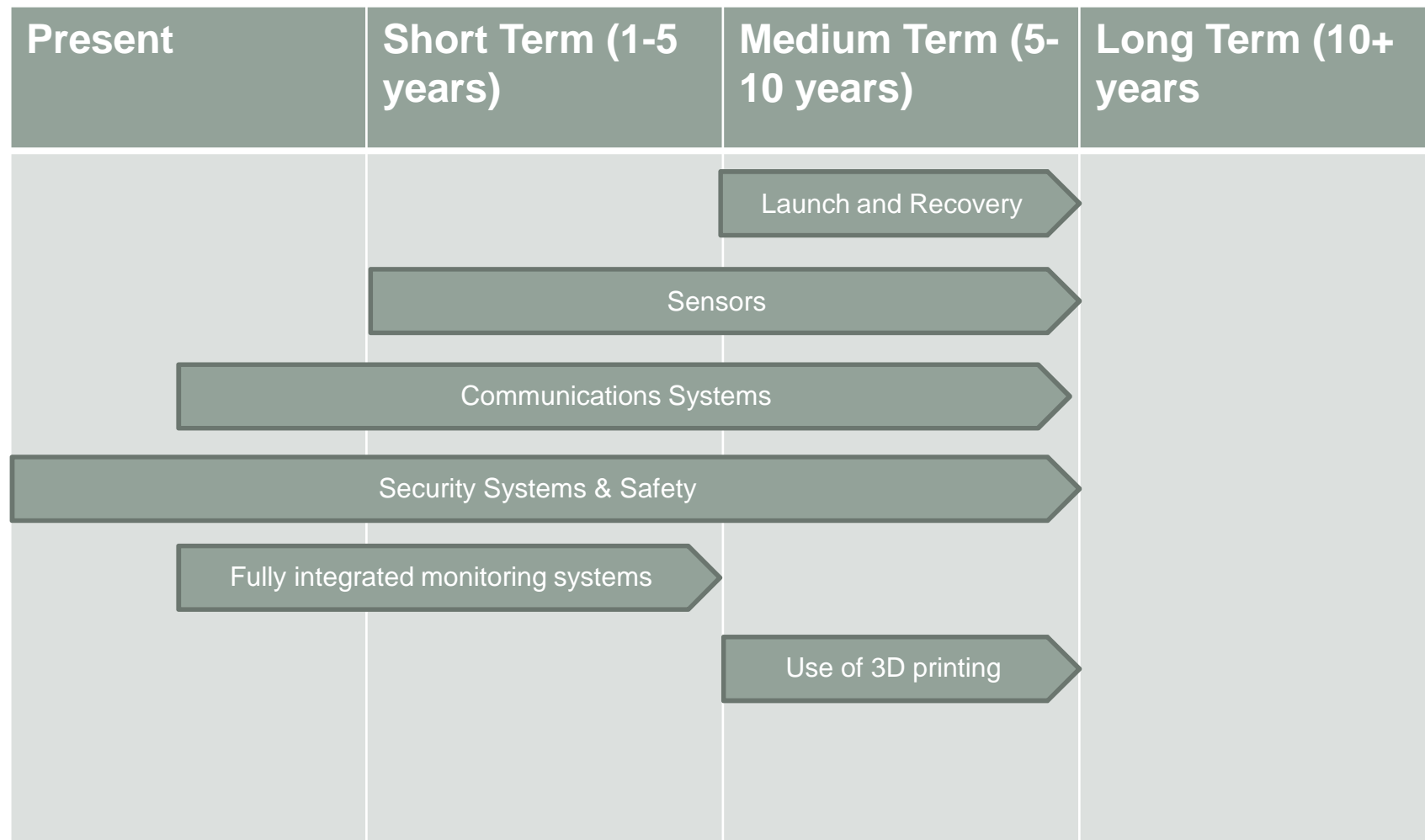
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Technology	Technology Description
Use of 3D printing Robotics	This includes the use of different types of marine engineering systems.

Exploitation Timescales



Exploitation Timescales



Challenges & Risks

- Reducing the burden of through life costs and making use of onboard data. Rather than wait until it breaks and fix it, make use of predictive technologies – like RR Aerospace model.
- Increasing platform operational flexibility. As cost challenges become ever greater there is increasing need to multi role platforms. Becoming more common on Naval vessels but will become more common place.
- Managing unmanned vehicle operation. Need to understand integration issues and legal operational issues and crew impacts – some unmanned systems increase crew burden.
- Security will become a greater risk – evidenced by recent high profile security breaches – drone flying over QEC aircraft carrier whilst at berth.

Examples

- RNLI SIMS - Systems and Information Management System. An electronic integrated bridge system that allows the crew to monitor, operate and control many of the lifeboat's functions directly from their shock-absorbing seats.
- US Navy Integrated Condition Assessment System (ICAS) to fill this requirement. ICAS has the ability to trend machinery performance and diagnose machinery health.
- Newport News Shipbuilding began a research and development project to learn how to apply Augmented Reality (AR) to shipbuilding. They called the project "Drawingless Deckplate" Now covers Operations, Maintenance, Safety & Training.

Conclusions

- Significant challenges exist particularly in through life cost constraints, increasing flexibility, reducing crew workload and security.
- Technologies are available to address these challenges and exist within the maritime sector or within adjacent industries.