Slide 1

Good morning, my name is Andy Gough.

As Director General Navy Capability, Plans and Engagement, I have key responsibility in the development of the Navy's strategic direction and long-term future - including providing a focus on modelling and simulation issues within the RAN.

I would like to extend my appreciation to the Williams Foundation for the invitation to provide a summary of how the Navy integrates simulation capabilities throughout the training continuum and provide some thoughts on the role simulation plays in meeting Navy's future requirements.

There is a deal of imprecision in the taxonomy 'Live, Virtual and Constructive' which is used to broadly classify modelling and simulation enabled training methods. I do not intend to go into the taxonomy beyond observing that LVC is not an option to be considered when selecting simulation to enable delivery of training, it is always the answer. The question is more frequently and usefully how, and how much, should we combine those capabilities in training for an integrated ADF.

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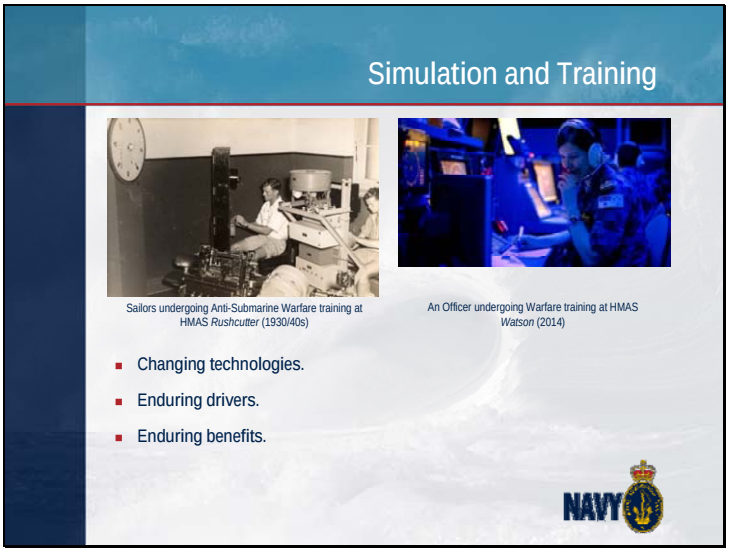

The RAN's use of simulation to enable surface warfare training dates back to the 1930s with the establishment of the Anti-Submarine Warfare School in Rushcutters Bay, Sydney. Whilst the simulation systems of today are vastly more complex and capable, the drivers and benefits of simulation in 2015 parallel those of the 1930s.

The drivers for the use of simulation include:

- Limited asset availability for the conduct of live training;
- Increasing complexity in ship fitted systems and operational tasks - bringing aspects that can not technically nor safely be replicated without simulation; and
- Increasing demand for discretion.

Simulation continues to provide the corresponding benefits:

- Increase the efficiency and effectiveness of training and the operational availability of platforms,
- Reduce the risks that training poses to the safety of personnel and the integrity of operational equipment, and
- Properly planned and executed simulation events can reduce the need for time intensive and expensive live exercises.

These enduring drivers and benefits provide an important place holder for our discussion today.

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Notwithstanding our long-term use of simulation, many of the Navy's individual training programs required a final period of on-the-job training in order to provide competency endorsement. This created uneven training opportunities and outcomes leading to both training and preparedness choke points in our operational units - which contribute to critical shortfalls in some employment categories.

Over the past four years, the Navy has increased its use of shore-based simulation to remove choke points in the individual training continuum, especially at sea. There is now a clear relationship between the procurement of simulation systems and the remediation of our critical personnel categories.

The RAN is focused on acquiring systems to enable achievement of individual platform knowledge and competencies through the use of simulation-based training ashore. Sea-based training, if required, is being limited to the achievement of platform-based endorsements of competencies.

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The following examples highlight the diversity of simulation applications in the initial training and qualification of personnel.

In an area that many thought was 'a sacred cow', Chief of Navy approved the award of the Bridge Warfare Certificate using simulation ashore. Our existing shore-based training package was extended to provide a more challenging and consistent training and assessment program, than the trainee officers could as a cohort, achieve in different ships at sea. Officers now achieve their primary 'ship driving' qualification ashore and then gain a Platform Endorsement at-sea in an average of 220 at-sea hours – under the legacy system, an average of 724 at-sea hours was required.

The Submarine Virtual Walkthrough – known as Boat 7 – is a first person, 3D model of a Collins Class Submarine, built on a commercial game engine. It allows trainees to navigate around a Collins class submarine in order to learn compartment layouts, equipment locations, and undertake safety rounds; three activities that represent the common minimum competencies required of all crew members on joining. Boat 7 has reduced our reliance on platform availability and standardised the learning and assessment environment for submariners. Increased use of simulation within a redeveloped initial Submariner training and qualification process is one factor that led to a 22% increase in the number of submariners awarded their dolphins last financial year.

High fidelity desktop simulators have been introduced into the ab initio Marine Systems Technician course in HMAS *Cerberus.* The simulators, which host several generic engineering models as well as an LHD-specific model, allow operators to obtain and rehearse watchkeeping principles and knowledge, including operation of valve systems and main and auxiliary machinery. The simulators expose trainees to a wider range of engineering breakdown scenarios, many of which are either impractical or too dangerous for personnel or equipment on board. Standardising and broadening the range of the learning experience better prepares trainees to obtain their platform-specific endorsement at sea. The employment of these simulators as part of Navy's marine engineering training and qualification process has been validated by the Australian Maritime Safety Authority, which now provides civil recognition of these RAN qualifications.

As with individual training, Navy exploits simulation to achieve collective training outcomes. Many simulation assets enable training in both continuum.

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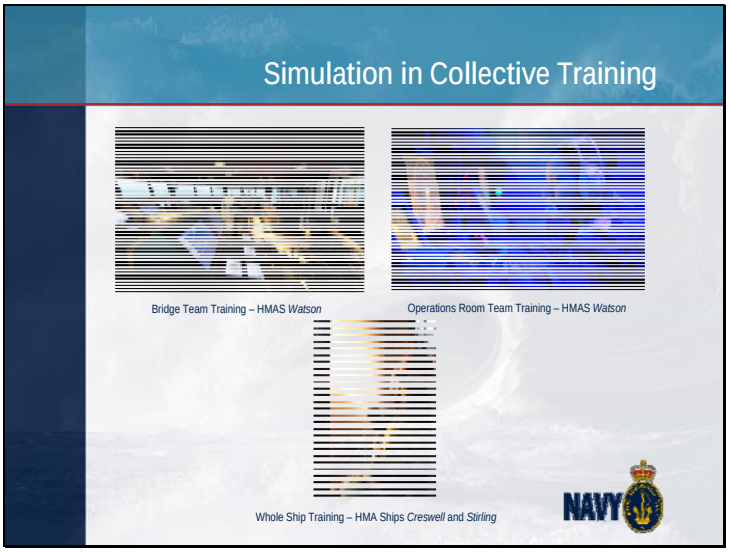

Increasingly, virtual and constructive simulation is replacing live simulation because it can provide more complex, realistic, repeatable and replayable training events.

Virtual and constructive simulation enable training that may be of far greater fidelity than can be achieved through live simulation. Synthetic entities are able to accurately reflect real world characteristics of platforms and munitions (such as a supersonic anti-ship missile) rather than injecting the artificialities representative live assets (such as a Lear Jet) bring.

Further, simulation allows realistic departmental level training to occur independent of other areas of a unit. This is an important capability as Navy's need to train and certify Task Group level activities increases. Simulation systems can provide the required capability alongside, negating the need to send a group of ships to sea only to focus on what is largely a C2 activity for an embarked Command.

The ability of simulation to provide training that is too risky, too costly or too complex to replicate using real world assets, is as evident for warfare proficiencies as it is for marine engineering systems, which have increased in complexity and remain susceptible to damage through live breakdown training.

Navy is keenly aware that regardless of the simulation used - a complex virtual game that stimulates the full range of ships sensors or a basic live medical exercise using mannequins - it is vital that the responses elicited from participants and systems are realistic. It is of no use to simply employ simulation to save resources, it must add value to the training continuum. Further, the right balance between simulation and real-world training needs to be carefully considered.

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Effective on board training capabilities are required to complement shore-based training and to maintain skill levels. On Board Training Systems, or OBTS, allow for greater integration of Live, Virtual and Constructive simulation capabilities.

The sophistication of these facilities has increased with that of the underpinning technologies. The FFG class has a high-fidelity on-board operational training system, as will the *Hobart* class DDGs when they enter service. A similar capability is under development for the Anzac class frigates, and complementary technologies are now entering the Fleet in other departments. For example, the engineering systems in our new LHDs provide an immersive environment that supports engineering team training whilst the ship's plant remains available to meet the manoeuvring requirements of the ship's program. These systems include the ability to simulate emergency and critical condition scenarios that, due to their inherent risks to personnel safety and equipment integrity, can not be performed under conventional training conditions.

On board training will be essential in achieving Joint Force training and certification. For example, the use of high fidelity mannequins may be the only way to fully stress, and in turn provide certification for, the health support capability of the LHDs.

There are a number of second order effects that come with increased use of sophisticated on-board training systems:

- They provide a level of discretion – a secure network can assure system performance and deliver high-end mission training and preparation into the ship's company's workplace without providing any external indication of the activity or its focus.

- They will allow training and certification for future missions whilst a unit remains on station – Naval units have an inherent requirement to be able to adapt to changing mission requirements without returning to a port or re-entering a formal mission preparation cycle. On-board training means that a crew undertaking Border Protection duties can simultaneously be preparing for a high-end warfare mission.

Slide 7

Navy has employed distributed simulation to support collective warfare training since 2001. HMAS *Watson* provides the focal point for the conduct of Navy's distributed warfare training activities both within the RAN and with coalition partners.

In October 2014 the RAN undertook it's first solely Australian-run distributed synthetic exercise - Exercise TRITON SIMULATION. Linked by the Australian Defence Simulation and Training Centre, the crews of HMA Ships *Sydney*, *Perth* and *Melbourne* exercised warfare skills in a multi-ship environment using simulation systems ashore in HMAS *Watson* and HMAS *Stirling* and afloat in HMAS *Sydney*. This was also the first exercise to incorporate the FFG class On Board Training System into a distributed environment; for the past five years, the OBTS in each FFG has only been used as a stand-alone trainer.

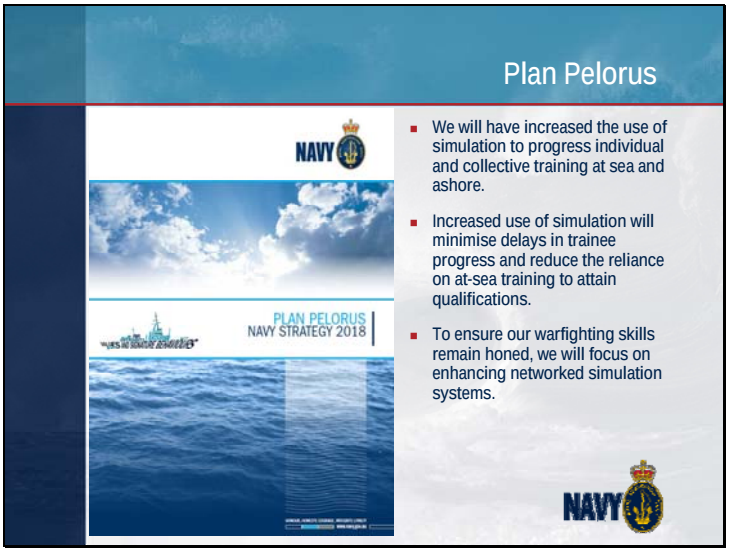
In late April this year, the crews of HMA Ships *Melbourne*, *Arunta* and *Sydney* used the same architecture to join American units in what is currently the largest tactical synthetic exercise in the RAN's history – the US Navy's FLEET SYNTHETIC TRAINING-JOINT 15-72. FST-J 15-72 exercised two carrier strike groups, an expeditionary strike group, six composite task forces, thirteen surface combatants, three Maritime Patrol Aircraft simulators, one submarine simulator, and multiple US Army and Air Force staffs across Australia, the Pacific and continental USA.

The RAN has a long history of participation in such FST-J events, which develop high-end war fighting proficiencies and task group operational skills, both of which are prerequisites for CN’s plan to generate and deploy self-supported and sustainable maritime task groups capable of accomplishing the full spectrum of maritime security operations.

In this sense, Navy sees a very specific need in the development of force level simulation. That need is significantly realised through the spine of the DTEN and the technology and service support offered in JP3035-2. The specific requirement to commit multiple units and facilities across the DTEN is different to the aspirations expressed by MAJGEN McLaughlin.

This completes my scan of the past and present. I will turn now to Navy's strategic direction and long-term future for modelling and simulation.

Slide 8



The Chief of Navy recently released Plan Pelorus, his strategic intent for the Navy of 2018. Plan Pelorus recognises that delivery of effective and efficient training, assessment and certification lies in the development and increased use of simulation. Significant improvements in capability are being introduced in new ship classes and through existing Fleet modernisation programs. The development of knowledge and skills in the management and operation of these new systems require training enabled by an appropriate blend of live, virtual and constructive simulation.

The success of the Bridge Simulator needs to be replicated through development of similar levels of training for non-warfare personnel and specialisations, particularly alongside - the MT Desktop Trainer and Submarine Virtual Walkthrough vouch that this can be achieved.

Exercise TRITON SIMULATION and our involvement in the FST-J series underline the value that synthetic training offers - Fleet Synthetic Training will be a key component in Navy realising maritime task groups.

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Plan Pelorus states the importance of strengthening relationships with industry partners. If Australia is to have the distributed LVC capability required to train, assess and certify task groups, then we need an industry with the competency and capacity to deliver, sustain and refresh those capabilities.

In the lead up to last year's largest global simulation conference and exposition, I/ITSEC 2014, the magazine Military Technology published an article in an annual series on 'Simulation and Training Bosses'. The quotes on this slide are taken from responses provided to a question seeking views on the role of networked simulation in multi-unit, multi-role and multi-national training.

The alignment between Navy's strategic vision and the expectations of international industry bodes well for the achievement of Plan Pelorus.

Slide 10

Plan Pelorus recognises that as today's Navy works to achieve the strategic outcomes of 2018, it must also define and deliver the next Navy through the Future Submarine, Future Frigate, Offshore Patrol Vessel and Future Replenishment Vessel projects. Inherently, training for these future capabilities will be substantially simulation based.

Delivery of the future Navy will be substantially enabled through holistic Platform Systems Centres, where platform specific development and training is consolidated in a single facility. The use of high fidelity platform systems, utilising accurate physics-based models, in these centres allows for detailed system analysis and risk treatment prior to delivery of the first platform. These models also provide accurate training and preparation of the crews and experimentation/trials of shipboard functions in order that management practices, SOPs and orders can be developed before the first turn of the screw.

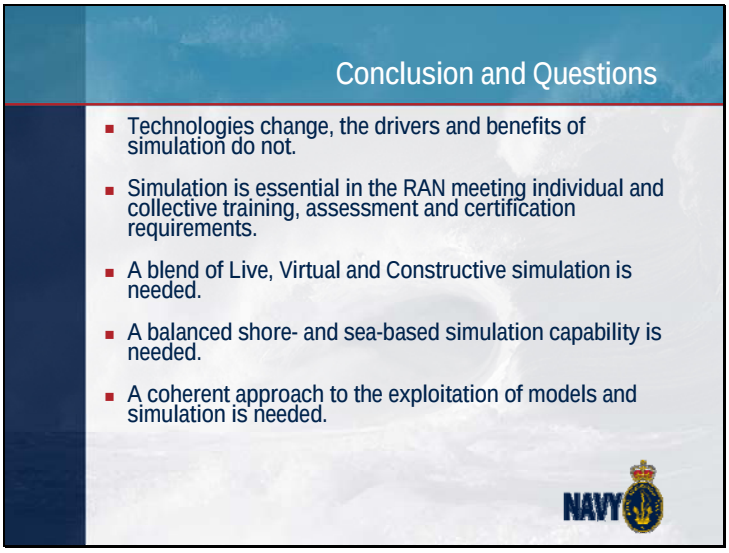
The three examples shown here demonstrate the shared benefits that Platform Systems Centres can offer.

LHD. An off-base, contractor run Training Facility provided whole ship crew competencies and specific training in marine engineering, electrical, and communications systems to the crew of HMAS *Canberra*; the facility is currently providing the same service to the crew of NUSHIP *Adelaide*. Engineering training in particular highlights the requirement for physics-based models to enable the delivery of high fidelity simulation; the Marine Engineering department have been able to operate highly complex systems in a platform that Navy had previously not operated.

USN Combat Systems Engineering Development Site. Known to locals as the "Cruiser in the Cornfield", the USN Combat Systems Engineering Development Site brings together Navy and industry personnel to undertake research and development of the AEGIS Combat System. Following installation of a SPY-1D radar antenna, the site is able to resolve shipboard issues by using a fully integrated combat system in a controlled environment and to test next-generation systems before they're put to sea. The site also allows sailors to get real training on the same equipment they'll use at sea.

Astute Class Training Service. In order to train, qualify and certify crews for the Astute Class submarine, the Royal Navy engaged a prime contractor to design, develop, and then operate and maintain training facilities for a 30 year period. Training has been purchased as a service, rather than purchasing trainers and training equipment on which to deliver training, with the expectation that officers and sailors will be deemed qualified and certified to undertake their duties on completion of training. Additionally, the physics-based models used to stimulate equipment enable a level of fidelity that allow defects in SOP to be identified and rectified prior to implementation on real-word systems - unforseen, and potentially expensive, technical issues are able to be avoided.

Slide 11



So far as we are concerned here today, my key points are:

- Technologies change, but the drivers and benefits of simulation do not.
- Simulation is essential for the RAN to meet its individual and collective training, assessment and certification requirements.
- A blend of Live, Virtual and Constructive simulation is needed.
- A balanced shore- and sea-based simulation capability is needed.
- A coherent approach to the exploitation of models and simulation is needed.

I would like to again thank the Williams Foundation for this opportunity, I thank you for your attention and would like to invite any questions.

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