## **Discovering Why – Planning How**

#### **Optimising Manoeuvring and Port Operations**



Sim Connect Vancouver 2017 Garland Hardy

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## Dissecting what we think "We Know"







#### Knowledge - Oxford Dictionary







The sum of what is known.

Information held on a computer system

True justified belief, as opposed to opinion





## Can Simulation Improve Knowledge?

Simulation provides flexibility in scenario creation and control. Change one variable at a time.

Simulation scenarios create experiential learning.

Accurate mental models allow us to apply learning to real world applications.





# **Information Management**

#### A little knowledge can be a dangerous thing









# **Risk Aversion**







#### Desired Simulation Outcomes Improve Operational Process – Mitigate the Risk

#### Enhanced Mariner Skills

Determine operating parameters for new port and terminal developments.

Improve and optimise existing manoeuvring and transit procedures.



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#### **Effective Risk Management**













# **Remember Lab Class**







#### **Traditional Risk Mitigation Process**







## Structured Risk Mitigation Process

- Identify manoeuvring problem or desired operational outcome;
- Develop "Non-Dynamic" Area Model (Docks, Channel, etc.)
- Collect Data and Develop "Variable" environmental models (Wind, Tidal Stream, Acoustic Doppler Current Profiling, etc.).
- If required, develop ship and tug hydrodynamic/ manoeuvring models.
- Determine key parameters that need to be tested/ evaluated.
- □ Prepare and Validate Test Scenarios Optional Desktop Simulation
- Conduct Manned Manoeuvring/ Operational Assessment
- □ Review results and outcomes, identify key risk factors.
- Publish a report of findings and risk management plan.
- □ Conduct Live Trial confirmation of simulation results.
- Implement procedures and policy.
- Practice procedures and policy (simulation and live trials).





#### Non Dynamic Model Source Data







#### Non Dynamic Model Source Data







#### Non Dynamic Model Source Data







#### What's Missing?







## **Develop Dynamic Environmental Data**







#### **Develop Dynamic Environmental Data**







#### Variables and Risk







#### Ascertain Specific Test Conditions







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#### Ascertain Specific Test Conditions



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#### **Conduct Operational Assessment**







## Test Thoroughly







## **Analyse Results Careful**







#### **Analysing Results**

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#### Implementation







#### **Live Trials**







#### Refine Process – Reiterative Approach

#### Figure 4: Stern Tug - "Stern Tug, ahead, 45º towards, easy"



Figure 5: Stern Tug - "Stern Tug, back, 45º away, half"







#### Manoeuvring Simulators Have Limitations







## Scenario and Object Oriented Simulation

The focus is not only on perfecting the manoeuvring characteristics of the ship, but of the entire maritime environment.

Detailed simulation scenarios require definition of participant roles and object features.

The degree of comprehensive procedural practice and critical decision making is greatly enhanced.





#### **Object Oriented Simulation - Defined**

Nearly any physical object can be simulated All vessels have complete hydrodynamic and physical properties, only the control mechanisms vary: Operator Control, Instructor Control, Automated Control Mechanism (Rule Based Behaviour)

Objects are interactive and can be "connected together"



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#### Benefits: 3D Physical Models and Physics Engine







#### Wide Range of 3-D Models and Bodies







#### **Potential Participants**







#### **Unparalleled Ability to Analyse Data**

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#### **Unparalleled Ability to Analyse Data**







## **Unparalleled Ability to Analyse Data**







#### **Proactively Shaping the Future**

Test procedures and methodologies for new technology

Explore new mechanisms for vessel control

Take a leadership role in establishing new regulations

Demonstrate how mariner's skills will be applied in the future







# **Questions?**





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