Submarine Delivery Agency

Emergency Response for Naval Ships

UK MOD Capability

Morgan Griffiths

Naval Authority – Ship Stability & Hydrodynamics

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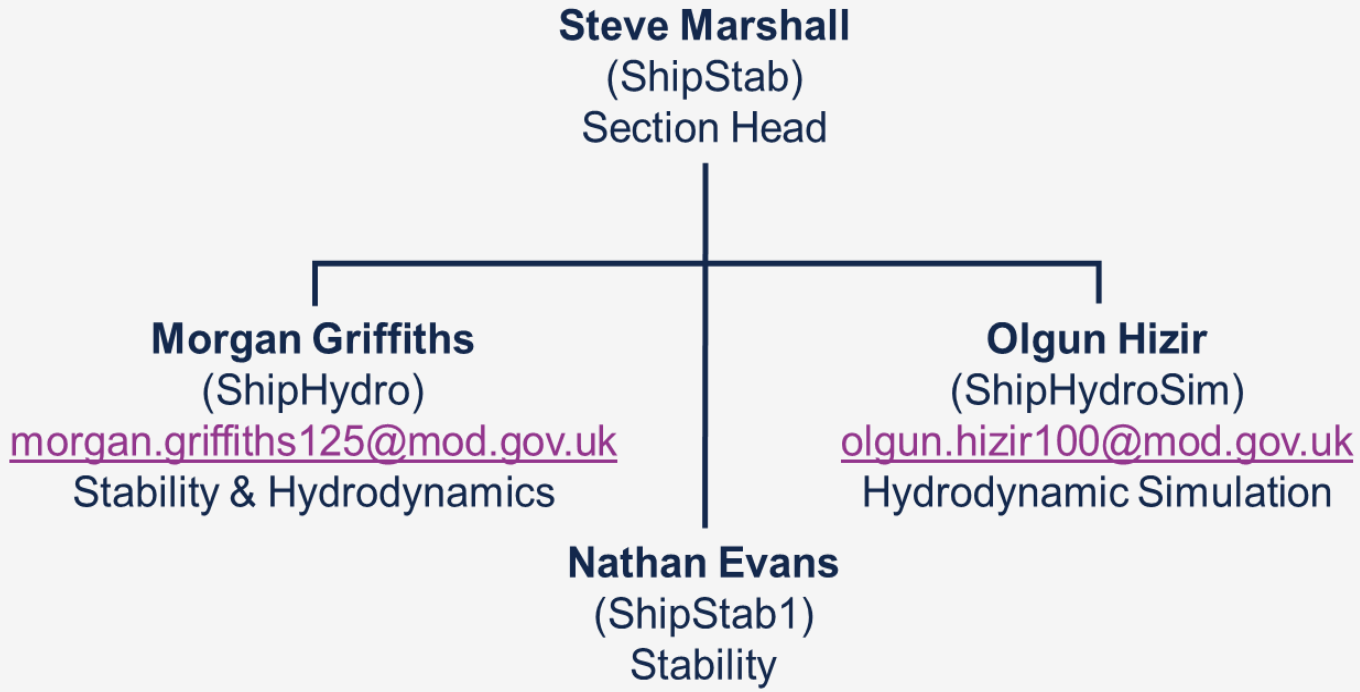
Submarine Delivery Agency



- Flag State for Royal Navy Warships
- Own the UK MOD Naval Stability Standard
- Certify and assure the Ship Stability Hazard Area for Intact and Damage Stability
- Provide guidance to Acquisition and Inservice Project Teams as Subject Matter Experts
- Manage corporate knowledge for Ship Stability including:
  - Liaison with internal MOD and external International bodies (such as NATO)
  - Emergency Response Activities
  - Ship Hydrodynamics

Contents

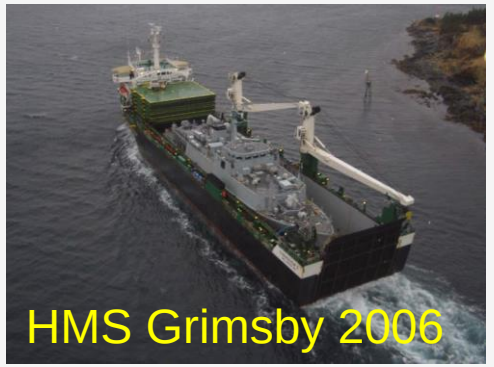
Accidents Happen!

Submarine Delivery Agency


HMS Grafton 2001


HMS Nottingham 2002


USS McCain 2017


HMS Grimsby 2006


HMS Endurance 2008


USS Fitzgerald 2017


Helge Ingstad 2018


HMNZS Manawanui 2024

The Requirement

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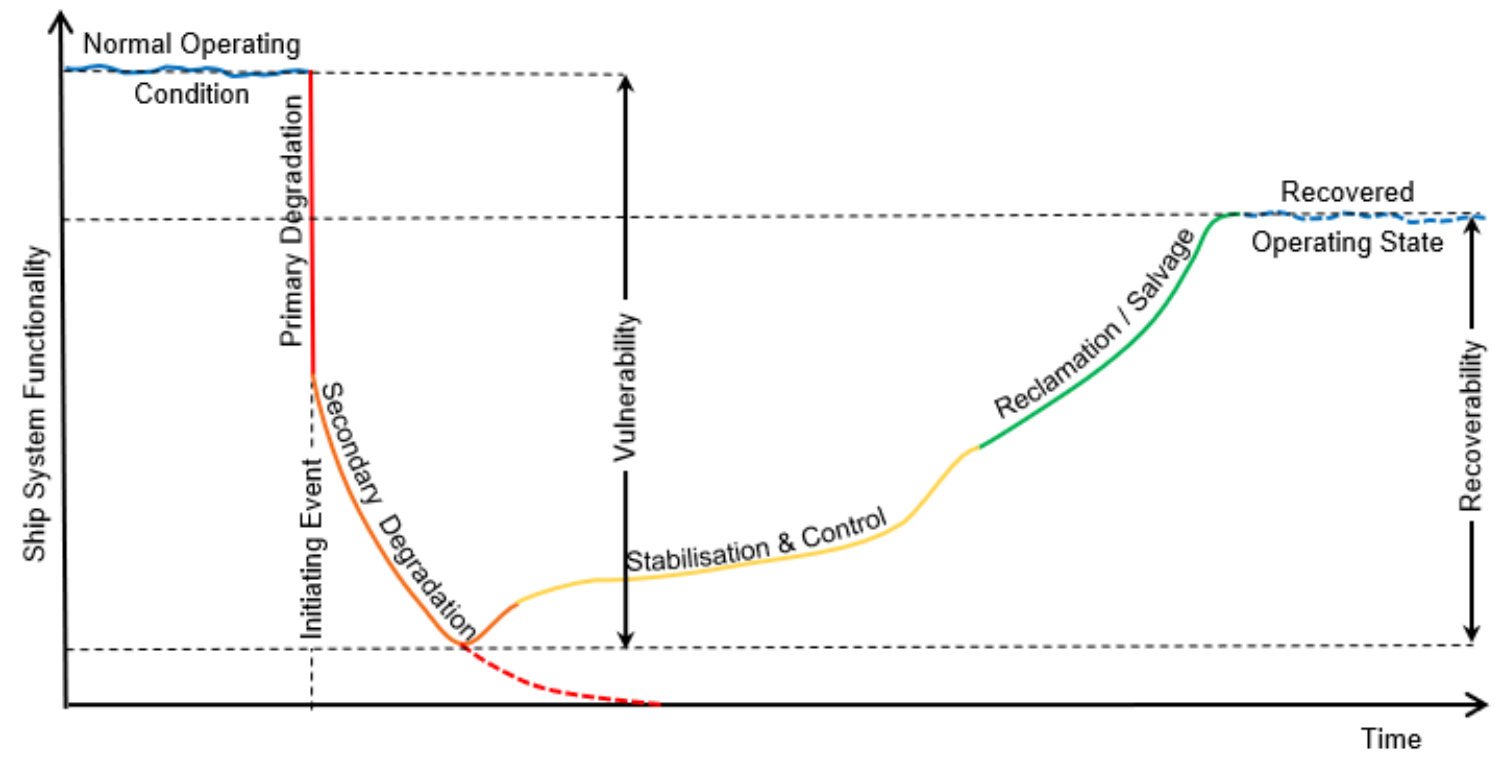
- MOD Shipping Regulations for Safety and Environmental Protection sets the requirement for emergency preparedness system **equivalent to that required for merchant shipping**, i.e. to be able to provide technical assistance from ashore to a stricken vessel.
- To provide high level technical support to allow the platform to maintain and/or recover its Defence capability, i.e. supporting the command decision process and the intrinsic shipboard recoverability capability.



- Class Societies (LR and DNV) provide Ship Emergency Response Services (**SERS**) for Auxiliaries and Patrol vessels
- MOD Naval Architects (NA) provide this service for all combatants

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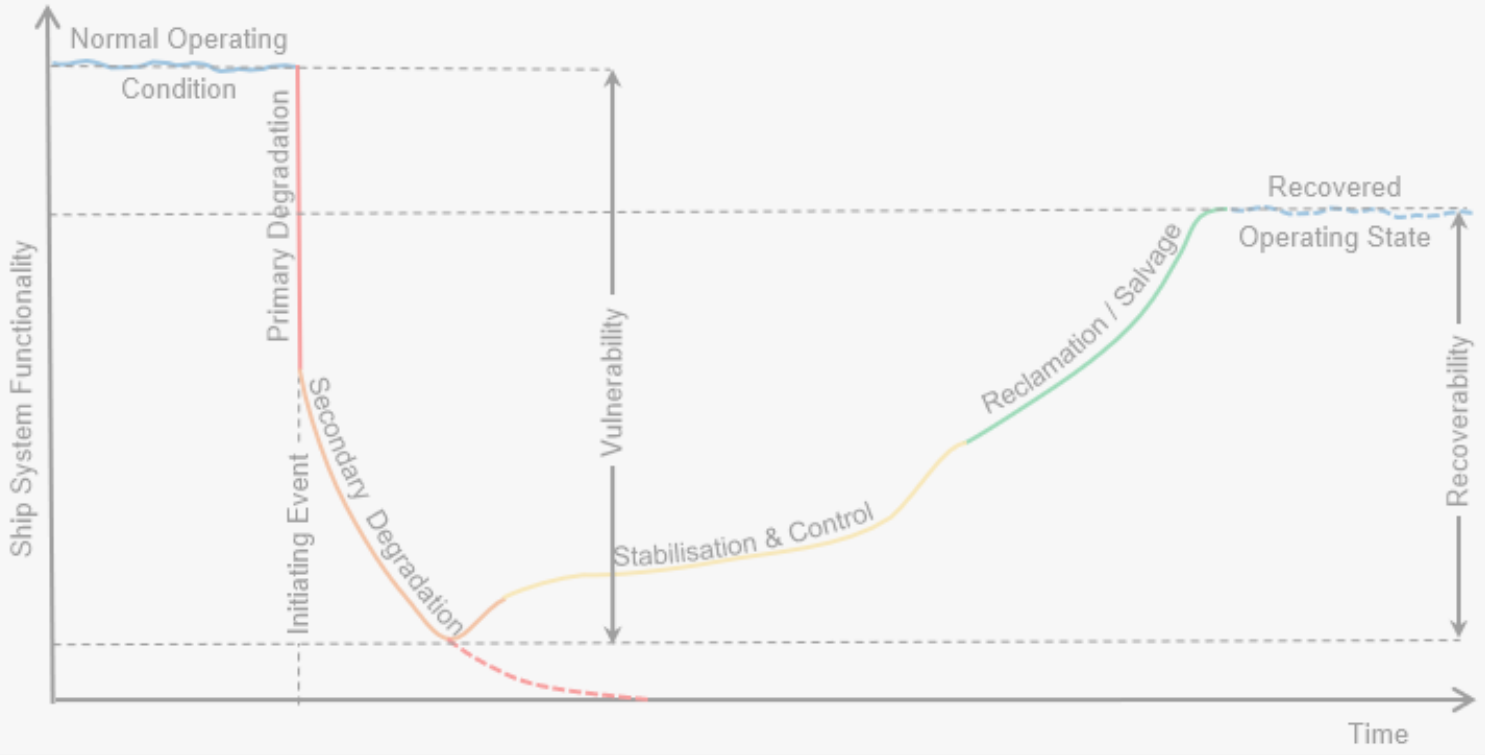

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Roles & Responsibilities

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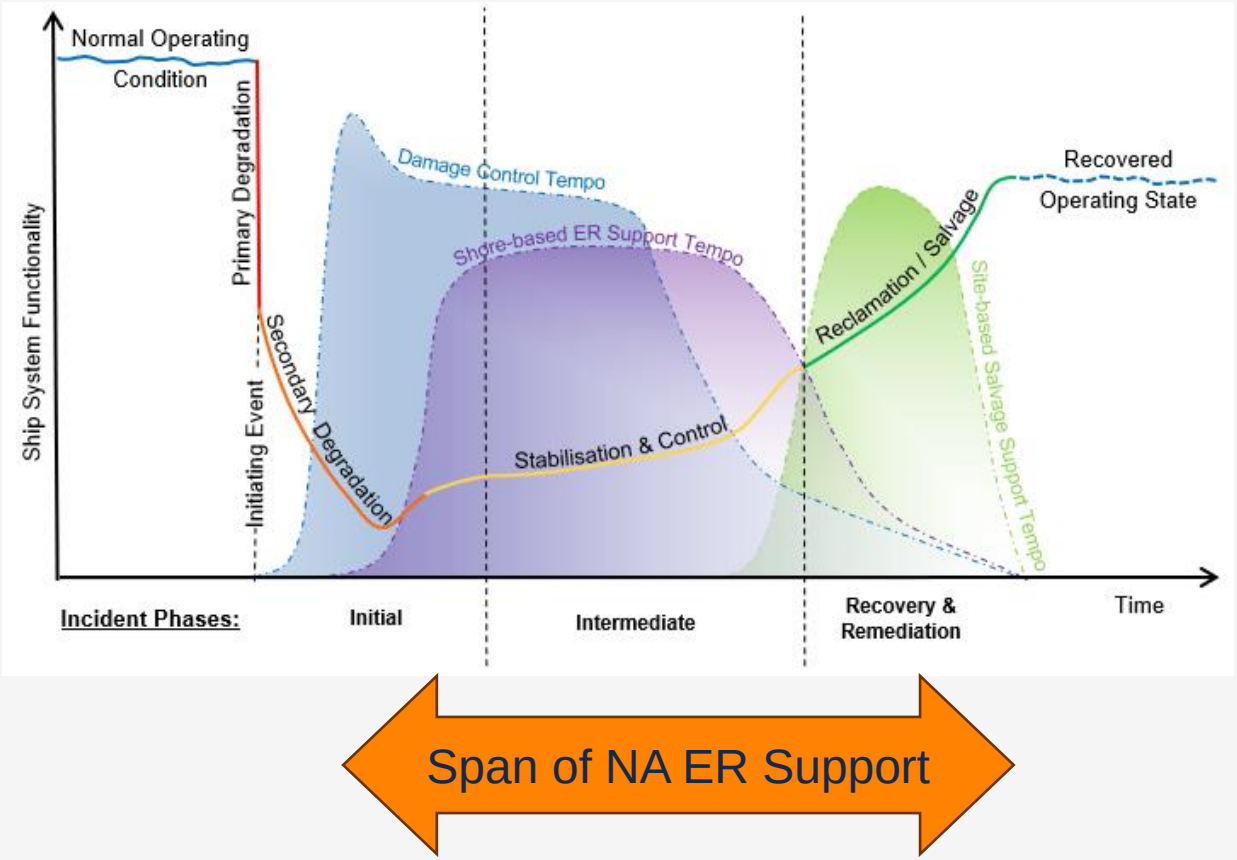
- **Develop and provide ER decision support** to the DCCT via shoreside support organisation.
- Ensure that the casualty's **condition is diagnosed to an acceptable level of fidelity** by addressing the uncertainty, inconsistency & incompleteness in the situational understanding
- Assess each diagnosed condition in a timely manner to determine the **casualty's survival prognosis** with respect to **residual buoyancy, stability and structural strength**.
- **Respond to the Command Aim** requests whilst ensuring that the DCCT is informed and advise of the impact upon the survival prognosis of any action, or any reasonably predictable potential situation changes.



Process

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Describe and communicate our findings, assumptions and recommendations.
Reassure the family that the casualty is getting better!

The Gathering information about the casualty and its symptoms.

Determine conditions that could account for the symptoms. Develop and verify hypotheses that may account for differences.
How sick is it? ✓

Forecast the likely outcome of the condition
What do we have to do to stop it getting worse? ✓

Assess therapies necessary to return the casualty to good health
How do we make it better? ✓

Checking that the therapies are achieving the goal
Verify that the patient is getting better! ✓

- **All activities are iterative and continue throughout the whole Emergency Response**
- Uncertainty and Inconsistency is reduced through repetition and verification.

Challenges - Information

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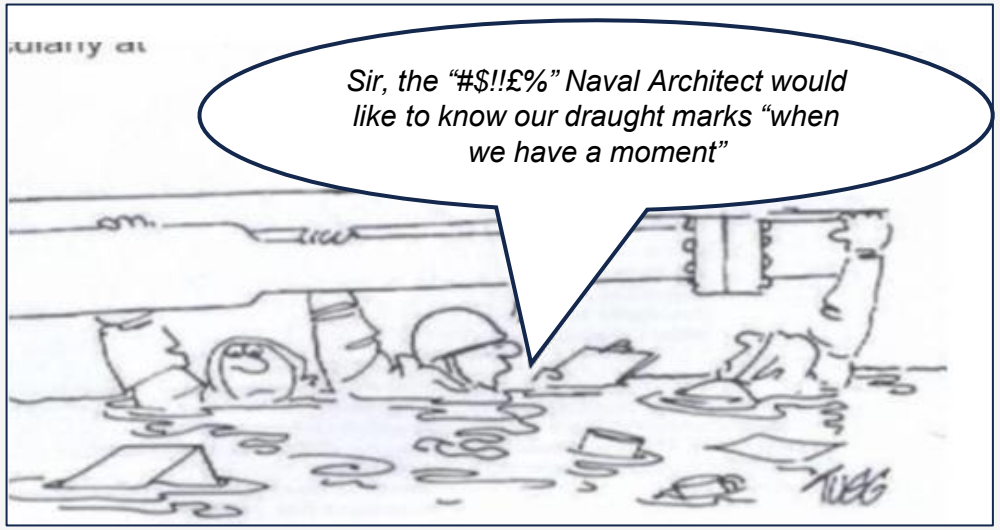
Aim: Provide a seamless interface between ship information and computer model. Commonality between Maritime Incident Report Form (MIRF) and computer model. Matching computer model data entry to what is measured onboard e.g. flooded compartment ullage, sounding tubes

- Two slightly different worlds: Royal Navy & Naval Architects
- Understanding that information can be uncertain, inconsistent and incomplete
- Battle tempo and information flow
- Situational fidelity



EXERCISE-EXERCISE-EXERCISE
OFFICIAL

FLASH
190900Z SEP 18
FROM HMS ST ALBANS
TO DFC
INFO FLEET COMMANDER
DES BRISTOL

OFFICIAL
SIC H5F H4B H4D H9L I2A I2C L4H
SUBJ UNDEX INCIDENT
DES BRISTOL FOR CST MARITIME OPS

1. UNKNOWN UNDEX AT 0800Z.
2. OIL SLICK SIGHTED ON PORT SIDE.
3. DC SEARCH UNDERWAY.
4. LOCATION 26°03'N 52°30'E
5. POWER TO BOTH SHAFTS LOST.
6. SEA STATE 2, FAIR CONDITIONS

Ship Signal Example

Maritime Incident Response Form (MIRF) example

EXERCISE EXERCISEEXERCISE

MARINE INCIDENT RESPONSE FORM

PART A

DTG: 190930Z SEP 18 ZULU

Ship Name: HMS ST ALBANS Position (Lat / Long): 26°03'N 52°30'E

Incident Type (tick):

		Comments
Collision		
Grounding		
Structural		
Fire / Explosion	✓	UNDEX
Other		

General Ship Condition (indicate draught marks or freeboard) and Time of Measurement:

	Port	Stbd				
Draught Marks / ~~Freeboard~~ Fwd:	4.9		m	Water Depth Fwd:	N/A	m
Draught Marks / ~~Freeboard~~ Aft:	4.4		m	Water Depth Mid:	Deep	m
Heel:	6.5 P		deg	Water Depth Aft:	Water	m

If freeboard state where measured:

Heel is current condition; draught is from a draught reading 2 days ago.

Approximate Loading Condition (Tick):

Light Seagoing	20%	30%	40%	50%	60%	70%	80%	90%	Deep Seagoing
						✓			

EXERCISE EXERCISEEXERCISE

EXERCISE EXERCISEEXERCISE

Compartments Known to Be Affected (FF – Free Flood, SF – Slow Flood, F – Fire, SD – Structural Damage):

Compartment	FF / SF / F / SD	Compartment	FF / SF / F / SD
4J	FF	5J	
		3J, 3L, 3K, 2J	SF
5K	FF		

Cause of flooding (if known):

Ingress of water into compartments listed above.

Oil slick seen on surface on port side assumed to be from 5J Deiso Tanks

3J, 3K, 3L slow flood from hatches.

2J slow flood from burst fire main

Contact Details

Position:	DMEO
Fax No:	NA
Sat No:	NA
Email:	

Misc. relevant information:

Oil slick sighted on surface.

Tank soundings partially complete.

Request advice on mitigating action with consideration to structural strength and environmental impact.

Freeboards are being recorded every half hour to monitor sinkage where possible.

EXERCISE EXERCISEEXERCISE

Challenges - Tools

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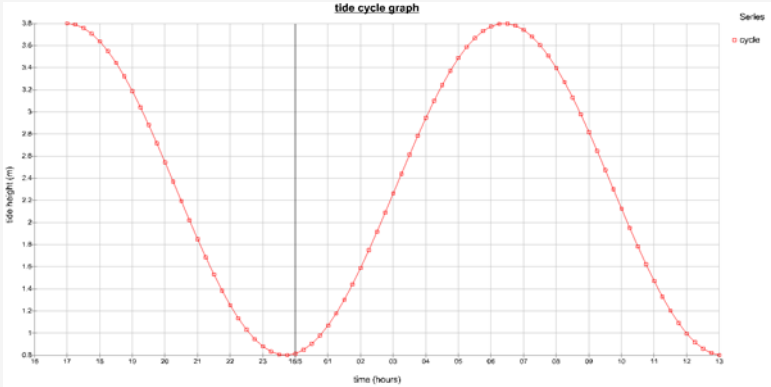
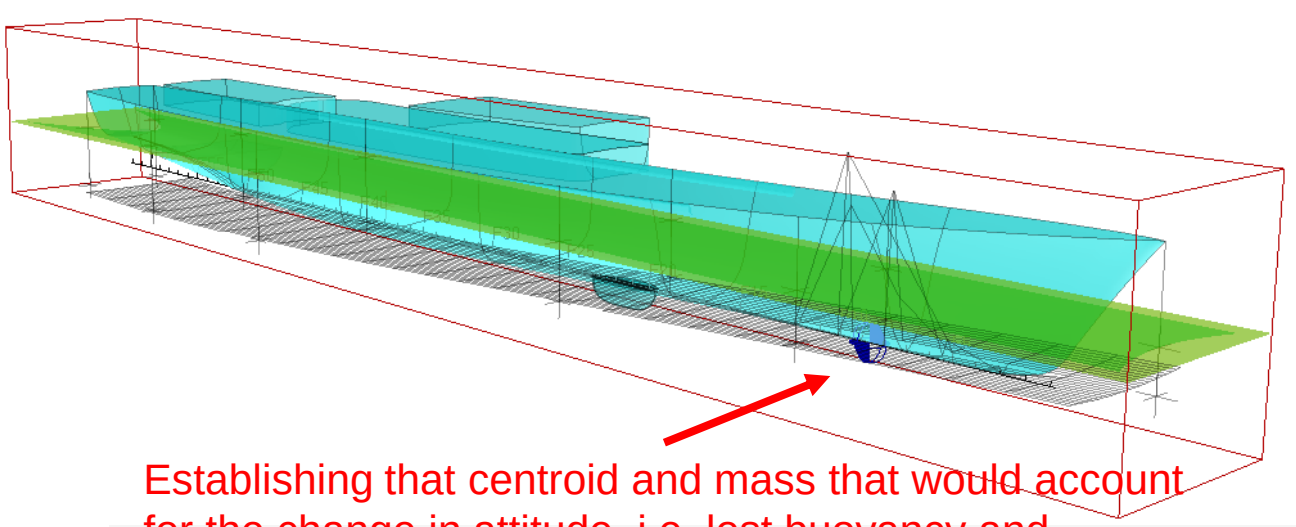
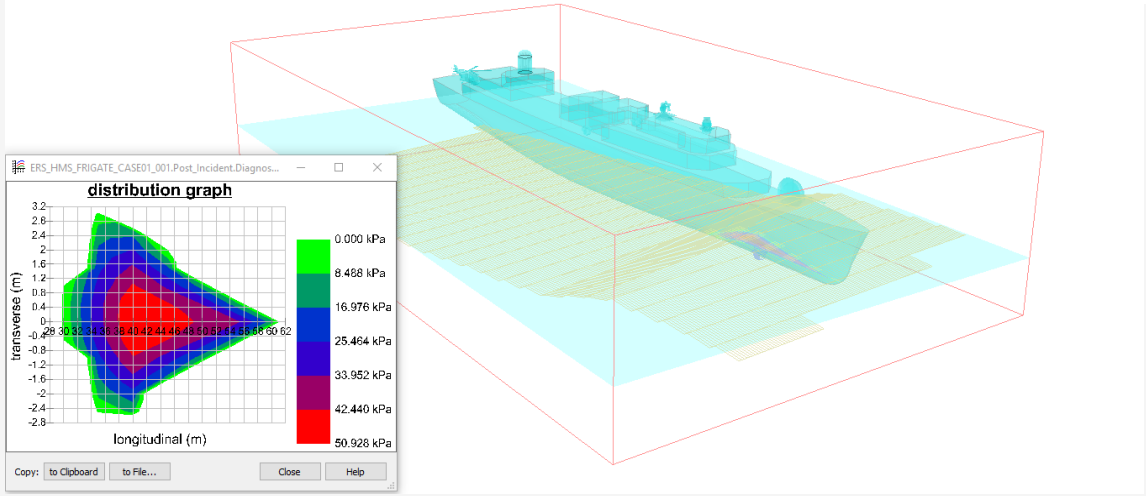
Defining the post-incident attitude and seabed using freeboards & soundings

Inputting and modifying the local tide data

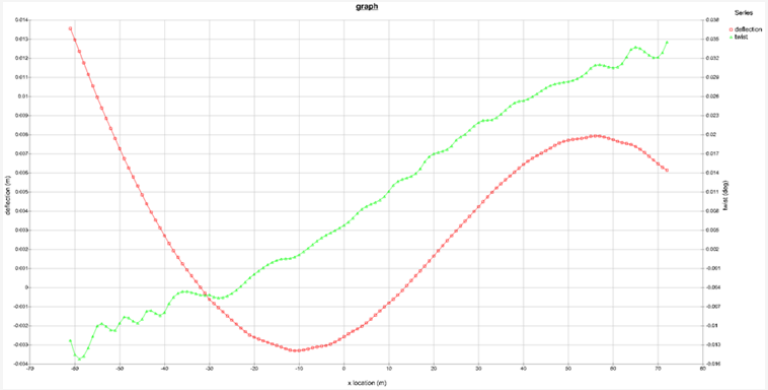




Establishing that centroid and mass that would account for the change in attitude, i.e. lost buoyancy and ground reaction.



Inspecting the post-incident hull deflection and twist



Challenges – Competent Naval Architects

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Training for a non-routine low probability high consequence incident and maintain a suitable level of corporate Subject Matter Expertise (SME).

Individual:

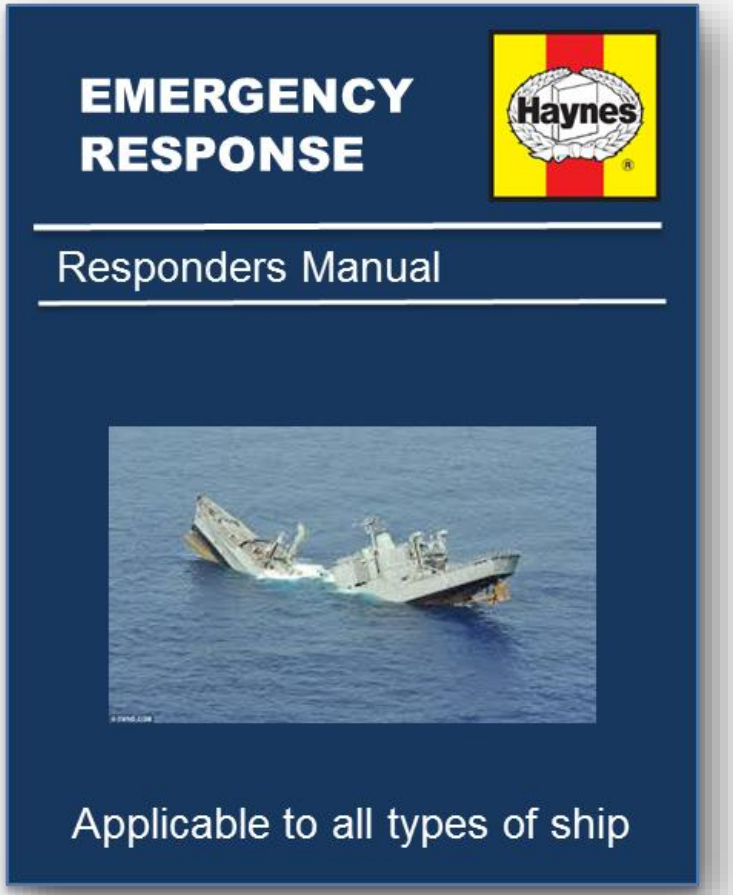
- Handbook
- Training Course
- Functional Competence Assessment

Team:

- Desktop simulated exercises (SME and Naval Architects)

Collective

- Simulated / realistic scenario interactive exercises



Training Exercise - Goals

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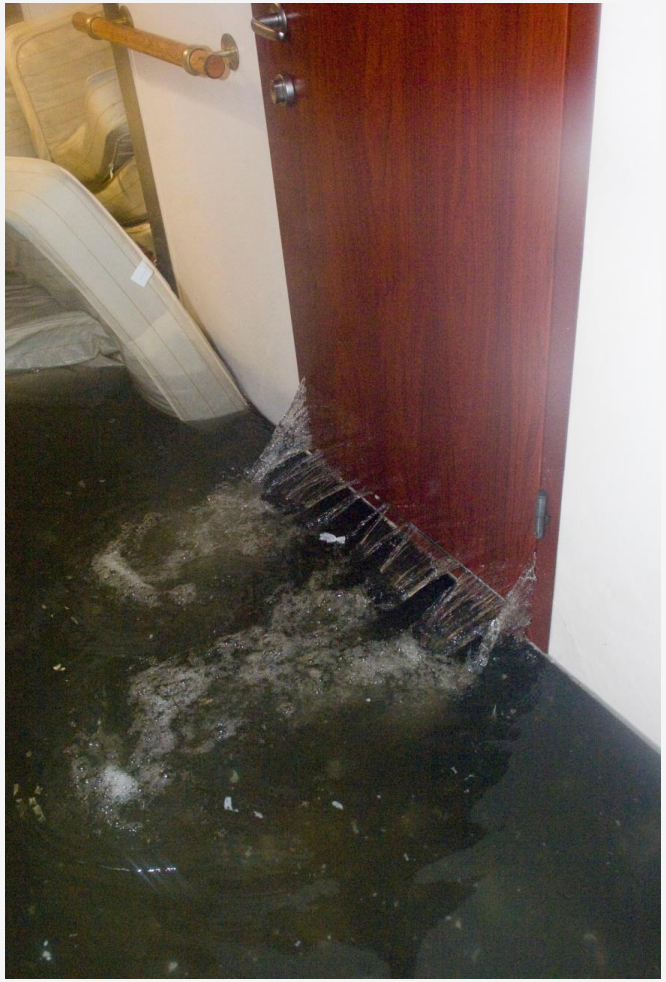
The annual training event designed for Naval Architects to apply skills, learn and highlight development opportunities (tabletop only).

It is one element of a system to develop and maintain rarely employed skills to assist commands in decision making regarding global safety of the ship from structural and stability perspective.

- Deliver the training and development needs objective.
- Work against time-based deadline.
- Provide advice based on scant information.
- Use the ship stability book and not switch on the computer immediately.
- Provide a tension between stability and structures.
- Provide verbal status reports.
- Handover effectively to the next team in an enduring event.



Training Exercise - Preparation

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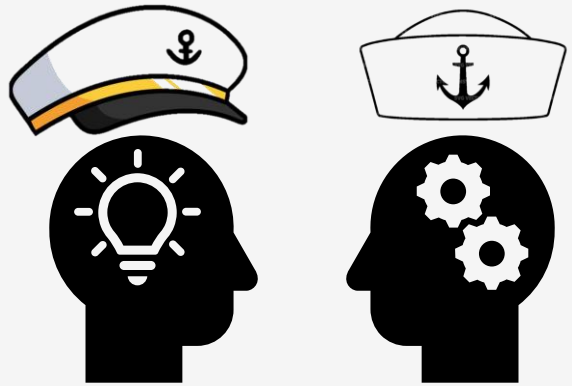
Preparation, Preparation, Preparation!

Two-day event with four teams of Naval Architects



- The complexity of preparing the scenario should not be underestimated (1 year)
- The designer is both the Ship and Ship's Staff!
- Create inconsistency and confusion.
- Every avenue of potential team response must be explored.
- Set challenges aligned with teams' skill set (differential learning)
- Room set-up – information, communication, assessment
- Participation of real Naval Officers to test team's briefing skils

Summary

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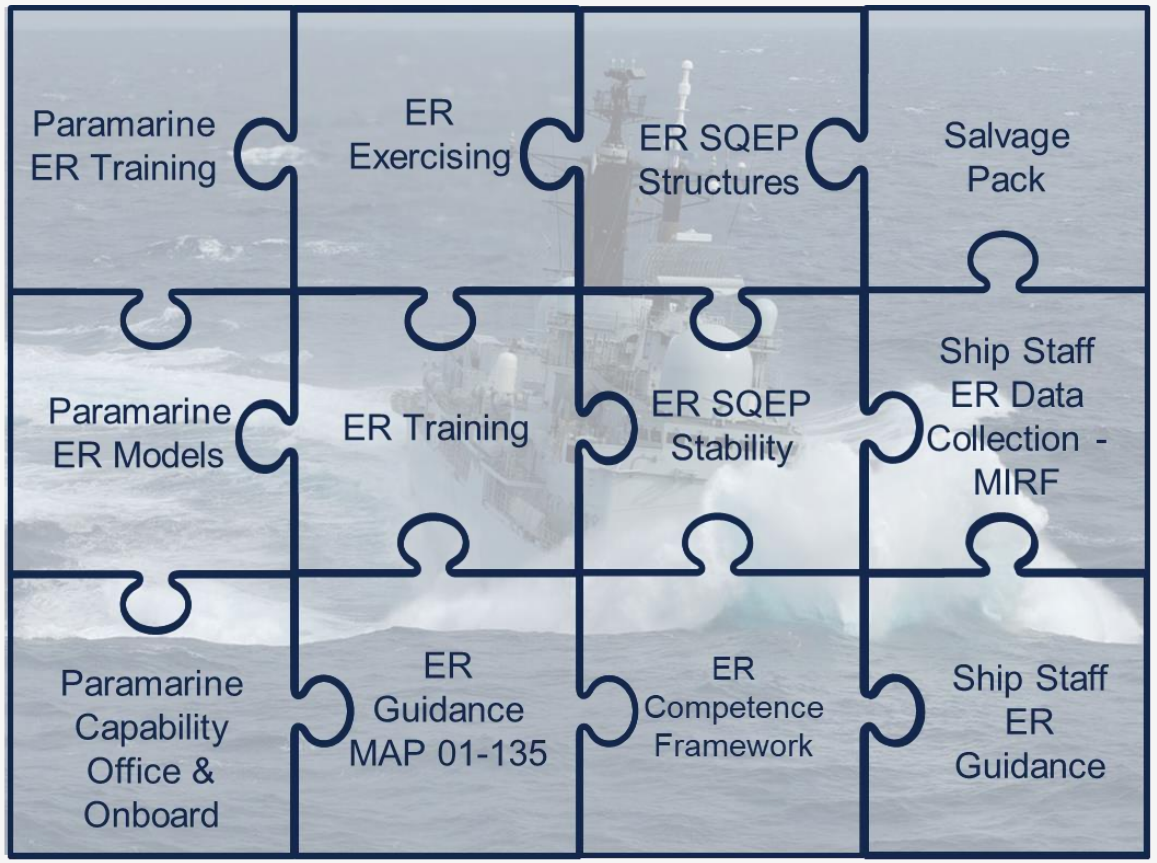
Low probability, high consequence incident

Four Pillars of Naval Architect Emergency Response Development:

- **Tools** – ER functionality to facilitate diagnosis to treatment
- **SQEP Enablers** – Development and maintenance of knowledge, skills, and attitude
- **Competence** – Assessment and measuring of Naval Architect pool
- **Information** – Interfacing and data transfer

Preparation, Preparation, Preparation!



SQEP = Suitably Qualified & Experienced Person
ER = Emergency Response

Example Exercise

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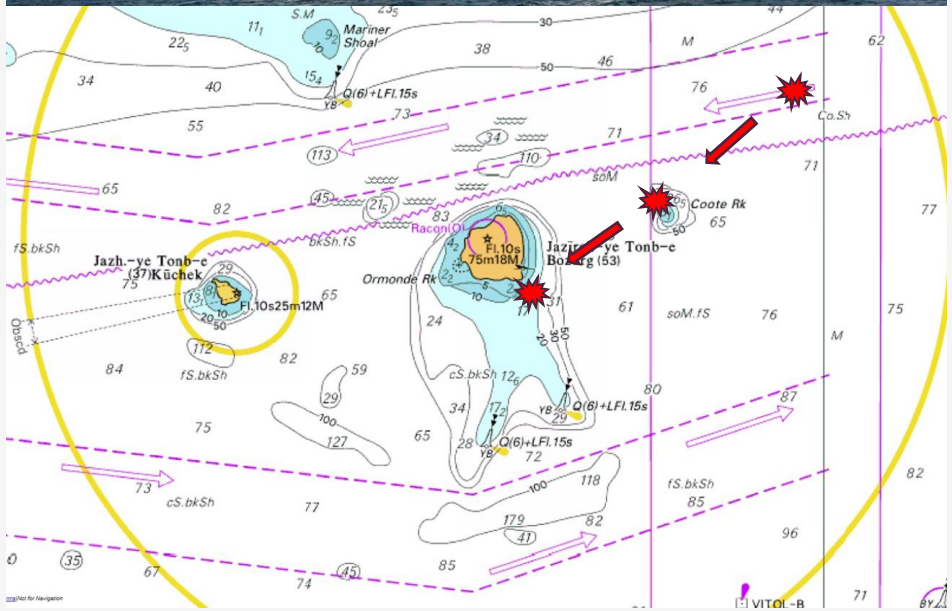
The Incident:

- HMS AVON (Batch 2 OPV) is transiting through the straits of Hormuz enroute to Bahrain from Oman
- Due to poor visibility and manoeuvring to avoid hostile state shipping AVON is damaged following a collision with a local fishing trawler which subsequently flees the scene
- AVON loses propulsion from Engine room and AMR flooding, and power distribution is compromised following an explosion in the MCR switchboard
- Without propulsion the ship drifts towards the Tunb Island chain subsequently grounding on a rock outcrop
- A rising tide allows the ship to float off, but without propulsion AVON continues to drift
- A second grounding occurs on a sandbar close to the main island. AVON is unable to float off during the exercise.



Example Exercise – Group 1

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True Ship Condition:

- Engine room is flooding up (4.9m)
- FF compartments: Prt Dieso Tank, 3D AMR, 4D Stabiliser space
- Prt Stabiliser is lost
- Firefighting in 2D
- No propulsion & limited pumping capability
- Ship remains stable – Passes DEFSTAN 02-109 Damage criteria

Information received:

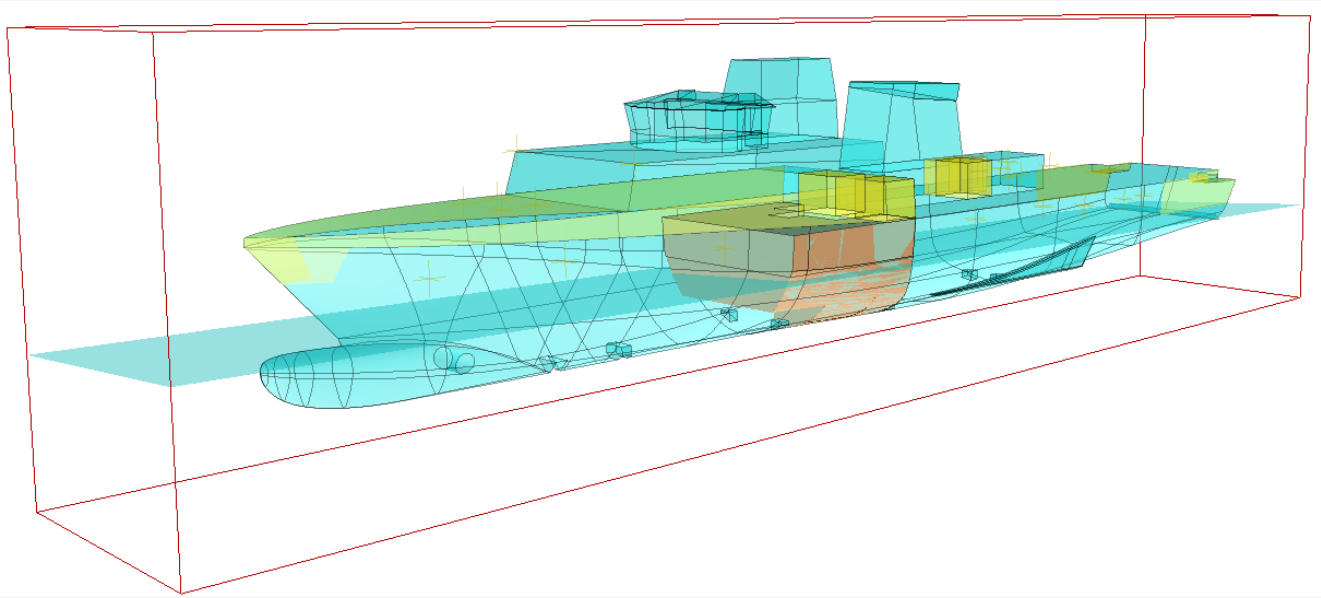
- Initial Signal
- MIRF1-A
- SITREP 1
- MIRF1-B
- MIRF2-A
- SITREP 2

Modelling:

- Free floating damage assessment
- Grounding assessment

Expected Response:

1. Discuss plan and roles during response
2. Mark up incident board – Where is the damage sustained? What is the extent of damage?
3. Use the SSB for quick understanding of ultimate ship capabilities
4. Consider the impact of loss of propulsion
5. Consider the impact of firefighting water on 1 deck
6. Start to set up the model



Example Exercise – Group 2

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True Ship Condition:

- Grounded on rock pinnacle at frame 48
- Additional FF compartments: WB tank no.1, Bow Thruster Space, WB Tank no.2
- Helicopter evacs casualties
- Tide is falling
- Sister Ship is re-tasked to assist
- Engine room hole is plugged stopping flood
- Ship remains stable – Passes DEFSTAN 02-900 Damage criteria

Expected Response:

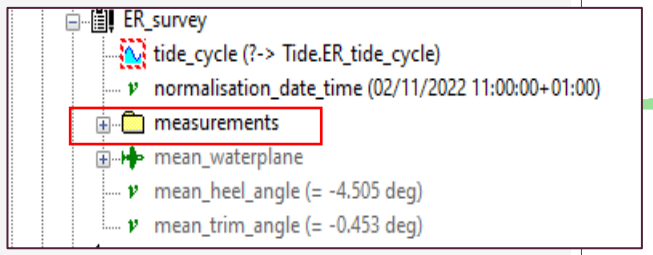
1. Manage Information Flow
2. Baseline model with new information – begin tracking error between provided and modelled ship attitude
3. Model grounding in Paramarine, understand what information is needed to populate the model:
    1. Request Regular Freeboards
    2. Request seabed soundings
4. Identify that tide is falling and assess stability
5. Identify that Helicopter has left the ship
6. Identify that Sister ship is enroute to assist

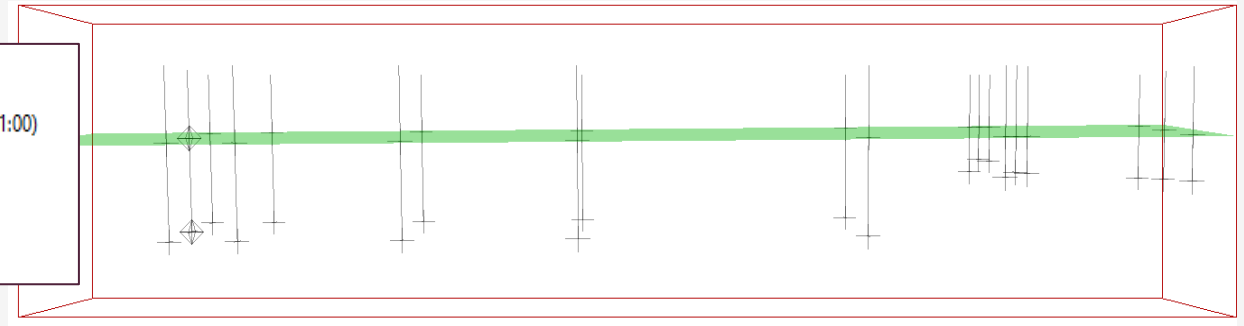
Information received:

- MIRF2 – B
- SITREP 3

Modelling:

- Grounding assessment
- Free Floating Assessment





Example Exercise – Group 3

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True ship Condition:

- Tide is rising
- Ship will float of 1.5 hours before high tide
- Failed to restore power and propulsion
- Engine room flood level is reducing

Information received:

- SITREP 4
- MIRF3-A

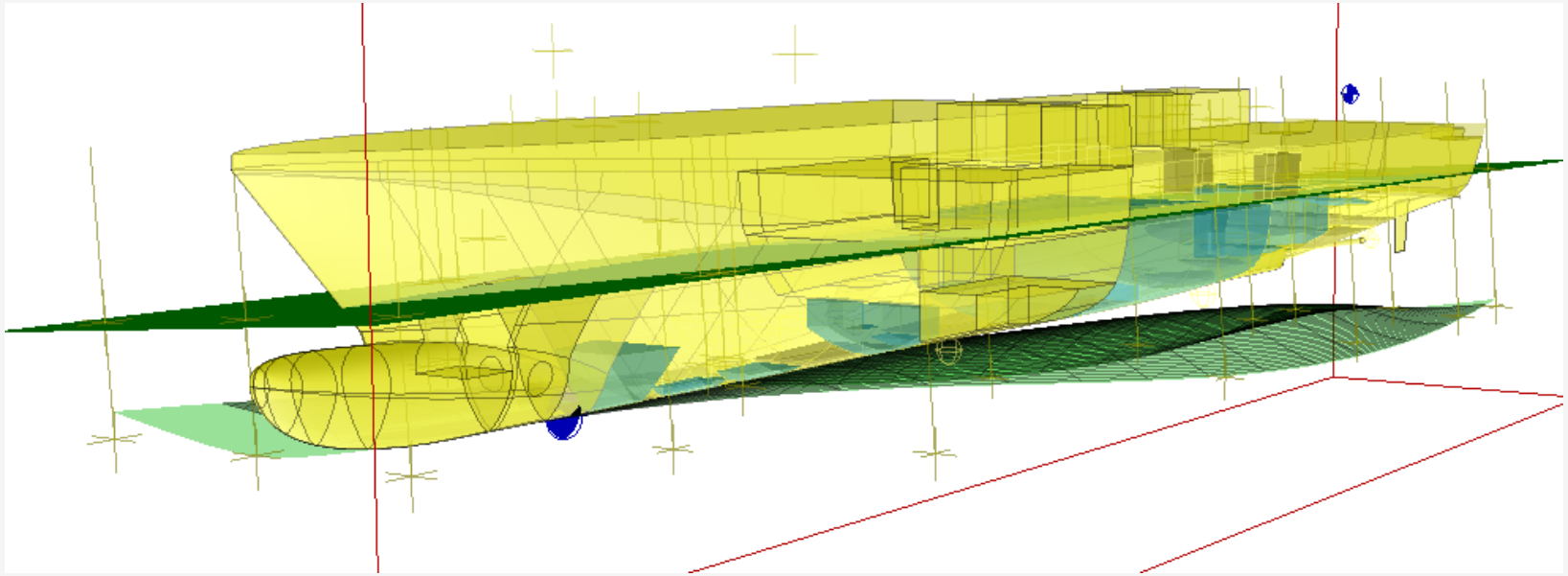
Modelling:

- Grounding assessment

Expected Response:

1. Manage Information Flow
2. Identify rising tide and imminent float off
3. Prepare vessel for float off – identify that without propulsion the vessel will drift

4. BRANCHING DECISION: When vessel floats-off she will continue drifting resulting until a subsequent grounding incident.



Example Exercise – Group 4

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True ship Condition:

- Ship drifts towards land and grounds on sand bar
- Tide is falling
- Sister Ship arrives on the scene
- Condition prevents float off
- Unaltered condition prevents pull off from sister ship

Information received:

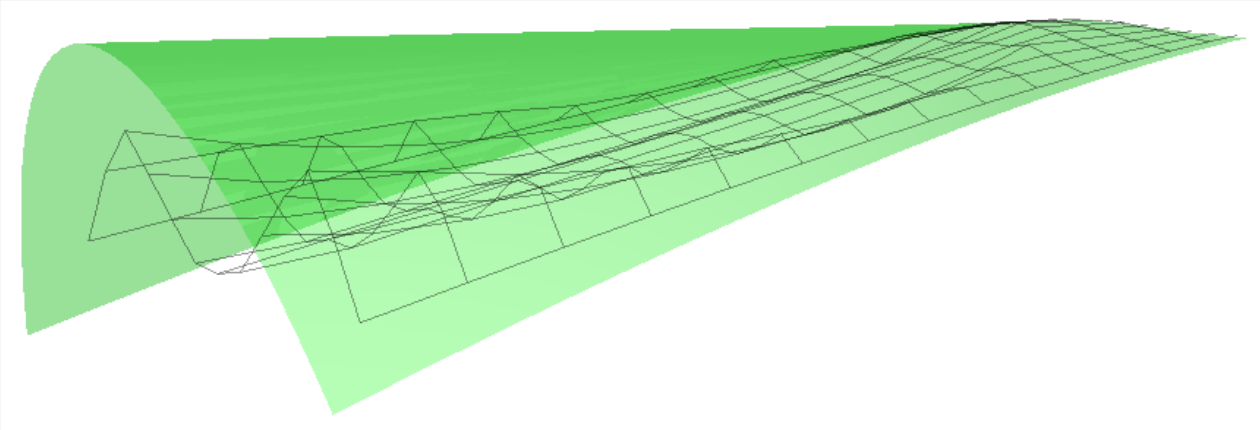
- MIRF3-A
- SITREP 5
- MIRF3 - B

Modelling:

- Grounding assessment
- Pull Off Assessment

Expected Response:

1. Manage Information Flow – a lot of information received at point of handover
2. Identify falling tide – assess whether float off is possible and when
3. Identify that the ship can't float off-
    1. Assess pull off
    2. Lightening plan
4. Prepare ship for pull off
5. Prepare Sister ship for pull off
6. Engine room recovery




Questions?