

# **Instantaneous Monitoring of Global Maritime Safety**

***iStand*** - New dimension to intelligence onboard

***Dr Andrzej Jasionowski***

**Presented by**  
***Dr George Mermiris***



# Presentation layout

- Background
- State-of-the-art knowledge
- Practical application
- iStand Decision-Support System
- Future potentials
- Communication requirements

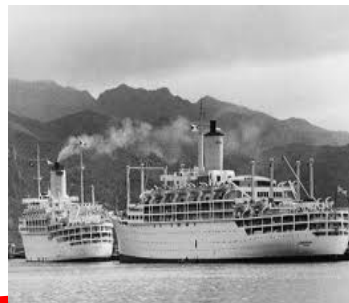


# Background Passenger ships

Capacity / complexity



1950



1970



1990



2009

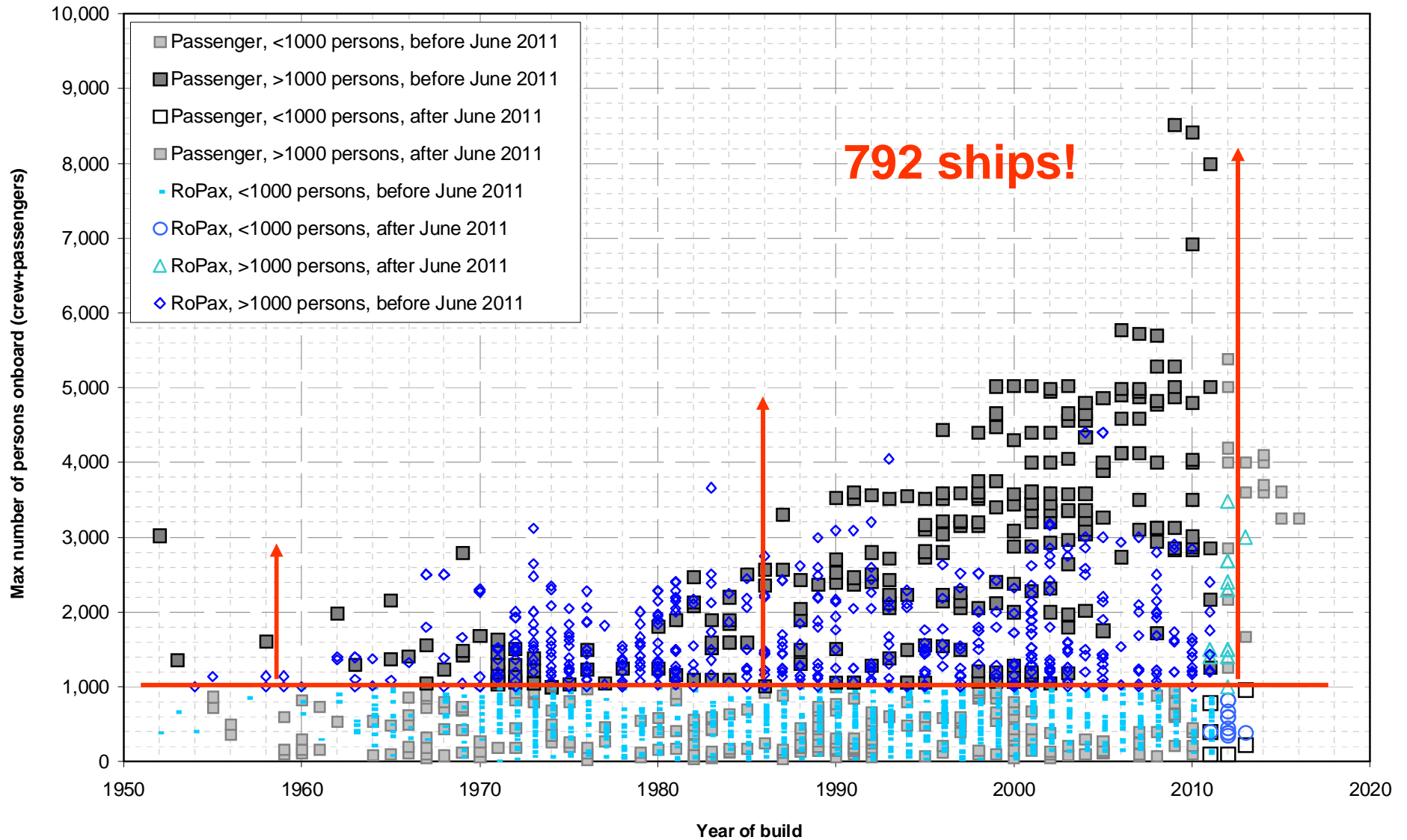


Time



# Background

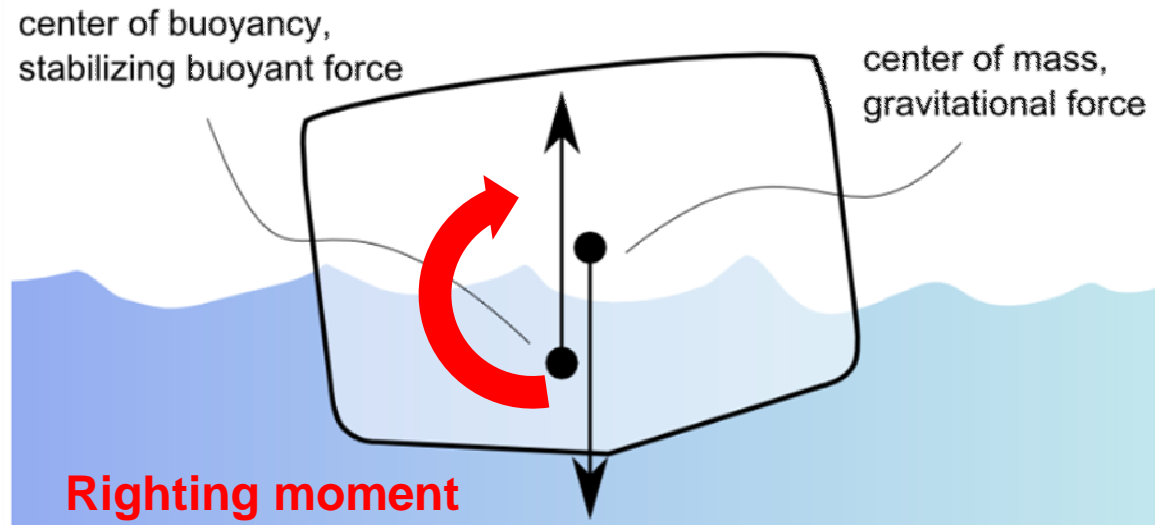
## Passenger ships – World fleet statistics





# Background

## Stability



***Watertight door***



# Background

## SOLAS Regulation II-1/22.4

“Certain watertight doors **may be permitted to remain open** during navigation only **if considered absolutely necessary**; that is, being open is determined essential to the safe and effective operation of the ship's machinery or to permit passengers normally unrestricted access throughout the passenger area. Such determination shall be made by the Administration only **after careful consideration** of the impact on ship operations and **survivability**. A watertight door permitted to remain thus open shall be clearly indicated in the ship's stability information and shall always **be ready to be immediately closed**.”



# Background

Things happen very fast and ... irreversibly!



*Sea Diamond, 2007*



*Costa Concordia, 2012*



# Background

## Societal perception

**It is unbelievable... that this should happen  
to a 21<sup>st</sup> Century ship**

Simon Calder, Travel Editor, *Independent*

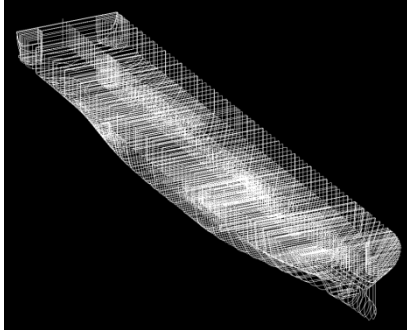
<http://www.bbc.co.uk/news/world-europe-16560617>



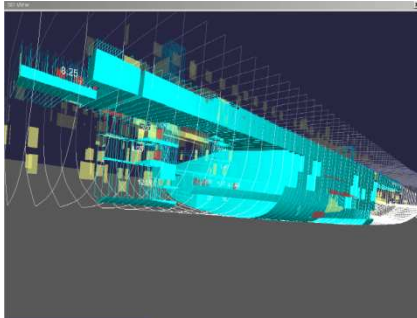


# State-of-the-art knowledge

## Ship survivability



In order to study the behaviour of the damaged ship in waves a **detailed model** is necessary.

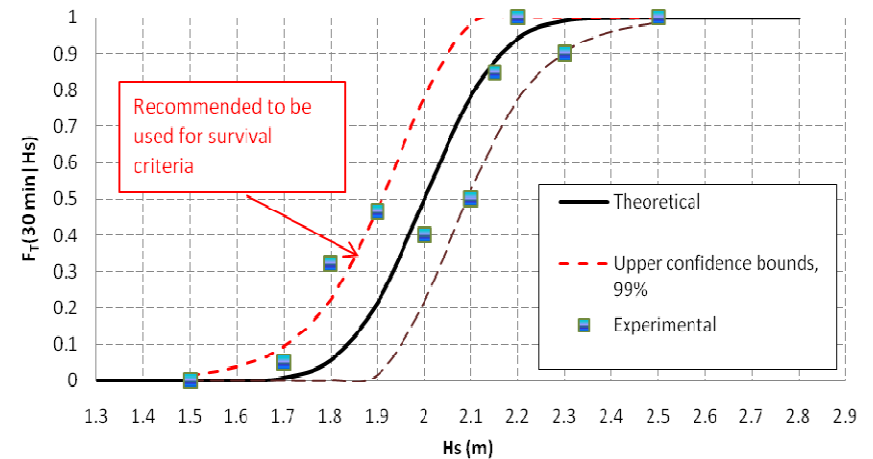


Through **time-domain simulations** we get information about ship movements and flood water mass and location as well as floating position and ship dynamics.



The process can be verified and enhanced by **physical experimenting**.

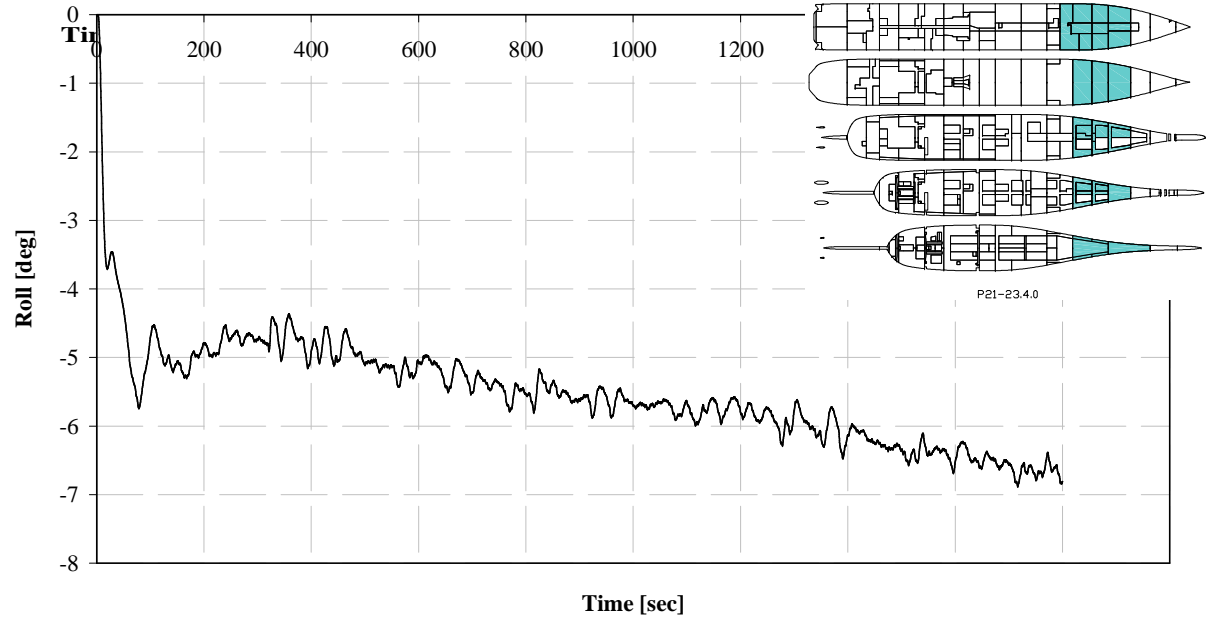
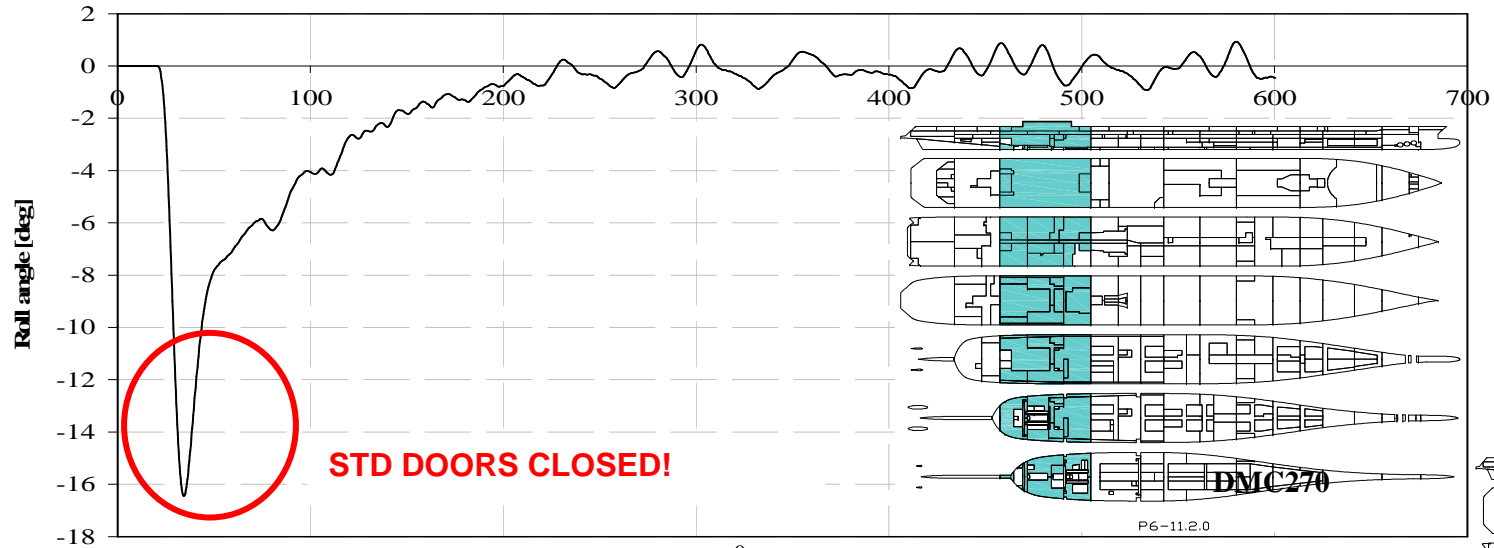
### Uncertainty quantification





# State-of-the-art knowledge

## Enhanced survivability



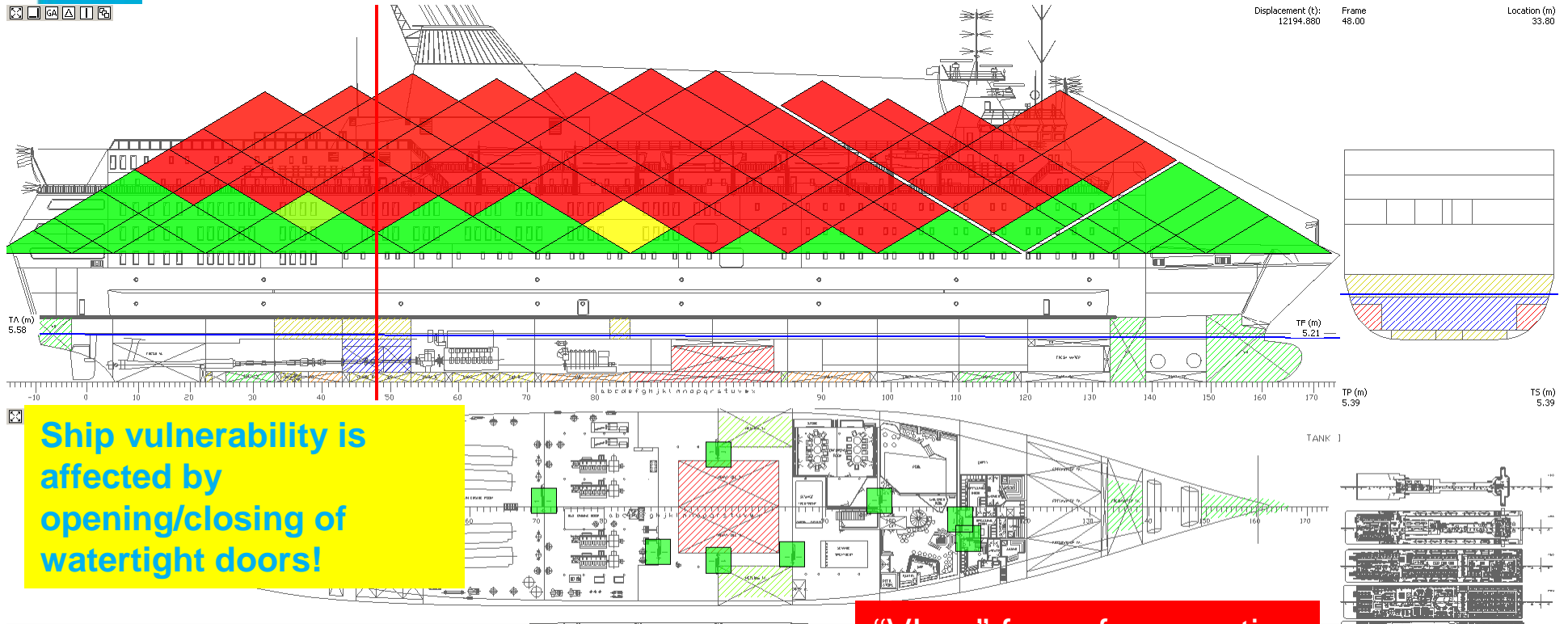


# Application

- New paradigm for **safe operation**
  - **Vulnerability** – The probability of capsizing in 3 hours for given damage and sea state conditions
  - **Vlog** – monitoring of vulnerability variation in parallel to ship operation
- New functionality for **damage assessment**
  - **Rapid** detection of damage extent via a network of sensors
- New critical **decision-support**
  - Abandon ship / Stay onboard



# iStand



**"VLog" for safe operation**

**Controls**

Wave Height [m]:

Tcap [minutes]:

Hull Deflection [m]:

Seawater Density [t/m3]:

Number of Passengers and Crew:

Colour Theme:

Evacuation Simulation:

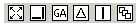
**Vulnerability Log**

VL: 18.740% Date: 16:14, Monday, 21 Jun 2010 Axis Range:

Doors | Event Log | GZ Curve | Loading Summary | Mass Loads | Reporting | Rooms/Spaces | SOLAS Criteria | Stability Parameters | Stability Summary | Strength Chart | Systems
Clear Flooding
Next Calculation in 40 Minutes...
Most Likely Flooding
Crisis Response
Sensors Offline

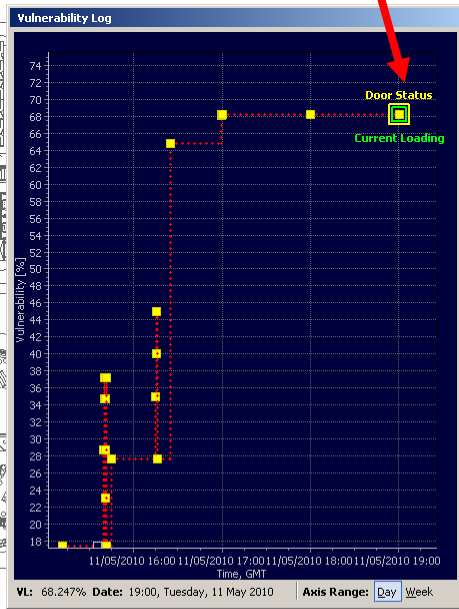
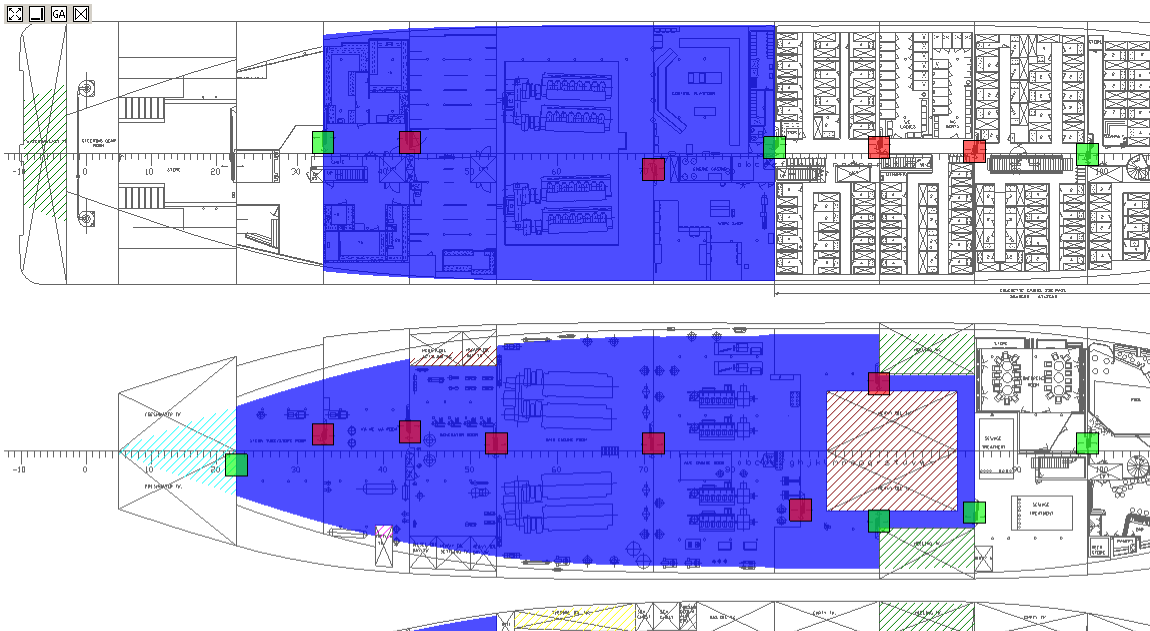
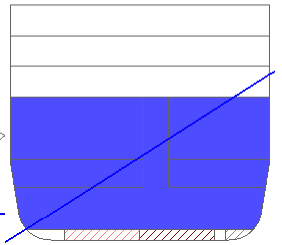
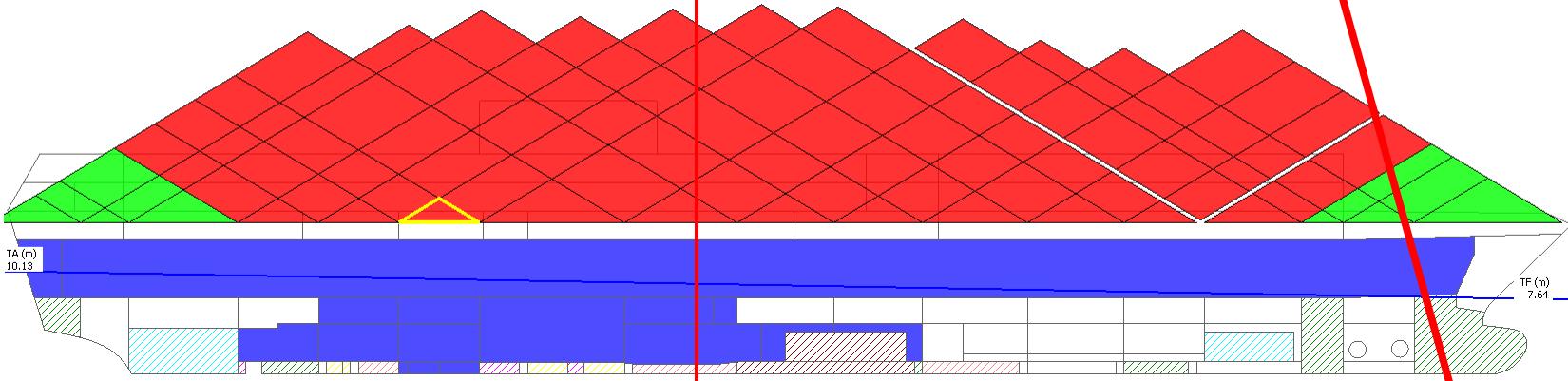


# iStand

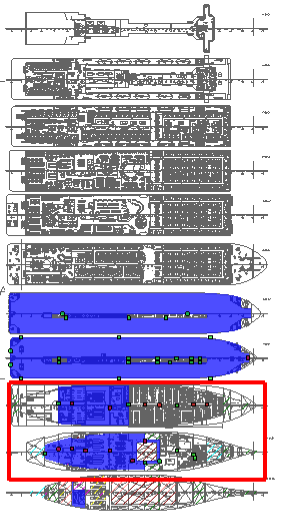


“VLog” for safe operation

Location (m)  
59.40



TP (m) 1.17 T5 (m) 16.60





# iStand – Advisory capacity

Displacement (t): 12380.420  
Frame: 82.85  
Location (m): 79.40

TA (m): 5.54  
TF (m): 5.42  
TP (m): 4.34  
TS (m): 6.63

**Critical decision advisory capacity (e.g. 100 t of water to be added to tank R901)**

Crisis Response	
<b>STATUS</b>	
Trim [deg]:	-0.052
Heel [deg]:	5.441
Survival Time:	10:00:00
Evacuation Time:	00:58:11
Search for Corrective Action	
<b>STATUS AFTER CORRECTIVE ACTION:</b>	
Trim [deg]:	-0.065
Heel [deg]:	0.565
Survival Time:	10:00:00
Evacuation Time:	00:58:06
<b>CORRECTIVE ACTION:</b>	
Room Name	Volume Change
R901	122.911

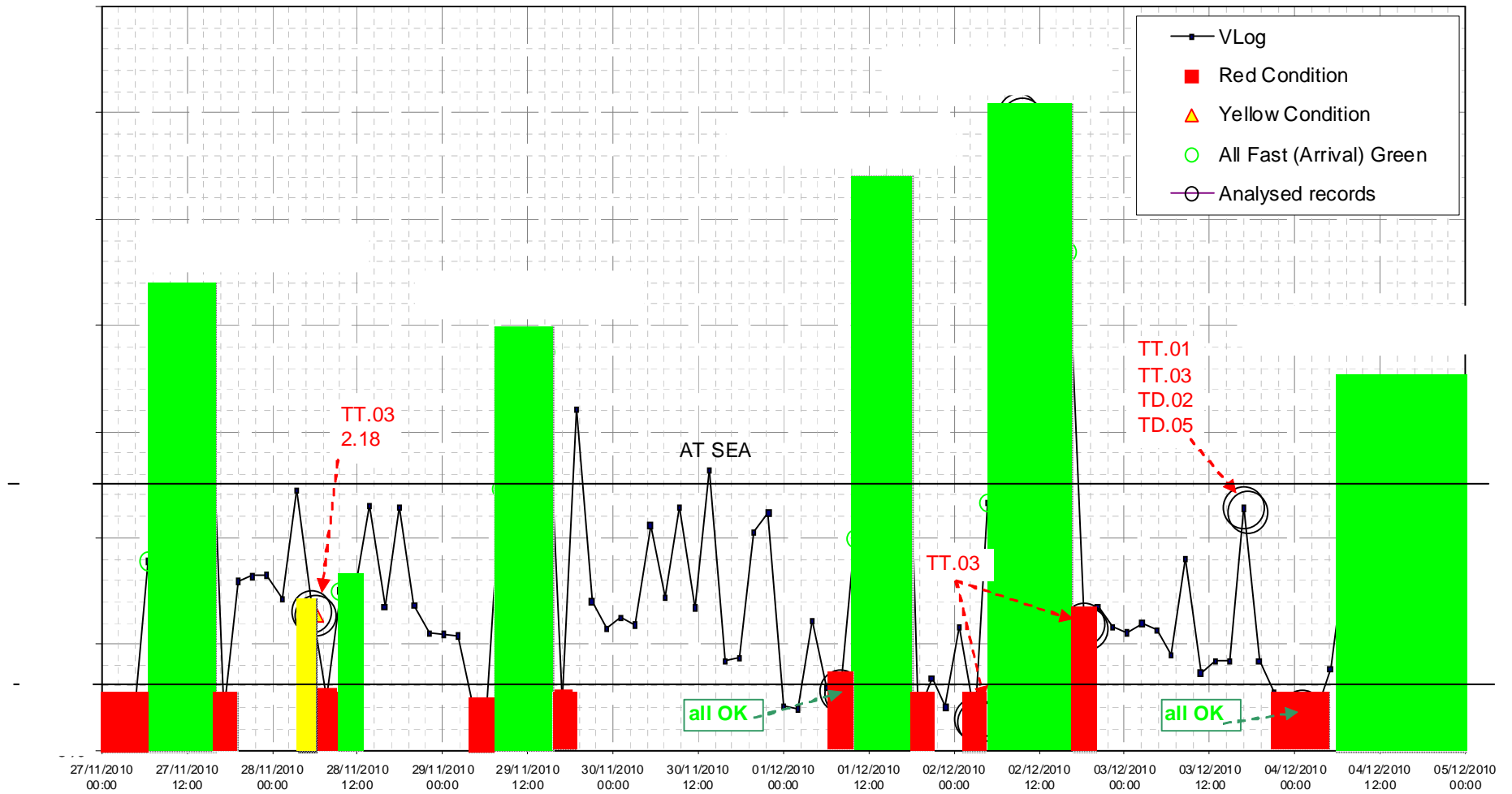
Controls | Doors | Event Log | GZ Curve | Loading Summary | Mass Loads | Reporting | Rooms/Spaces | SOLAS Criteria | Stability Parameters | Stability Summary | Strength Chart | Systems | Vulnerability Log

Clear Flooding | Next Calculation in 42 Minutes... | Most Likely Flooding | Crisis Response | Sensors Offline



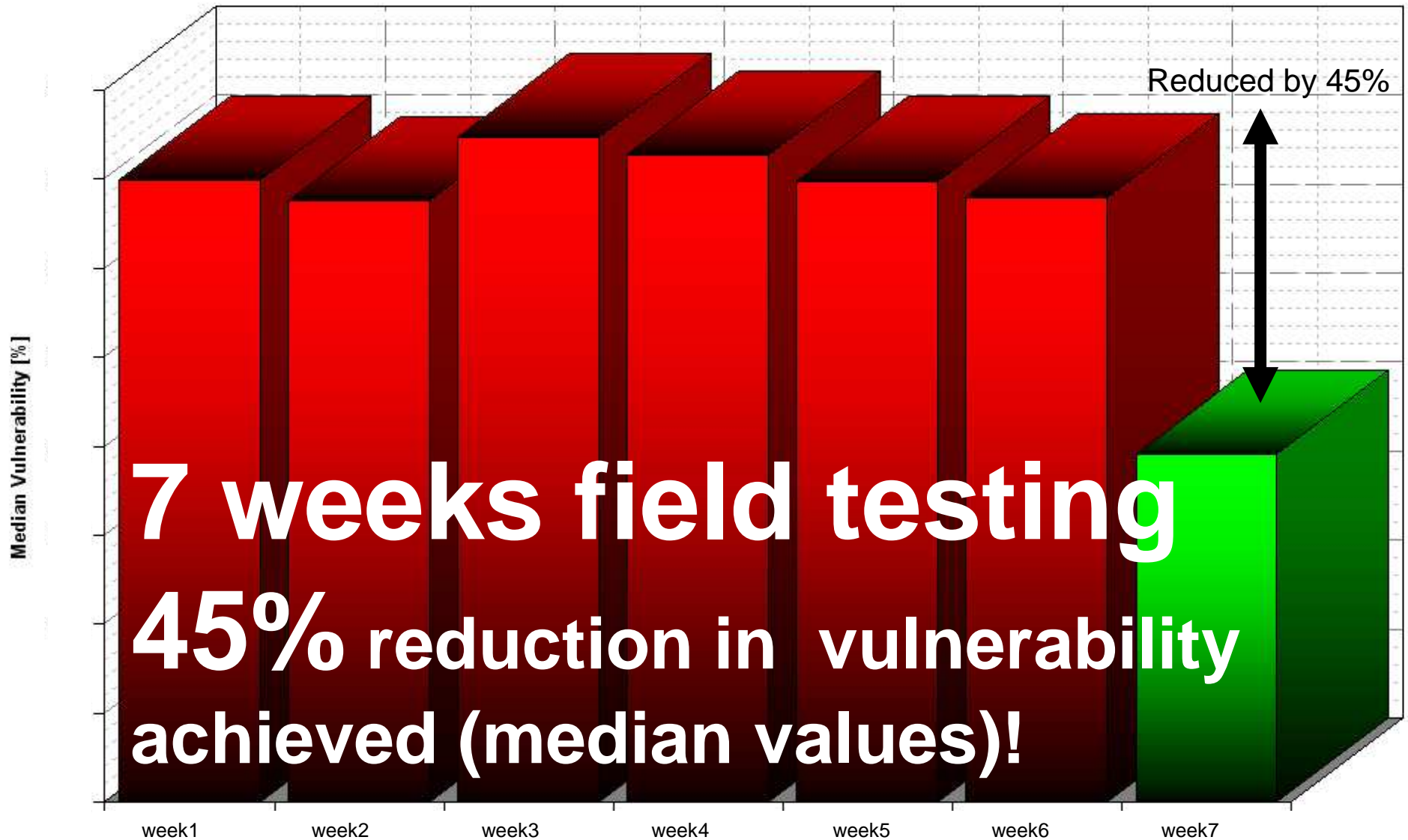
# Life Cycle Management

## Design + Training + Measurable audit





# Training/Trials







# Future potentials SafeSeaNET

Scenario & criticality

Advisory

Vulnerability

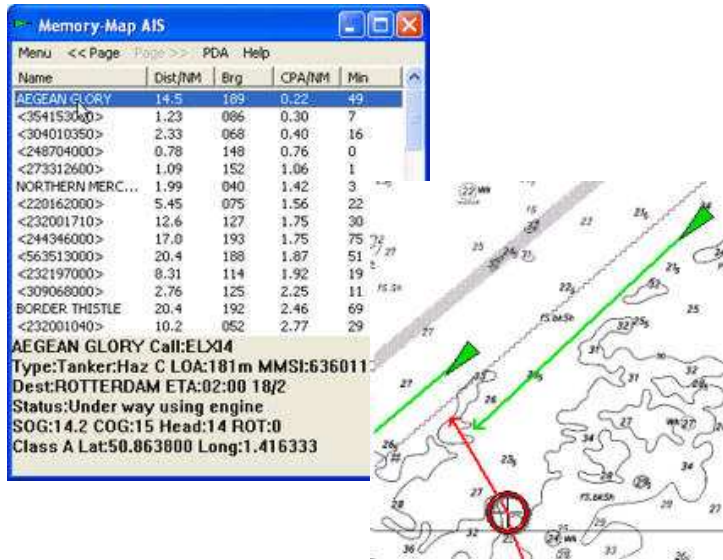
The screenshot displays the SafeSeaNET software interface, which is used for maritime risk assessment. It features several key components:

- Scenario & criticality:** A top-down view of a ship's deck layout with colored overlays (cyan, purple, pink) representing different risk levels or criticality zones.
- Advisory:** A detailed view of the ship's hull and deck structure, overlaid with a red and green grid, likely representing structural integrity or damage assessment.
- Vulnerability:** A detailed view of the ship's internal structure, including the hull, deck, and various compartments, with colored overlays indicating vulnerability levels.
- Configuration Panel:** A sidebar on the left with the EMSA logo, showing various settings and options for the simulation.
- Tables and Data:** A central window displays a table of data, likely related to the ship's stability or structural analysis. The table includes columns for 'Tank', 'Volume Change', and 'Value'.
- Status and Metrics:** A right-hand panel shows various status indicators, including 'Stability', 'Straight Survey', 'Heel', 'Trim', 'Hull Deflection', 'Deckweight', 'Displacement', 'GM Correction', 'Hull GM', 'Required GM', 'Shear Force', and 'Bending Moment'. It also includes a 'Status Assessment' section with 'Survival Time' and 'Evaluation Time'.
- Navigation and Tools:** The interface includes a browser window at the top (Mozilla Firefox) and a taskbar at the bottom with various application icons.

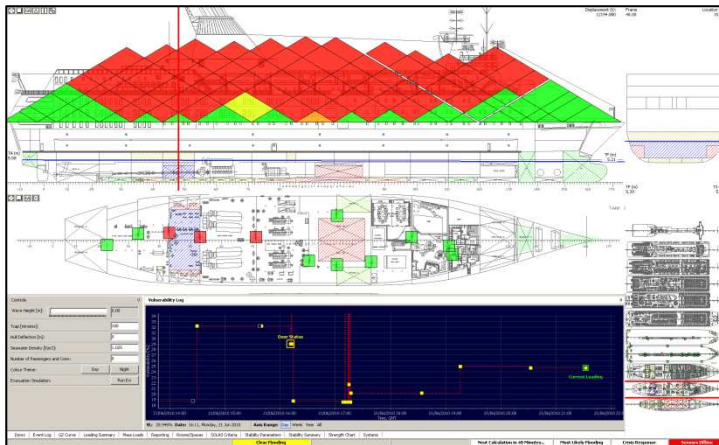


# Future potentials

## Complementing AIS, LRIT, etc.



Vulnerability

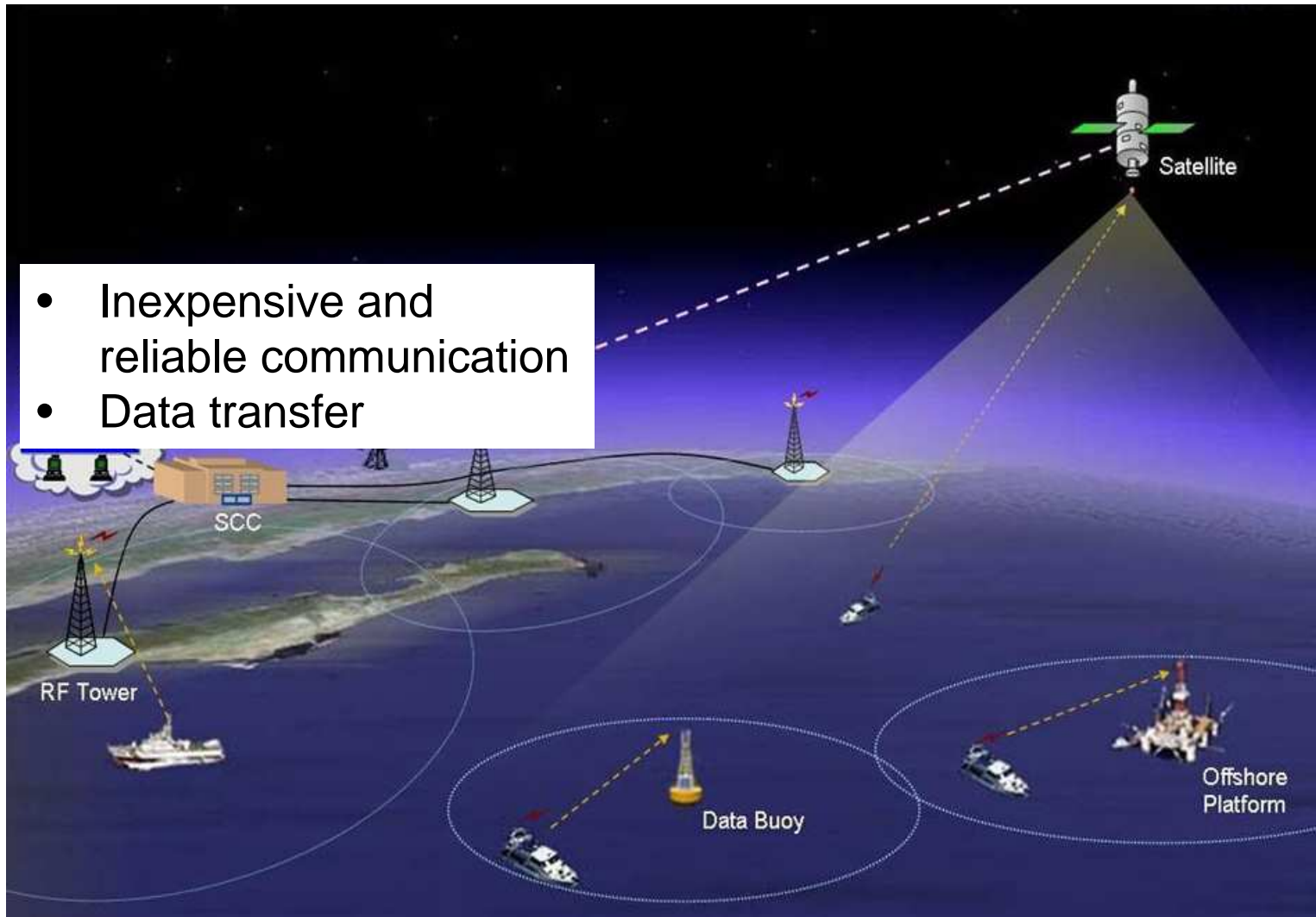


**Cost-effective  
management of  
residual risk in  
operation**



# Communication requirements

- Inexpensive and reliable communication
- Data transfer





[www.safety-at-sea.co.uk](http://www.safety-at-sea.co.uk)