On the edge of the AXE … !

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Koninklijke Nederlandse Redding Maatschappij

Short introduction

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Our world and environment…

Evolution is necessary

- Need for reduced vertical accelerations, vibrations and noise
- Need for improved directional stability and manoeuvrability
- Shifting profile volunteer
- Increased availability and quality of information
- Need for improved situational awareness for safety and mission execution

The three Safety Elements

- Hull Design
- Human-Machine Interface in a broad context
- Situational Awareness

Hull Design

Innovation by synergy

- Science — Dr. Ir. Lex Keuning, Delft University of Technology
- Design — De Vries Lentsch, Damen Engineering
- Construction — Damen Shipyards
- Operational experience — KNRM

Design: from concepts to blue printing

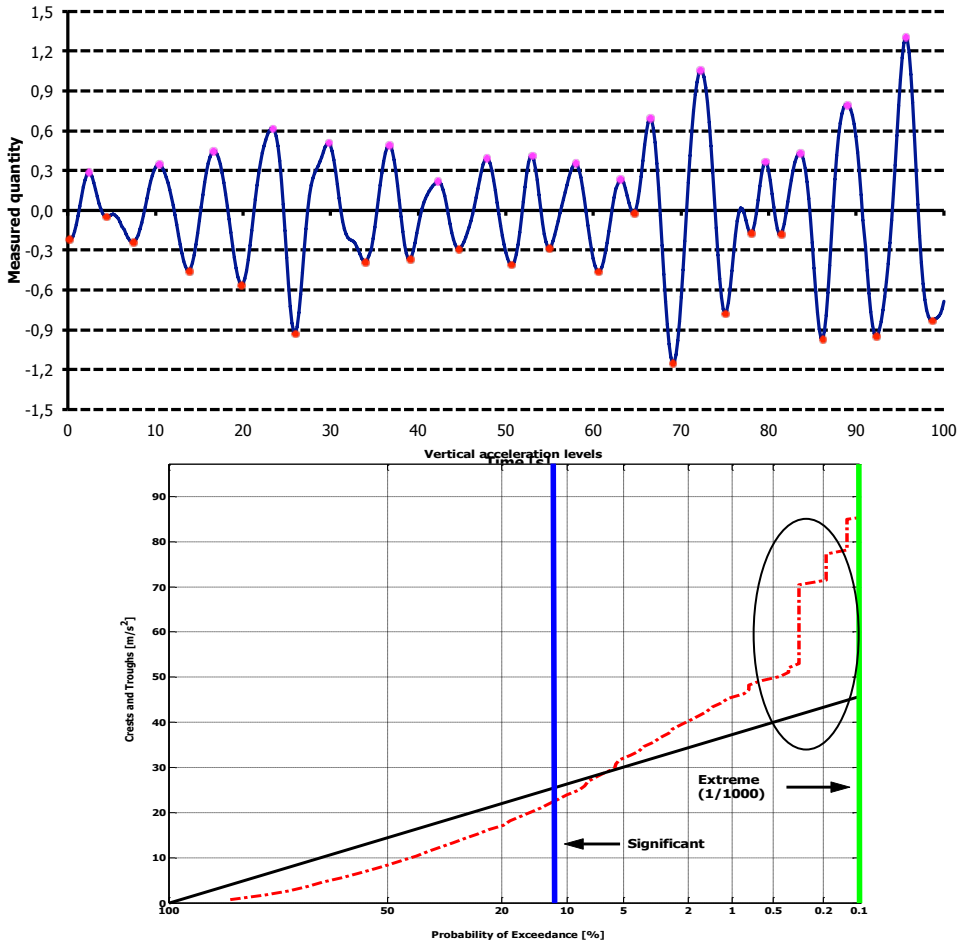
Reference ‘Arie Visser’ class

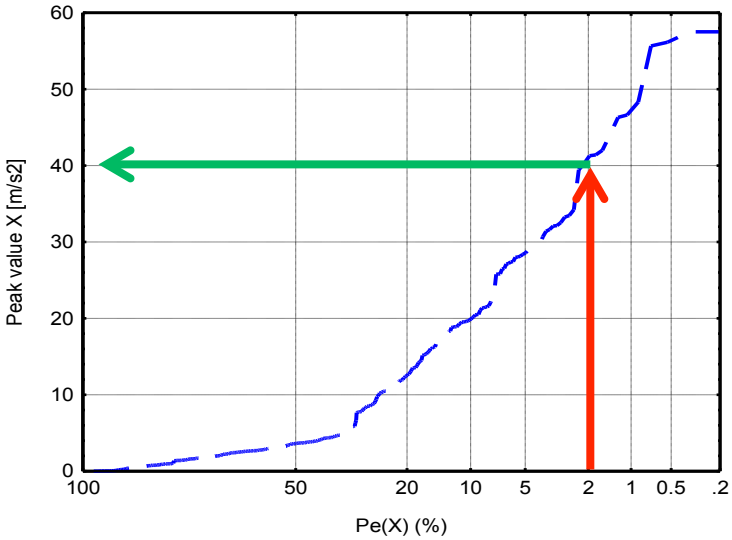
Evolution Concept 1

Revolution Concept 2

SAR1816 Concept 3

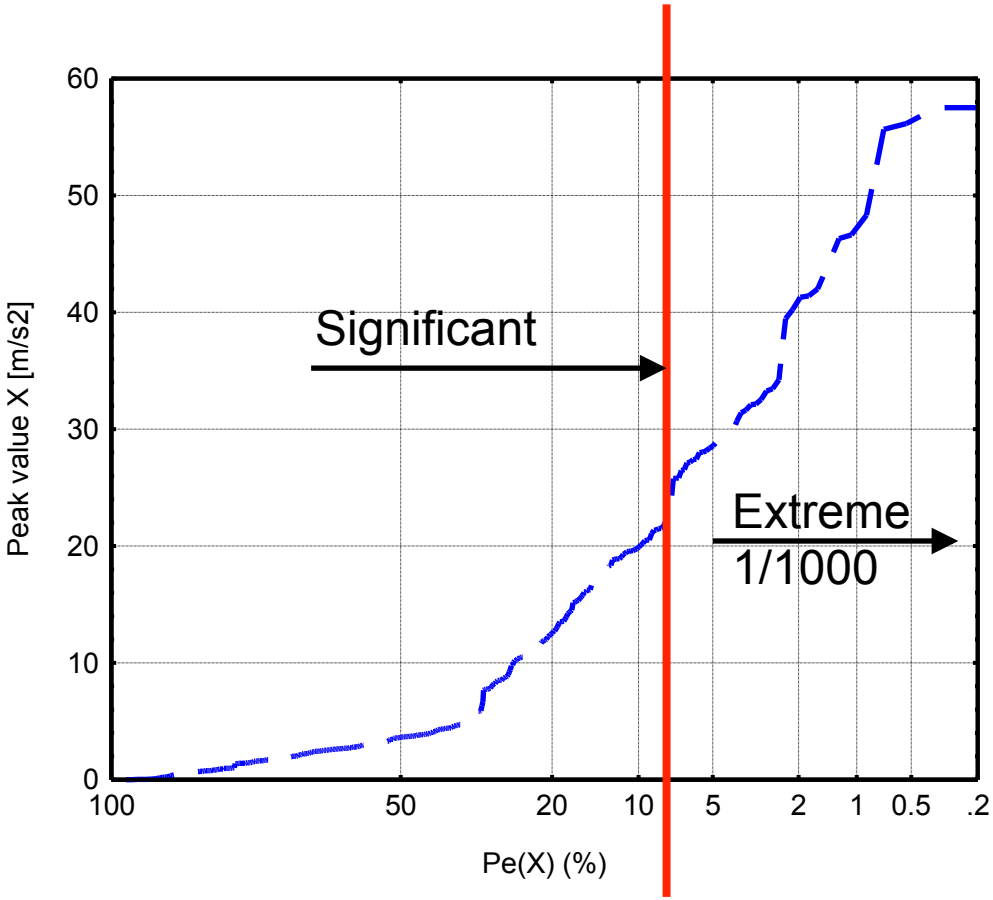
Previous Research: Operability Criteria



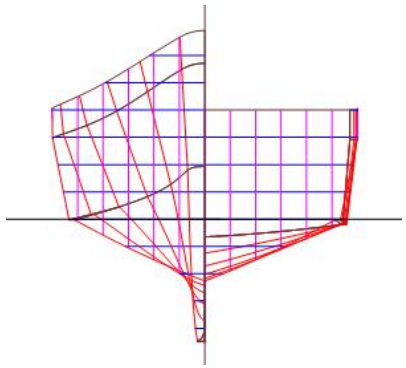


- Strong nonlinear behavior in accelerations
- 85% of speed reductions voluntary
- Peaks are avoided irrespective of significant level at the time

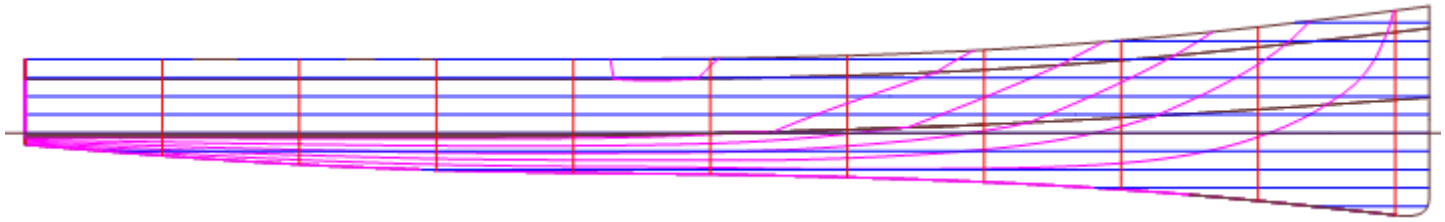
How to improve seakeeping?



Design: The AXE Bow Concept (2006)

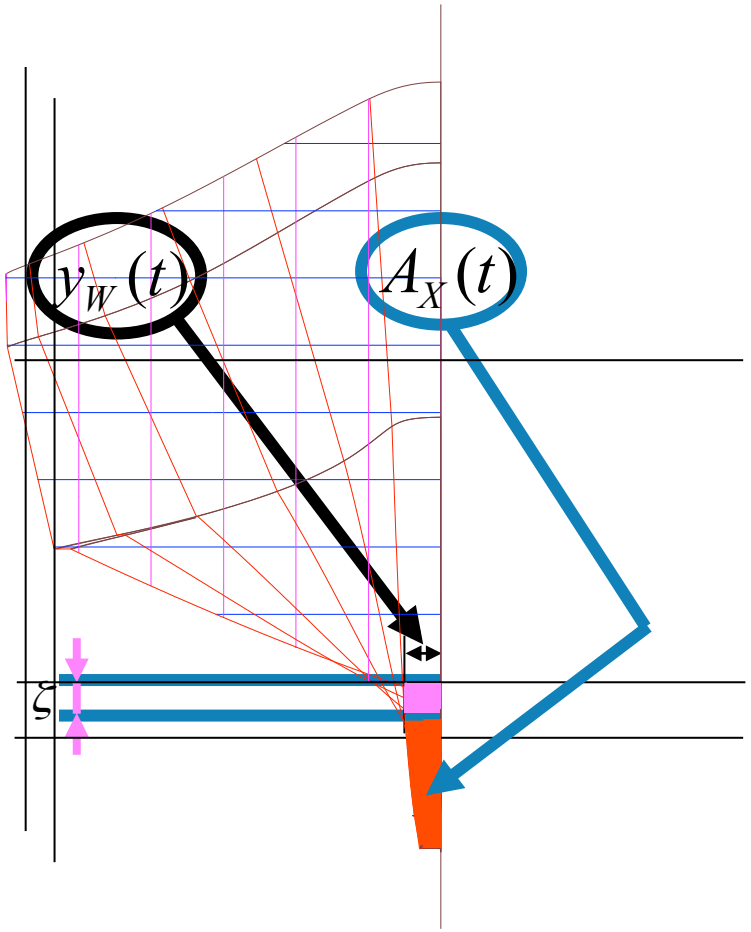


- ✓ No Flair
- ✓ Vertical Sides
- ✓ Increased Sheer
- ✓ Downwards slope and contour



Design: Principle of the AXE Bow concept

$A_X(t)$,
$y_W(t)$,
m_a
dm_a /dt
reduced



"Reducing the Froude-Kriloff force and the hydrodynamic lift forces particularly in the forward part of the ship"

The AXE BOW!

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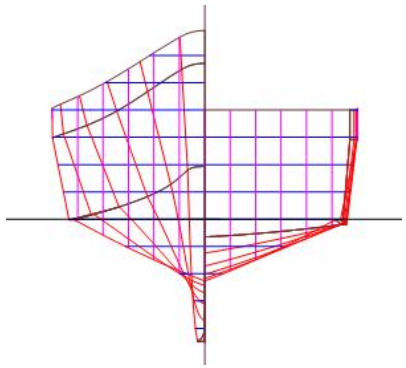

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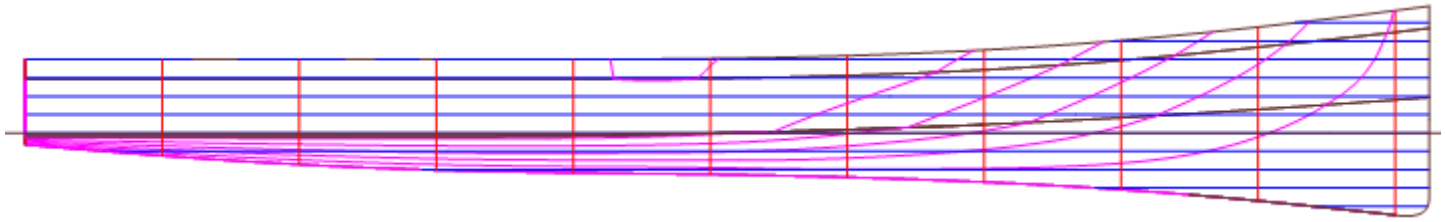
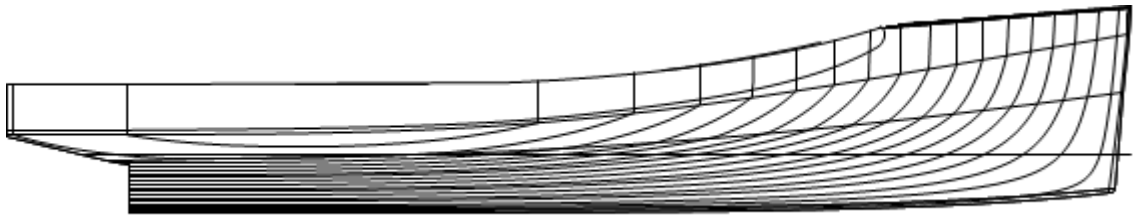


Evolution of AXE Bow to Nh1816 design

- ✓ Length 21.0 m
- ✓ Beam 6.4 m
- ✓ Displacement 34 tons
- ✓ Speed 33 knots



Model trails at Marin Institute NL

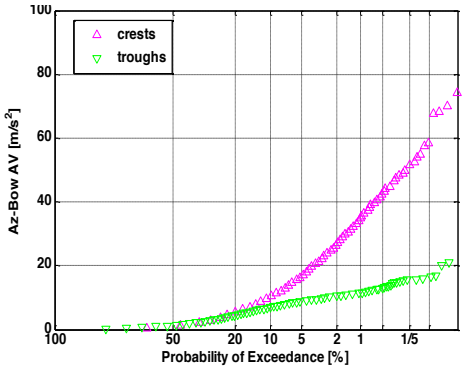
Stern quartering seas Vs = 25 knots Hs = 2.5 m

Arie Visser

Concept 2

Open water, side by side, tests AV & Concept

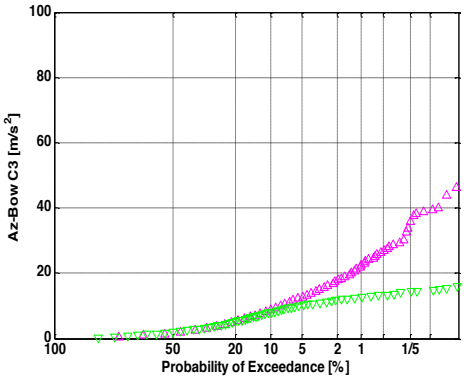
AV



AV

Axe

Axe



The result …

Construction
- Aluminium Hull
- GRP Wheelhouse
- Noise ≤ 72 dB

Humphree trim system
Finding the right trim

Modified AXE Bow
Vert. acc ≤ 4,5 g
Specific SAR / KNRM adjustments

Retractable Fins
For course stability fins deployed
or for manoeuvrability fins retracted

The next challenge …

- How to operate a ship like this?
- How to “fit this ship like a glove”?
- How to support a volunteer to operate as a professional?

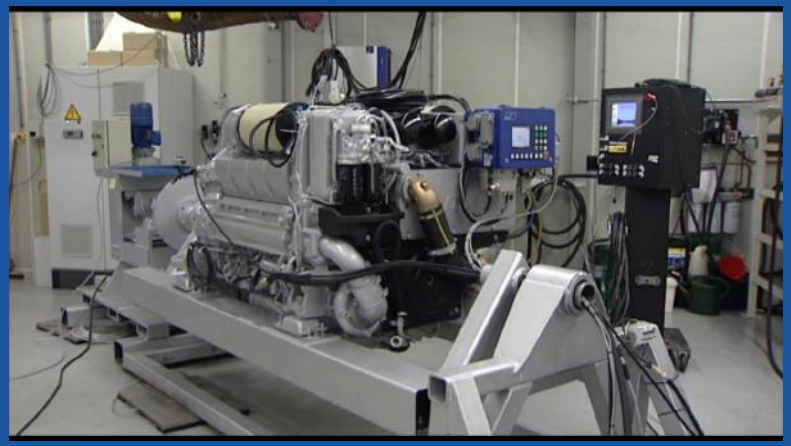
KNRM IPMS

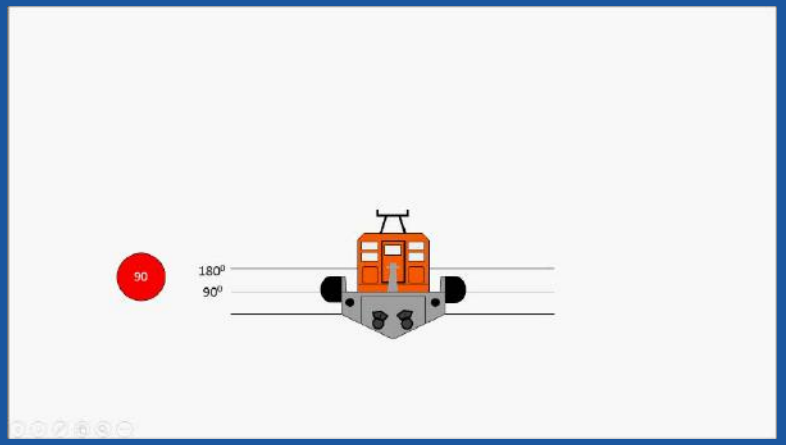
The KNRM "Integrated Platform Management System"

Designed and built by KNRM and L&T Servowatch UK

KNRM Integrated Platform Management System

- Introduction of sophisticated process technology on SAR vessel
- Enables complex capsize scenario (continuous propulsion availability)





KNRM Integrated Platform Management System

- Connects the crew with the vessel by a Human-Machine-Interface
  - ✓ Remote operability – State reading / controlling
  - ✓ Initiutive interface, easy to understand
  - ✓ Different ways of interacting

KNRM Integrated Platform Management System

- Modular, redundant, highly-available, built with proven technology
  - ✓ Quintuple network aka “Lord of the Rings”
  - ✓ Redundant information and source strategie
  - ✓ Critical equipment can be remotely or manual be controlled

KNRM Integrated Platform Management System

- Provides a platform to integrate vessel information, sensor data, communication and external information

Principles of KNRM IPMS

- Introduction of sophisticated process technology on a SAR vessel
- Enables complex capsize scenario (continuous propulsion availability)
- Connects the crew with the vessel by a Human-Machine-Interface
  - Remote operability – State reading / controlling
  - Initiutive interface, easy to understand
  - Various ways of interacting
- Modular, redundant, highly-available, built with proven technology
- Provides a platform to integrate vessel information, sensor data, communication and external information

Finished?

uhm NO!

- The role of information during a mission?
- Support interpreting professional information?
- How and which information can help to get a better understanding of the Situational Awareness?
- What are the requirements for infrastructure and tools?

KNRM Information and Situational Awareness

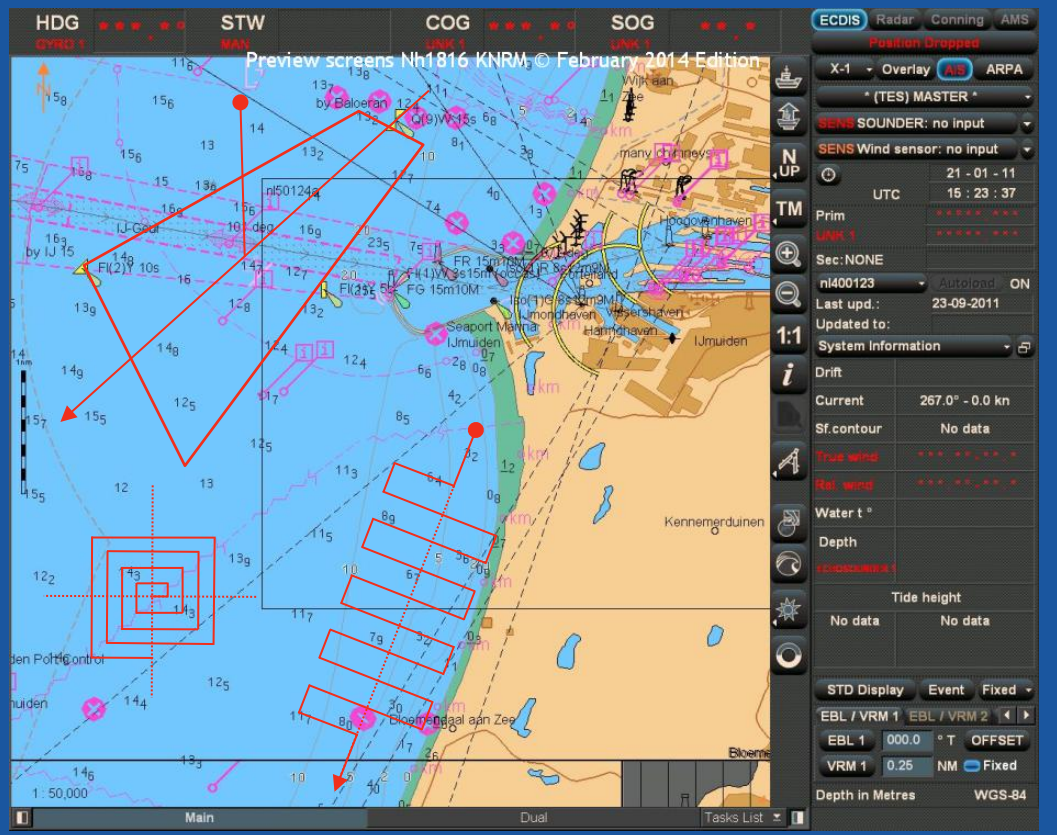
KNRM Information and Situational Awareness

- SAR Information

✓ Information in layers
  - SAR patterns
  - SAR areas
  - Hazards and dangers

✓ Effective Command & Control for SAR operations

✓ In the near future exchange of vector based Shore Radar and AIS Coastguard data



KNRM Information and Situational Awareness

- Mission Information

- ✓ Meteo information
- ✓ Wave condition
- ✓ Tidal information
- ✓ Sitreps
- ✓ Elementary Messenger service
- ✓ Crew information
- ✓ Vessel information

Questions and others?

Thank you for your interest!