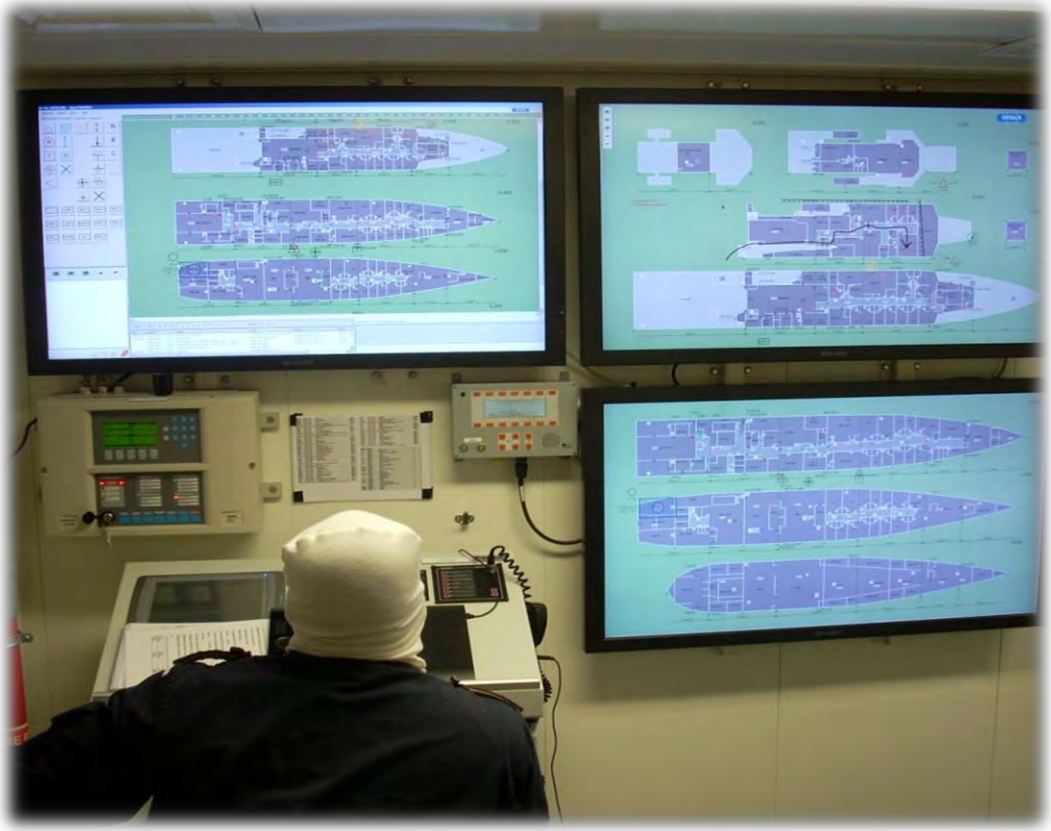
Fire Fighting & Damage Control Automation

"Enabling future crew reduction"



Content

Reduced manning of Naval Vessels

'Holland Class' Patrol vessel: Complement of 50

Enabling technologies:
- Watermist systems
- Automation systems
- Human Centered engineering

Prerequisites RNLN

Patrol vessel: 50 crew

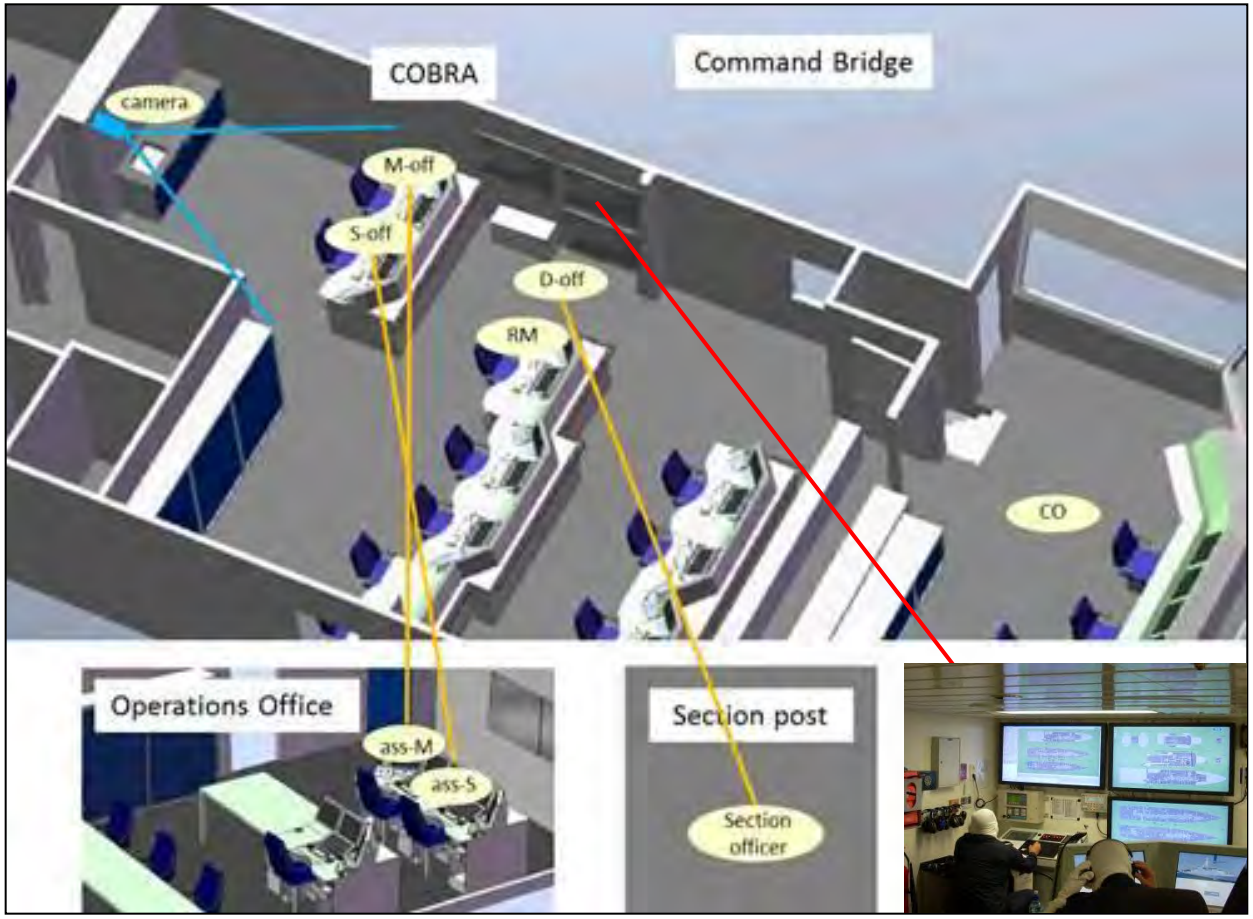
Operational Requirements:

- Single threat
- No fight through

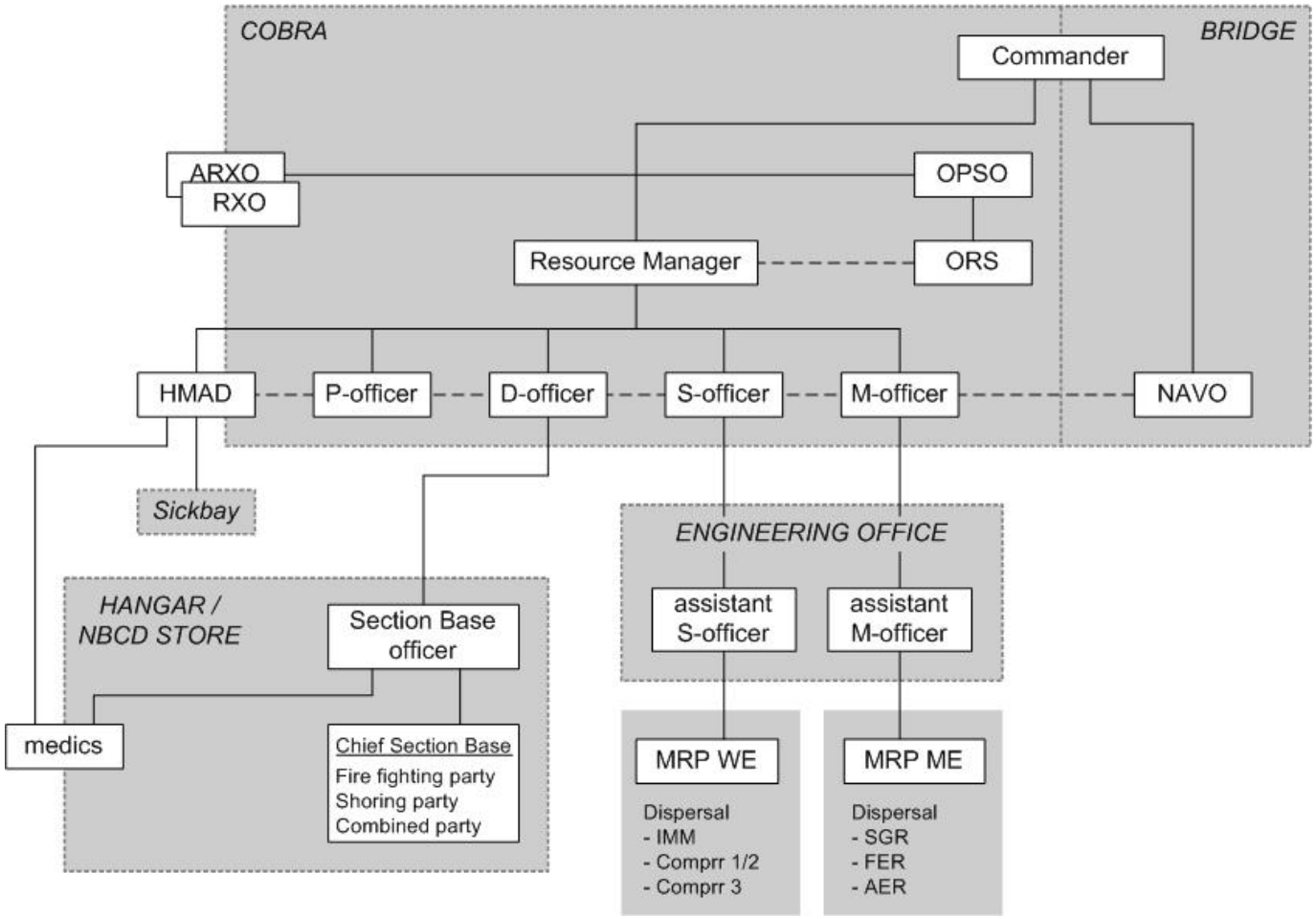
Future frigate for RNLN similar manning targets:

- Operational decision support
- Operational Maintenance support
- Reduced BDR organisation

Patrol Vessel Command Bridge Infrastructure

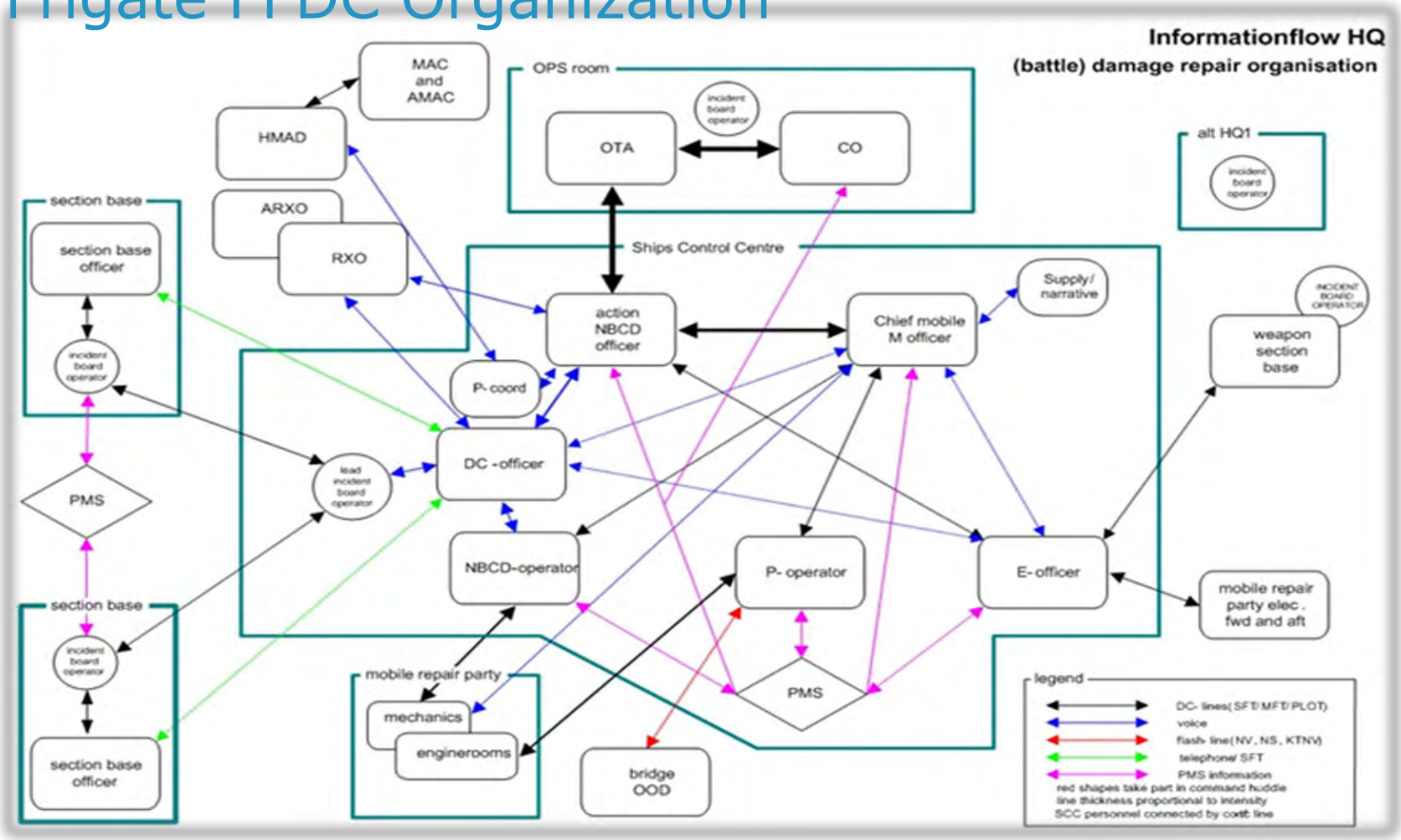


Patrol Vessel FFDC Organization

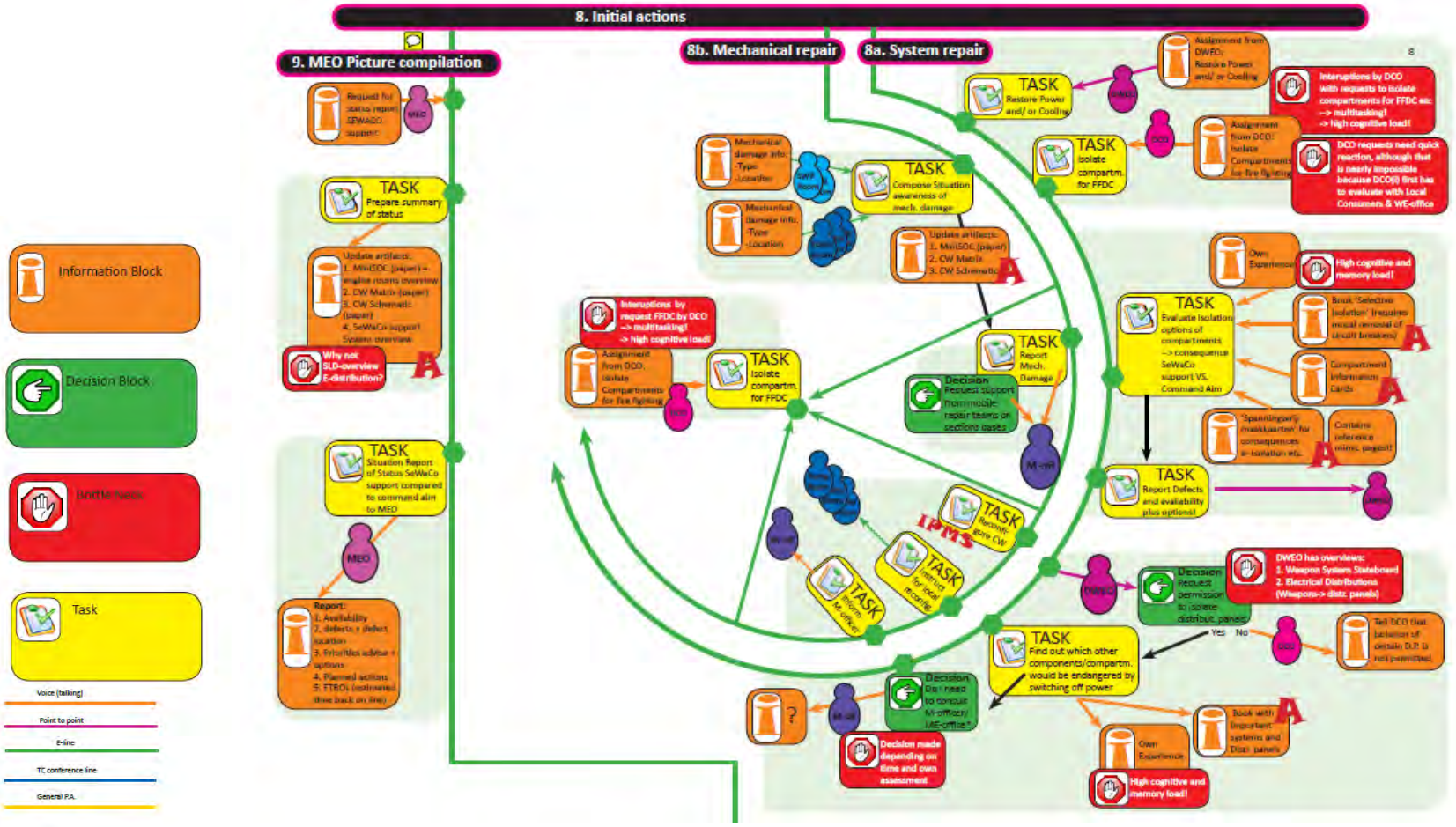


Content

Frigate FFDC Organization



Workload Analysis DCO-L

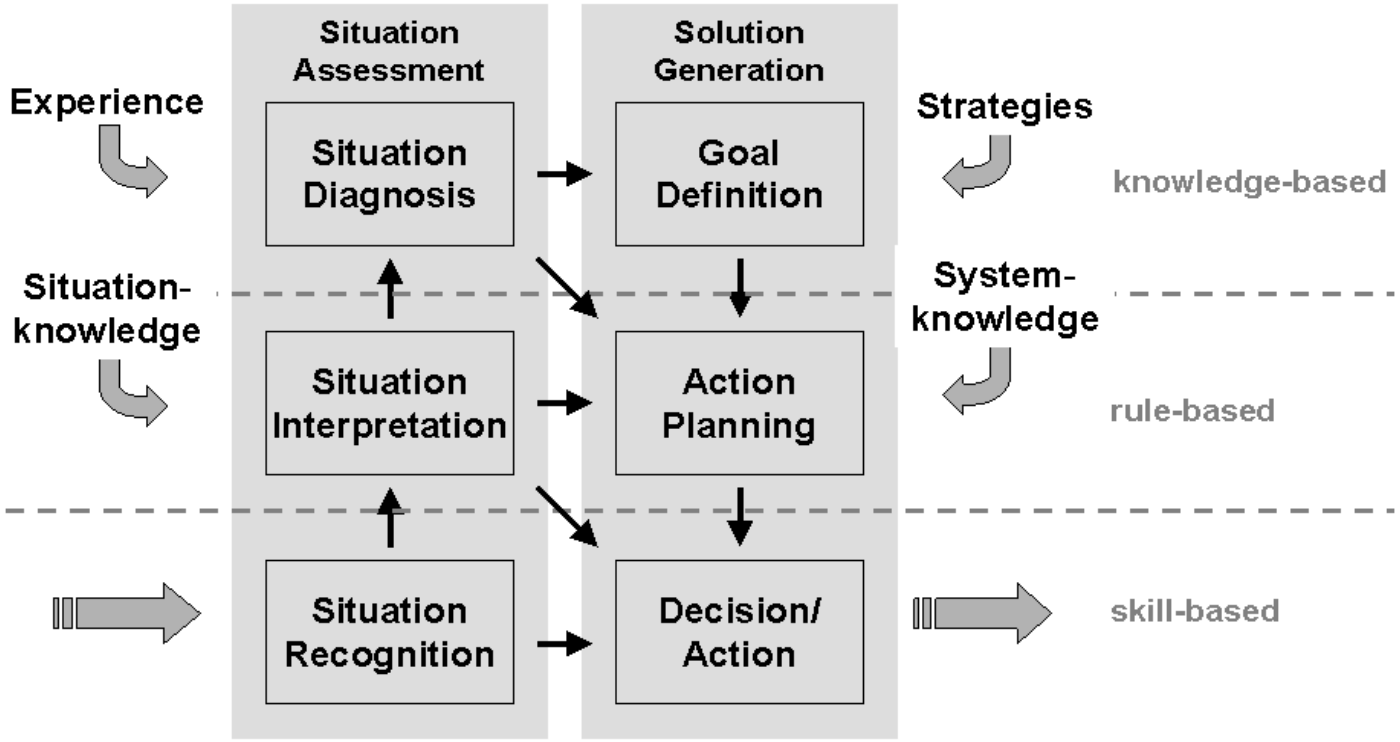


2 Task analysis of frigate BDR Organization

	Gather information (comm's and plot)	Assess information: Situational awareness	Decision making	Acting: Repetitive operator sequences
NBCD officer	50%	30%	20%	
Damage control officer	50%	30%	20%	
Survivability operator	20%		10%	70%
Plotter DCO	100%			
Plotter SBO FWD	100%			
Plotter SBO AFT	100%			
SBO FWD	40%	30%	30%	
SBO AFT	40%	30%	30%	
Messenger FWD	100%			
Messenger AFT	100%			
Mechanical Officer	50%	30%	20%	
Mobility Operator	20%		10%	70%
Electrical Officer	50%	330%	20%	
Electrical Operator	20%		10%	70%
TOTALS 14	**840%**	**180%**	**170**	**210%**
Overall percentage	**70%**	**13%**	**12%**	**15%**

Content

Decision Model (Rasmussen)



Performance Shaping Factors

Operator Workload is primarily determined by:

1. **Situational Awareness**
   - Communication
   - Visual Aids
   - Experience
2. **Procedures**
   - Battle Damage Repair procedures
   - Operational procedures (technical)
   - Experience / Training
3. **Automation**
   - Automated control Sequences
   - Human Machine interface
     - Visual, design of mimics
     - Decision Support Systems

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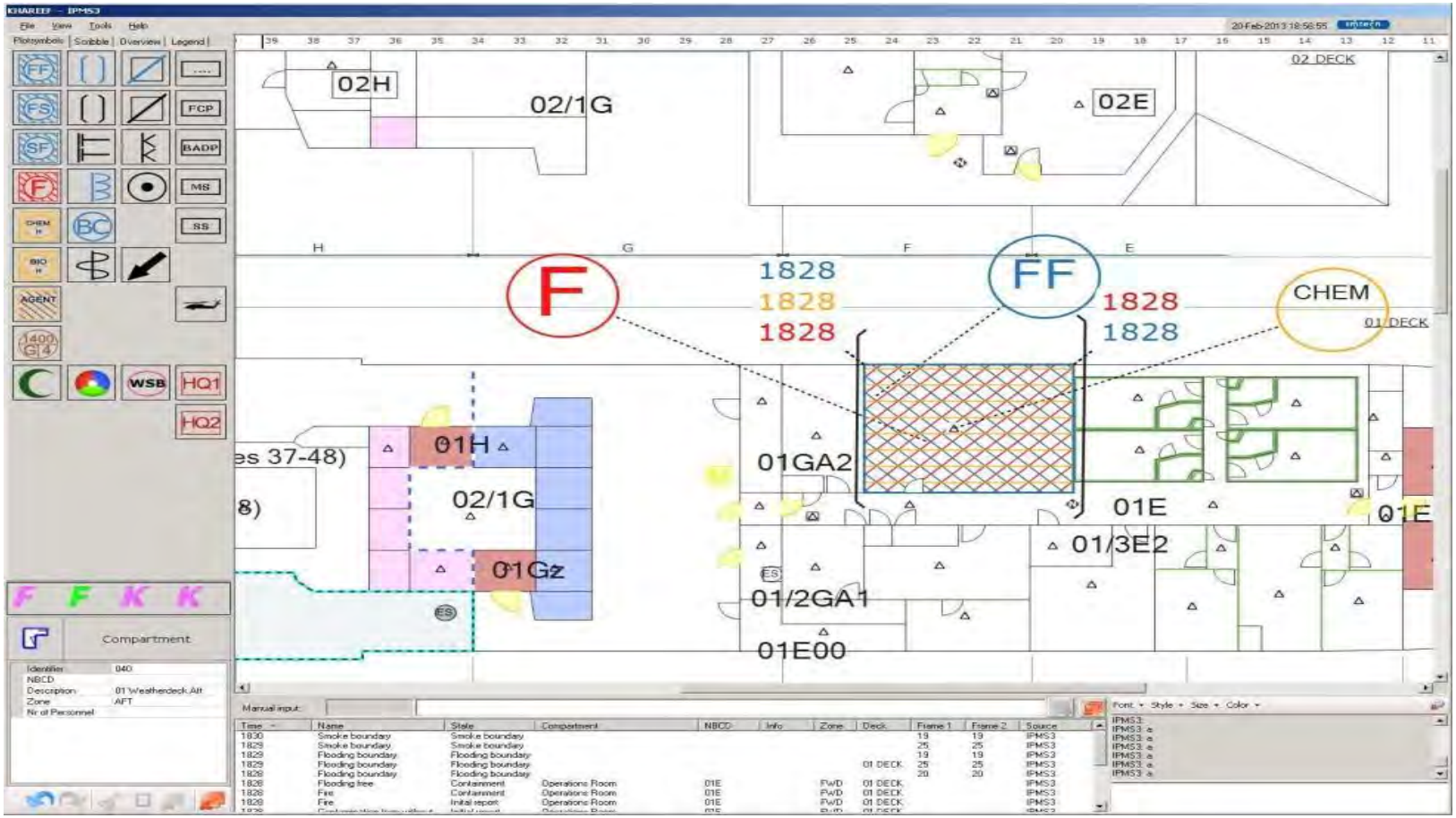
Interactive Electronic Incident Board



Wireless Handheld Devices

Flexible Task Allocation

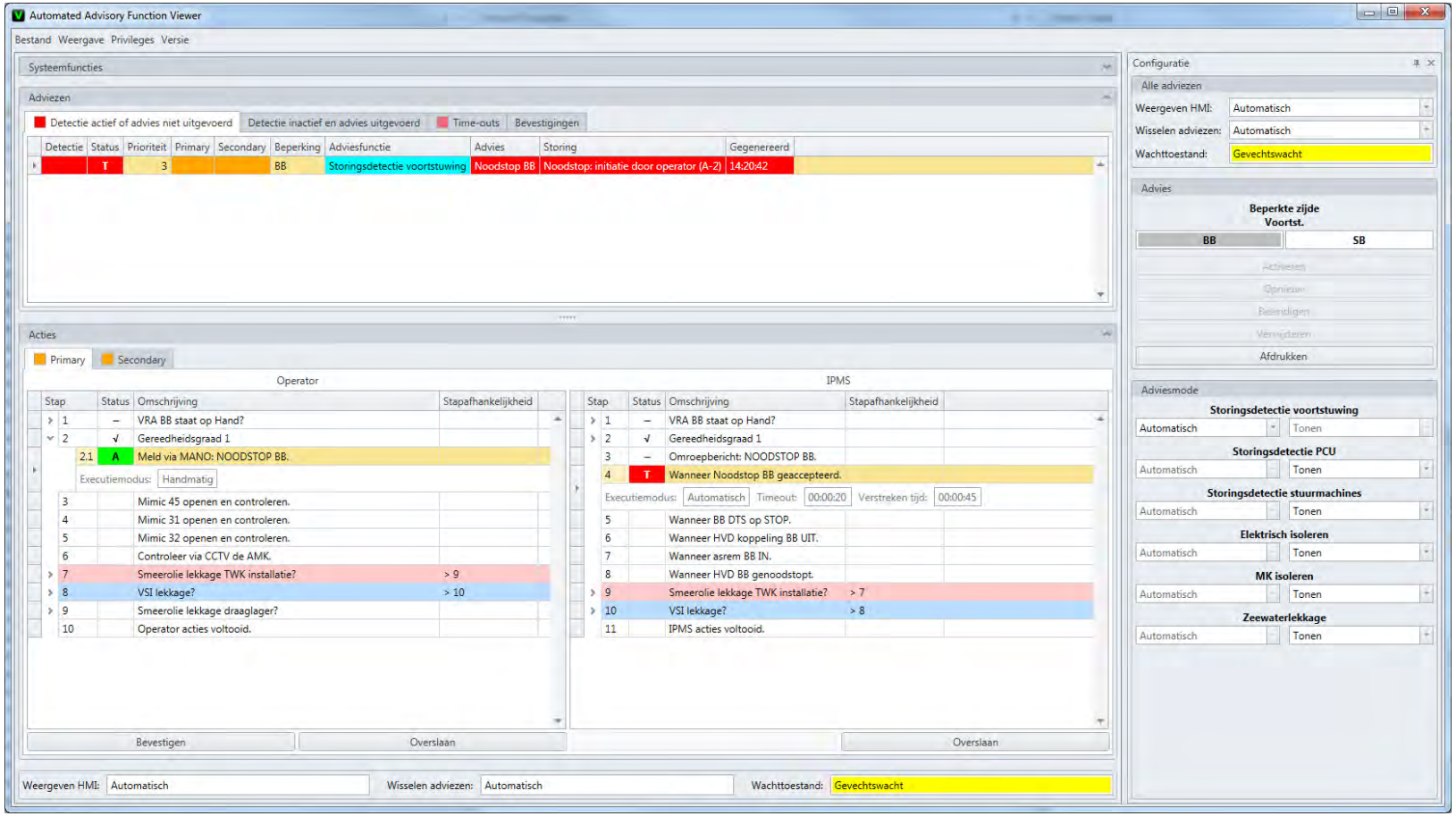
1. Person in Control
2. Responsible Person #1
3. Responsible Person #2
4. Listeners

Features

- Control & Monitoring via WLAN
- Messaging / MMS
- Function Allocation
- Potential: Ticket System

PIC

BCD Procedure Human Machine Interface



Stability Interface

Interface between the Interactive Electronic Incident Board and the (3rd Party) Stability Software.

- Comprehensive 'Traffic Light' User Interface
- Plotted information is automatically evaluated by the Stability Calculator

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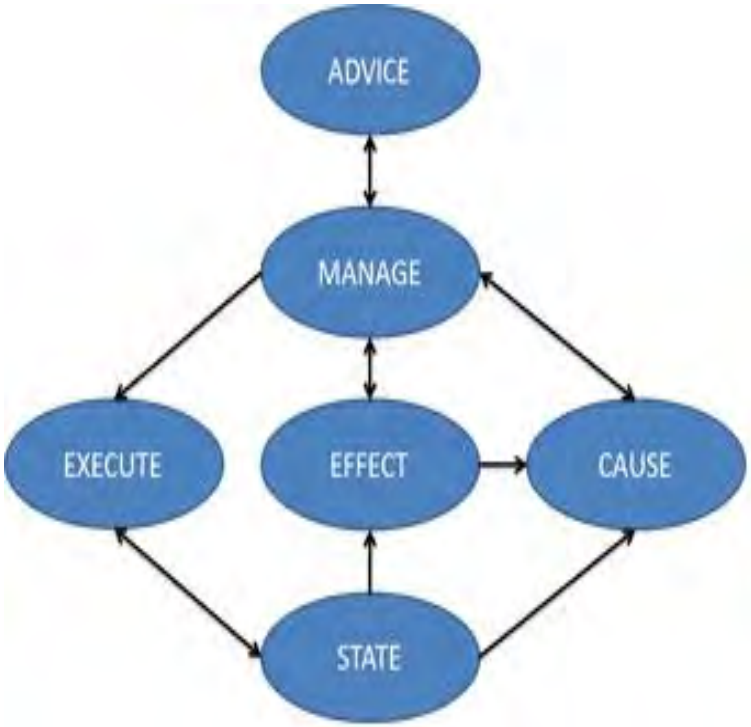
RNLN Operational Maintenance Support Model

Top Down approach to project Operational Capabilities and Management processes on:

- Payload / Weapon Systems
- (Platform) Support Systems and
- BDR activity cycle

Implementation:

- Integration of CMS and IPMS
- Sufficient (diagnostic) I/O
- Functional Chain Analysis



Distributed Intelligent Networked Control Systems

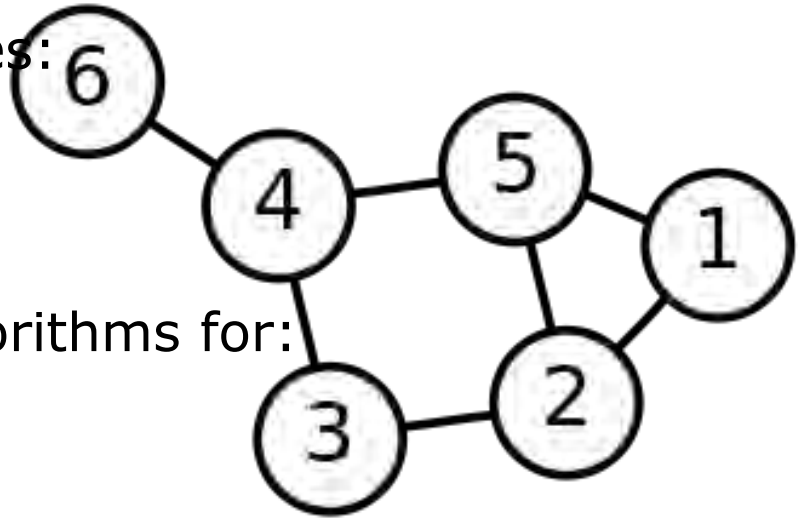
Mathematical representation of Platform Systems by Devices and Connections as Edges and Nodes in a 'Graph'

Properties of Edges / Nodes:

- Cost
- Capacity
- Priority

Mathematics provided algorithms for:

- Shortest path
- Maximum flow
- Minimum cost



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6 Conclusion

The Holland Class Patrol Vessel is able to perform its' operational tasks with a complement of 50, which could not have been achieved without increasing automation level, in particular for Battle Damage Repair.

A further reduction of the Workload of the Battle Damage Repair Organization is possible when Human Centered Engineering principles are applied and combined with available technologies.

Navy involvement and rapid prototyping are essential to Design & Develop Task oriented applications for Battle Damage Repair.

Thank you for your Attention

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