Roadmap for Remote Controlled Ships

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Marine Trends
Ship Intelligence

REMOTE CONTROL/OPERATION

DECISION SUPPORT

NAVIGATION & POSITIONING

CONDITION MANAGEMENT

OPERATIONS OPTIMISATION

ONBOARD AUTOMATION
System complexity

Complexity / no.


Storable data points
Software code lines
Software integration interfaces
Physical I/O points

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"Information web"

10,000 signals
100 computer screens
High-speed data communications
Remote access to shore centres
Data we are logging

Other available data:
- RCI data, safety records, Doc Library, maintenance data, ERP/Baan/SAP data, Design data from PLM, test records, service reports

- Product usage specific data
- Vessel Position Data
- Vessel Operational Performance Data
- Selection of Control Systems data
- Environmental data
- Vibration, Oil monitoring (particles, moisture), speed, load, steering angle
- Fuel and efficiency specific data
- Product condition specific data (temp, pressures, etc.)
Unified Bridge
Common Look & Feel Style-guide
The new Icon DP, Acon IAS, Alarm Management System, Power Management System and thruster controls are purposely designed for Unified Bridge integration.

Common functions:
Multi-function screens, common dimming, day/dusk/night mode
oX – future bridge concept
1. Augmented Navigation
2. Adjusting HUD graphics
oX – Augmented Reality

1. Augmented Navigation
2. Adjusting HUD graphics
1. Augmented Assistance
2. Remote Operated Sub-Systems
Remote Control Opportunities
Intelligent ship today

- Decision support
- Weather routing
- Onboard optimization (energy, power management, etc.)
- Condition based maintenance
  - EHM on main components
  - Ship sensors
- E-Navigation
  - AIS
  - ECDIS

- Fleet monitoring

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Intelligent ship tomorrow

Remote control
Autonomous operation

E-Navigation
AIS
ECDIS

Common automation standard and user interface

Fully sensored (ship awareness), feedback to operator
EHM on all ship systems
(machinery, ship systems, payload systems,..)
Predictive maintenance

Fleet optimization for best profit
Total fleet routing
(revenue (cargo), weather, current, ship performance, bunker prices, maintenance schedules)
Decision support
(collision avoidance, risk mitigation, emergency reaction)

Automatic mooring
Automatic cargo handling and optimization

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Remote Controlled Ships

Making ship transport more efficient and safe!
Remote Controlled Ships

- Reduced crew costs
- Access to competent crew
- Improved ship efficiency
- Improved safety
Unmanned Trend in Society

It is not IF, but WHEN...
Marine is only following todays trend!
Crew Trends

Crew size for ocean going ships

Number of crew

1850 1900 1950 2000 2050

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Crew Competence

How to best utilise the skills of the crew?

- What is the core skill of the crew vs. what do they spend their time doing?

Crew is often the 2nd biggest element in ship running costs after fuel
Remote Operations

Better working environment
• Safe
• Comfortable
• Close to family and friends

Attract young people to shipping
Safety

A remote controlled ship must be as safe or safer than a conventional ships!

• New technology to aid the navigation of ships
• Most marine accidents are related to human errors
• Redundant machinery with predictive maintenance schemes will improve reliability
• Automatic safe mode if loss of control occurs

Unmanned operation is not suited for all types of ships – we will still have seafarers at sea in the future
Safety

What is safer?

– 20 persons onboard a vessel in the North Sea in a raging storm, or
– 2 persons in a control room on land?
Remote Controlled Ships - Features

- No deck house
- More cargo
- New possibilities:
  - New machinery locations
  - Novel machinery types
  - Better cargo handling
  - Etc…
- Communications:
  - Ship-to-shore
  - Ship-to-ship
  - IT security
  - Etc…
- No hotel systems:
  - Water production
  - Water heating
  - AC
  - Sewage treatment
  - Etc…
- Lower costs
- Redundant machinery
- Better weight distribution
- Lower power demand:
  - Lower resistance from reduced LWT
  - Lower hotel load
  - Etc…
## Remote Control or Autonomous?

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ROADMAP for Unmanned Ships
Key Development Areas

Remote control center
- Operations management
- Situational awareness interface
- Human interaction interface

Communications
- Ship-to-shore and ship-to-ship
- Communication infrastructure
- Data filtering and processing

Operation optimization
- Fleet optimization
- e-Navigation and route optimization
- Performance management
- Decision support systems

Health & safety management
- Remote diagnostics and predictive maintenance
- Reliability and redundancy
- Safety and security systems

Remote controlled systems
- Machinery, propulsion and auxiliary systems
- Cargo handling and payload systems
- Mooring
- Ship level integration of functions

Situational awareness systems
- Obstacle detection, classing and tracking
- Near field path planning and execution
- Environmental condition monitoring
- Situational awareness interfacing with remote control center

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EXAMPLES OF CONFLICTS WITH PRESENT INTERNATIONAL RULES AND REGULATIONS

- SOLAS Ch. IV 12
- COLREG Pt. A-B
- SOLAS Ch. V Reg 11, 14, 22, 33, 44, ...
- SUA Art. 3-8
- MCTW (cont'd)
- SOLAS Reg. II-1, III
- SOLAS C179-180
- UNCLOS Art. 94, ISM Code, Salvage Ch. 2
- SOLAS
- GMDDS, Ship Registration Convention
- ISPS Code

- Remote machinery control
- Remote machinery monitoring
- Remote machinery diagnostics
- Remote watch-keeping
- Automated ship-shore administration
- Machine collision avoidance
- Remote deep sea navigation
- Autonomous deep sea navigation
- Fleet monitoring & control
- Shore-side Bridge Proxy

International Regulatory Obstacles

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Unmanned ships will most likely start with local applications!
Early Opportunities with Remote Operations

Remote Support and Operations will enable lean ships with reduced crew

- Remote service support
- Remote machinery operation
- Automatic watchkeeping
- Automatic mooring
Fundamental Changes in Shipping

Historic changes:

- From sail to steam
- Coal to diesel
- Introduction of the container ship
- Cross Atlantic airflights (end of the ocean liners)
- etc.

What will be the most fundamental changes in shipping in the near future?
The most fundamental change in shipping: UNMANNED SHIPS

Ship Intelligence will make shipping more efficient and safer!
The best way to predict the future is to create the future