Host (on behalf of ASD):

ADS is the Premier Trade Organisation for companies in the UK Aerospace, Defence, Security and Space Sectors.

SNS FOR MAJOR SHIPBUILDING PROJECTS

Name of presenter: Peter KUHN & Andrew HARTLEY

Rank/title of presenter:

Company/organization: German Naval Yards Kiel & Sir Joseph Isherwood Limited

S1000D User Forum, London *October 14-16, 2019*

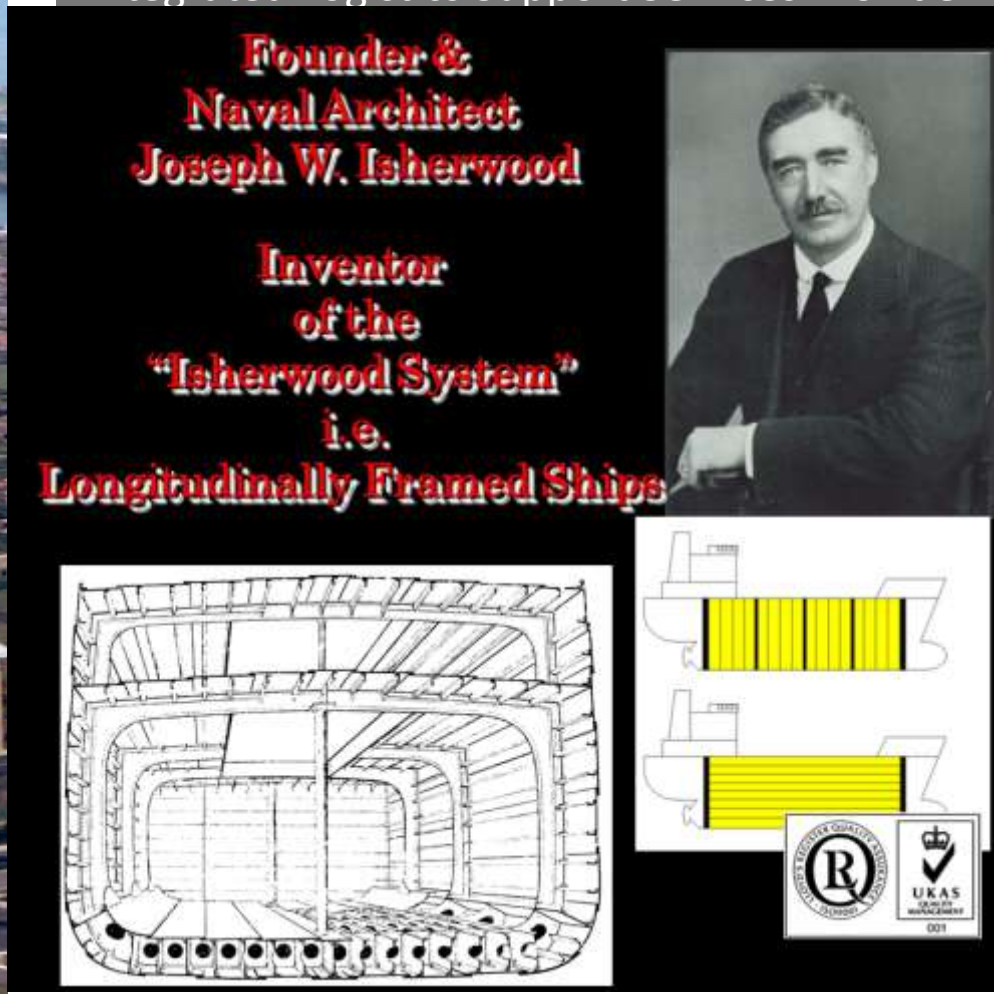
GERMAN NAVAL YARDS KIEL

Shipyard

YARD AREA	250,000 m²
COVERED SHEDS	55,000 m²
MEGA DRY DOCK	426 m x 90 m
Sheltered DRY DOCK	241 m x 44 m
GANTRY CRANE	900 t
PIERS	395 m + 210 m
HARBOUR	58 x 50 m

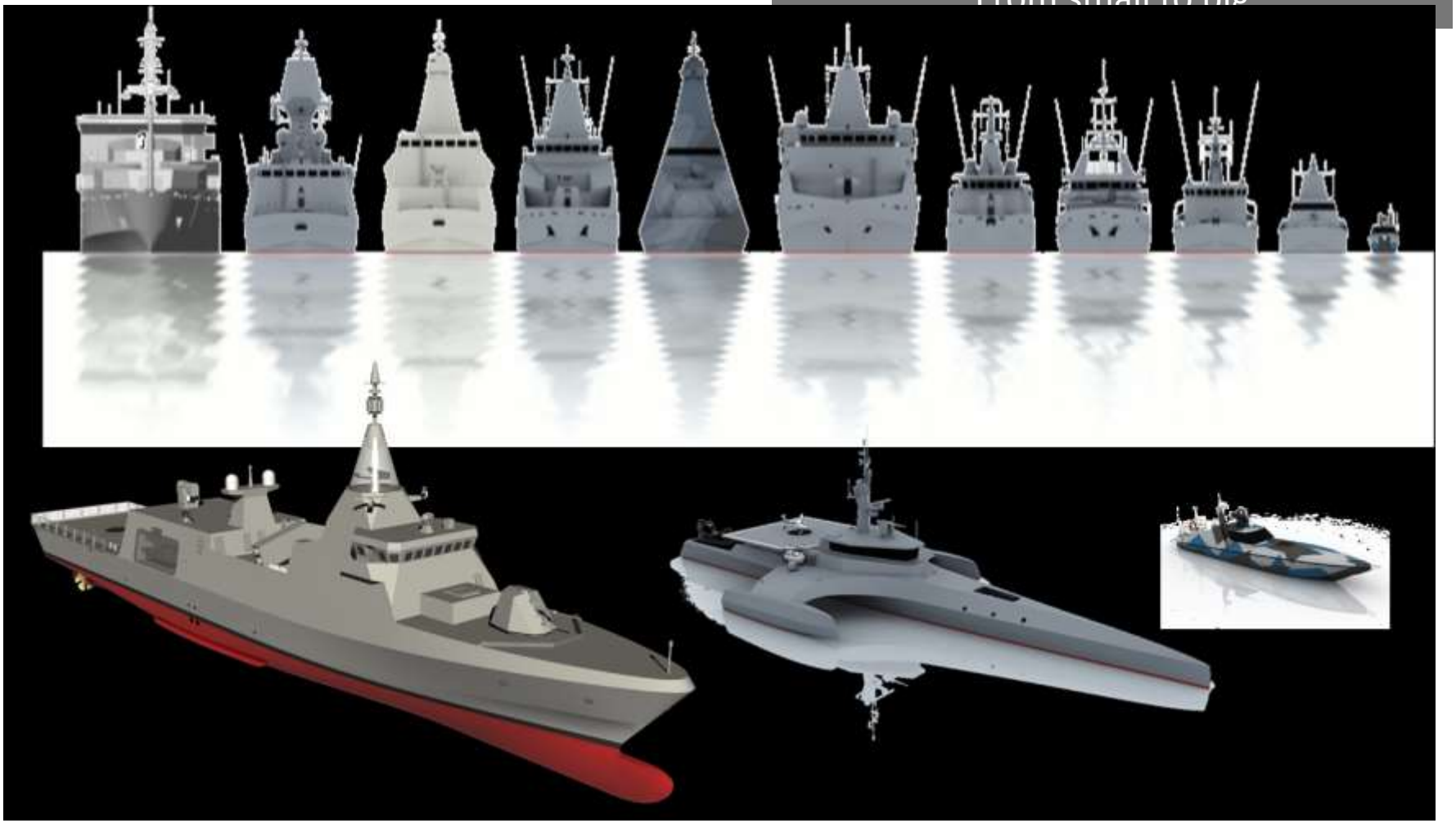
SIR JOSEPH ISHERWOOD LIMITED

Integrated Logistics Support Services Provider



RANGE OF PRODUCTS

From small to big



SHIPBUILDING IS VERY TRADITIONAL

What are we talking about?

Tradition is what you do,
when you can`t do it right the first time.

WORK BREAKDOWN STRUCTURES

Structuring projects

- When designing a ship, naval architects use one of the existing WBS, either from the shipyard or provided by the customer
- Naval projects in Germany are structured according to the „Marinebaugruppenverzeichnis“
- International projects might specify SWBS or the ESWBS of the USN or the SFI group system (Norwegian Ship Research Institute (Senter for Forskningsdrevet Innovasjon)

Different purposes of the WBS

- Structure works establish Statement of Works (SoW)
- Structure materials establish Bill of Materials (BoM)/ Scope of supplies
- Structure functionalities Assisting maintenance concepts
- Etc.

STANDARD - WBS

For example Marinebaugruppenverzeichnis

Most of the systems provide a hierarchical structure for different levels of integration of equipment, for example the MBGrpV, which comprises a four digit numbering method, as below:

- 1st digit [X000] Main Construction Group (HBA = Hauptbauabschnitt)
- 1st + 2nd digit : [XX00] Construction Group (BA = Bauabschnitt)
- First three digits: [XXX0] Main Module (HBGr = Hauptbaugruppe)
- All digits: [XXXX] Module (BGr = Baugruppe)

0000 → **GUIDELINES AND OBJECTIVES FOR PLANNING, BUILDING AND UTILIZATION OF SHIPS**
1000 → **SHIP, EQUIPMENT AND ARRANGEMENT**
2000 → **DRIVE SYSTEMS**
3000 → **E-SYSTEMS**
4000 → **SHIP OPERATING SYSTEMS**
5000 → **Telecommunications, navigation, tracking and electronic warfare systems**
6000 → **Command and Control as well as weapon control systems**
7000 → **Weapons systems**
8000 → **Mine warfare weapon systems**
9000 → **Equipment, tools, spare parts, technical documentation, machine tools**

COMPARISON

US - ESWBS

The ESWBS (5 digits) works in a similar way based on the SWBS` groups (3 digits)

- 000 General Guidance and Administration
- 100 Hull Structure
- 200 Propulsion Plant
- 300 Electric Plant
- 400 Command and Surveillance
- 500 Auxiliary Systems
- 600 Outfit and Furnishings
- 700 Armament
- 800 Integration/Engineering
- 900 Ship Assembly and Support Services

COMPARISON

ASD S1000D

2.1 Main systems

This general sea vehicle SNS is divided into the 19 main systems.

Table 2 Top level breakdown for a general sea vehicle

System	Title
A0	Propulsion, General
B0	Structure, General
C0	Armaments, General
D0	Electrical power, General
E0	Communications, General
F0	Navigation, General
G0	Surveillance, General
H0	Steering, General
J0	Ventilation and air conditioning, General
K0	Hydraulics and pneumatics, General
L0	Electronic systems, General
M0	Auxiliary, General
N0	Survivability, General
P0	Special equipment and systems, General
Q0	Outfit and furnishings, General
R0	Training, General
S0	Repair, test and support, General
TO	Management system
UO	Meteorological and oceanography system

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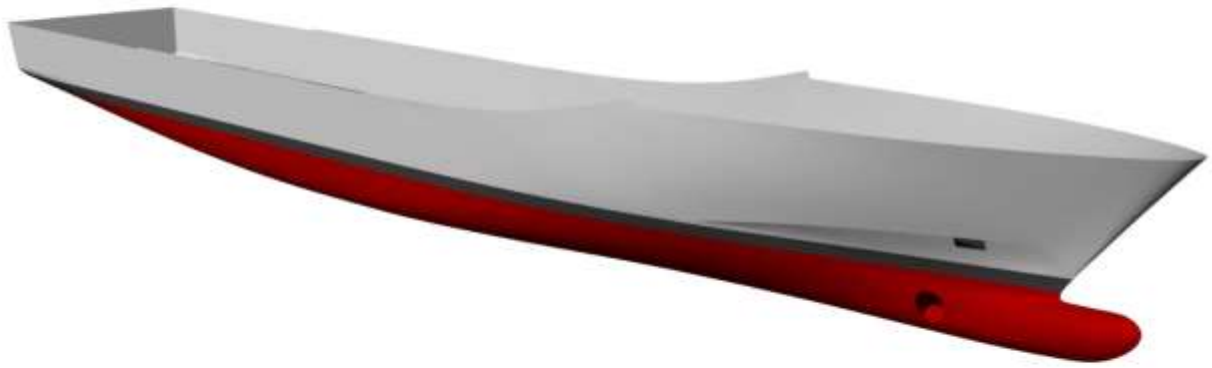
PHILOSOPHY

Mindset

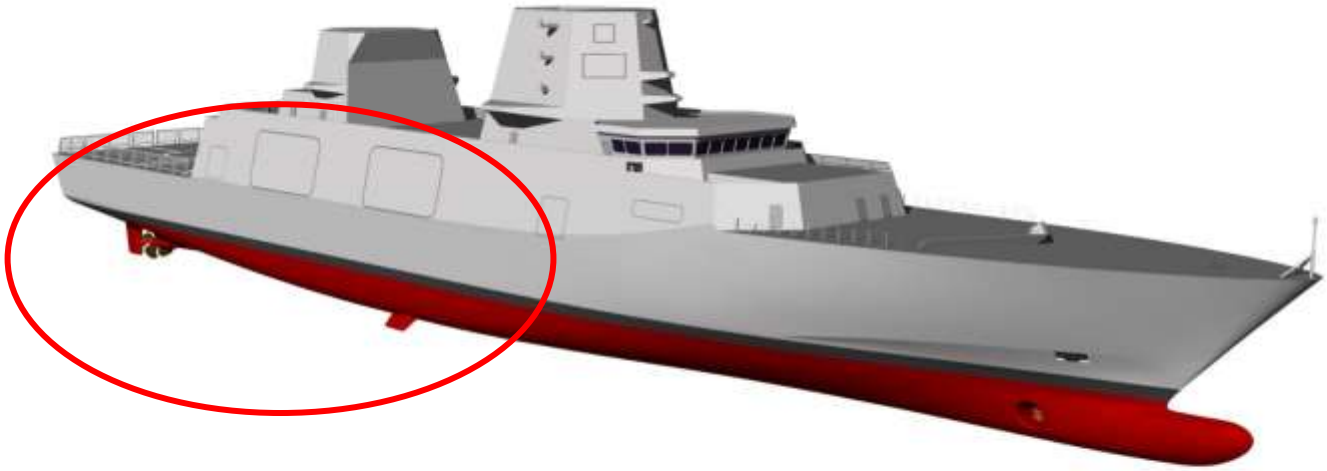


PHILOSOPHY

Mindset

PHILOSOPHY

Mindset



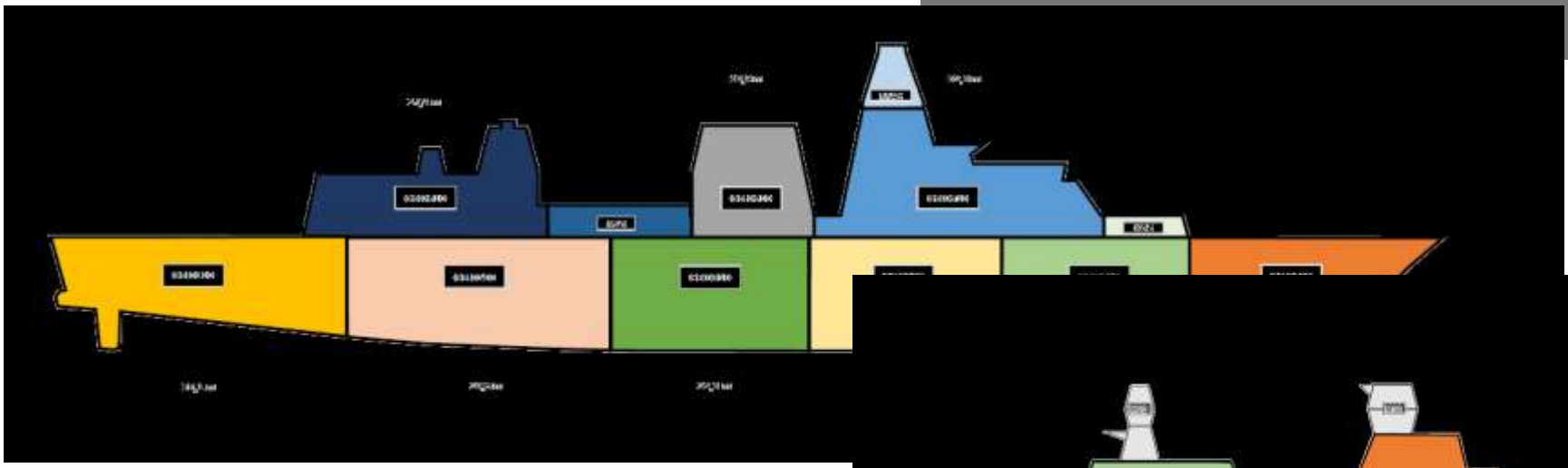
PHILOSOPHY

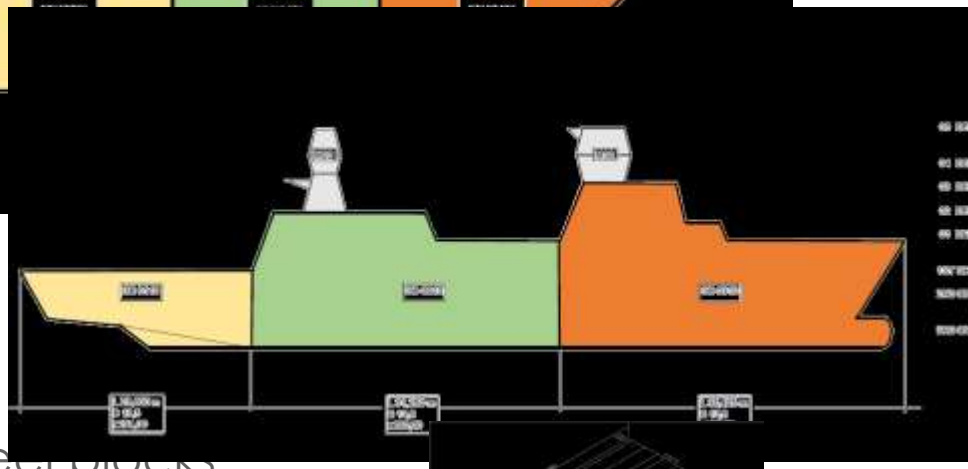
Mindset

PHILOSOPHY

Mindset

BIG BLOCK ASSEMBLY





- Blocks up to 40 m in length/width
- Block weight up to 800 t
- High degree of pre-outfitting of steel blocks
- Significantly reduced construction time in dry dock
- Entire construction/ outfitting under cover in sheds/ covered dry-docks

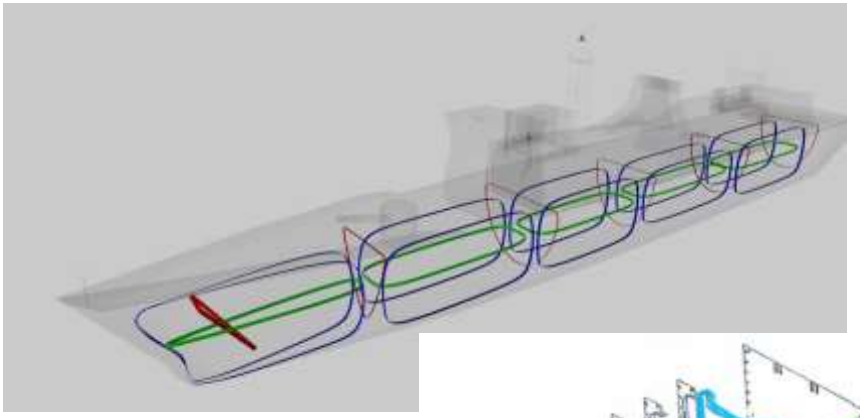
PREFABRICATED MODULES

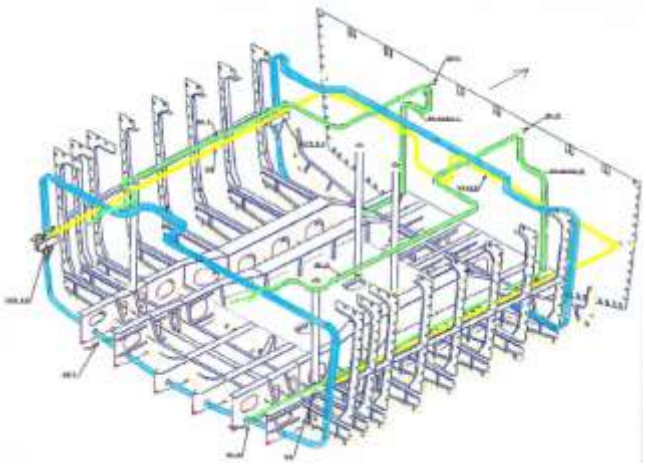
Tests before installation

Keep construction process in mind, when designing a ship.

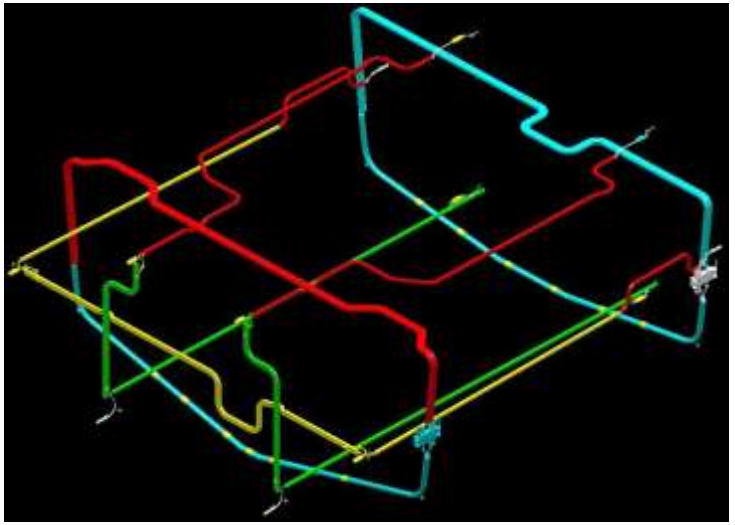
EXAMPLE DEGAUSSING SYSTEM

Building process influences layout





A typical 3-D design drawing of cable trays and pipes on a ship and a coil layout for a degaussing system



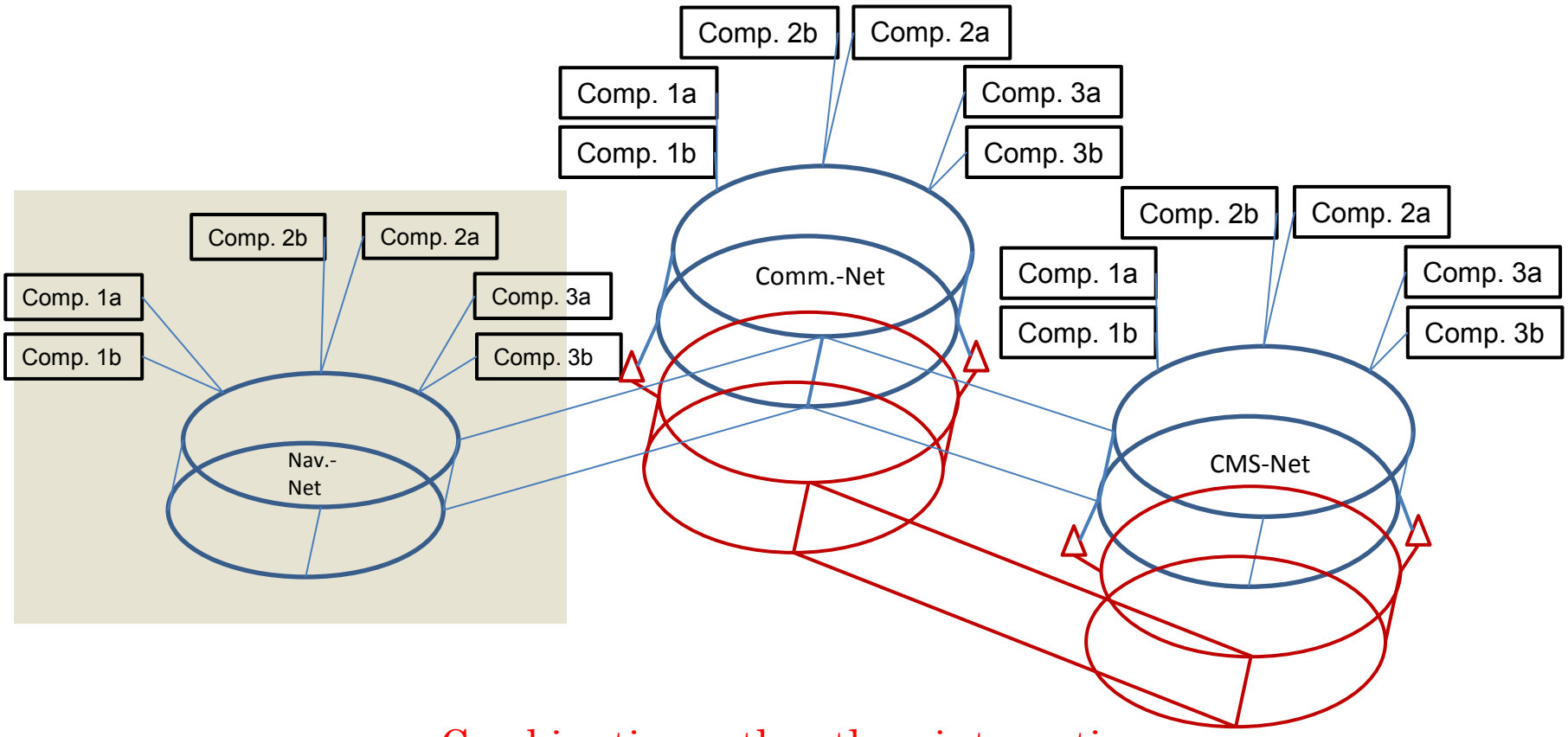
V-Coils

L-Coils

A-Coils

EXAMPLE NETWORKS ON BOARD A SHIP

Combining components



Combination rather than integration

FORM DEFINES CONTENT

Traditional blocks modernization

Traditional shipyards are mainly specialized in shipbuilding

- System Ship
- Main focus on steel handling / mechanical engineering
- Electronics does not fit into these structures
- Complex system structures are merely considered
- Installation into ship`s hull considered as “integration”

Ship Versus Weapon System.

SYSTEM ENGINEERING

System of Systems

Military projects are comprised of integration works for different systems.

It is not just the ship itself, i.e. **the platform**, but also:

- the **mission systems** (weapons)
- especially the IT-infrastructure on board (IT-security)
- the mission related software
- the configuration of the mission systems
  - ammunition as payload
  - additional mission modules
- the logistics support elements (training, spares, special tools)
- land based infrastructure
  - stimulated original hardware for training purposes
  - workshops, warehouses, schools and accommodations

… and sometimes a whole shipyard.

STRUCTURE NUMBERING SYSTEM

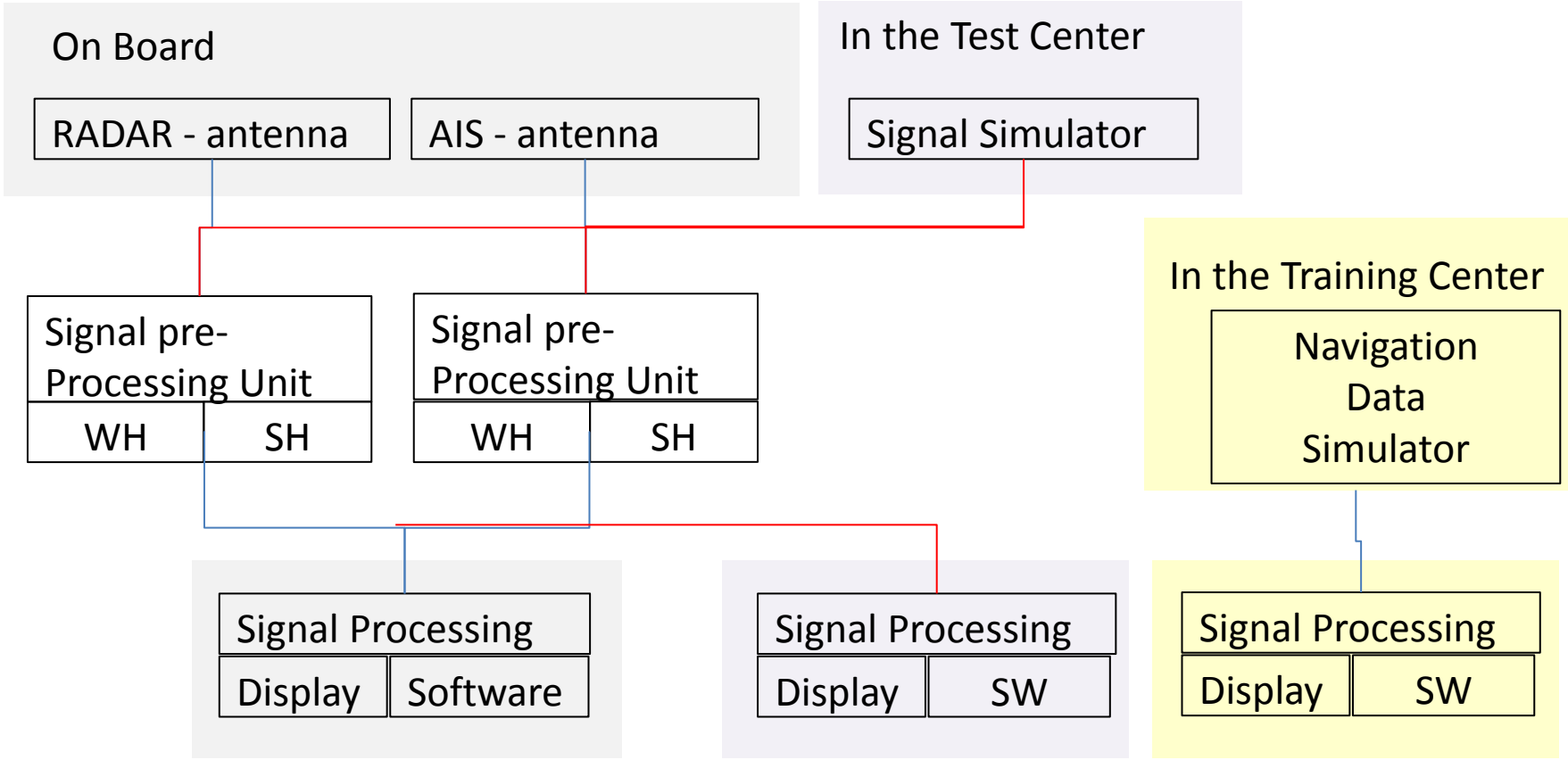
System Breakdown

Impact on the WBS / SNS

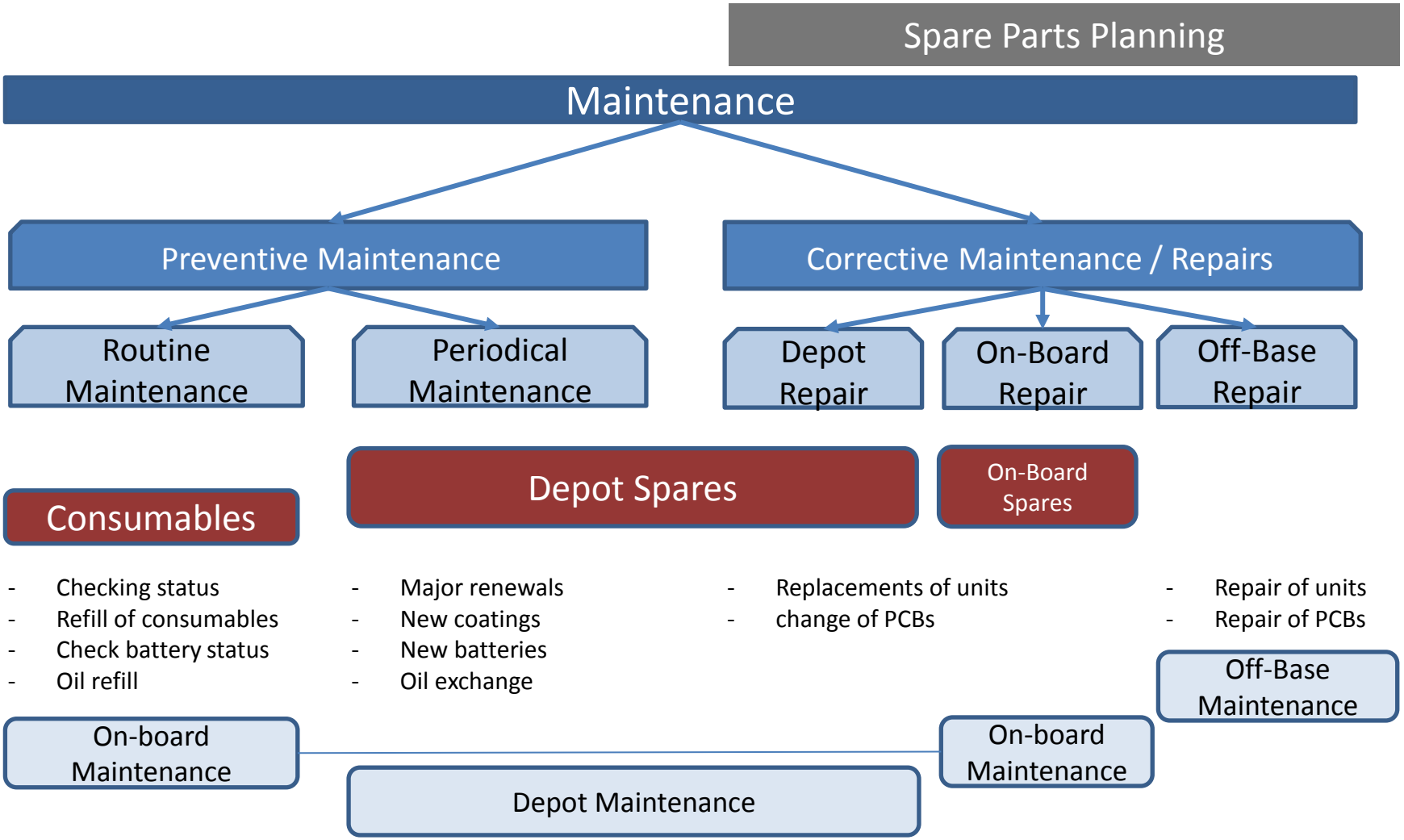
- The SNS shall follow the whole project, not just the ship
- The functional structure should have priority versus physical structure
- The software plays a much more important role and shall be represented in the physical structure as well
- For construction reasons the building process must be considered as well, i.e. importance of location of system elements, for example

EXAMPLE NAVIGATION SYSTEM

Same consoles in different systems

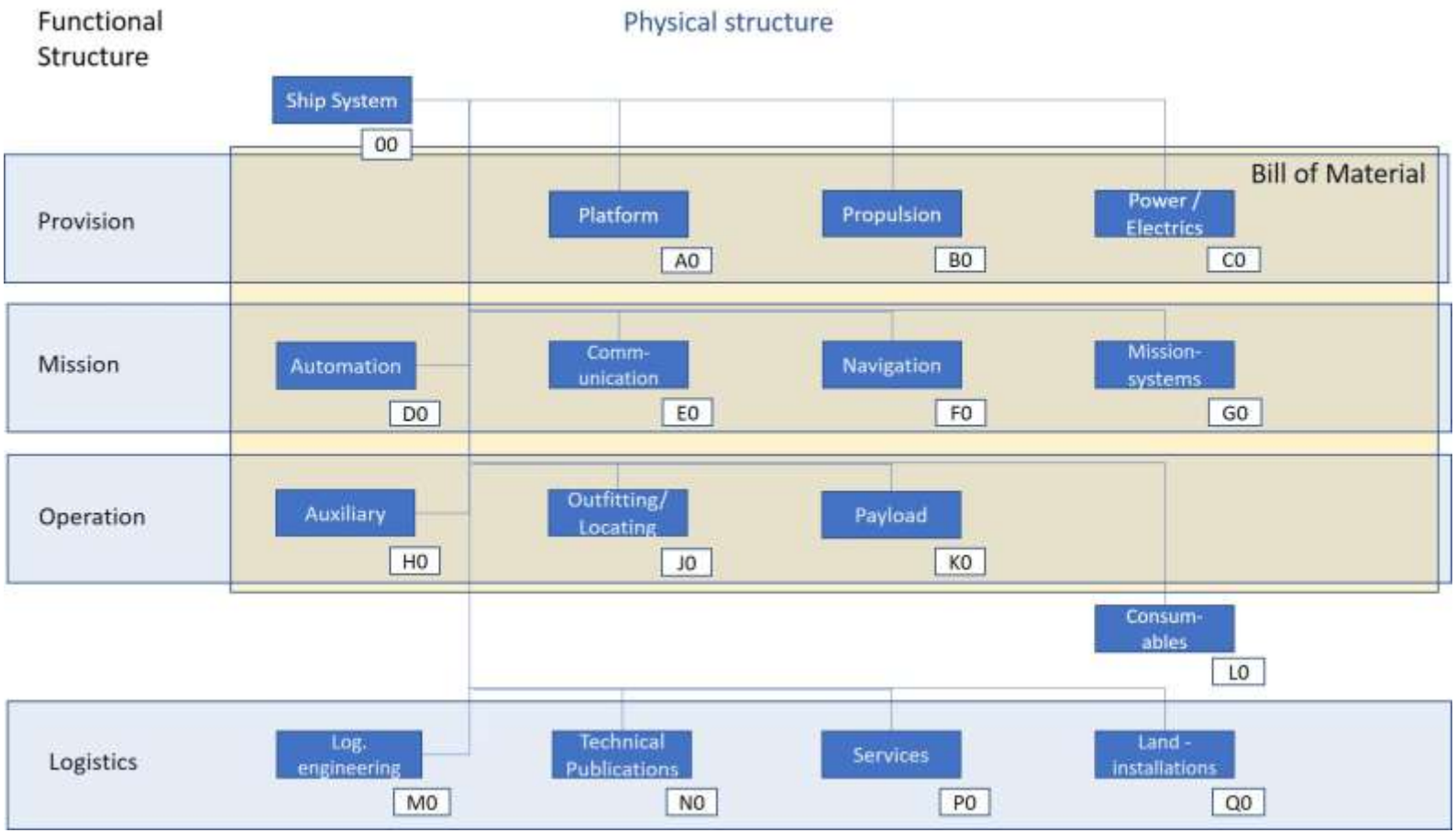


STRUCTURAL IMPACTS ON MAINTENANCE CONCEPT



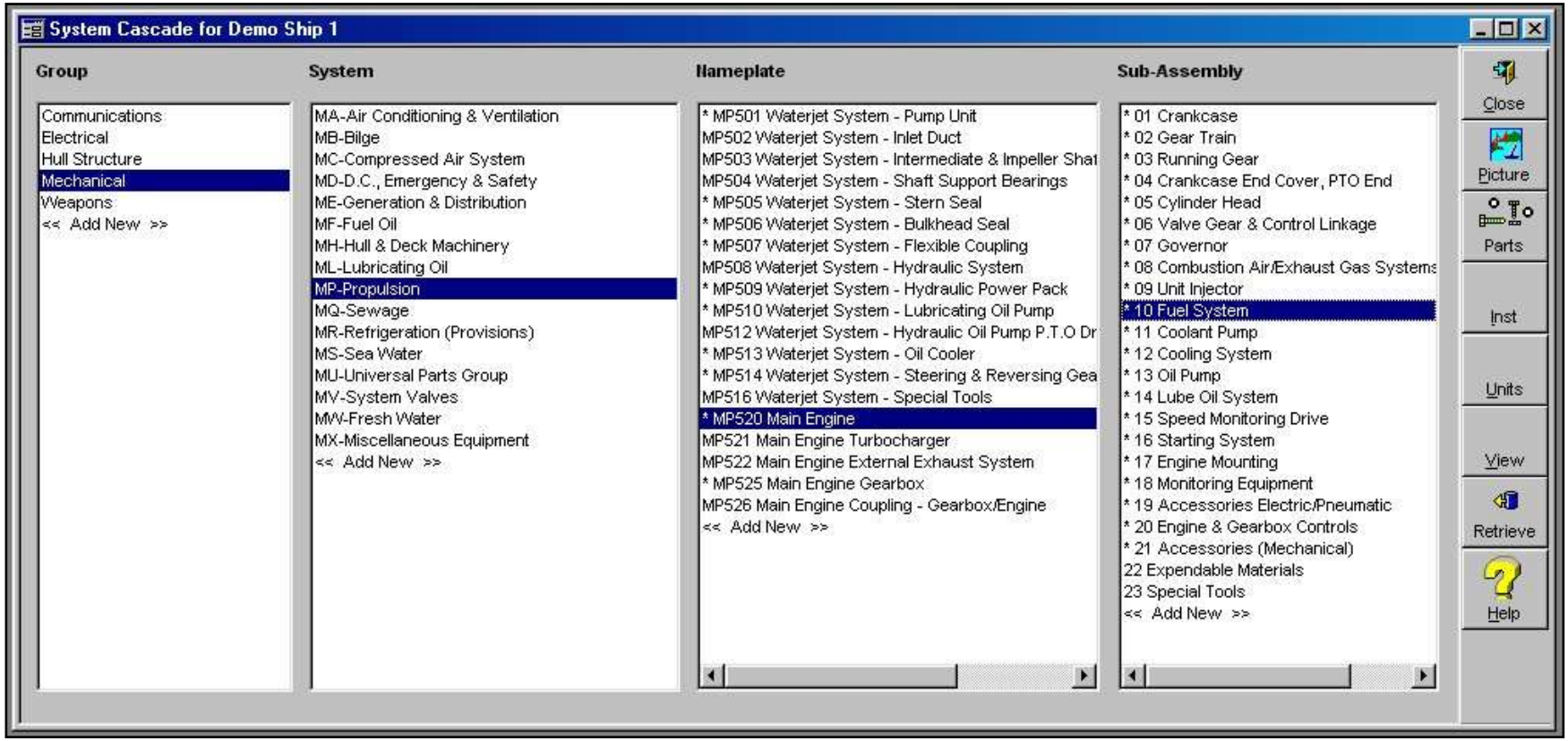
ENHANCING PROJECT STRUCTURE

Having project in mind



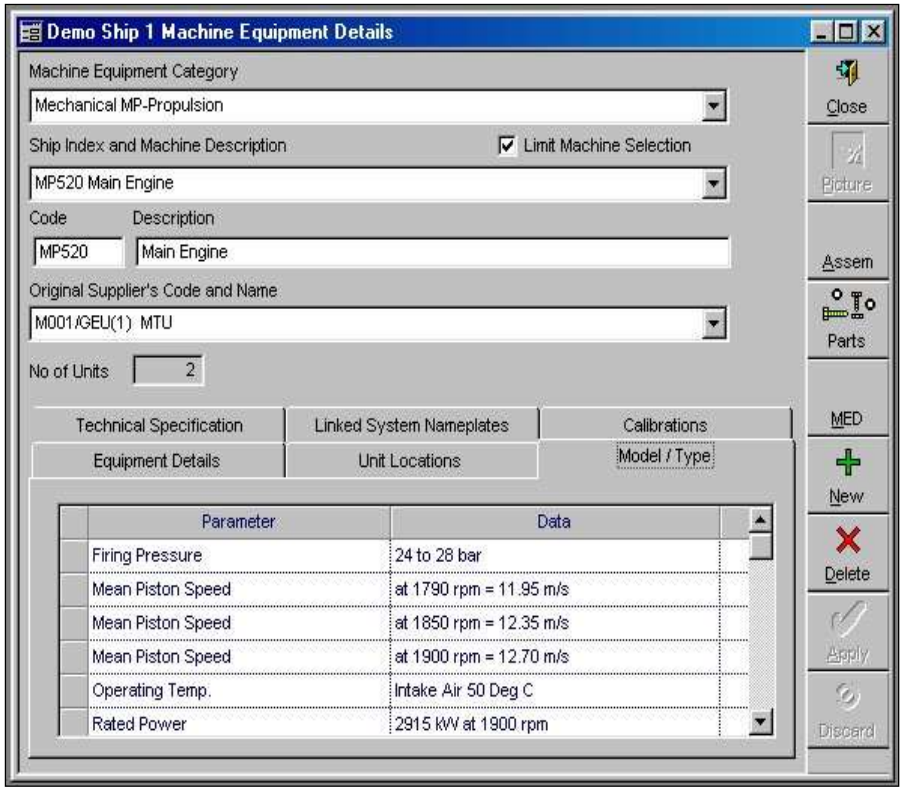
ISHERWOODS' IMIS® SOFTWARE SOLUTION

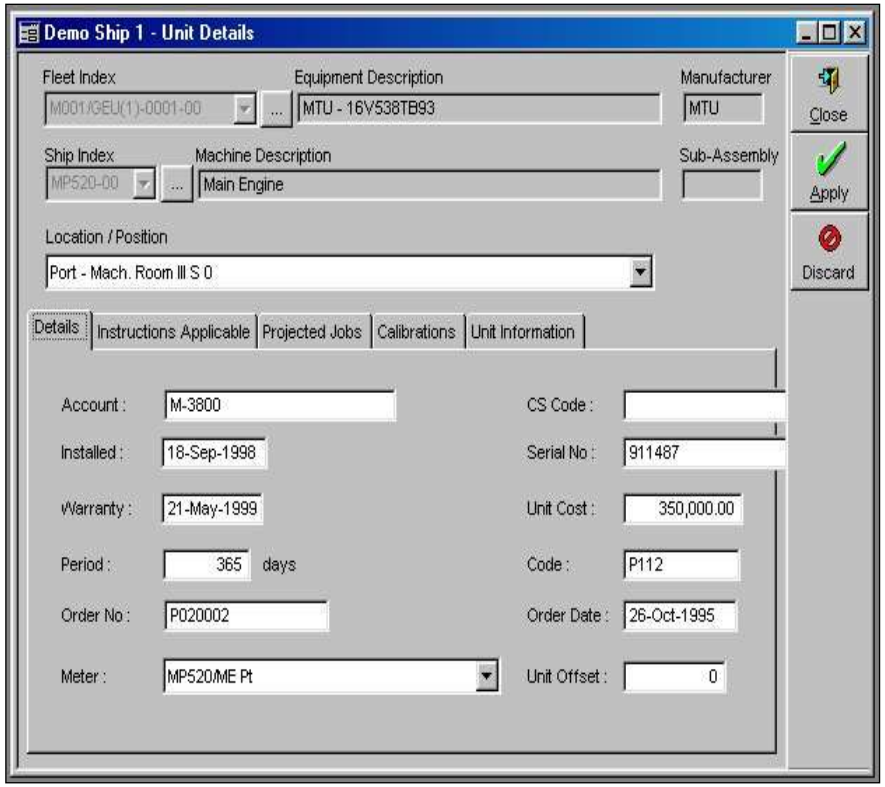
System Configuration Breakdown Structure



CONFIGURATION ITEM IDENTIFICATION

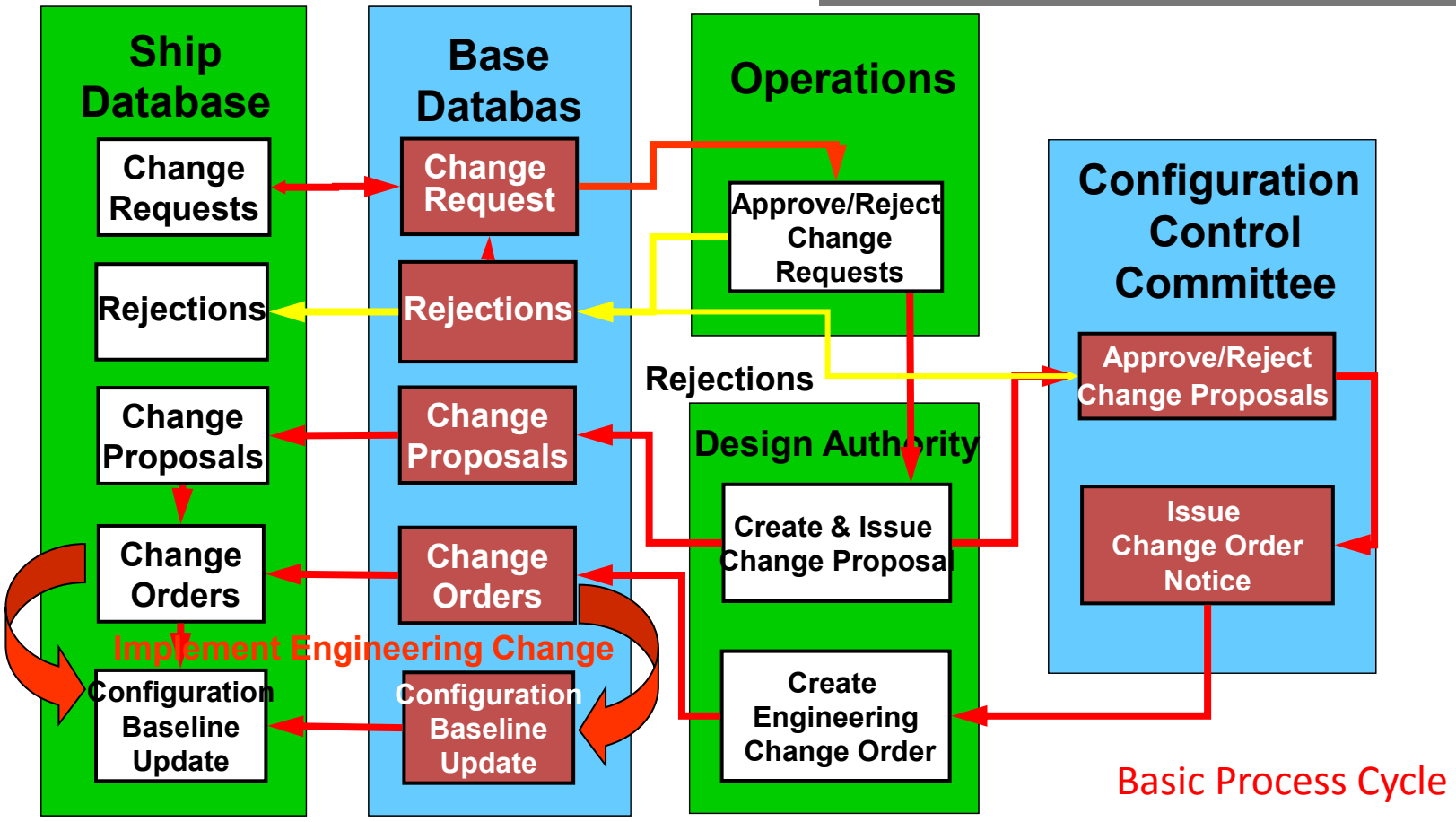
Equipment Details





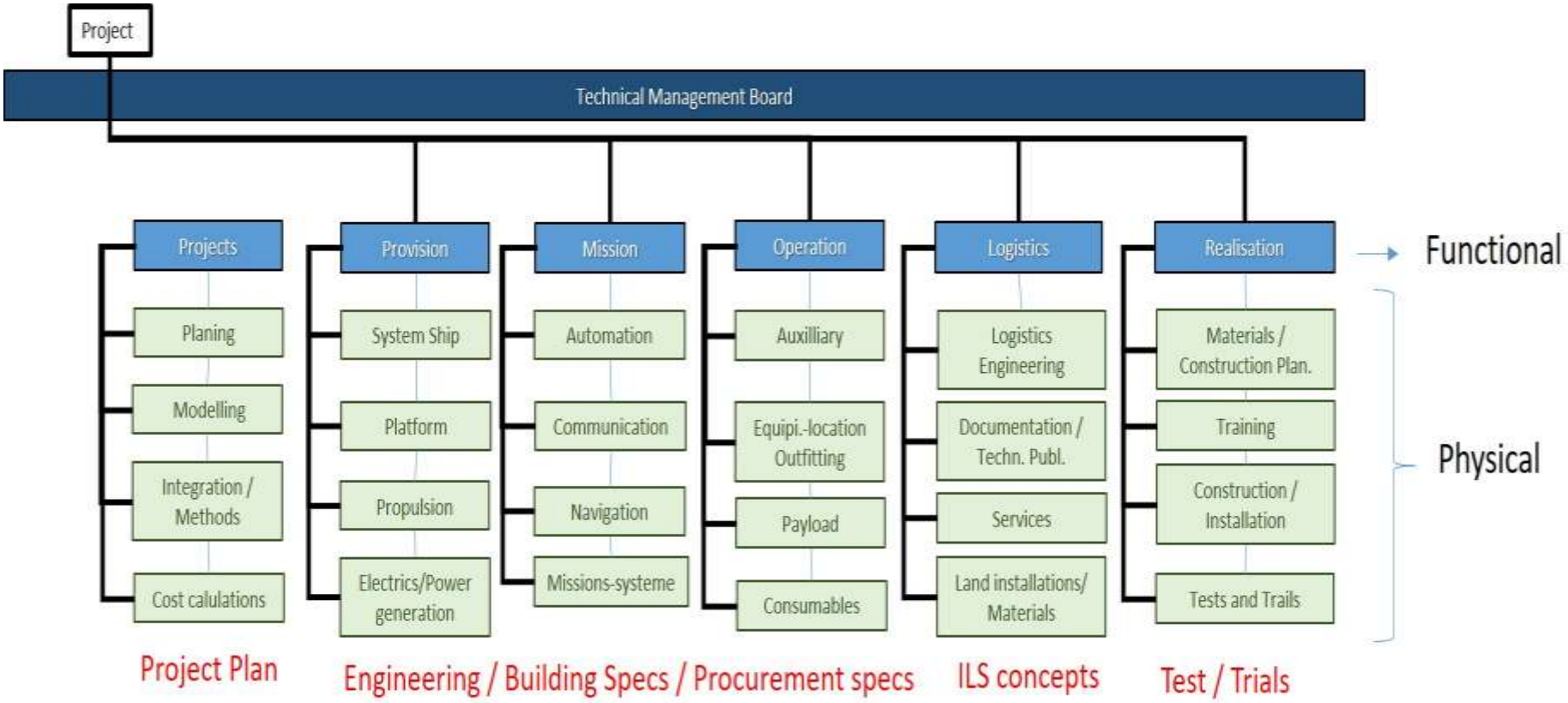
CONTROL OF CONFIGURATION CHANGES

Implementation of Processes



FORM FOLLOWS CONTENT

Required restructure of organization



Thank you

for your attention!

Questions?

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Single Template

US - ESWBS

Dual Template

ASD S1000D