This project has received funding from European Union´s Horizon 2020 research and innovation programme under grant agreement Nº 723360

Status i EU-projekten RAMSSES och Fibreship

Franz Evegren
RISE Research Institutes of Sweden
Safety & Transport
Fire Safe Transport

This project has received funding from European Union´s Horizon 2020 research and innovation programme under grant agreement Nº 723360

FIBRESHIP PROJECT:

SUMMARY OF THE PROJECT AND RESULTS

Alfonso Jurado
Head of R&D at TSI
FIBRESHIP Coordinator
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September 17th, 2020

1. FIBRESHIP: A SUCCESSFUL H2020 PROJECT

One of the greatest challenges for the European Shipping and Shipbuilding Industry in terms of BLUE ECONOMY and WATERBORNE TRANSPORT.

- Regulatory bodies engagement
- *Ad-hoc* software tools for designing
- Lightweighting structural design of vessels
- Definition of LCA decision tool and SHM strategy
- FRP adoption roadmap based on end-users satisfaction
- Maritime stakeholders engagement
- FRP methodology selection
- Guidelines on FRP materials, design and production
- Numerous experimental tests for validation
- Cost-Benefit calculator and Global Business Plan

Effort, continuous working and dedication

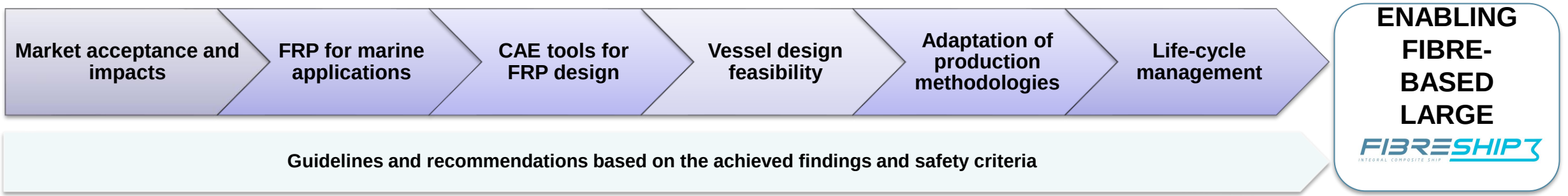
FIBRE-BASED LARGE-LENGTH VESSELS ARE FEASIBLE!

2. BRIEF DESCRIPTION OF THE FIBRESHIP PROJECT

2. FIBRESHIP PROJECT DESCRIPTION

FIBRESHIP Project

- FIBRESHIP addresses the **feasibility** of using **FRP** technology in **large-length vessels** (greater than 50m/500GT), trying to overcome the identified technical challenges and promoting a change in the regulatory framework that enables the design, building, and operation of this sort of vessels.



Main particulars of FIBRESHIP:

- Grant Number: 723360
- Duration: 36 months (June2017-May2020)
- Project Budget / EU Contribution: €11M / €8,7M
- TRL: 7-9
- International collaboration among 18 partners of 11 European countries with a broad experience in different disciplines

This project has recived funding from European Union's Horizon 2020 research and innovation programme under grant agreement Nº 723360

FIBRESHIP COORDINATOR: TSI

TSI, Ateknea Solutions, iXblue DIVISION H2X, danaos, COMPASS www.compassls.com, TUCO MARINE GROUP, NAVROM SHIPYARD, ANEK LINES www.anek.gr, FOINIKAS SHIPPING COMPANYNE, Lloyd's Register, RINA, BUREAU VERITAS 1828, CIMNE, VTT, TWI, UNIVERSITY OF LIMERICK OLLSCOIL LUIMNIGH, FUNDACIÓN soermar

FIBRESHIP - FINAL PROMOTIONAL VIDEO

FIBRESHIP

INTEGRAL COMPOSITE SHIP

4. SPECIFIC RESULTS OF THE PROJECT

4. SPECIFIC RESULTS – SUMMARY (1/6)

Cost-Benefit calculator and Global Business Plan

FRP adoption roadmap in the European shipping market considering end-users satisfaction

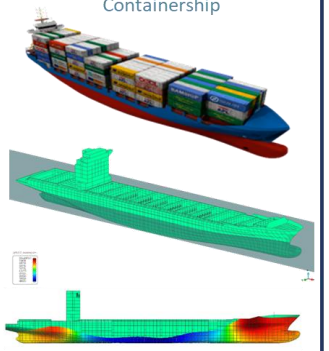
FRP methodology selection

Experimental results for validation:

- Materials and joints mechanical tests.
- Small- & medium scale fire tests of FRP panels with and without insulation.
- Influence of environmental conditions on FRP panels.
- Onboard N&V tests and URN measurements.
- Structural full-scale vessel test.
- Modal analysis and NDT of FRP panels for detection of delamination failures.
- Engineering solutions for aesthetic improvements.

Structural design of three type of vessel in fibre:

CATEGORY I
Light Commercial Vessels:
Containership

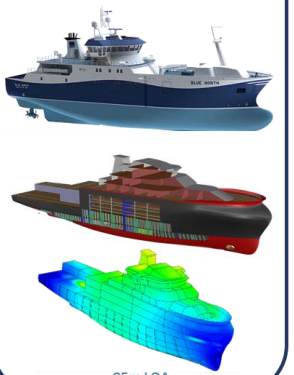


250m LOA

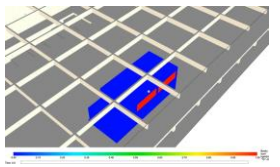
CATEGORY II
Passengers Transportation & Leisure Vessels:
ROPAX

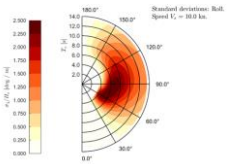
204m LOA

CATEGORY III
Special Services Vessels:
Fishing Research Vessel (FRV)



85m LOA





Coupled software capable to assess the vessel structural and fire performance

Definition of vessel inspection and SHM strategy

Decision Support Tool on life-cycle assessment (LCA)

FRV ship block fully in composites as a demonstrator

Guidance notes and recommendations:

- Optimised materials and joining techniques.
- Structural design based on structural and fire criteria.
- Adoption of new production strategies and building techniques.

4. SPECIFIC RESULTS – FRV Structural design (2/6)

FIBRESHIP 3

STANDARD SCANTLING FOR STRUCTURAL DESIGN

Classification Society Rules

Structural configuration definition

Materials and laminates definition

Midship and Web-frame Scantling

1st stage

3D MODELLING

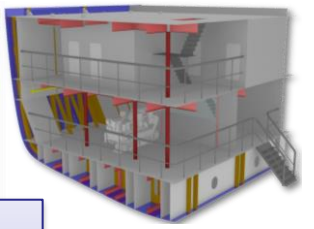
From Midship to a full 3D ship structure

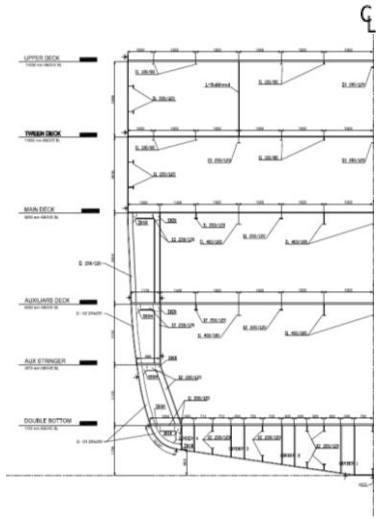
2nd stage

Demonstrator design for construction

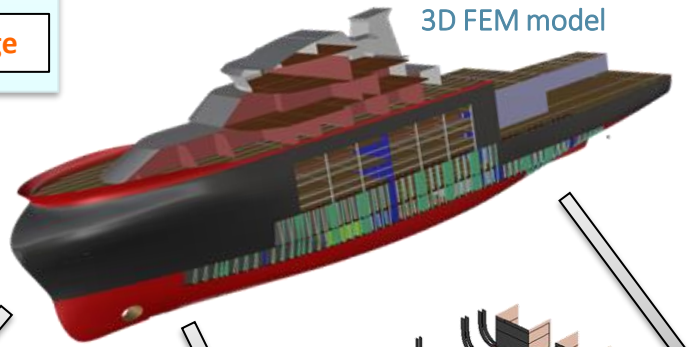
FEM Analysis

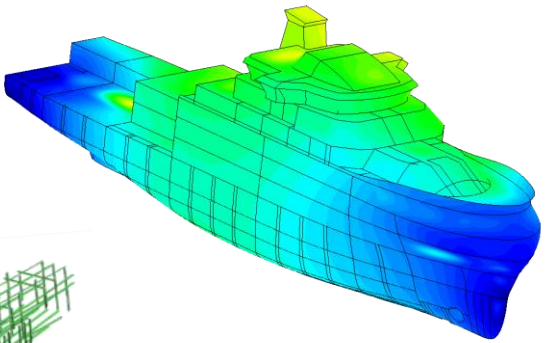
Optimization stage

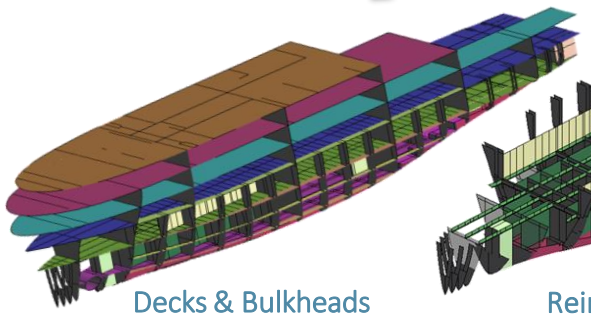




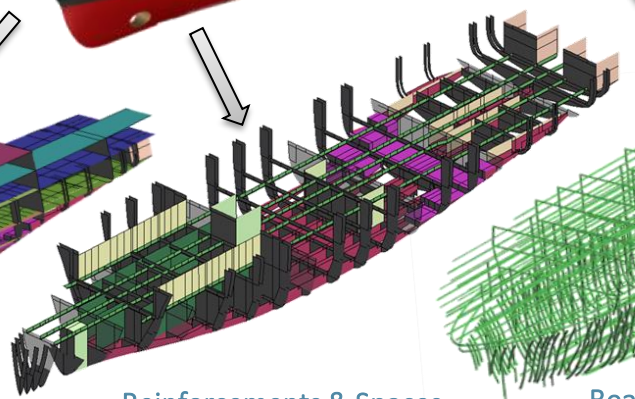
3D FEM model



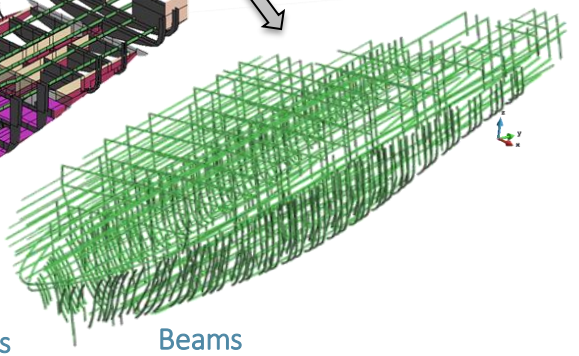




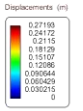
Decks & Bulkheads



Reinforcements & Spaces



Beams



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4. SPECIFIC RESULTS – Fibre-based vessels comparison (3/6)

CATEGORY I
Light Commercial Vessels:
Containership

CATEGORY II
Passengers Transportation &
Leisure Vessels:
ROPAX

CATEGORY III
Special Services Vessels:
Fishing Research Vessel (FRV)

FIBRESHIP: Structural vessel design in FRP materials				
Vessel type		**Containership**	**ROPAX**	**Fishing Research Vessel (FRV)**
Vessel Category		Lightweight commercial vessels	Passenger transportation and leisure vessels	Special services vessels
Overall Length	(m)	260.0	204	86,4
Length between PP	(m)	244.8	185.4	79.9
Steel-based Structural Weight	(ton)	10952	8629	2252
Fibre-based Structural Weight w/o insulation	(ton)	4675	4232	525
Fibre-based Structural Weight w insulation	(ton)	5925	5502	684
Average Composite Scantling	(mm)	35 (Torsion box 100)	41	32
Structural Weight Reduction wrt the reference steel-based vessel		**45,9%**	**36,2%**	**69,6%**
Steel-based Lightship displacement	(ton)	16535	13051	3701
Fibre-based Lightship displacement	(ton)	11508	9924	2133
Overall Lightship Weight Reduction wrt a steel-based vessel		**30,4%**	**24,0%**	**42,4%**
Main conclusions		The FRP containership design fulfils all the requirements and reduces the stresses well below the acceptable limits. Only the maximum global deflection may be a limiting factor when considering extreme navigation conditions.	Local Roll-On/Roll-Off areas have been checked. Significant local failure modes due to Roll-on/Roll-off cargo have identified. More structural optimization is needed.	The FRV in composites fulfills all the structural requirements for all navigation conditions. It can be said that fibre-based vessels of up to 85 m length are feasible from the structural point of view.
		Fire safety improvement is the next challenge to overcome.	Fire safety improvement is the next challenge to overcome.	Fire safety improvement is the next challenge to overcome.

6. MAIN CHALLENGES FOR THE FUTURE

6. MAIN CHALLENGES FOR THE FUTURE: TOWARDS FIBRESHIP 2

1. Further engagement of regulatory bodies for **evolving the current regulatory framework** to enable this technology.
2. Further **characterization of FRP materials** and development of composites with **improved fire resistance properties** to increase safety in vessels.
3. Further research on **computational simulation and assessment tools** to enhance the accuracy of the performance studies of the fibre-based vessels.
4. Research on **automation of modular construction techniques** and further research on **joining** techniques in order to improve production.
5. Application and development of **industry 4.0 tools** in European shipbuilding: vessel 4.0 and shipyard 4.0
6. Further research on **LCA, recycling and waste management** of composites assets.

Realisation and Demonstration of Advanced Material Solutions for Sustainable and Efficient Ships

01.06.2017
~~31.05.2021~~
-> Nov 2021

Budget: €13.5 M
Funding: €10.8 M

36 partners
12 countries

www.ramsses-project.eu

Call Topic: MG-2.2-2016 Development and Use of High Performance and Lightweight Materials … (IA)

Coordinator: CETENA (Italy) – Financial and Administrative

CMT (Germany) – Technical and Dissemination

The project RAMSSES has received funding under the European Union's Horizon 2020 research and innovation programme under the grant agreement No 723246.
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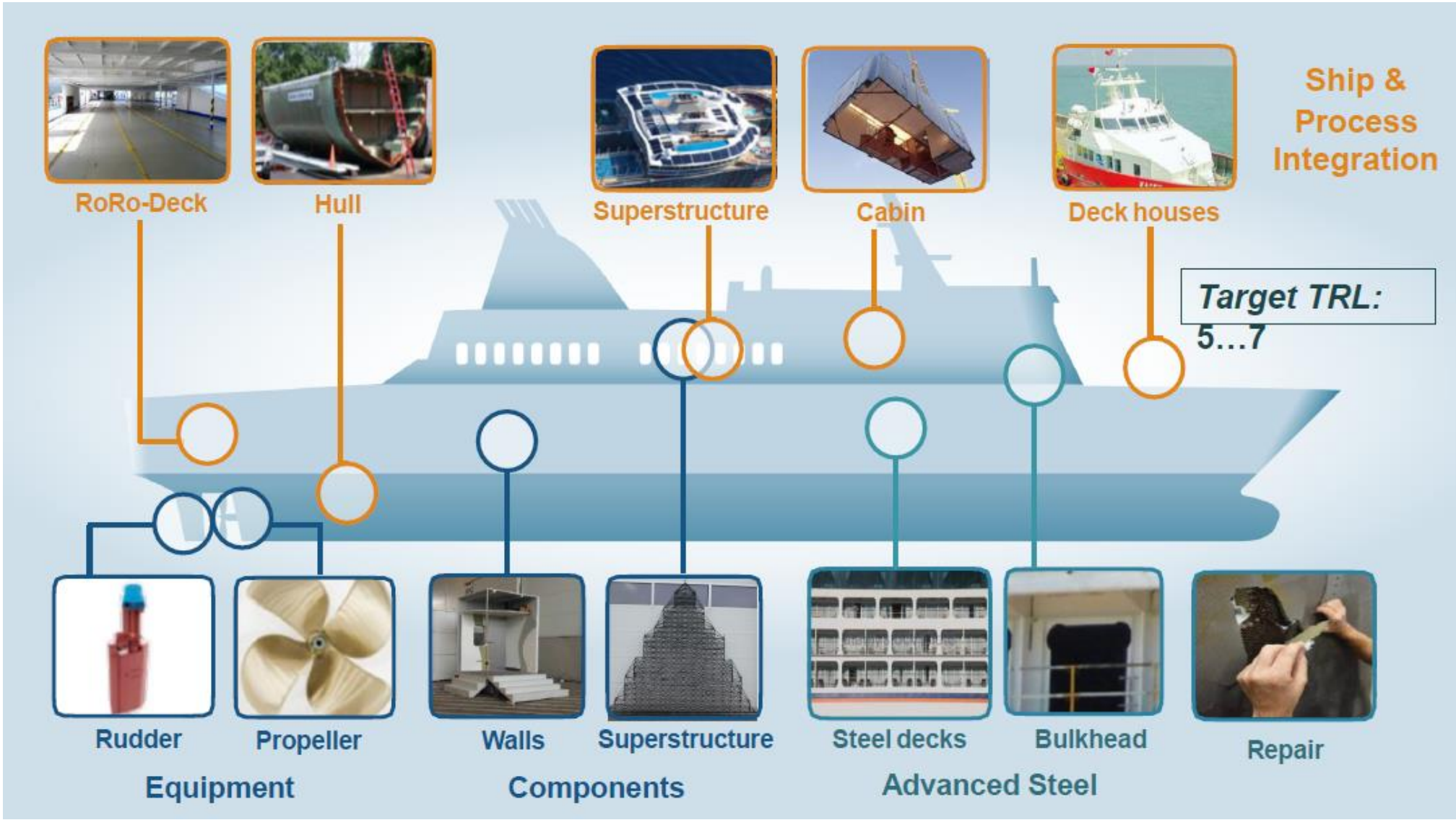
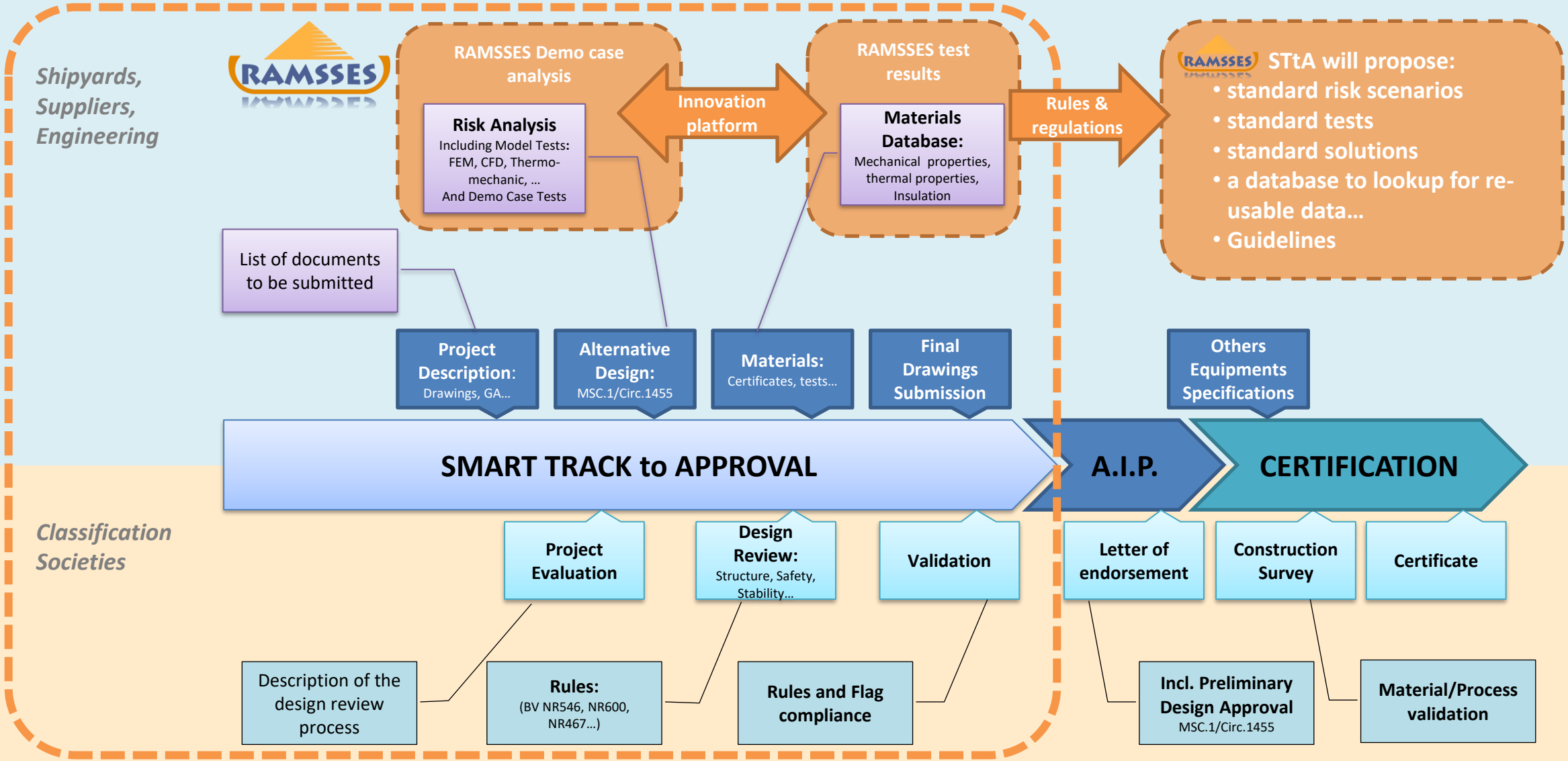
RAMSSES – Demostrators



Smart Track to Approval



Finding pre-approved solutions

- Suggestion to use selection tables to find existing solutions

Material selection	Test Compliance			
	Test A	Test B	Test C	Test D
Material 1	✓	✓		
Material 2		✓	✓	✓
Material 3	✓		✓	
Material 4			✓	✓

Pre-approved solutions	Standard fire risk scenarios			
	Scenario A	Scenario B	Scenario C	Scenario D
Solution 1			✓	✓
Solution 2		✓	✓	
Solution 3	✓		✓	
Solution 4	✓	✓		

- Quickly known what is already possible, and what is not
- More time available to assess safety of new elements

Finding pre-approved solutions

RAMSSES:

- Demonstrated **advantages** of composite materials in shipbuilding,
- Proved the **ability** to build large structure in composite,
- Proposed **new approach** for fire division rating

- Ask Member States to:
  - **support using our results in evaluation of MSC.1/Circ.1574**