Appendix III – Table overview of developing projects

Name of project	Involved parties	Time period	Scope – area of interest	Conclusion / links
LASS-C (part of BESST) – Norwe-gian Future	9 parties	2008-2012	Five upper decks in FRP composite on hypothetical Panamax cruise vessel. An extension of the LASS project to consider elements which are part of the hull girder, affecting the ship's global strength.	
MOSAIC	CETENA (Italy) and 10 partners from 6 European countries	Sept. 2009 – Sept. 2015	Introduction of High Strength Low Alloyed Steels (HSLA) in specific structural details, and replacement of specific structural parts of the ship with composite materials to reduce weight and corrosion. Special emphasis on steel to composite joints.	
Co-Patch	15 organisation from eight European countries	Jan 2010 – Dec. 2012	Developing a novel, effective repair/reinforcement method (Composite patching) for defects in large steel structures to prevent crack growth and extend lifetime of the repaired structure.	
E-LASS	140 international organisations from academia, research, centres, ship owners, classifications societies, shipyards, suppliers and service providers.dd	Sept. 2005 – present	Promote the use of lightweight materials and lightweight design in the maritime industry. Outcome is a number of internationally type approved solutions for both fire rated divisions and "fire restricting" requirements.	
LASS	29 organisations	Jan. 2005 – June 2008	Re-design five existing vessels and one offshore living quarter using new lightweight composite and aluminium materials.	
COMPASS	DBI, DTU, Niels Hjørnet and 9 companies	2014-2015	Composite superstructure on a large passenger ship	
Eco-Island ferry	MARKIS, Kockums, AAU, SP Sweden, DMA, Swedish Transport Agency, 2 others.	Dec. 2010-July 2013	Regulation 17 risk assessment, LCA, and LCCA on a fictive small island ferry made in carbon fibre sandwich composite.	
E-ferry	Aro municipality, Siemens, DNV-GL, DMA, CERTH, DBI, JKR Consult, Søby Shipyard, Tuco Shipyard.	June 2015 – June 2019	Real electric battery driven ferry looking at the possibility of making certain parts of the ship in composite – structural analysis, design and effects	
FIRE RESIST	18 partners from 9 European countries	Feb. 2011-Jan. 2015	Validate and improve the fire performance of composite materials by developing new concepts for composite materials that are both lightweight and fire-resisting.	
SAFEDOR	Managed by GL and joined by 53 partners from the European maritime industry	Feb. 2005 – April 2009	To establish a risk-based regulatory framework that links performance prediction with risk assessment. Application of probability and reliability-based approaches and methods in ship design. Presents modern risk-based methods and applications to ship design, operation and regulation. Reference to Goal-based standards/regulation.	

De-Light Transport	19 European partners	Nov. 2006 – Nov. 2009	Investigate and promote the design, manufacturing and use of lightweight sandwich structures in the marine, rail and freight container industries. Design and manufacturing of prototype structures including deck and deckhouse structures for ships by use of risk-based design principles to comply with existing regulatory frameworks.	
BESST	Leading EU shipyards, 20 research institutions and universities, five class societies, and 31 industrial companies.	Sept. 2009 – March 2013	Increase competitiveness of European built ships through decreased life cycle cost, drastically reduced environmental impact and improved safety. Focus on cruise vessels, passenger ships, ferries (Ro-Pax) and mega yachts.	
Convince	Military project including 26 partners from France, Italy, Netherlands, Sweden, Norway and the United Kingdom	2012-Sept. 2014	The Convince project assessed the potential use of composites in naval structures. The core investigations of the Convince project were structural materials selection for improved fire performance, proposal of fire risk control options, small coupon tests for fire, physical and mechanical properties, fragmentation tests, medium and large scale fire and blast tests on representative structure, together with simulations of fire and blast events. Weight and cost-effectiveness for enhanced performance are considerations that have informed all activities throughout the project.	Link
Tank Light Module		2011	50% weight reduction on tanker by replacement of superstructure with FRP and payback time of 5-7 years.	link
saNDI	Military project including Ministries of Defence from Norway, Denmark, Sweden, Finland and the United Kingdom.	2001-2004	Methods to detect defects and damage in sandwich structures and how to deal with defects and damages that have been detected. Develop methods for repair, production control and damage inspection for sandwich structures in naval ships. Improve knowledge of how defects grow in sandwich structures under loading. Establish acceptance criteria in terms of weather and when a damage or defect should be repaired.	See two articles on Dropbox
EUCLID (3 projects)	24 industrial entities from six countries.	1900'ies	Look at reliable, durable, lightweight and affordable technologies for composite structures for application in major naval ships. Also looked at survivability and structural vulnerability to internal blast. Focus was on a frigate with glass fibre (GRP) composite superstructure and steel hull.	Link
Sand.core	15 partners from Europe	Jan. 2004 - June 2006	SAND.CORe aims to foster the application of innovative sandwich structures in the European transport sector. This will be done by benchmarking, harmonising and complementing previous research work and evaluating state-of-the-art knowledge and experiences. The overall objective of the project is to boost the applications of sandwich structures in several transport sectors. As a consequence of non-coordinated research, the general knowledge about the sandwich panels is widespread over the industry and other parties (research, classification societies, suppliers, shipyards...). Therefore, there is the need to co-ordinate research, to conduct knowledge transfer and foster the application of various types of sandwich structures. Moreover, the current knowledge on different sandwich types varies, some are quite completely known (e.g. composite sandwich panels), while for others, like metallic sandwich panels, a lack of knowledge in several aspects still exists. The parties that are supposed to apply	Link

			sandwich systems, particularly shipyards, are insufficiently familiar with the characteristics of sandwich structures and their integration in ship design and fabrication to apply them to the extent desirable.	
SURSHIP-FIRE	Leader was VTT Technical Research Centre of Finland	2007 – 2009	Survivability of ships in case of fire has been studied in the SURSHIP-FIRE research project as a part of the SURSHIP cooperation, a coordinated European research program on Maritime safety. The work was performed in four subprojects related to materials used in shipbuilding, fire hazards on board, ship structures, and evacuation in ship conditions. Fire test data of products commonly used in shipbuilding were stored to a free-of-charge accessible database for the use of design engineers. Guidelines were defined for using fire test data in simulation and product development.	Link and final report on Dropbox
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CARGO EXPRESS		Around 2010-2012	Sustainable Maritime Transport looking at a competitive container vessel with 60 % less fuel consumption. Presents an innovative solution for a sustainable and competitive cargo vessel with composite surfaces.	Link and article on Dropbox
FLIGHT (Fast Light Hull Technology)	7 partners mainly from the Netherlands	Before 2009	Integrate the fragmented knowledge of composite material suppliers in a well ordered and usable form for the ship/boat designer and builder. Also looked at new material technology and structural joint solutions capable to withstand impact and cyclic loads, and more efficient production process.	Article on Dropbox

Network:

Composite Superstructure Concept (CSC) by Kockums AB, DIAB and Thermal Ceramics