E-LASS – MESA Workshop

Lightweight Structures in the maritime Industries

Boras, 8-9 Oct. 2013

Existing Networks and their Role

MESA Support Action and the MARPOS Gap Analysis

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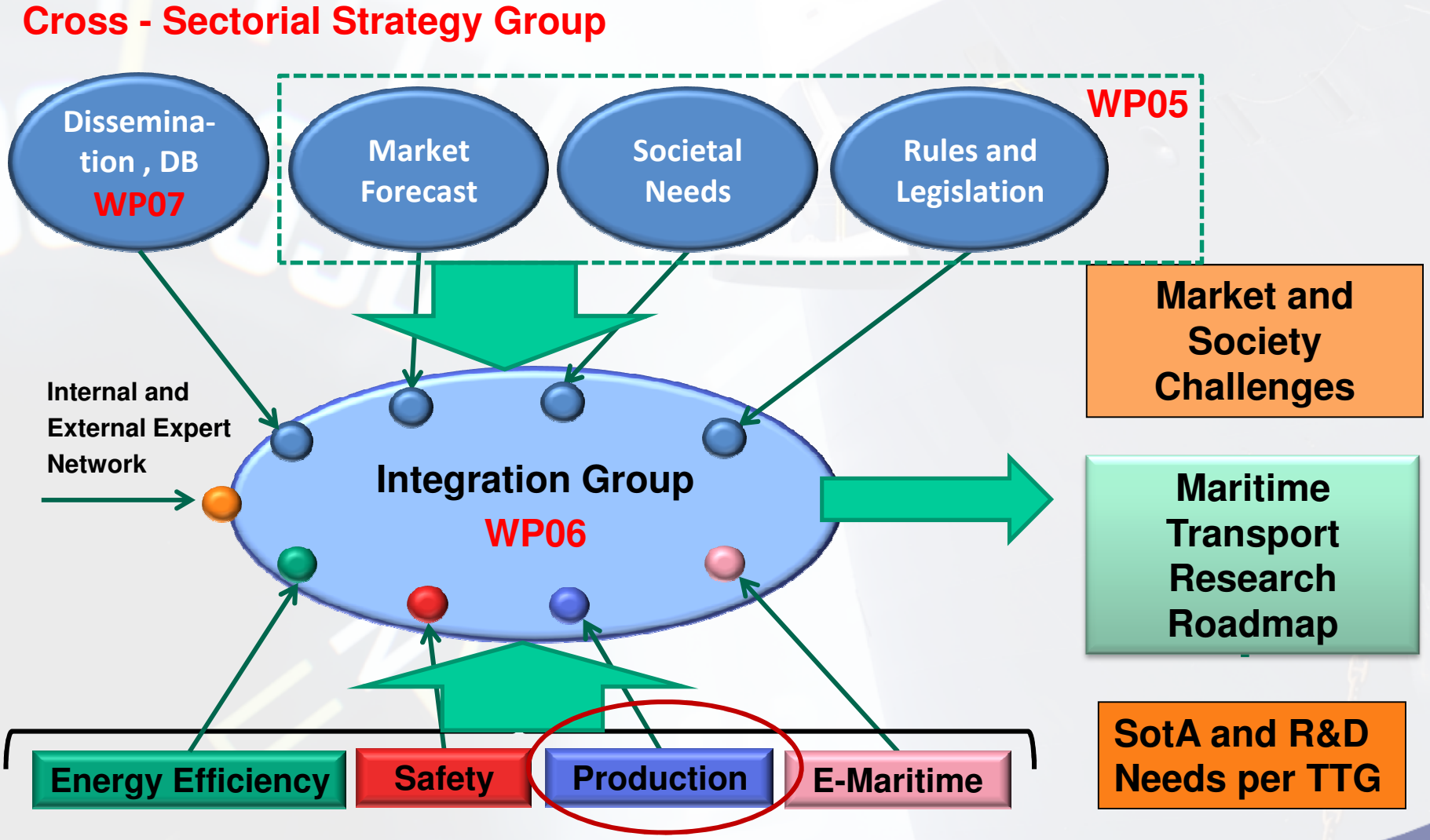
Background

- **Research Needs** in EU Research are defined in Strategic Documents elaborated around the WATERBORNE Technology Platform
  - WATERBORNE Strategic Documents (www.waterborne-tp.org)
  - ECMAR – European Council for Maritime Applied Research (www.ecmar.eu)
  - „Vessels of the Future“ (PPP) document
- The Elaboration of those documents is supported by **Coordination and/or Support Actions (CSA)**
  - early technical **Thematic Networks** (e.g. CEPS, ERASTAR, TRANSLAS)
  - Coordination Actions e.g. www.sandcore.net
  - MARPOS **Technology Gap Analysis** and Research Needs
- **MESA** is the new support action of WATERBORNE TP aiming at
  - Analysing the **State of Research and Application** in selected technical areas;
  - Define technology gaps, research needs and priorities (RTD Roadmap);
  - Find and show RTD success stories and mega trends
  - Foster cooperation and communication between projects and experts

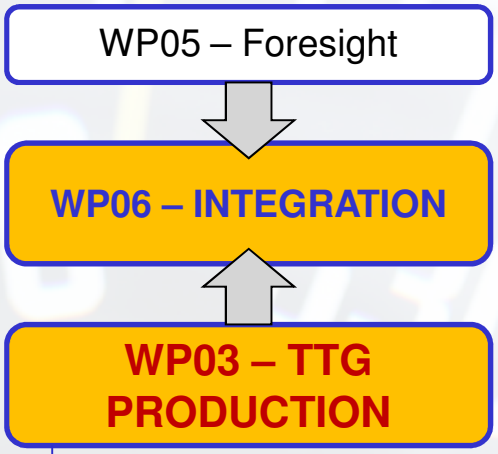
  MESA started in **09/2013** and will continue for **three years**

  First SotA report approximately after six months

The MESA Overall Structure



TTG Production and Materials within MESA



- Market and societal needs, no direct involvement of TTG3
- Synthesis of R&D Needs and Roadmap
- TTG03 represented through CMT
- Cross TTG Priorization and Harmonization
- WP-Leader: Center of Maritime Technologies (CMT)
- Analysis, synthesis and priorization on TTG level

Pre-identified Technology Sub-Areas (TSA)

TSA 3-A	Design Tools & Integration	FSG
TSA 3-B	Production Preparation and Mgt.	CMT
TSA 3-C	Metals and Processing	RWTH
TSA 3-D	None metalic structures and processing	CMT
TSA 3-E	Corrosion and fouling protection	SAF
TSA 3-F	Assembly and Outfitting	FSG
TSA 3-G	Maintenance, Repair, Retrofit, End-of-Life	CMTI

Extended Expert Network

MESA partners outside TSA and TTG to be involved as experts

External experts and networks for each TSA
(outside MESA partnership)

TTG Production – Scope of Work

Scope

All processes along the life cycle of maritime products with focus on production

- focus on TRANSPORT products (ships) and OFFSHORE (Wind) structures
- processes characteristic for shipbuilding (not standard mechanical engg.)
- production includes all processes from early design to delivery

Aim

Research covered in TTG03 aims to improve competitiveness of European producers of ships (including its design and equipment)

- enables companies to improve Life Cycle Performance (Design for LC)
- with competitive production cost in reduced lead time
- enables industry to design and build (up to) single products

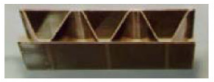
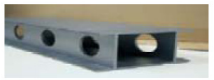
TSAs

Technology Sub-Areas (with lead experts) have been defined to organize the work

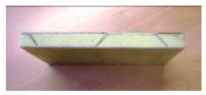
- analyse state of the art (research projects);
- analyse state of application (large industry, small industry, all LC phases)
- derive and prioritize research needs and trends

Coverage of “Lightweight Topics”

- **Lightweight structures** can be achieved with traditional (metallic) materials, „new“ (composite) materials or hybrid

Sandwich Structure Material	Core Stiffeners	
	Unidirectional	Multi-Directional
All-Steel	 Corrugations	
	 Flat bars (I-Core™)	 Wire pyramids (COREX™)
	 Z-Profiles	
All-Aluminium	 Extrusions	 Aluminium Honeycomb
	 Corrugations (CORALDEC™)	

Core Type		
Filled Metallic Stiffeners	Non-Metallic Stiffeners	Non-Metallic Solid
		
- Bonded solid blocks of cellular material (e.g. polymer foams such as polyurethane, balsa wood, Rockwool, metallic foams, etc.). - In-situ "liquid" filling using polymer foams, light concrete, etc.	- Non-metallic stiffeners adhesively bonded or mechanically joined to metallic face sheets.	- Non-metallic solid core layer, such as a polyurethane elastomer (as in the Sandwich Plate System – SPS) or light concrete, between metallic face sheets.

Core Type		
Polymer Foam	Honeycomb	Polymer Foam / FRP Stiffeners
		
The example shown above consists of glass reinforced epoxy facings and a rigid polyurethane foam core	The example shown above consists of glass reinforced epoxy facings and a phenolic reinforced aramid paper honeycomb core	The example shown above consists of glass reinforced epoxy facings and a rigid polyurethane foam core with additional glass reinforced epoxy corrugated stiffeners.

Source:
SAND.CORe Best ractice Handbook (public)

- Weight reduction can also be achieved by combining functionalities in adaptive or smart materials and structures (ADAM4EVE);
- Design, assembly and outfitting as well as repair and end of life are challenges;
- Aspects related to lightweight are covered by several Technology Sub-Areas within MESA TTG03, but primarily in TSA-3C (Metals) and TSA-3D (none-metals)

The MARPOS Technology Gap Analysis (1)

- conducted in 2010/2011, covering projects from FP5 to FP7-3 TRANSPORT;
- Analysis performed by experts using material from EU data bases and own material;
- covering 128 pre-selected projects from FP5 to FP7-3, multiple choice possible;
- Defined SotA in research, technology gaps and research needs

Clusters and Topics			Editor	Projects covered			
				FP5	FP6	FP7	Total
COMPETITIVENESS	**COM-1**	**Competitive SHIPPING**					
	COM-1-1	Innovative Ship Concepts	CMT	0	1	4	5
	COM-1-2	Shipping Operations, e-maritime	BMT	2	2	3	7
	COM-1-3	Ship Shore Interfaces and Ports	BMT	4	4	0	8
	COM-2	**Competitive SHIP DESIGN**					
	COM-2-1	Design tools for structural reliability	LR	3	2	1	6
	COM-2-2	Design tool integration	CMT	1	2	1	4
	COM-3	**Competitive SHIP PRODUCTION**					
	COM-3-1	Structural materials and combinations	CMT	5	6	3	14
	COM-3-2	Coatings and coating processes	CMT	6	1	1	8
	COM-3-3	Production equipment and processes	CMT	5	3	1	9
	COM-3-4	Process organization and integration	CMT	1	4	0	5
	COM-4	**Competitive LIFE CYCLE SERVICES**					
	COM-4-1	Inspection and maintenance	CMT	6	4	2	12
	COM-4-2	Repair, retrofit and dismantling	CMT	2	4	3	9
	COM-4-3	Life Cycle Assessment and Sevices	CMT	0	4	2	6

continued…

The MARPOS Technology Gap Analysis (2)

… continued

ENVIRONMENT	**ENV-1**	**Reducing GAS EMISSIONS**					
	ENV-1-1	Alternative Fuels	MARINTEK	1	3	3	7
	ENV-1-2	Exhaust gas after treatment	MARINTEK	0	1	1	2
	ENV-1-3	Low emission engines	MARINTEK	2	2	3	7
	ENV-1-4	Green ship operations	MARINTEK	0	2	4	6
	ENV-2	**Reducing OTHER EMISSIONS**					
	ENV-2-1	Airborne and underwater noise	MARINTEK	2	1	3	6
	ENV-2-2	Emissions by paints	MARINTEK	2	1	1	4
	ENV-3	**Impact by WASH and BALLAST WATER**	MARINTEK	1	1	0	2
	ENV-4	**EMERGENCY Intervention**	MARINTEK	1	4	3	8
ENERGY	**ENE-1**	**Optimizing RESISTANCE and PROPULSION**					
	ENE-1-1	Resistance and Drag	HSVA	5	3	3	11
	ENE-1-2	Propulsion	HSVA	6	1	4	11
	ENE-2	**Increasing ONBOARD EFFICIENCY**					
	ENE-2-1	Engines	CMT/MAN	3	1	2	6
	ENE-2-2	Alternative Energy Sources and Energy Mgmt.	CMT	1	1	6	8
SAFETY	**SAF-1**	**Improving SAFETY by DESIGN**	S@S	10	7	4	21
	SAF-2	**SAFE Shipping Operations**	S@S	3	5	6	14
	SAF-3	**SECURITY**	S@S	0	0	1	1
HUMAN	**HUM-1**	**DECISION SUPPORT Systems**	BMT	5	3	2	10
	HUM-2	**Improving PASSENGER COMFORT**	BMT	1	0	1	2

The MARPOS Gap Analysis forms the basis for the work in MESA

Working Steps in MESA TTG03

1.	**Building the Network of internal and external experts** (ongoing) ▪ first list complete ▪ continuous update
2.	**Identify Projects and Collect Information** (ongoing) ▪ first ca. 120 projects identified, continuous update ▪ national projects and projects outside EU TRANSPORT priority to be added ▪ systematically collect information on projects and industrial applications
3.	**Edit SotA Report including Technology Gaps** ▪ describe SotA and technology gaps on TSA level ▪ edit SotA on TTG level (Deliverable) and provide summary to WP06
4.	**Define Research Needs and Roadmap** ▪ describe research needs and pre-prioritize on TSA level ▪ Prioritize and schedule research needs on TTG level ▪ Edit TTG03 Research Roadmap v1 (Deliverable) and summary to WP06
5.	**Analyse Applications and Document Show Cases** ▪ identify applications and propose show cases on TSA level ▪ select success stories ▪ document success stories (Deliverable) and provide summary to WP06

Workshop to be clarified at MESA level

MESA TTG03 Status - Building the Network

		MESA - Technology Sub-Areas within TTG 03 "Production and Materials"						
		TSA 3-A Design Tools	TSA 3-B Production IT	TSA 3-C Metal Proc.	TSA 3-D None-metals	TSA 3-E Coatings	TSA 3-F Assembly	TSA 3-G MRC
MESA Partners	TSA-Leader	FSG - IND - DE	CMT - RES - DE	RWTH - UNI - DE	CMT - RES - DE	SAF - IND - UK	FSG - IND - DE	CMTI - RES - NL
	TTG03 Partners	MW - Boekhoff	MW - Boekhoff	MW - Boekhoff	MW - Boekhoff	MW - Boekhoff	MW - Boekhoff	MW - Boekhoff
		DAM - PH, PvT	DAM - PH, PvT	DAM - PH, PvT	DAM - PH, PvT	DAM - PH, PvT	DAM - PH, PvT	DAM - PH, PvT
		FSG - D. Steinhauer, J. de Payrebrune	FSG - D. Steinhauer, J. de Payrebrune	FSG - D. Steinhauer, J. de Payrebrune	FSG - D. Steinhauer, J. de Payrebrune	FSG - D. Steinhauer, J. de Payrebrune	FSG - D. Steinhauer, J. de Payrebrune	FSG - D. Steinhauer, J. de Payrebrune
	MESA Partners	TBD	TBD	TBD	TBD	TBD	TBD	TBD
External Experts			IMG - IND - DE	IMG - IND - DE	IMG - IND - DE		IMG - IND - DE	
		NTUA - UNI - GR			NTUA - UNI - GR			NTUA - UNI - GR
		SAARE - IND - EE	SAARE - IND - EE		SAARE - IND - EE		SAARE - IND - EE	
			ASTANDER - IND - SP	ASTANDER - IND - SP			ASTANDER - IND - SP	ASTANDER - IND - SP
		SDG - IND - RO	SDG - IND - RO	SDG - IND - RO	SDG - IND - RO		SDG - IND - RO	SDG - IND - RO
		Chalmers - UNI - SE		Chalmers - UNI - SE	Chalmers - UNI - SE	Chalmers - UNI - SE		Chalmers - UNI - SE
					Airex - IND - CH			
		BLA - IND - SE	BLA - IND - SE		BLA - IND - SE		BLA - IND - SE	BLA - IND - SE
					SAERTEX - IND - DE		SAERTEX - IND - DE	
		BAL - IND - DE	BAL - IND - DE	BAL - IND - DE	BAL - IND - DE	BAL - IND - DE	BAL - IND - DE	BAL - IND - DE
		SICOMP - RES - SE	SICOMP - RES - SE		SICOMP - RES - SE		SICOMP - RES - SE	SICOMP - RES - SE
			ALUFLAM - IND - DK		ALUFLAM - IND - DK		ALUFLAM - IND - DK	ALUFLAM - IND - DK
		AIMEN - RES - SP	AIMEN - RES - SP	AIMEN - RES - SP	AIMEN - RES - SP	AIMEN - RES - SP	AIMEN - RES - SP	AIMEN - RES - SP
		CETENA - RES - IT	CETENA - RES - IT	CETENA - RES - IT	CETENA - RES - IT	CETENA - RES - IT	CETENA - RES - IT	CETENA - RES - IT
Multiplyers	world	ISSC Fabrication	ISSC Fabrication	ISSC Fabrication	ISSC Fabrication	ISSC Fabrication	ISSC Fabrication	ISSC Fabrication
				IIW WG Shipbuilding				
	EU	ECMAR WG PRO	ECMAR WG PRO	ECMAR WG PRO	ECMAR WG PRO	ECMAR WG PRO	ECMAR WG PRO	ECMAR WG PRO
		SEA RDI - EU	SEA RDI - EU	SEA RDI - EU	SEA RDI - EU	SEA RDI - EU	SEA RDI - EU	SEA RDI - EU
			SimCoMar - EU	HILDA/MOSAIC IAG	E-Läss - EU			SEA Europe - SMRC
	Countries	CMT - DE	CMT - DE	CMT - DE	CMT - DE	CMT - DE	CMT - DE	CMT - DE
		VSM AK IE - DE	VSM AK IE - DE	VSM AK FERT - DE	VSM AK FERT - DE	VSM AK FERT - DE	VSM AK FERT - DE	VSM AK FERT - DE
			SIMUFit - DE	DVS AK Schiffbau - DE				

confirmed / informed (green) — contacted (yellow) — to be contacted XXX (grey)

MESA-TTG3-Projects and Contacts FR-TTG03 Contacts 20130924

MESA TTG03 Status - State of the Art Analysis

Identifying Projects to be analyzed:

		MARPOS KA 3, FP 5	MARPOS SST, FP 6	MARPOS, CMT new SST, FP 7	CMT new German BMWi	CMT new IGF
TSA 3-A	Design Tools and Integration	MARSTRUCT, CRASHCOASTER, DISCO, MOBISHIP, HARDER, NEREUS, RORPROP, SAFETY FIRST, FIRE EXIT, PODS in SERVICE, HULLMON+, NEREUS, S@S, OPTIPOD,	IMPROVE, InterSHIP, SAFEDOR, CREATE3S, DE-LIGHT, CAS, SUPERPROP, ADOPT, SAFECRAFTS, SAFETOW, HANDLING WAVES, CREATING,	TULCS, EXCITING, RISPECT, GOALDS, FIREPROOF, EXTREME SEAS, BESST, ECO-REFITEC, THROUGHLIFE, RETROFIT, GRIP, REFRESH, MOVE IT!; AQUO, SONIC, FAROS, CASCADE, CRESCENDO, ADAM4EVE, JOULES, SHOPERA, SMARTYards, SEAHORSE	SESIS, BEKAS	T-Joints, ShipMesh, Adhesive Bonding (Standard-Kleben), Life Cycle Costing
TSA 3-B	Production Preparation and Management	DOCKLASER	InterSHIP, CREATE3S, IMPROVE, DE-LIGHT	BESST, ECO-REFITEC, RETROFIT, GRIP, SMARTYards	SESIS, GENESIM, SIMBA, SIMGO, PROSPER, POWER-VR	Elasta, Handplasma, MeKaPro, Gewischtsmanagement, Curved Panel II

MESA-TTG3-Projects and Contacts FR-TTG03 Projects 200813

Additional Projects (screening needed):

- EU FP5-7; Priorities: ICT, NMP, ENV, SME
- ERA-NETs: MARTEC, CORNET
- other national programs

Template for information collection is available – External Experts will be contacted shortly

Project information will be stored at CMT in data base

Maritime Materials and Structures in H2020

- Based on gaps and research needs identified in MARPOS, experiences from CMT R&D project and discussions with the EU wide network:

  Topic proposal **„Towards smart, adaptive and multi-material complex ships“**

- included in the WATERBORNE list of proposed topics,

  but NOT INCLUDED in draft Work Programm TRANSPORT 2014-2015 by COM (budget restrictions?)

  Topic remains important – it is hoped it can be included in the 2015 or 2016 call.

- **Elements proposed:**
  - **New frontiers**: smart and adaptive materials for hull and outfitting;
  - **Enabling technologies**: fire retardant composites, cooperation with other sectors, modularization and new models of work sharing;
  - **Applied research** for technologies and processes along the life cycle;
  - **Life Cycle Sustainability** including methods and integration in design;
  - **Prove of concept** and large scale, real life testing;
  - **Standardization** and **rule development;**
  - **Technology transfer** from material sciences and other sectors to maritime, including smaller yards

MESA TTG03 and E-Läss – an "Ideal Match"

- Both initiatives follow similar or identical goals;
- both address a similar (though not identical) community and have limited resources
- Both have different „kick-off" funding sources but must rely on private engagement to ensure sustainability
- MESA and E-Läss are also complementary:
  - MESA: broader maritime range and direct link to EC and WATERBORNE;
  - E-Läss: larger specialized community reaching beyond maritime
- Cooperation has already started:
  - Thanks to Tommy (SP) for the initiative and the openness to cooperate
  - MESA TTG03 Call for external experts distributed through E-Läss – many responses – Thank you!
  - Workshop programme was elaborated jointly, serves as a first SotA workshop
- We intend to continue close collaboration and hope this is supported by COM and the E-Läss community

Thank you for your attention!
Questions and comments are welcome !

Complete lists, statistics and TTG03 preparatory documents at CMT

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