

CMOROC Appendix D - Processes

Identification of Competences for MASS Operators in Remote Operation Centres

V 2.2

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Fundamentals About Processes

Processes

In this project is followed a process-oriented approach. The process descriptions are designed according to the general definition of a process.

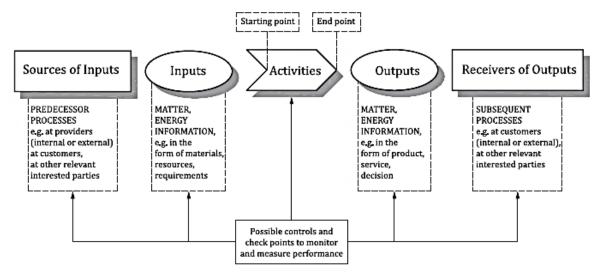


Figure 1: Scheme of elements of single processes (ISO 9001:2015)



Process Description Structure

The single processes are described in a systematic structure. They are in accordance with the requirements of ISO 9001:2015 (Clause 4.4.1).

Table 1: Content of process descriptions

Process nn	<pre><pre><pre><pre><pre><pre><pre><pre></pre></pre></pre></pre></pre></pre></pre></pre>
Scope of	In which areas is the process used?
application	Differentiations are done for:
	> Ship type
	> "With crew on board" and "without crew on board".
Process	What is to achieve by the process as a general objective?
objectives	
Process	Operators who are involved in this process.
operators	Differentiated by "MASS operators in ROC" and "MASS operators on board".
	Assignment to operational or management level.
	Definition of the location and workstation where the process is mainly
	operated.
	Assumption of RACI for the different roles:
	R=Responsibility, A-Accountability, C-Consulted, I-Informed
Interfaces	Interfaces to other functions.
Event: input	Specific input to process, trigger to start, starting point.
Process	Brief description of tasks, activities, and functionalities.
description	
Resources	Needed resources to ensure availability of the process, such as equipment,
needed	systems, interfaces, HMI.
	Marked whether needed for
	MASS: it is with crew on board
	ROC: it is with or without crew on board
Regulations	Major regulations to be considered in the process.
Event: output	Specific outcomes, results of the process, ending point
Required	Required competences,
competences	differentiated by the different roles:
	C/L = competence level
	STCW = related table
	MASS = additional competences needed by MASS operators (new table)
Additional	Only if required for further explanations.
comments	

Process Map

The purpose of the process map is to allow a general overview about all main processes related to the MASS system.

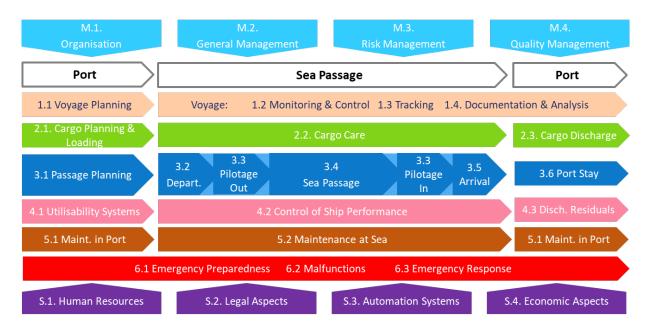


Figure 2: Process map for MASS operations



Management Processes

M.1 Organisation of MASS-ROC-Systems

Process M.1	Organisation of MASS-R	OC-Systems			
Scope of	All types of MASS				
application	A) Dry Cargo – Contain	er Feeder – short	sea		
	B) Ferry – RoPax – one hour passage				
	C) Dry Cargo – Bulk Carrier – long distances				
	MASS with crew on board				
	> Remote Operation C	entre			
	MASS without crew on boa	rd			
	> Remote Operation C				
Process	To achieve smooth and safe	operation of the e	ntire MASS system		
objectives					
Process	MASS operators in ROC	Level	in ROC		RACI
operators	> Senior Navigator	> Managemen	t > Planning station		R, A
	> Senior Engineer	> Managemen	t > Planning station		R
Interfaces	> System Administrator				
	> System Specialists (e.g. I	T, automation,))		
	> Shipping Companies Mar				
Event: input	Concept of Operations of a M	1ASS system (orga	anisational, technologid	cal, and	human
	related perspectives)				
Process	Manage all processes of MAS	SS system:			
description	> Plan processes				
	> Develop processes				
	> Implement processes	s and improvemer	nts		
	Determine and maintain the o	•			
		he MASS system	with allocation of tasks	and	
	responsibilities				
	> Determine required r				
	Develop and manage the Human-Machine-Interfaces:				
	> Work and rest time management				
	> Ergonomic design of HMI				
Resources	Personnel				
needed	> Manpower of operators, a	and specialists			
	Equipment:				
D	> Commercial IT-system				
Regulations	MASS regulations				
	International shipping law				
-	National regulatory framewor			00	4
Event: output	Implemented organisational s	structure and proc	esses for the entire MA	iss sys	tem
Required	The MASS Senior Operator	(Navigator Engi	ineer) on	C/L	STCW
competences	management level is able			0,2	0.00
MASS Senior	regarding using and applying		rsina (C/L 4)		
Operators	to use organisation d	• •	(3	MASS
Management	to implement commu	•	o achieve seamless	3	MASS
Level	internet access				
	regarding evaluating (C/L 5)	and creatina (C/L	6)		
	to organize MASS sy	- ,	,	5	MASS
	to implement process			5	MASS



Process M.1	Organisation of MASS-ROC-Systems		
	 to develop, implement and supervise standard operational procedures, to develop and determine structural organisation,	5	MASS
	to allocate tasks and functions to operators,	5	MASS
	to implement and improve human-machine interfaces.	5	MASS
		5	MASS
Additional	J.		
comments			

M.2 General Management of MASS-ROC-Systems

Process M.2	General Mar	agement of MASS-R	OC Systems			
Scope of	All types of MASS					
application	A) Dry Cargo – Container	Feeder – short sea				
• •	B) Ferry – RoPax – one h	our passage				
	C) Dry Cargo – Bulk Carri	•				
	MASS with crew on board	ŭ				
	> Remote Operation Cer	ntre				
	MASS without crew on board					
	> Remote Operation Cer	ntre				
Process	To manage the success factor		a MASS-System by			
objectives	appropriate leadership and esta		•	system		
Process	MASS operators in ROC	Level	in ROC	RACI		
operators	> Senior Navigators	> Management	> Planning station	R, A		
•	> Navigators	> Operational		Ċ		
	> Senior Engineers	> Management	> Planning station	R		
	> Engineers	> Operational	3	С		
	> System Administrator	> Operational		С		
Interfaces	> MASS System Specialists (·	.)			
	> Shipping Company- Operations					
	> Shipping Companies - Man					
Event: input	Organisation of MASS-System		technologies			
Process	Leadership					
description	> Apply situational leadership					
	> Support and improve teams	vork				
	> Allocate tasks and manage	workloads				
	> Improve decision making					
	> Establish a just culture					
	Situational awareness					
	> Control workload to avoid fa	atigue				
	> Improve the human-machine-interaction, especially for using sensors and trust					
	in automation					
	> Keep situational awareness machine-interfaces	> Keep situational awareness in all situations, especially when using human-				
	MASS certification					
	> Control of all required certif	icates to operate the N	MASS			
Resources	Personnel		···· ·- ·- ·			
needed	> Manpower of management	operators, and specia	alists			
	manponor or management	, ara opoole				

Process M.2	cess M.2 General Management of MASS-ROC Systems					
	Equipment:					
	> Navigational systems (ECDIS, radar, AIS, sounder,)					
	> Alarm and control systems (machinery, auxiliary and deck equipment, safety					
	equipment)					
		> Information systems (publications, MIS, forecasts, traffic information)				
	> Computer systems	,				
	> Sensor data (MASS status)					
Regulations	MASS regulations					
rtogalationio	International shipping law					
	National regulatory framework, e.g. labour law					
Event: output	Smooth and integrated operations					
Event. output	omooti and integrated operations					
Required	The MASS Navigator (operational level) is able	C/L	STCW			
competences	regarding knowledge (C/L 1) and understanding (C/L 2)	0				
MASS	to describe the system of sensors and how to use them to keep	2	MASS			
Navigator	situational awareness	_	1717 100			
Operational	regarding using and applying (C/L 3) and analysing (C/L 4)					
Level		3	A-II/1			
Levei	to use knowledge about shipboard personnel management and	_ J	A-11/ 1			
	training	2	A-II/1			
	to apply leadership and teamworking skills	3				
	to apply task and workload management	3	A-II/1			
	to apply effective resource management	3	A-II/1			
	to apply decision-making techniques	3	A-II/1			
	to operate the remote-control system with its specific interfaces	3	MASS			
	to maintain a safe remote watch					
	to maintain appropriate situational awareness when using the	3	MASS			
	human-machine interfaces when monitoring or controlling	3	MASS			
	remotely					
Required	The MASS Senior Navigator (management level) is able	C/L	STCW			
competences	regarding using and applying (C/L 3) and analysing (C/L 4)					
MASS Senior	to use leadership and managerial skills	3	A-II/2			
Navigator	to apply shipboard personnel management training	3	A-II/2			
Management	to apply task and workload management to apply effective	3	A-II/2			
Level	resource management					
	to apply decision-making techniques	3	A-II/2			
	to apply a MASS-ROC-related resource management	3	MASS			
	to apply international and national regulatory framework for	3	MASS			
	MASS and shipping					
	to apply national and international regulatory framework for the	3	MASS			
	shore-based operators					
	to monitor and control compliance with legislative requirements	3	MASS			
	and measures concerning MASS systems					
	,					
	regarding evaluating (C/L 5) and creating (C/L 6)					
	to establish a safety culture in the entire MASS-ROC-	4	MASS			
	system					
	to improve the human-machine interaction, especially to	5	MASS			
	1					
	keep the situational awareness on a high level					
	keep the situational awareness on a high level to foster the teamwork and communication in the entire	5	MASS			
	to foster the teamwork and communication in the entire	5	MASS			
		5 5	MASS			



Process M.2	General Management of MASS-ROC Systems		
	to identify behaviours of operators in distributed work	5	MASS
	locations		
	to identify the level of situational awareness in a team of	5	MASS
	operators and to improve in case of loss of sufficient S/A		
	to implement and improve systematic decision-making	5	MASS
	procedures in remote monitoring and control	_	
	to identify too high workloads in the operator and MASS	5	MASS
	team and to reduce stress levels by appropriate measures	_	
	to apply classification cycles for MASS systems and	5	MASS
	consider intervention scheme requirements	_	
	to manage MASS system related certificates	5	MASS
Required	The MASS Engineer (operational level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS	to use knowledge about shipboard personnel management and	3	A-III/1
Engineer	training		
Operational	to apply leadership and teamworking skills	3	A-III/1
Level	to apply task and workload management	3	A-III/1
	to apply effective resource management	3	A-III/1
	to apply decision-making techniques	3	A-III/1
	to maintain a safe remote watch	3	MASS
	to maintain appropriate situational awareness by using the	3	MASS
	human-machine interfaces and monitoring or controlling		
	remotely	•	
	to operate the remote-control systems with its specific	3	MASS
	interfaces		
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS Senior	to use leadership and managerial skills	3	A-III/2
Engineer	to apply shipboard personnel management training	3	A-III/2
Management	to apply task and workload management	3	A-III/2
Level	to apply effective resource management	3	A-III/2
	to apply decision-making techniques	3	A-III/2
	to apply a MASS-ROC-related resource management	3	MASS
	to apply international and national regulatory framework for	3	MASS
	MASS and shipping		
	to apply national and international regulatory framework for the	3	MASS
	shore-based operators		
	to monitor and control compliance with legislative requirements	4	MASS
	and measures concerning MASS systems		
	and measures concerning MASS systems regarding evaluating (C/L 5) and creating (C/L 6)		
		5	MASS
	regarding evaluating (C/L 5) and creating (C/L 6)	5	MASS
	regarding evaluating (C/L 5) and creating (C/L 6) to improve the human-machine interaction, especially to keep	5 5	MASS
	regarding evaluating (C/L 5) and creating (C/L 6) to improve the human-machine interaction, especially to keep the situational awareness on a high level		
	regarding evaluating (C/L 5) and creating (C/L 6) to improve the human-machine interaction, especially to keep the situational awareness on a high level to apply classification cycles for MASS systems and consider		
Required	regarding evaluating (C/L 5) and creating (C/L 6) to improve the human-machine interaction, especially to keep the situational awareness on a high level to apply classification cycles for MASS systems and consider intervention schemes requirements	5	MASS
Required competences	regarding evaluating (C/L 5) and creating (C/L 6) to improve the human-machine interaction, especially to keep the situational awareness on a high level to apply classification cycles for MASS systems and consider intervention schemes requirements to manage MASS system related certificates	5 5	MASS MASS
	regarding evaluating (C/L 5) and creating (C/L 6) to improve the human-machine interaction, especially to keep the situational awareness on a high level to apply classification cycles for MASS systems and consider intervention schemes requirements to manage MASS system related certificates The MASS System Administrator (operational level) is able	5 5	MASS MASS
competences	regarding evaluating (C/L 5) and creating (C/L 6) to improve the human-machine interaction, especially to keep the situational awareness on a high level to apply classification cycles for MASS systems and consider intervention schemes requirements to manage MASS system related certificates The MASS System Administrator (operational level) is able regarding using and applying (C/L 3) and analysing (C/L 4)	5 5 C/L	MASS MASS STCW
competences MASS	regarding evaluating (C/L 5) and creating (C/L 6) to improve the human-machine interaction, especially to keep the situational awareness on a high level to apply classification cycles for MASS systems and consider intervention schemes requirements to manage MASS system related certificates The MASS System Administrator (operational level) is able regarding using and applying (C/L 3) and analysing (C/L 4) to use knowledge about shipboard personnel management and	5 5 C/L	MASS MASS STCW



Process M.2	General Management of MASS-ROC Systems		
Operational	to apply effective resource management	3	A-III/6
Level	to apply decision-making techniques	3	A-III/6
	to foster the teamwork and communication in the entire MASS team in ROC and at sea	5	MASS
	to enable teams to work coordinated in different distributed locations	5	MASS
	to identify behaviours of operators in distributed work locations	5	MASS
	to identify the level of situational awareness in a team of operators and to improve in case of loss of sufficient S/A	5	MASS
	to implement and improve systematic decision-making procedures in remote monitoring and control	5	MASS
	to identify too high workloads in the operator and MASS team and to reduce stress levels by appropriate measures	5	MASS
Additional	./.		
comments			

M.3 Risk Management in MASS-ROC-Systems

Process M.3	Risk Management in MASS-ROC-Systems				
Scope of	All types of MASS				
application	A) Dry Cargo – Container Feeder – short sea				
	B) Ferry – RoPax – one hour passage				
	C) Dry Cargo – Bulk Carrier – long distances				
	MASS with crew on board				
	> Shipping company - operations				
	MASS without crew on boar	rd			
	> Remote Operation Ce	entre			
Process objectives	To identify and assess risks in	n the entire MASS ar	nd remote-control systen	ו	
Process	MASS operators in ROC	Level	in ROC	RACI	
operators	> Senior Navigator	> Management	> Planning station	R, A	
-	> Senior Engineer	> Management	> Planning station	R	
Interfaces	> MASS System Administra	tor			
	> MASS System Specialists	(e.g. IT, automation	,)		
	> Shipping Companies - Op	erations			
	> Shipping Companies - Ma	nagement			
Event: input	Starting with hazard identifica	tion (HAZID) in all fie	elds of operation		
Process	> Hazard and risk identificat	ion in all fields of a N	MASS-system		
description	> Risk assessment				
	> Definition of mitigating me				
	> Implementation of measur				
	> Control of effectiveness of	measures			
Resources	Personnel:				
needed	> Manpower of operators ar	nd specialists			
	Equipment:				
	> n/a				
Regulations	According to the field of asses	ssment			
Event: output	Identified risks and implemen	ted mitigating measu	ires		



Process M.3	Risk Management in MASS-ROC-Systems		
Required	The MASS Operator (Navigator, Engineer) (operational level) is	C/L	STCW
competences	able		
Operators	regarding using and applying (C/L 3) and analysing (C/L 4)		
Operational	to use appropriate tools to identify and assess operational risks	4	MASS
Level	in the operation of MASS		
	to determine measures to mitigate operational risks and to	4	MASS
	implement them		
Required	The MASS Senior Operator (Navigator, Engineer)	C/L	STCW
competences	(management level) is able		
Senior	regarding using and applying (C/L 3) and analysing (C/L 4)		
Operators	to identify hazards for the operations of a MASS system,	4	MASS
Management	covering all technical, organisational, and human-related		
Level	aspects		
	to derive risks which may arise by operation of a remote-	4	MASS
	controlled MASS		
	to use appropriate tools to identify and assess operational risks	4	MASS
	in the operation of MASS		
	to determine measures to mitigate operational risks and to	4	MASS
	implement them		
	regarding evaluating (C/L 5) and creating (C/L 6)		
	to identify and evaluate risk levels and to determine	5	MASS
	appropriate mitigation measures by applying systematic risk		
	management tools		
	to set measures in place to reduce risk	5	MASS
	to manage risk mitigating activities	5	MASS
Additional	Risk management is required in all functionalities including navigatio	n, engir	neering,
comments	communication, or integration of humans.		

M.4 Quality Management of MASS-ROC-Systems

Process M.4	Management of	of Quality of MASS-	ROC-Systems	
Scope of	All types of MASS			
application	A) Dry Cargo – Container	Feeder – short sea		
	B) Ferry – RoPax – one h	our passage		
	C) Dry Cargo – Bulk Carri	er – long distances		
	MASS with crew on board	-		
	> In Remote Operation C	Centre		
	MASS without crew on board			
	> In Remote Operation C	entre		
Process	To determine the quality standa	ards for safe operation	ns with an available an	d
objectives	reliable system, to implement a	nd continuously impi	rove them.	
Process	MASS operators in ROC	Level	in ROC	RACI
operators	> Senior Navigator	> Management	> Planning station	R, A
•	> Navigator	> Operational		С
	> Senior Engineer	> Management	> Planning station	R
	> Engineer	> Operational		С
	> System Administrator	> Operational		С
Interfaces	All relevant systems, equipmen	it, persons	1	1
		•		



Process M.4	Management of Quality of MASS-ROC-Systems		
Event: input	Determined quality standards and management reviews		
Process description	> Definition, implementation, and improvement of management sy (but not limited to) Quality of the MASS and ROC system Energy and climate aspects Environmental protection Safety and security systems Occupational health	stems,	such as
Resources needed	Personnel: > Manpower of management, operators, and specialists > Stakeholder's requirements > Interested parties' expectations Equipment: > Inputs of all systems, equipment is needed		
Regulations	Entire regulatory framework		
Event: output	Transparency on all quality standards and a continuous improvement	nt	
Required competences	The MASS Senior Operator (Navigator, Engineer) on management level is able	C/L	STCW
MASS Senior Operators Management Level	regarding using and applying (C/L 3) and analysing (C/L 4) to apply all relevant management systems to determine objectives related to the required standards to communicate the requirements with all stakeholders and	3 4 4	MASS MASS MASS
	interested parties regarding evaluating (C/L 5) and creating (C/L 6) to determine the appropriate organisation and management of the named systems	5	MASS
	to set-up processes for continuous improvement to manage all relevant measures and activities to obtain the determined objectives	5	MASS MASS
	to conduct internal and external audits of MASS and ROC management systems	5	MASS
Required competences MASS	The MASS Operator (Navigator, Engineer, System Administrator) on operational level is able regarding knowledge (C/L 1) and understanding (C/L 2)	C/L	STCW
Operators Operational Level	to explain management systems for quality, energy, environmental protection, safety, and security regarding using and applying (C/L 3) and analysing (C/L 4) to set quality improving measures into place and to communicate them to all involved persons	3	MASS MASS
Additional comments	The development and implementation of management systems is a concerning the entire MASS and ROC system in wider sense. It sha aspects as the operational system, environment, energy, safety, sechuman occupational health.	ıll cont	

Operational Core Processes

1 Voyage Planning & Control

1.1 Voyage Planning

Process 1.1		Voyage Planning					
Scope of	All types of MASS						
application	A) Dry Cargo – Container	Feeder - short sea					
	B) Ferry – RoPax – one hour passage						
	C) Dry Cargo – Bulk Carrier – long distances						
	MASS with crew on board	5					
	> Remote Operation Cer	ntre					
	> On board of MASS	iuo					
	MASS without crew on board	Ī					
Drassa	· · · · · · · · · · · · · · · · · · ·		il it by anasifia assaids				
Process	To plan and prepare a voyage	that a MASS can sa	iii it by specific conside	ration of			
objectives	automation requirements		1				
Process	MASS operators in ROC	Level	in ROC	RACI			
operators	> Senior Navigator	> Management	> Planning station	R, A			
	MASS operators on board	Level	On board				
	> Senior Navigator	> Management	> Planning station	С			
Interfaces	> Commercial office (booking	cargo/pax), charter	ers				
	> Port authorities	, , ,					
	> Port facility operators (term	inals, tugs, stevedor	es, pilots,)				
	> Agencies	, 0,	, , ,				
Event: input	Cargo (type, amount) and port	(POL. POD)					
Zvoriti iriput	Commercial data						
	Automated Port Facilities						
	Navigational Support Systems						
Process	Plan the voyage						
description	Arrangement for navigational r	requirements					
description		equilements					
	> Getting passage permits	Jata					
	> Getting data transmission s						
	> Ensuring of availability of n	•	ems				
	Arrangement of port and fairway facilities						
	> Arrangement for MASS-rela	ated AFS (automation	c facility services)				
	>						
Resources	Personnel		Crew	ROC			
needed	> Operators		X	X			
	Equipment:						
	> MASS IT-system		X	X			
	> Port and passage informati	on	X	X			
Regulations	MASS regulations						
· ·	International shipping law						
	Local shipping law						
Event: output	> Voyage schedule						
c oatpat	> Passage permits and availa	able navigational fac	ilities				
	> Available resources (to ope	•		e \			
Poguired	` .		· · ·	· · · · · · · · · · · · · · · · · · ·			
Required	The MASS Senior Navigator	-	-	STCW			
competences	regarding using and applying (∪/∟ ၖ) and anaiysing	J (U/L 4)				



Process 1.1	Voyage Planning		
MASS Senior	to apply international and national regulatory framework for	3	MASS
Navigator	MASS, ROC and shipping to plan and use automated facilities		
Management	and services at sea and in ports		
Level	to apply national and international regulatory framework for the shore-based operators	3	MASS
	to analyse the requirements for navigation and port operations	3	MASS
	to identify all possible restrictions for MASS system on the specific planned voyage	4	MASS
	to plan schedules for MASS voyages	5	MASS
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS Senior Engineer	to apply international and national regulatory framework for MASS, ROC, and shipping to plan, and use automated	3	MASS
Management Level	facilities and services at sea and in ports to apply national and international regulatory framework for the shore-based operators	3	MASS
Additional	Commercial tasks will be done in the operations department of the s	hippin	g
comments	company. Expertise of navigators is required for specific technical content interfaces for autonomous operation.	oordina	ation of

1.2 Voyage Monitoring & Control

Process 1.2	Voyage Monitoring & Control					
Scope of	All types of MASS	All types of MASS				
application	A) Dry Cargo – Container	A) Dry Cargo – Container Feeder – short sea				
	B) Ferry – RoPax – one h	B) Ferry – RoPax – one hour passage				
	C) Dry Cargo – Bulk Carr	C) Dry Cargo – Bulk Carrier – long distances				
	MASS with crew on board					
	> Remote Operation Cer	ntre				
	> On board of MASS					
	MASS without crew on board	b				
	> Remote Operation Cer	ntre				
Process	To ensure correct functioning of	of the sensors and t	he automation and thus a	a safe		
objectives	operation of the MASS system					
Process	MASS operators in ROC	Level	in ROC	RACI		
operators	> Navigator	> Operational	> Monitoring station	R		
	> Senior Navigator	> Management	> Direct control st.	R, A		
	> Engineer	> Operational	> Monitoring station	R		
	> Senior Engineer	> Management	> Direct control st.	R		
	MASS operators on board	Level	on board	RACI		
	> Senior Navigator	> Management	> Direct control st.	R, A		
	> Navigator	> Operational	> Monitoring station	R		
	> Engineer	> Operational	> Monitoring station	R		
Interfaces	> MASS System Administrate	or				
	> MASS System Specialists	(e.g. IT, automation	,)			
Event: input	> All data (e.g. Sensor Data,	Objectives, Decisio	ns) of the automation sys	stem		

Process 1.2	Voyage Monitoring & Control				
Process	Monitor the correct functioning of all systems of the MASS automation				
description	> Assess correct functioning of sensor system and MASS Situational awareness (MASS SA)				
	> Assess correct functioning of automated navigation system and associated				
	interpretation of SA Information and Decision Making unit				
	> Assess correct functioning of automated control system				
	> Assess correct functioning of autonomous communication system				
	> Assess correct functioning of autonomous emergency resp	onse sy	/stem		
	Take over control if MASS automation reaches its limitations				
Resources	Personnel	Crew	,	ROC	
needed	> Manpower of operators, and specialists	Χ		X	
	Equipment:				
	> MASS automation system (including all systems, data	Χ		X	
	& state of actuators)				
Regulations	MASS flag state regulations				
	MASS local coastal and port state regulations				
	Radiocommunication regulations				
Event: output	> Correct functioning of the automation of the MASS is valida	ited and	lensı	ıred	
	> In cases correct functioning cannot be ensured, control is to	aken ov	er by	the	
	Navigator				
Required	The MASS Navigator (operational level) is able		C/L	STCW	
competences	regarding knowledge (C/L 1) and understanding (C/L 2)				
MASS	to understand the basics of automation and control techniq	ues	2	MASS	
Navigator	to explain and consider the limitations and conditions of		2	MASS	
Operational	automation and control techniques				
Level	to discuss the objectives and systems of the automation		2	MASS	
	to discuss the basics of automation and control systems		2	MASS	
	to explain the limitations of automation, e.g. in challenging		2	MASS	
	traffic situations or weather conditions				
	regarding using and applying (C/L 3) and analysing (C/L 4)				
	to monitor the automation and check whether the automatic	on	4	MASS	
	objectives are being met				
	to intervene if critical deviations and situations occur		4	MASS	
	to monitor and interpret the sensor data of the MASS (take	а	4	MASS	
	proper outlook)				
	to assess the reliability of sensor values		4	MASS	
	to interpret aggregated information of automation and contr	rol	4	MASS	
	techniques appropriately				
	to assess interdependencies between different elements of	f	4	MASS	
	information				
	to interpret errors and critical situations correctly (e.g. espe	cially	4	MASS	
	when dealing with subsequent errors)				
	to communicate as part of a MASS system with other static	ons	4	MASS	
	by using standardised phrases				
	to monitor the communication of the MASS with ROC and		4	MASS	
	automated navigational aids or systems				
Required	The MASS Senior Navigator (mgmt. level) is able		C/L	STCW	
competences	regarding evaluating (C/L 5) and creating (C/L 6)				
MASS Senior	to take over direct control of the MASS (get quickly into the	loop	5	MASS	
Navigator	and adapt quickly to the situation and the vessel involved)				
Management	to adjust and change parameters of the automation		5	MASS	
Level					

Process 1.2	Voyage Monitoring & Control		
Required	The MASS Engineer (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)		
MASS	as Navigator		MASS
Engineer	regarding using and applying (C/L 3) and analysing (C/L 4)		
Operational	as Navigator		MASS
Level	regarding evaluating (C/L 5) and creating (C/L 6)		
	as Navigator		MASS
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences	regarding evaluating (C/L 5) and creating (C/L 6)		
MASS Senior	to take over direct control of the MASS (get quickly into the loop	5	MASS
Engineer	and adapt quickly to the situation and the vessel involved)		
Management	to change parameters of the automation		
Level	to identify and evaluate consequences of changes in the	5	MASS
	voyage	5	MASS
Additional	J.		
comments			

1.3 Voyage Tracking

Process 1.3		Voyage Tracking			
Scope of	All types of MASS	All types of MASS			
application	> Dry Cargo – Container	> Dry Cargo – Container Feeder – short sea			
	> Ferry – RoPax – one he	our passage			
	> Dry Cargo – Bulk Carri	er – long distances			
	MASS with crew on board				
	> Remote Operation Cen	tre			
	> On board of MASS				
	MASS without crew on board				
	> Remote Operation Cen	tre			
Process	To observe the voyage and to r	nanage changes			
objectives					
Process	MASS operators in ROC	Level	in ROC		RACI
operators	> Senior Navigator	> Management	> Planni	ng station	R, A
	MASS operators on board Level On board				
	> Senior Navigator	> Management	> Planni	ng station	С
Interfaces	> Commercial office (booking	cargo/pax), charter	ers		
	> Port authorities				
	> Port facility operators (termi	nals, tugs, stevedo	res, pilots, .)	
	> Agencies				
Event: input	> Changes in voyage schedul	е			
	> Changes in passage permit	s and available nav	igational fac	cilities	
	> Change in available resource	es in each port (be	rth, facilities	s,)	
Process	> Observe the status of MASS	3			
description	> Observe for deviations in vo	yage parameters			
	> Manage changes of voyage	parameters			
Resources	Personnel	Personnel Crew ROC			
needed	> Manpower of management,	operators, and spe	ecialists	X	X
	Equipment:				
	> Commercial IT-system				X
	> Navigational systems (ECD	IS, radar, AIS, sour	nder,)	X	X



Process 1.3	Process 1.3 Voyage Tracking			
	> Information systems (publications, MIS, forecasts, traffic information)	X	X	
D 1."	> Sensor data (MASS status)	Х	X	
Regulations	International regulations			
	MASS flag state regulations			
	Local port regulations			
Event: output	> Revised voyage schedule with all changes of required capab	ilities and	facilities	
Required	The MASS Senior Navigator (management level) is able	C/L	STCW	
competences	regarding using and applying (C/L 3) and analysing (C/L 4)			
MASS Senior	to apply the regulating framework for operations of MASS	3	MASS	
Navigator	to use automated facilities and services at sea and in ports	3	MASS	
Management Level	to analyse the requirements for navigation and port operation regarding evaluating (C/L 5) and creating (C/L 6)	ns 4	MASS	
	to identify all possible restrictions for MASS system on the specific planned voyage	5	MASS	
	to plan schedules for MASS	5	MASS	
	to identify and evaluate consequences of changes in the voyage	5	MASS	
Additional	In general, most of required competences are the same as in pro	ocess 1.1 \	⊥ /oyage	
comments	Planning			

1.4 Voyage Documentation and Analysis

Process 1.4	Voyage Documentation and Analysis				
Scope of	All types of MASS				
application	> Dry Cargo – Containe	> Dry Cargo – Container Feeder – short sea			
	> Ferry – RoPax – one h	nour passage			
	> Dry Cargo – Bulk Carr	rier – long distances	3		
	MASS with crew on board				
	> Remote Operation Ce	ntre			
	> On board of MASS				
	MASS without crew on board	d			
	> Remote Operation Ce	ntre			
Process	To collect all relevant data and	to analyse it for im	provement of the MASS	system	
objectives					
Process	MASS operators in ROC	Level	in ROC	RACI	
operators	> Senior Navigator	> Management	> Planning station	R, A	
	> Senior Engineer	> Management	> Planning station	R	
	> System Administrator	> Operational	> System control st.	R	
	MASS operators on board	Level	on board	RACI	
	> Senior Navigator	> Management	> Planning station	R, C	
Interfaces	> MASS systems				
Event: input	Data of all MASS systems				
Process	> Continuous collecting and	gathering of voyage	related data and information	ation	
description	> Checking data and informa				
	> Analysing data				
	> Storage of data and inform	ation continuously			

Process 1.4	Voyage Documentation and Analysis		
Resources	Equipment in ROC and on board Cr	ew	ROC
needed	> Navigational systems (ECDIS, radar, AIS, sounder,)	<	X
	> Information systems (publications, MIS, forecasts, traffic	<	X
	information)		
	> Sensor data (MASS status)	<	X
	> IT storage and analysis systems		X
Regulations	International regulations		
	MASS flag state regulations		
	Local port regulations		
Event: output	Electronic logbooks with status and performance data for all operation	onal is	sues,
	such as for example:		
	> Navigation and deck		
	> Propulsion and machinery		
	> Safety and security		
	> MASS status and performance		
Required	The MASS Operators (navigator and engineer on operational	C/L	STCW
competences	level) is able		
MASS	regarding using and applying (C/L 3) and analysing (C/L 4)		
Operators	to document and file operational data	3	MASS
Operational	to analyse data indicating performance, availability, and	4	MASS
Level	reliability of all MASS systems		
	to determine data being relevant for operation of a MASS,	4	MASS
	i.e. parameters reflecting operational states of all relevant		
	systems on a MASS		
	to optimise data for evaluation purposes	4	MASS
	to save all data and information of the MASS system	3	MASS
	to prepare regular status reports from operational data	4	MASS
Required	The MASS Senior Navigator (on management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)	O/L	01011
MASS Senior	to determine relevant data for operation of a MASS, i.e.	4	MASS
Navigators	parameters reflecting operational states of all relevant	•	100
Management	systems on a MASS		
Level	to use software tools for data analysis	3	MASS
LOVOI	to use digital platforms	3	MASS
	to determine and measure standards of performance of a	4	MASS
	MASS system		11,5 100
	to map applications and hardware of automation systems	4	MASS
	to field level, control level, or supervisory level respectively	•	
	("Automation Pyramid")		
	regarding evaluating (C/L 5) and creating (C/L 6)		
	to evaluate performance, reliability, and availability of all	5	MASS
	MASS and ROC subsystems		
	to structure and evaluate collected data and information	5	MASS
	to derive baselines and thresholds for equipment from	5	MASS
	operating data that may be used for generating meaningful		
	alarms and events		
	to derive information to analyze the MACC aveter	5	MASS
	to control the performance of a MASS system	5	MASS
	to evaluate the reliability of automation and control		
	systems	5	MASS
	to derive information to analyze the MACC aveter		
	to derive information to analyse the MASS system		

Process 1.4	Voyage Documentation and Analysis		
	to optimise operations of MASS by using digital twins	5	MASS
		5	MASS
Required	The MASS Senior Engineer (on management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS Senior	to determine data being relevant for operation of a MASS,	4	MASS
Engineers	i.e. parameters reflecting operational states of all relevant		
Management	systems on a MASS		
Level	to use software tools for data analysis	3	MASS
	to use digital platforms	3	MASS
	to analyse the automatic control systems by diagnostic	4	MASS
	applications		
	to analyse automatic control systems by using digital twins	4	MASS
	to use robotic systems for inspections on MASS	3	MASS
	 to evaluate performance, reliability, and availability of all MASS and ROC subsystems 	4	MASS
	to map applications and hardware of automation systems	4	MASS
	to field level, control level, or supervisory level respectively		
	("Automation Pyramid")		
	regarding evaluating (C/L 5) and creating (C/L 6)		
	to evaluate the performance of auxiliary and machinery automatic controlled systems	5	MASS
	to evaluate the performance of propulsion automatic	5	MASS
	controlled systems		
	to evaluate the remote-control system for integrity and	5	MASS
	reliability	_	
	to determine and measure standards of performance of a	5	MASS
	MASS system	_	
	to structure and evaluate collected data and information	5	MASS
	to derive baselines and thresholds for equipment from	4 5	MASS MASS
	operating data that may be used for generating meaningful	3	IVIAGG
	alarms and events	5	MASS
	to derive information to analyse the MASS system	5	MASS
	to control the performance of a MASS system	5	MASS
	to evaluate the reliability of automation and control systems		1711/100
	to derive information to analyse the MASS system	5	MASS
	to optimise operations of MASS by using digital twins	5	MASS
Required	The MASS System Administrator (operational level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)	C/L	3100
MASS	to document and file operational data	3	MASS
System	to analyse data indicating performance, availability, and	4	MASS
Administrator	reliability of all MASS systems	'	1717 (00
Operational	to determine data being relevant for operation of a MASS,	4	MASS
Level	i.e. parameters reflecting operational states of all relevant		
	systems on a MASS		
	to optimise data for evaluation purposes	4	MASS
	to save all data and information of the MASS system	3	MASS
	to prepare regular status reports from operational data	4	MASS
	regarding evaluating (C/L 5) and creating (C/L 6)		
	to determine and measure standards of performance of a MASS system	5	MASS
	WAS SUCION	1	1



Process 1.4	Voyage Documentation and Analysis						
	to evaluate performance, reliability and availability of all						
	MASS and ROC subsystems	5	MASS				
	to structure and evaluate collected data and information						
Additional	J.						
comments							



2 Cargo Operations

2.1 Cargo & Persons Embarkation Planning and Preparation

Process 2.1	Cargo & Persons E	Embarkation Plan	ning and Preparation			
Scope of	All types of MASS					
application	> Dry Cargo – Container Feeder – short sea					
	> Ferry – RoPax – one h	our passage				
	> Dry Cargo – Bulk Carri	er – long distances	3			
	MASS with crew on board	· ·				
	> Remote Operation Cer	ntre				
	MASS without crew on board					
	> Remote Operation Cer	ntre				
Process	Ensure a safe loading of the Ma					
objectives	Ensure a safe embarkation of p		rs. maintenance and ser	vice		
,	crew, ship crew)	(,			
Process	MASS operators in ROC	Level	in ROC	RACI		
operators	> Senior Navigator	> Management		R, A		
operatore	> Navigator	> Operational	> Planning station	C		
Interfaces	> Shipping company - operati	· · · · · · · · · · · · · · · · · · ·				
Interfaces	> Terminal, stevedores, port f		p planner			
Event: input	Cargo to be loaded	acililes				
Event: input	Persons to be embarked					
Drasass						
Process	Cargo handling and stowage	d planning of lood;	na and stavious plans			
description	> Identification of cargoes, an	. •	• • •			
A) Feeder	> Identification and planning of	•		argo		
C) Bulker	> Identification and planning of	•	•			
	> Planning of securing of carg	goes and equipmer	זנ			
	Ship condition					
	> Planning preparation of the		_			
	> Preparation of cargo holds	and loading equipn	nent			
	Operation of ship					
	> Planning of ship stability, tri	m and strength inc	luding ballasting			
Process	Cargo handling and stowage					
description	> Identification of vehicles and		~			
B) Ferry						
	> Planning of securing of vehicles					
	Ship condition					
		> Planning of preparation of the ship for loading of vehicles and persons				
	embarkation					
	Operation of ship and care for					
	> Planning of persons boarding	•				
	> Planning of ship stability an	d ballasting				
Resources	Personnel					
needed	> Manpower of terminal					
	Equipment:					
	> MASS technical specification	ons (ship, holds, ha	atch covers, loading and			
	discharging equipment,)					
	> Stability calculator					
	> Loading and Stability Manu	al,				
	> Cargo Securing Manual,					
	,					

Process 2.1	Cargo & Persons Embarkation Planning and Preparat	tion				
	> Ship operational data (bunker, ballast, provisions)					
Regulations	International regulations (SOLAS, CSS, IMDG, IMSBC,)					
	MASS flag state regulations					
	Local port regulations					
	Occupational health and accident prevention regulations					
Event: output	Plan of loading and embarkation,					
	Loading and boarding operations are prepared and can start.					
Required	he MASS Navigator (operational level) is able C/L STCW					
competences	regarding knowledge (C/L 1) and understanding (C/L 2)					
MASS	to explain the ship construction to maintain seaworthiness of	2	A-II/1			
Navigator	the ship					
Operational	to describe different types of MASS and their specific	2	MASS			
Level	constructional differences					
	to explain the handling of cargo on a MASS, e.g. as container,	2	MASS			
	break bulk, bulk, liquid, or Ro-Ro-cargo					
	to describe requirements of specific missions of MASS, e.g. as	2	MASS			
	in research, offshore, or dredging operations					
	to explain the control of persons on board of a MASS	2	MASS			
	regarding using and applying (C/L 3) and analysing (C/L 4)					
	to explain and apply stability issues to maintain seaworthiness	3	A-II/1			
	of the ship					
	to control trim, stability, and stress by using tables, diagrams,	3	A-II/1			
	and stress-calculating equipment					
	to use remote controlled or autonomous systems to control	3	MASS			
	stability, trim, and stress					
	to use remotely controlled or autonomous pumping systems for	3	MASS			
	liquids (ballast water, fuels,) and to control remotely tank					
	filling					
	to monitor remote the ship stability, trim, and stress	3	MASS			
Required	The MASS Senior Navigator (management level) is able	C/L	STCW			
competences	regarding knowledge (C/L 1) and understanding (C/L 2)					
MASS Senior	explain tankers and tanker operations	2	A-II/2			
Navigator	regarding using and applying (C/L 3) and analysing (C/L 4)					
Management	to consider compliance with legislative requirements ensuring	4	A-II/2			
Level	safe cargo handling (as CSS-Code, IMDG-Code, IMSBC-					
	Code, MARPOL, accident prevention)					
	regarding evaluating (C/L 5) and creating (C/L 6)					
	to plan a safe loading and stowage, taking all cargo properties	5	A-II/2			
	into account					
	to plan a safe securing of cargoes	5	A-II/2			
	to plan trim, stability, and stress by using tables, diagrams, and	5	A-II/2			
	automatic data-based equipment					
	to plan and set the parameters for stability conditions of a	5	MASS			
	MASS passage					
	to control trim, stability, and stress in regard of fundamental	5	A-II/2			
	principles of ship construction, theories, and affecting factors					
	to plan the carriage of dangerous cargo according to IMDG and	5	A-II/2			
	IMSBC Codes					
	to plan and control automated cargo and mission operations	5	MASS			
	to evaluate the stability and reliability of the MASS	5	MASS			
	to evaluate the reliability of the remote stability control system	5	MASS			



Process 2.1	Cargo & Persons Embarkation Planning and Preparation					
	to plan procedures and control of passengers and other 5 MAS					
	persons on board of a MASS to ensure a safe carriage					
Additional	All three use cases of the study require the same competences.					
comments	The task of cleaning the holds of a bulk carrier is not covered by this process and					
	needs a riding crew unless technologies for cargo hold cleaning are available					

2.2 Cargo Loading & Persons Embarkation

Process 2.2	Cargo Loa	ading & Persons En	nbarkation				
Scope of	All types of MASS						
application	> Dry Cargo – Container Feeder – short sea						
	> Ferry – RoPax – one h	our passage					
	> Dry Cargo – Bulk Carri	er – long distances					
	MASS with crew on board	-					
	> Remote Operation Cer	ntre					
	MASS without crew on board						
	> Remote Operation Cer	ntre					
Process	Operate a safe loading of the N	MASS					
objectives	Operate a safe embarkation of	persons (passengers	s, maintenance and ser	vice			
	crew, ship crew)						
Process	MASS operators in ROC	Level	in ROC	RACI			
operators	> Senior Navigator	> Management	> Cargo control st.	R, A			
	> Navigator	> Operational	> Cargo control st.	R			
Interfaces	> Shipping company - operati	ons, charterer, ship	planner				
	> Terminal operators, stevedo						
	> Auditors						
Event: input	Start of cargo loading or persor	ns embarkation					
Process	Cargo handling and stowage						
description	> Monitor and control loading	operations					
A) Feeder	> Monitor and control securin	g operations					
B) Ferry	> Monitor for cargo damages	and document if any					
C) Bulker	Ship condition						
	> Prepare loading systems (e	.g. hatch covers, ran	nps, doors conveyors,)			
	> Prepare gangways and ship	o-shore-connections	to MASS				
	> Check MASS and equipme	nt for defects and da	mages				
	Operation of ship and care for p	persons					
	> Ensuring security (ISPS)						
	> Confirming cargo loaded in the documentation						
	> Boarding and counting of crew and passengers						
	> Ballasting when loading, control of stability, trim, and stress						
	> Monitor ship-shore-connect	ions					
Resources	Personnel						
needed	> Manpower of terminal						
	Equipment						
	> MASS technical specification	ons (ship, holds, hatc	h covers, loading and				
	discharging equipment,)						
	> Stability calculator,						
	> Loading and Stability Manu	al,					
	> Cargo Securing Manual,						
	> Cargo information,						
	> Ship operational data (bunk	ker, ballast, provision	s)				



Process 2.2	Cargo Loading & Persons Embarkation				
Regulations	International regulations (SOLAS, CSS, IMDG, IMSBC,)				
	MASS flag state regulations				
	Local port regulations				
	Occupational health and accident prevention regulations				
Event: output	End of loading and embarkation, all cargo without any damages and safely on board	l perso	ns		
Required	The MASS Navigator (operational level) is able	C/L	STCW		
competences	, ,				
MASS	to explain the ship construction to maintain seaworthiness of	2	A-II/1		
Navigator	the ship		Δ-11/ 1		
Operational	regarding using and applying (C/L 3) and analysing (C/L 4)				
Level	to explain and apply stability issues to maintain seaworthiness	3	A-II/1		
	of the ship				
	to monitor a safe loading and stowage	3	A-II/1		
	to monitor cargo securing	3	A-II/1		
	to inspect and report defects and damages to cargo spaces,	3	A-II/1		
	hatch covers, and ballast tanks				
	to monitor compliance with legislative requirements	3	A-II/1		
	to monitor cargo or mission related equipment by remote	3	MASS		
	control				
	to monitor the interfaces of the MASS to terminal and port	3	MASS		
	operations	3	MASS		
	to support cargo or mission operations by providing all required information to other parties involved		IVIAGO		
	to monitor persons (crew and passengers) on the MASS	3	MASS		
	to monitor and check specific MASS systems (automated	3	MASS		
	berthing systems, ship-shore-connections, cargo operation				
	remote monitoring systems)				
	to understand and monitor person identification and counting	3	MASS		
	devices to control access to the MASS				
	to inspect a MASS for structural damages and report these when the MASS is in the port.	4	MASS		
Required	The MASS Senior Navigator (management level) is able	C/L	STCW		
competences	regarding using and applying (C/L 3) and analysing (C/L 4)	0,2	0.00		
MASS Senior	to consider compliance with legislative requirements ensuring	4	A-II/2		
Navigator	safe cargo handling (as CSS-Code, IMDG-Code, IMSBC-		, , , , , ,		
Management	Code, MARPOL, IS-Code, accident prevention)				
Level	regarding evaluating (C/L 5) and creating (C/L 6)				
	to ensure and operate a safe loading and stowage, taking all	5	A-II/2		
	cargo properties into account				
	to ensure a safe securing and handling of cargoes	5	A-II/2		
	to control trim, stability, and stress by using tables, diagrams,	5	A-II/2		
	and automatic data-based equipment				
	to control trim, stability, and stress in regard of fundamental	5	A-II/2		
	principles of ship construction, theories, and affecting factors	_			
	to assess reported defects and damage to cargo spaces, hatch	5	A-II/2		
	covers, and ballast tanks and take appropriate action	_	A 11/0		
	to load dangerous cargo according to IMDG and IMSBC	5	A-II/2		
	Codes	5	MASS		
	to evaluate the stability and reliability of the remote stability		IVIAGG		
	control system to evaluate the stability and reliability of the MASS	5	MASS		
	to evaluate the stability and reliability of the MASS		IVIAGO		



Process 2.2	Cargo Loading & Persons Embarkation					
	to evaluate the reliability of the remote stability control system	5	MASS			
	to handle luggage and personal effects safely	5	MASS			
	to perform remote inspections of the structure and deck equipment	3	MASS			
	to evaluate defects or damages of a MASS	5	MASS			
	to initiate corrective measures to ensure safe cargo and mission operations	5	MASS			
	regarding communication and cooperation					
	to establish effective communication and working relationship between ship and terminal personnel	5	A-II/2			
	to coordinate all activities to control stability, trim, and strength of a MASS	5	MASS			
Additional	The required competences regarding to the loading and boarding pro	ocesse	es are			
comments	the same for each MASS use case. The differences are determined provisions.	by the	cargo			

2.3 Cargo Care & Persons Control at Sea

Process 2.3	Cargo Care & Persons Control at Sea				
Scope of	All types of MASS				
application	> Dry Cargo – Container	Feeder – short sea			
	> Ferry – RoPax – one h	our passage			
	> Dry Cargo – Bulk Carri	er – long distances			
	MASS with crew on board				
	> Remote Operation Cer	ntre			
	MASS without crew on board				
	> Remote Operation Cer				
Process	Safe carriage of cargo and pers	sons on board			
objectives					
Process	MASS operators in ROC	Level	in	ROC	RACI
operators	> Senior Navigator	> Management	>	Cargo control st.	R, A
	> Navigator	> Operational	>	Cargo control st.	R
Interfaces	> Shipping company, Fleet O	peration Centre			
Event: input	Commence of voyage				
Process	Cargo care				
description	> Monitoring of cargo, securir	ng of containers			
A) Feeder	> Monitoring of dangerous ca	•			
C) Bulker	> Monitoring of temperatures		reef	er containers	
	> Control of ventilation of carg	go holds			
	Control of persons on board				
	> Monitoring of persons on bo				
	> Monitoring of ambient cond			3	
	> Providing provisions, servic	es, and accommoda	ition		
Process	Cargo care				
description	> Monitoring of cargo, securir	_			
B) Ferry	> Control of ventilation of carg	go holds			
	Control of persons on board				
	> Monitoring of persons on bo		-		-
	> Monitoring of ambient cond	ilions in accommoda	เนอทร	s and public spaces	;

Process 2.3	Cargo Care & Persons Control at Sea				
	> Providing of provisions and convenience services				
	> Cleaning and hygienic services				
Resources needed	Personnel > Manpower of ratings and service crew Equipment > Cargo information > Ship operational data (bunker, ballast, provisions)				
Regulations	International regulations (SOLAS, CSS, IMDG, IMSBC,) MASS flag state regulations Occupational health and accident prevention regulations				
Event: output	No damages of cargo and safely disembarked persons				
Required competences	The MASS Navigator (operational level) is able regarding using and applying (C/L 3) and analysing (C/L 4)	C/L	STCW		
MASS Navigator	to use remote controlled or autonomous systems to control stability, trim, and stress	3	MASS		
Operational Level	to use remotely controlled or autonomous pumping systems for liquids (ballast water, fuels,) and to remotely control tank filling	3	MASS		
	to monitor remote the ship stability, trim, and stress	3	MASS		
	to apply and monitor sensor-based cargo monitoring systems	3	MASS		
Required competences	The MASS Senior Navigator (management level) is able regarding evaluating (C/L 5) and creating (C/L 6)	C/L	STCW		
MASS Senior	to ensure safe stowage, securing, and care during the voyage	5	A-II/2		
Navigator Management	to care about dangerous cargo according to IMDG and IMSBC Codes	5	A-II/2		
Level	to control trim, stability, and stress in regard of fundamental principles of ship construction, theories, and affecting factors	5	A-II/2		
	to take care of cargo and missions on a MASS when at sea and to initiate all required remote-controlled activities for a safe shipment or execution of tasks	5	MASS		
	to evaluate the stability and reliability of the remote stability control system	5	MASS		
	to evaluate the stability and reliability of the MASS	5	MASS		
	to evaluate remotely hazards to the MASS in the seaway, the cargo, and persons on board, and to establish appropriate measures	5	MASS		
	to evaluate remotely hazards to the cargo and persons on board, and to establish appropriate measures	5	MASS		
	to control persons and passengers, and monitor passengers on board remotely	5	MASS		
	to evaluate the behaviour of persons on board by remote observations	5	MASS		
	to establish a communication between ROC and MASS areas with persons on board	4	MASS		
	to organise the care for persons and passengers on board of the MASS	4	MASS		
	to monitor passenger and accommodation areas to ensure safety of persons	4	MASS		
Additional comments	The care of persons on board of a ferry needs a service crew				



2.4 Cargo Discharging & Persons Disembarkation

Process 2.4	Cargo Discha	rging & Persons Di	sembarkation			
Scope of	All types of MASS					
application	> Dry Cargo – Container Feeder – short sea					
	> Ferry – RoPax – one ho	our passage				
	> Dry Cargo – Bulk Carrie	er – long distances				
	MASS with crew on board	· ·				
	> Remote Operation Cen	tre				
	MASS without crew on board					
	> Remote Operation Cen	tre (planning station))			
Process	Operate a safe discharging of the		<u>'</u>			
objectives	Operate a safe disembarkation		ers, maintenand	e and	service	
,	crew, ship crew)	o. po. co	, 5. 5,5			
Process	MASS operators in ROC	Level	in ROC		RACI	
operators	> Senior Navigator	> Management	> Cargo cont	rol st	R, A	
operators	> Navigator	> Operational	> Cargo conf		R	
Interfaces	01111				11	
IIILEITACES			naillei			
		res, port racilities				
F						
Event: input	Start of cargo discharging or pe	rsons disemparkatio	n			
Process	Cargo handling					
description	> Monitor and control prepara					
A) Feeder	> Monitor and control discharg	ging operations				
B) Ferry	Ship condition					
C) Bulker	> Prepare loading systems (e.g. hatch covers, ramps, doors, conveyors,)					
	> Prepare gangways and ship	-shore-connections t	to MASS			
	> Check MASS and equipmer	nt for defects and dar	mages			
	Operation of ship and care for p	ersons				
	> Ensuring security (ISPS)					
	> Disembarking and counting	of leaving crew and	passengers			
	> Ballasting when loading, cor	ntrol of stability, trim,	and stress			
	> Monitor ship-shore-connecti	ons				
Resources	Personnel					
needed	> Manpower of terminal					
	Equipment					
	> MASS technical specificatio	ns (ship, holds, hatc	h covers, loadin	g and		
	discharging equipment,)	•				
	> Stability calculator					
	> Loading and Stability Manual,					
	> Cargo Securing Manual,	,				
	> Cargo information,					
	> Ship operational data (bunk	er ballast provisions	s)			
Regulations	International regulations (SOLA	· · ·	<u>, </u>			
i togulations	MASS flag state regulations	o, ooo, iivibo, iivioi	JO, <i>)</i>			
	Local port regulations					
	Occupational health and accide	nt prevention require	tions			
Eventi eutnut					oroono	
Event: output	End of discharging and disemba	arking all cargo witho	out any damages	ь апи р	ersons	
Doguirod	safely from board	anal laval\ ia abla		CII	QTC\A/	
Required	The MASS Navigator (operation	•		C/L	STCW	
competences	regarding knowledge (C/L 1) an		,		A 11/4	
MASS	to explain the ship construct	tion to maintain seaw	vortniness of	2	A-II/1	
Navigator	the ship					

Process 2.4	Cargo Discharging & Persons Disembarkation		
Operational	regarding using and applying (C/L 3) and analyzing (C/L 4)		
Level	to explain and apply stability issues to maintain seaworthiness	3	A-II/1
	of the ship		
	to monitor a safe unloading	3	A-II/1
	to monitor cargo un-securing	3	A-II/1
	to inspect and report defects and damages to cargo spaces,	3	A-II/1
	hatch covers and ballast tanks		A-II/1
	to monitor compliance with legislative requirements	3	A-II/1
	to monitor cargo or mission related equipment by remote	3	MASS
	control to monitor the interfaces of the MASS to terminal and port operations	3	MASS
	to support cargo or mission operations by providing all required information to other parties involved	3	MASS
	to monitor persons (crew and passengers) on the MASS	3	MASS
	to magnitude and about an arific MACC avetages (avetagestad	3	MASS
	berthing systems, ship-shore-connections, cargo operation		
	remote monitoring systems)	3	MASS
	to use remote controlled or autonomous systems to control stability, trim, and stress	3	IVIAGG
	to use remotely controlled or autonomous pumping systems for liquids (ballast water, fuels,), and to control remotely tank	3	MASS
	filling	_	NAACC
	to monitor remote the ship stability, trim, and stress	3 4	MASS MASS
	to inspect a MASS for structural damages and report these when the MASS is in the port.	_	WIAGO
Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)	J , _	0.00
MASS Senior	to consider compliance with legislative requirements ensuring	4	A-II/2
Navigator	safe cargo handling (as CSS-Code, IMDG-Code, IMSBC-	•	7 11/2
Management	Code, MARPOL, IS-Code, accident prevention)		
Level	regarding evaluating (C/L 5) and creating (C/L 6)		
20101	to ensure and operate a safe discharging, taking all cargo	5	A-II/2
	properties into account		7
	to ensure a safe un-securing and handling of cargoes	5	A-II/2
	to control trim, stability, and stress by using tables, diagrams	5	A-II/2
	and automatic data-based equipment		7, _
	to control trim, stability, and stress in regard of fundamental	5	A-II/2
	principles of ship construction, theories, and affecting factors		7, _
	to evaluate the stability and reliability of the MASS	5	MASS
	to evaluate the reliability of the remote stability central system	5	MASS
	to passed reported defects and demand to parago spaces, batch	5	A-II/2
	covers, and ballast tanks, and take appropriate action		
	to discharge dangerous cargo according to IMDG and IMSBC Codes	5	A-II/2
	to evaluate the stability and reliability of the remote stability	5	MASS
	control system to handle luggage and personal effects safely	5	MASS
	regarding communication and cooperation		
	to establish effective communication and working relationship	5	A-II/2



Process 2.4	Cargo Discharging & Persons Disembarkation			
	to coordinate all activities o control stability, trim and strength	5	MASS	
	of a MASS			
Additional	The required competences regarding the loading and boarding process are the			
comments	same for each MASS use case. The differences are determined by the cargo			
	provisions.			



3 Navigation

3.1 Navigation when Leaving Port

3.1.1 Passage Planning

Process 3.1.1	Navigation whe	n Leaving Port - Pa	ssage Plannii	ng	
Scope of	All types of MASS				
application	A) Dry Cargo – Container Feeder – short sea				
	B) Ferry – RoPax – one hour passage				
	C) Dry Cargo – Bulk Carrier – long distances MASS with crew on board > Remote Operation Centre				
	MASS without crew on board				
	> Remote Operation Cer				
Process	To prepare a passage plan from	n berth to berth			
objectives	MAGO ANAMATAN IN DOG		: DOO		DAOL
Process	MASS operators in ROC	Level	in ROC	. 4 . 12	RACI
operators	> Senior Navigator	> Management	> Planning		R, A
	> Navigator	> Operational	> Planning		С
	> Senior Engineer	> Management	> Planning	station	R
Interfaces	> Shipping company - operat	ions, charterer, ship p	olanner		<u>'</u>
	> Navigational data provider	(weather forecasts, e	lectronic chart	s,)	
Event: input	Order to sail from the port of de	eparture to the port of	destination		
Process	Plan the passage :				
description	> Prepare the passage plan (waypoints, courses, speed)				
	> Determine and plan specific manoeuvres				
	> Consider environmental conditions, water depth, obstructions, etc.				
	> Determine communication	•			
	> Update all navigational data	a as electronic naviga	ational charts,	nautical	
	publications, MSI,				
	 Check availability of navigational systems and plan probable required maintenance Confirmation and release of passage plan by MASS Master or Supervise 				
December		T passage plan by MA	ASS Master or	Supervi	sor
Resources needed	Equipment:				
needed	> Navigational systems, e.g., > Publications	ECDIS			
	> Publications Information and Data:				
	> Voyage schedule				
	> Navigational data, MIS, weather forecasts				
	> Data for updating of navigational systems (charts, publications)				
	> MASS status (navigational, propulsion, persons on board, draught,)				
Regulations	International regulations (COLREG,)				
MASS flag state traffic regulations					
	Local port state and coastal sta				
Event: output	Prepared and approved passa				
Required	The MASS Navigator (operation			C/L	STCW
competences	regarding knowledge (C/L 1) a		,		
MASS	to understand radar and AF	RPA regarding perfor	mance, use,	2	A-II/1
Navigator	types and limitations				

Process 3.1.1	Navigation when Leaving Port - Passage Planni	ng	
Operational	to understand ECDIS regarding capabilities and limitations	2	A-II/1
Level	regarding using and applying (C/L 3) and analysing (C/L 4)		
	to plan a passage by applying terrestrial and coastal	3	A-II/1
	navigation		
	to plan a passage by using electronic systems	3	A-II/1
	to plan a passage by using and interpreting meteorological	4	A-II/1
	information		
	to prepare a passage plan	3	A-II/1
	to use radar and ARPA to maintain safety of navigation	3	A-II/1
	to operate radar navigation by interpreting and analysing radar and ARPA information	4	A-II/1
	to operate ECDIS by interpreting and analysing of	4	A-II/1
	information obtained from ECDIS		
	to plan a passage with consideration of MASS relevant	4	MASS
	communication and data transfer demands		
	to plan a passage with consideration of MASS relevant	4	MASS
	navigational aids		
	to prepare all navigational and communication systems of a	4	MASS
	MASS for operation, as updates and settings		
Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences	regarding evaluating (C/L 5) and creating (C/L 6)		
MASS Senior	to plan a passage for all conditions by using all acceptable	5	A-II/2
Navigator	methods of plotting ocean tracks		
Management	to determine positions and assess accuracy of the resultant	5	A-II/2
Level	position fix by terrestrial observations	_	A 11/0
	to determine positions and assess accuracy of the resultant	5	A-II/2
	position fix by modern electronic navigational aids	_	A 11/0
	to establish watchkeeping arrangements and procedures	5 5	A-II/2 A-II/2
	to maintain safe navigation through the use of information	3	A-11/2
	from navigation equipment and systems to assist command decision making		
	to maintain the safety of navigation through the use of	5	A-II/2
	ECDIS and associated navigation systems to assist		Λ-11/2
	command decision making		
	to foregot weether and accomparable conditions	5	A-II/2
	to evaluate and release a necessary plan for a MACC	5	MASS
	to evaluate and release a passage plan for a MASS to evaluate provided navigational data and information with	5	MASS
	respect to the demands of a MASS		
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences	regarding evaluating (C/L 5) and creating (C/L 6)		
MASS Senior	to plan a passage of a MASS with specific evaluation and	5	MASS
Engineer	consideration of energy consumption		
Management	to plan a passage of a MASS with specific evaluation and	5	MASS
Level	consideration of availability of propulsion and auxiliary		
	systems		
Additional	J.		1
/ taaitionai	,		



3.1.2 Departure / De-Berthing

Process 3.1.2	Navigation when Leaving Port - Departure / De-Berthing				
Scope of	All types of MASS				
application	A) Dry Cargo – Container	Feeder – short sea			
	B) Ferry – RoPax – one h	our passage			
	C) Dry Cargo – Bulk Carrier – long distances				
	MASS with crew on board				
	> Remote Operation Centre				
	MASS without crew on board				
	> Remote Operation Cer				
Process	To leave the berth safely and t				
objectives	_				
Process	MASS operators in ROC	Level	in ROC		RACI
operators	> Senior Navigator	> Management	> Direct contro	ol st.	R, A
'	> Navigator	> Operational	> Direct contro	ol st.	Ċ
Interfaces	> Navigational data provider				
mioriacce	> Port control	(Wodiner Torocacie, c	noon onno onanto, .	,	
	> Local port AFS, Local port	facilities			
	> Local pilot (remote or on bo				
Event: input	Order for departure	bara)			
Process	Prepare leaving berth -> 'ready	, to go'			
		_	rome and controls	for int	o arity
description	> Check systems and mainta		ems and controls	IOI IIIL	egnty
	and availability for de-berthing				
	> Get port clearance				
	> Ensure watertight integrity				
	> Check for all people from board and all PAX and service crew on board				
	> Change to autonomous operations				
	> Disconnect all in autonomo	ous or manual mode	(power, water, fue	el,	
	gangway,)				
	Leaving				
	 Monitor the MASS manoeuvres in autonomous mode. Change to direct control if required by system or situation or environmental 				
		required by system o	r situation or envi	ronme	ntai
	conditions				
	> Let-go all (release MASS, s				
	> Incorporate pilot (on board or by remote advice)				
	> Manoeuvre MASS to fairwa	ау			
Resources	Equipment on board				
needed	> Navigational systems (ECDIS, radar, AIS, sounder, specific positioning				
	system,)				
	> Information systems (public		ts, traffic informat	ion)	
	> Sensor data (MASS status)	<u></u>			
Regulations	International regulations (COL	•			
	MASS flag state traffic regulations				
	Local port state and coastal sta				
Event: output	MASS is de-berthed and is in p	position to start pilota	ge		
Required	The MASS Navigator (operat	ional level) is able		C/L	STCW
competences	regarding knowledge (C/L 1) a	•			
MASS	to understand radar and Af		•	2	A-II/1
Navigator	types, and limitations		, 450,	_	
Operational	to understand ECDIS regar	rding capabilities and	Llimitations	2	A-II/1
Level	to explain the manoeuvring	• .		2	A-II/1
LOVOI	to explain the manoeuvillig	g and nanding of a Si	יוץ		/\-(1)/ I

Process 3.1.2	Navigation when Leaving Port - Departure / De-Berthing				
1100000 01112	to discuss the application of MASS-specific systems and their	2	MASS		
	use for autonomous ships	_	100		
	to explain the handling of a MASS regarding the mooring	2	MASS		
	equipment and the use of automated port facilities	_			
	regarding using and applying (C/L 3) and analysing (C/L 4)				
	to conduct a passage and determine a position by using	3	A-II/1		
	electronic systems				
	to conduct a passage and determine a position by using echo-	3	A-II/1		
	sounders				
	to conduct a passage and determine a position by using	3	A-II/1		
	magnetic and gyro compasses				
	to conduct a passage by using and adjusting steering control	3	A-II/1		
	systems				
	to conduct a passage by using and interpreting meteorological	4	A-II/1		
	information				
	to maintain a safe navigational watch by analysing traffic	4	A-II/1		
	situations and applying the international Regulations for				
	Preventing Collisions at Sea				
	to maintain a safe navigational watch by using all equipment,	3	A-II/1		
	provisions, information, regulations, principles, techniques, and				
	procedures for watchkeeping				
	to maintain a safe navigational watch by applying bridge	3	A-II/1		
	resource management principles				
	to use radar and ARPA to maintain safety of navigation	4	A-II/1		
	to operate radar navigation by interpreting and analysing radar	4	A-II/1		
	and ARPA information				
	to operate ECDIS by interpreting and analysing of information	4	A-II/1		
	obtained from ECDIS				
	to operate the navigational and communication system of a	3	MASS		
	MASS				
	to explain the handling of a MASS regarding the mooring	2	MASS		
	equipment and the use of automated port facilities				
	to use specific navigational aids for MASS	3	MASS		
	to use remotely all navigational tools to verify and assess the	4	MASS		
	MASS position, course, and speed				
	to interpret remotely the environmental conditions and to verify	4	MASS		
	and assess the status of the MASS in the sea				
	to monitor and operate the data and information exchange	4	MASS		
	between MASS and all relevant stations	4	MACC		
	to monitor and operate sensor systems by interpretation and	4	MASS		
	analysing reliability of provided information	4	MACC		
	to monitor the automated functionalities of a MASS	4	MASS MASS		
	to analyse and adjust automated systems in terms of	4	IVIASS		
	navigational parameters	4	MASS		
	to take over the manual control from automated systems in all	4	IVIAGG		
D	situations	0"	070:		
Required	The MASS Senior Navigator (management level) is able	C/L	STCW		
competences	regarding evaluating (C/L 5) and creating (C/L 6)	_	A 11/0		
MASS Senior	to determine positions and assess accuracy of resultant	5	A-II/2		
Navigator	position fix by terrestrial observations	_	A 11/0		
Management	to determine positions and assess accuracy of the resultant	5	A-II/2		
Level	position fix by modern electronic navigational aids				



Process 3.1.2	Navigation when Leaving Port - Departure / De-Berthi	ng	
	to determine and allow for compass errors (magnetic and gyro)	5	A-II/2
	to establish watchkeeping arrangements and procedures		
	to maintain safe navigation through the use of information from	5	A-II/2
	navigation equipment and systems to assist command decision making	5	A-II/2
	to maintain the safety of navigation through the use of ECDIS and associated navigation systems to assist command decision making	5	A-II/2
	to forecast weather and oceanographic conditions	5	A-II/2
	to manoeuvre and handle a ship in all conditions, especially	5	A-II/2
	when unberthing or undocking and when using tugs		
	to manoeuvre and handle a ship in all conditions, especially manoeuvring in restricted and shallow waters	5	A-II/2
	to take over the command by changing from automated to	5	MASS
	manual mode of a MASS to communicate remotely with port services when berthing or unberthing	4	MASS
	to berth and unberth a MASS based on sensor data	5	MASS
	to handle a MASS safely in all manoeuvres as berthing, anchoring, fairway and sea passages	5	MASS
	to handle a MASS according to environmental influences	5	MASS
	to evaluate and ensure the data and information exchange between MASS and all relevant stations	5	MASS
	to evaluate the reliability of data and information provided by	5	MASS
	sensor systems to coordinate and adjust the different automated functionalities	5	MASS
	of a MASS to analyse and adjust automated systems in terms of navigational parameters	5	MASS
Additional comments	J.	L	1

3.2 Navigation on Pilotage - Outbound

Process 3.2	Naviga	tion on Pilotage - O	outbound	
Scope of	All types of MASS			
application	A) Dry Cargo – Containe	r Feeder – short sea		
	B) Ferry – RoPax – one h	nour passage		
	C) Dry Cargo – Bulk Carrier – long distances			
	MASS with crew on board			
	> Remote Control Centr	е		
	MASS without crew on board			
	> Remote Control Centr	e (direct control)		
Process	To navigate the MASS safely through restricted waters in pilotage conditions			
objectives				
Process	MASS operators in RCC	Level	in RCC	RACI
operators	> Senior Navigator	> Management	> Direct control st.	R, A
	> Navigator	> Operational	> Direct control st.	R
Interfaces	> Navigational data provider	(weather forecasts,	electronic charts, naviga	tional
	aids,)			
	> Port control			

Process 3.2	Navigation on Pilotage - Outbound			
	> Local port AFS, Local port facilities			
	> Local pilot (remote or on board)			
	> Other ships, VTS			
Event: input	Commence of pilotage			
Process	Navigate the MASS through restricted waters:			
description	> Change to autonomous mode and monitor the MASS condit	ions		
	> Monitor position of MASS and water depth			
	 Monitor the traffic situation Monitor the movement of the MASS and identify influences such as by 			
	currents, wind impact squat, interactions, etc	such a	s by	
	> Change to direct control if required by system, situation, or e	nviron	mental	
	conditions	,11011011	mentai	
	> Incorporate the pilot (on board or remotely) and take pilots a	dvice		
	coordinate with MASS system	u 1100,		
Resources	Equipment on board			
needed	> Navigational systems (ECDIS, radar, AIS, sounder, local position	ing sy	stems,	
)			
	> Information systems (publications, MIS, forecasts, traffic informations)	tion)		
	> Sensor data (MASS status)			
Regulations	International regulations (COLREG,)			
	MASS flag state traffic regulations			
	Local port state and coastal state traffic regulations			
Event: output	End of pilotage outbound, commence of sea passage			
Required	The MASS Navigator (operational level) is able	C/L	STCW	
competences	regarding knowledge (C/L 1) and understanding (C/L 2)	_		
MASS	to understand radar and ARPA regarding performance, use,	2	A-II/1	
Navigator	types, and limitations	2	A 11/4	
Operational Level	to understand ECDIS regarding capabilities and limitations to explain the manoeuvring and handling of a ship	2 2	A-II/1 A-II/1	
Level	to explain the manoeuving and nanding of a snip to explain the navigational and communication system of a	2	MASS	
	MASS	_	1017 (00	
	regarding using and applying (C/L 3) and analysing (C/L 4)			
	to conduct a passage and determine a position by applying	2	MASS	
	terrestrial and coastal navigation			
	to conduct a passage and determine a position by using electronic systems	3	A-II/1	
	to conduct a passage and determine a position by using echo-	3	A-II/1	
	sounders		, , , , ,	
	to conduct a passage and determine a position by using	3	A-II/1	
	magnetic and gyro compasses			
	to conduct a passage by using and adjusting steering control	3	A-II/1	
	systems			
	to conduct a passage by using and interpreting meteorological information	3	A-II/1	
	to maintain a safe navigational watch by analysing traffic	4	A-II/1	
	situations and applying the international Regulations for			
	Preventing Collisions at Sea			
	to maintain a safe navigational watch by using all equipment,	4	A-II/1	
	provisions, information, regulations, principles, techniques, and			
	procedures for watchkeeping			

Process 3.2	Navigation on Pilotage - Outbound		
	to maintain a safe navigational watch by applying bridge	3	A-II/1
	resource management principles		
	to use radar and ARPA to maintain safety of navigation	3	A-II/1
	to operate radar navigation by interpreting and analysing radar and ARPA information	3	A-II/1
	to operate ECDIS by interpreting and analysing of information obtained from ECDIS	4	A-II/1
	to apply collision-avoidance regulations for a MASS	4	MASS
	to use specific navigational aids for MASS	3	MASS
	to use all navigational tools remotely to verify and assess the MASS position, course and speed	4	MASS
	to interpret the environmental conditions remotely and to verify and assess the status of the MASS in the sea	4	MASS
	to initiate manageures of the MACC to avoid collisions	4	MASS
	to initiate manoeuvies of the MASS to avoid collisions to control the speed and course remotely according to the	4	MASS
	manoeuvring parameters of the MASS		
	To take-over control according to levels of alarm	4	MASS
	to monitor and operate the data and information exchange	4	MASS
	between MASS and all relevant stations		
	to monitor cellular and satellite communication networks	4	MASS
	to monitor and operate sensor systems by interpretation and	4	MASS
	analysing reliability of provided information		
	to monitor the automated functionalities of a MASS	4	MASS
	to analyse and adjust automated systems in terms of	4	MASS
	navigational parameters		
	to take control from automated systems according to alarm	4	MASS
	levels		
Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences	regarding evaluating (C/L 5) and creating (C/L 6)		
MASS Senior	to determine positions and assess accuracy of resultant	5	A-II/2
Navigator	position fix by terrestrial observations		
Management Level	to determine positions and assess accuracy of resultant position fix by modern electronic navigational aids	5	A-II/2
	to determine and allow for compass errors (magnetic and gyro)	5	A-II/2
	to establish watchkeeping arrangements and procedures	5	A-II/2
	to maintain safe navigation through the use of information from	5	A-II/2
	navigation equipment and systems to assist command decision making		
	to maintain the safety of navigation through the use of ECDIS and associated navigation systems to assist command decision	5	A-II/2
	making	_	A 11/0
	to forecast weather and oceanographic conditions	5	A-II/2
	to manoeuvre and handle a ship in all conditions, especially	5	A-II/2
	when unberthing or undocking, and when using tugs to manoeuvre and handle a ship in all conditions, especially	5	A-II/2
	manoeuvring in restricted and shallow waters to take over command by changing from automated to manual	5	MASS
	mode of a MASS		
	to manoeuvre a MASS based on sensor data	5	MASS
	to evaluate and ensure the data and information exchange between MASS and all relevant stations	5	MASS
	Detween MVOO and all relevant stations		



Process 3.2	Navigation on Pilotage - Outbound		
	to evaluate the reliability of data and information provided by sensor systems	5	MASS
	to coordinate and adjust the different automated functionalities of a MASS	5	MASS
	to analyse and adjust automated systems in terms of navigational parameters	5	MASS
Additional	J.		
comments			

3.3 Navigation on Sea Passage

Process 3.3	Nav	igation on Sea Pas	sage			
Scope of	All types of MASS					
application	A) Dry Cargo – Container	Feeder – short sea				
	B) Ferry – RoPax – one h					
	C) Dry Cargo – Bulk Carri					
	MASS with crew on board	3				
	> Remote Control Centre)				
	MASS without crew on board					
	> Remote Control Centre	(monitoring station)				
Process	To navigate the MASS safely o	<u> </u>				
objectives		1 0	Ŭ			
Process	MASS operators in RCC	Level	in RCC	RACI		
operators	> Senior Navigator	> Management	> Monitoring station	R, A		
•	> Navigator	> Operational	> Monitoring station	R		
Interfaces	> Navigational data provider (· •		onal		
	aids,)	,	, 0			
	> Other ships, VTS					
Event: input	Commence of sea passage					
•						
Process	Navigate the MASS through op	en sea:				
description			the MASS conditions			
·	_					
	MASS if required (alarr		-	J		
	> Change parameters and settings of the MASS system as appropriate to					
	keep the MASS in required operational conditions					
	> Change to direct communication with other stations if required by					
	navigational situations					
	> Change to a direct control station if required by system or situation or					
	environmental conditio	ns				
	> Identify malfunctions a	nd arising emergenc	y situations and alert dire	ct		
	control stations and ex	perts to take over				
Resources	Equipment on board					
needed	> Navigational systems (ECD	IS, radar, AIS, sound	der, local positioning syst	ems,		
)					
	> Information systems (public	ations, MIS, forecast	ts, traffic information)			
	> Sensor data (MASS status)					
	,					

Process 3.3	Navigation on Sea Passage		
Regulations	International regulations (COLREG,)		
	MASS flag state traffic regulations		
	Local coastal state traffic regulations		
Event: output	End of sea passage, change to pilotage inbound		
Required	The MASS Navigator (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)		
MASS Navigator	to understand radar and ARPA regarding performance, use, types, and limitations	2	A-II/1
Operational	to understand ECDIS regarding capabilities and limitations	2	A-II/1
Level	to explain the manoeuvring and handling of a ship	2	A-II/1
Level	to explain the manifestiving and nariding of a snip to explain the navigational and communication system of a	2	MASS
	MASS		WAGG
	to explain the handling of a MASS regarding the mooring equipment and the use of automated port facilities	2	MASS
	regarding using and applying (C/L 3) and analysing (C/L 4)		
	to conduct a passage and determine a position by applying terrestrial and coastal navigation	3	A-II/1
	to conduct a passage and determine a position by using electronic systems	3	A-II/1
	to conduct a passage and determine a position by using echo- sounders	3	A-II/1
	to conduct a passage and determine a position by using	3	A-II/1
	magnetic and gyro compasses to conduct a passage by using and adjusting steering control	3	A-II/1
	systems to conduct a passage by using and interpreting meteorological	4	A-II/1
	information to maintain a safe navigational watch by analysing traffic	4	A-II/1
	situations and applying the international Regulations for Preventing Collisions at Sea		
	to maintain a safe navigational watch by using all equipment, provisions, information, regulations, principles, techniques, and	3	A-II/1
	procedures for watchkeeping to maintain a safe navigational watch by applying bridge resource management principles	3	A-II/1
	to use radar and ARPA to maintain safety of navigation	3	A-II/1
	to operate radar navigation by interpreting and analysing radar and ARPA information	4	A-II/1
	to operate ECDIS by interpreting and analysing of information obtained from ECDIS	4	A-II/1
	to monitor and operate the data and information exchange between MASS and all relevant stations	4	MASS
	to apply collision avoidance regulations for a MACC	4	MASS
	to use enecific nevigational side for MASS	4	MASS
	to use all navigational tools remotely to verify and assess the	4	MASS
	MASS position, course and speed	4	MASS
	to interpret the environmental conditions remotely and to verify and assess the status of the MASS in the sea	4	IVIASS
	to use specific navigational aids for MASS	3	MASS
	to use all navigational tools remotely to verify and assess the	4	MASS
	MASS position, course and speed		

Process 3.3	Navigation on Sea Passage		
	to interpret the environmental conditions remotely and to verify	4	MASS
	and assess the status of the MASS in the sea		
	to monitor cellular and satellite communication networks	4	MASS
	to monitor and operate sensor systems by interpretation and	4	MASS
	analysing reliability of provided information		
	to monitor the automated functionalities of a MASS	4	MASS
	to analyse and adjust automated systems in terms of	4	MASS
	navigational parameters		
	to take over control from automated systems according to	4	MASS
	alarm levels		
Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences	regarding evaluating (C/L 5) and creating (C/L 6)		
MASS Senior	to determine positions and assess accuracy of resultant	5	A-II/2
Navigator	position fix by terrestrial observations		
Management	to determine positions and assess accuracy of resultant	5	A-II/2
Level	position fix by modern electronic navigational aids		
	to determine and allow for compass errors (magnetic and gyro)	5	A-II/2
	to establish watchkeeping arrangements and procedures	5	A-II/2
	to maintain safe navigation through the use of information from	5	A-II/2
	navigation equipment and systems to assist command		
	decision making		
	to maintain the safety of navigation through the use of ECDIS	5	A-II/2
	and associated navigation systems to assist command		
	decision making		
	to forecast weather and oceanographic conditions	5	A-II/2
	to manoeuvre and handle a ship in all conditions	5	A-II/2
	to take over the command by changing from automated to	5	MASS
	manual mode of a MASS		
	to manoeuvre a MASS based on sensor data	5	MASS
	to evaluate and ensure the data and information exchange	5	MASS
	between MASS and all relevant stations		
	to evaluate the reliability of data and information provided by	5	MASS
	sensor systems		
	to coordinate and adjust the different automated functionalities	5	MASS
	of a MASS		
	to analyse and adjust automated systems in terms of	5	MASS
	navigational parameters		
Additional	J.		
comments			

3.4 Navigation on Pilotage - Inbound

Process 3.4	Navigation on Pilotage - Inbound
Scope of	All types of MASS
application	A) Dry Cargo – Container Feeder – short sea
	B) Ferry – RoPax – one hour passage
	C) Dry Cargo – Bulk Carrier – long distances
	MASS with crew on board
	> Control Centre
	MASS without crew on board
	> Remote Control Centre (direct control)



Process 3.4	Navigation on Pilotage - Inbound				
Process	To navigate the MASS safely	through restricted wa	aters in pilotage c	onditio	ns
objectives					
Process	MASS operators in RCC	Level	in RCC		RACI
operators	> Senior Navigator	> Management	> Direct cont	rol st.	R, A
	> Navigator	> Operational	> Direct cont	rol st.	С
Interfaces	 Navigational data provider aids,) Port control Local port AFS, Local port Local pilot (remote or on both control) Other ships, VTS 	facilities	electronic charts,	naviga	ational
Event: input	Commence of pilotage				
Process	Navigate the MASS through r	estricted waters:			
description	 Monitor position of MASS Monitor the traffic situation Monitor the movement of wind impact squat, interact Change to direct control if conditions Incorporate the pilot (on b with MASS system 	n the MASS and identif tions required by system o	or situation or env	rironme	ental
Resources	Equipment on board				
needed Regulations	 Navigational systems (EC) Information systems (publ Sensor data (MASS status International regulations (COI 	ications, MIS, forecas	•		sterris,
Regulations	MASS flag state traffic regular Local port state and coastal s	tions			
Event: output	Arrival at berth, start of mooring				
Required	The MASS Navigator (opera	tional level) is able .		C/L	STCW
competences	regarding knowledge (C/L 1)				
MASS Navigator	to understand radar and A types, and limitations		•	2	A-II/1
Operational	to understand ECDIS rega	arding capabilities and	d limitations	2	A-II/1
Level	to explain the manoeuvrin			2	A-II/1
	to explain the navigationa MASS regarding using and applying	l and communication	system of a	2	MASS
	to conduct a passage and terrestrial and coastal nav	determine a position		3	A-II/1
	to conduct a passage and electronic systems	-	by using	3	A-II/1
	to conduct a passage and sounders	determine a position	by using echo-	3	A-II/1
	to conduct a passage and magnetic and gyro compa	·	by using	3	A-II/1
	to conduct a passage by usystems		teering control	3	A-II/1
	to conduct a passage by uninformation	using and interpreting	meteorological	4	A-II/1

situations and applying the international Regulations for Preventing Collisions at Sea to maintain a safe navigational watch by using all equipment, provisions, information, regulations, principles, techniques, and procedures for watchkeeping to maintain a safe navigational watch by applying bridge resource management principles to use radar and ARPA to maintain safety of navigation 3 to operate radar navigation by interpreting and analysing radar and ARPA information to operate ECDIS by interpreting and analysing of information obtained from ECDIS to monitor and operate the data and information exchange between MASS and all relevant stations to apply collision-avoidance regulations for a MASS 4 to use specific navigational aids for MASS 4 to use all navigational tools remotely to verify and assess the MASS position, course and speed to interpret the environmental conditions remotely and to verify and assess the status of the MASS in the sea to use all navigational tools remotely to verify and assess the MASS position, course and speed to interpret the environmental conditions remotely and to verify and assess the to use all navigational tools remotely to verify and assess the MASS position, course and speed to interpret the environmental conditions remotely and to verify and assess the status of the MASS in the sea to monitor cellular and satellite communication networks 4 to monitor and operate sensor systems by interpretation and analysing reliability of provided information to monitor the automated functionalities of a MASS to analyse and adjust automated systems in terms of navigational parameters	A-II/1 A-II/1 A-II/1 A-II/1 A-II/1 A-II/1 MASS MASS MASS MASS MASS MASS
Preventing Collisions at Sea to maintain a safe navigational watch by using all equipment, provisions, information, regulations, principles, techniques, and procedures for watchkeeping to maintain a safe navigational watch by applying bridge resource management principles to use radar and ARPA to maintain safety of navigation to operate radar navigation by interpreting and analysing radar and ARPA information to operate ECDIS by interpreting and analysing of information obtained from ECDIS to monitor and operate the data and information exchange between MASS and all relevant stations to apply collision-avoidance regulations for a MASS to use specific navigational aids for MASS to use all navigational tools remotely to verify and assess the MASS position, course and speed to interpret the environmental conditions remotely and to verify and assess the status of the MASS in the sea to use specific navigational aids for MASS to use all navigational tools remotely to verify and assess the MASS position, course and speed to interpret the environmental conditions remotely and to verify and assess the status of the MASS in the sea to use all navigational tools remotely to verify and assess the MASS position, course and speed to interpret the environmental conditions remotely and to verify and assess the status of the MASS in the sea to monitor cellular and satellite communication networks to monitor and operate sensor systems by interpretation and analysing reliability of provided information to monitor the automated functionalities of a MASS to analyse and adjust automated systems in terms of navigational parameters	A-II/1 A-II/1 A-II/1 MASS MASS MASS MASS MASS
Preventing Collisions at Sea to maintain a safe navigational watch by using all equipment, provisions, information, regulations, principles, techniques, and procedures for watchkeeping to maintain a safe navigational watch by applying bridge resource management principles to use radar and ARPA to maintain safety of navigation to operate radar navigation by interpreting and analysing radar and ARPA information to operate ECDIS by interpreting and analysing of information obtained from ECDIS to monitor and operate the data and information exchange between MASS and all relevant stations to apply collision-avoidance regulations for a MASS to use specific navigational aids for MASS to use all navigational tools remotely to verify and assess the MASS position, course and speed to interpret the environmental conditions remotely and to verify and assess the status of the MASS in the sea to use specific navigational aids for MASS to use all navigational tools remotely to verify and assess the MASS position, course and speed to interpret the environmental conditions remotely and to verify and assess the status of the MASS in the sea to use all navigational tools remotely to verify and assess the MASS position, course and speed to interpret the environmental conditions remotely and to verify and assess the status of the MASS in the sea to monitor cellular and satellite communication networks to monitor and operate sensor systems by interpretation and analysing reliability of provided information to monitor the automated functionalities of a MASS to analyse and adjust automated systems in terms of navigational parameters	A-II/1 A-II/1 A-II/1 MASS MASS MASS MASS MASS
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to monitor cellular and satellite communication networks to monitor and operate sensor systems by interpretation and analysing reliability of provided information to monitor the automated functionalities of a MASS to analyse and adjust automated systems in terms of navigational parameters	MASS
to monitor and operate sensor systems by interpretation and analysing reliability of provided information to monitor the automated functionalities of a MASS to analyse and adjust automated systems in terms of navigational parameters	
analysing reliability of provided information to monitor the automated functionalities of a MASS to analyse and adjust automated systems in terms of navigational parameters	MASS
to monitor the automated functionalities of a MASS to analyse and adjust automated systems in terms of navigational parameters	MASS
to analyse and adjust automated systems in terms of navigational parameters	
navigational parameters	MASS
	MASS
to take over the control from automated systems according to 4	MACC
	MASS
alarm levels	
	STCW
competences regarding evaluating (C/L 5) and creating (C/L 6)	
'	A-II/2
Navigator position fix by terrestrial observations	
, , , , , , , , , , , , , , , , , , , ,	A-II/2
Level position fix by modern electronic navigational aids	A 11/0
1 (3	A-II/2
	A-II/2
to maintain safe navigation through the use of information from 5	A-II/2
navigation equipment and systems to assist command	
decision making	A 11/0
	A-II/2
and associated navigation systems to assist command	
decision making to forecast weather and oceanographic conditions 5	
iii to to to court it causes and cocasing aprile contained	۸ ۱۱/۵
to manoeuvre and handle a ship in all conditions, especially 5	A-II/2 Δ-II/2
when un-berthing or un-docking and when using tugs	A-II/2 A-II/2

Process 3.4	Navigation on Pilotage - Inbound		
	to manoeuvre and handle a ship in all conditions, especially	5	A-II/2
	manoeuvring in restricted and shallow waters		
	to take over command by changing from automated to manual	5	MASS
	mode of a MASS	_	
	to manoeuvre a MASS based on sensor data	5	MASS
	to evaluate and ensure the data and information exchange	5	MASS
	between MASS and all relevant stations		
	to evaluate the reliability of data and information provided by	5	MASS
	sensor systems		
	to coordinate and adjust the different automated functionalities	5	MASS
	of a MASS		
	to analyse and adjust automated systems in terms of	5	MASS
	navigational parameters		
Additional	J.		
comments			

3.5 Navigation when Entering the Port

3.5.1 Anchoring

Process 3.5.1	Navigation wh	en Entering the Po	rt - Anchoring		
Scope of application	All types of MASS A) Dry Cargo – Container Feeder – short sea B) Ferry – RoPax – one hour passage C) Dry Cargo – Bulk Carrier – long distances MASS with crew on board				
	> Remote Operation Cen MASS without crew on board > Remote Operation Cen	tre (direct control)			
Process objectives	To anchor the MASS in waiting	position			
Process operators	MASS operators in ROCSenior NavigatorNavigator	Level > Management > Operational	in ROC > Direct control st. > Direct control st.	RACI R, A C	
Interfaces	 Navigational data provider (VTS, port control Local pilot (remote or on bo 		lectronic charts,)		
Event: input	Order for anchoring				
Process description	Prepare anchoring and drop an > Check and maintain state availability for mooring > Change to direct control incorporate pilot if requestive incorporate pilot if requestive incorporate anchoring systems. In the proposition is a maintain incorporate pilot if requestive incorporate pilot if requestive incorporate pilot if requestive incorporate pilot if requestive incorporate pilot incorporate pilot if requestive incorporate pilot incorpora	atus of ship systems a operations ol and monitor automatired (on board or by tem, anchors ready to the holding of and surrounding trans	ated manoeuvre remote advice) o drop ffic d other ships		

Process 3.5.1	Navigation when Entering the Port - Anchoring					
	Heaving anchor and proceeding					
	> Prepare anchoring system for heaving anchor					
	> Monitor the manoeuvre in direct control condition					
	> Secure anchors when manoeuvre is finished					
	> Change to appropriate control mode to continue with the pas	ssage				
Resources	Equipment					
needed	> Navigational systems (ECDIS, radar, AIS, sounder, specific position)	tioning	system,			
	Information systems (publications, MIS, forecasts, traffic informaSensor data (MASS status)	tion)				
Regulations	International regulations (COLREG,)					
	MASS flag state traffic regulations					
	Local port state and coastal state traffic regulations					
Event: output	Anchors up and passage can be continued					
Required	The MASS Navigator (operational level) is able	C/L	STCW			
competences	regarding knowledge (C/L 1) and understanding (C/L 2)					
MASS	to explain the handling of a MASS regarding the anchoring	2	MASS			
Navigator	equipment					
Operational	regarding using and applying (C/L 3) and analysing (C/L 4)					
Level	to conduct a passage and determine a position by using	3	A-II/1			
	electronic systems					
	to conduct a passage and determine a position by using echo-	3	A-II/1			
	sounders					
	to conduct a passage and determine a position by using	3	A-II/1			
	magnetic and gyro compasses					
	to conduct a passage by using and adjusting steering control systems	3	A-II/1			
	to conduct a passage by using and interpreting meteorological information	4	A-II/1			
	to maintain a safe navigational watch by analysing traffic situations and applying the international Regulations for Preventing Collisions at Sea	4	A-II/1			
	to maintain a safe navigational watch by using all equipment, provisions, information, regulations, principles, techniques, and	3	A-II/1			
	procedures for watchkeeping to maintain a safe navigational watch by applying bridge	3	A-II/1			
	resource management principles	1	A-II/1			
	to use radar and ARPA to maintain safety of navigation	4	A-II/1 A-II/1			
	to operate radar navigation by interpreting and analysing radar	4	A-II/ I			
	and ARPA information	4	A 11/4			
	to operate ECDIS by interpreting and analysing of information	4	A-II/1			
	obtained from ECDIS		NAA CC			
	to monitor and operate the data and information exchange between MASS and all relevant stations	4	MASS			
	to use specific navigational aids for MASS	3	MASS			
	to use all navigational tools remotely to verify and assess the	4	MASS			
	MASS position, course and speed					
	to interpret the environmental conditions remotely and to verify	4	MASS			
	and assess the status of the MASS in the sea					
	to monitor and operate sensor systems by interpretation and analysing reliability of provided information	4	MASS			
	to monitor the automated functionalities of a MASS	4	MASS			



Process 3.5.1	Navigation when Entering the Port - Anchoring		
	to analyse and adjust automated systems in terms of	4	MASS
	navigational parameters		
	to take over control from automated systems according to	4	MASS
	alarm levels		
Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences	regarding evaluating (C/L 5) and creating (C/L 6)		
MASS Senior	to determine positions and assess accuracy of resultant	5	A-II/2
Navigator	position fix by terrestrial observations		
Management	to determine positions and assess accuracy of resultant	5	A-II/2
Level	position fix by modern electronic navigational aids		
	to determine and allow for compass errors (magnetic and gyro)	5	A-II/2
	to establish watchkeeping arrangements and procedures	5	A-II/2
	to maintain safe navigation through the use of information from	5	A-II/2
	navigation equipment and systems to assist command decision making		
	to maintain the safety of navigation through the use of ECDIS	5	A-II/2
	and associated navigation systems to assist command		
	decision making		
	to forecast weather and oceanographic conditions	5	A-II/2
	to manoeuvre and handle a ship in all conditions, especially	5	A-II/2
	when anchoring		
	to manoeuvre and handle a ship in all conditions, especially	5	A-II/2
	manoeuvring in restricted and shallow waters		
	to take over command by changing from automated to manual mode of a MASS	5	MASS
	to anchor a MASS based on sensor data	5	MASS
	to handle a MASS safely in all manoeuvres as berthing,	5	MASS
	anchoring, fairway and sea passages		
	to handle a MASS according to environmental influences	5	MASS
	to evaluate and ensure the data and information exchange	5	MASS
	between MASS and all relevant stations		
	to evaluate the reliability of data and information provided by	5	MASS
	sensor systems		
	to coordinate and adjust the different automated functionalities	5	MASS
	of a MASS		
	to analyse and adjust automated systems in terms of	5	MASS
	navigational parameters		
Additional	This process can also be applied in other circumstances such as an	choring	in
comments	shelter positions or in case of malfunctions		

3.5.2 Arrival / Berthing

Process 3.5.2	Navigation when Entering the Port - Arrival / Berthing			
Scope of	All types of MASS			
application	D) Dry Cargo – Container Feeder – short sea			
	E) Ferry – RoPax – one hour passage			
	F) Dry Cargo – Bulk Carrier – long distances			
	MASS with crew on board			
	> Remote Control Centre			
	MASS without crew on board			
	> Remote Control Centre (direct control)			



Process 3.5.2	Navigation when Entering the Por	t - Arrival / Beri	thing			
Process	To berth the MASS safely in the plar	nned position				
objectives						
Process	MASS operators in RCC Lev	el	in RCC		RACI	
operators	> Senior Navigator >	Management	> Direct contr	ol st.	R, A	
	> Navigator >	Operational	> Direct contr	ol st.	С	
Interfaces	> Navigational data provider (weat	her forecasts, el	ectronic charts,)		
	> Port control					
	> Local port AFS, Local port facilities	es				
	> Local pilot (remote or on board)					
Event: input	MASS in position to start mooring m	anoeuvre				
Process	Prepare mooring operations:					
description	> Check and maintain status of	of ship systems a	and controls for	integrit	y and	
·	availability for mooring opera				•	
	> Incorporate pilot (on board o	or by remote adv	ice)			
	Mooring					
	> Monitor the manoeuvring of	the MASS to the	e berth			
	> Change to direct control if re	equired by syster	m or situation or	enviro	nmental	
	conditions					
	> Check for all vessel fixing co			s)		
	> Connect all (power, water, fo	uel, gangway,	.)			
	Arrival					
	> Check for all PAX and service crew from board					
	> Switch automation systems	to port condition	S			
Resources	Equipment					
needed	> Navigational systems (ECDIS, ra	idar, AIS, sound	er, specific posit	ioning	system,	
	,)				
	> Information systems (publications	s, MIS, forecasts	s, traffic informat	lion)		
Dogulations	> Sensor data (MASS status)	\				
Regulations	International regulations (COLREG,) MASS flag state traffic regulations					
	Local port state and coastal state tra	offic regulations				
Event: output	MASS is moored, port operations ca					
Event. output	With the 15 meeters, port operations on	ii start				
Required	The MASS Navigator (operational	•		C/L	STCW	
competences	regarding knowledge (C/L 1) and un		•		A	
MASS	to understand radar and ARPA r	egarding perforr	nance, use,	2	A-II/1	
Navigator	types, and limitations				A 11/4	
Operational	to understand ECDIS regarding	•		2	A-II/1	
Level	to explain the manoeuvring and	•	•	2	A-II/1	
	to explain the navigational and c	ommunication s	ystem of a	2	MASS	
	MASS	C regarding the	maaring	2	MASS	
	to explain the handling of a MAS equipment and the use of autom	-	-		IVIAGG	
	regarding using and applying (C/L 3)	•				
	to conduct a passage and determ		•	3	A-II/1	
	electronic systems	imic a position t	y using		, , , , , ,	
	to conduct a passage and detern	nine a nosition h	v usina echo-	3	A-II/1	
	sounders	imio a position t	y doing cont-			
	to conduct a passage and detern	nine a position h	v usina	3	A-II/1	
	magnetic and gyro compasses	p-5.0011 &	, / 9			



Process 3.5.2	ess 3.5.2 Navigation when Entering the Port - Arrival / Berthing				
	to conduct a passage by using and adjusting steering control	3	A-II/1		
	systems				
	to conduct a passage by using and interpreting meteorological	4	A-II/1		
	information				
	to maintain a safe navigational watch by analysing traffic	4	A-II/1		
	situations and applying the international Regulations for				
	Preventing Collisions at Sea				
	to maintain a safe navigational watch by using all equipment,	3	A-II/1		
	provisions, information, regulations, principles, techniques, and				
	procedures for watchkeeping				
	to maintain a safe navigational watch by applying bridge	3	A-II/1		
	resource management principles				
	to use radar and ARPA to maintain safety of navigation	4	A-II/1		
	to operate radar navigation by interpreting and analysing radar	4	A-II/1		
	and ARPA information				
	to operate ECDIS by interpreting and analysing of information	4	A-II/1		
	obtained from ECDIS				
	to monitor and operate the data and information exchange	4	MASS		
	between MASS and all relevant stations				
	to use specific navigational aids for MASS	3	MASS		
	to use all navigational tools remotely to verify and assess the	4	MASS		
	MASS position, course and speed				
	to interpret the environmental conditions remotely and to verify	4	MASS		
	and assess the status of the MASS in the sea				
	to monitor and operate sensor systems by interpretation and	4	MASS		
	analysing reliability of provided information				
	to monitor the automated functionalities of a MASS	4	MASS		
	to analyse and adjust automated systems in terms of	4	MASS		
	navigational parameters				
	to take over the control from automated systems	4	MASS		
Required	The MASS Senior Navigator (management level) is able	C/L	STCW		
competences	regarding evaluating (C/L 5) and creating (C/L 6)				
MASS Senior	to determine positions and assess accuracy of resultant	5	A-II/2		
Navigator	position fix by terrestrial observations				
Management	to determine positions and assess accuracy of resultant	5	A-II/2		
Level	position fix by modern electronic navigational aids				
	to determine and allow for compass errors (magnetic and gyro)	5	A-II/2		
	to establish watchkeeping arrangements and procedures	5	A-II/2		
	to maintain safe navigation through the use of information from	5	A-II/2		
	navigation equipment and systems to assist command				
	decision making	_	A 11/0		
	to maintain the safety of navigation through the use of ECDIS	5	A-II/2		
	and associated navigation systems to assist command				
	decision making	_	A 11/0		
	to forecast weather and oceanographic conditions	5	A-II/2		
	to manoeuvre and handle a ship in all conditions, especially	5	A-II/2		
	when berthing or docking, and when using tugs	_	A 11/0		
	to manoeuvre and handle a ship in all conditions, especially	5	A-II/2		
	manoeuvring in restricted and shallow waters	_	MASS		
	to take over command by changing from automated to manual	5	MASS		
	mode of a MASS				



Process 3.5.2	Navigation when Entering the Port - Arrival / Berthing		
	to communicate remotely with port services when berthing or	4	MASS
	unberthing		
	to handle a MASS safely in all manoeuvres such as berthing,	5	MASS
	anchoring, fairway, and sea passages		
	to handle a MASS according to environmental influences	5	MASS
	to berth and unberth a MASS based on sensor data	5	MASS
	to evaluate and ensure the data and information exchange	5	MASS
	between MASS and all relevant stations		
	to evaluate the reliability of data and information provided by	5	MASS
	sensor systems		
	to coordinate and adjust the different automated functionalities	5	MASS
	of a MASS		
	to analyse and adjust automated systems in terms of	5	MASS
	navigational parameters		
Additional	J.		
comments			

3.6 Port stay

Process 3.6		Port Stay			
Scope of	All types of MASS				
application	A) Dry Cargo – Container Feeder – short seaB) Ferry – RoPax – one hour passage				
	C) Dry Cargo – Bulk Carrier	 long distances 			
	MASS with crew on board				
	> Remote Control Centre				
	MASS without crew on board				
	> Remote Control Centre				
Process	To stay safely in the port with foc	us on the MASS sa	afety		
objectives					
Process	MASS operators in RCC	.evel	in RCC	RACI	
operators	> Navigator >	Operational	> Monitoring station	R, A	
Interfaces	> Port control				
	> Local port AFS and port facilit	ies			
	> Terminal				
Event: input	Moored MASS, commence of por	t operations			
Process	Maintaining a port watch with foci	us to safe conditior	n of the MASS		
description	> Monitoring all MASS-sho	re connections			
	> Monitoring environmenta	conditions to iden	tify hazardous situations	;	
	> Monitoring of availability	of all MASS systen	ns required in the port		
	> Operating of remote-cont	rolled equipment			
Resources	Equipment				
needed	> MASS status information				
	> Sensor data (MASS status)				
Regulations	International regulations				
	MASS flag state traffic regulations				
	Local port state and coastal state				
Event: output	MASS in safe and operational co	nditions			



Doguirod	The MACC Nevigetor (energtional level) is able	C/L	STCW
Required	The MASS Navigator (operational level) is able	C/L	SICW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)		
MASS	to explain the navigational and communication system of a	2	MASS
Navigator	MASS		
Operational	to explain the handling of a MASS regarding the mooring	2	MASS
Level	equipment and the use of automated port facilities		
	regarding using and applying (C/L 3) and analysing (C/L 4)		
	to observe meteorological information	4	A-II/1
	to maintain a safe navigational watch by using all equipment,	3	A-II/1
	provisions, information, regulations, principles, techniques, and		, , , , ,
	procedures for watchkeeping		
	, ,	4	MASS
	to monitor and operate all connections of the MASS with the	4	IVIASS
	shore		
	to monitor and operate the data and information exchange	4	MASS
	between MASS and all relevant stations		
	to monitor and operate sensor systems by interpretation and	4	MASS
	analysing reliability of provided information		
	to monitor the automated functionalities of a MASS	4	MASS
	to analyse and adjust automated systems in terms of	4	MASS
	operational parameters		
	to take over control from automated systems according to	4	MASS
	alarm levels		
Additional			
Additional	J.		
comments			



4 Engineering Operations

4.1 Utilisable Condition of MASS System

4.1.1 Bunker and Supply

Process 4.1.1	Utilisable Condition	of MASS System -	Bunker ar	nd Supply		
Scope of	All types of MASS					
application	A) Dry Cargo – Container Feeder – short sea					
	B) Ferry – RoPax – one hour passage					
		C) Dry Cargo – Bulk Carrier – long distances				
	MASS with crew on board					
	> Remote Operation Cer					
	MASS without crew on board					
	> Remote Operation Cer					
Process	To provide the MASS with all for	uel, power, provisions	s, consuma	ibles for the		
objectives	passage	11	: DOO		DAGI	
Process	MASS operators in ROC	Level	in ROC	: 4 . 4 :	RACI	
operators	> Senior Engineer	> Management		ing station	R, A	
	> Engineer	> Operational > Operational		oring station	R C	
Interfaces	> System Administrator> Terminal and port facilities	> Operational	> Monit	oring station		
interfaces						
	Service providersShipping company - operat	ione				
Event: input	Status of products and materia		narding stat	ile		
Lvent. Input	otatus of products and materia	i on board, battery cr	iaigiiig stai	lus		
Process	> Connect all automated sup	oly lines				
description	> Monitor supply operations	ory initial				
	> Initiate securing of the area	and avoiding enviror	nmental im	nact		
	> Load spare parts	and avoiding on the	inionia ini	paor		
Resources	Equipment					
needed	> Bunkering and charging sys	stems				
	> Ballast and tank system					
Regulations	International regulations					
	MASS flag state traffic regulation	ons				
	Local port state regulations					
Event: output	MASS is able to sail the planne	ed voyage				
Required	The MASS Engineer (operation	onal level) is able		C/L	STCW	
competences	regarding knowledge (C/L 1) a		(L 2)			
MASS	to explain the provisions an			2	MASS	
Engineer	fuels	·				
Operational	regarding using and applying (C/L 3) and analysing	(C/L 4)			
Level	to ensure compliance with	pollution-prevention		3	A-III/1	
	requirements					
	to maintain seaworthiness	of the ship, especially	/ ship	3	A-III/1	
	stability, trim, stress, and w					
	to maintain seaworthiness	•		3	A-III/1	
	fundamental action in the e	vent of partial loss of	intact			
	stability					
	to operate and control auto		ns with	3	MASS	
	monitoring and control fund	tions				



	to operate and monitor automated battery charging system with monitoring and control functions	3	MASS
	<u> </u>		
Required competences	The MASS Senior Engineer (management level) is able regarding evaluating (C/L 5) and creating (C/L 6)	C/L	STCW
MASS Senior	to plan and schedule operations by consideration of	5	A-III/2
Engineer	physical and chemical properties of fuels and lubricants		
Management	to manage fuel, lubrication, and ballast operations	5	A-III/2
Level	including the operation of machinery such as pumps and piping systems		
	to manage automated and remote-controlled bunkering systems	5	MASS
	to manage automated and remote-controlled battery charging systems	5	MASS
Daminad		0/1	OTOM
Required	The MASS System Administrator (operational level) is	C/L	STCW
competences	able		
MASS	regarding using and applying (C/L 3) and analysing (C/L 4)		
System	to ensure compliance with pollution-prevention	3	A-III/6
Administrator	requirements		
Operational	to operate and monitor automated battery charging	3	MASS
Level	systems		
Additional	J.		
comments			

4.1.2 System Checks

Process 4.1.2	Utilisable Conditi	on of MASS syster	m - Systems Checks		
Scope of application	All types of MASS A) Dry Cargo – Container Feeder – short sea B) Ferry – RoPax – one hour passage C) Dry Cargo – Bulk Carrier – long distances MASS with crew on board > Remote Operation Centre MASS without crew on board > Remote Operation Centre				
Process objectives	To ensure that the MASS is fully utilisable and available with all functionalities necessary to sail a safe voyage				
Process	MASS operators in ROC	Level	in ROC	RACI	
operators	> Senior Engineer	> Management	> Monitoring station	R, A	
•	> Engineer	> Operational	> Monitoring station	R	
	> System Administrator	> Operational	> Monitoring station	С	
Interfaces	> All MASS and ROC system	ns			
Event: input	Voyage order with operational	parameters			
Process description	 Check and prepare of propulsion systems (according to type of ship and propulsion system) Check and prepare all auxiliary systems (according to ship type) Check and prepare automation and communication systems Operate plausibility checks for system integrity and reliability Confirm "ready to go" status 				
Resources	Equipment				
needed	> All MASS systems				

Process 4.1.2	Utilisable Condition of MASS system - Systems Che	cks	
Regulations	International regulations		
	MASS flag state traffic regulations		
	Local port state regulations		
Event: output	MASS with all systems is "ready to go"		
Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS	to operate remote controls of propulsion plant and engineering	4	A-II/2
Navigator	systems and services		
Management			
Level			
Required	The MASS Engineer (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)		
MASS	to explain the ship construction	2	A-III/1
Engineer	to explain the entire automation system with interfaces and	2	MASS
Operational	control parameters		NAA 00
Level	to explain the digital twin of the MASS	2	MASS
	regarding using and applying (C/L 3) and analysing (C/L 4)	3	MASS
	to operate system checks of automated systems by using	3	IVIASS
Required	operational scenarios The MASS Senior Engineer (management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)	C/L	SICW
MASS Senior		3	A-III/2
Engineer	to apply the IMO regulations about control trim, stability, and stress	3	A-111/2
Management	regarding evaluating (C/L 5) and creating (C/L 6)		
Level	to plan and schedule operations by consideration of	5	A-III/2
LCVCI	technology of materials and ship construction		Α-111/2
	to operate, observe, assess performance and maintain safety	5	A-III/2
	of propulsion plant and auxiliary machinery		
	to manage operation of electrical and electronic control	5	A-III/2
	equipment		
	to control trim, stability, and stress and take measures to	5	A-III/2
	preserve trim and stability		
	to evaluate system checks based on operational scenarios and	5	MASS
	to manage corrective measures		
	to evaluate systems integrity and reliability by applying	5	MASS
	plausibility checks and using digital twins		
	to evaluate the reliability of data and information provided by	5	MASS
	sensor systems		
	to coordinate and adjust the different automated functionalities	5	MASS
	of a MASS		
Required	The MASS System Administrator (operational level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)	J -	• • • • • • • • • • • • • • • • • • •
MASS	to monitor the operation of electrical, electronic, and control	4	A-III/6
System	systems		
Administrator	to monitor the operation of automatic control systems of	4	A-III/6
Operational	propulsion and auxiliary machinery		
Level	to operate generators and distribution systems	3	A-III/6
	to operate and maintain power systems in excess of 1,000	4	A-III/6
	volts		
	to operate computers and computer networks on ships	3	A-III/6



Process 4.1.2	Utilisable Condition of MASS system - Systems Checks					
	to use internal communication systems	3	A-III/6			
	to operate system checks of automated systems by using operational scenarios	3	MASS			
Additional	J.					
comments						

4.2 Control of MASS Performance

4.2.1 Auxiliary and Machinery Systems

Process 4.2.1	Control of MASS Performance - Auxiliary and Machinery	Systen	าร			
Scope of	All types of MASS					
application	A) Dry Cargo – Container Feeder – short sea	A) Dry Cargo – Container Feeder – short sea				
	B) Ferry – RoPax – one hour passage					
	C) Dry Cargo – Bulk Carrier – long distances					
	MASS with crew on board					
	> Remote Operation Centre					
	MASS without crew on board					
	> Remote Operation Centre					
Process	To keep all auxiliary and machinery systems available and operate	them o	n			
objectives	required performance levels					
Process	MASS operators in ROC Level in ROC		RACI			
operators	> Senior Engineer	station	R, A			
	> Engineer	station	R			
	> System Administrator > Operational > Monitoring	station	C			
Interfaces	> All MASS auxiliary and machinery systems					
Event: input	MASS is in operations					
Process	> Control of automated auxiliary and machinery systems, in engine	e, deck	and			
description	accommodation departments					
	> Control of automated power management and availability of sys	tems				
Resources	Equipment					
needed	> All auxiliary and machinery systems					
Regulations	International regulations					
	MASS flag state traffic regulations					
	Local port state regulations					
Event: output	All auxiliary and machinery systems are operating as required					
Required	The MASS Engineer (operational level) is able	C/L	STCW			
competences	regarding knowledge (C/L 1) and understanding (C/L 2)	O/L	0.00			
MASS	to explain the fundamentals of process data processing	2	MASS			
Engineer	to explain fundamentals of mathematics and statistics in terms	2	MASS			
Operational	of operation engineering					
Level	to explain the sensor technologies used in automated systems	2	MASS			
	to explain the sensor technologies used in automated systems to explain robotic technologies and how to use them in MASS	2	MASS			
	operation engineering	_				
	to discuss MASS-specific propulsion and auxiliary systems	2	MASS			
	and their use for autonomous ships	-				
	to explain the limitations of automation, e.g., in challenging	2	MASS			
	environmental conditions	_				

Process 4.2.1	Control of MASS Performance - Auxiliary and Machinery	Syster	ns
	regarding using and applying (C/L 3) and analysing (C/L 4)		
	to maintain a safe engineering watch, keeping the watch with	3	A-III/1
	all duties		
	to use internal communication systems	3	A-III/1
	to operate main and auxiliary machinery and associated	3	A-III/1
	control systems		
	to operate fuel, lubrication, ballast, and other pumping systems and associated control systems	3	A-III/1
	to operate electrical, electronic, and control systems	3	A-III/1
	to monitor cellular and satellite communication networks	4	MASS
	to take over manual control from automated systems in all	4	MASS
	situations		
	to monitor and operate the data and information exchange	4	MASS
	between MASS and all relevant stations		
	to monitor and operate sensor systems by interpreting and analysing reliability of provided information	4	MASS
	to monitor the automated functionalities of a MASS	4	MASS
	to analyse and adjust automated systems in terms of	4	MASS
	engineering parameters		
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)	0,2	0.01
MASS Senior	to analyse the automatic control systems by diagnostic	4	MASS
Engineer	applications		
Management	to analyse automatic control systems by using digital twins	4	MASS
Level	to use robotic systems for inspections on MASS	3	MASS
	regarding evaluating (C/L 5) and creating (C/L 6)		
	to plan and schedule operations by consideration of physical	5	A-III/2
	fundamentals		
	to plan and schedule operations for refrigeration systems	5	A-III/2
	to perform operations, surveillance, performance assessment,	5	A-III/2
	and maintain safety of auxiliary machinery		
	to manage operation of electrical and electronic control equipment	5	A-III/2
	to manage troubleshooting, and restoration of electrical and	5	A-III/2
	electronic control equipment to operating condition		
	to evaluate the performance of auxiliary and machinery	5	MASS
	automatic controlled systems		
Required	The MASS System Administrator (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)		
MASS	to explain the fundamentals of process data processing	2	MASS
System	to explain fundamentals of mathematics and statistics in terms	2	MASS
Administrator	of operation engineering		
Operational	to explain the sensor technologies used in automated systems	2	MASS
Level	regarding using and applying (C/L 3) and analysing (C/L 4)		
	to monitor the operation of electrical, electronic and control systems	4	A-III/6
	to monitor the operation of automatic control systems of	4	A-III/6
	propulsion and auxiliary machinery		
	to operate generators and distribution systems	3	A-III/6
	to operate and maintain power systems in excess of 1,000	4	A-III/6
	volts	3	A-III/6
	to operate computers and computer networks on ships		Λ-111/0



Process 4.2.1	Control of MASS Performance - Auxiliary and Machinery Systems				
	to use internal communication systems	3	A-III/6		
	to monitor cellular and satellite communication networks	4	MASS		
Additional	J.				
comments					

4.2.2 Propulsion Systems

Process 4.2.2	Control of MASS	Performance - Pr	opulsion S	ystems	
Scope of	All types of MASS				
application	A) Dry Cargo – Container	Feeder – short sea	l		
	B) Ferry – RoPax – one h	our passage			
	C) Dry Cargo – Bulk Carri	er – long distances			
	MASS with crew on board	J			
	> Remote Operation Cer	ntre			
	MASS without crew on board				
	> Remote Operation Cer	ntre			
Process	To keep all propulsion systems		ate them or	n required	
objectives	performance levels	•		•	
Process	MASS operators in ROC	Level	in ROC		RACI
operators	> Senior Engineer	> Management		ring station	R, A
	> Engineer	> Operational		ring station	R
	> System Administrator	> Operational		ring station	C
Interfaces	> All MASS propulsion syster	·	1	annig etatien	
menacc	, an in the propagation system				
Event: input	MASS is in operations				
•					
Process	> Control of automated propu	Ision systems			
description		,			
Resources	Equipment				
needed	> All propulsion systems (as	main engine, wind	l systems, e	lectric motor	s and
	generators, steering gea		•		
Regulations	International regulations	.,	o, ascara	,,	100,
	MASS flag state traffic regulation	ons			
	Local port state regulations				
Event: output	All propulsion systems are ope	rating as required			
		9 q			
Required	The MASS Engineer (operation	onal level) is able .		C/L	STCW
competences	regarding knowledge (C/L 1) ai				
MASS	to explain the fundamentals	• (,	2	MASS
Engineer	to explain fundamentals of	•	•	2	MASS
Operational	terms of operation engineer				
Level	to explain the sensor techni	_	omated	2	MASS
	systems	J			
	to explain robotic technolog	ies and how to use	them in	2	MASS
	MASS operation engineering				
	to discuss MASS-specific p	-	iary	2	MASS
	systems and their use for a		-		
	to explain the limitations of			2	MASS
	challenging environmental	_			

Process 4.2.2	Control of MASS Performance - Propulsion S	ystems	
	regarding using and applying (C/L 3) and analysing (C/L 4)		
	to maintain a safe engineering watch, keeping the watch	3	A-III/1
	with all duties		
	to use internal communication systems	3	A-III/1
	to operate main and auxiliary machinery and associated	3	A-III/1
	control systems		
	to operate fuel, lubrication, ballast, and other pumping	3	A-III/1
	systems and associated control systems		
	to operate electrical, electronic, and control systems	3	A-III/1
	to operate wind propulsion systems (as Flettner rotors,	3	MASS
	rigid sails)		
	to operate fuel cells	3	MASS
	to operate power generation by solar cells and wind	3	MASS
	turbines		
	to monitor cellular and satellite communication networks	4	MASS
	to take over manual control from automated systems in	4	MASS
	all situations		
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences			
MASS Senior	regarding using and applying (C/L 3) and analysing (C/L 4)		
Engineer	to operate remote controls of propulsion plant	4	A-II/2
Management	to analyse the automatic control systems by diagnostic	4	MASS
Level	applications		
	to analyse automatic control systems by using digital	4	MASS
	twins		
	to use robotic systems for inspections on MASS	3	MASS
	regarding evaluating (C/L 5) and creating (C/L 6)		
	to plan and schedule operations by consideration of	5	A-III/2
	physical fundamentals		
	to plan and schedule operations for refrigeration	5	A-III/2
	systems		
	to perform operations, surveillance, performance	5	A-III/2
	assessment, and maintain safety of auxiliary machinery		
	to manage operation of electrical and electronic control	5	A-III/2
	equipment		
	to manage troubleshooting, and restoration of electrical	5	A-III/2
	and electronic control equipment to operating condition		
	to evaluate the performance of propulsion automatic	5	MASS
	controlled systems	_	
	to evaluate the operability of new propulsion systems as	5	MASS
	wind systems, fuel cells, electric systems		
Required	The MASS System Administrator (operational level) is	C/L	STCW
competences	able		
MASS	regarding knowledge (C/L 1) and understanding (C/L 2)	_	
System	to explain the fundamentals of process data processing	2	MASS
Administrator	to explain fundamentals of mathematics and statistics in	2	MASS
Operational	terms of operation engineering		
Level	to explain the sensor technologies used in automated	2	MASS
	systems		
	(0.11)		1
	regarding using and applying (C/L 3) and analysing (C/L 4)		
	to monitor the operation of electrical, electronic, and control systems	4	A-III/6



Process 4.2.2	Control of MASS Performance - Propulsion Systems					
	to monitor the operation of automatic control systems of	4	A-III/6			
	propulsion and auxiliary machinery					
	to operate generators and distribution systems	3	A-III/6			
	to operate and maintain power systems in excess of	4	A-III/6			
	1,000 volts					
	to operate computers and computer networks on ships	3	A-III/6			
	to use internal communication systems	3	A-III/6			
	to monitor cellular and satellite communication networks	4	MASS			
Additional	J.					
comments						

4.2.3 Performance Monitoring

Process 4.2.3	Control of MASS P	erformance - Perfo	rmance Monitoring			
Scope of	All types of MASS					
application	A) Dry Cargo – Container	Feeder – short sea				
	B) Ferry – RoPax – one h	our passage				
	C) Dry Cargo – Bulk Carri					
	MASS with crew on board					
	> Remote Operation Cer	ntre				
	MASS without crew on board					
	> Remote Operation Cer	itre				
Process	To control the MASS to stay wi	thin the planned per	formance parameters			
objectives						
Process	MASS operators in ROC	Level	in ROC	RACI		
operators	> Senior Engineer	> Management	> Monitoring station	R, A		
	> Engineer	> Operational	> Monitoring station	R		
	> System Administrator	> Operational	> Monitoring station	С		
Interfaces	> All MASS systems					
	> Shipping company - operati	ons				
Event: input	MASS is in operations					
Process	> Monitoring the technical MA	ASS systems				
description	Monitoring of propulsio	n system				
	Monitoring of auxiliary	and machinery syste	ems			
	Monitoring of hotelling	systems				
	Identification of deviation	ons				
	Change of settings when appropriate					
	Managing of alarms					
	Taking actions to stabilise the MASS systems if required					
	Calling experts when m	nalfunctions occur				
	Pass the MASS to dire	ct control stations in	cases of failure search a	ınd		
	direct control activities					
Resources	Equipment					
needed	> All technical automatic cont	rolled systems				
	> Sensor data (MASS status)					
Regulations	International regulations					
	MASS flag state traffic regulation	ons				
	Local port state regulations					

Process 4.2.3	Control of MASS Performance - Performance Monit	oring	
Event: output	The MASS is operating within the planned performance parameter	S	
Required competences	The MASS Engineer (operational level) is able regarding knowledge (C/L 1) and understanding (C/L 2)	C/L	STCW
MASS Engineer	to explain hydrodynamic parameters, provisions of coatings, and air lubrication systems influencing hull performance	2	MASS
Operational Level	to explain physical parameters influencing MASS performance	2	MASS
	to describe the system of sensors and how to use them to keep situational awareness	2	MASS
	regarding using and applying (C/L 3) and analysing (C/L 4) to maintain a safe engineering watch, keeping the watch with all duties	3	A-III/1
	to use internal communication systems	3	A-III/1
	to operate main and auxiliary machinery and associated control systems	3	A-III/1
	to operate fuel, lubrication, ballast, and other pumping systems and associated control systems	3	A-III/1
	to operate electrical, electronic, and control systems	3	A-III/1
	to operate the remote-control systems with its specific interfaces	3	MASS
	to monitor cellular and satellite communication networks	4	MASS
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences MASS Senior	regarding evaluating (C/L 5) and creating (C/L 6) to plan and schedule operations by consideration of physical	5	A-III/2
Engineer Management	fundamentals to plan and schedule operations for propulsion and auxiliary	5	A-III/2
Level	systems to perform operations, surveillance, performance	5	A-III/2
	assessment, and maintaining safety of propulsion plant and auxiliary machinery		
	to manage operation of electrical and electronic control equipment	5	A-III/2
	to evaluate the remote-control system for integrity and reliability	5	MASS
Required competences	The MASS System Administrator (operational level) is able	C/L	STCW
MASS System	regarding using and applying (C/L 3) and analysing (C/L 4) to analyse the performance of automation control and data	4	MASS
Administrator Operational Level	processing systems to monitor cellular and satellite communication networks	4	MASS
Additional comments	J.		



4.2.4 Hotelling

Scope of			S Performance	• • •	• • • • • • • • • • • • • • • • • • • •		
	All types of MASS						
application	A) Dry Cargo – Container	Fee	der – short sea				
	B) Ferry – RoPax – one h	our p	assage				
	C) Dry Cargo – Bulk Carri	er – ˈ	long distances				
	MASS with crew on board						
	> Remote Operation Cen	itre					
	MASS without crew on board						
	> Remote Operation Cen	itre					
Process	To keep all hotelling systems a		ble and operate	the	m on requir	ed perfor	mance
	levels		'		'	•	
-	MASS operators in ROC	Lev	/el	in	ROC		RACI
	> Senior Engineer	_	Management	>	Monitorin	g station	R, A
	> Engineer		Operational	>	Monitorin	-	R
	> System Administrator		Operational	>	Monitoring	-	C
	> All MASS hotelling systems		Operational		Wichitoffity	gotation	
interiaces	/ All MAGO Hotelling systems						
Event: input	MASS is in operations, persons	on I	board				
'	, , ,						
Process	> Control of automated hotelli	ing s	vstems				
description			,				
	Equipment						
needed	> All propulsion systems (suc	h as	fresh water sup	ply a	and sewage	e, ventila	tion
	and air condition, convenie		•	' '	J	•	
Regulations	International regulations		,				
_	MASS flag state traffic regulation	ons					
	Local port state regulations						
Event: output	All hotelling systems are operate	ting a	as required				
	The MASS Engineer (operation		•			C/L	STCW
competences	regarding knowledge (C/L 1) ar						
MASS	to explain the fundamentals	of p	rocess data pro	cess	sing	2	MASS
Engineer	to explain fundamentals of i	math	ematics and sta	tisti	cs in	2	MASS
Operational	terms of operation engineer	ing					
Level	to explain the sensor technology	ologi	es used in autor	nate	ed	2	MASS
	systems						
	to explain robotic technolog	ies a	and how to use the	hem	ı in	2	MASS
	MASS operation engineerin	g					
	regarding using and applying (0	C/L 3) and analysing	(C/I	_ 4)		
	to maintain a safe engineer	ing w	vatch, keeping th	ne w	atch with	3	A-III/1
	all duties						
	to use internal communicati	on s	ystems			3	A-III/1
	to operate main and auxilia	ry ma	achinery and as	soci	ated	3	A-III/1
	control systems						
	to operate fuel, lubrication,	balla	st and other pur	npir	ng	3	A-III/1
	systems, and associated co	ntrol	systems				
	to operate electrical, electro	nic,	and control syst	ems	3	3	A-III/1
The state of the s							

Process 4.2.4	Control of MASS Performance - Hotelling		
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS Senior	to analyse the automatic control systems by diagnostic	4	MASS
Engineer	applications		
Management	to analyse automatic control systems by using digital twins	4	MASS
Level	to use robotic systems for inspections on MASS	3	MASS
	regarding evaluating (C/L 5) and creating (C/L 6)		
	to plan and schedule operations by consideration of physical fundamentals	5	A-III/2
	to plan and schedule operations for refrigeration systems	5	A-III/2
	to perform operations, surveillance, performance	5	A-III/2
	assessment, and maintain safety of auxiliary machinery		
	to manage operation of electrical and electronic control	5	A-III/2
	equipment		
	to manage troubleshooting, and restoration of electrical and	5	A-III/2
	electronic control equipment to operating condition		
	to evaluate the performance of automatic controlled auxiliary	5	MASS
	systems		
Required	The MASS System Administrator (operational level) is able	C/L	STCV
competences			
MASS	regarding knowledge (C/L 1) and understanding (C/L 2)		
System	to explain the fundamentals of process data processing	2	MASS
Administrator	to explain fundamentals of mathematics and statistics in	2	MASS
Operational	terms of operation engineering		
Level	to explain the sensor technologies used in automated systems	2	MASS
	regarding using and applying (C/L 3) and analysing (C/L 4)		
	to monitor the operation of electrical, electronic, and control	4	A-III/6
	systems		
	to monitor the operation of automatic control systems of	4	A-III/6
	propulsion and auxiliary machinery		
	to operate generators and distribution systems	3	A-III/6
	to operate and maintain power systems in excess of 1,000	4	A-III/6
	volts		
	to operate computers and computer networks on ships	3	A-III/6
	to use internal communication systems	3	A-III/6
A . I . I ! C I	-	I	1
Additional	<u>.</u> /.		

4.3 Discharging residues

Process 4.3	Discharging residues
Scope of	All types of MASS
application	A) Dry Cargo – Container Feeder – short sea
	B) Ferry – RoPax – one hour passage
	C) Dry Cargo – Bulk Carrier – long distances
	MASS with crew on board
	> Remote Operation Centre
	MASS without crew on board
	> Remote Operation Centre



Process 4.3		Discharging residue	?S		
Process	To discharge all residues by avoiding any environmental impact				
objectives					
Process	MASS operators in ROC	Level	in ROC		RACI
operators	> Senior Engineer	> Management	> Monitoring	station	R, A
	> Engineer	> Operational	> Monitoring	station	R
	> System Administrator	> Operational	> Monitoring	station	С
Interfaces	> Terminal				
	> Port AFS				
Event: input	MASS is alongside and ready f	or port operations			
Process	> Discharge of garbage and s	sewage			
description	> Discharge of residues of no	xious liquid and solid	d harmful substa	nces	
	> Discharge of oily residues,				
Resources	Equipment				
needed	> Discharging system with se	nsors			
Regulations	International regulations				
	MASS flag state traffic regulation	ons			
	Local port state regulations				
Event: output	All residues discharged without	environmental impa	ct		
Required	The MASS Navigator (operati	onal level) is able		C/L	STCW
competences	regarding knowledge (C/L 1) ar	nd understanding (C/	'L 2)		
MASS	to explain automatic port fa	cilities		2	MASS
Navigator	regarding using and applying (C/L 3) and analysing	(C/L 4)		
Operational	to keep the MASS in position	on for discharging op	erations	3	MASS
Level					
Required	The MASS Engineer (operation			C/L	STCW
competences	regarding knowledge (C/L 1) ar		'L 2)		
MASS	to explain automatic port fa			2	MASS
Engineer	regarding using and applying (
Operational	to operate fuel, lubrication,	· ·	mping systems,	3	A-III/1
Level	and associated control syst				
	to ensure compliance with	•	•	3	A-III/1
	to operate automatic port fa			3	MASS
Required	The MASS Senior Engineer (r	•	is able	C/L	STCW
competences	regarding evaluating (C/L 5) an	- , ,		_	
MASS Senior	to consider all regulations for	•	charge by	5	MASS
Engineer	using automated port facilit	ies			
Management					
Level					
Additional	.l.				
comments					



5 Maintenance

5.1 Maintenance in Port

5.1.1 Maintenance Planning

RACI R, A R R
R, A R
R
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1ASS
MASS
/

Process 5.1.1	Maintenance in Port – Maintenance Planning		
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS Senior	to ensure safe working practices	3	A-III/2
Engineer	to manage safe and effective maintenance and repair	3	A-III/2
Management	procedures by application of knowledge of marine engineering		
Level	practice		
	to apply maintenance strategies as predictive, condition-	3	MASS
	based, or risk-based maintenance for a MASS		
	regarding evaluating (C/L 5) and creating (C/L 6)		
	to manage safe and effective maintenance and repair	5	A-III/2
	procedures		
	to detect and identify the cause of machinery malfunctions and	5	A-III/2
	correct faults		
	to perform remote analysis of system parameters and	4	MASS
	communication protocols to identify the root cause of failures		
	to derive maintenance requirements from operating data and	5	MASS
	to plan the tasks and jobs for a MASS		
	to determine maintenance equipment for remote use and	4	MASS
	control	_	
	to derive maintenance requirements from operating data	5	MASS
	("predictive maintenance")		
Required	The MASS System Administrator (operational level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS	to apply maintenance and repair of electrical and electronic	3	A-III/6
System	equipment		
Administrator	to apply maintenance and repair of automation and control	3	A-III/6
Operational	systems of main propulsion and auxiliary machinery		
Level	to apply maintenance and repair of bridge navigation	3	A-III/6
	equipment and ship communication systems		
	to apply maintenance and repair of electrical, electronic, and	3	A-III/6
	control systems of deck machinery and cargo-handling		
	equipment	_	A 111/C
	to apply maintenance and repair of control and safety systems	3	A-III/6
	of hotel equipment	_	MAGG
	to use risk-based and predictive maintenance tools for	3	MASS
	inspection and maintenance	,	MACC
	to perform remote analysis of system parameters and	4	MASS
	communication protocols to identify the root cause of failures		
	regarding evaluating (C/L 5) and creating (C/L 6)	_	MASS
	to derive maintenance requirements from operational data and to plan the tasks and jobs for a MASS	5	IVIASS
Additional	./.		
	d.		
comments			



5.1.2 Overhaul and Repair

Process 5.1.2	Maintenanc	e in Port – Overha	ul and Repair		
Scope of	All types of MASS				
application	A) Dry Cargo – Container	Feeder – short sea	1		
	B) Ferry – RoPax – one h				
	C) Dry Cargo – Bulk Carri	C) Dry Cargo – Bulk Carrier – long distances			
	MASS with crew on board > Remote Operation Centre				
	MASS without crew on board				
	> Remote Operation Cer	ntre			
Process	To operate all corrective mainte				
objectives	To operate all contents maint				
Process	MASS operators in ROC	Level	in ROC		RACI
operators	> Navigator	> Operational	> Monitoring s	tation	R
operatore	> Engineer	> Operational	> Monitoring s		R
	> System Administrator	> Operational	> Monitoring s		R
Interfaces	> Shipping company - operat	·	/ Worldoning 5	tation	
Interfaces	> Service provider	10113			
	> Manufacturer				
Event: input	Planned and unplanned correct	tive repairs and eve	arhaula		
Process	<u>'</u>	<u> </u>	illauis		
	> Control of corrective repairs				
description	> Control of planned overhau		. 4 . 42		
	> Control of all jobs on the Ma		station		
	> Update of systems and soft	ware			
Resources	Equipment				
needed	> All systems and equipment				
	> All systems and equipment	in ROC			
Regulations	International regulations				
	MASS flag state and class regu				
	Local port state and coastal sta		S		
Event: output	All MASS systems are in worki	ng order again			
					0=0111
Required	The MASS Navigator (operation)	•		C/L	STCW
competences	regarding using and applying (- '		
MASS	to operate remote system to	ipdates of navigatio	nal and	4	MASS
Navigator	communication systems				
Operational	to apply remotely all setting	s of the navigation	al and	3	MASS
Level	communication equipment				
	to analyse malfunction alar	ms and to identify n	eed for	4	MASS
	corrections				
	to operate maintenance an		-	3	MASS
Required	The MASS Engineer (operation	onal level) is able .		C/L	STCW
competences	regarding using and applying (C/L 3) and analysin	g (C/L 4)		
MASS	to operate maintenance and	d repair of electrical	l and electronic	3	A-III/1
Engineer	equipment				
Operational	to operate an appropriate u	se of hand tools, m	achine tools,	3	A-III/1
Level	and measuring instruments	for fabrication and	repair on board		
	to operate maintenance an	d repair of shipboar	d machinery	3	A-III/1
	and equipment	-	-		
	to operate maintenance an	d repairs of MASS	systems	3	MASS
	to integrate machinery and		-	3	MASS
	remote-control system again				



Process 5.1.2	Maintenance in Port – Overhaul and Repair		
	to perform remote analysis of system parameters and communication protocols to identify the root cause of failures	4	MASS
	to use risk-based and predictive maintenance tools for inspection and maintenance	4	MASS
Required competences	The MASS System Administrator (operational level) is able regarding using and applying (C/L 3) and analysing (C/L 4)	C/L	STCW
MASS System	to apply maintenance and repair of electrical and electronic equipment	3	A-III/6
Administrator Operational	to apply maintenance and repair of automation and control systems of main propulsion and auxiliary machinery	3	A-III/6
Level	to apply maintenance and repair of bridge navigation equipment and ship communication systems	3	A-III/6
	to apply maintenance and repair of electrical, electronic, and control systems of deck machinery and cargo-handling equipment	3	A-III/6
	to apply maintenance and repair of control systems of hotel equipment	3	MASS
	to integrate machinery and equipment after repairs into the remote-control system again and to operate tests accordingly	3	MASS
Additional	Most maintenance tasks are to be expected in port. Maintenance joi	bs are	I .
comments	expected to be done by shore-based persons.		

5.1.3 Spare Part Control

Process 5.1.3	Maintenance	in Port – Spare P	art Control	
Scope of	All types of MASS			
application	A) Dry Cargo – Container Feeder – short sea			
	B) Ferry – RoPax – one hour passage			
	C) Dry Cargo – Bulk Carrier	 long distances 		
	MASS with crew on board			
	> Remote Operation Centr	e		
	MASS without crew on board			
	> Remote Operation Centr	e		
Process	To get all demanded spare parts	on time to the MAS	SS by avoiding too muc	h stock
objectives				
Process	MASS operators in ROC	Level	in ROC	RACI
operators	> Senior Navigator	> Management	> Planning station	R, A
	> Senior Engineer	> Management	> Planning station	R
Interfaces	> Shipping company - operation	าร		
	> Service provider			
	> Manufacturer			
Event: input	Demand for spare parts based or	n preventive mainte	enance and by unplanne	ed
	events.			
Process	> Evaluation of demand of spar	e parts that MASS	keeps to be able to sail	
description	> Planning of specifications, an	nounts, availability,	stocks, delivery	
	> Placing purchase orders to the shipping company administration			
	> Control of incoming spare parts			
	> Management of stocks on MA	ASS or warehouses	or ROC	



Process 5.1.3	Maintenance in Port – Spare Part Control		
Resources	Equipment		
needed	> All systems and equipment on board		
	> All systems and equipment in ROC		
Regulations	International regulations		
	MASS flag state and class regulations		
	Local port state and coastal state traffic regulations		
Event: output	All demanded spare parts on time in required specification and amo	unt ava	ilable
Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences	regarding evaluating (C/L 5) and creating (C/L 6)		
MASS Senior	to evaluate spare part demands and to manage availability to	5	MASS
Navigator	ensure safe operation of MASS		
Management			
Level			
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences	regarding evaluating (C/L 5) and creating (C/L 6)		
MASS Senior	to evaluate spare part demands and to manage availability to	5	MASS
Engineer	ensure safe operation of MASS		
Management	to use a digital twin for evaluating the spare part demands	5	MASS
Level			
Additional	$\int J$.		
comments			

5.2 Maintenance at Sea

Process 5.2		Maintenance at Se	ea	
Scope of	All types of MASS			
application	A) Dry Cargo – Container Feeder – short sea			
	B) Ferry – RoPax – one hour passage			
	C) Dry Cargo – Bulk Carri	er – long distances		
	MASS with crew on board			
	> Remote Operation Cer	ntre		
	MASS without crew on board	•		
	> Remote Operation Cer			
Process	To operate preventive maintena	ance at sea		
objectives				
Process	MASS operators in ROC	Level	in ROC	RACI
operators	> Senior Navigator	> Management	> Monitoring station	R, A
	> Senior Engineer	> Management	_	R
	> System Administrator	> Operational	> Monitoring station	R
Interfaces	> Shipping company - operation	ions		
	> Service provider			
	> Manufacturer			
	> Riding crew			
	> Service crew (Ferry only)			
Event: input	Planned maintenance tasks			
		4		
Process	> Inspection of all propulsion	<u>-</u>	1	
description	> Inspection of all machinery	and auxiliary equip	ment	

Process 5.2	Maintenance at Sea		
	> Inspection of all safety equipment		
	> Inspection of all navigational and communication equipment		
	> Inspection of all ROC systems		
	> Updates of software in all systems		
	> Minor repairs in all systems		
Resources	Equipment		
needed	> All systems and equipment on board		
	> All systems and equipment in ROC		
Regulations	International regulations		
	MASS flag state and class regulations		
	Local port state and coastal state traffic regulations		
Event: output	All systems in good working order		
Required	The MASS Navigator (operational level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS	to operate remote-controlled maintenance tasks on a MASS	4	MASS
Navigator	to operate remote system updates of navigational and	4	MASS
Operational	communication systems		
Level	to apply all settings of the navigational and communication	3	MASS
	equipment remotely		
	to analyse malfunction alarms and to identify need for	4	MASS
	corrections		
	to operate maintenance and repairs of MASS systems	3	MASS
Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS Senior	to manage maintenance, inspection, and repairs of MASS	3	MASS
Navigator	systems		
Management	regarding evaluating (C/L 5) and creating (C/L 6)		
Level	to evaluate the options for a remote maintenance of	5	MASS
	navigational and communication equipment		
	to evaluate the options for a remote maintenance of MASS	5	MASS
	structure and deck equipment		
	to manage remote maintenance with or without riding crews on	5	MASS
	board		
	to guide personnel on board to support maintenance and	4	MASS
	repair tasks		
	to report incidents to IT service providers and to track	4	MASS
	incident/problem management		
	to interoperate with IT service providers and to comply to	4	MASS
	respective service processes		
	to report incidents to IT service providers and to track	4	MASS
	incident/problem management		
Required	The MASS Engineer (operational level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS	to operate maintenance and repair of electrical and electronic	3	A-III/1
Engineer	equipment		
Operational	to operate an appropriate use of hand tools, machine tools,	3	A-III/1
Level	and measuring instruments for fabrication and repair on board		
	to operate maintenance and repair of shipboard machinery	3	A-III/1
	and equipment		
	to operate remote-controlled maintenance tasks on a MASS	3	MASS
	to apply all settings of the operational engineering equipment	4	MASS
	remotely		

Process 5.2	Maintenance at Sea		
	to analyse malfunction alarms and to identify a need for corrections	4	MASS
Required competences	The MASS Senior Engineer (management level) is able regarding using and applying (C/L 3) and analysing (C/L 4)	C/L	STCW
MASS Senior	to ensure safe working practices	3	A-III/2
Engineer	to manage safe and effective maintenance and repair	3	A-III/2
Management Level	procedures by application of knowledge of marine engineering practice		
	to manage maintenance, inspection and repairs of MASS systems	3	MASS
	regarding evaluating (C/L 5) and creating (C/L 6) to manage safe and effective maintenance and repair procedures	5	A-III/2
	to detect and identify the cause of machinery malfunctions and correct faults	5	A-III/2
	to evaluate the options for a remote maintenance	5	MASS
	to evaluate the options for a remote maintenance of MASS structure and deck equipment	5	MASS
	to manage remote maintenance with or without riding crews on board	5	MASS
	to guide personnel on board to support maintenance and repair tasks	4	MASS
	to report incidents to IT service providers and to track incident/problem management	4	MASS
	to interoperate with IT service providers and to comply to respective service processes	4	MASS
	to report incidents to IT service providers and to track incident/problem management	4	MASS
Required competences	The MASS System Administrator (operational level) is able regarding using and applying (C/L 3) and analysing (C/L 4)	C/L	STCW
MASS System	to apply maintenance and repair of electrical and electronic equipment	3	A-III/6
Administrator Operational	to apply maintenance and repair of automation and control systems of main propulsion and auxiliary machinery	3	A-III/6
Level	to apply maintenance and repair of bridge navigation equipment and ship communication systems	3	A-III/6
	to apply maintenance and repair of electrical, electronic, and control systems of deck machinery and cargo-handling equipment	3	A-III/6
	to apply maintenance and repair of control systems of hotel equipment	3	MASS
	to restore system function from backups in case of data loss	4	MASS
	to guide personnel on board to support maintenance and	4	MASS
	repair tasks		
	regarding evaluating (C/L 5) and creating (C/L 6) to evaluate the options for a remote maintenance	5	MASS
	to manage remote maintenance with or without riding crews on	5	MASS
	board		
Additional	It is expected that at sea, only preventive maintenance is possible or	n a MA	SS. All
comments	corrective measures as repairs must be done in port, except of mino	r repai	rs.
	Riding crews are to be expected on board.		



6 Malfunctions & Emergencies

6.1 Emergency Preparedness

Process 6.1	Emergency Preparedness			
Scope of application	All types of MASS > Dry Cargo – Container Feeder – short sea > Ferry – RoPax – one hour passage > Dry Cargo – Bulk Carrier – long distances MASS with crew on board > Remote Operation Centre MASS without crew on board > Remote Operation Centre			
Process	Contingency plans are available, and the crew on board and the t	eam in th	e ROC	
objectives Process	are trained on malfunction and emergency response MASS operators in ROC Level in ROC		RACI	
operators	 Senior Navigator Senior Engineer System Administrator Level Management Management Planning Operational Planning 	station	RACI R, A R C	
Interfaces	> Shipping company - operations> ROC> Authorities		,	
Event: input	Risk assessments and regulations			
Process description	 Evaluate risk assessment mitigating measures and develop MASS specific contingency plans Prepare muster lists, role, and further supporting instructions and checklists Get approval from shipping company and authorities as far as requested Set-up trainings for MASS operators and service crews on board Set up trainings for MASS operators in ROC Plan and operate drills in regular sequence on the different emergency and malfunction scenarios Check of availability of all safety equipment on board Check of all safety equipment in the ROC 			
needed	EquipmentSafety systems and equipment			
Regulations	International safety regulations (SOLAS, Codes,) MASS flag state and class regulations			
Event: output	The operators are prepared for malfunction and emergency respondent the ROC are well equipped with safety and security equipment		MASS	
Required	The MASS Navigator (operational level) is able	C/L	STCW	
competences	regarding knowledge (C/L 1) and understanding (C/L 2)			
MASS Navigator	to explain the content of IAMSAR Manual concerning search and rescue	2	A-II/1	
Operational Level	 to explain the specific emergency operations for a MASS with and without crew on board regarding using and applying (C/L 3) and analysing (C/L 4) to ensure compliance with pollution-prevention requirements 	3	MASS A-II/1	
	by precautions, procedures, equipment, and measures prevent, control, and fight fires on board, including advanced fire-fighting (STCW A-VI/3)	3	A-II/1 A-VI/3	



Process 6.1	Emergency Preparedness		
	operate life-saving appliances, including survival craft and	3	A-II/1
	rescue boats (STCW A-VI/2) -> only if crew is on board		A-VI/2
	apply medical first aid on board ships, including elementary	3	A-II/1
	first aid (STCW A-VI/4) -> only if crew is on board		A-VI/4
Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences	regarding evaluating (C/L 5) and creating (C/L 6)		
MASS Senior	to maintain safety and security of the ship's crew and	5	A-II/2
Navigator	passengers and the operational condition of life-saving, fire-		
Management	fighting, and other safety systems		
Level	to develop emergency and damage control plans	5	A-II/2
	to assess cyber risks and to identify cyber attacks	5	MASS
	to evaluate the MASS and ROC security-related situation, and	5	MASS
	to initiate appropriate measures, including STCW A-VI/5	_	A-VI/5
	to implement and apply a MASS and ROC security plan	5	MASS
	to implement concepts of cyber security on board and ashore	5	MASS
	to manage that all remote-controlled safety equipment is in operational availability	5	MASS
Required	The MASS Engineer (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)	0,=	0.0
MASS	to explain the specific emergency operations for a MASS with	2	MASS
Engineer	and without crew on board		
Operational	regarding using and applying (C/L 3) and analysing (C/L 4)		
Level	to prevent, control, and fight fires on board, including	3	A-III/1
	advanced fire-fighting (STCW A-VI/3)		A-VI/3
	to operate life-saving appliances, including survival craft and	3	A-III/1
	rescue boats (STCW A-VI/2) -> only if crew is on board		A-VI/2
	to apply medical first aid on board ship, including elementary	3	A-III/1
	first aid (STCW A-VI/4) -> only if crew is on board		A-VI/4
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences	regarding evaluating (C/L 5) and creating (C/L 6)		
MASS Senior	to control trim, stability, and stress and to take	5	A-III/2
Engineer	countermeasures in event of damage to, and consequent		
Management	flooding of a compartment	_	
Level	to maintain safety and security of the ship's crew and	5	A-III/2
	passengers and the operational condition of lifesaving, fire-		
	fighting and other safety systems to develop emergency and damage control plans and handle	_	A 111/0
	emergency situations	5	A-III/2
	to manage that all remote controlled agents aguinment is in	5	MASS
	operational availability	5	IVIAGG
	to assess cyber risks and to identify cyber attacks	5	MASS
	to evaluate the MASS and ROC security-related situation and	5	MASS
	to initiate appropriate measures		IVII (OO
	to implement and to apply a MASS and ROC security plan	5	MASS
	to implement concepts of cyber security on board and ashore	5	MASS
Required	The MASS System Administrator (operational level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS	to explain the specific emergency operations for a MASS with	2	MASS
System	and without crew on board		
Administrator	to prevent, control, and fight fires on board	3	A-III/6
	to operate life-saving appliances	3	A-III/6



Process 6.1	Emergency Preparedness		
Operational	to apply medical first aid on board ship	3	A-III/6
Level			
Additional	Emergency preparedness includes all malfunctions and emergencie	s acco	rding to
comments	the risk assessments. Cyber security is also part of emergency prep	aredne	ess.

6.2 Malfunction Response

Process 6.2	Malfunction Response				
Scope of	All types of MASS				
application	> Dry Cargo – Container Feeder – short sea				
	 Ferry – RoPax – one hour passage Dry Cargo – Bulk Carrier – long distances 				
	MASS with crew on board				
	> Remote Operation Centre				
	MASS without crew on board				
	> Remote Operation Centre				
Process	To respond to malfunctions efficiently, and to keep the MASS in operational	l			
objectives	conditions in case of a malfunction				
Process	MASS operators in ROC Level in ROC	RACI			
operators	> Senior Navigator > Management > Direct control st.	R, A			
·	> Navigator	С			
	> Senior Engineer	R			
	> Engineer	С			
	> System Administrator > Operational > Direct control st.	С			
Interfaces	> Shipping Company - Operations				
	> Traffic Services				
	> Service providers				
Event: input	Malfunctions of the MASS or ROC occur				
Process	> use of contingency plan				
description	> set-up of a response organisation				
	> initiating measures to get the MASS back under control				
	black out				
	steering gear failure, emergency steering				
	loss of engine				
	loss of propulsion				
	extreme list, shifted cargo or equipment				
	spills (SOPEP)				
	failures of sensors and automation devices				
	loss of data connectivity				
	failure of remote-control system				
	extreme weather and environmental conditions				
Resources	Equipment				
needed	> Contingency plans				
	> Safety equipment on board				
	> All equipment related to the malfunction				
Regulations	International regulations and codes				
	MASS flag state regulations				
	Local coastal state regulations				
Event: output	MASS is under control				

Process 6.2	Malfunction Response		
Required	The MASS Navigator (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)		
MASS	to explain critical equipment of a MASS and its possible	2	MASS
Navigator	malfunctions		
Operational	to explain how to get critical equipment of a MASS back under	2	MASS
Level	control		
	regarding using and applying (C/L 3) and analysing (C/L 4)		
	to respond to emergencies by applying emergency procedures	3	A-II/1
	to identify malfunctions and to initiate an immediate remote	4	MASS
	response		
Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS Senior	to take actions to protect and safeguard all persons on board	4	A-II/2
Navigator	regarding evaluating (C/L 5) and creating (C/L 6)		
Management	to respond to navigational emergencies	5	A-II/2
Level	to handle emergency situations	5	A-II/2
	to take actions to limit damage and salve the ship following	5	A-II/2
	fire, explosion, collision, or grounding		
	to evaluate malfunctions and emergency situations and to	5	MASS
	initiate appropriate measures		
	to organize, control, and operate emergency response	5	MASS
	activities in the ROC and on a MASS		
	to set-up measures to get the MASS system back under	5	MASS
	control after malfunctions or emergencies		
	to manage entering of a MASS not under control (NUC)	5	MASS
Required	The MASS Engineer (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)	0,2	0.00
MASS	to explain critical equipment of a MASS and its possible	2	MASS
Engineer	malfunctions	_	1411 (00
Operational	regarding using and applying (C/L 3) and analysing (C/L 4)		
Level	to perform a take-over in manual control to get the MASS	3	MASS
LOVOI	system back under control after malfunctions or emergencies		IVII (OO
	occur		
	to apply a faty properties and take action in the areat of fine	3	A-III/1
	with particular reference to oil systems	5	A-111/ 1
	to identify malfunctions and initiate an immediate remote	4	MASS
		7	IVIAGO
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)	C/L	SICW
MASS Senior		4	A 111/2
	to take actions to protect and safeguard all persons on board	4	A-III/2
Engineer Management	regarding to evaluating (C/L 5) and creating (C/L 6)		A 111/2
Management	to handle emergency situations	5 5	A-III/2
Level	to take actions to limit damage and salve the ship following) J	A-III/2
	fire, explosion, collision, or grounding		MACC
	to evaluate malfunctions and emergency situations and to	5	MASS
	initiate appropriate measures	_	N4400
	to organize, control, and operate emergency response	5	MASS
	activities in the ROC and on a MASS	1	
	to set-up measures to get the MASS system back under control after malfunctions or emergencies	5	MASS



Process 6.2	Malfunction Response		
Required	The MASS System Administrator (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)		
MASS	to explain critical automation equipment of a MASS and its	2	MASS
System	possible malfunctions		
Administrator	regarding using and applying (C/L 3) and analysing (C/L 4)		
Operational	to perform a take-over in manual control to get the MASS	3	MASS
Level	system back under control after malfunctions or emergencies occurred		
	to identify malfunctions and to initiate an immediate remote response	4	MASS
	to get automation of critical equipment of a MASS back under control	4	MASS
Additional	The competences to respond to malfunctions and to emergencies a	re quite	e equal
comments			

6.3 Emergency Response

Process 6.3	Emergency Response				
Scope of	All types of MASS				
application	> Dry Cargo – Container Feeder – short sea				
	> Ferry – RoPax – one hour passage				
	> Dry Cargo – Bulk Carrier – long distances				
	MASS with crew on board				
	> Remote Operation Cer	ntre			
	MASS without crew on board	I			
	> Remote Operation Cer	ntre			
Process	To response to emergencies ef	fficiently, and to keep	the MASS in operation	nal	
objectives	conditions in case of an emerge	ency.			
Process	MASS operators in ROC	Level	in ROC	RACI	
operators	> Senior Navigator	> Management	> Direct control st.	R, A	
	> Navigator	> Operational	> Direct control st.	С	
	> Senior Engineer	> Management	> Direct control st.	R	
	> Engineer	> Operational	> Direct control st.	С	
	> System Administrator	> Operational	> Direct control st.	С	
Interfaces	> MROC				
	> Shipping company - operati	ions			
	> Traffic Services, other vess				
	> Rescue forces, salvage forces				
Event: input	Emergency of the MASS or RC	OC occur			
Process	> use of contingency plan				
description	> set-up of a response organi	isation			
·	> initiating measures to get th		control		
	structural damage				
	water ingress / flooding				
	fire in holds, engine roo		accommodation		
	medical emergencies				
	cyber attack				
	emergency towing				

Process 6.3	Emergency Response		
	evacuation PAX / service crew / crew		
	person over-board		
	helicopter operations in emergencies		
	SAR support		
Resources	Equipment		
needed	> Contingency plans		
1100000	> Safety equipment on board		
	> All equipment related to the emergency		
Regulations	International regulations and codes		
regulations	MASS flag state regulations		
	Local coastal state regulations		
Event: output	MASS is under control, no persons in danger, no environmental imp	act	
Event. Output	MASS is dilder control, no persons in danger, no environmental imp	acı	
Required	The MASS Navigator (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)		
MASS	to explain emergency situations of a MASS and its possible	2	MASS
Navigator	impacts to the MASS	_	11,5 100
Operational	regarding using and applying (C/L 3) and analyzing (C/L 4)		
Level	to respond to emergencies by applying emergency procedures	3	A-II/1
20101	reapond to distress signals at see	3	A-II/1
	to perform a take ever in manual central to get the MACS	3	MASS
	system back under control after malfunctions or emergencies		1017 (00
	occurred		
	to identify emergency cityations and to initiate immediate	4	MASS
	response		
	to anours appriring propodures for the MASS at any and in part	3	MASS
	to explain and apply the applicable and relevant experience;	3	MASS
	measures to protect the MASS system		1017 (00
	measures to protect the MAOO system		
Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS Senior	to take actions to protect and safeguard all persons on board	4	A-II/2
Navigator	regarding evaluating (C/L 5) and creating (C/L 6)		
Management	to coordinate search and rescue operations according to	5	A-II/2
Level	IAMSAR		,, _
	to perform duties and assess the ship as a ship security officer	5	A-VI/5
	to respond to navigational emergencies	5	A-II/2
	to manageure and handle a ship in all conditions, aspecially	5	A-II/2
	when launching rescue boats or picking-up survivors		,, _
	As Is a sell a superpose side self-und	5	A-II/2
	to take actions to limit demand and action the chin following	5	A-II/2
	fire, explosion, collision, or grounding		/ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
	to get up magazines to get the MACC healt under central	5	MASS
	to set-up measures to get the MASS back under control		, .55
Required	The MASS Engineer (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)		
MASS	to explain the specific emergency operations for a MASS with	2	MASS
Engineer	and without crew on board		IVIAGG
Operational	to combine with all a majors and of a MACO and its arranged by	2	MASS
Level	malfunctions	_	IVIAGG
FCACI	manunctions		

Process 6.3	Emergency Response		
	regarding using and applying (C/L 3) and analysing (C/L 4) to perform a take-over in manual control to get the MASS system back under control after malfunctions or emergencies	3	MASS
	 occurred to apply safety precautions and take action in event of fire, with particular reference to oil systems 	3	A-III/1
	to identify malfunctions and to an initiate immediate remote response	4	MASS
	 to ensure security procedures for the MASS at sea and in port to explain and apply the applicable and relevant cyber security measures to protect the MASS system 	3 3	MASS MASS
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences MASS Senior Engineer	regarding using and applying (C/L 3) and analysing (C/L 4) to take actions to protect and safeguard all persons on board regarding evaluating (C/L 5) and creating (C/L 6)	4	A-III/2
Management Level	 to handle emergency situations to take actions to limit damage and salve the ship following fire, explosion, collision, or grounding	5 5	A-III/2 A-III/2
	to set-up measures to get the MASS back under control	5	MASS
Required competences	The MASS System Administrator (operational level) is able regarding knowledge (C/L 1) and understanding (C/L 2)	C/L	STCW
MASS System	to explain critical automation equipment of a MASS and its possible malfunctions	2	MASS
Administrator Operational	to explain the specific emergency operations for a MASS with and without crew on board	2	MASS
Level	regarding using and applying (C/L 3) and analysing (C/L 4) to perform a take-over in manual control to get the MASS system back under control after malfunctions or emergencies occur	3	MASS
	to ensure security procedures for the MASS at sea and in port	3	MASS
	to explain and apply the cyber security measures to protect the MASS system	3	MASS
	to identify emergency situations and to initiate an immediate remote response	4	MASS
	to get automation of critical equipment of a MASS back under control	4	MASS
	to implement concepts of cyber security on board and ashore	5	MASS
Additional comments	The competences to respond to malfunctions and to emergencies a	re quite	e equal



Support Processes

S.1 Human Resources – Providing and Developing

Process S.1	Providing an	d Developing Huma	an Resources			
Scope of	All types of MASS					
application	> Dry Cargo – Container Feeder – short sea					
	> Ferry – RoPax – one hour passage					
	> Dry Cargo – Bulk Carri					
	MASS with crew on board	3				
	> Remote Operation Cer	ntre				
	MASS without crew on board					
	> Remote Operation Cer					
Dragons	-					
Process	To enable persons to work as I	MASS operator				
objectives	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	T	1. 500			
Process	MASS operators in ROC	Level	in ROC	RACI		
operators	> Senior Navigator	> Management	> Office	R, A		
	> Senior Engineer	> Management	> Office	R		
Interfaces	> All processes					
Event: input	Persons who intend to work as	MASS operator				
·		·				
Process	> Ensure the basic competen	ices in maritime safe	tv and security issue	es		
description	Survival at sea		.,			
docomplion	Election Control Control					
		ocial responsibility				
	Personal safety and so	cial responsibility				
	Security matters					
	Safety equipment on M					
	> Ensure the basic competer	nces in working with r	maritime automated	and		
	autonomous systems					
	Challenges of automat	ion systems				
	Situational awareness	by using sensors				
	Fast decision making of	on machine informati	on			
	Workload management					
	Stress management					
	> Ensure communication skil	ls				
	English for MASS systems, including standard communication phrases					
	Communication in MASS systems					
	Communication between	•	ad other stations as			
			iu oliiei stations as			
D	conventional ships and	1 1 1 5				
Resources	n/a					
needed						
Regulations	International regulations					
	MASS flag state traffic regulation					
	Occupational health regulation	S				
Event: output	MASS operators with basic ski	lls				
Required	The MASS Navigator (operati	ional level) is able	. C	L STCW		
competences	regarding knowledge (C/L 1) a	nd understanding (C	(L 2)			
MASS	to explain the challenges for		· ·	2 MASS		
Navigator	automated systems					
				1		

Operational	regarding using and applying (C/L 3) and analysing (C/L 4)		
Level	to use SMCP and English in written and oral form	3	A-II/1
	to transmit and receive information by visual signalling (not	3	A-II/1
	really necessary)		A D.//O
	to take part in GMDSS radio communication, including STCW	3	A-IV/2
	A-IV/2 as radio operator	3	A-II/1
	to contribute to the safety of personnel and ship by applying	3	A-11/1 A-VI/1
	personal survival techniques, including STCW A-VI/1-1 -> only if crew is on board		A-VI/ I
	As a subsite of the substitution of the substi	3	A-II/1
	fire prevention and applying firefighting, including STCW A -		A-VI/1
	VI/1-2		/ (• //)
	to contribute to the safety of personnel and ship by	3	A-II/1
	demonstrating personal safety and social responsibility,		A-VI/1
	including STCW A-VI/1-4		
	to explain and to take part in security-related emergency and	3	A-II/1
	contingency procedures, including STCW A-VI/6-1 and 6-2		A-VI/6
	to apply MASS specific safety equipment	3	MASS
	to apply behavioural techniques to keep situational awareness	3	MASS
	and to make decisions when using information by sensors and		
	machines		
	to organize workload and minimise stress when working with	3	MASS
	automated systems		
	to communicate as part of a MASS system with other stations	3	MASS
	by using standardised phrases		
Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences	regarding evaluating (C/L 5) and creating (C/L 6)	O/L	31011
MASS Senior	to organise and manage the provision of medical care on	5	A-II/2
Navigator	board		
Management	to evaluate the MASS and ROC security-related situation and	5	MASS
Level	to initiate appropriate measures, including STCW A-VI/5		A-VI/5
	to implement and to apply a MASS and ROC security plan		
Required	The MASS Engineer (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)		
MASS	to explain the challenges for humans of highly automated	2	MASS
Engineer	systems		
Operational Level	regarding using and applying (C/L 3) and analysing (C/L 4)	3	A-III/1
Levei	 to use English in written and oral form to contribute to the safety of personnel and ship by applying	3	A-III/1 A-III/1
	personal survival techniques, including STCW A-VI/1-1 -> only	3	A-111/1
	if crew is on board		\ \frac{1}{2} \
	to contribute to the cofety of personnal and chin by explaining	3	A-III/1
	fire prevention and applying fire-fighting, including STCW A -		A-VI/1
	VI/1-2		
	to contribute to the safety of personnel and ship by	3	A-III/1
	demonstrating personal safety and social responsibility,		A-VI/1
	including STCW A-VI/1-4		
	to explain and to take part in security-related emergency and	3	A-III/1
	contingency procedures, including STCW A-VI/6		A-VI/6
	to apply MASS specific safety equipment	3	MASS

	to apply behavioural techniques to keep situational awareness and to make decisions when using information by sensors and machines	3	MASS
	to organise workload and minimise stress when working with automated systems	3	MASS
	to communicate as part of a MASS system with other stations by using standardised phrases	3	MASS
	to apply international communication standards for MASS operations	3	MASS
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences	regarding evaluating (C/L 5) and creating (C/L 6)		
MASS Senior	to implement and to apply a MASS and ROC security plan	5	MASS
Engineer			
Management			
Level	The MACO Administrative (see each constitution) is also	0/1	OTOM
Required	The MASS Administrator (operational level) is able regarding knowledge (C/L 1) and understanding (C/L 2)	C/L	STCW
competences MASS	to explain the challenges for humans of highly automated	2	MASS
Administrator	systems		IVIAGG
Operational	regarding using and applying (C/L 3) and analysing (C/L 4)		
Level	to use English in written and oral form	3	A-III/6
LOVOI	to contribute to the safety of personnel and ship by applying	3	A-III/6
	personal survival techniques, including STCW A-VI/1-1 -> only if crew is on board		A-VI/1
	to contribute to the safety of personnel and ship by explaining	3	A-III/6
	fire prevention and applying fire-fighting, including STCW A-VI/1-2		A-VI/1
	to contribute to the safety of personnel and ship by	3	A-III/6
	demonstrating personal safety and social responsibility, including STCW A-VI/1-4		A-VI/1
	to explain and to take part in security-related emergency and	3	A-III/6
	contingency procedures, including STCW A-VI/6		A-VI/6
	to apply MASS specific safety equipment	3	MASS
	to apply behavioural techniques to keep situational awareness	3	MASS
	and to make decisions when using information by sensors and machines		
	to operate workload and minimise stress when working with automated systems	3	MASS
	to communicate as part of a MASS system with other stations by using standardised phrases	3	MASS
Additional	Personal and social capabilities to be integrated and to coordinate v	vith pro	cess
comments	M.2 General Management		
-			



S.2 Legal Aspects

Process S.2		Legal Aspects			
Scope of	All types of MASS				
application	> Dry Cargo – Container Feeder – short sea				
	> Ferry – RoPax – one hour passage				
	> Dry Cargo – Bulk Carrier – long distances				
	MASS with crew on board				
	> Remote Operation C	entre			
	MASS without crew on boa	rd			
	> Remote Operation C	entre			
Process	To ensure compliance with a	Il relevant legislation	and regulations		
objectives					
Process	MASS operators in ROC	Level	in ROC		RACI
operators	> Senior Navigator	> Management	> Office		R, A
	> Navigator	> Operational	> Office		С
	> Senior Engineer	> Management	> Office		R
	> Engineer	> Operational	> Office		С
Interfaces	> All processes				
Event: input	Operations of MASS system				
Process	> Ensure the application of	all relevant legislatio	n and regulations	. such a	as
description	certificates and docu		-		
	Load Line Conventio				
	SOLAS				
	MARPOL				
	International health re	egulations			
	International instrume	•	of shin nassenge	rs crew	and
	cargo	onto ancoung salety	or omp passerige	15, 010W	, unu
	National legislation for	or implementing inter	national agreeme	nts and	1
	conventions	or implementing inter	national agreeme	into and	l
	> Ensure the application of	all relevant legislation	n and regulations	concer	nina
	MASS systems, e.g. as	an relevant legislatio	in and regulations	COLICCI	illig
	MACC flamatata	lations			
	DOO 1111				
	Coastal and part stat				
	International agreem	•	MACC		
Resources	<u> </u>	· · ·	IVIAGG		
needed	> All relevant laws and reg	uiations			
Regulations	International regulations (CO	I REG \			
Regulations	MASS flag state traffic regula	•			
	Local port state and coastal s		ne		
Event: output	Compliance with all legislatio		15		
Required	The MASS Navigator (operation			C/L	STCW
competences	regarding knowledge (C/L 1)	•		J, L	3.311
MASS	to explain international m			2	A-II/1
Navigator	recommendations		arru		/ \11/ 1
Operational	to explain national legisla	tion		2	A-II/1
Level			nislation and	2	MASS
Level to explain international and national MASS legislation and regulation 2					
	regarding using and applying	(C/I 3) and analysis	na (C/L 4)	3	A-II/1
	to monitor compliance with	, ,	- '		/\frac{11/1}{1}
	to mornior compnance wil	ii iegisialive requirer	Helito		

Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences MASS Senior Navigator	regarding using and applying (C/L 3) and analysing (C/L 4) to monitor and control compliance with legislative requirements and measures to ensure safety of life at sea, security and the	4	A-II/2
Management	protection of the marine environment		
Level	to apply international and national regulatory framework for MASS and shipping	3	MASS
	to apply national and international regulatory framework for the shore-based operators	3	MASS
	to monitor and control compliance with legislative requirements and measures concerning MASS systems	4	MASS
	regarding evaluating (C/L 5) and creating (C/L 6) to apply classification cycles for MASS systems and consider	5	MASS
	intervention schemes requirements to manage MASS system related certificates	5	MASS
Required	The MASS Engineer (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)		
MASS	to explain international and national MASS legislation and	2	MASS
Engineer	regulation		
Operational	regarding using and applying (C/L 3) and analysing (C/L 4)		
Level	to monitor compliance with legislative requirements	3	A-III/1
Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences MASS Senior	regarding using and applying (C/L 3) and analysing (C/L 4)	3	A-III/2
Engineer	to apply international and national regulatory framework for MASS and shipping	3	A-111/2
Management Level	to apply national and international regulatory framework for the shore-based operators	3	MASS
Level	to monitor and control compliance with legislative	4	MASS
	requirements and measures concerning MASS systems to monitor and control compliance with legislative	4	MASS
	requirements and measures to ensure safety of life at sea,	-	
	security and the protection of the marine environment		
	regarding evaluating (C/L 5) and creating (C/L 6)	_	
	to apply classification cycles for MASS systems and consider	5	MASS
	intervention schemes requirements	_	MACC
	to manage MASS system related certificates	5	MASS
Required	The MASS Administrator (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)		MACC
MASS Administrator	to explain international and national MASS legislation and regulation	2	MASS
Operational			
Level			
Additional	J.	<u> </u>	<u> </u>
comments			



S.3 Automation Systems

Process S.3	Automation Systems					
Scope of	All types of MASS					
application	A) Dry Cargo – Container Feeder – short sea					
	B) Ferry – RoPax – one hour passage					
	C) Dry Cargo – Bulk Carrier – long distances					
	MASS with crew on board					
	> Remote Operation Centre					
	MASS without crew on board					
	> Remote Operation Centre					
Process	To provide and operate the MASS and ROC system with an available and reliable					
objectives	infrastructure for all control and communication systems					
Process	MASS operators in ROC Level in ROC		RACI			
operators	> Senior Navigator > Management > Planning st	tation	R, A			
	> System Administrator > Operational > Planning st	tation	R			
Interfaces	> The entire control and communication system					
	> Experts on IT and communication systems					
	> Service providers (cloud systems, communication,)					
Event: input	Commence of operation of the control and communication system					
Process	Operate the entire system					
description	> keep the entire system running					
	> checks and tests					
	> maintain hardware configuration					
	> keep software updated					
	> check of data interfaces for reliability, consistency, integrity					
	> securing of data					
Resources	Equipment					
needed	> All systems and equipment on board					
	> All systems and equipment in ROC					
Regulations	n/a					
Event: output	All systems (hardware and software) can be operated in reliable mo	de				
Required	The MASS Navigator (operational level) is able	C/L	STCW			
competences	regarding knowledge (C/L 1) and understanding (C/L 2)	0, =				
MASS	to explain the technical design of a MASS and to name the 2 MASS					
Navigator	differences to a conventional ship					
Operational	to explain the operational design of a remote-control centre for 2 MASS					
Level	a MASS	_				
	to explain the operational design and components of the	2	MASS			
	workstations with its equipment to control a MASS	_				
	to explain digital platforms	2	MASS			
	to explain the design, use, and limitations of satellite and	2	MASS			
	cellular networks available to MASS systems	_				
	to explain the design and use of remote automation control	2	MASS			
	networks	_				
	to explain the different degrees of autonomy of the	2	MASS			
	navigational and communication systems					
	regarding using and applying (C/L 3) and analysing (C/L 4)					
	to apply procedures to operate a MASS in different remote-	3	MASS			
	control modes by using the work stations		, .55			
	Control modes by doing the work stations					

	to maintain situational awareness with limited sensor	3	MASS
	availability to operate all navigational and communication controls in the ROC and on the MASS	3	MASS
	to map applications and hardware of automation systems to field level, control level, or supervisory level respectively ("Automation Pyramid")	4	MASS
	to name examples of interfaces and protocols being used on each level of automation	4	MASS
Required	The MASS Senior Navigator (management level) is able	C/L	STCW
competences MASS Senior	regarding using and applying (C/L 3) and analysing (C/L 4) to take actions to protect and safeguard all persons on board	4	A-II/2
Management Level	regarding evaluating (C/L 5) and creating (C/L 6) to coordinate search and rescue operations according to IAMSAR	5	A-II/2
Level	to perform duties and assess the ship as ship security officer	5	A-VI/5
	to respond to navigational emergencies	5	A-II/2
	to manoeuvre and handle a ship in all conditions, especially	5	A-II/2
	when launching rescue boats or picking-up survivors		
	to handle emergency situations	5	A-II/2
	to take actions to limit damage and salve the ship following fire, explosion, collision or grounding	5	A-II/2
	to set-up measures to get the MASS back under control	5	MASS
Required	The MASS Engineer (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)	_	
MASS Engineer	to explain the technical design of a MASS and to name the differences to a conventional ship	2	MASS
Operational Level	to explain the operational design of a remote-control centre for a MASS	2	MASS
	to explain the operational design and components of the work	2	MASS
	stations with their equipment to control a MASS	_	
	to explain digital platforms	2	MASS
	to implement communication brokers to achieve seamless internet access	2	MASS
	regarding using and applying (C/L 3) and analysing (C/L 4) to apply procedures to operate a MASS in different remote- control modes by using the work stations	3	MASS
	to establish operational platforms for information processing, also in cooperation with data service providers	3	MASS
	to operate all engineering controls in the ROC and on the MASS	3	MASS
	to maintain situational awareness with limited sensor availability	3	MASS
	to operate the control systems and communication systems for a MASS	3	MASS
	to maintain availability and reliability of the control and communication systems for a MASS	3	MASS
	to map applications and hardware of automation systems to field level, control level, or supervisory level respectively ("Automation Pyramid")	4	MASS
	to name examples of interfaces and protocols being used on each level of automation	4	MASS

	to interoperate with IT service providers and to comply to	4	MASS
	respective service processes to involve IT service providers and to track related	4	MASS
	incident/problem management	7	IVIAGG
	to apply tests and checks and to evaluate the quality of the	5	MASS
	MASS system performance		
	to decide on appropriate measures to stabilize a MASS control	5	MASS
	and communication system and to keep it available	0/1	07011
Required competences	The MASS Senior Engineer (management level) is able regarding evaluating (C/L 5) and creating (C/L 6)	C/L	STCW
MASS Senior	to evaluate and ensure the entire control and communication	5	MASS
Engineer	system for operating a MASS		
Management	to give advice to keep data availability, consistency, and	5	MASS
Level	reliability		
	to manage the control systems and communication systems for a MASS	5	MASS
Required	The MASS System Administrator (operational level) is able	C/L	STCW
competences	regarding knowledge (C/L 1) and understanding (C/L 2)	O/L	31011
MASS	to explain the technical design of a MASS and to name the	2	MASS
System	differences to a conventional ship		
Administrator	to explain the operational design of a remote-control centre for	2	MASS
Operational	a MASS		
Level	to explain the operational design and components of the work	2	MASS
	stations with their equipment to control a MASS to explain digital platforms	2	MASS
	to explain digital platforms to explain the features of fieldbus standards and their network-	2	MASS
	based equivalents		
	to discuss the function of analogue and digital interfaces	2	MASS
	between MASS control systems and on-board hardware		
	to explain the design and use of satellite and cellular networks	2	MASS
	available to MASS systems to explain the design and use of navigation and	2	MASS
	communication networks	_	
	to implement communication brokers to achieve seamless	2	MASS
	internet access		
	regarding using and applying (C/L 3) and analysing (C/L 4)		
	to apply procedures to operate a MASS in different remote-	3	MASS
	control modes by using the work stations to operate all engineering controls in the ROC and on the	3	MASS
	MASS		1417 (00
	to map applications and hardware of automation systems to	4	MASS
	field level, control level, or supervisory level respectively		
	("Automation Pyramid")		
	to name examples of interfaces and protocols being used on	4	MASS
	each level of automation	3	MASS
	 to operate the control and communication system for a MASS to maintain availability and reliability of the control and	3	MASS
	communication system for a MASS		
	to save all data and information	3	MASS
	to establish operational platforms for information processing,	3	MASS
	also in cooperation with data service providers	A	MACC
	to interoperate with IT service providers and to comply to	4	MASS
	respective service processes		



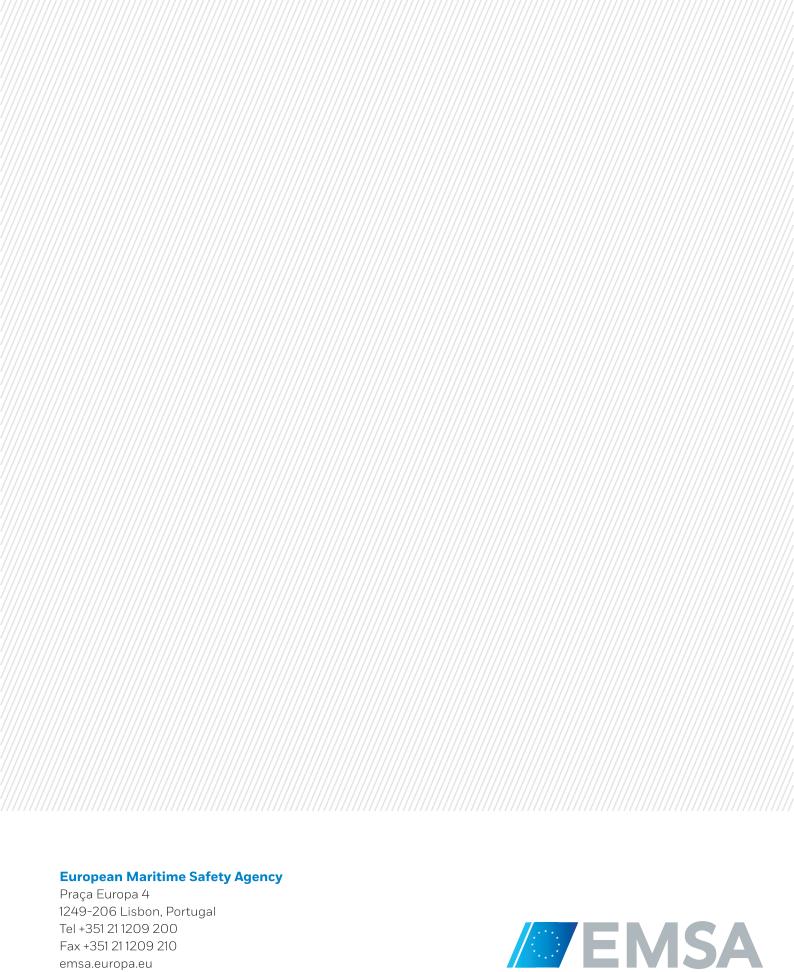
	to involve IT service providers and to track related	4	MASS
	incident/problem management to operate backup facilities to maintain data protection and availability	4	MASS
	to operate on-board facilities for monitoring and troubleshooting	4	MASS
	to improve human-machine interfaces to demands of MASS control	4	MASS
	regarding evaluating (C/L 5) and creating (C/L 6) to apply tests and checks and to evaluate the quality of the MASS system performance	5	MASS
	decide on appropriate measures to stabilise a MASS control and communication system and to keep it available	5	MASS
Additional comments	.J.		

S.4 Economic Aspects

Process S.4		Economic Aspects			
Scope of	All types of MASS				
application	 D) Dry Cargo – Container Feeder – short sea E) Ferry – RoPax – one hour passage F) Dry Cargo – Bulk Carrier – long distances 				
	MASS with crew on board > Remote Operation Centre MASS without crew on board				
	> Remote Operation Cen	tre			
Process	To take economic aspects in th	e operations of a MA	SS system in	nto accou	nt
objectives					
Process	MASS operators in ROC	Level	in ROC		RACI
operators	> Senior Navigator	> Management	> Plannino	g station	R, A
	> Senior Engineer	> Management	> Plannino	g station	R
Interfaces	> Shipping company - operations				
Event: input	Decisions on technical and operational improvements				
Process	> Calculations of costs and in	vestments			
description	> Evaluation of operational be	enefits			
	> Evaluation of impacts on sa	fety of the MASS sys	stem		
Resources	n/a				
needed					
Regulations	> n/a				
Event: output	Decisions on technical and ope	rational improvemen	t affecting sa	fety of the	MASS
	system				
Required	The MASS Senior Navigator (management level)	is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)				
MASS Senior	to use remote-controlled resources and infrastructure cost-		3	MASS	
Navigator	effectively and economically	/			
Management	to determine technical and	•		4	MASS
Level	regarding evaluating (C/L 5) an				
	to evaluate economic effect	s of optimisation mea	asures	5	MASS



Required	The MASS Senior Engineer (management level) is able	C/L	STCW
competences	regarding using and applying (C/L 3) and analysing (C/L 4)		
MASS Senior	to use remote-controlled resources and infrastructure cost-	3	MASS
Engineer	effectively and economically		
Management	to determine technical and operational benefits	4	MASS
Level	regarding evaluating (C/L 5) and creating (C/L 6)		
	to evaluate economic effects of optimisation measures	5	MASS
Additional	.l.		
comments			



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