Upcoming legislation from IMO - MASS Code and autonomous ships

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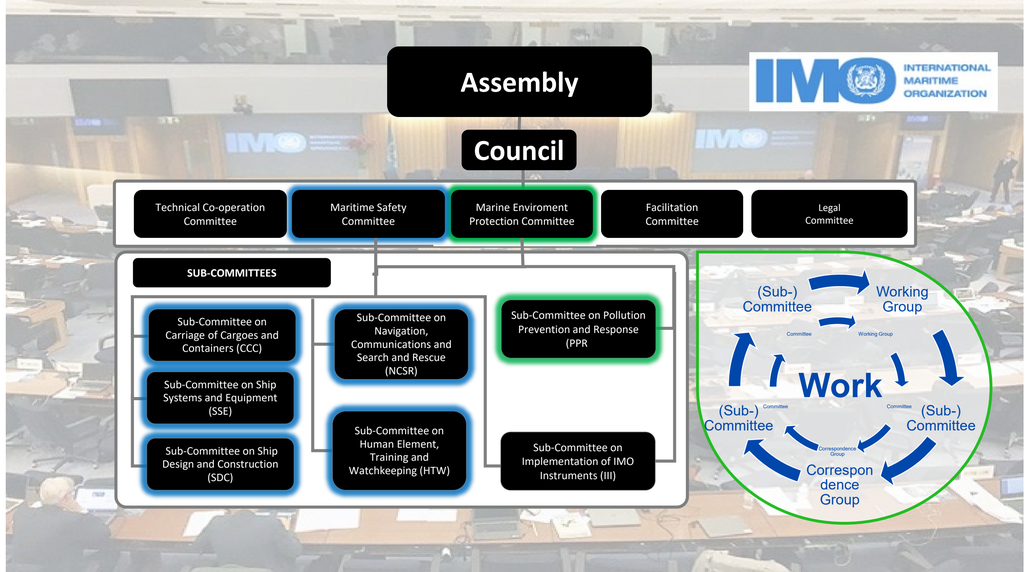
IMO

International Maritime Organisation(IMO)

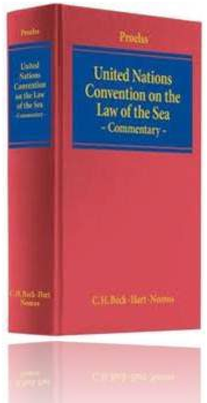
A specialized agency of the United Nations

The global standard-setting authority for the safety, security and environmental performance of international shipping.

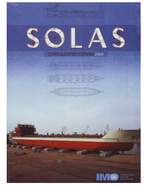
Its objectives: **Safe, secure and efficient shipping on clean oceans**.


Assembly
Council
Technical Co-operation Committee
Maritime Safety Committee
Marine Enviroment Protection Committee
Facilitation Committee
Legal Committee
SUB-COMMITTEES
Sub-Committee on Carriage of Cargoes and Containers (CCC)
Sub-Committee on Ship Systems and Equipment (SSE)
Sub-Committee on Ship Design and Construction (SDC)
Sub-Committee on Navigation, Communications and Search and Rescue (NCSR)
Sub-Committee on Human Element, Training and Watchkeeping (HTW)
Sub-Committee on Pollution Prevention and Response (PPR
Sub-Committee on Implementation of IMO Instruments (III)
(Sub-) Committee
Working Group
Work
(Sub-) Committee
(Sub-) Committee
Correspondence Group
INTERNATIONAL MARITIME ORGANIZATION

International Maritime Conventions



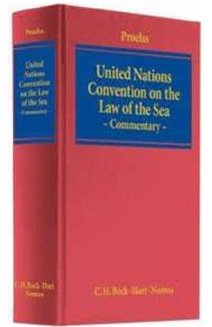
"Four pillars of international maritime law regulations"



18 December, 2023

United Nations Convention on the Law of the Sea, UNCLOS

- Defines the **rights and responsibilities of nations** with respect to their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources.
- Defines the rights and responsilities of **coastal states, flag states** as well as other states
- Intends **to regulate all aspects of the resources of the sea** and uses of the ocean as a framework convention.
- **Provisions are of a general nature** and are implemented by regulations of the competent international organization



United Nations Convention on the Law of the Sea, UNCLOS

Duties of the Flag State (art 94)

Over ships flying its flag Every State shall:

effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag, and **its master, officers and crew** in respect of **administrative, technical and social** matters concerning the ship

take such measures as are necessary to ensure safety at sea with regard **the manning of ships**, labour conditions and
training of crews, including the use of signals,
the maintenance of communications and **the prevention of collisions**.

United Nations Convention on the Law of the Sea, UNCLOS

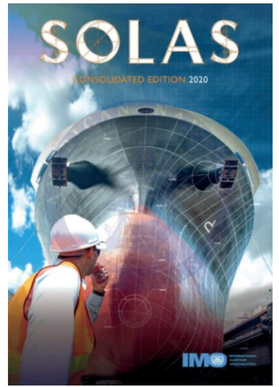
Such measures shall ensure:

b) that each ship is in the charge of a master and officers who possess appropriate qualifications, in particular in seamanship, navigation, communications and marine engineering, and that the crew is appropriate in qualification and numbers for the type, size, machinery and equipment of the ship

c) that the master, officers and, to the extent appropriate, the crew are fully conversant with and required to observe the applicable international regulations concerning the safety of life at sea, the prevention of collisions, the prevention, reduction and control of marine pollution, and the maintenance of communications by radio.

The Maritime Safety Committee (MSC)

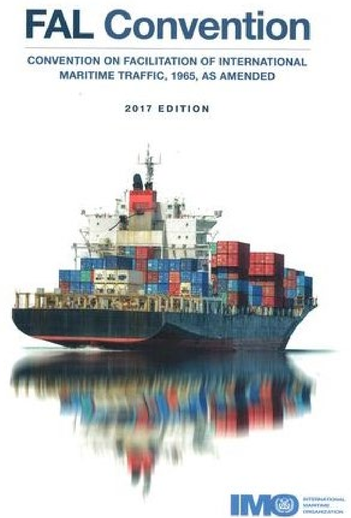
- All matters related to **maritime safety and maritime security** which fall within the scope of IMO, covering both **passenger ships and all kinds of cargo ships**.
- International Convention for the **Safety of Life at Sea (SOLAS)**, 1974
- Updating the SOLAS Convention and related codes
- MSC also deals with human element issues, including amendments to the **STCW Convention on training and certification of seafarers**.



The Facilitation Committee (FAL)

Deals with matters related to the facilitation of international maritime traffic,

- including the **arrival**,
- **stay** and
- **departure** of ships, persons and cargo from ports.

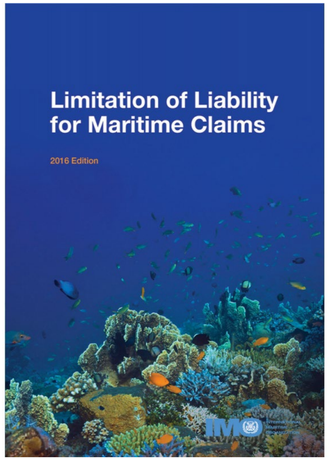


Legal Committee (LEG)

Deals with **any legal matters** within IMO's scope.

Liability and compensation issues **related to the operation of ships**, including damage, pollution, passenger claims, and wreck removal.

Addresses seafarer matters, including **the fair treatment of seafarers, and issues concerning unlawful activities at sea** which affect the safety of navigation.



Marine Environment Protection Committee (MEPC)

Addresses environmental issues under IMO's remit.

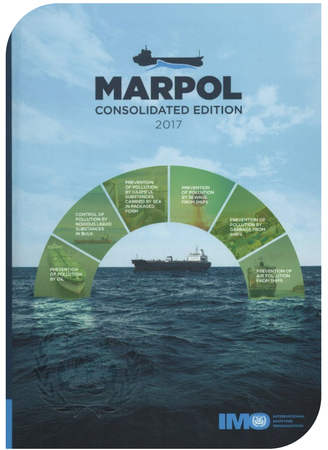
This includes the control and prevention of ship-source pollution covered by the MARPOL treaty, including :

- Oil
- Chemicals carried in bulk
- Sewage
- Garbage
- Emissions from ships, including air pollutants and greenhouse gas emissions

MEPC has not yet reviewed IMO instruments under its purview for any barriers that may exist preventing **MASS operations**.

MSC 99 had invited MEPC to consider undertaking a regulatory scoping exercise on MASS for instruments under its purview, which MEPC 73 had to defer owing to its heavy workload,

MSC 108 will recommend to MEPC to commence consideration of MASS for instruments under its purview.



Commencement of MASS regulation

First time the automation in ships was on the agenda in MSC VIII, in 1964

¨a definition of automation “automation refers to those processes in which machines – often including electronic controls – adjust and control their own performance with little or no human intervention once the operation is started. A distinction is generally made between a fully automated system, a partly automated system and remote control.”

(MSC VIII/11, 9 March 1964).

Three levels of automation

The work on MASS started at MSC 98, in 2017, when MSC accepted an output

"Regulatory scoping exercise for the use of Maritime Autonomous Surface Ships (MASS)",

Regulatory Scoping Exercise

A MASS (Maritime Autonomous Surface Ships) working group started is work at MSC 99

Levels of automation

Method of the RSE (Regulatory Scoping Exercise)

Member states volunteered to review the instruments under purview of MSC

Finland volunteered on SOLAS chapters XI and XIV and the Codes annexed to those chapters

RSE was finally concluded and its results accepted in MSC 103, 2021

Legal Committee and Facilitation Commitee decided to review instruments under their purview

- **The method used was similar to MSC**
- **LEG 106, 2019**
- **FAL 43, 2019**
- **LEG finalized their RSE at LEG 108, in July 2021**
- **FAL had an intersessional working group in October 2021, and FAL 46 in May 2022 approved the RSE**
- **Finland reviewed Salvage Convention and FAL Convention**

Section A/1 General	DEGREE ONE	B
Section A/1 General	DEGREE TWO	B
Section A/1 General	DEGREE THREE	B
Section A/1 General	DEGREE FOUR	B
Section A/2 Definitions	DEGREE ONE	B
Section A/2 Definitions	DEGREE TWO	B
Section A/2 Definitions	DEGREE THREE	C
Section A/2 Definitions	DEGREE FOUR	C
Section A/3 Application	DEGREE ONE	B
Section A/3 Application	DEGREE TWO	B
Section A/3 Application	DEGREE THREE	B
Section A/3 Application	DEGREE FOUR	B
Section A/4 Responsibilities of Contracting Governments	DEGREE ONE	B
Section A/4 Responsibilities of Contracting Governments	DEGREE TWO	B
Section A/4 Responsibilities of Contracting Governments	DEGREE THREE	B
Section A/4 Responsibilities of Contracting Governments	DEGREE FOUR	B

Method of the ”RSE”

Assessing IMO instruments and identifying provisions which:

- applied to MASS and prevented MASS operations;
- applied to MASS and did not prevent MASS operations and require no actions;
- applied to MASS and did not prevent MASS operations but may need to be amended or clarified, and/or may contain gaps;
- have no application to MASS operations.

The degrees of autonomy identified for the purpose of the scoping exercise were:

- Degree one: Ship with automated processes and decision support. Seafarers are on board to operate and control shipboard systems and functions. Some operations may be automated and at times be unsupervised but with seafarers on board ready to take control.
- Degree two: Remotely controlled ship with seafarers on board. The ship is controlled and operated from another location. Seafarers are available on board to take control and to operate the shipboard systems and functions.
- Degree three: Remotely controlled ship without seafarers on board: The ship is controlled and operated from another location. There are no seafarers on board.
- Degree four: Fully autonomous ship: The operating system of the ship is able to make decisions and determine actions by itself.

RSE Outcome

The outcome highlighted a number of high-priority issues, cutting across several instruments, that would need to be addressed at a policy level to determine future work.

- MASS terminology and definitions,
- clarification of the meaning of the term “master”, “crew” or “responsible person”,
  - Particularly in Degrees Three (**remotely controlled ship**) and Four (**fully autonomous ship**)
- addressing the functional and operational requirements of the remote-control station/centre
- the possible designation of a remote operator as seafarer.

Interim guidelines for trials of autonomous ships

MSC 101 approved the guidelines (MSC.1-Circ.1604).

- The trials should be conducted in a manner that provides at least the same degree of safety, security and protection of the environment as provided by the relevant instruments.
- Risks associated with the trials should be appropriately identified and measures to reduce the risks, to as low as reasonably practicable and acceptable, should be put in place.
- Any personnel involved in MASS trials should be appropriately qualified and experienced
- Appropriate steps should be taken to ensure sufficient cyber risk management of the systems and infrastructure used when conducting MASS trials.

IMO MARITIME ORGANIZATION

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MSC.1/Circ.1604
14 June 2019

INTERIM GUIDELINES FOR MASS TRIALS

1 The Maritime Safety Committee, at its 101st session (5 to 14 June 2019), with the aim of assisting relevant authorities and relevant stakeholders with ensuring that the trials of Maritime Autonomous Surface Ships (MASS) related systems and infrastructure are conducted safely, securely and with due regard for protection of the environment, approved Interim Guidelines for MASS trials, as set out in the annex.

2 The Committee agreed to keep the Interim Guidelines under review and to amend them in view of the experience gained with their application and/or as and when the circumstances so warrant.

3 Member States and international organizations are invited to use the annexed Interim Guidelines and bring them to the attention of all parties concerned.

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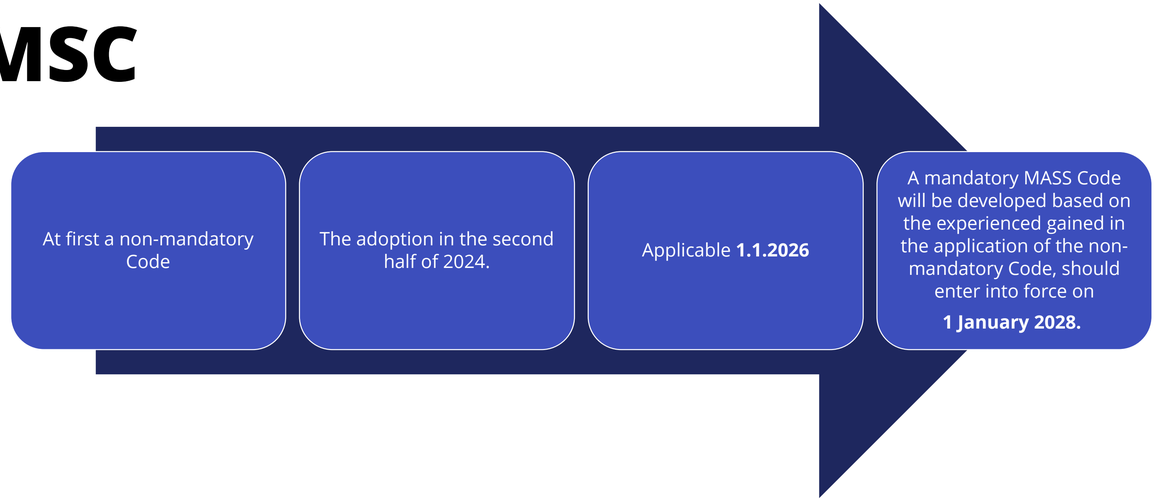
Development of MASS Code

Work at MSC

MSC 104 agreed to develop a goal-based instrument for maritime autonomous surface ships (MASS).

- Development of a goal-based instrument for maritime autonomous surface ships (MASS)", with a target completion year of 2025, in its biennial agenda for 2022-2023 and the provisional agenda for MSC 105.

- Agreed that the first step in the work on the new output would be the finalization of a road map.
- MSC 105 approved a road map
- The MASS Correspondence Group started after MSC 105 and reported to MSC 107



The MASS Correspondence Group

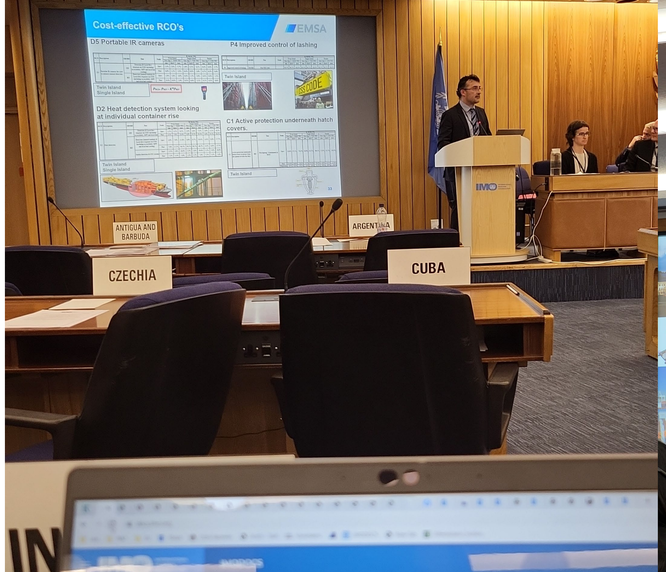
Volunteering Member States and organizations selected sections of the draft MASS Code

Splitting this work up among participating Member States

Finland participates **Navigation** and **SAR** sections

Working groups at MSC 106 and MSC 107

- MASS ISWG 2 was held in November 2023



INTERNATIONAL CODE OF SAFETY FOR MARITIME AUTONOMOUS SURFACE SHIPS (MASS CODE)

Goal-based instrument

Code addresses the functions needed to obtain safe and reliable operations of MASS insofar as they are not adequately or fully addressed in other applied IMO instruments

- Add-on instrument
- technology neutral

The Code applies to **cargo ships to which SOLAS chapter I applies** which have functions that **enable autonomous or remote operations** including any associated ROC(s) [when the Administration deems it that direct compliance with other/existing instruments is not practicable].

MASS Code Structure

Part 1 Introduction

- Covering overarching matters to be considered in the application of the Code.

Part 2 Main Principles for MASS and MASS Functions

- Containing those main principles that should be followed in the application, to a MASS or MASS functions, of the goals, functional requirements and provisions as laid out in part 3 of the Code

Part 3 Goals, Functional Requirements and Provisions Goals

- Containing, in each Chapter, the goal of the chapter, functional requirements to fulfil the goal,

PART 1 INTRODUCTION

Purpose, principles and application	
Terminology	• Will be determined at the later stage
Approval process	• A structured approval process to enable the MASS to obtain the required approval along with the necessary certificates related to statutory requirements for their intended operation.
Certificate and Survey	• Every ship to which this Code applies should have a valid MASS Certificate, issued after an initial or renewal survey

PART 2

Operational context for a MASS

all aspects of the MASS operation and describe the autonomous or remote-controlled ship function(s) and the external environment that influences its operation.

Concept of Operation

Operational Envelope

Fallback state

Mode(s) of Operation

Risk Assessment

A risk assessment should be conducted to ensure that risks arising from the use of MASS functions,

Human element

System design principles

MASS systems performing and supervising any specific function of the ship should be capable of complying with relevant applicable international regulations and instruments at all times

Software principles

responsible stewardship and ensure software and AI systems (referred to as software) used within remote operation or fully autonomous ships and systems are trustworthy, safe and secure.

Connectivity

MASS should establish reliable, stable and secure connectivity with ROC and other external stakeholders

PART 3

Each chapter consists of:

- the goal of the chapter,
- functional requirements to fulfil the goal,
- the [expected performance] [provisions] associated with those functional requirements.

A MASS should be considered to meet a functional requirement set out in this part when either:

- the ship's design and arrangements **comply with all the provisions associated** with that functional requirement;
- part(s) or all of the ship's relevant design and arrangements have been **reviewed and confirmed to be in accordance with SOLAS** (detailed provisions yet to be developed)

PART 3 - Chapters

Navigation	Remote Operations	Communcations	Subdivision, Stability and Watertight Integrity	Fire Protection/Safety	Life Saving Appliances and Equipment	Management of Safe Operations	Security	Search and Rescue
	Cargo Handling	[Personnel Safety and Comfort]	Towing and Mooring	Marine Engineering/Machinery Installations	Electrical and Electronic Engineering	Maintenance and Repair	Emergency Response	

Development of competencies relating to MASS operations

MSC agreed that the HTW Sub-Committee would eventually have **to develop competencies relating to MASS operations**

- premature to consider the matter, given the early stage of the MASS Code development

MSC 107 could not agree whether to invite the Committee to instruct the **HTW Sub-Committee to consider amending chapter VIII of the STCW Convention** separately from the STCW comprehensive review,

- to address the prescriptive provisions with regard to the watchkeeping provisions.

MASS ISG 2 acknowledged **the need to develop high-level training provisions** for the MASS Code whereby the detailed competency and knowledge, understanding and proficiency (KUPs) provisions may be developed by the HTW Sub-Committee when the Code has been finalized.

- HTW 11 may discuss on MASS competencies (in 2025)
- development of high-level training provisions in the MASS Code, which could be considered by the Correspondence Group,

Flag State oversight over MASS/ROC

When the ROC host State was different from the flag State of the MASS, the it is considered **the oversight mechanism under the ISM Code** as a potential template for the MASS Code

The **considerations of the flag State** oversight in the context of ensuring **the safe operation of a MASS**, i.e. technical requirements, training, management of the processes etc. fall in the remit of MSC

The legal considerations on the matter of jurisdiction will be undertaken in the **Legal Committee**.

IMO instruments

MASS Code will be annexed to SOLAS

Possibly other applicable IMO instruments

Load Line Convention?

MSC 107 agreed that there was no need to amend COLREG as it could be applied in full to any MASS

Joint MSC-LEG-FAL Working Group on Maritime Autonomous Surface Ships (MASS-JWG)

A cross-cutting mechanism to address common high-priority issues identified by the regulatory scoping exercises for the use of MASS conducted by the three committees.

Working Group that addresses only the common gaps

The Committees give the Terms of Reference

The Committees have to approve its results

Two meetings:

- September 2022
- April 2023
- According to the work plan the group should have two meetings in a year

JWG 1 only agreed on had agreed to the use of a table for the identification and collection of information of options for interpretations for the common issues in the instruments under the purview of the three Committees

The results of JWG 2

There should be a human master responsible for a MASS

- Doesn't need to be on board
- Master should have the means to intervene, when necessary
- A master may be responsible for multiple MASS at the same time, under certain conditions. (Committees will further consider these conditions).
- Several masters may be responsible for a MASS on a single voyage, under certain conditions (Committees will further consider these conditions).

Has yet to discuss the roles of the crew of MASS as the definition of the role of the master may affect their roles and responsibilities.

The results of JWG 2

The definition of a Remote Operations Centre (ROC): “A location remote from the MASS that can operate some or all aspects of the functions of the MASS.”

- The possibility of one or more ROC being responsible for a MASS on a single voyage, under certain conditions, should not be excluded - which needs to be further considered by the appropriate Committee(s).
- Only a single ROC must be responsible for a MASS at any one time.

The definition of a remote operator: "A qualified person who is employed or engaged to operate some or all aspects of the functions of a MASS from a remote operations centre.”

FAL Committee

Amending or interpreting the FAL Convention as the most appropriate way to address the majority of barriers identified vis-à-vis MASS operations

- the information required on arrival and departure,
- a new kind of certification for remotely controlled operations,
- sharing of information,
- arrangements and obligations concerning the solving of situations
- pre-arrival information regarding persons rescued at sea, stowaways and/or refugees.

The FAL MASS Working group proposed only one clarification to the Explanatory Manual of the FAL Convention

- **with regard to the RSE to the Annex to the FAL Convention to address the issues related to MASS operations throughout the FAL Convention**
  - **Contracting Governments and public authorities shall ensure that a ship, regardless of its mode of operation (e.g. remotely operated or fully autonomous, and with reduced crew or without crew on board), fully demonstrates and documents compliance, as appropriate, with the Standards in the FAL Convention.**
- **The work continues in FAL 48**

Legal Committee

LEG 110 agreed that UNCLOS did not prevent the regulation of the operation of MASS

The liability issues with regard to MASS operations

Will start its discussion at LEG 111, in 2024

A need for clarity on definitions and concepts relating to MASS, before advancing amendments to conventions and other legal instruments.

LEG 111 will probably commence legal considerations on the Flag State oversight over MASS/ROC on the matter of jurisdiction

LEG 111 may address issues

- with respect to liability arising from MASS operations.
- with respect to the implementation of provisions in instruments under the purview of LEG
- relating to UNCLOS and its potential implications on MASS operations

Where are we now?

The development of MASS Code continues

LEG starts its work

FAL will review FAL Convention once again

MEPC is asked to review its instruments

JWG keeps addressing the Common gaps

In particular, need to to review and harmonize different sections in the Code