Proposals for Unmanned Vessels

Focusing on Jurisdiction Regulation and Liability Regime

SEABEYOND

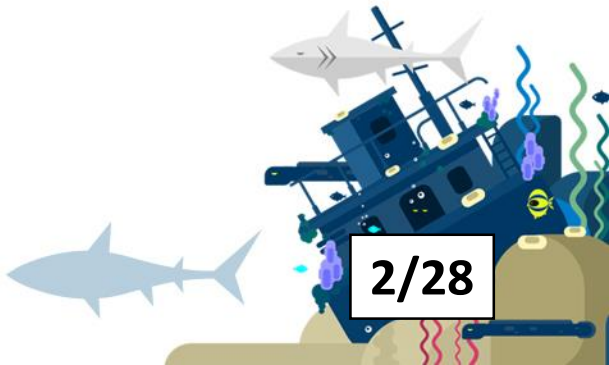
Coordination with IMO's TDCs & SDs

TDC 2.3. Marine technology to foster a safety culture and the Efficiency of Shipping

-> Automation and Remote Operations

SD2 for 2018-2023 Integrate New and Advancing Technologies in the Regulatory Framework

-> "… new and advancing technologies will significantly affect shipping, creating a more interconnected and efficient industry "



Current Major On-going Projects

(Norway)
Kongsberg and Yara - Yara Birkeland

Aim: establish navigation support system that decreases maritime collisions/accidents
- Obstacle Zone by Target : assists avoiding collisions with nearby ships

(UK)
Rolls-Royce Marine and Autonmous Waterborne Applications Initiative (EU-funded project)

2020

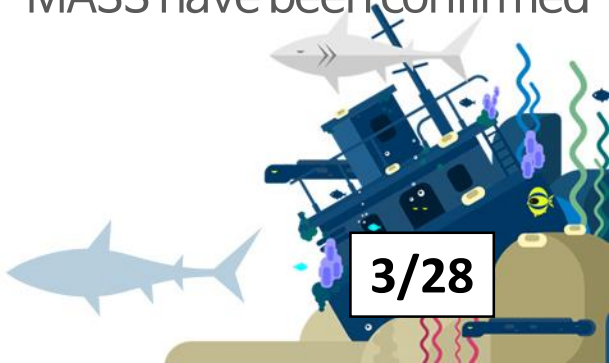
Relatively short route from Brevik to Larvik

2025

(Japan)
Japanese Ministry of Land, Infrastructure, transportation and Mitsui

2025-2030

Domestic routes until the legal and technical stance of MASS have been confirmed



Anticipated Benefits – Cost Effectiveness

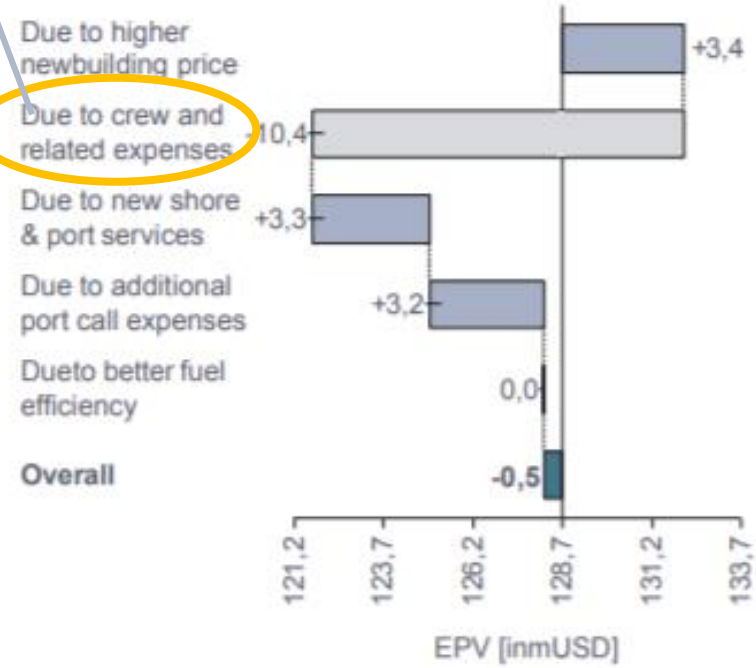
Scenario A: Reduced Crew

No deckhouse, no air conditioning/ heating, more freight loading available

Scenario A: Main assumptions

Fuel price based on	USD 80 per barrel of crude oil
New building costs	110% of conv. Bulker
Main fuel type	HFO both vessels
Considered effects	Reduced crew New shore/port services
EPV costs, conv. bulker	128.7 mUSD
EPV costs, auton. bulker	128.2 mUSD
Relative RFR	99.6%

Scenario A: Changes of the autonomous bulker's EPV of costs:



Kretschmann, Lutz, et al. "Analyzing the Economic Benefit of Unmanned Autonomous Ships: An Exploratory Cost-Comparison between an Autonomous and a Conventional Bulk Carrier." *Research in Transportation Business & Management*, vol. 25, 2017.

Used at MUNIN's Final Event at Hamburg Germany on 2015/6/10

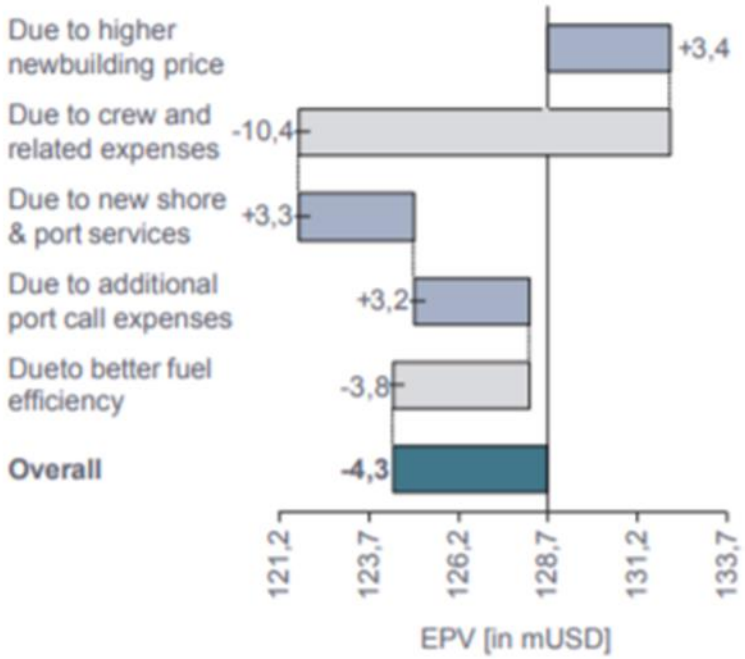
Anticipated Benefits – Cost Effectiveness

Scenario B: Reduced Crew, Increased Fuel Efficiency

Scenario B: Main assumptions

Fuel price based on	USD 80 per barrel of crude oil
New building costs	110% of conv. Bulker
Main fuel type	HFO both vessels
Considered effects	Reduced crew New shore/port services Better fuel efficiency
EPV costs, conv. bulker	128.7 mUSD
EPV costs, auton. bulker	124.3 mUSD
Relative RFR	96.6%

Scenario B: Changes of the autonomous bulker's EPV of costs:



Kretschmann, Lutz, et al. "Analyzing the Economic Benefit of Unmanned Autonomous Ships: An Exploratory Cost-Comparison between an Autonomous and a Conventional Bulk Carrier." *Research in Transportation Business & Management*, vol. 25, 2017

Anticipated Benefits - Increased Safety

2. Safer because…

85% of maritime accidents happen because of human crews (http://biz.chosun.com/site/data/html_dir/2017/11/21/2017112100015.html)

Use big data to share real-time seafaring information (weather, changes in landscape…)

Wróbel, Krzysztof, et al. "Towards the Assessment of Potential Impact of Unmanned Vessels on Maritime Transportation Safety." *Reliability Engineering & System Safety*, vol. 165, 2017

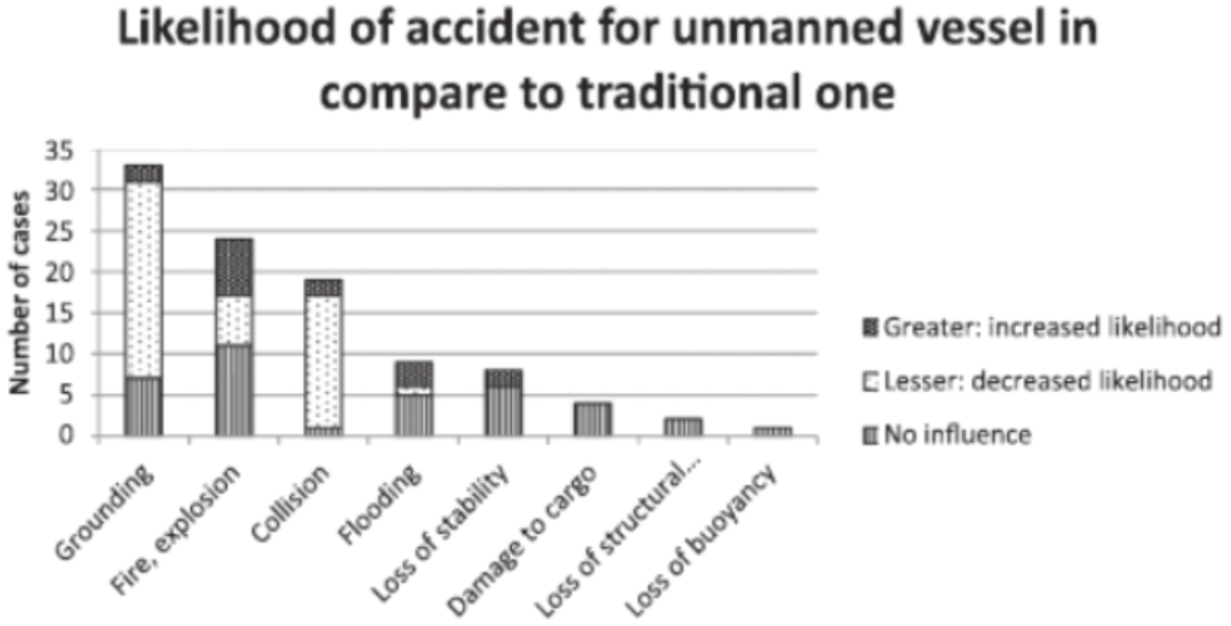


Fig. 6. Influence of unmanned system on accident's likelihood.

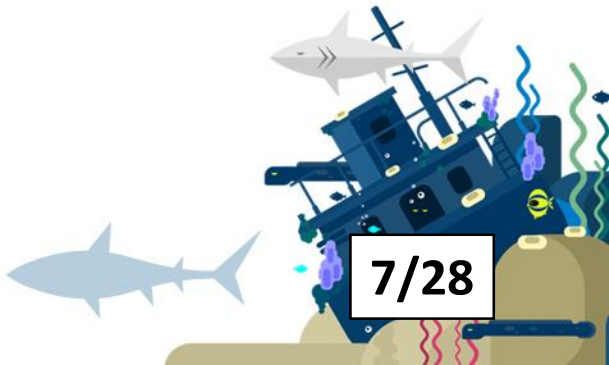
Defining MASS – Levels of Autonomy

1. Ship with automated processes and decision support: Seafarers are on board to operate and control shipboard systems and functions. Some operations may be automated.

2. Remotely controlled ship with seafarers on board: The ship is controlled and operated from another location, but seafarers are on board.

3. Remotely controlled ship without seafarers on board: The ship is controlled and operated from another location. There are no seafarers on board.

4. Fully autonomous ship: The operating system of the ship is able to make decisions and determine actions by itself



Ship Registration Law

Ship's Registration

: The process of documenting a Ship's given Nationality

Reasons for Registration

: In order to document ship for ownership

-〉 Reason for the Owner to Exercise Jurisdiction and Control over Ship

Registration Requirements

- Requirements Vary between Nations
- **The Genuine Link** between the State and the Ship required

〈Convention on the High Seas Art. 5(1)〉

Each State shall fix the conditions for the grant of its nationality to ships, for the registration of ships in its territory, and for the right to fly its flag. Ships have the nationality of the State whose flag they are entitled to fly. **There must exist a genuine link between the State and the ship**; in particular, the State must effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag. (emphasis added)

〈1982 UN Convention on the Law of the Sea Art. 91 (1)〉

Every State shall fix the conditions for the grant of its nationality to ships, for the registration of ships in its territory, and for the right to fly its flag. Ships have the nationality of the State whose flag they are entitled to fly. **There must exist a genuine link between the State and the ship**. (emphasis added)

The Genuine Link & its Controversy

The Genuine Link

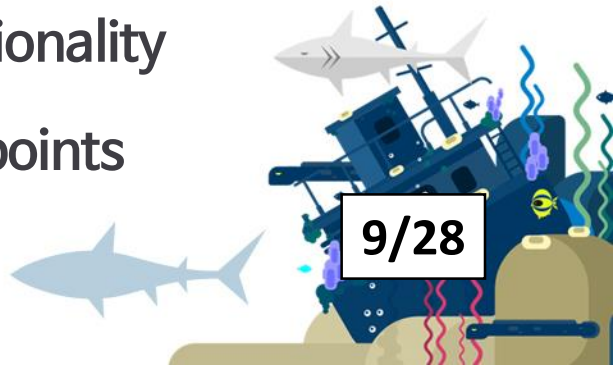
Constituting a legal bond connecting an individual with the state vesting upon him its nationality

If exists, the state can exercise jurisdiction and control over ships flying its flag

Controversy

Absence of the description of this concept in terms of preconditions for the grant of the nationality

Diversity and Controversial Viewpoints



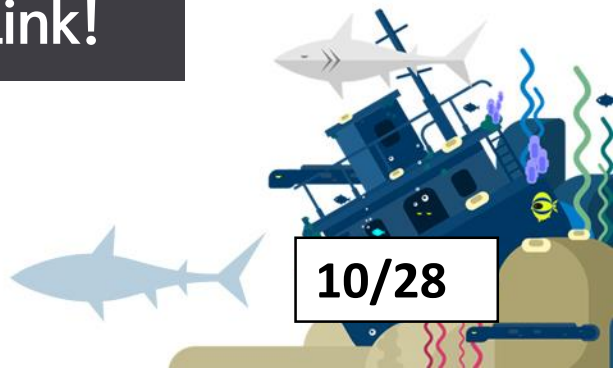
Regulatory Barrier to Current Jurisdictional Regulation

No Consensus among States about Genuine Link

Disputes about who can Exercise Jurisdiction over Ships

▼
▼
▼

Need to Define the Genuine Link!



Establishment of the Genuine Link

According to the UN Registration Convention,

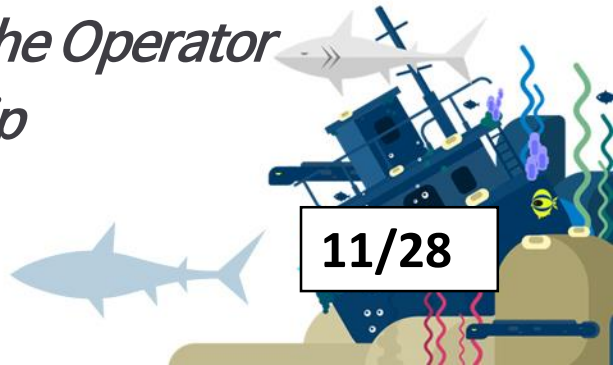
Ownership of the ships, Nationality of the crew, Management of the ship
constitute the genuine link

Presumes the Presence of the Seafarers On Board

Therefore, in case of MASS,

Key Elements of the Genuine Link can be considered as

Ownership of the Ships, Nationality of the Operator and Management of the Ship



Establishment of the Genuine Link

Ownership

Strict law on Conferring Nationality to Ships

-〉 Strictly require Ship owners to Perform required Duties & Authorities

Nationality of Operators

Replacement of Seafarers with Operators

- No human beings on board in MASS
- Necessary Qualifications of Operators

Management

Relevance with the Flag State

- Who is responsible for the Management and Operation of the ship relates to the duties as Flag States

Conclusion
– Suggestion of the Genuine Link of MASS

Nationality of the Ship Concerning Genuine Link

- Nationality decided upon the Genuine Link between the State and the Ship

- No Explicit Criteria on the Genuine Link
  -> Different Interpretations on which state is in charge of the ship

- Genuine Link on the basis of ownership of the vessel, the nationality of operators and the management of the ship

By Clarifying “the Genuine Link” Concept,
Flag State can effectively exercise its Jurisdiction and Control over Ships

Current regimes of liabilities in Autonomous Vehicles

Autonomous Vehicles

Unmanned Aerial System | Driverless Cars | MASS

“Who will be in charge of accidents caused by autonomous vehicles?”

Discussing the current regimes
1. Unmanned Aerial System

stipulated by **Montreal Convention** or the **Warsaw Convention**

Cargo liability

Carrier is held liable!

art. 2 of the Rome Convention
-Damages to a Third Party

Remotely Controlled	Fully Autonomous
Operator	**Registered Owner**

Discussing the current regimes
1. Unmanned Aerial System

stipulated by **Montreal Convention** or the **Warsaw Convention**

Royal Decree-*Drone insurance*

Operator

Must be insured for Third party Liability

4.5.2.1.3 Drone insurance

Belgium has also adopted a Royal Decree on the use of remote-controlled aerial vehicles in the Belgian Airspace.[275] This royal decree regulates the recreational and professional use of drones in the Belgian Airspace in order to guarantee the safety and the privacy of citizens. The Drone Decree requires that the operator, using a remote-controlled UAV for professional or commercial purposes, must be insured for third party liability in accordance with the minimum requirements of art. 7 of the European Regulation on insurance requirements for air carriers and aircraft operators.[276] The operators of a drone for recreational purposes must also take out an insurance for civil liability, in order to cover material and personal damages of third parties.[277]

Discussing the current regimes
2. Driverless Cars

Partially Autonomous

The **Driver** remains responsible for taking over and controlling the vehicle

Fully Autonomous

The **Autonomous Car System** and all of its components are responsible

Fault-based Liability

V.

Presumed-Fault Liability

Discussing the current regimes
2. Driverless Cars

	Fault-based Liability	Presumed-Fault Liability (Product Liability)
Related Statute	Art. 1382 C.C	Consumer Protection Act 1987, FMVSS
Premise	The driver is held liable if he committed an error or if he was negligent	Strict products liability(Presumed-Fault Liability) may place fault solely on the manufacturer
Features	The victim would need to find out who made the error in designing/programming/manufacturing	-more victim-friendly -If it seems that a defective component of the car or its software was caused by another party, car manufacturers could take recourse against this party -may increase the cost of product

STILL CONTROVERSIAL

Discussing the current regimes
2. Driverless Cars

From. J.D. Power and law firm Miller Canfield
"Automated Vehicles: Liability Crash Course"

- *Consumers are equally split if they would ride in a fully automated, self-driving vehicle, with 14% saying they "definitely would," and 33% saying they "probably would" compared with 29% saying they "probably would not," and 17% saying they "definitely would not."*
- *One-third of drivers report that they would be willing to take additional training for an ADS driver's license designation.*
- *More than half (51%) of consumers would pursue litigation for a Level 5 fully automated vehicle if it was involved in a collision and caused an injury. For this research, Level 5 is described as a vehicle where there is no human*

Requirements
-Driverless car needs to pass the safety test before actual driving
-The owner of driverless car should receive training regarding the use of driverless car
- Or, all vehicles are required to have a human operator ready to take immediate control of the car if anything went wrong

Discussing the current regimes
3. MASS

Belgian Maritime Law

Hague-Visby Rules291, the Hamburg Rules292
-Contract of Carriage

"When the cargo would be damaged, lost or delayed due to a technological defect"

The **Carrier** will be held liable

art. 1384 C.C- **Extra Contractual Liability**

"When unmanned vessel would cause damages to third parties"

-Autonomous vessels
: The ship owner

-Remote Controlled Vessels
: The ship owner or operator

Make the vessel **SEAWORTHY**
(Art. 3.1 (a) Hague-Visby Rules; Art. 14 (a) Rotterdam Rules)

Convention on Limitation of Liability for Maritime Claims (LLMC)

Amendments to 1996 Protocol
Adoption: 19 April 2012
Entry into force: 8 June 2015

Under the amendments to the 1996 Protocol, the limits are raised as follows:

The limit of liability for claims for **loss of life or personal injury** on ships not exceeding 2,000 gross tonnage is 3.02 million SDR (up from 2 million SDR).

For larger ships, the following additional amounts are used in calculating the limitation amount:

- For each ton from 2,001 to 30,000 tons, 1,208 SDR (up from 800 SDR)
- For each ton from 30,001 to 70,000 tons, 906 SDR (up from 600 SDR)
- For each ton in excess of 70,000, 604 SDR (up from 400 SDR).

The limit of liability for **property claims** for ships not exceeding 2,000 gross tonnage is 1.51 million SDR (up from 1 million SDR).

For larger ships, the following additional amounts are used in calculating the limitation amount:
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- For each ton from 30,001 to 70,000 tons, 453 SDR (up from 300 SDR)
- For each ton in excess of 70,000 tons, 302 SDR (up from 200 SDR).

Liability of owner is limited based on the weight of a ship

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No special statute for MASS Liability

Discussing the current regimes
3. MASS

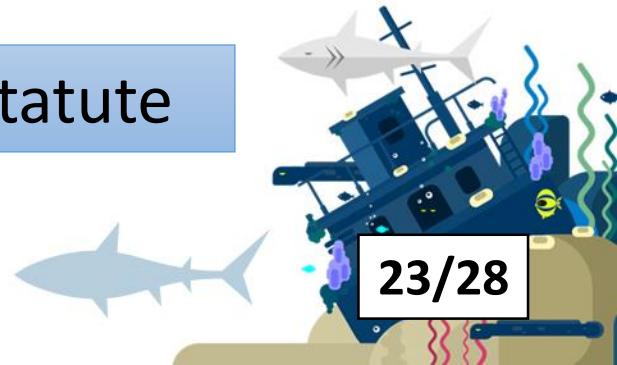
International Regulations for Preventing Collisions at Sea 1972 (COLREGs)

rule 5) places a positive duty on the vessel to maintain
'a proper lookout by sight and hearing as well as by all available means appropriate in the prevailing circumstances'.

→ Assumes a presence of crew onboard

→ if it **fails to** satisfy COLREGs,
regulation 6 of the Merchant Shipping (Distress Signals and Prevention of Collisions) states the owner and SBOs could find themselves criminally liable for failing to obey the COLREGs

MASS would not comply to this statute



Conclusion–Possible solutions for MASS

1. Rule 5 could be amended to read

'Every manned vessel shall…. maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances…..'

thus relieving the autonomous ship from the lookout by sight and hearing requirement

Laying groundwork to apply Product Liability Regime

Conclusion-Possible solutions for MASS

2. Considering specialty of MASS, LLMC should include additional articles

Product Liability Regime should be applied to MASS since it is operated by IT system, not by human crews

It is required to include

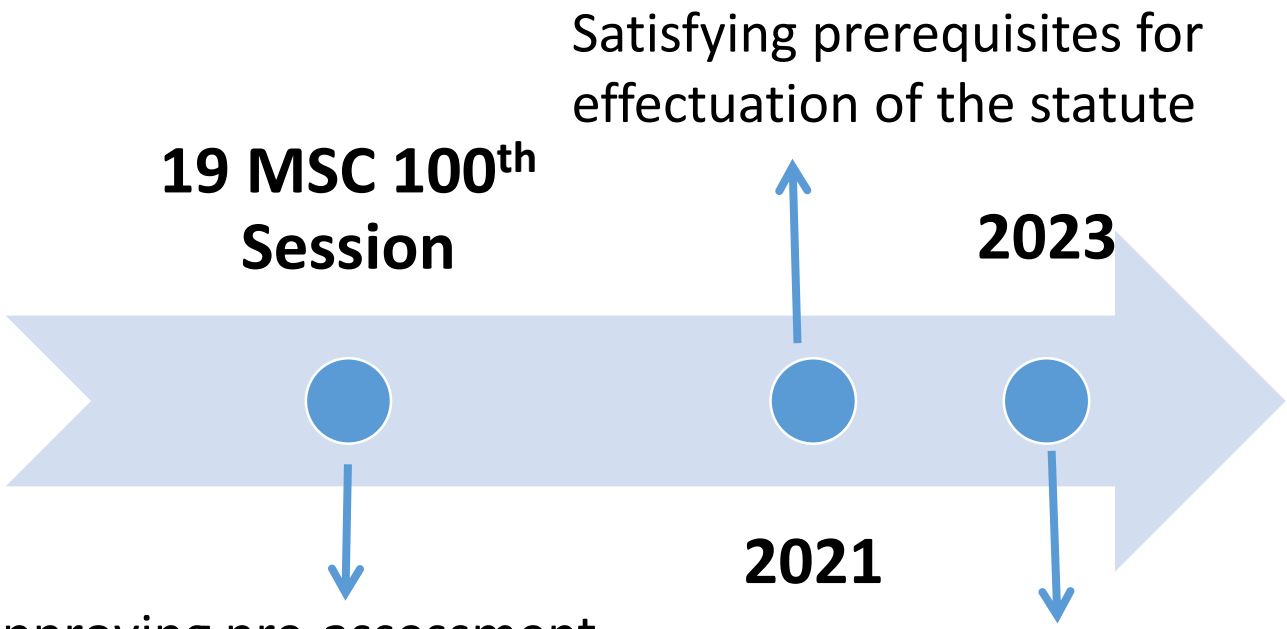
1) The owner of MASS which passed the *safety test* of international standard would be exempted from the liability
2) The owner of MASS which didn't pass the *safety test* would be applied Fault-based Regime

→The overall limit of shipowner liability needs to be decreased, since MASS is operated by IT system

3. All MASS should be enforced to join insurance like unmanned aerial system

Conclusion-Possible solutions for MASS

2018-2023 IMO PLAN



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Thank you