

Considerations regarding SMART Ships

In this document, the Swedish Shipowners' Association's (SSA) position concerning so called SMART Ships is summarized. The purpose with the position has been to establish a common view within the SSA regarding SMART Ships, to participate in the discussions on national and international level, and to highlight and put SMART Ships on the agenda among Swedish ship owners.

Definition

The name of the captioned type of vessel that should be communicated is SMART Ships. The name Autonomous should be avoided.

A SMART Ship is a ship that is digitalized and automated to a higher degree. There are several levels of digitalization and automation. Already today, most ships are digitalized and automated to some degree, and there will always be ships on the different levels but generally, the SMART Ship is more, or much more, digitalized and automated than current vessels.

Reason

The reasons for developing SMART Ships should be to attain increased safety, efficiency, and sustainability.

Ship owners' perspective

From the SSA point of view, it is expected that in general, the future ships will be increasingly digitized and automated, and there are many opportunities with this technology that can and should be exploited. For example, improved Performance Management, facilitated by e.g. improved remote monitoring and crew support via Operation Centers is expected to be implemented on a larger scale within the near future.

There are various initiatives and potential for smart ships in different segments and traffic areas.

There are no reasons though, to increase either digitalization or automation just because the technology is available and the reasons to introduce SMART Ships must always be improved safety, efficiency and sustainability. Support from authorities and Non-Governmental Organizations in the form of recommendations, guidelines, rules and regulations will be key for the implementation of SMART Ships.

Crew perspective

Even on the highest level of digitalization and automation, human interaction will be necessary, with people either onboard, or ashore. It is not expected that the required work force to operate the ships will be much less than today, although more (or all) personnel might be ashore. In fact, current experience suggests that the more high-tech that is installed on board, the larger and more qualified crew is required to handle it.

It is important that system interfaces provides a clear and comprehensive view of the processes and that the vessels' operators can govern limit values and set points according to prevailing external weather conditions for example.

The human role will remain central also in future shipping. Today, the operation of ships requires a lot of human interaction, not only for navigation, but also e.g. in machinery spaces and various loading and unloading operations. Furthermore, the crew onboard is an important part of the safety organization as well as the maintenance organization.

New competencies will be required in order to operate the SMART Ships. There will be a need for updated standards required by STCW to reflect the demands of new technology.

There are already today various support systems on board. To achieve advantages with higher level of automation and digitalization, standardization and harmonization of the systems is key. And in order for the technology to be safe, it is crucial that operators can handle the systems that are developed. HMI should be in focus. It may be a challenge to make the crew trust the systems, not the least if the systems use Artificial Intelligence and change behavior over time.

Authorities' perspective

It is not considered that existing rules and regulations are sufficient for highly automated and digitalized vessels with only a minor, or no crew. This means that rules and regulations for SMART Ships needs to be established and this must take place on an international level; IMO needs to lead this.

In connection with this, it is probably necessary to establish different levels of digitalization and automation.

New standards need to be defined for digitalized and gradually automated systems when it comes to capabilities and performance for SMART Ships. It is also necessary to define a procedure on how to validate that the system performs in accordance to standards.

A major challenge will be to integrate various sensor systems so that all relevant dangerous situations are reliably detected and appropriately acted upon.

It will be crucial to establish responsibilities, for example who is responsible at different levels of automation (crew/Captain on board, crew/Captain ashore, manufacturer?)

Requirements for crew competence needs to be established.

Most likely, rules and regulations concerning security and Information Safety will have to be updated. This work should be done through the industry and IMO guidance/regulations on cyber risk management/cyber security.

National or regional regulation should be avoided. To achieve a level playfield and compliance by ship owners and managers, robust uniform international rules and standards focusing to ensure safety of vessels and crew are preferred.

If Artificial Intelligence is implemented and used to some degree for controlling the ship, there will most likely be a need for new rules that covers self-learning systems that change behavior as time goes.

Testing in the real environment is an important part of the development of new technology. In order to facilitate this, authorities should support by allowing testing of highly automated and digitalized vessels at sea in selected areas.

Manufacturer's perspective

At the moment it seems like the SMART Ships agenda is driven partly by the manufacturers. The commoditization of ship systems and equipment manufacturing is driving a need for manufacturers to show they are innovative. It is also assumed that they see great opportunities for new business ideas, trying to position themselves in a growing industry.

Increased cooperation between manufacturers and shipowners should be beneficial for both parties in general.

The Nordic perspective

Increased cooperation within the Nordic countries between shipowners, industry, authorities and academy is probably beneficial for Nordic manufacturers to take new positions in the maritime domain. Furthermore, it will give opportunities for Swedish shipowners to develop, and to foster their brands within sustainable shipping.

Transport and logistic chain perspective

The development of applying new technology and increased digitalization should be seen from a broader perspective and focus should be on the entire transport and logistics chain. For example, implementation of new technology and increased digitalization in ports and reporting systems. Another example is remote pilotage.

Safety, security

As previously mentioned, one of the most important reasons for making the ships smarter is to improve safety. However, as the industry becomes increasingly digitized and automated, the vulnerability to cyber incidents also increases and thus the risk of accidents leading to vessels and/or business being damaged, not to mention the risk of people being hurt or killed. Hence, cyber security and safety management is an area that will require high attention as this new technology is introduced. The international approach to cyber risk management at the IMO, with development of existing and future international codes and guidelines, provides maritime operators with a coherent approach to cyber security.

The Guidelines on Cyber Security Onboard Ships¹ states; *The growing use of comprehensive data analysis, smart ships and the “Industrial Internet of Things” (IIoT) will increase the amount of information available to threat actors and the potential attack.*

Priority

It is generally considered that the work to pave the way for SMART Ships should be supported by Authorities and Non-Governmental Organizations. This work should focus on safety, efficiency and sustainability, but must not hinder the general ongoing efforts within the same areas.

Research and innovation

The shipping industry needs more research funds to develop and test new technology. In the area of smart ships, one suggested area in the SSA research strategy² is the potential of digitalization. Where the focus is on developing an ever-smarter shipping that works in symbiosis with an all smarter ambient environment. In this area, synergies with society in general, and especially the different parts of the logistics system, are particularly prominent.

Some general thoughts

The concept of an unmanned ship is not unrealistic. Neither is ships that are remotely controlled, and/or operating with unmanned bridges.

It is assumed though, that the development of SMART Ships will take place gradually on a general level. In certain sectors, e.g. domestic ferries, survey vessels or cargo vessels operating at short routes between two fixed port positions, it is likely that the technology will be implemented on a high

¹ [Guidelines on Cyber Security Onboard Ships, Version Four | International Chamber of Shipping \(ics-shipping.org\)](https://www.ics-shipping.org/)

² <http://www.sweship.se/wp-content/uploads/2019/04/190401-Forskningsstrategin-2019-2022-pdf>
<http://www.sweship.se/nyhet/swedish-shipowners-association-launches-research-strategy-2019-2023/>

level first. Perhaps within just a couple of years. In this sector, it is expected that we will first see remote controlled vessels.

For larger ships on international trades, it is expected to take much longer time before unmanned ships will be implemented on a large scale, if ever? The development of relevant international rules is a restraining factor here, as well as the fact that vessels on long distance routes need to be maintained by people while they are in service.

One key factor for a highly digitalized ship is that it is connected and online. In this respect, existing technology for ships that are operating worldwide will not be sufficient. This may be another potential barrier for the development of SMART Ships.

The ethics behind SMART Ships. How can a highly digitalized and automated SMART Ship decide to follow the law, distribute risk, and minimize damage in morally ambiguous situations?