

Scope of Work for WiSP JIP Task 3.1

July 25, 2019

1. Scope of work

Task 3.1 is to identify existing statutory regulations and classification rules relevant to vessels equipped with WASP systems. The effort will be made to describe the path of achieving the compliance with existing statutory regulations and classification rules. The detailed work will be divided into two steps:

Step 1:

An inventory of relevant statutory regulations and classification rules will first be created. These regulations and standards will be studied to identify the topics applicable to vessels equipped with WASP systems. Specifically, the requirements selection and the impact evaluation will include the following aspects:

- a. **Structures:** structural requirements for the structure foundation of the wind assisted propulsion system, e.g. rotor sail, rigs for wing sails and hull reinforcement; impact of additional wind load on the global and local hull structural strength.
- b. **Materials:** materials specifications and weld requirements for the foundation of the wind assisted propulsion system; the use of non-metallic materials.
- c. **Stability:** with WASP system, the intact stability during extreme adverse wind condition is a concern, as well as the additional heeling moment during normal operations, since it is subjected to greater wind heeling moment. The classification rules and IMO stability requirement have specific method of calculation for general vessel stability, but no clear standard has been established yet for vessels fitted with WASP systems.
- d. **Noise and vibration:** structural design considerations due to the wind load and vibration on the WASP system, and the potential impact of noise and vibrations on the habitability of the personnel onboard.
- e. **Machinery and control system:** regulations on machinery for wind assisted propulsion, related to additional power needed to power rotor sail, automatic control system that adjusts the power output between WASP system and the main propulsion system to reach optimum vessel efficiency, hydraulic or electrical systems that might be needed to drive or control the WASP system, and emergency plans to turn off the system.
- f. **Personnel safety:** the potential heeling angle due to the operation of WASP system could be a concern for crew habitability and operational safety.
- g. **Fire safety:** fire safety requirements for ships equipped with WASP systems, including the additional requirement for firefighting, the use of non-steel components, etc.
- h. **Installation and operation in a hazardous area:** Bulk carriers and oil tankers are among the ships most suitable for the installation of WASP systems due to the availability of open deck space and stability margin. However, oil tankers and bulk carriers carrying certain

cargos have hazardous areas where additional requirements are needed during the installation and operation of WASP systems.

- i. **Ship maneuvering:** MSC resolution 137(76) specifies maneuvering standards but specified that it is applicable to ships that are shaft driven and has conventional rudders. Most WASP vessels should also fall into the category since the primary driver is still conventional propeller. Effect of operating the WASP system needs to be included in calculations. It is also related to the calculation of minimum propulsion power (MPP) to maintain maneuverability. However, it is uncertain whether the larger windage area added by the WASP system could place vessels at disadvantage in the MPP calculation. More propulsion power could be needed just to provide the ship with enough power to maneuver under unfavorable wind conditions.
- j. **Safety of navigation:** bridge visibility requirement for vessels with WASP systems, which could lead to the specific placement of WASP systems on vessel. Air draft and the ability of vessels to travel under bridges with the excessive height of the WASP systems, warning signals on the WASP systems
- k. **Winterization:** for vessels operating in adverse temperature environments, winterization requirement needs to be addressed.
- l. **Retractable WASP systems:** mechanical systems to be able to retract WASP systems for safety, navigation reasons, etc. Some WASP systems may be retractable during extremely adverse wind conditions or for operational purposes.

Step 2:

As the second step, the experience from the design, installation and operation of existing WASP systems will be collected, with a focus on the experience related to the processes and obstacles in reaching compliance with existing statutory regulations and classification rules. Several JIP participants such as Norsepower, EcoFlettner, ANEMOI, DSIC, and Computed Wing Sail have practical experience with WASP systems and their inputs will be solicited. Other potential source of information outside the WiSP JIP could include, for instance, SkySails GmbH & Co. KG and Becker Marine Systems.

2. Deliverables

The final deliverables for this task include:

- a. An inventory of statutory regulations and classification rules and guidelines relevant to vessels equipped with WASP systems
- b. A report detailing the impact of the existing regulations and standards on vessels equipped with WASP systems, compliance with existing classification rules and regulations, and the recommendations on the development of new requirements