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Discussion Paper on AtoNs specifically designed to support autonomous navigation

# AtoNs Specifically Designed to Support Autonomous Navigation

The IALA Maritime Buoyage System R1001 states in Section *3.2.6. AtoN in Relation to Maritime Autonomous Surface Ships (MASS)* the following:

*“Current applications, marks and signals exhibited by AtoN as described in this document apply to all vessels, including maritime autonomous surface ships (MASS). MASS operate with varying degrees of autonomy and utilize AtoN based on the level of autonomy and type of technology used. MASS may use AtoN described within the maritime buoyage system and there may be developments of AtoN that are tailored specifically for MASS.”*

Thus, the recommendation foresees the possibility in the future to develop AtoNs that are tailored specifically for MASS.

This may imply, in the future, the provision of AtoNs which have some additional functionality to support vessels with higher degrees of automation or even the provision of AtoNs which are primarily designed to assist autonomous vessel operations.

IALA may want to consider defining new terminology and concepts related to the anticipated development of these types of AtoNs which could, for example, be categorized using the tentative terminology shown below (Table 1).

1. Possible categorization of AtoNs designed to support vessels with various degrees of automation.

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| --- | --- | --- |
| Type of AtoN | Functionality | Primary target group |
| Adaptive AtoN (name to be confirmed) | Provision of M2M AtoN information | Various intermediate degrees of shipboard automation from traditionally operated vessels to autonomous vessels |
| Supportive AtoN (name to be confirmed) | Emulating visual AtoN functionalities by other means e.g. radio transmissions | Assisted autonomous vessels |

## Adaptive AtoNs

The traditional AtoNs could be upgraded to Adaptive AtoNs by amending them with machine focused functionalities. This would mean that the traditional AtoN would be equipped with a Machine-to-Machine (M2M) interface directly communicating with shipboard equipment. These type of AtoNs, for example AIS AtoNs, are already being developed and deployed.

## Supportive AtoNs

The principal idea of Supportive AtoNs would be to transform the information provided by traditional AtoNs so it is provided in a different form. For example, the traditional visual functionalities could be replaced (or supplemented) by radio transmissions that emulate the visual functionalities locally.

Based on risk assessment methodologies, competent authorities will decide if or when to deploy Supportive AtoNs in addition to Adaptive and traditional AtoNs.

# References

1. IALA Recommendation R1001 The IALA Maritime Buoyage System (MBS), Edition 2.0 urn:mrn:iala:pub:r1001:ed2.0
2. Oltmann, Jan-Hendrik. 2023. 'What makes an AtoN >MASS-compatible<'. Proceedings of the 20th IALA Conference, Vol 2. Saint-Germain-en-Laye: IALA. 138-154.