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**Input paper for the following Committee(s):** **Purpose of paper:**

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**Agenda item** 7.7

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Proposal on the draft guideline on use of drones for aton management

# Summary

This document presents several suggestions for revision of the Draft Guideline on Use of Drones for AtoN Management, based on the application of drones in marine Aid(s) to Navigation (AtoN) management. The suggested revisions include introducing new chapters titled “Application Scenarios of Drones in AtoN Management” and “Cost Analysis”, as well as the refinement of maintenance items in Chapter 5.

## Purpose of the document

It aims to further promote the revision of the Draft Guideline on Use of Drones for AtoN Management.

## Related documents

1. IALA committee work programme 2023-2027
2. ARM19-12.1 Report of ARM19
3. IALA WP Draft Revised Guideline Use of Drones for AtoN Management

# Background

In accordance with the IALA 2023-2027 work programme, ARM has been assigned the task to develop a recommendation and guideline on the use of drones for AtoN inspection and maintenance. The draft guideline now has been developed and forwarded to ENG and DTEC together with the liaison note. ARM plans to further revise the guideline according to the feedback in ARM 20.

# Discussion

The Guideline on Use of Drones for AtoN Management is designed to offer comprehensive technical guidance for the application of drones in marine AtoN management such as using Unmanned Aerial Vehicle(UAV) to inspect lighthouses. However, the contents of section "5.7 Maintenance" in the draft guideline are not specific enough. Additionally, there is an absence of dedicated chapters that specifically address application scenarios and cost analysis regarding using UAVs in AtoN management.

## Adding A new chapter “Application Scenarios in AtoN Management”

It is recommended to introduce a new chapter entitled "Application Scenarios in AtoN Management" following "Chapter 2 Scope". This chapter should detail various aspects, including routine AtoN inspections, AtoN malfunction inspections, and support for AtoN deployment:

*X.1 Routine Visual AtoN Inspections*

*The routine visual AtoN inspections conducted by UAVs include, but are not limited to, position verification, appearance evaluation, and light quality assessment.*

*X.2 AtoN Malfunction Inspections*

*Upon receiving the AtoN alarm, UAVs can be deployed to verify the fault, capture the on-site information of the malfunction.*

*X.3 Support for AtoN Deployment*

*UAVs can be effectively utilized for terrain survey and site selection, offering significant application advantages in remote islands, capes, or other areas that are challenging for human access.*

*X.4 Other Application Scenarios*

*By deploying suitable software and hardware equipment, UAVs can be effectively applied in other scenarios, including but not limited to, radio signal detection, remote control of AtoN equipment, lighthouse range assessment, and radar beacon signal monitoring.*

## Adding A new chapter “Cost analysis”

The use of drones in the AtoN management may lead to additional expenditures. It is therefore recommended to include a "Cost Analysis" chapter following "Chapter 2 Scope" in the guideline, providing a comprehensive cost analysis frame before introducing drones into AtoN management. The contents should include, but be not limited to, the following aspects:

*The use of drones in the AtoN management may lead to additional expenditures. Therefore, the Responsible Authority should conduct a cost analysis before implementation.*

*X.1 Infrastructure and Personnel Requirements*

*UAV take-off and landing facilities;*

*Ground control stations and other facilities;*

*Qualifications and certifications of operators.*

*X.2 Area Conditions*

*Scope of operations;*

*Operational cycle*

*Existing available sites;*

*Local environment factors (airspace, wind and wave conditions, etc.).*

*X.3 Input and Output*

*Acquisition cost and durable years of new drones;*

*Cost of drone spare parts;*

*Insurance costs;*

*Maintenance and operational expenses;*

*Development and maintenance costs of the drone system;*

*Training expenses for drone operators;*

*The impact on reducing labor costs and labor intensity, as well as other expenses associated with vessel operations;*

*Other potential benefits.*

## Supplementing the content in section “5.7 Maintenance”

It is suggested to further refine the maintenance items and add the following contents to "5.7 Maintenance":

*Maintenance items include, but are not limited to, batteries, fuselage structure and power systems.*

## Supplementing the definitions in Chapter 8

Chapter 8 of the draft guideline is intended to add the definitions of Unmanned Aerial Vehicle (UAV), Unmanned Surface Vehicle (USV) and Unmanned Underwater Vehicle (UUV). The following definitions are recommended:

*a. Unmanned Aerial Vehicle (UAV):* *It refers to an aircraft that operates without an onboard pilot, that is equipped with its own flight control system, and engages in non-manned flight activities, including remotely piloted aircraft, autonomous aircraft, model aircraft, etc.*

*b. Unmanned Surface Vehicle (USV):* *It refers to a small surface self-propelled carrier with surface ships as the support platform, that can be a long time autonomous long-range navigation unmanned intelligent equipment.*

*c. Unmanned Underwater Vehicle (UUV):* *It refers to the unmanned equipment which is controlled by wired or wireless means or navigates underwater by autonomous program, that can be used for ocean exploration, resource survey, equipment maintenance and other tasks.*

## 3.5. proposal

It is proposed that the ARM Committee give due consideration to the suggestions mentioned in paragraphs 3.1, 3.2, 3.3 and 3.4 of the discussion section of this document, and make pertinent amendments to the Guideline on Use of Drones for AtoN Management.

# References

1. IALA WP Draft Revised Guideline Use of Drones for AtoN Management
2. G1047 Cost-Comparison-Methodology-of-Buoy-Technologies（Ed.1.1）

# Action requested of the Committee

The Committee is requested to:

1. consider the proposal in section 3.5; and

2 take actions as appropriate.