



GUIDANCE NOTES ON

USING UNMANNED AERIAL VEHICLES

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Foreword

Suitable means of access to structures is required for surveys to be carried out safely, effectively and efficiently. Surveyors use a combination of permanent and alternative means of access (e.g. staging, scaffolding, rafting, and rope access) in order to conduct class surveys. Remote inspection techniques are considered as additional alternative means of access. **These means help to reduce safety risks to the Surveyor (e.g., working at heights).**

Unmanned Aerial Vehicles (UAVs), as a remote inspection technique, allows the attending Surveyor to evaluate the condition of the structure from a stationary location. This technique also provides a benefit to the asset Owner/Operator by reducing operational intrusiveness.

These Guidance Notes are intended to **offer** best practices for class surveys and non-class inspections carried out using UAVs. These best practices include recommendations and guidance on applications of UAVs, qualification and proficiency of the **UAV** Service Provider, **UAV** operation and data handling, **all** intended to facilitate a safer, more effective and efficient survey. IACS Recommendations No. 42, Guidelines for Use of Remote Inspection Techniques for Surveys, has been considered in the development of these Guidance Notes.

This revision incorporates additional, relevant industry standards and ABS Guides and Guidance Notes. Section 5 has been removed and the content is reorganized into Section 2 and 4 to streamline the guidance. A recommended checklist is in Appendix 3 to aid asset owners and operators in decision making for UAV inspection process.

These Guidance Notes become effective on the first day of the month of publication.

Users are advised to check periodically on the ABS website www.eagle.org to verify that this version of these Guidance Notes is the most current.

We welcome your feedback. Comments or suggestions can be sent electronically by email to rsd@eagle.org.

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SECTION 1 Introduction

1 General

An Unmanned Aerial Vehicle (UAV) is an aircraft with no pilot on board that is controlled remotely or able to fly autonomously based on a pre-defined flight route and/or dynamic automation systems. These Guidance Notes provide best practice recommendations on the use of UAVs to facilitate safer, more effective, and efficient **inspections**.

3 Scope

The purpose of these Guidance Notes is to provide:

- i) Information related to the use of UAVs in conjunction with class surveys
- ii) Guidance to the marine and offshore industries on non-class-related UAV inspections

If UAVs **are** used in conjunction with class-related activities:

- i) It is considered an alternative remote inspection technique to assist the attending Surveyor in performing an examination of hard to reach structures.
- ii) **Data supporting the crediting of class-related activities should be submitted to ABS.**

Note: The acceptance of the inspection results is at the discretion of the attending Surveyor. If the attending Surveyor is not satisfied with the results provided by the UAV inspection, additional **inspections** using alternative or traditional inspection techniques may be required.

For non-class-related inspections, recommendations on selecting a Service Provider, conducting flight **operations** and **data** handling should be considered to allow for a safer, more effective, and efficient **inspections**.

These Guidance Notes are intended for pilot-operated UAVs, **which may be referred to as Remote Piloted Aircraft (RPA), applications only. Local requirements and regulations for the use of UAVs should be checked and followed.**

These Guidance Notes cover:

- Applications of UAVs (Section 2)
- **Guidance for Service Provider Selection** (Section 3)
- Survey Process (Section 4)

IACS Recommendations No. 42, Guidelines for Use of Remote Inspection Techniques for Surveys, were considered in the development of these Guidance Notes.

5 Associated Documents

- *ABS Guidance Notes on Job Safety Analysis for the Marine and Offshore Industries*
- *ABS Guidance Notes on Risk Assessment Applications for the Marine and Offshore Oil and Gas Industries*
- *ABS Guidance Notes on the Investigation of Marine Incidents*
- *ABS Guide for Means of Access to Tanks and Holds*
- *ABS Guide for Dropped Object Prevention on Offshore Units and Installations*

- ABS Guides and Guidance Notes on CyberSafety™
- ABS Rules for Survey After Construction (Part 7)
- ABS Rules for Building and Classing Mobile Offshore Drilling Units, Part 7, “Surveys”

7 Terminology and Abbreviations

ABS Recognized External Specialist Program: A program that ABS administers to certify service providers who perform services on behalf of an equipment manufacturer, shipyard, vessel’s owner or other clients in connection with classification and/or statutory services.

Beyond Visual Line of Sight (BVLOS) Operation: Operations where the pilot does not need to keep the UAV within their visual line of sight at all times.

Civil Aviation Authority (CAA): The statutory corporation that oversees and regulates all aspects of civil aviation in the United Kingdom. Use of UAVs within the United Kingdom is subject to CAA regulations.

Close-up Survey: A survey where details of structural components are within close visual inspection range of the Surveyor (i.e., normally within hand’s reach), which is defined in the *ABS Rules for Building and Classing Steel Vessels (SVR)*. A Close-up Survey may be referred by the offshore industry as “Close Visual Inspection” (CVI), which is defined in the *ABS Rules for Building and Classing Mobile Offshore Drilling Units (MODU Rules)*.

Digital Data: Visual data (e.g., still images, live-stream video, and recorded video), gauging data, and data from other emerging technologies.

ESP: Enhanced Survey Program.

Extended Visual Line of Sight (EVLOS) Operation: Operations that rely on one or more remote observers to keep the UAV in visual sight at all times. These remote observers, relay critical flight information via radio and assist the pilot in maintaining a safe separation from other aircraft.

Federal Aviation Administration (FAA): The national aviation authority of the United States, with powers to regulate all aspects of American civil aviation. Use of UAVs within the United States is subject to FAA regulations.

Flight Control Modules: An onboard system that can control a UAV’s direction in flight.

Hazardous Areas: In the context of these Guidance Notes, areas where flammable or explosive gases, vapors, or dust are normally present or likely to be present.

Hazardous Area Plan: An arrangement plan clearly indicating the hazardous areas with classification levels. It may be referred to as “Area Classification Plan” by the industry.

High-Definition (HD) Resolution: Video/Image of substantially higher resolution and quality than standard-definition (i.e., 720P, 1080P, 4K).

Job Safety Analysis (JSA): A technique that focuses on job tasks as a way to identify hazards. It focuses on the relationship between workers, tasks, tools, and the work environment. It also includes steps to eliminate or reduce the hazards to an acceptable level. JSA’s can be done formally, with requisite subject matter experts. They may be performed at the job site immediately prior to the beginning of a work activity.

Metadata: Data that provides information about other data. The metadata that can be collected with still imagery and video includes, but is not limited to: time/date stamps, GPS location, camera orientation, focal length, shutter speed, aperture setting, ISO level, camera type, lens type, etc.

Notice to Airman: A notice filed with an aviation authority to alert aircraft pilots of potential hazards along a flight route or at a location that could affect the safety of the flight.

Original Equipment Manufacturer (OEM): In the context of these Guidance Notes, an original UAV equipment manufacturer.

Overall Survey: A survey intended to report on the overall condition of the structure and to determine the extent of additional Close-up Surveys, which is defined in the *ABS Rules for Building and Classing Steel*

Vessels (SVR). An Overall Survey may be referred to by the offshore industry as “General Visual Inspection” (GVI), which is defined in the *ABS Rules for Building and Classing Mobile Offshore Drilling Units (MODU Rules)*.

Payload: The carrying capacity of a UAV in terms of weight. It normally refers to the reserved lifting ability of the UAV to perform additional **operations** excluding the basic systems required for flying.

Pilot: An operator who directly controls the flight of the UAV.

Payload Operator: An operator who **only** controls the onboard modules of the UAV.

Personal Protection Equipment (PPE): Protective clothing, helmets, goggles, or other garments or equipment designed to protect **a** person from an injury or hazard.

Quality Management System (QMS): A set of policies, processes and procedures required for planning and execution (production/development/service) in the core business area of an organization.

***Receiver Autonomous Integrity Monitoring (RAIM):* A technology developed to assess the integrity of Global Positioning System (GPS) signals in a GPS receiver system.**

***Remote Piloted Aircraft (RPA):* A type of UAV that is controlled remotely by a pilot**

Safety Management System (SMS): A systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.

Safety Risk Management (SRM): A key component of the SMS, meant to determine the need for, and adequacy of, new or revised risk controls based on the assessment of acceptable risk.

Safety Assurance (SA): A key component of the SMS, meant to evaluate the continued effectiveness of applied risk control strategies and supports the identification of new hazards.

Service Provider: A company which provides specialized inspection services using UAVs.

SOLAS: International Conventions for the Safety of Life at Sea.

Standard Operation Procedure (SOP): a set of step-by-step instructions created by the organization to assist workers in carrying out routine operations.

Survey Planning Document: A document prepared by the Owner/Operator to support the survey pre-planning requirements for carrying out **class-related** surveys.

Unmanned Aerial Vehicle (UAV): An aircraft with no pilot on board that is controlled remotely or able to fly autonomously based on a pre-defined flight route and/or dynamic automation systems. Unmanned Aerial Vehicles may be referred to by the industry as “drones” or Remotely Operated Aerial Vehicles (ROAVs). UAV is also referred to as Unmanned Aircraft System (UAS), a system which comprises of the unmanned aircraft (i.e., UAV) and its associated ground control station, data links, and other support equipment. In these Guidance Notes, UAV is intended for remote-controlled vehicles only.

***Visual Line of Sight (VLOS) Operation:* Operations that keeps the UAV in the visual-line-of-sight of the pilot at all times. For example not flying a UAV into clouds or fog, not flying behind (or partially behind) topsides, jackup legs or other obstructions.**



SECTION 2 Application of Unmanned Aerial Vehicles

1 General

UAVs are typically equipped with a camera and flight control modules that are capable of collecting visual data in the form of still **images**, live-stream **videos**, or recorded **videos** of difficult to reach structures.

Listed below are a few examples of where UAVs can be used to aid/assist in inspection-related activities:

- i) **Working at Heights:** UAVs can reduce or **eliminate** the need for personnel **to** work at heights **using** conventional means of access (e.g., staging, scaffolding, rafting, etc.).
- ii) **Preliminary Condition Assessment:** UAVs can be used as a screening tool to quickly collect visual data at specified locations for preliminary condition assessments.
- iii) **Known Condition Assessment Monitoring:** UAVs can be used to periodically monitor temporary repairs that are in hard to reach areas. Additionally, known damage that does not require immediate repair can be monitored through photographic evidence or other data analysis collected by UAVs.
- iv) **Damage Assessment for Rapid Response:** UAVs can be used to assist rapid and timely damage assessment following certain situations (e.g., collision or grounding of vessels, etc.)

It is noted that UAVs are an evolving technology. Additional applications for the use of UAVs may become available in the future.

3 Application to Class Survey

UAVs are a tool **which may be used** to assist the attending Surveyor with class-related activities where **the** visual examination of the structure is required.

If a vessel owner or operator intends to incorporate the use of a UAV into an ABS Survey the local ABS office should be advised in advance, and the intended use of the UAV should be incorporated into the survey planning.

Compliance with all Rule and Regulatory requirements, in particular requirements for Close-Up Inspection, Hull Thickness Measurements and NDE also need to be considered, and incorporated into Survey Planning Documents as applicable. The role of the Owner/Operator, UAV Company, and ABS are outlined in Section 2, Table 1, "Roles and Responsibilities" below. For details on survey planning, scheduling and execution, the local ABS Survey office or ABS Divisional Assistant Chief Surveyors office should be contacted.

TABLE 1
Roles and Responsibilities

Activity	Role of Owner/Operator	Role of Service Provider	Role of ABS
Planning	Determine, in consultation with ABS, if the use of a UAV is appropriate Select a UAV Service Provider Provide supporting information to the Service Provider about the asset condition and drawings related to the work scope Review and accept the UAV inspection plan proposed by the Service Provider Provide Survey Planning Documentation, with inspection plan incorporated, to the attending Surveyor Coordinate logistical aspects of the inspection, such as obtaining work/site permits, onboarding crews, inspection preparation, etc.	Develop an inspection plan which includes, but is not limited to: - Determining the appropriate type of UAV to be used - Performing a risk assessment and develop the UAV flight plan based on the work scope	Review the proposed Survey Planning Document to verify the survey plan satisfies the applicable Rules, Guides, and organizational processes while employing the UAV as an inspection technique.
Operation	Initiate the UAV inspection Co-ordinate Survey and UAV activity with the Surveyor and the UAV Company	Execute the UAV inspection in accordance with the agreed to Survey Planning Document, Flight plan and to the satisfaction of the ABS Surveyor	Conduct the class survey in compliance with applicable Rules, Guides, and organizational processes
Reporting	Review the inspection results provided by the Service Provider	Provide inspection results and data to the Owner/Operator and ABS, as applicable	Evaluate the results of the UAV inspection for Surveyor credit.

As with Survey activity, acceptance of the inspection results will be to the satisfaction of the attending Surveyor. If the Surveyor is not satisfied with the inspection results provided by the UAV, alternative or traditional survey techniques may be required.

Additional conditions for using UAVs during class-related activities are discussed in Section 4.