

Deliverable 1.3

Di-PEGASUS solutions' regulatory compliance

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Authors: Pasquale Aversano (EUROUSC)
Sara Molinari (EUROUSC)

Abstract:

This deliverable offers a structured analysis of the current and emerging regulations and standards that are pertinent to the development of the technologies envisioned within the Di-PEGASUS project.

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Main authors	Pasquale, Aversano (EUROUSC) – Sara, Molinari (EUROUSC)
Contributors	Giovanni Franzini (ART) Catherine Daou Battais (SED) Muhammet Ebubekir Torbali (CRA)
Reviewers	Adrien Metge (ART) Nicoletta Martelli (ITL)
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LIST OF ACRONYMS

Acronym	Definition
AFRA BMP	Aircraft Fleet Recycling Association Best Management Practice
AMC	Acceptable Means of Compliance
ARP	Aerospace Recommended Practice
ASTM	American Society for Testing and Materials
CAO	Combined Airworthiness Organisation
CNS	Communication, Navigation and Surveillance
ATM	Air Traffic Management
DAA	Detect And Avoid
GSE	Ground Support Equipment
GM	Guidance Material
GNSS	Global Navigation Satellite System
HMI	Human – Machine Interface
IATA	International Air Transport Association
IEC	International Electrotechnical Commission
IVHM	Integrated Vehicle Health Management
MSO	Multiple Simultaneous UA flight Operations
OSO	Operational Safety objectives
QMS	Quality Management System
RNP	Required Navigation Performance
SORA	Specific Operations Safety Objectives
UAS	Unmanned Aircraft System
VTOL	Vertical Take-Off Landing

EXECUTIVE SUMMARY

The present deliverable titled “D1.3 Di-PEGASUS solutions' regulatory compliance”, has been developed within the framework of the Di-PEGASUS project which is funded by the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No 101096000.

The primary goal of this document is to identify and map all pertinent current and emerging regulations and standards relevant to the development and eventual deployment of Di-Pegasus technologies. Therefore, it serves not only as a foundational reference for the project but also as a strategic guide for all subsequent development activities. This mapping exercise includes a wide list of regulatory and normative domains, ensuring that every critical aspect is considered to facilitate safe and compliant innovation. The focus areas include:

- **Safety:** Assessing the regulatory requirements and standards that ensure the secure operation of drones, VTOLs and seaplanes.
- **Liability:** Evaluating frameworks that define responsibilities in the event of incidents or accidents involving Di-Pegasus technologies, clarifying the distribution of accountability among operators, manufacturers, and other stakeholders.
- **Insurance:** Reviewing the insurance landscape to determine mandatory coverage and risk mitigation strategies tailored to the unique operational context of autonomous seaplanes, VTOLs, and drones.
- **Cybersecurity:** Analysing standards and regulations aimed at protecting systems and data from malicious threats, ensuring the resilience and integrity of digital platforms and communications utilised by Di-Pegasus technologies.
- **Enforcement:** Investigating the mechanisms and authorities responsible for monitoring compliance and enforcing relevant regulations, including procedures for addressing sanctions.
- **Land Use:** Considering zoning laws, airspace management rules, and other spatial regulations that impact the deployment and operation of aerial and ground autonomous vehicles in both urban and remote environments.
- **Environmental Protection:** Identifying environmental standards and best practices designed to minimise the ecological footprint of new technologies, including noise, emissions, and the impact on biodiversity and natural habitats.

Through this deliverable, the project team aims to provide a robust regulatory and standards framework that will assist the successful integration of Di-Pegasus technologies into existing and future operational landscapes. The findings will support the technical development, risk management, and deployment strategies of the project, ensuring alignment with European and international best practices. Moreover, the insights generated will be instrumental for other work packages, such as WP2 and WP3, guiding the technical design and implementation phases to guarantee regulatory compliance and operational excellence throughout the project lifecycle.

The regulatory analysis was conducted collaboratively among project partners, ensuring comprehensive coverage of all relevant technological domains. The deliverable provides:

- A structured synthesis of key regulations applicable to Di-PEGASUS technologies.
- An analysis of technical standards (e.g., EUROCAE, ISO, NATO, RTCA, ASTM, etc.) and their relations to the technologies under development.

1. INTRODUCTION

1.1. Objectives and scope of the document

This document provides an overview of the regulatory and standardization framework relevant to the development and deployment of technologies under the Di-Pegasus project. The analysis goes beyond safety considerations, encompassing aspects such as liability, insurance, security, enforcement, land use, and environmental protection. Key references include European regulations and standards published by leading organizations such as EUROCAE, ISO, NATO, RTCA, ASTM. The insights gathered will serve as input for WP2 and WP3, supporting decision-making during the development phase.

1.2. Document structure

The document is organised as follows:

- **Section 1 – Introduction:** Presents the objectives and scope of the regulatory and standards analysis, outlining the overall purpose of the document.
- **Section 2 – Regulations:** Provides a detailed overview and mapping of the main regulations applicable to Di-PEGASUS technologies.
- **Section 3 – Technical Standards:** Examines pertinent European and international technical standards, evaluating their significance and impact on the development of the project's technologies.
- **Section 4 – Conclusions:** Summarizes the main findings, provides recommendations for technical and operational work packages, and suggests next steps to ensure ongoing compliance and integration of best practices.

2. REGULATIONS

This chapter provides a structured analysis of key regulations relevant to the Di-PEGASUS project. The identification and study of regulations have been carried out collaboratively by project partners, ensuring that each technological domain is addressed with respect to one or more of the following areas: safety, liability, insurance, security, enforcement, land use, and environmental protection. Given the innovative nature of the technologies under development, comprehensive regulatory coverage is not yet available across all proposed topics for each technology.

The mapping process highlights the specific constraints and requirements imposed by these regulations, enabling the project team to synchronize development and compliance efforts with established legal frameworks. This approach ensures that all technologies are produced in accordance with recognized best practices, stakeholder expectations, and evolving regulatory requirements.

Findings are summarized in tables as follows:

"Technology considered"						
Applicable Regulation	Applicable Article	Article Text	Relevance for the project	Topic covered	Status of the regulation	Link

Table 1 Regulations: Tables Template

Having the following meanings:

1. **Applicable regulation:** The official title of the regulation relevant to the technology;
2. **Applicable article:** The specific applicable article or section of the document;
3. **Article text:** The full text of the specific article or the extract that directly applies to the project;
4. **Relevance for the project:** An explanation of the article's impact on, and importance to, the project's development and objectives;
5. **Topic covered:** The primary regulatory category addressed (safety, liability, security, insurance, enforcement, land use and environmental protection);
6. **Status of the regulation:** Indicates whether the regulation has been already published or not;
7. **Link:** A hyperlink to the official text of the regulation, where available.

2.1. Swarm intelligence for multi-agent behaviour

SWARM INTELLIGENCE FOR MULTI-AGENT BEHAVIOUR						
Applicable Regulation	Applicable Article	Article Text	Relevance for the project	Topic covered	Status of the regulation	Link
CS-UAS (JARUS)	Annex B - SUBPART B.2100 Mass and Centre of gravity	Where the MSO ¹ has an influence on the loading of the individual UAs that could cause that one or more UA will operate out of certified limits, this influence must be considered for normal, abnormal and emergency operation, including failures of individual UAs.	This article defines a high-level overview of the operation requirements of the Swarm.	Safety	Already Applicable	CS-UAS
CS-UAS (JARUS)	Annex B - SUBPART B.2100 B-UAS.2102 Approved Flight Envelope	It must be ensured, that any normal, abnormal or emergency operation of an individual UA or the MSO in total does not lead to a conflict with the approved flight envelope of each individual UA participating on the MSO.	This article defines a high-level overview of the operation requirements of the Swarm.	Safety	Already Applicable	CS-UAS
CS-UAS (JARUS)	Annex B - UAS.2612 Equipment and Interfaces for Data Exchange Between the UA	(a) The individual or collective UAs involved in the MSO must be able to transmit: (1) the status of the UA (2) the performance related to the manoeuvrability	This article defines the minimum data that must be exchanged between UAS and Ground station.	Safety	Already Applicable	CS-UAS

¹ Multiple Simultaneous UA flight Operations (MSO)

	and the Ground Segment	(3) trajectory information to enable all participants in the operational environment to operate safely (4) any other information required by the relevant airspace authorities.				
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Table 2 Applicable regulations for "Swarm intelligence for multi-agent behaviour" technology

2.2. New generation control station HMI for AI tasked UAS

NEW GENERATION CONTROL STATION HMI FOR AI TASKED UAS						
Applicable Regulation	Applicable Article	Article Text	Relevance for the project	Topic covered	Status of the regulation	Link
EU 2019/947	AMC 1 Article 11	<p>Rules for conducting an operational risk assessment" - SORA, OSO #20 "A human factors evaluation has been performed and the HMI has been found appropriate for the mission".</p> <p>"INTEGRITY (L,M,H): The UAS information and control interfaces are clearly and succinctly presented and do not confuse, cause unreasonable fatigue, or contribute to remote crew errors that could adversely affect the safety of the operation.</p> <p>The applicant conducts a human factors evaluation of the UAS to determine whether the HMI is appropriate for the mission. The HMI evaluation is based on inspection or analyses.</p>	<p>This AMC outlines the specific requirements that must be met for the Human-Machine Interface (HMI) of an Unmanned Aircraft System (UAS) in a successful operational risk assessment. This requirement must be taken into account while developing a control station HMI.</p>	Safety	Already applicable	EU 2019/947

		<p>ASSURANCE (L): The applicant conducts a human factors evaluation of the UAS to determine whether the HMI is appropriate for the mission. The HMI evaluation is based on inspection or analyses.</p> <p>(M): Same as Low but the HMI evaluation is based on demonstrations or simulations. The competent authority should request EASA to witness the HMI evaluation of the UAS.</p> <p>(H): Same as Medium. In addition, EASA witnesses the HMI evaluation of the UAS and the competent authority of the MS or an entity that is designated by the competent authority witnesses the HMI evaluation of the possible electronic means used by the AO.</p>				
<p>Regulation (EU) 2016/679 – General Data Protection Regulation (GDPR)</p>	ALL	ALL	<p>GDPR impacts HMI development by requiring privacy-by-design, secure data handling, consent management, and user rights features. Compliance supports legal safety, trust, and smooth UAS integration in EU airspace.</p>	Liability	Already applicable	GDPR

<p>Regulation (EU) 2024/1689 – EU AI Act</p>	<p>ALL</p>	<p>ALL</p>	<p>The EU AI Act imposes strict rules on AI functions and will be useful for the HMI of UAS AI- tasked development. This regulation includes ensuring transparency, clearly indicating when AI influences decisions, providing effective human oversight with the option to override, maintaining strong cybersecurity and producing accurate/explainable results. All these requirements must be integrated from the start to guarantee safety, accountability, and ongoing compliance throughout the life of the system.</p>	<p>Security</p>	<p>Already applicable</p>	<p>EU AI act</p>
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Table 3 Applicable regulations for “New generation control station HMI for AI tasked UAS” technology

2.3. Flexible fleet and operations management

FLEXIBLE FLEET AND OPERATIONS MANAGEMENT						
Applicable Regulation	Applicable Article	Article Text	Relevance for the project	Topic covered	Status of the regulation	Link

<p>EU 2021/664</p>	<p>Art. 8 (2) Network identification service</p>	<p>The network identification service shall allow for the authorised users to receive messages with the following content:</p> <ul style="list-style-type: none"> (a) the UAS operator registration number; (b) the unique serial number of the unmanned aircraft or, if the unmanned aircraft is privately built, the unique serial number of the add-on; (c) the geographical position of the UAS, its altitude above mean sea level and its height above the surface or take-off point; (d) the route course measured clockwise from true north and the ground speed of the UAS; (e) the geographical position of the remote pilot or, if not available, the take-off point; (f) the emergency status of the UAS; (g) the time at which the messages were generated. 	<p>This article paragraph highlights the data that the software should provide when doing operation management.</p>	<p>Enforcement</p>	<p>Already applicable</p>	<p>EU 2021/664</p>
<p>EU 2021/664</p>	<p>Art. 8 (3) Network identification service</p>	<p>The information provided by the network identification services shall be updated at a frequency that the competent authority has determined.</p>	<p>This article highlights the importance of IT infrastructure performance and gives general design guidelines.</p>	<p>Enforcement</p>	<p>Already applicable</p>	<p>EU 2021/664</p>
<p>EU 2021/664</p>	<p>Art. 9 Geo-awareness service</p>	<p>1. A geo-awareness service consisting of the following geo-awareness information shall be provided to UAS operators:</p>	<p>This article outlines the basic requirements of the geo-awareness system.</p>	<p>Safety</p>	<p>Already applicable</p>	<p>EU 2021/664</p>

		<p>(a) information on the applicable operational conditions and airspace constraints within the U-space airspace;</p> <p>(b) UAS geographical zones, relevant to the U-space airspace;</p> <p>(c) temporary restrictions applicable to airspace use within the U-space airspace.</p> <p>2. U-space service providers shall dispatch the geo-awareness information in a timely manner to allow contingencies and emergencies to be addressed by UAS operators and shall include its time of update together with a version number or a valid time, or both.</p>				
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Table 4 Applicable regulations for "Flexible fleet and operations management" technology

2.4. Safe automatic landing aids at vertiports

SAFE AUTOMATIC LANDING AIDS AT VERTIPORTS						
Applicable Regulation	Applicable Article	Article Text	Relevance for the project	Topic covered	Status of the regulation	Link
Prototype Technical Design Specifications for Vertiports	CHAPTER D, SUBPART 2 – OBSTACLE FREE VOLUME	PTS VPT-DSN.D.440 General The objective of the obstacle-free volume (OFV) is to provide protection above	The Prototype Technical Design Specifications for Vertiports offers guidance to urban planners and local decision-makers as well as industry to enable the safe design of	Safety	Already applicable	Prototype Technical Design Specifications for Vertiports

		<p>vertiports to facilitate the introduction of vertiports in congested areas and an obstacle populated environment for VTOL-capable aircraft. The corresponding procedure is designated as 'vertical take-off and landing'. Due to the reduced footprint and vertical nature of the take-off and landing, synthetic cues may have to be used to guide the aircraft.</p>	<p>vertiports that will serve these new types of vertical take-off and landing (VTOL) aircraft, which are already at an advanced stage of development. The requirements for the definition of the obstacle-free volume should be taken into account in the development of the landing aids.</p>			
<p>ICAO Annex 14 Aerodromes</p>	<p>Vol II Heliports</p>	<p>ALL</p>	<p>Key elements covered in ICAO Annex 14, Volume II - Heliports include:</p> <ul style="list-style-type: none"> - Operational Procedures: Guidelines for safe heliport operations, addressing take-off, landing, and ground handling procedures. - Safety Measures: Standards to ensure the safety of helicopter operations at heliports, covering everything 	<p>Safety</p>	<p>Already applicable</p>	<p>ICAO Annex 14</p>

			from obstacle clearance to fire and rescue services.			
Arrêté TAC Helistation 29/09/2009	ALL	ALL	This arrêté (regulation) sets out specific requirements and guidelines for the establishment and operation of helistations, covering aspects such as safety, design, equipment, and operational procedures.	Safety	Already applicable	Arrêté TAC Helistation
FAA vertiports design	ALL	ALL	The document typically would cover various aspects of vertiport design to be taken into account for the project success. Overall, the document is intended to provide a comprehensive framework to support the safe, efficient, and sustainable development of vertiports, facilitating the integration of VTOL aircraft into the broader transportation network.	Safety	Under development	FAA vertiports design
SC-LUAS	SC-LUAS.2105 SC-LUAS.2130 SC-LUAS.2210 SC-LUAS.2410 SC-LUAS.2510	ALL	The SC LUAS document specifically addresses light unmanned aircraft and includes requirements relevant to their operation including landing.	Safety	Already applicable	SC-LUAS

SC-VTOL	SC-VTOL.2105(a) SC-VTOL.2130 SC-VTOL.2310 SC-VTOL.2330	ALL	The SC-VTOL document addresses the design, operation, and safety concerns for landing on vertiports. These may be outlined in sections focusing on ground operations, approach and landing operations, and related systems.	Safety	Already applicable	SC-VTOL
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Table 5 Applicable regulations for "Safe automatic landing aids at vertiports" technology

2.5. Health management of landed aircraft tool

HEALTH MANAGEMENT OF LANDED AIRCRAFT TOOL						
Applicable Regulation	Applicable Article	Article Text	Relevance for the project	Topic covered	Status of the regulation	Link
EU 1321/2014 AMC and GM to Part-145	Annex 2. Section A Technical requirements AMC 145.A.10	1. Line Maintenance should be understood as any maintenance that is carried out before flight to ensure that the aircraft is fit for the intended flight.	This AMC defines the compliance requirements applicable to individuals and organisations engaged in continuing airworthiness activities (including technical, facility, equipment and personnel requirements).	Liability	Already applicable	EU 1321/2014
EU 1321/2014	Art.4 (1)	Organisations involved in the continuing airworthiness of aircraft and components for installation thereon, including maintenance, shall be approved, upon their	List of the relevant document to follow to make a health management tool.	Liability	Already applicable	EU 1321/2014

		request, by the competent authority in accordance with the requirements of Annex II (Part-145), Annex Vc (Part-CAMO) or Annex Vd (Part-CAO), as applicable to the respective organisations.				
EU 1321/2014 Annex III (Part-66) Section A	ALL	ALL	This section defines the aircraft maintenance licence and establishes the requirements for application, issue and continuation of its validity.	Liability	Already applicable	EU 1321/2014

Table 6 Applicable regulations for "Health management of landed aircraft tool" technology

2.6. Innovative de-icing and biofouling mitigation strategies at vertiports/water airports

INNOVATIVE DE-ICING AND BIOFOULING MITIGATION STRATEGIES AT VERTIPORTS/WATER AIRPORTS						
Applicable Regulation	Applicable Article	Article Text	Relevance for the project	Topic covered	Status of the regulation	Link
EU 965/2012	Part - CAT.OP.MPA.250 and GM. Ice and other contaminants, ground procedures	(a) The operator shall establish procedures to be followed when ground de-icing and anti-icing and related inspections of the aircraft are necessary to allow the safe operation of the aircraft.	This represents the main reference to follow when dealing with de-icing problem and then must be considered in the Di-Pegasus framework.	Safety	Already applicable	EU 965/2012

Table 7 Applicable regulations for "Innovative de-icing and biofouling mitigation strategies at vertiports/water airports" technology

2.7. Sustainable circular economy in aircraft and vertiports/water airports through digitalization

SUSTAINABLE CIRCULAR ECONOMY IN AIRCRAFT AND VERTIPORT/WATER AIRPORTS THROUGH DIGITALIZATION						
Applicable Regulation	Applicable Article	Article Text	Relevance for the project	Topic covered	Status of the regulation	Link
EU 748/2012	Subpart K 21-A.303 Compliance with applicable requirements AMC and GM.	The showing of compliance of parts and appliances to be installed in a type-certificated product shall be made: (a) in conjunction with the type-certification procedures of Subpart B, D or E for the product in which it is to be installed; or (b) where applicable, under the ETSO authorisation procedures of Subpart O; or (c) in the case of standard parts, in accordance with officially recognised Standards.	This subpart explains how a part (in general, which includes even from a retired aircraft) must be inspected and certified by a competent maintenance organisation to be installed on another aircraft.	Enforcement	Already applicable	EU 748/2012
EU 1321/2024	Annex 2 Part 145.A.42 components AMC and GM	ALL	This annex explains the procedures that a maintenance organisation must follow when accepting components, including used ones, for installation (giving a procedure also about how to understand if it is possible or not the re-use).	Enforcement	Already applicable	EU 1321/2014

Table 8 Applicable regulations for "Sustainable circular economy in aircraft and vertiports/water airports through digitalization" technology

3. STANDARDS

This chapter provides a structured analysis of key standards relevant to the Di-PEGASUS project. The identification of standards has been carried out collaboratively by project partners, ensuring that each technological area is addressed with respect to one or more of the following areas: safety, liability, insurance, cybersecurity, regulatory enforcement, land use, and environmental protection. Given the innovative nature of the technologies under development, comprehensive standards coverage is not yet available across all proposed topics for each technology. The standards included in this chapter—sourced from leading European and international standardisation bodies such as EUROCAE, ISO, NATO, RTCA, ASTM, and others—cover all core Di-PEGASUS technologies.

This structured mapping allows the project team to synchronise development and compliance efforts with established industry standards. By linking the standards overview with the regulatory insights discussed in the previous chapter, this deliverable provides a practical and transparent guide for shaping and executing Di-PEGASUS solutions following best practices and meeting stakeholders’ needs.

“Technology considered”						
Applicable Standard	Relevant sections of the document	Standard Text	Relevance for the project	Topic covered	Status of the Standard	Link

Table 9 Standards: Tables Template

Having the following meanings:

1. **Applicable Standard:** The official title of the Standard relevant to the technology;
2. **Relevant sections of the document:** The reference to the specific standard parts or sections that are pertinent to the technology considered;
3. **Standard text:** The full text of the specific standard or the extract that directly applies to the project;
4. **Relevance for the project:** An explanation of the standard’s impact on, and importance to, the project’s development and objectives;
5. **Topic covered:** The primary standard category addressed (safety, liability, security, insurance, enforcement, land use and environmental protection);
6. **Status of the Standard:** Indicates whether the standard is currently in force or not;
7. **Link:** A hyperlink to the official text of the standard, where available.

3.1. Swarm intelligence for multi-agent behaviour

SWARM INTELLIGENCE FOR MULTI-AGENT BEHAVIOUR						
Applicable Standard	Relevant sections of the document	Standard Text	Relevance for the project	Topic covered	Status of the Standard	Link
NATO STANAG 4811 Sense and avoid for unmanned aircraft systems	Whole document	ALL	STANAG 4811 is a NATO standard that sets shared functional and performance guidelines for "Sense-and-Avoid" (SAA) systems on Unmanned Aircraft Systems (UAS), which are essential for operating drone swarms.	Enforcement	Published	NATO STANAG 4811
ASTM F3442 Standard Specification for Detect and Avoid System Performance Requirements	Whole document	N/A	ASTM F3442 (latest editions: F3442-25/-23, originally F3442-20) is a performance-based standard for "Detect-and-Avoid" (DAA) systems on small, unmanned aircraft (wingspan ≤ 25 ft, speeds < 100 knots) operating in low- to medium-risk airspace such as Classes G, E, B, C, and D—typically below 1,200 ft AGL. It defines safety performance thresholds and compliance methods (e.g., detection range, well-clear timing, near mid-air collision protection) for encounters with crewed aircraft under IFR/VFR, without mandating a specific architecture.	Enforcement	Published	ASTM F3442
RTCA DO-365 Minimum Operational Performance Standards (MOPS) for Detect and Avoid (DAA) Systems	Whole document	ALL	This standard contains Phase 1 Minimum Operational Performance standards (MOPS) for DAA systems used in aircraft transitioning to and from Class A or special use airspace (higher than 500' Above Ground Level (AGL)), traversing Class D, E, and G airspace in the NAS (US).	Enforcement	Published	RTCA DO-365

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Table 10 Applicable standards for “Swarm intelligence for multi-agent behaviour” technology

3.2. New generation control station HMI for AI tasked UAS

NEW GENERATION CONTROL STATION HMI FOR AI TASKED UAS						
Applicable Standard	Relevant sections of the document	Standard Text	Relevance for the project	Topic covered	Status of the Standard	Link
IEC 63303:2024 Human machine interface for process automation system	Whole document	N/A	This standard describes requirements of the HMI in the design, implement and operate stage. Moreover, it gives indications about the human factors and ergonomics, user sensory limits, user interaction and training.	Safety	Published	IEC 63303:2024
NATO STANAG 4586	Whole document	ALL	This standard defines architectures, interfaces, communication protocols, data elements and message formats. It includes data link, command and control, and human/computer interfaces.	Enforcement	Published	NATO STANAG 4586
MAVLink 2.0 Message signing & security features (more a protocol than a standard)	Whole document	ALL	MAVLink 2.0 is an open-source, lightweight communication protocol extensively utilized in Unmanned Aircraft Systems (UAS) and robotics to facilitate the exchange of telemetry, command, and control data among vehicles, ground stations, and onboard components. This protocol provides insight into the data and telemetry shared	Safety	Published	MAVLink 2.0

			between UAS components, allowing for subsequent display on the human-machine interface (HMI).			
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Table 11 Applicable standards for "New generation control station HMI for AI tasked UAS" technology

3.3. Flexible fleet and operations management

FLEXIBLE FLEET AND OPERATIONS MANAGEMENT						
Applicable Standard	Relevant sections of the document	Standard Text	Relevance for the project	Topic covered	Status of the Standard	Link
DO-178C/ED-12C Software Considerations in Airborne Systems and Equipment Certification	Whole Document	N/A	The primary standard that provides a Means of Compliance by which the certification authorities will approve all commercial airborne software. DO-178C prescribes a specific list of process to be followed in the development of airborne systems software.	Enforcement	Published	DO-178C ED-12C
DO-278A / ED-109A Software Integrity Assurance Considerations for Communication, Navigation, Surveillance and Air Traffic Management (CNS/ATM) Systems	Whole document	N/A	DO-278A is the equivalent standard as DO-178C adapted for complex, ground-based systems (CNS/ATM).	Enforcement	Published	DO-278A ED-109A

DO-330 /ED-215 Software tool qualification process	Whole document	ALL	This standard's purpose is to provide a guidance for the qualification of software tools, serving as an essential supplement to the application development processes of DO-178C (airborne) and DO-278A (ground-based).	Enforcement	Published	DO-330/ED-215
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Table 12 Applicable standards for "Flexible fleet and operations management" technology

3.4. Safe automatic landing aids at vertiports

SAFE AUTOMATIC LANDING AIDS AT VERTIPORTS						
Applicable Standard	Relevant sections of the document	Standard Text	Relevance for the project	Topic covered	Status of the Standard	Link
PinS (Point in Space) Procedure	Whole Document	ALL	Procedure to approach and landing on heliports, that could be a reference for safety to the approach and landing for AAM on vertiports.	Safety	Published	Helicopter point in space operations in controlled and uncontrolled airspace EUROCONTROL
Procedures for Air Navigation Services (PANS) Aircraft Operations - Volume I Flight Procedures (Doc 8168)	Whole Document	N/A	PANS-OPS includes detailed criteria for obstacle clearance, route spacing, and other safety-related parameters to ensure that the designed procedures provide an adequate level of safety. PANS-OPS also includes specific guidelines for helicopter procedures, including PinS (Point-in-Space) approaches and departures, ensuring the safe operation of helicopters in various flight conditions.	Safety	Published	PANS

<p>EASA AMC 20-27 – Airworthiness Approval and Operational Criteria for RNAV GNSS Systems for RNP APCH Operations, Annex III to EASA Decision 2009/019/R</p>	<p>Whole Document</p>	<p>ALL</p>	<p>EASA AMC 20-27 Key aspects include:</p> <ul style="list-style-type: none"> • Performance Criteria: Specifications for the required performance of navigation systems, including accuracy, integrity, availability, and continuity. • Operational Procedures: Procedures that must be adhered to by operators and pilots to ensure safe and efficient RNP operations. 	<p>Safety</p>	<p>Published</p>	<p>AMC 20-27 - EASA PDF</p>
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Table 13 Applicable standards for “Safe automatic landing aids at vertiports” technology

3.5. Health management of landed aircraft tool

HEALTH MANAGEMENT OF LANDED AIRCRAFT TOOL						
Applicable Standard	Relevant sections of the document	Standard Text	Relevance for the project	Topic covered	Status of the Standard	Link
<p>SAE ARP 4761 - Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment</p>	<p>Whole document</p>	<p>N/A</p>	<p>This document outlines how to use standard modelling methods to evaluate a system's safety.</p>	<p>Safety</p>	<p>Published</p>	<p>SAE ARP 4761</p>

<p>SAE ARP6883 - Guidelines for Writing IVHM (integrated vehicle health management) Requirements for Aerospace Systems</p>	<p>Whole document</p>	<p>N/A</p>	<p>This document contains specific IVHM writing guidelines that clarify requirements and improve systems management.</p>	<p>Safety</p>	<p>Published</p>	<p>SAE ARP6883</p>
<p>S5000F – International specification for in-service data feedback</p>	<p>Whole document</p>	<p>ALL</p>	<p>This standard defines a standardized, structured, and repeatable process for exchanging information about a product (e.g. airplane, seaplane, VTOL...) once it is operational. It's essential to consider while developing a health management tool order to work with any airline or manufacturer that adopts the standard.</p>	<p>Enforcement</p>	<p>Published</p>	<p>S5000F</p>
<p>BS EN 1915-1:2001+A1:2009 Aircraft ground support equipment. General requirements - Basic safety requirements</p>	<p>Whole document</p>	<p>N/A</p>	<p>This standard outlines the general design requirements applicable to aircraft ground equipment.</p>	<p>Safety</p>	<p>Published</p>	<p>BS EN 1915-1:2001+A1:2009</p>
<p>ISO 6966-1:2005 Aircraft ground equipment – Basic requirements.</p>	<p>Whole document</p>	<p>N/A</p>	<p>ISO 6966-1:2005 specifies the minimum general design requirements applicable to aircraft ground support equipment to ensure:</p>	<p>Liability</p>	<p>Published</p>	<p>ISO 6966-1:2005</p>

Part 1: General design requirements			<ul style="list-style-type: none"> • definition of aircraft ground support equipment general requirements for designers; • effective operation of aircraft ground support equipment. 			
ISO 6966-2:2014 Aircraft ground equipment – Basic requirements. Part 2: Safety requirements	Whole document	N/A	ISO 6966-2:2014 specifies the minimum design requirements applicable to all aircraft ground support equipment (GSE) to ensure safety of staff operating or maintaining the equipment or in its vicinity, and protection of aircraft against interference or damage.	Safety	Published	ISO 6966-2:2014

Table 14 Applicable standards for “Health management of landed aircraft tool” technology

3.6. Innovative de-icing and biofouling mitigation strategies at vertiports/water airports

INNOVATIVE DE-ICING AND BIOFOULING MITIGATION STRATEGIES AT VERTIPOINTS/WATER AIRPORTS						
Applicable Standard	Relevant sections of the document	Standard Text	Relevance for the project	Topic covered	Status of the Standard	Link
ICAO DOC 9640 - Manual of Aircraft Ground De-icing/Anti-icing Operations	Whole document	ALL	General ICAO guidelines for De-Icing operations that can be taken as reference.	Safety	Published	ICAO DOC 9640
SAE AS6285	Whole document	N/A	This document establishes the minimum requirements for ground-based aircraft de-	Enforcement	Published	SAE AS6285

Aircraft Ground De-icing/Anti-Icing Processes			icing/anti-icing methods and procedures to ensure the safe operation of aircraft during icing conditions on the ground.			
SAE AS6286 Aircraft Ground De-icing/Anti-Icing Training and Qualification Program	Whole document	N/A	This document establishes the minimum training and qualification requirements for ground-based aircraft de-icing/anti-icing methods and procedures.	Enforcement	Published	SAE AS6286
SAE AS6332 Aircraft Ground de-icing/Anti-icing Quality Management	Whole document	N/A	This document establishes the general requirements for the quality management of aircraft ground de-icing/anti-icing systems and processes. It covers the areas of: 1. Quality system, documentation and control of records; 2. Management responsibility; 3. Resource management; 4. Product realization; and 5. Measurement, analysis and improvement.	Enforcement	Published	SAE AS6332

Table 15 Applicable standards for "Innovative de-icing and biofouling mitigation strategies at vertiports/water airports" technology

3.7. Sustainable circular economy in aircraft and vertiports/water airports through digitalization

SUSTAINABLE CIRCULAR ECONOMY IN AIRCRAFT AND VERTIPORT/WATER AIRPORTS THROUGH DIGITALIZATION

Applicable Standard	Relevant sections of the document	Standard Text	Relevance for the project	Topic covered	Status of the Standard	Link
AFRA BMP Best Management Practice for Management of Used Aircraft Parts and Assemblies and for Recycling of Aircraft Materials	ALL	N/A	It provides a comprehensive framework of best practices for managing used aircraft parts and assemblies, as well as recycling aircraft materials at the end of their service life. These guidelines support environmentally responsible and efficient disassembly and recycling processes, ensuring compliance with industry-leading sustainability standards.	Enforcement	Published	AFRA BMP
IATA Aircraft Decommissioning Guidance Manual	ALL	N/A	This manual provides a comprehensive overview of the end-of-life process, including the regulatory and commercial aspects of parting-out an aircraft. These are the main guidelines that airlines follow.	Enforcement	Published	IATA Aircraft
EN 9100 QMS – Requirements Aviation, Space and defence Organizations; EN 9110	ALL	N/A	These standards mandate stringent requirements for product traceability (chain of custody) from origin to installation. This is fundamental for the re-use of materials, as it provides	Enforcement	Published	EN 9100 EN 9110 EN 9120

<p>QMS – Requirements for Aviation Maintenance Organizations; EN 9120 Quality Management Systems – Requirements for Aviation, Space and defence Distributors</p>			<p>auditable proof of a part's history, ensuring its authenticity.</p>			
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Table 16 Applicable standards for "Sustainable circular economy in aircraft and vertiports/water airports through digitalization" technology

4. CONCLUSIONS

This document emphasizes the crucial role of a robust regulatory and standards framework in guiding the development and deployment of Di-PEGASUS technologies. The primary objective is to ensure that all project activities are fully aligned with both current and emerging regulations and standards, with particular attention to safety, liability, insurance, cybersecurity, enforcement, land use, and environmental protection. Through a systematic mapping of all relevant European and international regulations and technical standards—such as EU regulations, EUROCAE, ISO, NATO, RTCA, and ASTM—the project ensures that every critical aspect is considered to enable safe and compliant innovation. This regulatory and standards analysis serves as a foundational reference for the technical work packages (WP2 and WP3), supporting risk management, technical design, and implementation strategies throughout the project lifecycle. By aligning with European and international best practices, the deliverable supports the effective integration of Di-PEGASUS technologies into real operational scenarios, while also promoting continuous improvement and proactive risk management. In summary, strict adherence to recognized regulations and standards is presented as the key to the safe, efficient, and sustainable adoption of next-generation aviation technologies.

However, given the innovative nature of the technologies under development within the Di-PEGASUS project, existing regulations and standards do not yet provide comprehensive coverage across all relevant domains. While current regulations and standards offer robust and detailed guidance on safety, liability and enforcement, there remains a pronounced shortfall in areas such as insurance, security, land use, and environmental protection. These domains are not yet supported by comprehensive, tailored regulatory frameworks that address the specific challenges posed by emerging technological systems. This significant gap not only hampers effective risk management and operational clarity but also underscores the urgent need for targeted engagement with standardisation bodies and policymakers. Addressing these deficiencies is essential to ensure the holistic and sustainable integration of next-generation technologies, and to foster an environment where innovation can proceed safely and responsibly.

The project's analysis highlights the need for proactive alignment with evolving frameworks to ensure responsible and compliant technological advancement.

5. REFERENCES

Di-PEGASUS Grant Agreement

Di-PEGASUS Consortium Agreement

