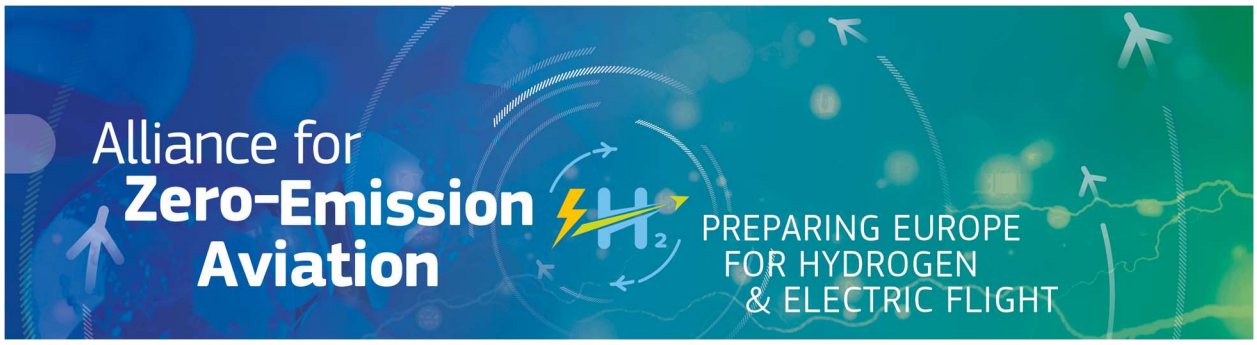

Alliance for Zero-Emission Aviation
Working Group 4

Current Standardization Landscape

16th May 2023
Brussels, Belgium

I. Introduction

Intensifying environmental concerns are driving significant technological advancements in the area of hydrogen and electric aviation which require an evolution of the regulatory framework to ensure their safe deployment. To establish Acceptable Means of Compliance to this new regulatory framework, aviation authorities and governments refer to industry consensus standards that reflect state-of-the-art best practices. Industry Standardization activities therefore assume a crucial role in facilitating the certification of aircraft and engines based on these new technologies, their operation and the infrastructure necessary to support them.

Considering the amount and the variety of standardization needs and the limited resources available to address them, it is essential for the aviation industry to harmonize standardization activities and foster collaboration between the committees carrying them out. Additionally, increasing attention is being focused on the alignment of priorities and timeframes for the development of new standards.

a. Objectives & Description

Within AZEA WG-4, a dedicated subgroup will focus on the industry-wide structuring of standardization efforts. Its main objective is to identify standards required to support the certification of hydrogen and electric aircraft, associated air and ground operations and the infrastructure required to support them.

To achieve this objective, existing standards are now being mapped, and a gap analysis of worldwide and cross-sectorial standardization activities will be performed. The result of this work will be a comprehensive standardization roadmap with recommendations to support its implementation.

b. Deliverables

The aim of WG-4 is to produce the following set of deliverables to address the aforementioned objectives.

- *Current Standardization Landscape*: a comprehensive mapping of existing standards and committees supporting electric, hybrid-electric and hydrogen-powered aircraft and ground infrastructure and operations. The purpose of this mapping is to provide a reference for the identification of gaps and risks of overlap in current standardization activities and will constitute the basis for the development of a comprehensive standardization roadmap.

- *Standardization Gap Analysis*: a review of the standardization mapping and identification of areas where new standards are needed to ensure compliance and safety. The analysis will serve as a resource for Standards Development

Organizations and industry stakeholders to identify areas where further standardization efforts are required and point out opportunities for collaboration and harmonization of activities.

- *Standardization Roadmap:* a comprehensive and structured set of recommendations to address gaps in standardization, identifying and prioritizing standardization needs, and setting goals for the development and implementation of new standards supporting electric, hybrid-electric and hydrogen-powered aircraft.

c. Scope:

The analysis will cover all aircraft types which may rely on hydrogen or electricity as their main source of power. Table 1 below presents a preliminary breakdown of possible power sources depending on aircraft type and propulsion system technology. The table maps the power source against applicable certification specifications.

In addition, the mapping and gap analysis will cover the following:

- Aircraft, including engines and components, and air operations.
- Ground operations including all aircraft handling and movement at airports (excluding active runways) such as refueling of hydrogen or recharging of batteries. This also includes emergency and first response.

Ground infrastructure on airport sites such as hydrogen storage, distribution and refueling means and electrical recharging means will be addressed by WG3. In support of AZEA activities, WG3 will perform an extensive analysis of all challenges posed by introducing hydrogen and electric/hydrogen aircraft at aerodromes including the impact on the aviation safety and security regulatory framework and the needs for standardization of infrastructure. In this context, coordination mechanisms with WG3 will be established to avoid duplication.

			Power increase →							
			CS-23	**CS-27**	**SC VTOL**	**CS-23**	**CS-29**	**CS-30/31**	**CS-25**	**CS-25**
		Existing Certification requirements	General Aviation (mono)	Light H/C	VTOL	Commuter (multi)	Heavy H/C	Airship	Regional A/C	BizJet Cial A/
Engine with H2 burning		CS-E	H2	H2	H2	H2	H2	H2	H2	H2
Engine with internal hybridization		CS-E								Elec
EHPS with FC	parallel	SC E-19		H2 & Elec		H2 & Elec	H2 & Elec		H2 & Elec	
	in serie	SC E-19, SC E-18			H2 & Elec	H2 & Elec		H2 & Elec	H2 & Elec	H2 & Elec
EHPS without FC	parallel	SC E-19		Elec		Elec	Elec		Elec	
	in serie	SC E-19, SC E-18	Elec		Elec	Elec		Elec	Elec	Elec
Elec prop with Batt		SC E-19, SC E-18	Elec	Elec	Elec	Elec				
Elec prop with FC		SC E-19, SC E-18	H2 & Elec	H2 & Elec	H2 & Elec	H2 & Elec		H2 & Elec	H2 & Elec	

Table 1. Power technology by configuration type[1]

For aircraft using electricity as their main source of power, the approach will focus on analyzing the requirements of EASA Special Condition E-19 as the baseline to structure this mapping. For hydrogen technologies, the work on standardization conducted within the Alliance for zero-emission aviation addresses the need to further map hydrogen related standards relevant to the aviation sector identified by the Hydrogen Alliance Roadmap on Standardization.

[1] This assessment will be evolving as there are several gaps in regulation and new engine and aircraft architectures emerge on a regular basis.

II. List of Abbreviations

Abbreviation	Meaning
AAM	Advanced Air Mobility
AGE	Aircraft Ground Equipment
AIR	SAE Aerospace Information Report
ARC	Aviation Rulemaking Committee
ARP	SAE Aerospace Recommended Practice
AS	SAE Aerospace Standard
ASD-STAN	Aerospace and Defense Industries Association of Europe-Standardization
ASTM	American Society for Testing and Materials
AZEA	Alliance Zero-Emission Aviation
CEN-CENELEC	European Committee for Electrotechnical Standardization
CS	Certification Specifications
EASA	European Aviation Safety Agency
eCTOL	Electric conventional takeoff and landing
ED	EUROCAE Document
EHPS	Electric/Hybrid Propulsion Systems
EM	Electromagnetic
EMC	Electromagnetic compatibility
ER	EUROCAE Report
EUROCAE	European Organisation for Civil Aviation Equipment
eVTOL	Electric Vertical Take-Off and Landing Aircrafts
EWIS	Electrical Wiring Interconnect System
FAA	Federal Aviation Administration
FC	Flight Cycle
GH2	Gaseous Hydrogen
GHSS	Gaseous Hydrogen Storage Systems

GSE	Airport Ground Support Equipment
H2	Hydrogen
ICAO	International Civil Aviation Organization
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
LH2	Liquid Hydrogen
LTA	Light Transport Aircraft
MASPS	Minimum Aviation System Performance Standards
NFPA	National Fire Protection Association
PEM	Pem-Air
RTCA	Radio Technical Commission for Aeronautics
SAE	Society of Automotive Engineers
SDO	Standard Delvelopment Organization
TC	Type Certificate
UAM	Urban Air Mobility
UAS	Unmaned Aircraft Systems
VTOL	Vertical Take Off and Landing
WG	Working Group

III. Background

The following section provides an overview of the standardization ecosystem in the aviation sector and the role the Alliance for Zero Emissions Aviation (AZEA) intends to play to support effective and efficient standards development.

a. Standardization Development Organizations (SDOs)

SDOs host groups of subject matter experts who produce state-of-the-art consensus standards on a wide variety of topics. These standards may be relied upon by governments and airworthiness authorities to develop and implement laws and regulations.

There is a wide array of SDOs at local, national and international levels throughout the world. The main international SDOs with significant aviation-focused activities are EUROCAE, SAE, RTCA and ASTM, complemented by national and international organizations and associations such as ISO, CEN-CENELEC, IEC, IATA, and ICAO.

Each of these organizations have its own policies, methodologies, practices and roadmaps. While there are collaboration agreements between SDOs, including several joint committees across organizations, it can be difficult for each SDO and its committees to establish and maintain an up-to-date oversight on this global network of standardization groups. This induces a risk of overlap or duplication of efforts.

b. Role of the Alliance for Zero Emission Aviation (AZEA) in the standardization ecosystem.

AZEA intends to play a crucial role in the global standardization ecosystem by facilitating the mapping of work between SDOs, organizations and associations. As a cross-sectoral collaboration platform, it serves as a link between aviation stakeholders and groups working on electric, hybrid-electric, and hydrogen-powered aircraft standardization. By doing so, it aims to provide the basis for a coordinated approach to standardization, minimizing the potential for duplicate efforts, promoting harmonization, highlighting opportunities for synergies, and improving overall coordination. Additionally, it aims to provide a platform for collaboration and information sharing between different committees and organizations involved in the standardization of alternative aircraft propulsion technologies, new aircraft architectures and novelties introduced in aircraft propulsion integration such as distributed propulsion.

IV. Current Standardization Landscape

As described above, AZEA WG-4 is developing a comprehensive mapping of existing standards and committees supporting electric, hybrid-electric and hydrogen-powered aircraft. To achieve this, the group largely relies on existing resources.

The current landscape is divided into two technology types: electric/hybrid-electric technologies, and hydrogen technologies. Depending on the type of aircraft considered, one or both technologies are applicable (see Table 1). For example, a CS-23 commuter aircraft with an “EHPS with FC” integrates both hydrogen technology components (fuel cell, hydrogen storage, hydrogen supply system, etc.) and electric technology components (electric motor, inverter, battery, etc.). In that case, standards of both the “Electric and Hybrid-Electric Propulsion Aircraft” and “Hydrogen-Powered Aircraft” sections are relevant.

The group will also map ICAO activities relevant for ground and airport infrastructure of zero emission aircraft, as well as those performed in other forums such as IATA and other SDOs which are expected to support ICAO.

The first results present existing WG/Committees whose main focus is on electric, hybrid and hydrogen-powered aircraft. This list will be completed in the future with committees working in peripheral fields whose standards will support these technologies without them being the main focus of the WG/Committees.

a. Electric and Hybrid-Electric Propulsion Aviation

The overall maturity of the standardization ecosystem supporting the introduction of electric and hybrid-electric propulsion in aviation is high with several committees performing work on the topic. Table 2 provides an overview of these committees.

Standardisation Organization	WG/COMMITTEE		WG/COMMITTEE Description
EUROCAE	WG-113 Hybrid Electric Propulsion		The aviation industry is witnessing a revolution that will see integration of more electricity to power vehicles. Studies into the electrification of aircraft propulsion revealed the potential of reducing carbon footprint by 50% between 2005 and 2050 – supporting ACARE goals. This WG aims to address the regulatory framework and means of compliance for these new architectures. The WG developed a report on standardization needs for EHPS and currently is working on Guidance material for endurance and durability substantiation of EHPS
	WG-112 Vertical Take Off and Landing (VTOL)	WG-112 is specifically tasked to develop in a timely manner all the standards necessary to support the Special Condition on Vertical Take-Off and Landing (VTOL) aircraft in close cooperation with EASA.Work is organised around 9 technical Sub-groups. Current activities include: batteries, Hi-voltage distribution, fire management, rotorburst, handling qualities, performance, energy & flight information, security and safety processes, seats for AAM aircraft, electromagnetic (EM) hazards for AAM/UAM, vertiport operations, charging infrastructure.	
		WG-112 SG-1 Electrical	WG-112 SG-1 will develop standards for VTOL-specific aspects of electrical systems
		WG-112 SG-2 Lift-Thrust	WG-112 SG-2 develops for VTOL-specific aspects for thrust / lift systems
		WG-112 SG-3 Safety	WG-112 SG-3 develops standards for VTOL-specific safety aspects
		WG-112 SG-4 Flight	WG-112 SG-4 develops standards for VTOL-specific aspects of flight
		WG-112 SG-5 Ground	WG-112 SG-5 develops standards for VTOL-specific aspects of ground infrastructure and airports
		WG-112 SG-6 Avionics	WG-112 SG-6 develops standards for VTOL-specific aspects of Avionics
		WG-112 SG-9 Electromagnetic Hazards	WG-112 SG-9 will develop standards for VTOL-specific aspects of EM hazards.
	WG-116 High Voltage Systems and Components in Aviation		The WG is tasked to define new standards for high voltage systems and components in aircraft. These standards are needed for the industry and the certification authorities to develop and certify new designs for electrical and hybrid aircraft, where electrical voltages will be much higher than the current standards. Current activities focus on Interface Characteristics and Power Quality of Aircraft High Voltage Propulsive Electrical Systems, Risk Mitigation at EWIS and Human Safety Level and Aging mechanisms of electrical insulation (this last activity joint with SAE AE-11)

Table 2. Part I. Main committees focused on electric and electric-hybrid propulsion aircraft.

Standardisation Organization	WG/COMMITTEE	WG/COMMITTEE Description
SAE	AE-7D Aircraft Energy Storage and Charging Committee	The AE-7D Aircraft Energy Storage and Charging Committee is responsible for creating and maintaining technical reports for battery energy storage, distribution, and charging. It covers standardization in charging plugs, something which will concerns charging standards at both the side of the airport and the aircraft.
	AE-9 Electrical Materials Committee	SAE AE-9 has the responsibility to develop and maintain SAE Technical Reports (including Standards and Material Specifications) for use in aircraft and engine electrical and avionic systems, including hardware items. The SAE AE-9 Committee is developing and publishing SAE Technical Reports (AIR's, ARP's, and AS's) on this topics.
	AE-10 High Voltage Committee	The AE-10 Committee is working on managing Higher Voltages in Aerospace Electrical Systems, safety and reliability, Insulation Monitoring Devices, Electric Load Analysis and Power Source Capacity Planning, while avoiding duplication. The Committee set prioritization and associated timescales, manages standards' deliverables per the roadmap defined by the HVCC, coordinates with other SAE standards activities as necessary; and establishes relevant collaboration with other SDOs (EUROCAE WG-112, WG-116, ASD-STAN, etc.) as appropriate.
	AE-11 Aging Models for Electrical Insulation in Hi-Enrgy Sys	This committee aims to identify the failure mechanisms of electrical insulation components, and analyze the resulting impacts on their physical properties, in order to define a multi-physics (electrical and thermal) model of the aging phenomenon. Joint with WG-116 EUROCAE
	E-36 Electronic Engine Controls Committee	Areas of interest include, but not be limited to, the design, installation, operation and maintenance of engine control system components including metering components and actuators and the interface and communication methods for (A) Cockpit Displays, (B) Flight Control, Diagnostic and Health Monitoring Systems. Coordination with other SAE committees will occur to minimize redundant activities within the organization and maximize the benefit of additional recommendations and standards.
	E-40 Electrified Propulsion Committee	The SAE E-40 Committee develops technical reports (Aerospace Standards, Aerospace Recommended Practices and Information Reports) covering electrified propulsion for aircraft with a payload weight above 150lb / 70KG. The committee will recommend standardized nomenclature, define applicable terms and fundamental architectures, and address considerations for performance (including endurance), safety, high voltage/high power, aircraft integration, components and interfaces within and between propulsion system and aircraft equipment.
	AGE-3 Aircraft Ground Support Equipment Committee	AGE-3 addresses all aspects of airport, ground support equipment and associated systems that interface or require compatibility with the aircraft. The objectives of the Committee are: a) Develop and maintain technical standards, specifications and reports related to aircraft ground servicing and in particular to: - Airport Ground Support Equipment (GSE) - Aircraft to GSE interface - GSE operation, maintenance and operator training - Airport facilities and systems that have a direct relationship to and interface with GSE - GSE environment related issues, including noise and emissions.

Table 2. Part II. Main committees focused on electric and electric-hybrid propulsion aircraft.

Standardisation Organization	WG/COMMITTEE	WG/COMMITTEE Description
ASTM	F39 - Aircraft Systems	To address growing concerns regarding aircraft electrical wiring systems, the US FAA's Small Airplane Directorate initiated a voluntary consensus standards effort to develop standards addressing general aviation electrical wiring systems. Due to objections regarding the utilization of generic guidance (such as FAA Advisory Circular 43.13-1B) as the certification basis for design and modification, Committee F39 is designed to develop standards for electrical wiring system design, fabrication, modification, inspection and maintenance procedures and processes.
	F44 - General Aviation Aircraft	This Committee addresses issues related to design and construction, systems and performance, quality acceptance tests, and safety monitoring for general aviation aircraft (also known as Part 23) that is less than 19,000 pounds and 12 passengers.Through the establishment of a Part 23 Aviation Rulemaking Committee (ARC), industry expressed an interest in evolving Part 23 regulations into a more performance based document, reliant on standards for the design and performance of aircraft, in order to leverage all the benefits that referencing standards has to offer. Ultimately, the desire is to reduce the regulatory burden on the industry (and therefore the cost of the aircraft) and leverage standards to allow technology to be readily updated in a streamlined certification process where appropriate.
	F37 - Light sport a/c	Working in a Standard Practice for Design and Manufacture of Electric Propulsion Units for Light Sport Aircraft covering minimum requirements for the design and manufacture of Electric Propulsion Units (EPU) for light sport aircraft, VFR use.

Table 2. Part III. Main committees focused on electric and electric-hybrid propulsion aircraft.

This first mapping covers initial activities focused on propulsion. Aircraft propulsion integration and aircraft topics such as EMC, energy storage and external lighting will be covered in future WG-4 activities.

In the short term, standardization efforts will largely be structured by the need to develop means of compliance to regulations applicable to both aircraft certification and operations and ground infrastructure. The main focus of the group will be to capture this ongoing work through review of industry reports and roadmaps and exchanges with key committees.

The group will use the requirements of EASA Special Condition E-19 as the baseline to structure this mapping. For each requirement, existing aviation-focused standards and committees developing means and methods of compliance will be identified. The baseline of E-19 requirements will be completed by other known requirements and standardization needs addressing both aircraft and ground infrastructure and operations.

Once this mapping is complete, the group will assess gaps. To achieve this, it will rely on existing gap analyses such as ER-025 produced by EUROCAE WG-113 as well as roadmaps and feedback provided by other key committees. Since this assessment has already largely been performed by these groups and committees, AZEA WG-4 does not expect to identify any new significant gaps but rather intends to consolidate data from these various sources into a single reference deliverable.

In addition to gaps, the group will identify risks of overlap and duplication as well as opportunities for synergies between existing and intended activities across committees.

b. Hydrogen-Powered Aviation

The maturity and the breadth of aviation-focused standardization activities supporting the introduction of H2-powered aircraft are not yet at the level of those supporting electrified propulsion. Furthermore, there are currently no aviation-specific regulation targeting H2 aircraft, making it more difficult to perform a detailed assessment of needs for means of compliance.

For these reasons the group's approach will be slightly different than that deployed for electrified propulsion. A list of technical risks and needs will be established and organized based on technologies, application types and aircraft types. The list will be drawn based on industry reports targeting both H2 aviation, such as the Clean Sky 2 Joint Undertaking report[2] on Hydrogen-powered aviation or the Vertical Flight Society's report[3] on Multimodal Hydrogen Airport Hubs. The group will also consult cross-industry reports such as the European Clean Hydrogen Alliance Roadmap on Hydrogen Standardization. Finally, the group will ensure the consistency of this framework with those developed by other AZEA working groups such as WG-1 and WG-3. Once this framework of needs is established, the group will map the published and planned standards addressing these needs as well as the committees developing them. Table 3 provides an overview of the main committees which have undertaken work on H2 propulsion.

[2] Hydrogen-powered aviation. A fact-based study of hydrogen technology, economics, and climate impact by 2050. Clean Sky 2 Joint Undertaking report (2020).
[3] Schneider. J (2023) Multimodal H2-Airport Hub. Vertical Flight Society, H2-Aero Team.

Standardisation Organization	WG/COMMITTEE	WG/COMMITTEE Description
EUROCAE/SAE	WG-80/AE-7F Hydrogen Fuel Cells	WG-80 was established jointly with AE-7F to develop guidelines and collect best practices to support qualification and certification of Hydrogen Fuel Cell Systems in the various intended applications for aircraft applications.The Hydrogen Fuel Cell activity is part of the more electrical aircraft strategy. It is looking into hydrogen fuel cell technology airborne use cases and certification objectives. The objective is to look into recommendations, to collect best practices, and to develop guidelines. Performance requirements such as power and reliability are outside the scope of this working group.
SAE	AE-5C Aviation Ground Fueling Systems Committee	Has responsibility for the resolution of problems in either design or service usage of aerospace fuel, oil and oxidizer systems, their components such as valves, pumps, couplings, fuel cells, quantity and flow gages, and tanks, and related problems as presure surger, icing, electrification, and safety. Develops standards addressing fuel, oil and oxidizer systems.
	AE-5CH Hydrogen Airport Taskgroup	AE-5CH has the responsibility for hydrogen as a fuel at the airport. The objective is to develop standardization for hydrogen in aerospace and other aspects at the airport such as fueling, transport and storage. Harmonization with existing SAE Standards efforts (including SAE, EUROCAE, etc.) and Codes (such as NFPA, etc.) will be a priority.
ASTM	D03 on Gaseous Fuels	D03 has 7 technical subcommittees working over these standards. These standards have and continue to play a preeminent role in the gaseous fuels (natural gas) industry and address issues relating to collection and measurement of gaseous fuel samples, determination of heating value and relative density of gaseous fuels, determination of special constituents of gaseous fuels, analysis of chemical composition of gaseous fuels, and thermophysical properties.
	F38.01 Airworthiness on Unmanned Aircraft Systems	This Committee addresses issues related to design, performance, quality acceptance tests, and safety monitoring for unmanned air vehicle systems. Working particularly on developing new specifications for aviation hydrogen fuels.

Table 3. Main WG/Committees focused on hydrogen propulsion in aviation.

Table 4 below provides a list of standards that each aforementioned WG/Committees is working on regarding hydrogen technologies in aviation.

WG/COMMITTEE	Standardisation Activity	Stand_Reference	Stand_Description	Domain	Applicable Hydrogen
EUROCAE/SAE WG-80/AE-7F Hydrogen Fuel Cells	Aircraft Fuel Cell Safety Guidelines	ED-219/AIR6464	Safe integration of PEM including liquid and gaseous hydrogen storage system, risk assessment and flammability considerations, design for safety, installation considerations (crashworthiness, handling, fueling,...)	Aircraft	LH2, GH2
	Installation of fuel cell systems on large civil aircraft	ED-245/AS6858	Detailed specifications provided for three PEM fuel cell system applications fed by gaseous hydrogen: - Medical evacuation operation as power supply for e.g. medical equipment - Standalone galley power isolated from electrical aircraft system - Emergency power system in case of loss of electrical power from aircraft engines	Aircraft	GH2
	Considerations for Hydrogen Fuel Cells in Airborne Applications	ER-20/AIR7765	A comprehensive document for 'decision-makers' on hydrogen, its applications and its benefits for aircraft. Introduction to hydrogen (properties, production, storage), current hydrogen usage (mobile and stationary), hazards and mitigations and benefits for airborne applications.	Aircraft	LH2, GH2
	MASPS for Liquid Hydrogen storage and distribution on-board aircraft	ED-XXX/AS6679	The MASPS defines the technical guidelines for the safe development, testing, integration, validation and certification of Liquid Hydrogen (LH2) including LH2 fuel storage and LH2 fuel distribution. It describes LH2 general properties and system definition and specifies critical requirements for the safe use of liquid hydrogen (LH2) on-board aircraft in terms of: Operation: storage and distribution; Maintenance; Safety; Qualification; Certification; Installation.	Aircraft	LH2
	MASPS for Gaseous Hydrogen Storage and Distribution for Small Aircraft	ED-XXX/AS7373	This document defines the technical guidelines for the safe integration, operation and maintenance, and for certification of Gaseous Hydrogen Storage Systems (GHSS) in general aviation. This document also defines guidelines for safe refuelling operation of gaseous hydrogen for aircraft. This document does not address airport infrastructure, nor how the refuelling means is specified, except the provisions required for the safety of the aircraft refuelling operation. MASPS to address the specifics of gaseous hydrogen storage and distribution systems for General Aviation Aircraft, small Rotorcraft and VTOL, including safety, maintenance.	Aircraft	GH2
	MASPS for Hydrogen Fuel Cells for Propulsion	ED-XXX	Aims to provide adequate standards to the usage of fuel cells for generation of power onboard aircraft to supply electrical propulsion systems.	Aircraft	LH2, GH2

Table 4. Part I. Main standards by WG/Committee focused on hydrogen propulsion in aviation.

WG/COMMITTEE	Standardisation Activity	Stand_Reference	Stand_Description	Domain	Applicable Hydrogen
SAE AE-5C Aviation Ground Fueling Systems Committee	Hydrogen Fueling of Aircraft, in both gaseous and liquid form	AIR8466	Establishes a baseline for hydrogen fueling protocol and process limits for both gaseous and liquid hydrogen fueling of aircraft (eCTOL, eRotor, eVTOL, LTA) at the airport from small aircraft to widebody. A further goal is to harmonize and establish common aircraft fueling safety definitions and protocols and harmonized wherever possible with other SAE, EUROCAE standards and NFPA codes, etc. standards alike.	Aircraft	LH2, GH2
SAE AE-5CH Hydrogen Airport Taskgroup	Hydrogen Airport Taskgroup has not currently defined a deliverable		Hydrogen Airport Taskgroup has not currently defined a deliverable	Ground	LH2, GH2
ASTM F38.01 Airworthiness on Unmanned Aircraft Systems	New Specification for Design of Fuel Cells for Use in Unmanned Aircraft Systems (UAS)	ASTM WK60937	This standard will outline specification for the use of fuel cell power generating systems for application in UAS	Aircraft	LH2, GH2
ASTM D03 on Gaseous Fuels	ASTM New Specification for Aviation Hydrogen Fuels	WK85474	This standard covers the use of purchasing agencies in preparing specifications for acquisition of hydrogen fuel intended for aviation uses.This specification defines the minimum property requirements for aviation hydrogen for use as a fuel cell or turbine fuel.This specification can be used as a standard in describing the quality of aviation hydrogen fuel from production to the aircraft.This specification does not include all fuels satisfactory for fuels cells and turbine engines used in aviation. Certain equipment or conditions of use may permit a wider, or require a narrower, range of characteristics than is shown by this specification. Aviation hydrogen fuels defined under this specification may be used in applications other than fuels cells or turbine engines that are specifically designed and certified for this fuel.	Aircraft	

Table 4. Part II. Main standards by WG/Committee focused on hydrogen propulsion in aviation.

In the future, the group will also consider and map some key committees which are not focused on aviation but develop standards which may be partially or fully appropriate for aviation applications such as the ISO/TC 197 Hydrogen Technologies Committee.

Once this mapping is complete, the group will identify gaps and provide recommendations to committees and to the industry to address them. Both the mapping and gap analysis will evolve iteratively as standards are produced and regulation is developed and published by authorities. Eventually, the intent for hydrogen technologies is to organize the mapping based on published rules in a similar fashion to the electrified propulsion aircraft standards mapping.

As for the electrified propulsion aircraft standards mapping, the group intends to identify risks of overlap and duplication of efforts between committees as well as opportunities for synergies.


ACI EUROPE
ACITURRI
AERnnova
ASD
AIRFRANCE KLM GROUP
Air Liquide
AIRBUS
AURA AERO
beyond AERO
BLUE SPIRIT AERO
CEN CENELEC
CENA Hessen
CLEAN AVIATION
Collins Aerospace
Cranfield Aerospace Solutions
DLR
European Commission DEFIS
EASA European Aviation Safety Agency
easyJet
ELSA INDUSTRY
EUROCAE
EUROCONTROL
CTA
Avio Aero
GAMA
H3Dynamics
Heart Aerospace
iberojet
IMIEU
ITP Aero
LEONARDO
LILIUM
NACO a company of Royal HaskoningDHV
NRG 2fly
ONERA THE FRENCH AEROSPACE LAB
PANTA HOLDINGS
PRATT & WHITNEY
ROLLS ROYCE
nlr
SAFRAN
dgac STAC
supernal
SAG
THALES
Universal Hydrogen
VÆRIDION
VOLOCOPTER
WIDERØE ZERO
ZEROAVIA