

H2 Certification Roadmap

A joint presentation by EASA, FAA, and CAA UK

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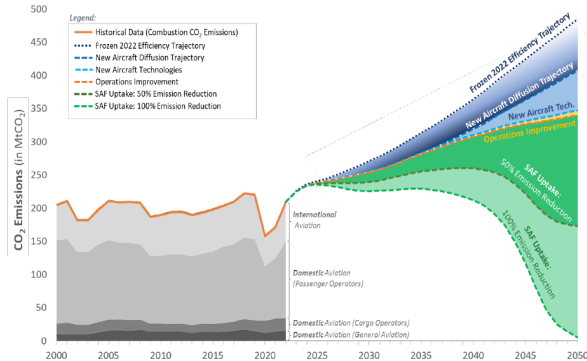
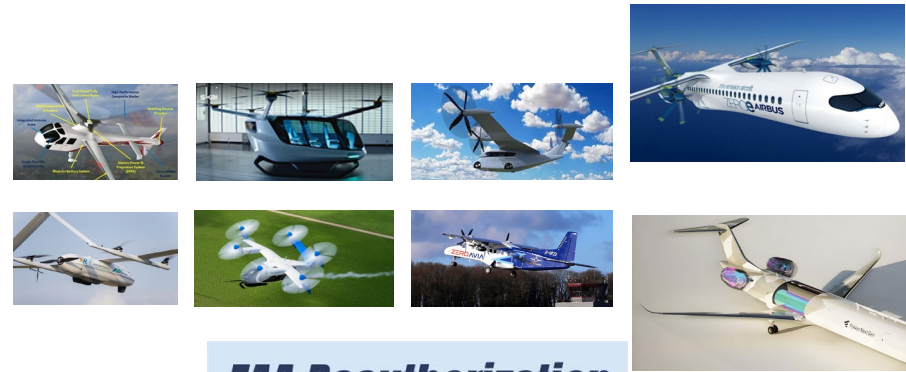
Your safety is our mission.

Content

- ❑ Motivation. Why a regulatory roadmap for H2
- ❑ Purpose
- ❑ Content
- ❑ Technologies
- ❑ Key Hazards
- ❑ Certification Options
- ❑ Technology readiness Vs Certification Readiness
- ❑ Plan and timeline.

Why

- Understanding of the risks to aviation safety and the right pathway to certification.
- Make sure regulation is fit for purpose and reduce challenges associated with the introduction of hydrogen fuel.



US Aviation Climate Action Plan



TRANSPORT NEEDS TO CUT EMISSIONS BY 90% BY 2050

Share of total EU Greenhouse Gas (GHG) emissions, per mode

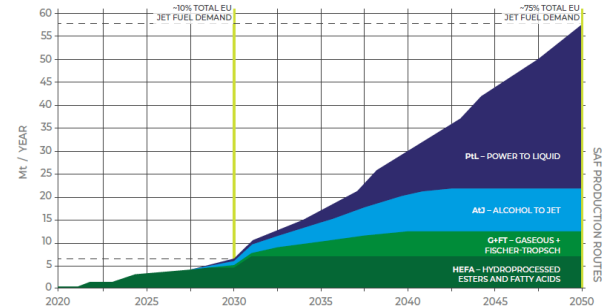


TRANSPORT AND THE EMISSIONS TRADING SYSTEM (ETS): PUTTING A PRICE ON CARBON

- Road**
 - Extension of the ETS to road transport and building fuels from 2026;
 - Focus on aviation fuel suppliers rather than households and car drivers;
 - Revenues to be channelled to support sustainable households and investments in cleaner mobility.
- Aviation**
 - Tighten cap on the number of allowances for city EU flights, starting from current levels and reduced by 4.2% annually;
 - Full phase-out of free allowances by 2026;
 - Extra European flights to be subject to auctioning under the international CORSIA scheme.
- Maritime**
 - Gradual extension of the ETS to maritime starting in 2023, with a 3-year phase in period;
 - Focus on large ships (above 5000 gross tonnage) accounting for 90% of CO₂ emissions;
 - Extra EU traffic and 50% of extra EU voyages covered by the scheme.



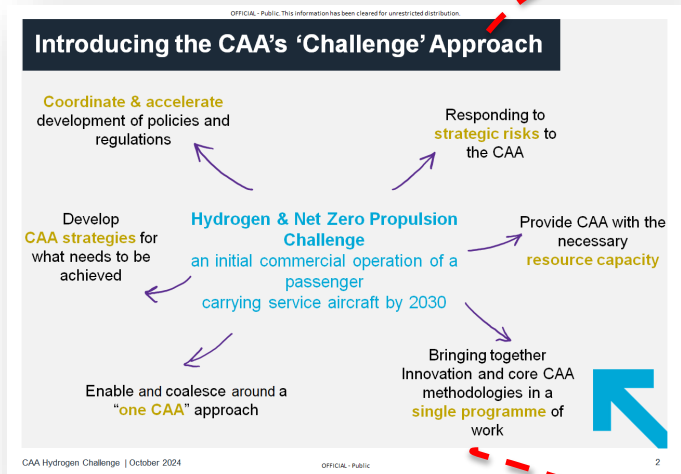
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Source: World Economic Forum (2021). *Guidelines for a Sustainable Aviation Fuel Blending Mandate in Europe*

Purpose

→ A plan to identify and address the regulatory issues associated with safely and efficiently incorporating hydrogen as an energy source in aircraft



EASA
European Union Aviation Safety Agency

CTH2 Roadmap, Issue DRAFT_02

Certification Directorate readiness for the H2 powered aviation products

Roadmap

Version DRAFT_02 (dd/mm/yyyy)

EASA Internal

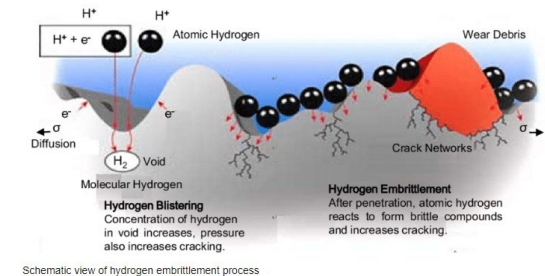
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Reviewed by:		
Accepted by:		



Key Hazards and Safety Research Needs

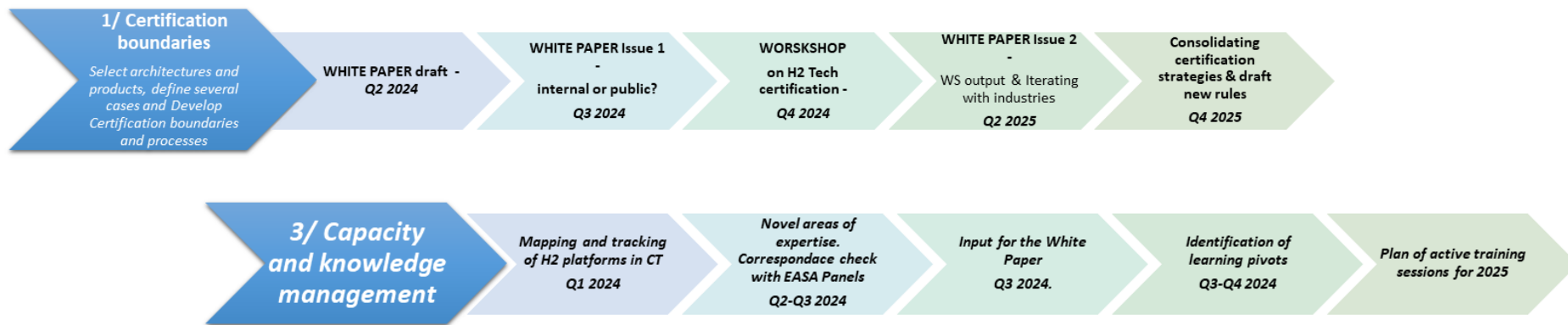
→ Examples - Depend on Technology Options

Hazards	Research needs
Fire and Explosion	<ul style="list-style-type: none"> Leak detection; fuel shut-off and relight; Safe venting Flammability and fire under flight conditions; detonation, including within powerplant Cabin evacuation
Crashworthiness	<ul style="list-style-type: none"> Inspection and maintenance procedures Survivable crash conditions. Surrounding structure that may contribute to the rupture of the tank
Material	<ul style="list-style-type: none"> Embrittlement, diffusion at altitude; extreme thermal cycling; purging Fuel cell membrane durability
Electrical/Mechanical/Other	<ul style="list-style-type: none"> Lighting and electrical faults; HV management Thermal management system Tank sloshing pressure collapse Cryogenic system; LH2 to GH2 conversion

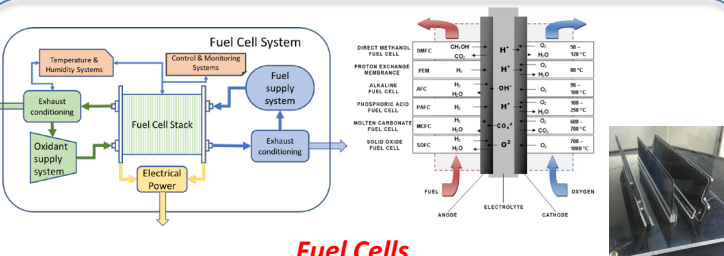


H2 Roadmap – covering 5 streams

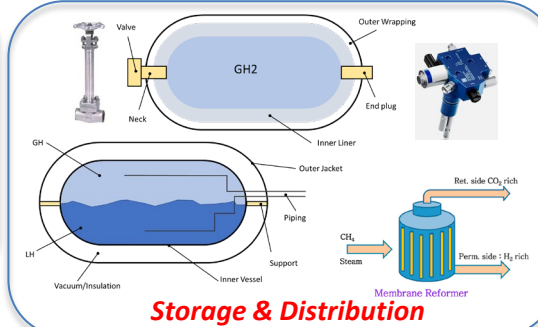
1. Certification process and product boundaries
2. Airworthiness standards and certification specifications
3. Capacity Building & Knowledge management
4. Communication Plan
5. International harmonization strategy



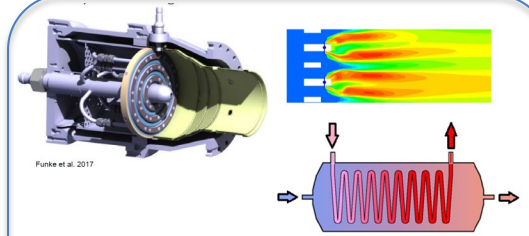
Technology bricks – divide and conquer



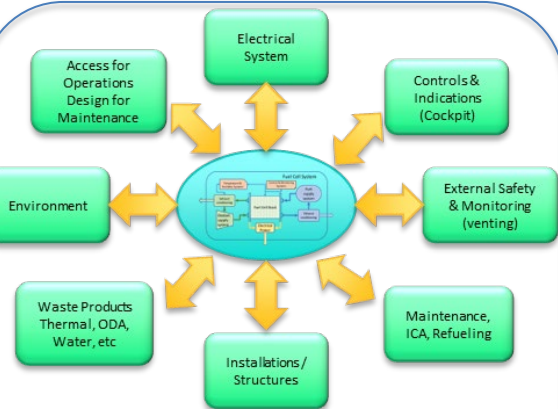
Fuel Cells



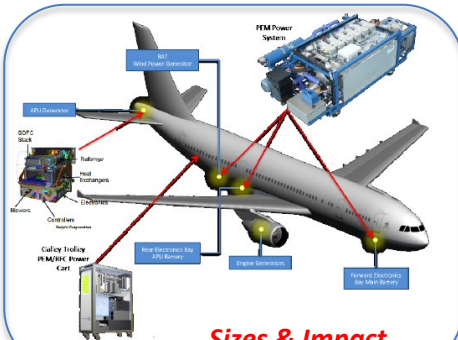
Storage & Distribution



Propulsion System (FC; H₂ burn; hybrid; ?)



Aircraft Integration
Aircraft Systems



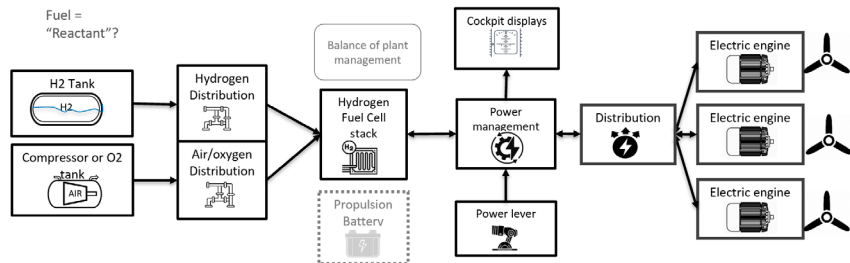
Sizes & Impact

Different Level of integration

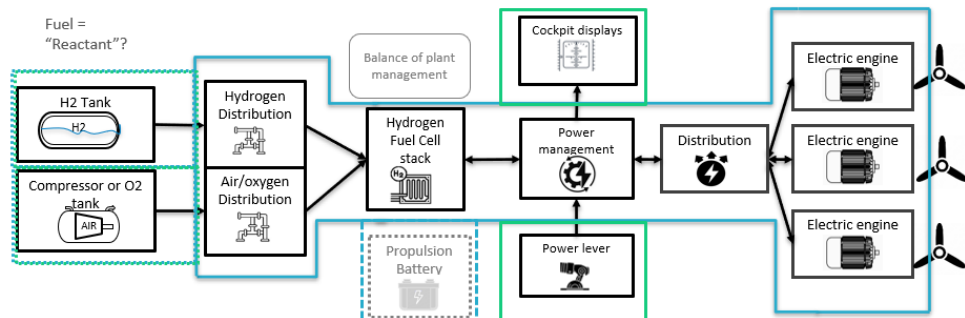
Smart thinking to translate the
tech-bricks into cert. bricks

- ❑ Cert. boundaries
- ❑ CSs gap analysis
- ❑ Determining need SCs and their scope
- ❑ Guidance and MoCs
- ❑ (...)

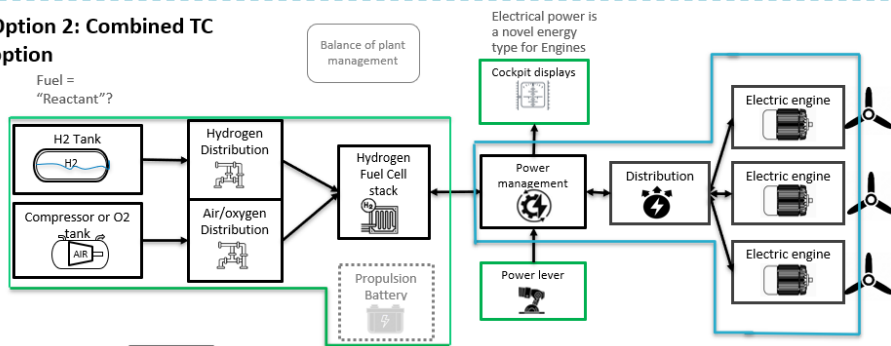
Possible approaches? summary - WIP



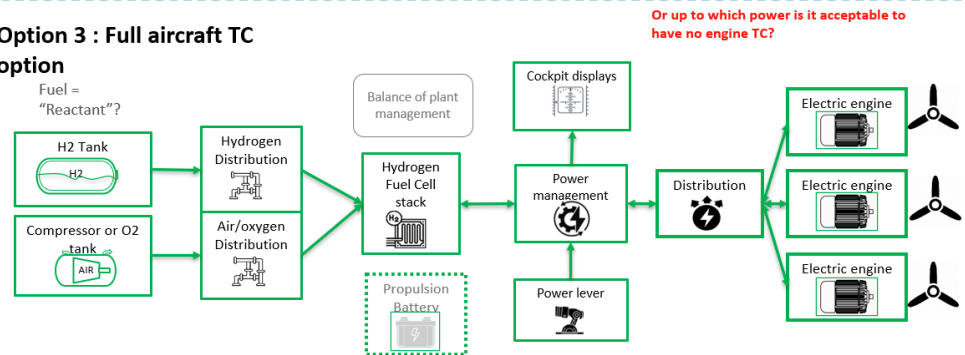
Option 1 : Engine TC option



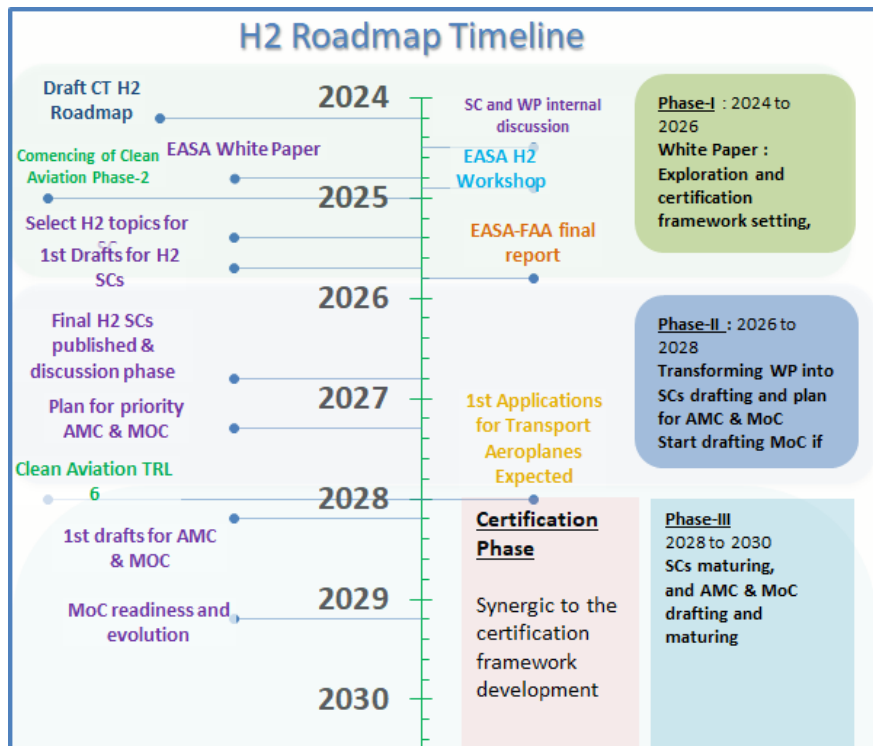
Option 2: Combined TC option



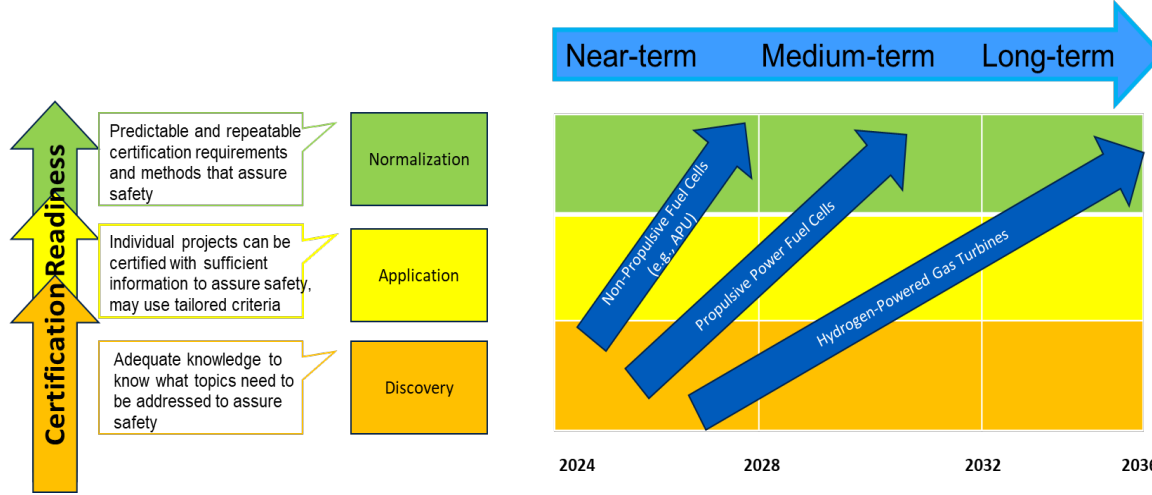
Option 3 : Full aircraft TC option



(EASA) H2 Roadmap – Timeline



Road Mapping – Technology Vs Regulation Vs Certification readiness



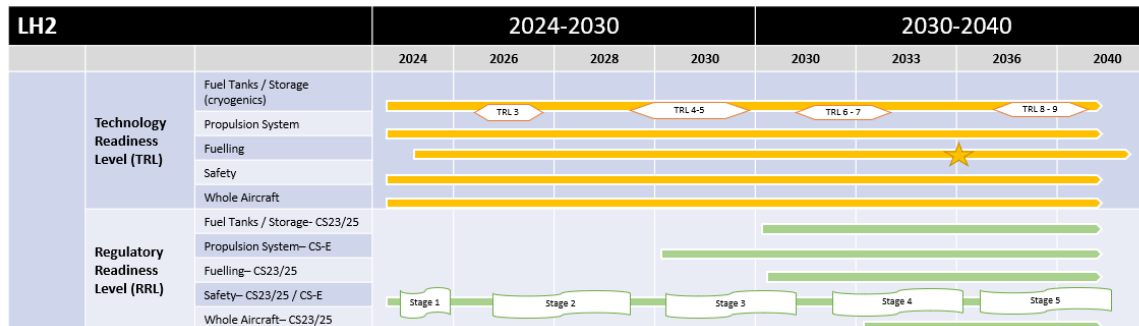
What the new/novel technology is, how it works and what is different compared to existing technology.



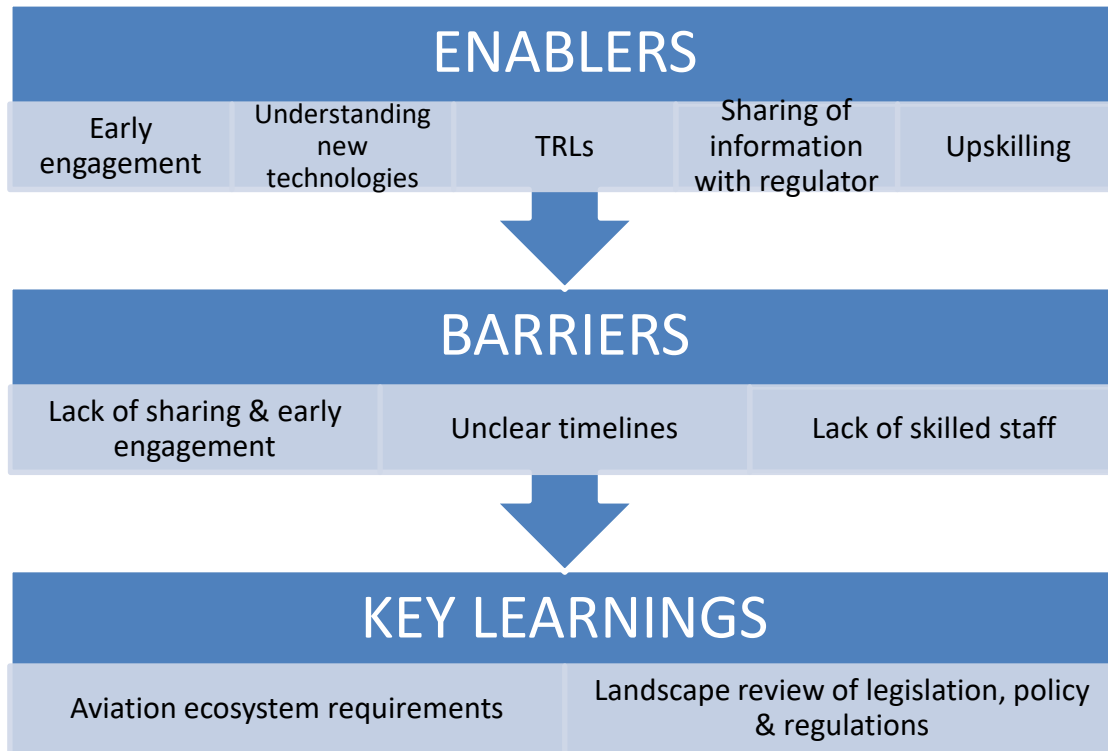
The gaps in current policy and regulation that need to be closed to enable the introduction of new technology.



The current TRL of each technology and the date it is expected to be ready to start the certification process to enable mapping against the regulation process for new policy development and delivery.



Enablers, Barriers & Key Learnings



Regulators Joint Working Group. Concluding remarks

- EASA-FAA COB WG on H2 launched in October'23.
Extension to a EASA, FAA, CAA UK, TCCA and ANAC Working Group (Charter under review).
- Navigate the Learning curve.
 - Regulators, Industry, SDOs
- Need to increase growth of technological knowledge and understanding.
 - Calibrate expectations and timelines
- Awareness on the challenges → turning them into opportunities.

