EASA
European Union Aviation Safety Agency

Federal Aviation Administration

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Electric and Hybrid Propulsion

A bridging technology

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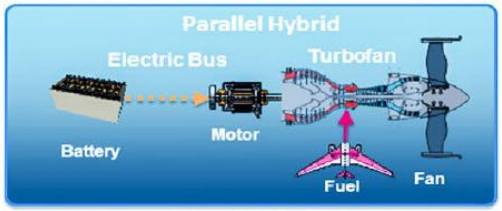
What is an EHPS

Parallel hybrid

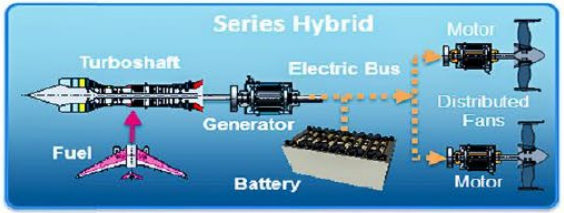


A system that uses a battery-powered motor and gas turbine engine both mounted on a shaft that drives fan, so one or both can provide propulsion at any given time

All electric

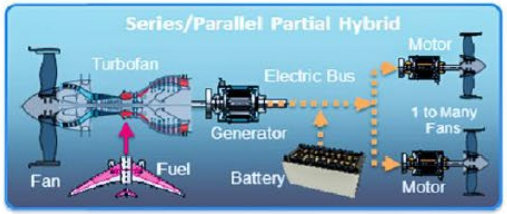
All-electric aircraft systems use batteries as the only source of propulsion power

Series hybrid



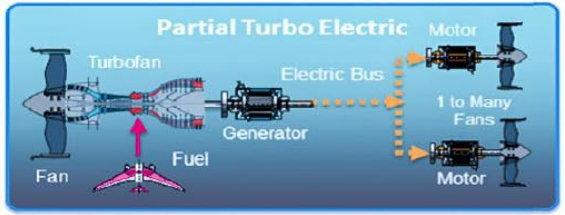
A system where only the electric motors are connected to the fans, and the gas turbine engine is used to drive an electrical generator which drives the motors and/or charges the batteries

Series/parallel partial hybrid



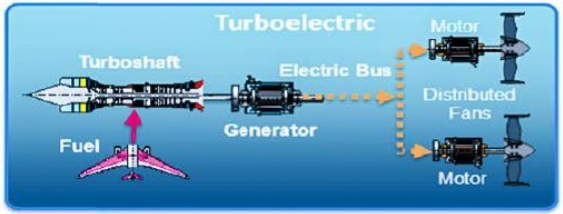
A system with one or more fans that can be driven directly by a gas turbine engine, and additional fans that are driven exclusively by electrical motors which can be powered by a battery or a turbine-driven generator

Partially turboelectric



A system that uses electric propulsion to provide part of the propulsive power, with the rest provided by a turbofan driven by a gas turbine

Fully turboelectric

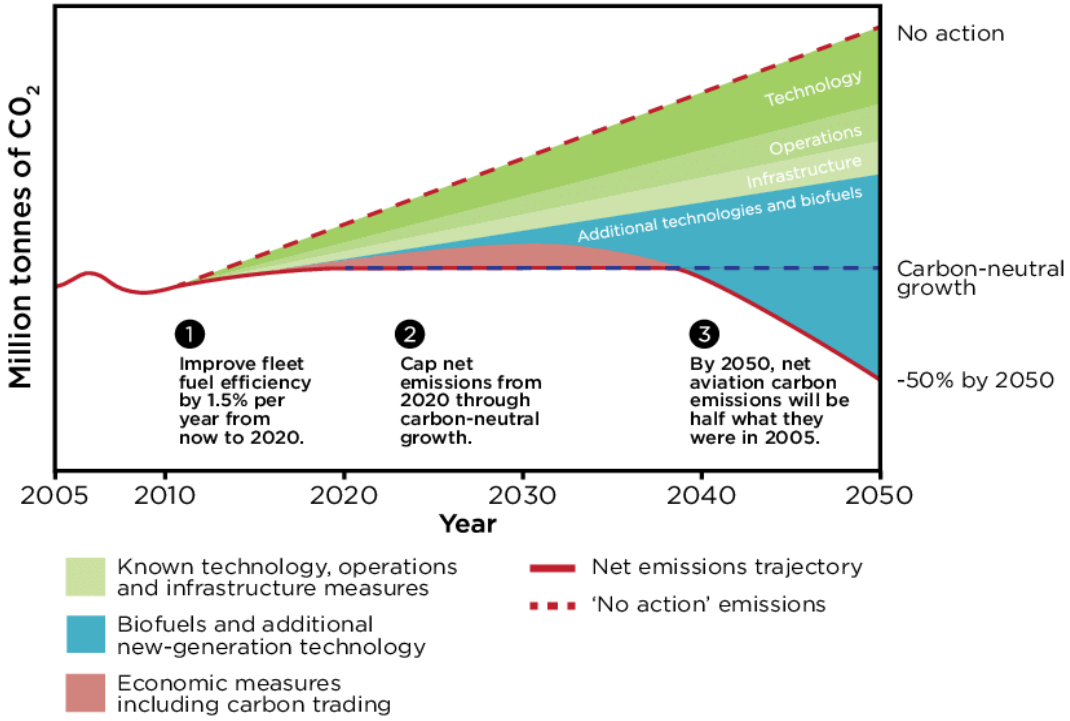


A system that relies fully on gas turbines to drive electric generators which then power inverters and motors to drive disturbed fans

source: https://www1.grc.nasa.gov/aeronautics/eap/airplane-concepts/aircraft-configurations/

EU ambition on sustainability

→ [European Green Deal (europa.eu)]



USA sustainability and infrastructure

→ Executive Order 14057
Federal Sustainability Plan

100% Carbon Pollution-Free Electricity by 2030, including 50% on a 24/7 basis

100% Zero-Emission Vehicle Acquisitions by 2035, including 100% light-duty acquisitions by 2027

Net-Zero Emissions Buildings by 2045, including a 50% reduction by 2032

Net-Zero Emissions Procurement by 2050

Net-Zero Emissions Operations by 2050, including a 65% reduction by 2030

Climate Resilient Infrastructure and Operations

Develop a Climate- and Sustainability-Focused Workforce

Advance Environmental Justice and Equity-Focused Operations

Accelerate Progress through Domestic and International Partnerships

EHPS - enablers to aviation change

Innovation

Creativity

New propulsion architectures

Sustainability

New opportunities

Challenges

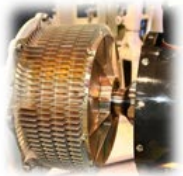
Current EHPS certification projects

From single electric engine to complete hybrid and distributed propulsion systems

Volocopter

Joby

MagniX magni650 EPU



Safran ENGINeUS100

Lilium

APUS with H2

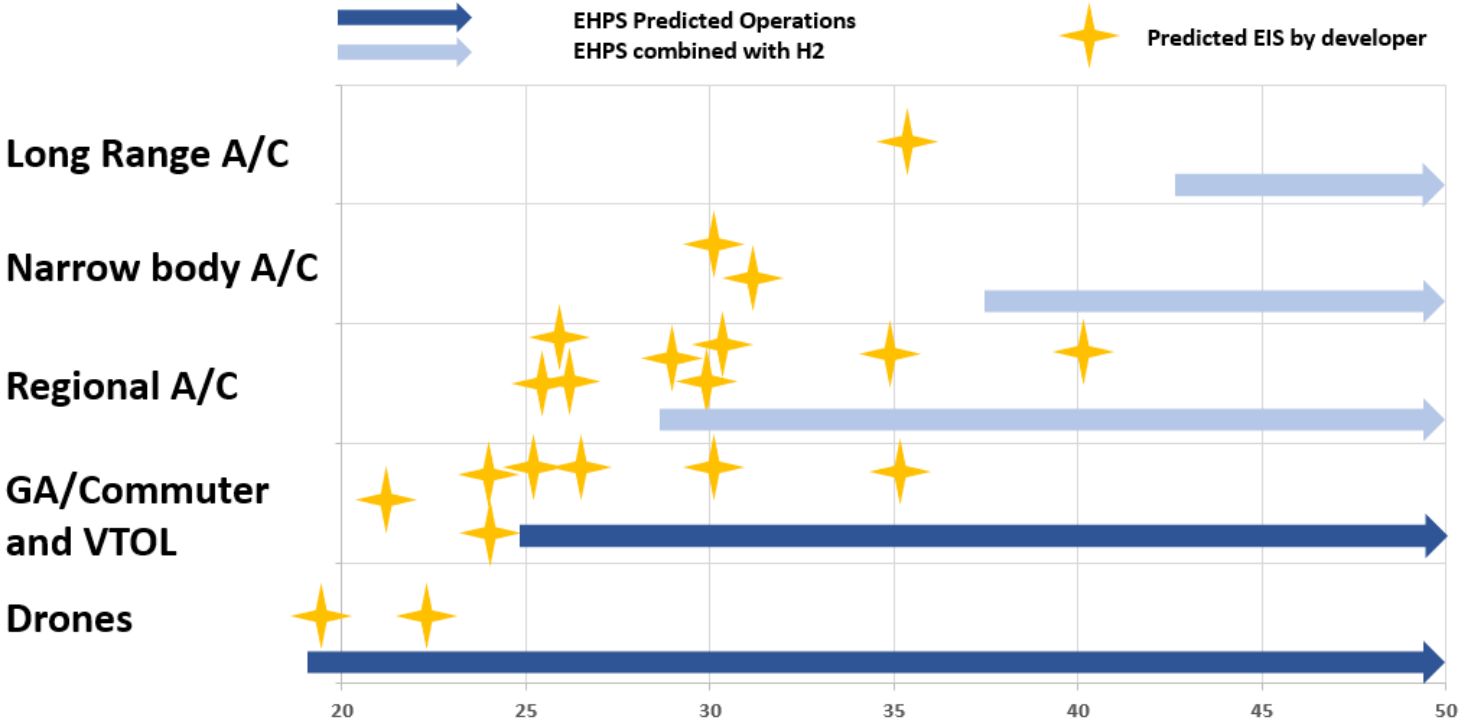
DA40E

H55 engine + battery

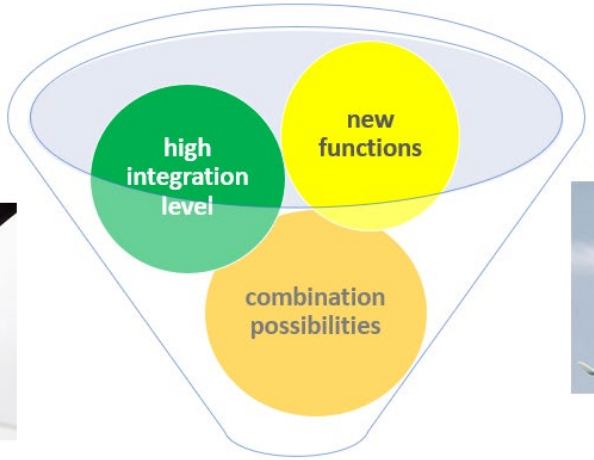
ZeroAvia

Heart Aerospace ES-30

Timelines


EHPS Predicted Operations
EHPS combined with H2
Predicted EIS by developer
Long Range A/C
Narrow body A/C
Regional A/C
GA/Commuter and VTOL
Drones
20
25
30
35
40
45
50

Challenges

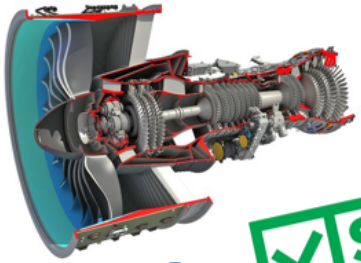


PRESCRIPTIVE RULES

PERFORMANCE BASED RULES

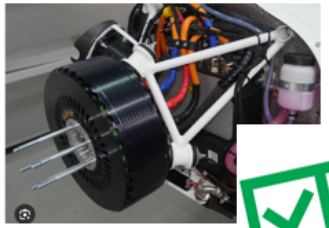
Supporting safe EHPS market entry

TODAY

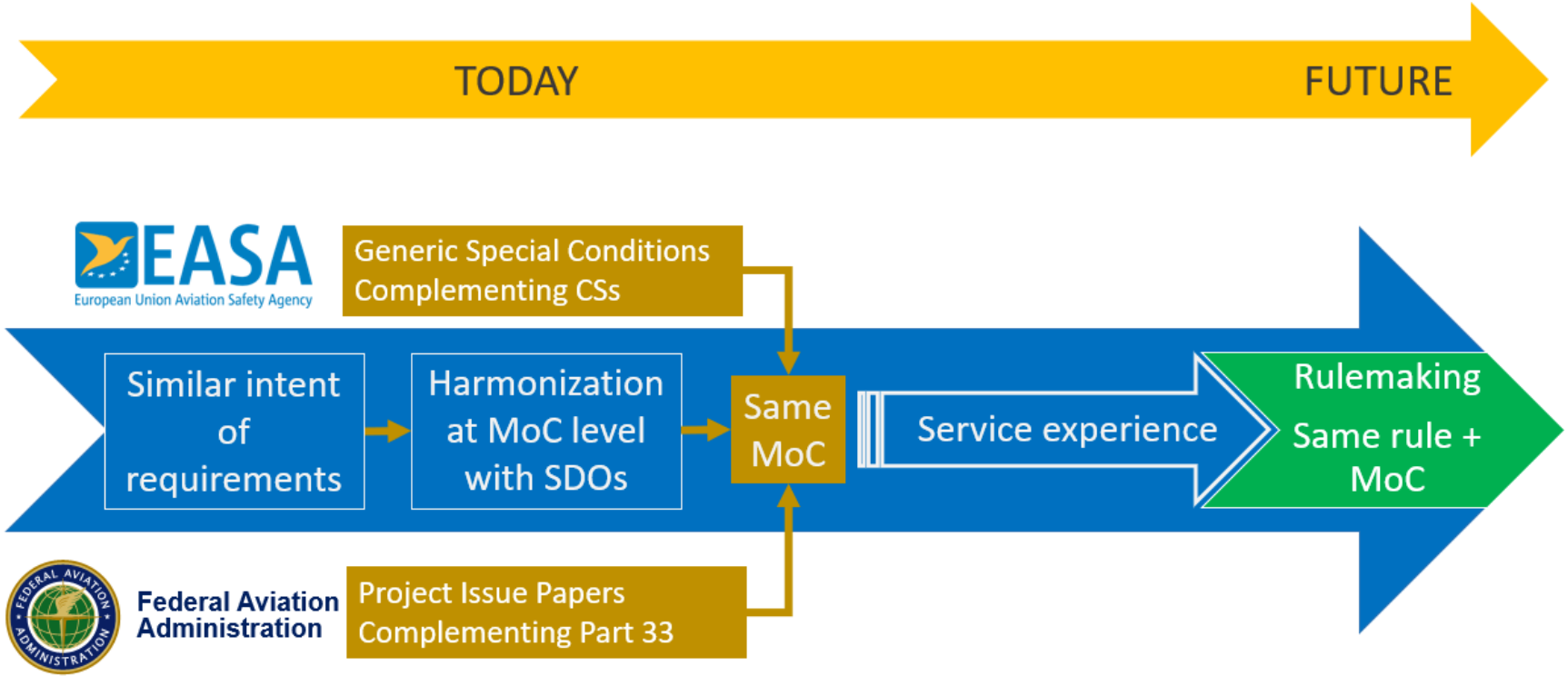
60 years of aviation experience → Prescriptive regulations →  → SAFE

Imposing the same safety records

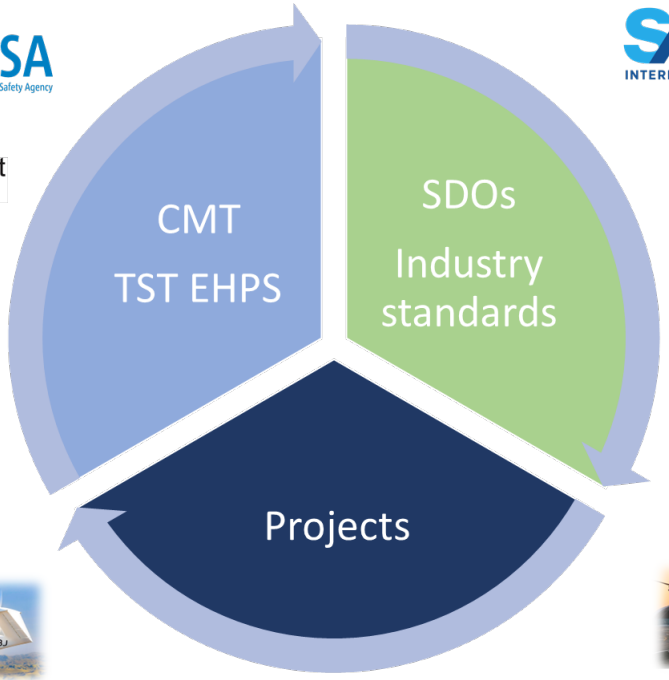
TOMORROW?

Step by step: from small to large products → Performance Based Rules + Industry Standards →  → SAFE

Harmonization efforts

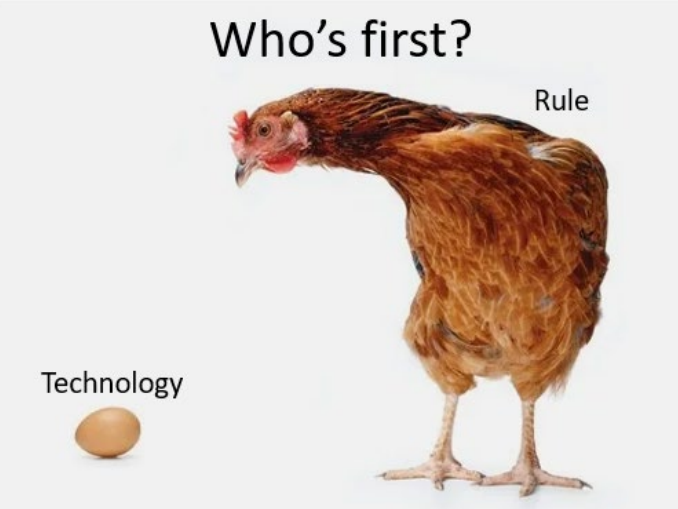


MoC harmonization – an iterative process



How do we get prepared

Conclusions



The answer is not easy.
Strong collaboration is required between Industry and Authorities.

Thank you for your attention

EHPS – success factors