

PIPISTREL

The Innovation Challenge

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Pipistrel

EASA Certification Conference 07 December 2022

Your safety is our mission.

An Agency of the European Union



Pipistrel EASA product range at a glance

EASA.A.573

Explorer



Velis Club



Velis Electro



EASA.E.234

E-811 Electric Engine



EASA.A.660

Panthera (upcoming)



The notion of “Type Certification”

- 1910 Self regulation
- 1920/30 First FAA Type Certification Principles and first Direct Air Ministry Approvals (UK)
- 1937 Introduction of “Approved Firms” (UK)
- 1944 Convention on International Civil Aviation (Chicago Convention):
1949 Annex 8: Airworthiness of Aircraft, Part II, Chapter 1: “Type Certification”
- 1945-46 First European “Type Approvals”
- 1968 – first Type Certificate in Europe (UK, Beagle Pup & Slingsby T53)

First Type Certificate (USA)

- 29 March 1927, by Department of Commerce Aeronautics Branch
- “Aircraft Type Certificate No.1” to Buhl-Verville CA-3 Airster, 3-seat open biplane.
- Company applied for the certificate on 31 January 1927, after Air Commerce Regulations on 31 December, 1926.



DEPARTMENT OF COMMERCE
AERONAUTICS BRANCH
Form R 81

License No. AT-1
Expires _____

APPROVED TYPE CERTIFICATE
LICENSED AIRCRAFT

Name Buhl Aircraft Company
Address Marquette, Mich.
Application No. 1 Date received 1/31/27 Class _____
Type J-4 Airster
Inspected by J. L. Rosch at Washington, D. C. on 2/29/27
Remarks: _____

REPLACEMENT PLATING ORDER

“Although the rules seemed fairly basic and straightforward, obtaining a type certificate proved somewhat difficult.”

Alfred Verville, 1927

“Although the rules seemed fairly basic and straightforward, obtaining a type certificate proved somewhat difficult.”

(A) A manufacturer of airplanes in quantities and of an exact similarity of type, structure, materials, assembly, and workmanship may, at the option of the manufacturer, file with the Secretary of Commerce an application for an approved type certificate.

(B) The application must be accompanied, under oath, by:

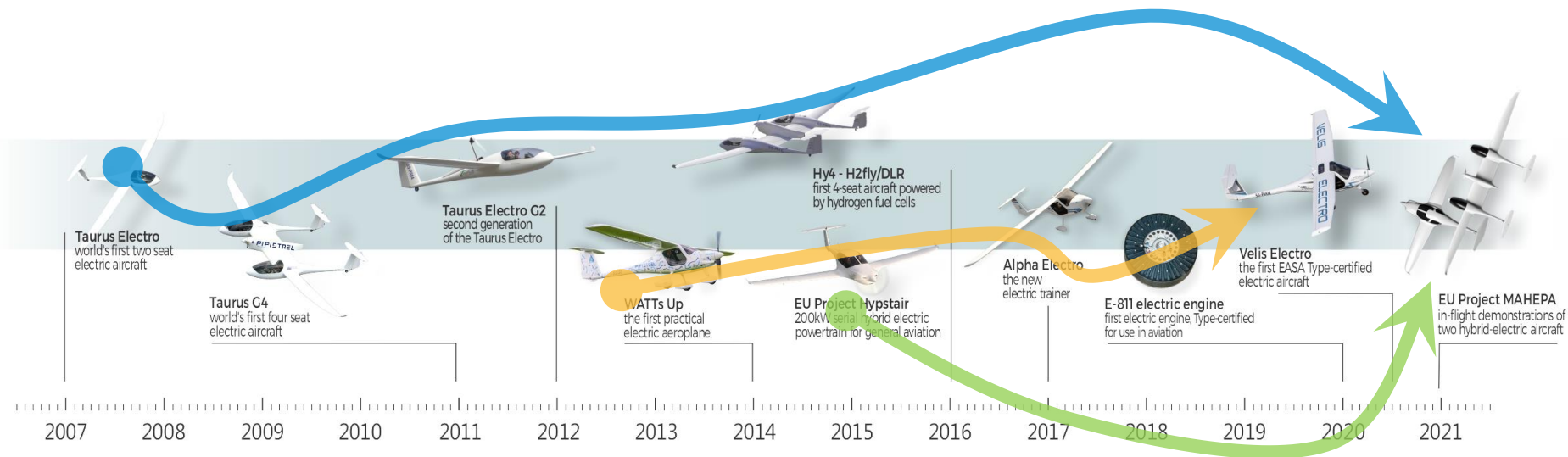
1. Three view drawings of the airplane with main dimensions, aerodynamical and other characteristics, accompanied by a balance diagram for varying conditions of load to be employed.
2. Description of power plant and power-plant installation with illustrative diagrams.
3. Description of wings, fuselage, including engine mount, landing gear and tail surfaces, materials employed, and drawings or dimensioned sketches of main structural members.
4. Stress analysis, with signature of the responsible engineer.

The Branch agrees to keep all information furnished by the manufacturer confidential.

(C) If the Secretary of Commerce approves the submitted design and the aircraft meets requirements, it would be inspected for exact similarity with the submitted design and specifications. Upon passing such inspection, the airplane has to undergo flight tests. If the aircraft passes the tests, the Secretary of Commerce issues an approved type certificate to the manufacturer.

(D) Once a manufacturer receives an approved type certificate, he has to file a quarterly affidavit with the Secretary of Commerce showing the number of airplanes constructed under the approved type certificate during the quarter, with a statement that no airplane being constructed under the approved type certificate deviated from the terms thereof.

(E) Manufacturers of airplanes constructed under an approved type certificate could make changes with the approval of the Secretary of Commerce.





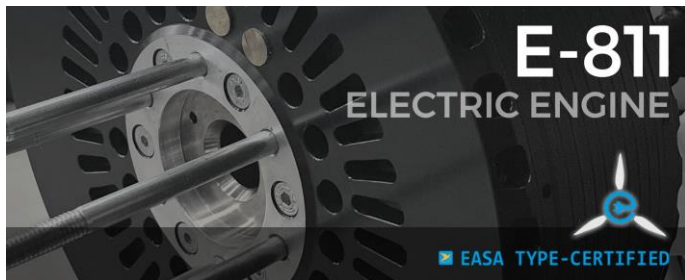
WATTsUP – Electric flight to future

Partnership with Siemens AG, who provided the electric main propulsion components, and represents the next generation of Pipistrel's electric aircraft.



Alpha Electro

Alpha Electro is a 2-seat electric trainer with performance which is tailored to the needs of flight schools.

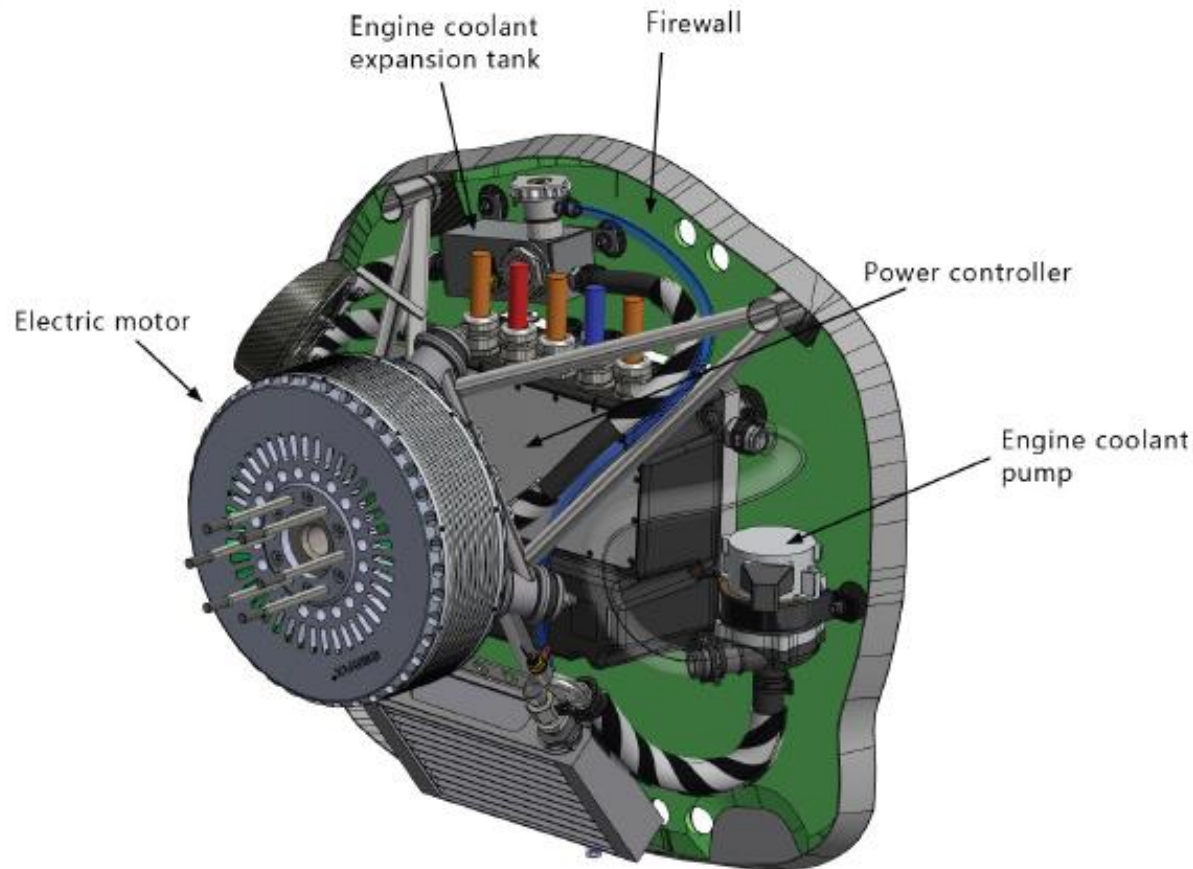


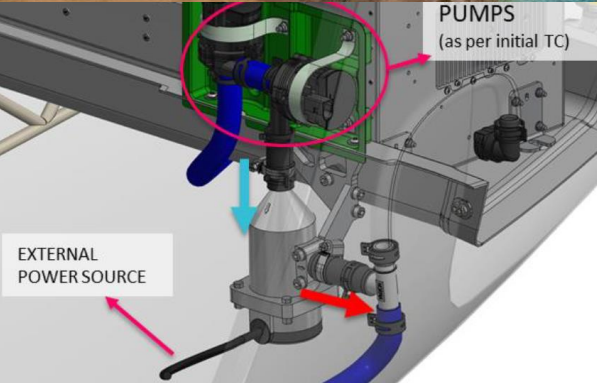
E-811 Electric Engine

The E-811 engine combines a liquid-cooled electric motor and a liquid-cooled power controller. Type-certified electric engine for powered sailplane, UL, LSA, VLA or Part-23 Level-1 aircraft



Velis Electro – Virus SW 128 EASA A.573, E-811 EASA E.234





VIDEO



- We are doing this for customers
- Customers need introduction, training, but most of all ASSURANCE
- Battery safety is an inherent part catering for safety, however not the most important part

Electric Aircraft Crash Too



OCCURRENCE REPORT

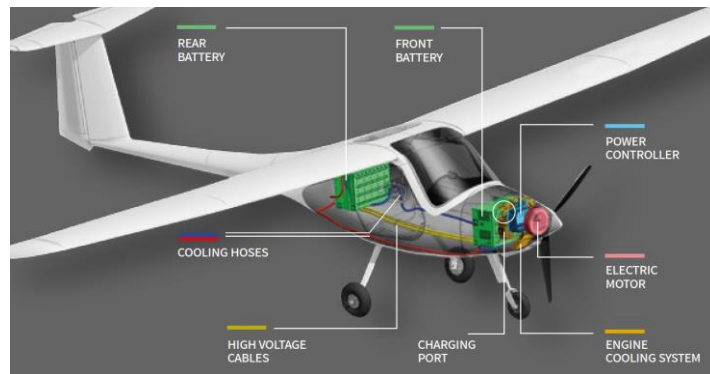


This leaflet should be used in combination with the Aircraft Pilot Operating Handbook

VELIS ELECTRO SAFETY & GROUND HANDLING

FUNCTION	NAME	DIGITAL SIGNATURE WITH TIMESTAMP
PREPARED	DE Alberto Favier	
VERIFIED	CVE Paolo Romagnoli	
APPROVED	HOA Vid Plevnik	

SUPPLEMENT TO POH LEAFLET GROUND RISKS
Doc.No.: SPOH-128-00-40-001 | Issue: A00 | DOA No.: EASA.21J.524



2 REGULAR GROUND OPERATION GUIDELINES:



Keep the A/C **charging port** and **cooling hatch closed** when not charging



Store the A/C at temperature above **-10°C**. Refer to aircraft POH for limitations



Make sure cables to not **interfere** with other airport operations.



Store portable chargers in a **dry** area and ensure they're not exposed to excessive moisture



INFORM AIRPORT AUTHORITIES ABOUT PECULIARITIES OF ELECTRIC AIRCRAFT

1 EMERGENCIES

1.1. BATTERY FIRE



Press the **"Stop charge"** button on the charger immediately (if charging)



Vacate the area around the A/C



Douse the fire with as much **water** as possible in order to delay fire propagation



Expect to use approximately **1000 L** of **water** per battery pack



LiPo batteries fire is **self-sustaining**; completely extinguishing it is impossible! Pouring water **prevents** or **delays** fire propagation.



Leave the aircraft **24h quarantine** after damage before moving it

1.2. SMOKE



Press the **"Stop Charge"** button on the charger immediately (if charging)



Vacate the area around the A/C



If **smoke** is observed stay away from the A/C since batteries may **self-ignite**

1.3. ACCIDENTS/DAMAGE



Rescue occupant first. Do **not move** the A/C. Ask for help of personnel familiar with electric aircraft.



Leave the aircraft **24h quarantine** after damage before moving it

3 CHARGING GUIDELINES



Avoid charging the A/C when it's exposed to **rain**



Have a water **hose-line** close enough (or equivalent equipment)



Do not forcefully **disconnect** the charging cables while **charging**



Make sure charging **cables** do not **interfere** with other airport operations



For indoor charging, locate the aircraft **next** to the **hangar door**



No crew on board during **charging**



Verify charging **status** before removing the charging cables



No crew on board during **charging**



Possibly stay in the **proximity** of the A/C while **charging**



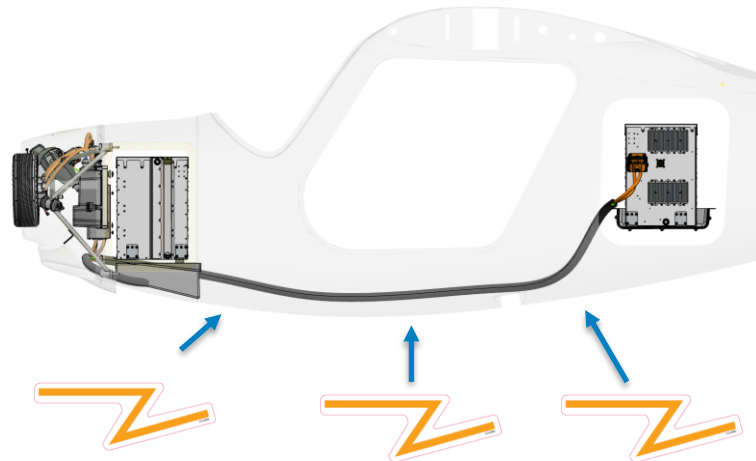
IN CASE OF EMERGENCY CALL 112



CHARGING OPERATIONS RESTRICTED TO QUALIFIED PERSONNEL



- HV markings placed on exterior (fuselage - belly) following cable placement
- Marks routing of HV lines



Certification candidates

Not when, but how

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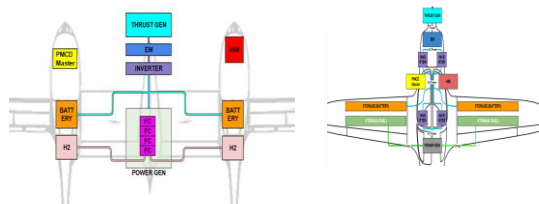
Development of Powertrains

Components designed for flight

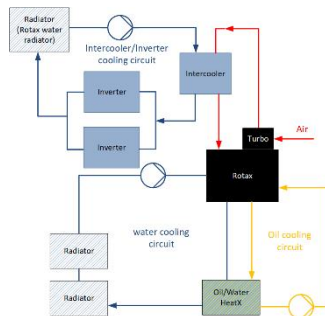


MAHEPA Project direct value propositions

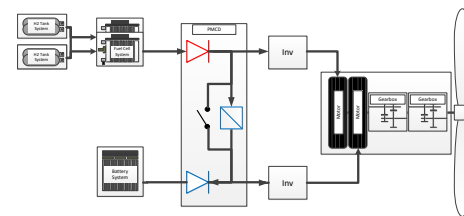
Methods



Modular Approach



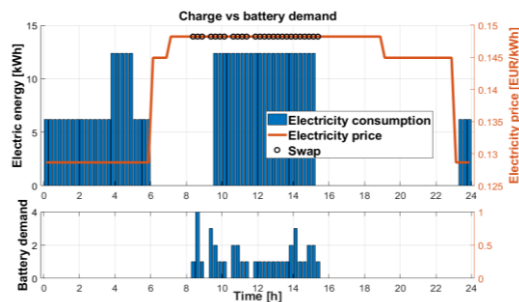
Cooling system design



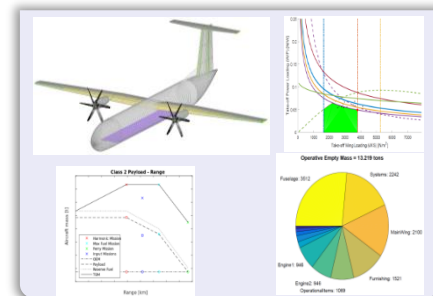
Flex FC hybrid architecture



Emission measurements



Battery Demands Estimations



HE aircraft design

MAHEPA Project direct value propositions

Components



Electric Drive



Power Generation Module



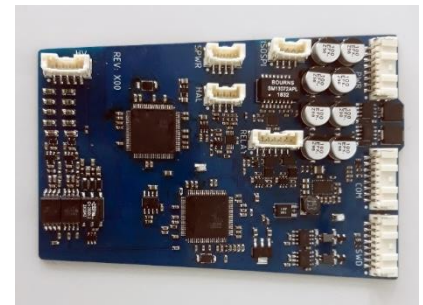
Fuel Cell System



Structure adaptations



Liquid cooled battery



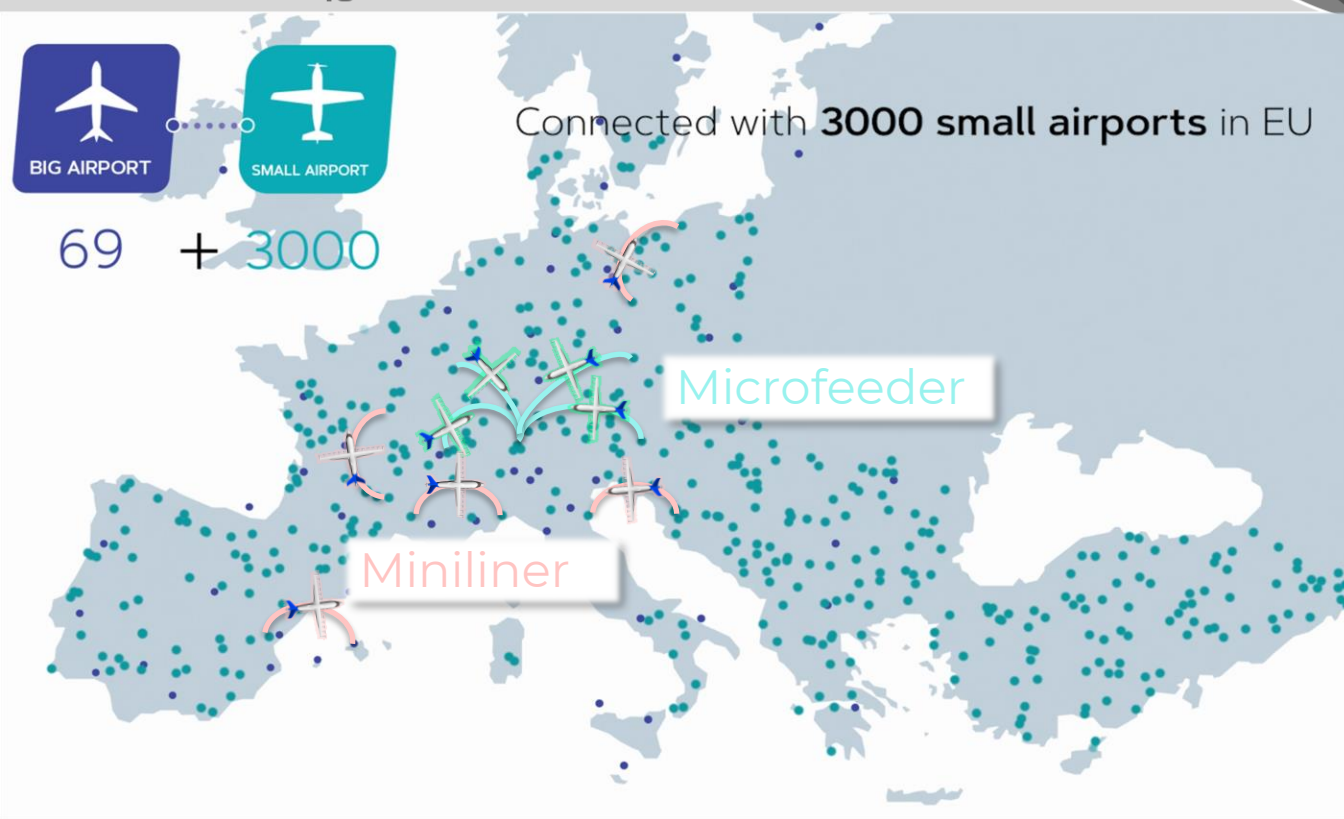
Battery Management System



R&T for long-range zero-emission flight







- ↑ Bring air-travel closer to people without compromising their well being
- ↑ Zero emission, quiet flight
- ↑ Minimal infrastructure investment

True innovators never consider failure, only the consequences of success

↑ UNIFIER19 kick-off meeting (October 2019):

↑ „...*the **only responsible, sensible and sustainable** way for European aviation for **regional** air-traffic to embrace, is going towards **complete zero emission flight.***“

↑ European Commission, INEA and Clean Sky workshop (January 2020):

↑ „***The project's focus** will be, from now on, on **hydrogen and battery based propulsion** for the well-being of European citizens and leadership of European Aerospace Industry.*“



PIPISTREL



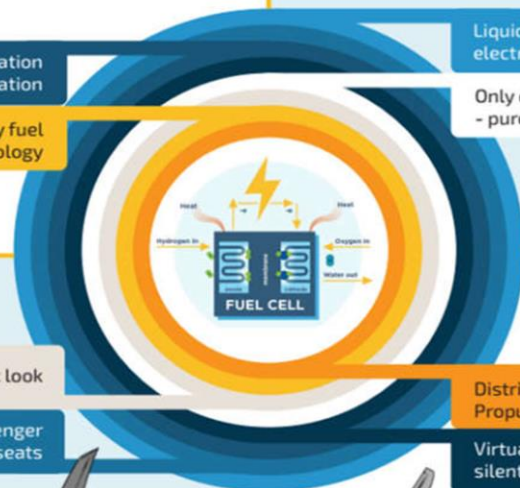
Four competing candidates have been downselected for the final UNIFIER19 configuration

CONCEPT
C3



Innovative configuration space exploration

High efficiency fuel cell technology



CONCEPT
C7A

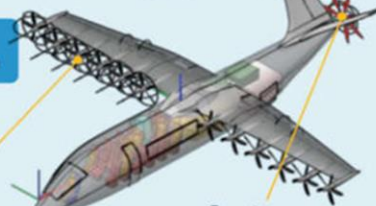


Liquid hydrogen electric power system

Only emission - pure water

Distributed electric propulsion

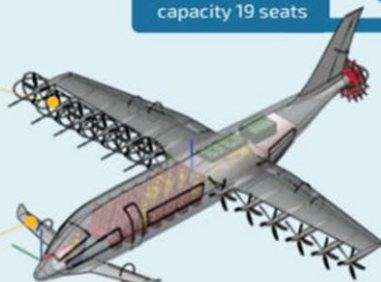
Counter rotating propellers



Distributed electric propulsion

CONCEPT
C2

Canard



Futuristic look

Passenger capacity 19 seats

Distributed Electric Propulsion

Virtually silent flight

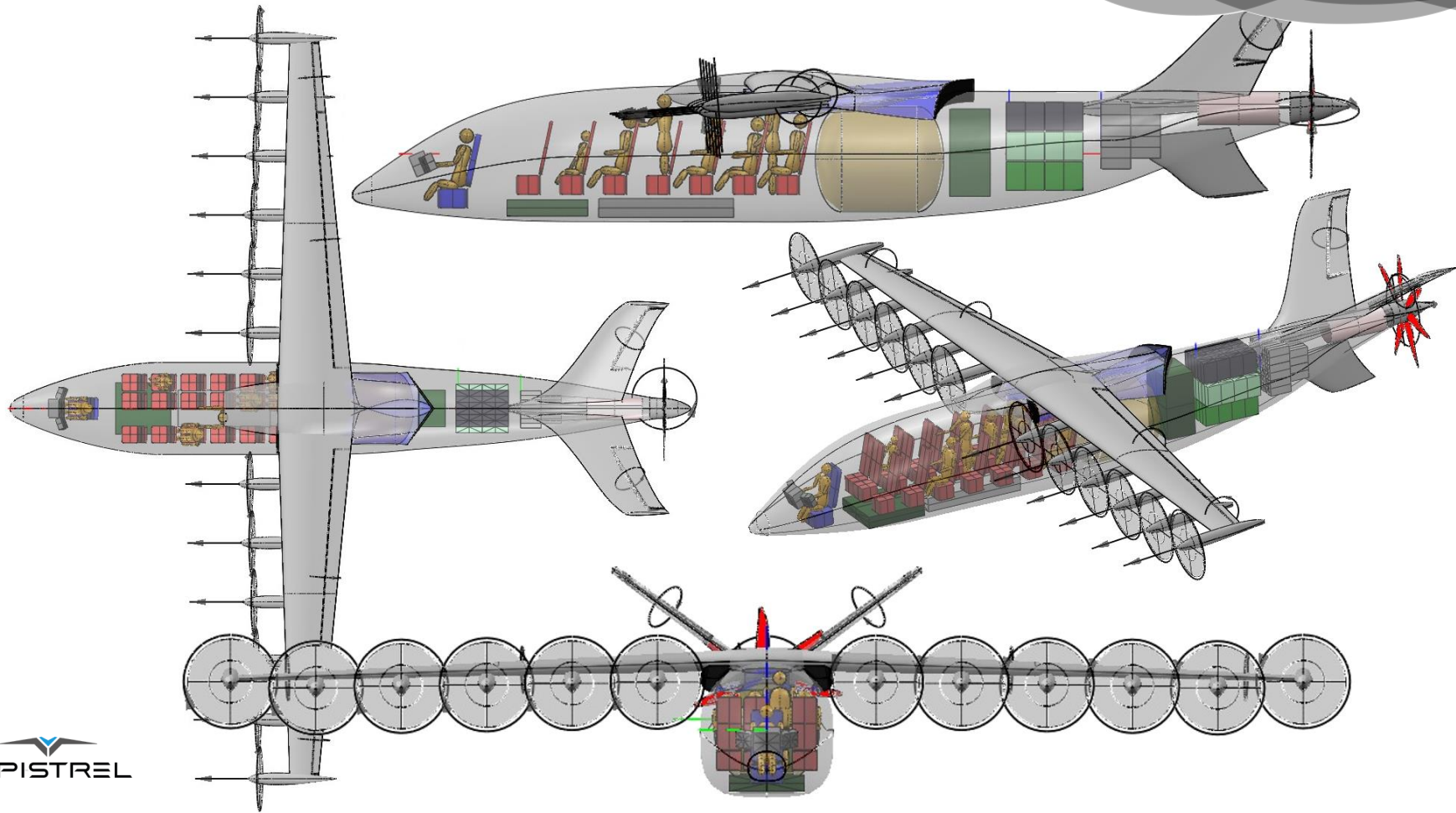


Ducted fan propulsion

Distributed electric propulsion

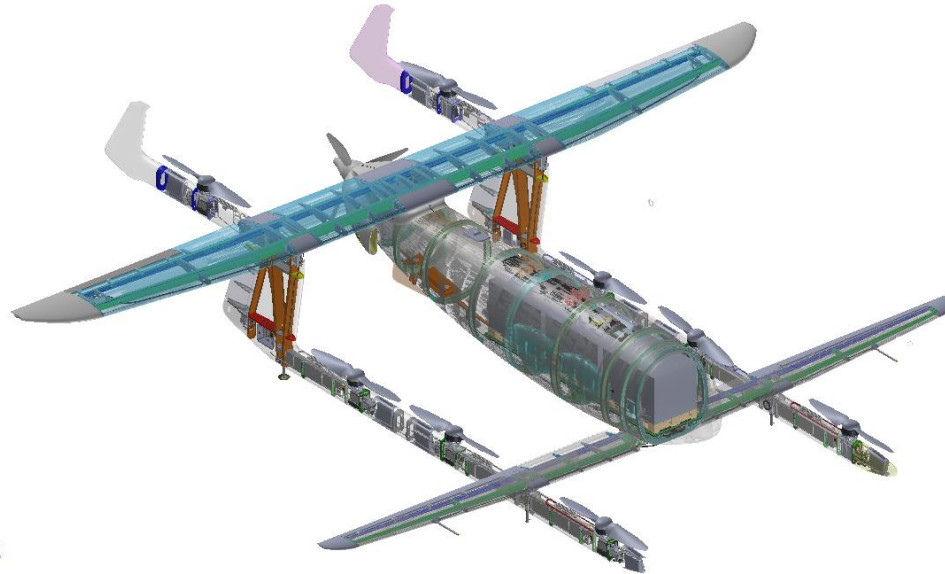


CONCEPT
PVS1





Large hybrid-electric VTOL cargo drone

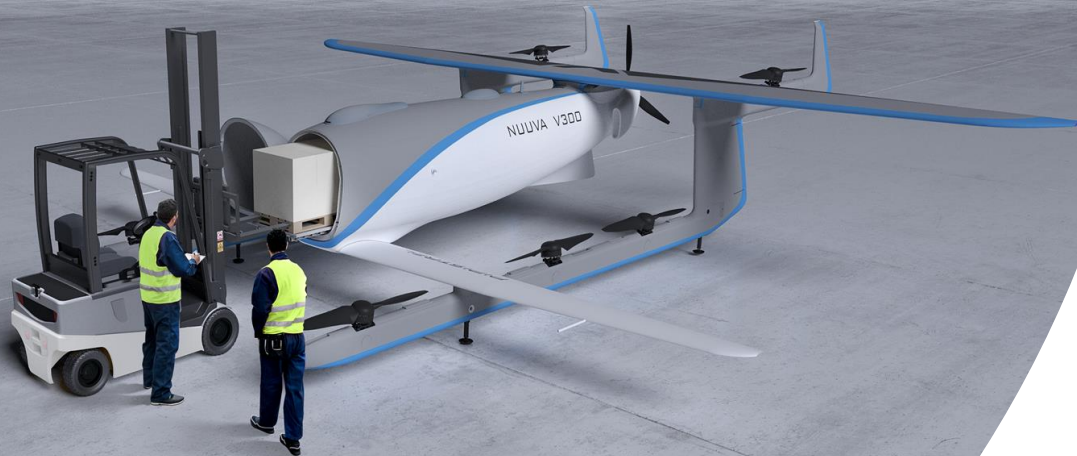


NUOVA
V300

Key characteristics:

1. Autonomous flights remotely surveyed by the operator at the GCS
2. Fully electric Vertical T/O and LDG
3. BVLOS operations, up to SAIL IV, via L-Band SATCOM connectivity with the GCS
4. Geofenced missions to waypoints 299km away from the departure point
5. Constant communication to a GCS for flight plan management capabilities (addition, modification and re/or reordering of waypoints) and live telemetry
6. Simple loading and dispatch of 3 standard EPAL (up to 450 kg)
7. Loadmaster console, in the form of a ruggedized tablet or mobile-phone, to assist the loadmaster in its duties (Pre-flight check steps, incoming vehicle flight track/status)

NUUVA V300



↑ Drive the change towards new services with drones in all airspaces, anytime and anywhere

↑ Support development of new procedures, technologies and services

↑ Deliver environmentally friendly, digital and connected aerial cargo delivery solutions across Europe

↑ Being a catalyst of modernization of European air traffic management

NUUVA V300

↑ Pave the way to Long-range Large-cargo delivery solutions

↑ Test & Demonstrate drone's control and oversight handover between two different Ground Control Station/Operators

↑ Address interoperability of ATC and U-Space services and procedures

↑ Collect valuable inputs to contribute to the evolution of the relevant regulatory frameworks



Future trends?

- Partial or Complete Self-Certification, Self-Declaration
 - Remember year 1910?
- Industry Consensus Standards (ASTM, SAE, EUROCAE)
 - Separation of Certification Specifications and Guidance (Standards)
- Early coordination between policy-makers, agency and OEMs. Precertification activity is key for identification of new technical fields and related opportunities
- Single Worldwide Certifications

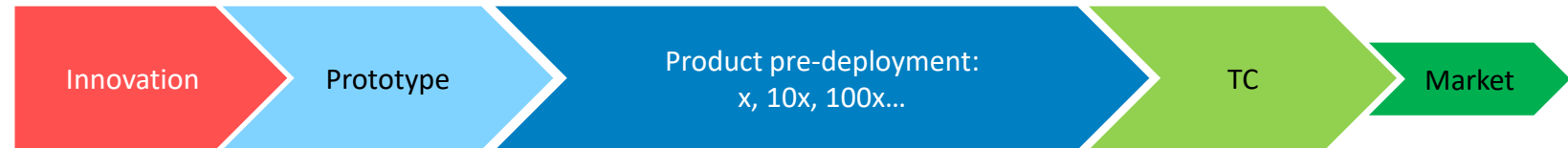
Go-to-Market as supported by aviation certification today



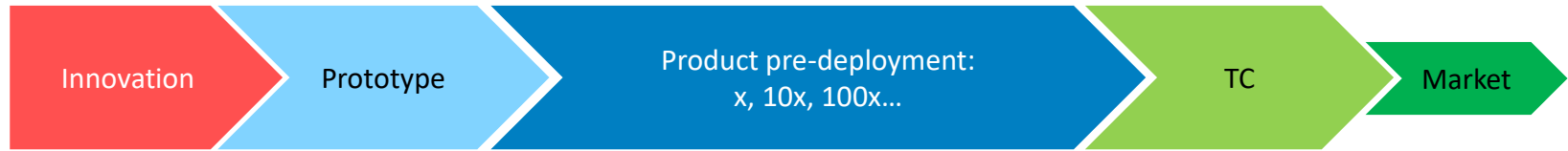
Innovation-to-Market as supported by aviation certification today



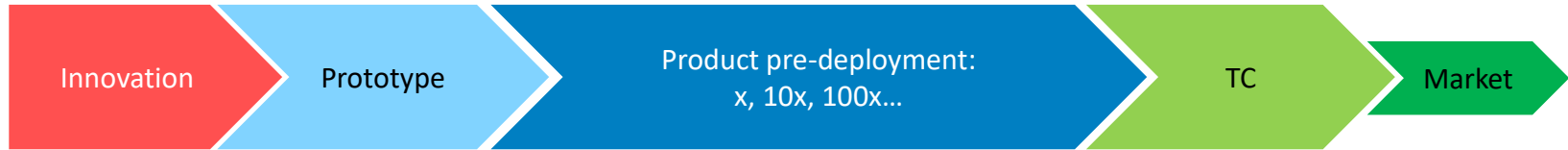
Innovation and safety booster a.k.a. Innovation/Regulatory sandbox



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Pharmaceutical approach to certification



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 - Separation of Certification Specifications and Guidance (Standards)
- Early coordination between policy-makers, agency and OEMs. Precertification activity is key for identification of new technical fields and related opportunities
- Single Worldwide Certifications

- Different certification process for true innovation
- Simplified certification process for similar products (Part-21 Light, LOI, DTO, etc.)

Thank you for your attention

easa.europa.eu/connect



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