EMERGING TECHNOLOGIES IN BUSINESS AND GENERAL AVIATION
GLOBAL CIVIL TYPE CERTIFICATE AIRCRAFT POPULATION ≈ 334,000

- Commercial Airliners ≈ 19,000
  - 2018: +3.8%
- Business Jets ≈ 17,000
  - 2018: +5.2%
- Turboprops ≈ 12,500
  - 2018: +5.2%
- Rotorcraft ≈ 20,500
  - 2018: +5.4%
- Piston Planes = 265,000
  - 2018: +5.0%
- *Registered UAS = 1,200,000

Source: Jetnet LLC, Flight Global, IAOPA World Assembly, FAA
GLOBAL GENERAL AVIATION DISTRIBUTION

North America = 60%
Europe = 26%
South America = 5%
Africa = 3%
Asia = 2%
Oceana = 4%
Easter morning 1900: 5th Ave, New York City. Spot the automobile.

Source: US National Archives.

Easter morning 1913: 5th Ave, New York City. Spot the horse.

Source: George Grantham Bain Collection.
HYBRID & ELECTRIC CONVENTIONAL STRUCTURE AIRCRAFT
MODIFIED LEGACY AIRCRAFT
Magni-X Beaver on Floats – Harbour Air
MODIFIED LEGACY AIRCRAFT

Hydrogen Fuel-cell Powertrain
There is a Rotax 912 combined with an electric motor on the prop shaft.
We are transforming existing passenger planes to electric. Our first twin-engine plane has a combustion engine in the nose and an electric engine in the tail, providing redundancy and improved levels of safety.
NEW CLEAN SHEET CONVENTIONAL STRUCTURE

**Pipistrel Alpha Electro**
- Conventional airplane with electric engine
- Certified in EU
- Trying to get approval for training in CA

**Bye Aerospace eFlyer**
- Conventional airplane w/ electric engine
- Flying Siemens production ready engine/controller in existing LSA airframe
- Picture of airframe in development
- Deposits coming in from flight schools
Bye Aerospace eFlyer
NASA X-57 DISTRIBUTED ELECTRIC PROPULSION DEMONSTRATOR

- Wingtip engines provide propulsion
- LE engines provide high lift
- Pilot has no direct control of propulsion system
Daher, Airbus, Safran - EcoPulse
Eviation Alice

- No direct thrust control
- Gnd control on TKO and LND
- 9 pax / 240 kts / 540 NM range
- Regional air service – think Cape Air
eVTOL
Wisk

FLYER

CORA

HEAVISIDE
MULTI-ROTOR ROTORCRAFT

Alakai Skia

- Current FAA project
- Prototype flying in US

Volocopter

- Current EASA and FAA project
- Prototype flying in Dubai
Pipistrel

Quiet | Safe | Fast

5 SEAT

Pipistrel Vertical Solutions
Bell and Safran share a vision for electric and hybrid-electric aircraft.

Affordable flight controls system that will serve future piloted and fully autonomous.
Piasecki Aircraft Corporation is investigating a more traditional rotorcraft configuration as its potential entry into the rapidly emerging eVTOL marketplace.

The PA-890 eVTOL aircraft is an all-electric-powered Slowed-Rotor Winged Compound helicopter. It is intended for use in a variety of missions including delivery of high-value On-Demand Logistics (ODL); On-Demand Mobility (ODM) personnel air transport; and Emergency Medical Services (EMS), as well as potentially aerial tourism and other commercial applications.
**Vertical Aerospace - UK**

- **POC**: Flew in 2018
- **Seraph**: Flew in 2019
GAMA EPIC AND SUBCOMMITTEES

Electric Propulsion & Innovation Committee (EPIC)

- Simplified Vehicle Operation Subcommittee (SVO)
- Hybrid & Electric Propulsion Subcommittee (ELC)
- eVTOL Subcommittee (eVTOL)
- Infrastructure Subcommittee (INF)
- DATA Communications Ad-Hoc Committee (DATA)
- Flight Licensing & Certification Ad-Hoc Committee (FLC)
PART/CS 23 – A BIG OPPORTUNITY

Part 23-63 (377 Regulations)

Part 23-64 (71 Regulations)

Consensus Stds.
SEPARATING SAFETY REQUIREMENTS FROM METHODS OF COMPLIANCE

Authority

Historic Part-23

New Part-23

Auth. Acceptance

International Aviation Community

Systems & Equipment

Powerplant: Engine

Structures: Design

Structures General

Detailed Design Standards

- Tiered where it makes sense
- Contains detailed compliance requirements
- Current P23 used as a starting basis

High-level requirements.
(safety driven)
NO technical solutions prescribed
No tiers or categories

Flight Characteristics, Performance, & Operating Limits

- Technical Solutions that meet standards
- Test specifications
- Specific compliance methods
ELECTRIC PROPULSION REGULATORY ENVIRONMENT: Q1-2016
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<th>CAAC</th>
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Uber and Hyundai team up to put flying taxis in the sky

Forbes
Toyota Invests $394 Million in Electric Air Taxi Company Joby Aviation
Six Urban Air Mobility Aircraft ‘Well Along’ in Type Certification, FAA’s Merkle Says
For once you have tasted flight you will walk the earth with your eyes turned skywards, for there you have been and there you will long to return.”

- Leonardo da Vinci –

1452 - 1519