GA Road Map: Working towards... the future

Simpler, lighter, better rules for General Aviation

Manfred Reichel

ODM Workshop

09-Mar-2016
ELECTRIC PROPULSION
and its impact onto
aviation regulation
Electric Propulsion - History

- GA & Electric Propulsion

- Certified glider
  - Lange E1 Antares, certified on 14-Jul-2006
  - Lange EA 42 (electric motor), certified under CS-22, Subpart H
  - Sportine Aviacija LAK-17B FES, certified on 31-Oct-2014
  - FES-LAK-100M (motor accepted as part of the aircraft)

- Lots of discussions and pre-application meetings

- ASTM F2480(-14), which is in force via CS-LSA 09-Mar-2016

ODM Workshop
Electric Propulsion -- Present and Future

Some Initiatives done / ongoing in Europe
- HypstAir within the Framework 2020 (EU Initiative)
- ASTM Electric Propulsion Working Group
- Solar Impulse and others

Outlook into the Future
- Electric propulsion is clearly developing far further and quicker
- Allows for a sustainable and environmentally friendly GA
- Promise to be an economical means for different operations
- There are challenges ahead (e.g. battery technology, controller of motor and battery, energy supply, ...)
- There is the need for EASA to look into the details
EASA’s participation

- Proposed to extend the MTOM of Microlights in Annex II when using electric propulsion, however no mutual recognition
- In parallel simplify procedures for certification to CS-LSA which already allows for electric propulsion and with mutual recognition
- New, re-organized Certification Specification CS-23
- Working further (currently) on Special Conditions for CS-23
- EASA is highly committed to support electric propulsion
  - Increasing internal expertise and resources
  - Developing adapted specifications, standards, and guidance
  - Working on Action Area for Electric Propulsion
- Initiated Action Area on Electric Propulsion
Action Area for Electric Propulsion

- Currently a PIA (Preliminary Impact Assessment) is under development
- Including investigation on
  - Impact of Electric Propulsion on regulation
  - Comparison of risks of new electric thrust generation against conventional thrust generation (pro and cons)
  - Economical impact (if nothing is done), but also
  - Political Issues
  - Already available and future technology and philosophy
- Looks into all regulations
- Issue for review and comments planned soon
Regulation (EU) 216/2008

- This is one of the easy ones and already on its way
- Main problem is the link to fuel in some areas
- Example

**Article 3. Flight Operations**

3.a.9. ... the applicable in-flight fuel management procedures must be used, when relevant.

**Proposal**

3.a.9. the applicable in-flight propulsive energy management procedures must be used, when relevant.

But other regulations are also affected
Electric Propulsion -- Impact

Electric Propulsion Action Area
- Risk based approach

Certification Specifications affected
- CS-VLA
- CS-23
- CS-28
- CS-27
- CS-29
- CS-25
- CS-23
- CS-E
- CS-36
- CS-22
- RPAS
- Part-21
- Basic Regulation
- Part M
- ATM
- MMEL
- FSD
- FCL
- OPS
- Part 65

Certification Process
- Software Certification
- FAA Panel Structure
- Special Conditions (interim solution)

Interdisciplinary Issues
- New Product
- Performance Based Licensing
- Performance Based Law

Affected Groups
- Training Organisations
- Affected Groups
- Operators
- Pilots
- Maintenance Staff
- Ground Crew
- Airfields, Aerodromes
- "Single Engine", "Multi Engine"
- Naturally In-stable aircraft
- General Philosophy

Technology
- Complex electronics hardware
- Solar Panel
- Battery
- Hybrids
- Motor
- Hypstatik
- S/C designed for LP
- Motor
- Wires (color coding)
- Fly-by-wire
- Fly-by-computer
- Software
- Control support
- Fuel Cell
- Solar Impulse

Research
- Technology
- NASA
- NAAs
- POMS
- Experts
- E-Fan, Voltair
- Aviation Research Committee (with FAA)

Starts Cert Projects
- Technology

Clusters
- Cluster

Naturally In-stable aircraft
- TC for electric motors?
- Engine part of a/c?
And finally just some thoughts ....

- Partly still thinking in the "old view and systems" on what is an aircraft and how to fly, but we need to look ahead
- First go with Special Conditions to avoid selection of technology by regulator
- Logical path from installation into conventional aeroplanes up to full electric propulsion design aeroplanes
- Aerodynamics influenced by the electric propulsion (active control of airflow)
- Talking about multi-engine / multi-cluster / distributed propulsion
- fly by wire -> control by electric motors -> fly by computer -> naturally instable aircraft -> pilotless aircraft (UAV)
- → software approval
- Very high voltage → sparking, insulation and segregation, rescue issues
- „fuel status“
- Accepted risk level, Cyber Security, ....
GA Road Map: Working towards... the future

Thank you for your attention!

Your safety is our mission.

An agency of the European Union