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## **FLIGHT TRAINING & CERTIFICATION OF ELECTRIC AIRPLANE**

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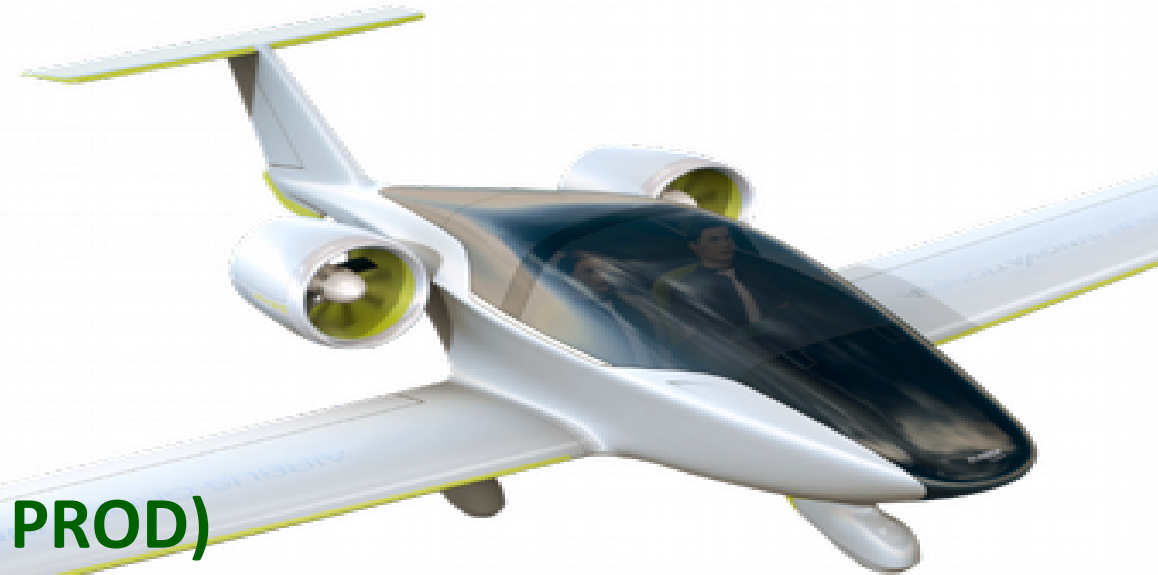
**AFTER THE EXPERIMENTAL CRICRI IN 2010,**

**WE STARTED EXPERIENCING THE EFAN-1  
DEMONSTRATOR (POC) FROM 2014,**



**THEN, AIRBUS LAUNCHED THE EFAN-2  
AS AN ELECTRIC PRIMARY TRAINER (SERIAL PROD)**

- Silent
- Low operating cost
- Certified



(Maiden flight was scheduled in 2018)

# CERTIFICATION IS NOT AN OPTION

- Certified Aircraft is mandatory in Europe for PPL flight training
- The only Certification Specification available for E-Aircraft was (and remains) CS-LSA
- EASA CS-LSA embeds ASTM F2840 (EPS for LSA)



The twin engine configuration would have added some complexity to the certification process :

- Safety consideration
- To be seen by the pilot as a “standard” single engine

# 1 HOUR ENDURANCE (+ reserve):

## WEAKNESS or OPPORTUNITY ?

### WEAKNESS

Not enough to perform cross country flights

### OPPORTUNITY

Room for working on a specific syllabus

45 hours (EASA requirement) = 60 hours “real life”

30 hours on E-trainer + 15 hours ICE + 15 hours ground sim

E-aircraft : easier to simulate + does not need to be certified

Total Cost of Training : -20% cut versus standard ICE training

# ELECTRIC PRIMARY TRAINER : STRONG OPPORTUNITY TO DISRUPT AND REVAMP THE COCKPIT.

- 1 – Full Glass
- 2 – Capable to emulate a large number of ICE config (including the “syllabus” one)
- 3 – Advanced energy flow HMI (with forecasted end of flight autonomy)
- 4 - New functions : eye-tracking, pilot’s action video recording ... supporting auto-analysis (always with FI support)
- 5 – Connected cockpit : part of a seamless network : pilot, FI, A&P mechanic  
Fleet manager : all sharing a common database

Within the Cert scope

Out the Cert scope





**EASA**  
European Aviation Safety Agency

# **CERTIFICATION STANDARD FOR ELECTRIC AIRCRAFT**

- **Today : ONLY CS-LSA (including ASTM F2840)**
- **ASTM F2840 not mature enough and first applicants may face some incomplete requirements**
- **To be completed with CRIs (Certification Review Item)**
- **Electric Aircraft will bring more electronics and CAN/Ethernet networks will become “must have”**
- **Hardware/software certification standard (DO-178/ DO-254) are not adapted to General Aviation**

# THE FRENCH INITIATIVE FOR E-TRAINER



**FFA** : French Private Pilot Association  
Founded in 1922, Non making profit  
Today 42.000 members (active pilots)  
#1 in Europe, #3 worldwide (AOPA, EAA)  
600 aero-clubs, 450 airfields, 2.200 a/c

Since 1922 ... we are still always preparing the future.

- Pilots have to be part of the energy transition
- Airport/airfields neighborhood complaining about a/c noise endanger the very existence of these platforms.
- Our fleet is aging (60% is over 30 years old)



In 2016, it appeared obvious that  
could be part of the answer

e-Aviation

First; the FFA needed to understand ...

1. What is an Electric Aircraft ?
2. How are we going to fly it, to operate and to maintain ?
3. Do we need a specific syllabus ?
4. Which regulation ? Which Licence ?
5. Which requirements for infrastructures ?

We created our R&D  
department at the FFA  
national level :

the **FABlab**



# What is our FABlab ?

1. A formal structure gathering a team of FI, Engineers, Club Executives, A&P Mechanics ... (all volunteers)
2. It is independent from any OEM or business operator
3. It is located at TOUSSUS-LE-NOBLE (LFPN) : the largest French GA airport ( about 30 km from Paris) 100.000 op/y
4. We are not going to fabricate any hardware
5. We aim to produce concepts & recommendations
6. Timescale : start ASAP and be ready when market offers will be ready



# What do we need ?

1. A reliable and safe aircraft : certification is a part of the answer
2. An aircraft with “demonstration capabilities” (it is a trainer)
3. Total Cost of Ownership should not start higher than new ICE 2-seaters, and expected to go down with serial prod.
4. An OEM with real serial production competencies
5. A production ramp up in accordance with our own agenda submitted to energy transition and airport neighborhood associations claiming against noise

And the **FABlab** is to be “the place” where we shall evaluate the different market offers.



# So, we choose the Alpha Electro ... Why ?

The only electric aircraft available on the market in 2017.

A reputed OEM with a large experience with non-certified aircraft.

The ALPHA ELECTRO is not certified and may not be certified.

PIPISTREL announced that the E-VIRUS would be certified in 2018.



DGAC, FFA & PIPISTREL executives at Paris Airshow.

We acquired 1 ALPHA ELECTRO and 2 E-VIRUS under conditions :

a –Alpha Electro to be evaluated at the end of 2018 under a Permit-to-Flight

b –E-VIRUS to be certified by the end of 2018.

To be evaluated at  
the **FABlab**

# WORK IN PROGRESS ...

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1. Now the **FAB**lab is implemented (objectives, roadmap, team, budget, funding, ...).
2. We placed an order on the a/c and the charging station is about to be installed
3. The Permit-to-Fly is under review at the EASA level; expected by the end of 2017 (must permit flight training)
4. A first batch of FI and A&P mechanics should be prior trained at the Pipistrel factory.
5. We shall be ready to go flying .... (beginning of 2018)



# WE ARE NOT ALONE ...

1. We are trying to organize a network of ALPHA ELECTRO early adopters
2. In order to share experience
3. We are connected with **TAM** (Los Angeles) and the **Sustainable Aviation Project** (Fresno)
4. We try to connect with the **Swiss initiative**



# RISK ANALYSIS : REGULATION ISSUE

## EASA PERMIT TO FLY :

- The Alpha Electro already had permit to fly in France : for demo flights, not yet for **flight training experiment**
- The Alpha Electro has not been designed for certification and consequently we anticipate than Pipistrel could face some difficulties (time) to answer to some **EASA requirements**
- **Software** seems to be a key point

## FAA AUTHORISATION:

- New Part-23 (Amendment 64) is **not Electric Aviation oriented**
- **“Fuel System” (Part 23)**  
    >> **“Energy Storage & Distribution System” (CS-23)**
- We (only) see a petition to *make Flight Training in the Electric-Powered Pipistrel ALPHA Electro Legal!* ([change.org](https://change.org))



**Thank you for your  
attention**