

Joint CLEANSKY 2 / FCH 2 JUs workshop on aeronautical applications of fuel cells and hydrogen technologies

The workshop took place in the DLR (Deutsches Zentrum für Luft- und Raumfahrt) Institute of Space Propulsion in Lampoldshausen (Germany) from 15 to 16 September 2015.

The objectives of the workshop were to analyze the state-of-the-art of FCH technologies applications in aeronautics (in-flight and on-the-ground applications) and to bring the two communities together to discuss the next steps of research and development in that field. Its ultimate goal was to identify how the two JUs could financially contribute to the deployment of the FC&H technologies in airports and airplanes.

About 60 members of the two communities participated in the workshop and contributed by lively discussions to the 15 technical presentations. These presentations are available on the websites of the two JUs (www.fch-ju.eu and www.cleansky.eu)

The first day of the workshop was devoted to fuel cells applications in airplanes. Many applications are already studied like the replacement of the RAT, galleys, autonomous cabin... not only for big airplanes but also for business jets with specific applications (medical evacuation, maritime survey...). It is important to differentiate non-intrusive applications (applications that do not influence the power of the airplane) and intrusive applications. A consensus seems to emerge from the discussions that non-intrusive applications represent the short-term priority, the intrusive ones being expected by 2030 upwards. It is also clearly mentioned that the business cases may be totally different for the builders of big aircrafts and the builders of business jets. Both agree that FC&H technologies in airplanes will only be possible if hydrogen infrastructure will be deployed in the airports. The discrepancy between the two types of planes lies in the number of airports that are concerned by the deployment of the hydrogen infrastructure: 1000 airports worldwide being needed for the big airplanes and more than 10000 airfields for business jets. Another surprising conclusion from the presentations is the high diversity of fuels already tested by the different companies involved: liquid hydrogen, compressed hydrogen, propylene glycol/water mixture, methanol and hydrogen from solid storage. A study of the advantages and drawbacks of the different fuels and their use in airplanes could be useful in view of standardizing the infrastructure deployment needs. The specificity of FC applications in aeronautics is also highlighted by many speakers. Specific operating conditions in terms of pressure, temperature, safety, oxidant supply, flight authorization... affect the FCs on board of planes. It is not possible to use FCs developed for cars or buses without important adaptations.

The second day was devoted to ground operations and FC propulsion systems. There are already some initiatives to deploy hydrogen refueling stations in some European airports but the fire brigades of the airports do not authorize their implementation on the runways, only

on the “city-side” of the airports. Interactions with some FCH JU projects on safety and firefighter’s education could be usefully considered to modify this situation. Here again similar comments to ground transport are addressed as regards for example the competition between battery and FC vehicles, the refueling infrastructure deployment in particular for small airfields, regulations in the airports.... The attention of the participants to the next call for proposals was raised as regards topics to which the aeronautical community could join terrestrial transport interested consortia. Synergies between ground transport (ambulances) and aeronautic transport (specialized medical jets) could also be reinforced.

Finally at the end of the workshop, a round table open discussion took place. It was made clear that if FC&H projects in aeronautics had to be financially supported by the FCH 2 JU, this required the participation of the aeronautical industries and research centers, which are members respectively of the Industry Grouping and the Research Grouping, in the working groups that are preparing the calls topics. The target was to have specific topics for aeronautical applications in the 2017 call. As regards the cooperation between the two JUs, the example of the HYCARUS project funded by the FCH JU and followed by the project IMACS funded by CLEANSKY 2 JU was highlighted. The FCH JU is in principle able to support financially the development of a FC system for aeronautical applications and to test it on the ground. Flight tests in real operational conditions could on the contrary be supported by CLEANSKY after successful completion of the FCH JU project. Coordination of the calls between the 2 JUs is needed and will be implemented.

The workshop ended with a very interesting visit of the DLR/ESA installations for testing the motors of the ARIANE rocket and the related huge hydrogen supply needed for performing the tests.

Jean-Luc DELPLANCKE