

## Synthesis of Advanced Battery Session (1/3)

- ➔ State of the art presented based on different EV, PVH applications (i-Mieve, Tesla S, Nissan Leaf, Prius) showing energy density around 100 Wh/kg (pack level *[Dr. Ogumi]*. Li ion battery is also penetrating the market of aeronautic (B787, A350, F35) *[Mr D'Ussel]*
- ➔ Battery is very important and is a key technology for long term vision *[Dr. Sizmann]* and future sustainable society ➔ **enabling technology** for aeronautics *[Dr. Ogumi]*.
- ➔ Gas turbine reaches asymptote ➔ Fill the gap with electrical energy but **requirement** is huge to fulfill a typical aircraft mission (Power needed for climb and TO and energy for endurance) : average calculated around 1,5 kWh/kg energy density needed *[Dr. Sizmann]* and at system level > 500 Wh/kg *[Dr. Fusalba]*
- ➔ Not only one solution for both power and energy needed : hybrid approach necessary *[Mr D'Ussel]*

## Synthesis of Advanced Battery Session (2/3)

- ➔ For aeronautics and also space (Satellites LEO, GEO), **weight** is key and that results of some synergies between both application even if the life time and nb of cycles are different [*Dr Naito*]
- ➔ Future battery gives **theoretical** great performance (LiS : 1 kWh/kg, LiO<sub>2</sub> : 15 kWh/kg) that makes future promising but too low C rate and nb of cycles at this stage
- ➔ Promising technology based on light weight solid electrolyte (LiBH<sub>4</sub>) but some R&D needed to manage interface between electrodes and electrolytic [*Pr. Takamura*]
- ➔ Some considerations gives new technology for **Li advanced** battery in 3 – 5 years and **LiS** in 5 – 10 years but **sizing parameters** is not only energy density and there is also key factors to be considered (T of using, C rate discharge, cycles, cost, ...) [*Mr. D'Ussel, Dr. Fusalba*]

## Synthesis of Advanced Battery Session (3/3)

- ➔ Li Air not before 10 years but take care about the complexity of integration and safety
- ➔ **Condition of comparison** to take care and publications give pretty optimistic figures that need to be **validated/challenged** following real conditions and duty cycle *[Dr. Möller, Dr. Ogumi]*.
- ➔ **Safety** remains priority N°1 for aeronautics
- ➔ Technology winning will results from a great combination of skills between our **2 World** (JP / EU) and a large of Investment on R&T *[Dr. Sizmann]*



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