SWAFEA
European Study for Alternative fuels in Aviation
Main outcomes

Ph. NOVELLI, coordinator

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Sustainable Way for Alternative Fuel and Energy in Aviation
A study funded by the European Commission (DGMOVE)
• A study for the European Commission DG MOVE
  ⇒ February 2009 – April 2011

• Purpose: "Feasibility Study and Impact Assessment on the Use of Alternative Fuels for Aviation"
  • Comparative assessment of the possible options
  • Possible vision and roadmap for deployment

⇒ Ultimate goal: information and decision elements for policy makers

• Multidisciplinary approach: suitability, sustainability and economics

• 20 organisations involved
  ➫ AIRBUS, AIFRANCE, ALTRAN, BAUHAUS LUFTFAHRT, CERFACS, CONCAWE, DLR, EADS-IW, EMBRAER, ERDYN, IATA, INERIS, IFP, ONERA, PLANT RESEARCH INTERNATIONAL, ROLLS-ROYCE, SHELL, SNECMA, University of Sheffield
Main focus of the study

- **Fuel suitability**
  - In 3 years, move from "technical feasibility" to "deployment issue"
  - Investigation of solutions beyond FT-SPK and HEFA 50% blends

- **Sustainability**
  - Life cycle GHG emissions (BTL & HEFA)
  - Biomass availability
  - Atmospheric impacts

- **Economics**
  - Business case (BTL & HEFA)

- **Deployment outlook**
• Significant GHG emissions reductions achievable with biofuels...
  – Confirmation of BTL high potential of reduction (> 80%)
  – HEFA's LCA dependence on feedstock
    ⇨ Major importance of cultivation practices
  – Paramount impact of Land Use change Emissions
    ⇨ Unsolved issue of Indirect Land Use Change

  ... and emissions reductions call for biofuels

• Atmospheric impact
  ⇩ Soot emissions reduction with decreased aromatics content
  ⇨ Positive impact on contrails radiative impact of soot emissions reduction
• Halving emissions in 2050 calls for:
  – New sources of biomass
  – More efficient process

• Achieving biomass potential needs:
  – Significant effort in agriculture development
  – Times

⇒ Biomass production development likely to be a bottleneck
⇒ Need for research and innovation
☞ Strong expectations on algae, but still requiring research and confirmation
The short term barrier of economic efficiency

- Initial lack of competitiveness of BTL and HEFA $\Rightarrow$ 1.5 to 2 x kerosene price
- Strong influence of feedstock price
  - **HEFA**: Dominating impact of oil price $\Rightarrow$ Secure "low cost" feedstock
  - **BTL**: Capital intensive $\Rightarrow$ Cost decrease expected with development
    $\Rightarrow$ Barrier for initial development
- Need to develop efficient and economic processes
  $\Rightarrow$ Expectation from “fermentation” routes
- Critical impact of biomass production
• **No start-up of biofuel without incentive policy**
  - Currently, ETS effect not seen as sufficient

• **Connexion with automotive fuel to be considered**
  - No process producing only aviation fuel
  - Required and possible synergy
  - Competition due to higher attractiveness of road transportation

Outcome:
The short term barrier of economic...
SWAFEA assessment: potentially "Drop-in" fuel

- **Economic interest of an initial low blending ratio strategy**
  Low ratio $\Rightarrow$ Lower specification on the blendstock $\Rightarrow$ Higher process efficiency

- **Upper blending limit of SPK**
  - Seals and density are the main issue
  - Current trend: synthetic aromatic

- **Interest of naphtheno-aromatics from liquefaction**
  - Viable option as a blendstock with HVO
  - Potential for aromatics substitution $\Rightarrow$ Further works recommended

- **Limited potential of FAE inclusion**

  "Fermentation routes" not tested but of real interest
Conclusions

- An actual potential for GHG emissions reduction
- Mid/long term issue: availability and development of biomass production
- Short term issue: competitiveness of biofuels

☞ A determined policy is required

- Define a sectoral goal for 2020
- Promote a number of "end to end" projects
- Combine incentive policies
- Use ETS revenue to fund the initial deployment plan
- Support research and innovation
- Harmonisation of sustainability rules at international level would help
Swafea reports available at: www.swafea.eu

Swafea team: Airbus, AIFRANCE, ALTRAN, Bauhaus Luftfahrt, Cerfacs, Concawe, DLR, EADS-IW, Embraer, Erdyn, Iata, Ineris, IFP, Onera, Plant Research International, Rolls-Royce, Shell, SNECMA, University of Sheffield