



ICAO AVIATION AND SUSTAINABLE ALTERNATIVE FUELS WORKSHOP

ICAO Headquarters, Montréal, Canada

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European Commission's framework for sustainable biofuels for aviation.

Associated Initiatives and R&D



Directorate 'Transport' / Unit 'Aeronautics' Directorate-General for Research and Innovation
European Commission

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- Energy and Transport policy
- Climate policy

2. Industry Framework:

- Vision for aeronautics provided by the industry

3. Industry/EC joint initiatives on biofuels

4. Aviation Biofuels related co-funded research

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Policy related Framework: Energy/Transport Policy Drivers

- High demand on **finite energy sources**: (Range of conventional oil: ~ 45 years);
- Increasing **energy import dependence**: (Import dependence for oil: 80% now; ~ 90% in 2030);
- Increasing **greenhouse gas emissions**: (Increase of transport CO2 emissions: 25% since 1990)

- Comprehensive long-term European fuel strategy: Substitution of oil for all transport modes, all segments
 - **Future transport fuel mix** (applies more to surface transport)
 - **Alternative fuel infrastructure**: EU-wide coverage important

- In the next framework program (**2014-2020**) structural funds will be divided in three sectors: Transport, Energy and ICT



Policy related Framework: Binding Renewable Energy Targets by 2020

Renewable Energy Directive (2009/28)

- 20% share** in overall final energy consumption
- 10% share** in all forms of transport
- Biofuels count** for them all, but only if sustainable



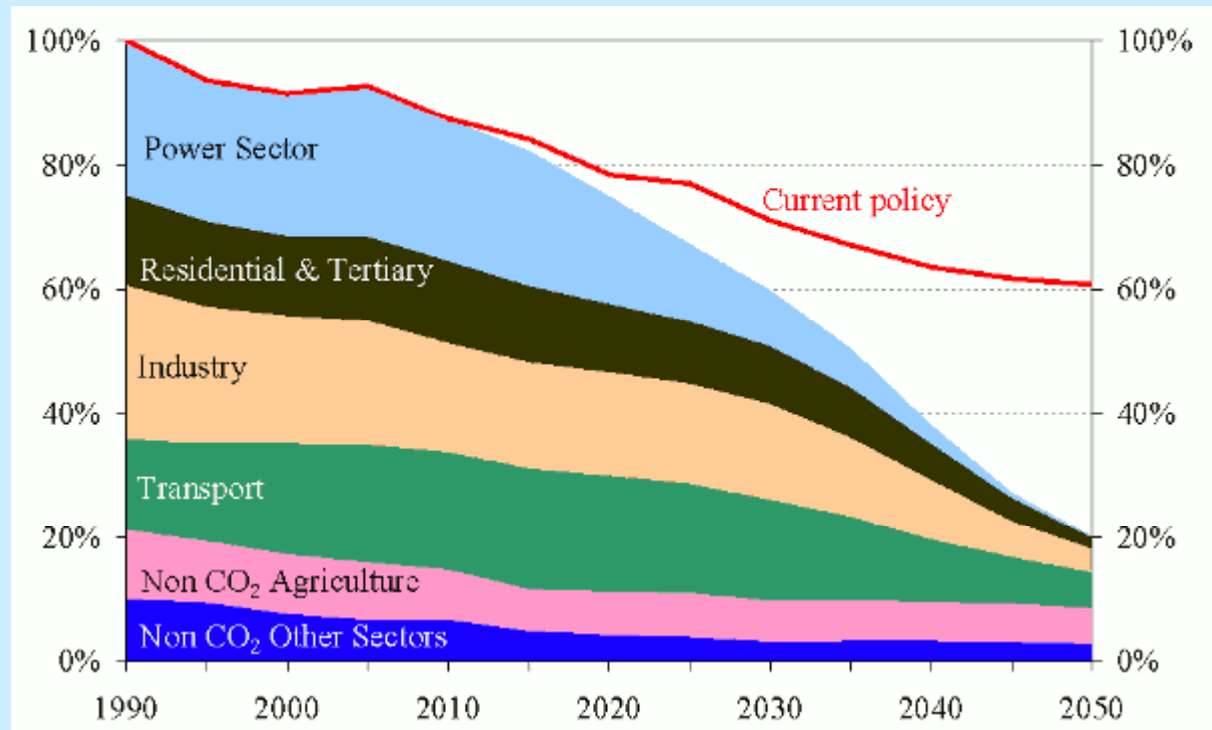
Policy related Framework: Binding Climate relevant Targets 2020-2050

20% emission reduction target by 2020

80% emission reduction target by 2050

To get there, Europe's emissions should be 40% below 1990 levels by 2030 and 60% below by 2040

→ All sectors will have to contribute.



EU-ETS system will grant biofuels 0% CO₂ emission as incentive for their use



Policy related Framework: a comprehensive approach to address aviation's climate impacts

- ATM Modernisation :Single European Sky, SESAR Joint Undertaking
- Research and Development of New Technology
 - Clean Sky Joint Technology Initiative (€1.6 bn over 7 years)
 - Sustainable alternative fuels
- New Standards: Through ICAO, e.g. new aircraft CO2 standard
- Market-Based Measures
 - EU Emissions Trading System
 - gives a long term, predictable commercial incentive to use things like biofuels
 - Includes direct support for aviation biofuels



Industrial Framework: Input from Aeronautics Industry

AI was asked to provide input for research programmes to be funded by the EC (2000)

→ Gave the seed for ACARE (Advisory Council for Aeronautics Research in Europe) which provided a SRA: research priorities within the time frame 2002-2020; to be updated at mid-term

→ 29 March 2011 (Aerodays in Madrid) publication of flightpath 2050 with SRI(Innovation)A currently under elaboration



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Industrial Framework:

Input from Aeronautics Stakeholders

Goals 2020 from ACARE SRA 2002/2004:

In 2020, the range and volume of damaging emissions has been substantially reduced mainly through fuel consumption reduction: **A 50% cut in CO₂ emissions per passenger kilometre (which means a 50% cut in fuel consumption in the new aircraft of 2020) and an 80% cut in nitrogen oxide emissions.**

→ **No biofuel target in 2002 ACARE SRA**

<http://www.acare4europe.org/docs/Vision%202020.pdf>





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Industrial Framework: Input from Aeronautics Stakeholders 2010 Updated vision → ACARE Flightpath 2050

http://www.acare4europe.org/docs/Flightpath2050_Final.pdf



- support to the Air Transport Action Group's (**ATAG**) target of 50% CO₂ emissions based on 2005 level
- In 2050 **technologies** and **procedures** allow - 75% CO₂ and -90% NO_x (relative to 2000)
- Europe major player for sustainable **alternative fuels** including those **for aviation**, based on a strong European **energy policy**

→ Biofuels introduced in ACARE's vision 2050 as necessary to help reaching the 2050 targets.

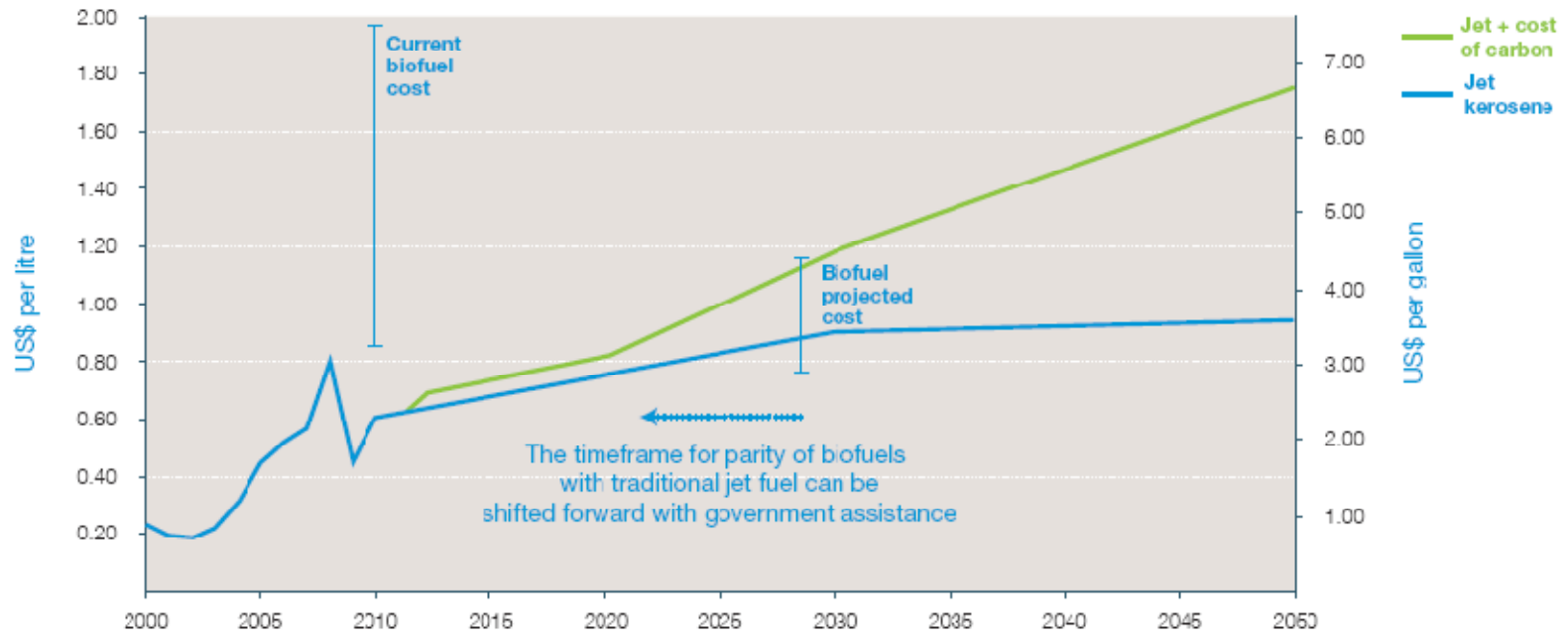


Industrial Framework: Input from Aeronautics Stakeholders **ATAG's economic case**

(From Powering the future of flight. The six easy steps to growing a viable aviation biofuels industry; <http://www.atag.org/our-publications/latest.html>)

Source: Jet kerosene price based on 25% markup over IEA's crude oil forecast in Energy Technology perspectives 2010. Carbon price taken from UK DECC 2010 central case forecast for traded carbon price. All are in constant (inflation adjusted) US dollars. IATA Economics. Schematic, indicative diagram.

Jet fuel and carbon prices





Joint initiative Industry/Policy: European Advanced Biofuels Flightpath

- **Biofuels FlightPath 2020** is a **joint initiative** of the airline and biofuels industries and the European Commission
- To achieve yearly production of **2 million tons of sustainable biofuels** used in the EU civil aviation sector by the year 2020 (4% of EU airlines fuel needs, 10% of EU major airlines)
- Establishing **appropriate and effective financial mechanisms** to support the construction of industrial “first of a kind” advanced biofuel production plants





European Advanced Biofuels Flightpath

1. Facilitate the development of standards for drop-in biofuels and their certification for use in commercial aircrafts;
2. Work together with the full supply chain to further develop worldwide accepted sustainability certification frameworks;
3. Agree on biofuel take-off arrangements over a defined period of time and at a reasonable cost;
4. Promote appropriate public and private actions to ensure the market uptake of paraffinic biofuels by the aviation sector;
5. Establish financing structures to facilitate the realization of 2G biofuel projects;
6. Accelerate targeted research and innovation for advanced biofuel technologies, and especially algae
7. Take concrete actions to inform the European citizen of the benefits of replacing kerosene by certified sustainable biofuels;





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European Advanced Biofuels Flightpath

<p>Short-term (next 0-3years)</p>	<p>Addressing funding mechanism; Significant volume of FT synthetic biofuels (>1000 tons); Ensure a market for aviation biofuels; industrial 2nd Generation biofuels plants; Mobilise fuel suppliers and logistics along the supply chain</p>
<p>Mid-term (4-7 years)</p>	<p>First quantities of algae oils used to produce aviation fuel; 1.2 Mt of biofuels blended with kerosene. Construction of 2nd series of 2G plants including algae biofuels and pyrolytic oils from residues. Operational by 2020.</p>
<p>Long-term (up to 2020)</p>	<p>2.0 Mt of biofuels are blended with kerosene. Biofuels are used in most EU airports.</p>

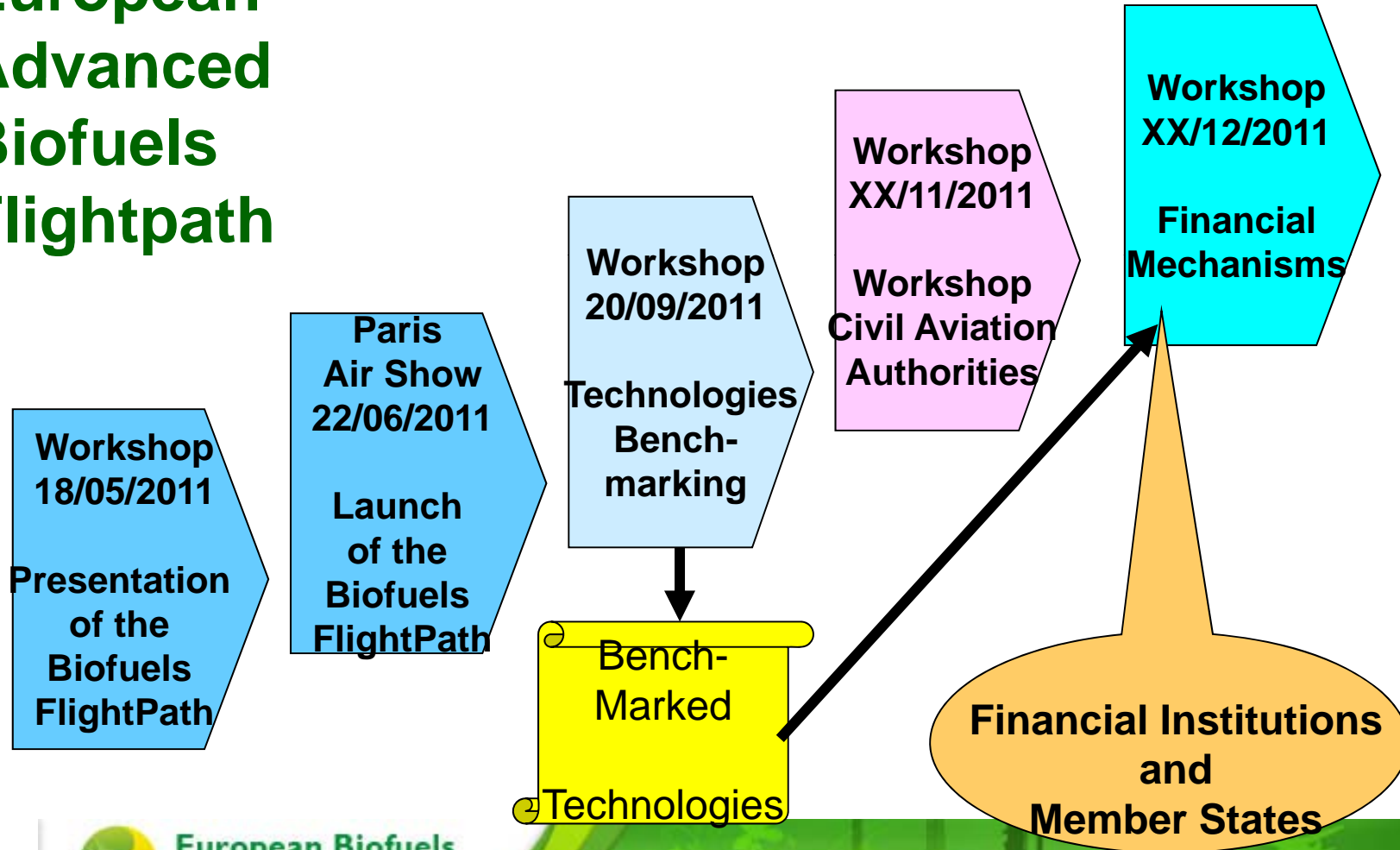


European Biofuels
TECHNOLOGY PLATFORM





European Advanced Biofuels Flightpath





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Associated Research, EC funded



- █ FP7 program (2007-2013) for TLR ≤ 5
- █ Joined call with Directorate Energy for TLR 5-6 (demonstrators) 2012: 10M€ 2013: more?, else?
- █ SWAFEA study (on sustainable ways for alternative fuels and energy in aviation, directorate Transports)
- █ Stakeholders involved in the definition of annual work programs
- █ International cooperation (non EU countries) welcomed (co-funding in some cases)






Some results of FP7 projects related to biofuels for aviation

 **DREAM** : addresses the goals of reducing CO2 and the increasing cost of Jet A1 fuel through:

 increasing rotor efficiency

 novel enabling architectures and structures

 characterising alternative fuels and demonstrating the operation of a small turbofan engine with the selected alternative fuel





DREAM main results related to biofuels for aviation

HVO are a good start but HEFA LCA must be improved

Develop alternative oils / Find a way to exploit efficiently

lignocelluloses

Oil profile diversity will required versatile, robust and efficient

hydro-processes

NEED TO ASSESS PRODUCTION/DELIVERY TRACKS and

CONTROL EFFICIENCY GLOBALLY






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Some results of FP7 projects related to biofuels for aviation

 **ALFA-BIRD**: goal is to investigate and develop a variety of alternative fuels for the use in aeronautics.

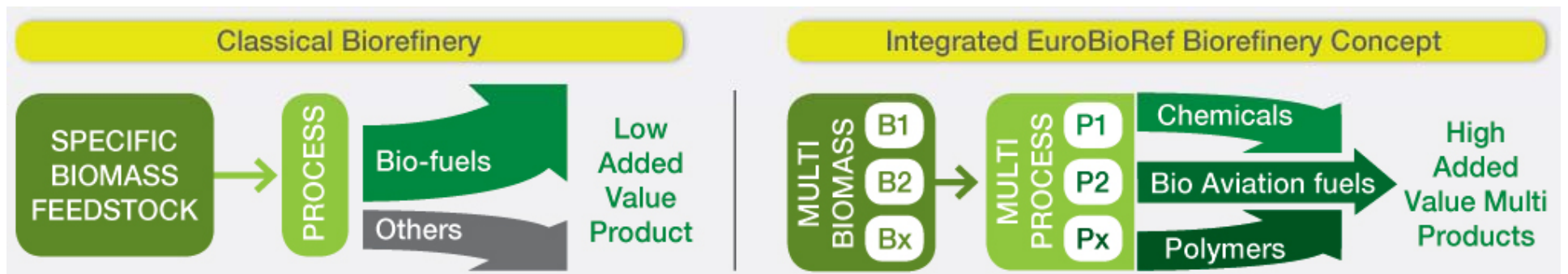
Collaboration with CAAFI, SWAFEA, DREAM

 The four fuels selected are FSJF, FT-SPK, a blend of FT-SPK and 50% naphthenic cut, and a blend of FT-SPK and 20% hexanol. This fuel matrix offers the possibility to evaluate the potential of **different chemical families**, which are paraffinic compounds, naphthenic compounds and, oxygenated compounds. This is representative of a **long term view**.





Some results of FP7 projects related to biofuels for aviation



EuroBioRef will bridge the gap between agriculture and chemical industry by integrating the whole biomass chain in a:

- ❖ **Multi-feedstock (non-edible),**
- ❖ **Multi-process (chemical, biochemical, thermochemical),**
- ❖ **Multi-products (aviation fuels and chemicals)**

commercially viable and adaptable approach for a sustainable bio-economy in Europe.





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Some results of FP7 projects related to biofuels for aviation

Objectives

- Produce a large diversity of sustainable biomass
- Produce high energy aviation fuels
- Produce multiple products
- Improve cost-efficiency by 30 %
- Reduce by 30 % the amount of needed energy
- Reduce time-to-market by 30 %
- Produce zero waste and rationalize the use of raw materials





Some results of FP7 projects on biofuels (not aviation typical)

Several demonstration plants:

Value chains:

- **Synthetic Fuels/hydrocarbons (Pitea, SE)**
- **Bioenergy carriers (pyrolysis at Azko Nobel),**
- **Renewable hydrocarbons (Abengoa);**
- **Ethanol & higher alcohols (Kalundborg);**
- **Microorganisms (site to be selected , Spain);**





Perspectives

- LCA** : progress still needed
(Benchmark of LCA for biofuel on algae soon organized)
- Sustainability criteria**: deserve an international approach
- Investments**: agreement between biofuels producers and airlines possible: MoUs ?
- Reliability** in the production/delivery tracks assessment must be provided
- Which should be the **priorities for funding**: research, demonstration, industrial initiatives?
- Other ways** complementary to bio-mass path
- International cooperation**



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**Thank you for your attention
and success to the Workshop !**

