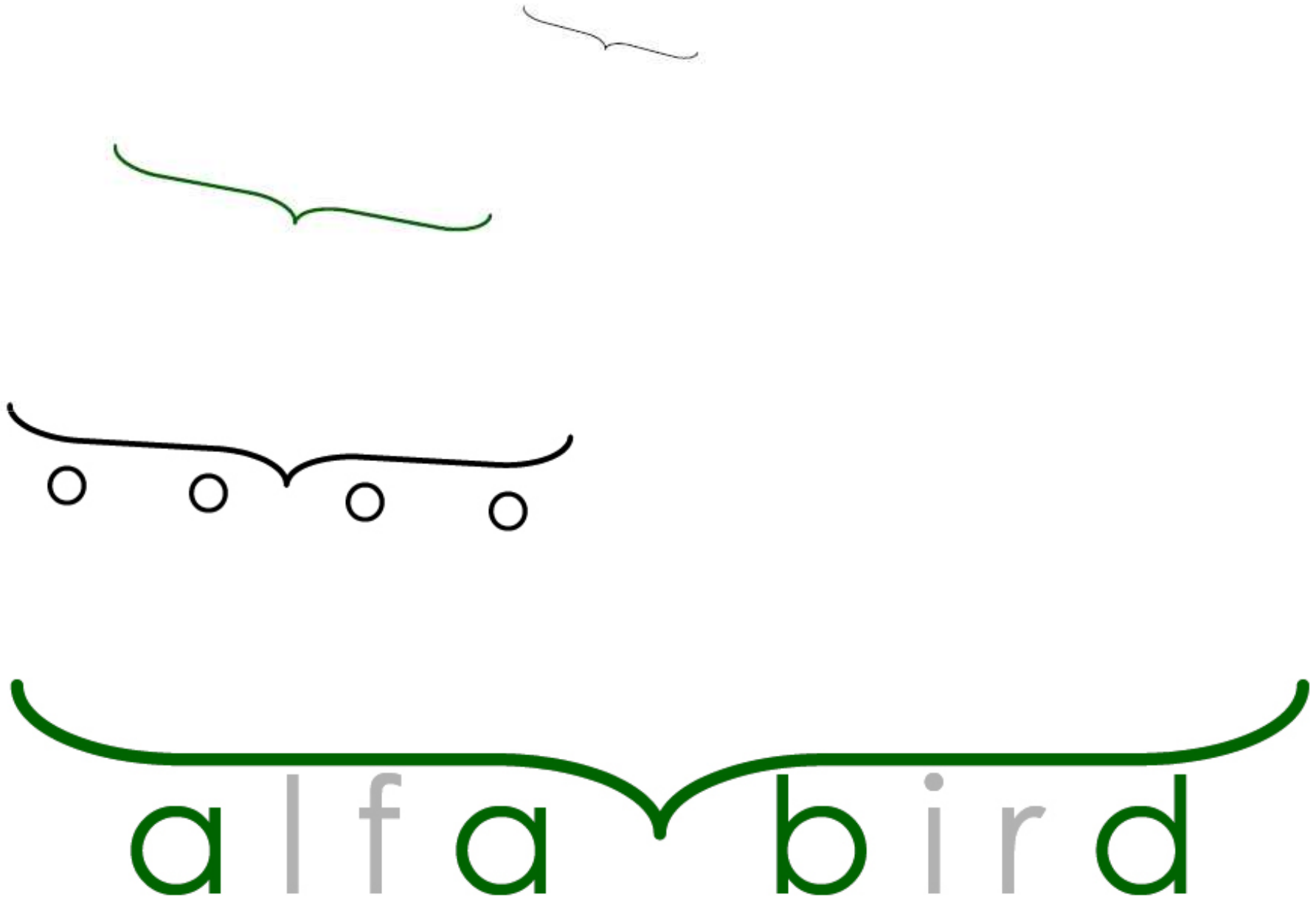
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SWAFEA 1st European Stakeholder Meeting,
23rd – 24th April 2009, Brussels

ALFA-BIRD OVERVIEW

Elements of context
Description of the project

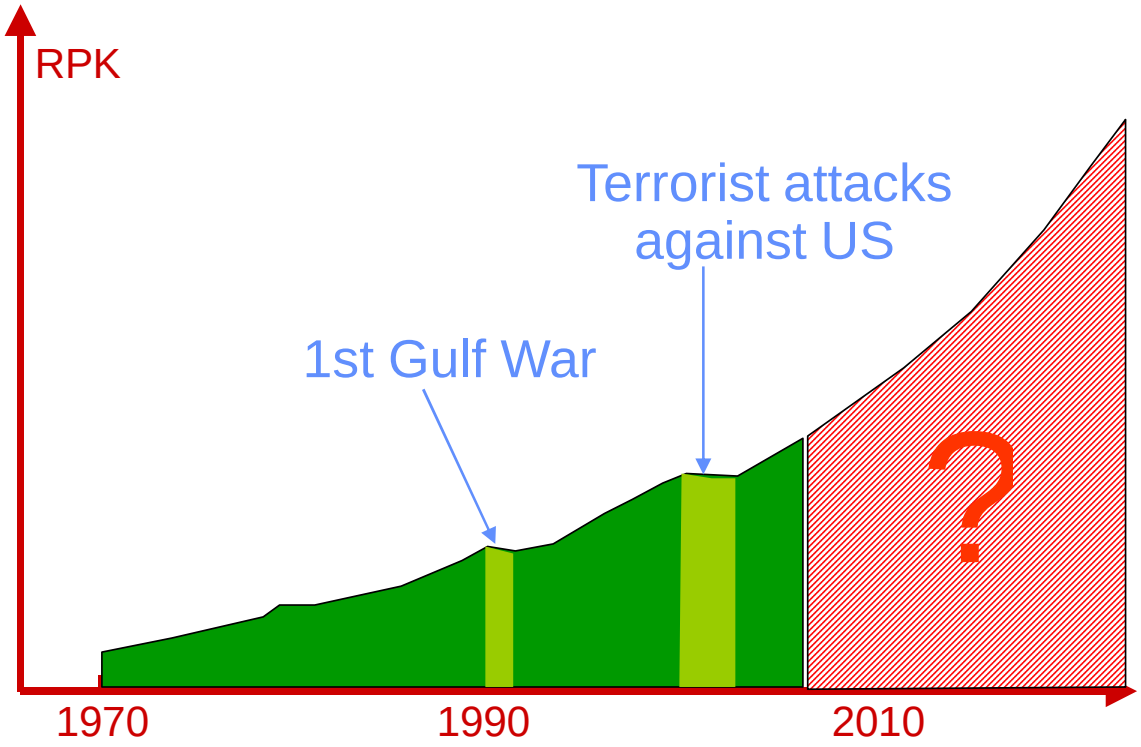
prepared by O. Salvi (EU-VRi) & P. Costes (Airbus F)

ALFA-BIRD

Elements of Context

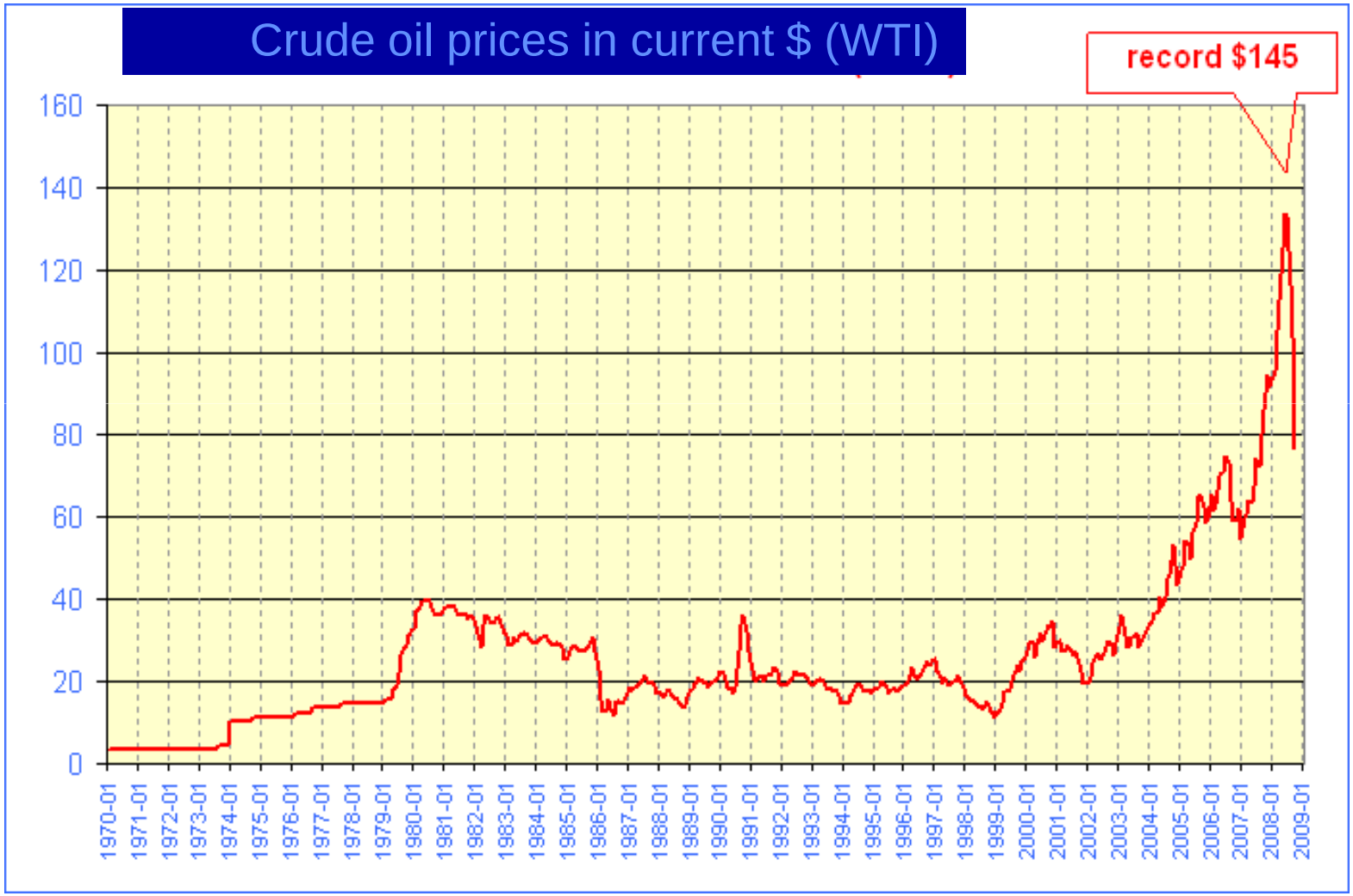
prepared by P. Costes (Airbus F)

Air Traffic growth



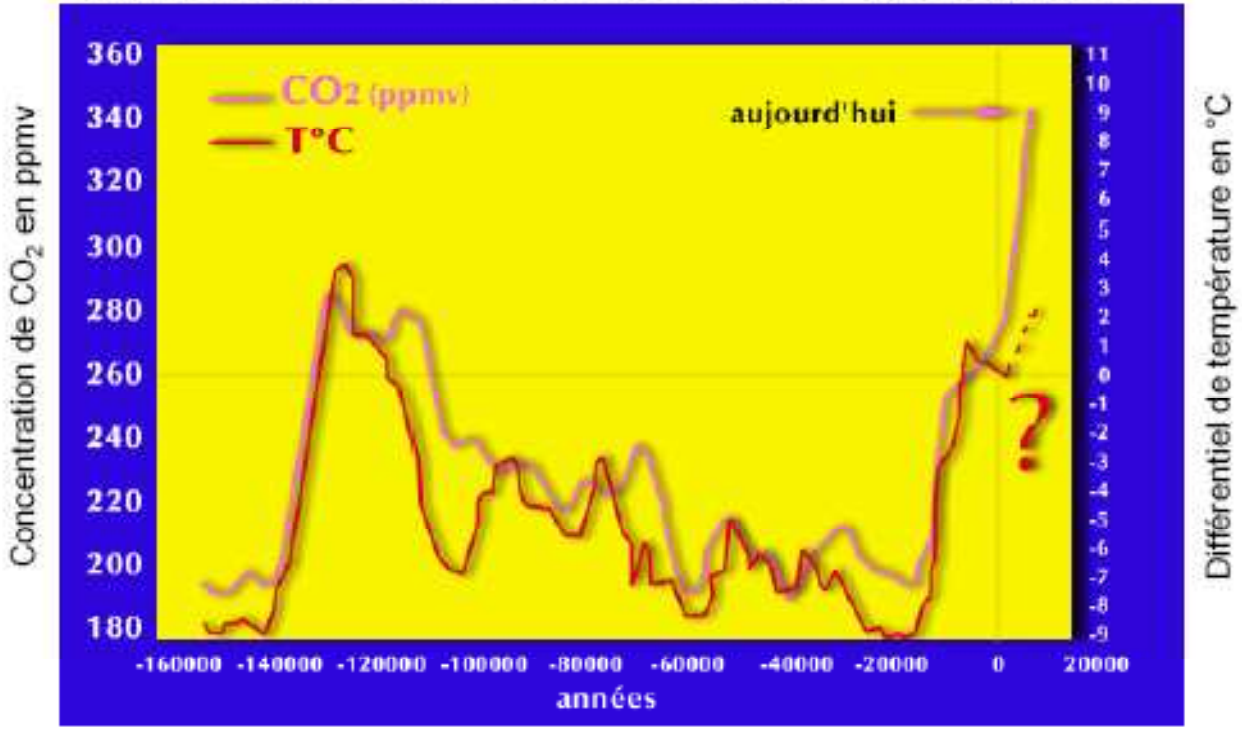
What will be the future with oil/economic crisis ?

Fuel oil prices



CO_2 : a greenhouse gas

TIME HISTORY OF CO_2 CONCENTRATIONS AND GLOBAL TEMPERATURE IN GEOLOGICAL ERA



Source : C. Lorius, LGGG-CNRS

Source: "Grenelle de l'environnement", 2008

Civil air transport market features

- **Air transport operators**
  - A context of intense competition, driven by low-cost carriers
  - Which implies low beneficial margins (below 2% per year)
  - Only perspective : market development to reduce costs
  - But fuel contribution to DOC is dramatically increasing with fuel price:
    - *short range mission : from 30% (2006) to 45% (01/2008)*
    - *long range mission : from 40% (2006) to 55% (01/2008)*
    - *low cost carriers : up to 70 %*
  - And present economy crisis is a threat to development

- **Aircraft/engine manufacturers**
  - Again, intense competition, where the burden of dollar trades is favourable to US against Europe
  - New programs imply very high investment levels, that need to be recovered
  - Aircraft deliveries are much dependent on air transport operators fair economic health

The specificities of aircraft fuels

- **Very wide temperature envelope**
  - Fuel has to prove operational use (remain liquid) at
    - *High altitudes (10 000 m), with T lower than –50°C*
  - Thermal stability (chemical formulation) must be proven at
    - *Low latitudes (eg equatorial zone), where T can get higher than 70°C inside the fuel tanks*

- **Global market**
  - Commercial aircraft fly all around the world (contrarily to automotive traffic which is much more local)
  - Implies compatibility of the fuels provisioned anywhere

- **Range constrained by fuel tanks volume and fuel energy content**

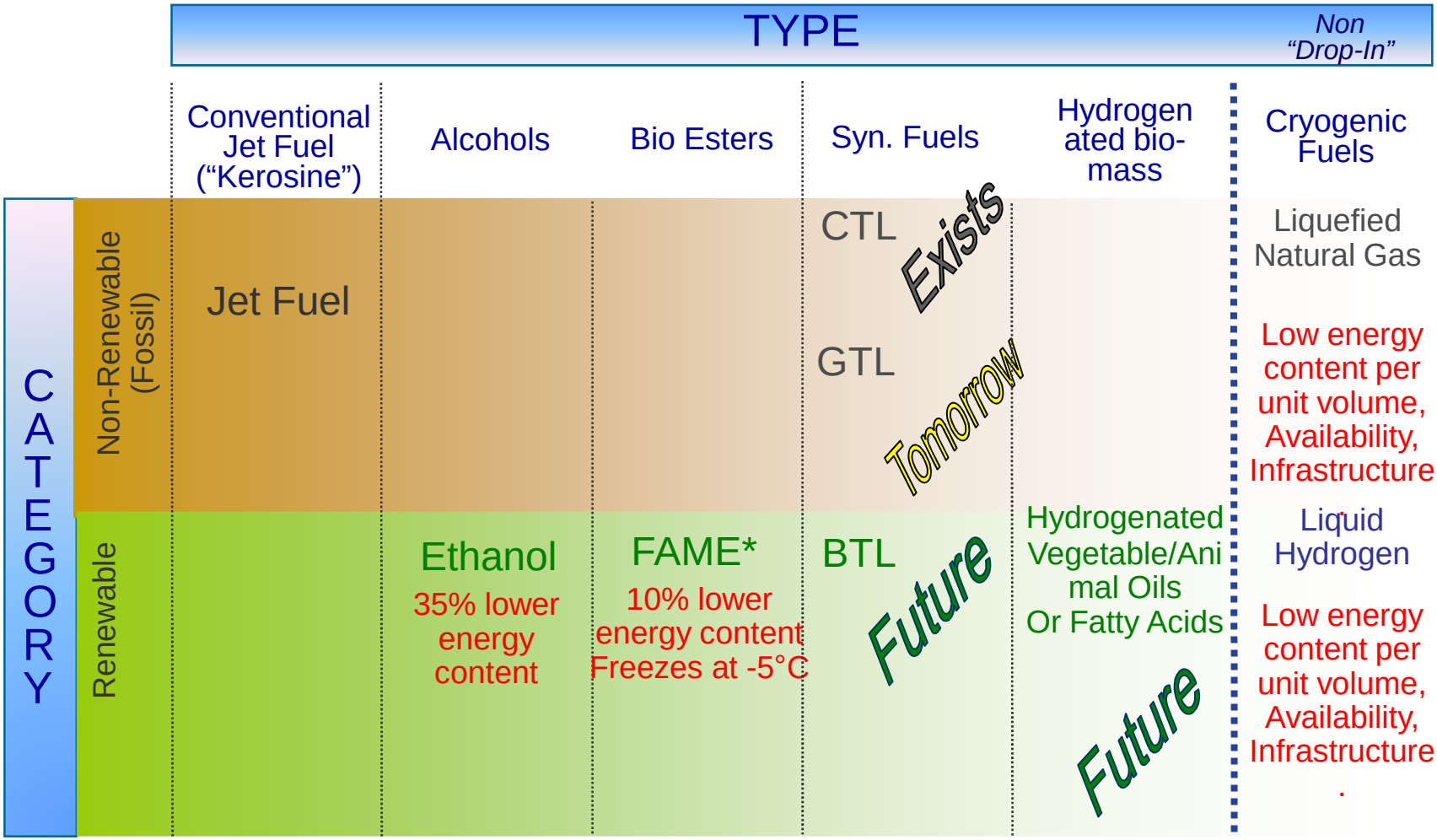
- **Performance and emissions linked to weight (and fuel density)**

- **Low fleet renewal rate (~30 years) implies "drop-in" solutions (ie full compatibility of any fuel with existing aircraft/engines)**

- **Safety is a major concern : fuel vapour ignition must not be observed at low T**

→ Fuel specifications under strict control

Commercial Aviation Alternative Fuels Options



** FAME =Fatty Acid Methyl Esters CTL, GTL & BTL = Coal, Gas or Biomass to Liquids*

ALFA-BIRD

Description of the project

prepared by O. Salvi (EU-VRi)

Basic ideas and main objectives

ALFA-BIRD aims at developing the use of alternative fuels in aeronautics.

In a context where the price of oil is increasing and with impact of fossil fuels on climate change, the sustainable growth of the civil aviation is conditioned by the respect of the environment.

In this context, using biofuels and alternative fuels in aeronautics is a great challenge, since the operational constraints (e.g. flight in very cold conditions) are very strict, and due to the long lifetime of current civil aircraft (almost 50 years).

Basic ideas and main objectives

The main objective of ALFA-BIRD is to develop the use of alternative fuels in aeronautics with a long-term perspective, and therefore to help

- improving each country's energy independence,
- lessening global-warming effects,
- and softening the economic uncertainty of crude oil peaking.

ALFA-BIRD will investigate new approaches and new alternative fuels to power aircrafts with the possibility to revisit the fuel specifications and reconsider the whole aircraft system composed by the triplet: fuel, engine and ambience.

Basic ideas and main objectives

In operational terms, ALFA-BIRD addresses the following objectives :

- To identify and evaluate possible alternative fuels to petroleum kerosene, considering the whole aircraft system;
- To assess the adequacy of a selection of up to 5 alternative fuels with aircraft requirements, based on series of tests and experiments ;
- To evaluate the environmental and economical performance of selected alternative fuels ;
- To set the path towards industrial use of the “best” alternative fuels.

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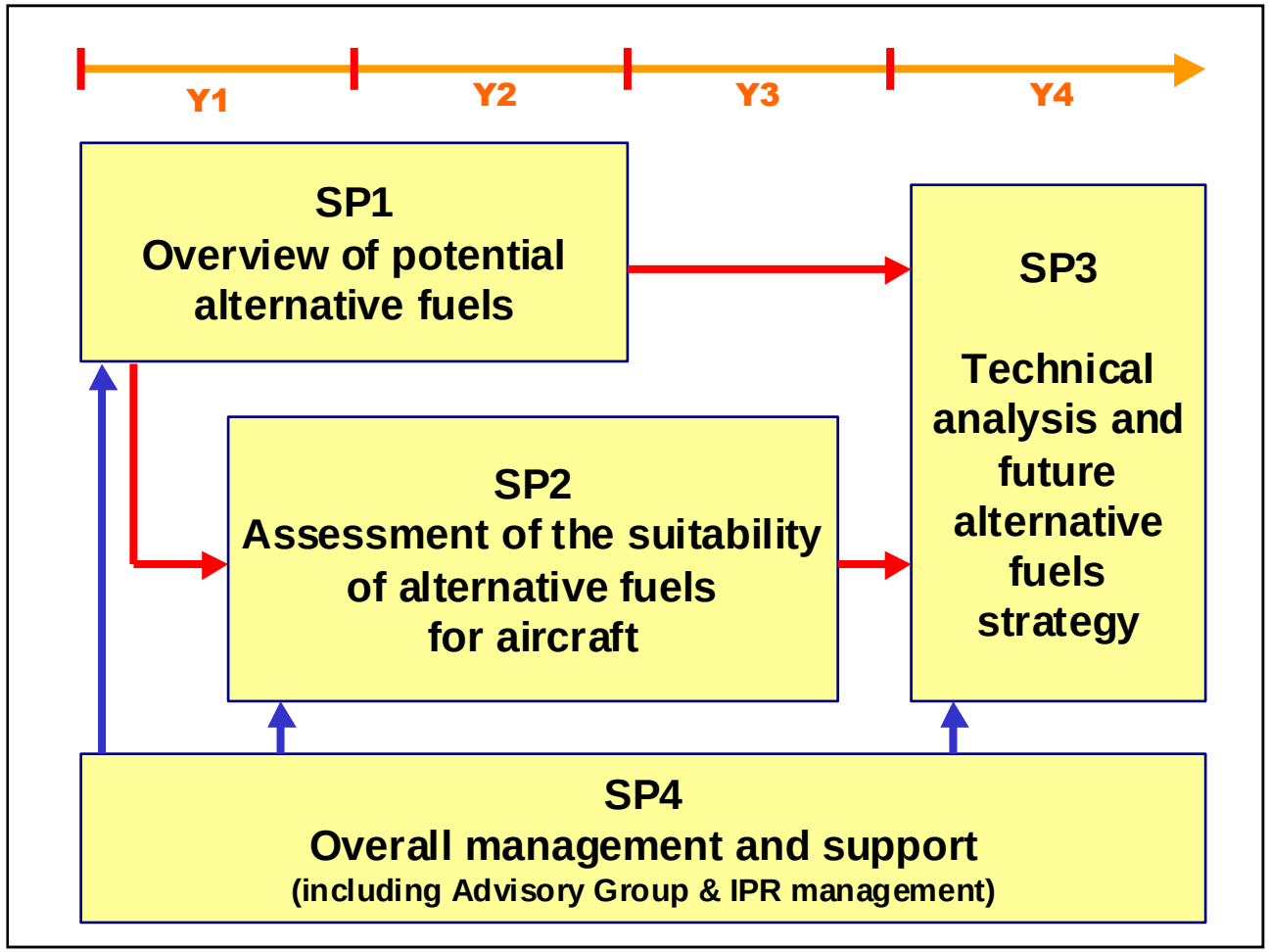
Partner involved

1 European Virtual Institute for Integrated Risk Management, DE
2 Airbus France, FR
3 Airbus Central Entity, FR
4 Airbus UK, UK
5 Avio S.p.A, IT
6 Centre National de la Recherche Scientifique, FR
7 Technologica Group, BE
8 Dassault Aviation, FR
9 Deutsches Zentrum für Luft- und Raumfahrt e.V., DE
10 Institut National de l'Environnement Industriel et des Risques, FR
11 Institut National des Sciences Appliquées of Toulouse, FR
12 IFP-Institut Français du Pétrole, FR
13 Lesaffre Group, FR
14 MTU Aero Engines GmbH, DE
15 Office National d'Études et de Recherches Aérospatiales, FR
16 ROLLS-ROYCE, UK
17 SASOL Technology (Pty) Ltd., ZA
18 SHELL Aviation, UK
19 SNECMA, FR
20 University of Sheffield, UK
21 Universität Karlsruhe, DE
22 Graz University of Technology, AU
23 University of Toronto, CA

Project overview



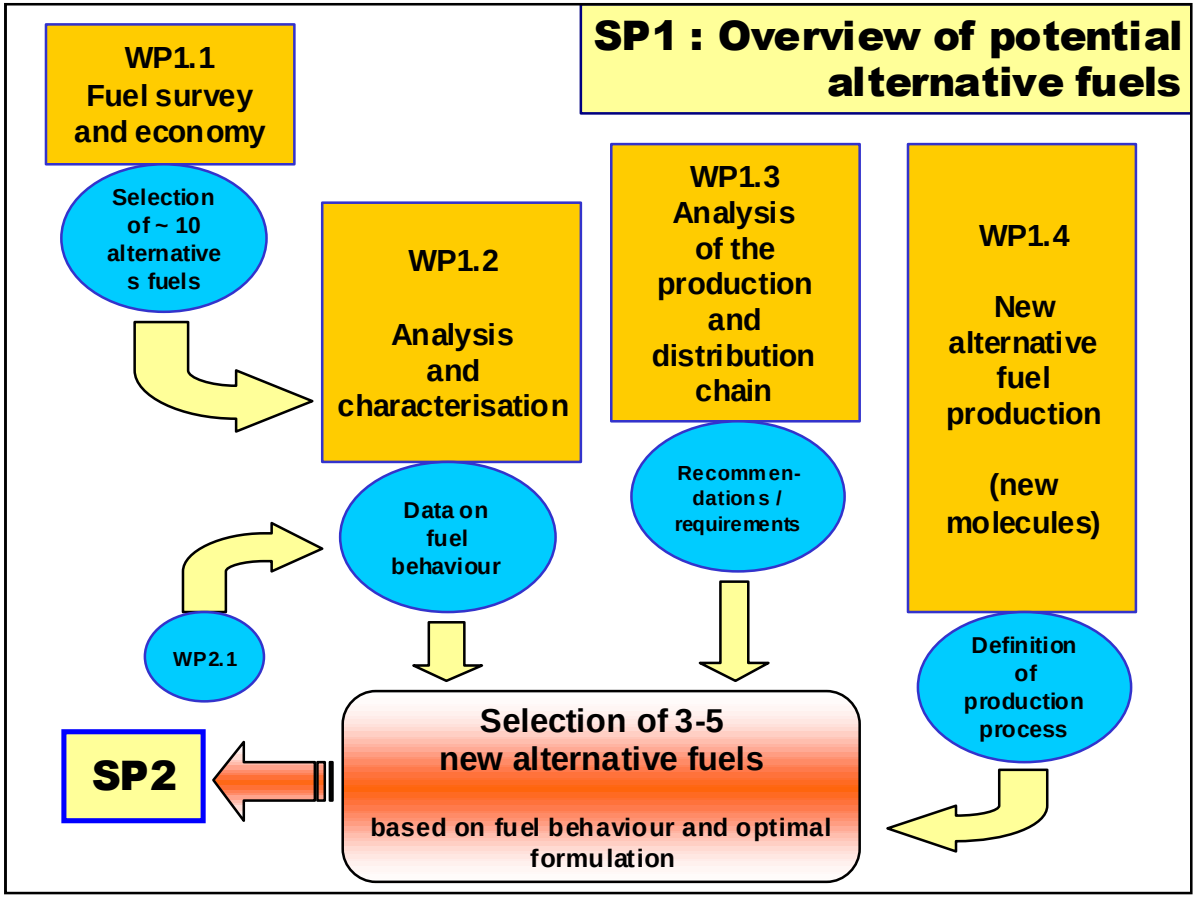
14 WP

44 tasks

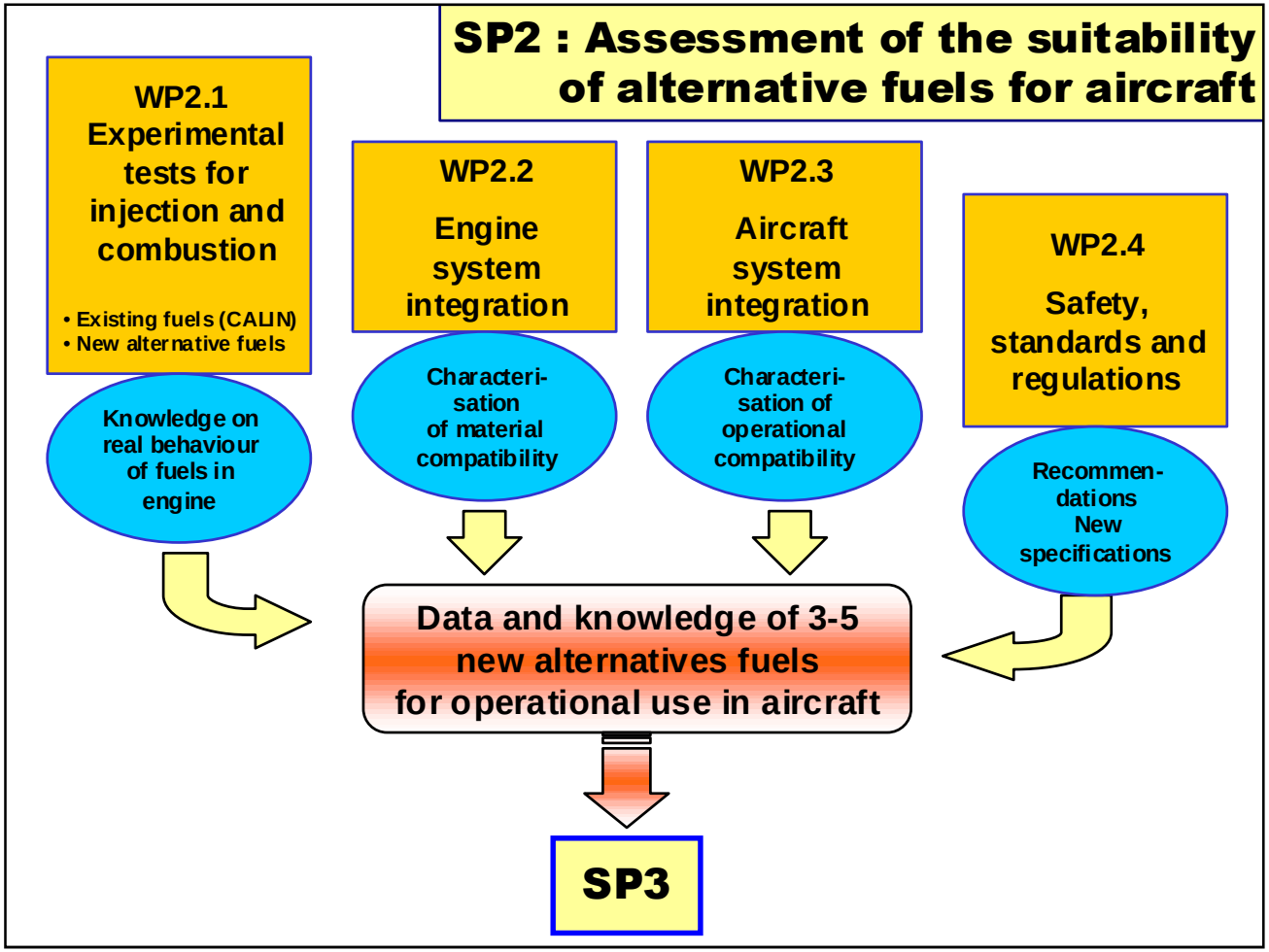
52 deliverables

9 Milestones

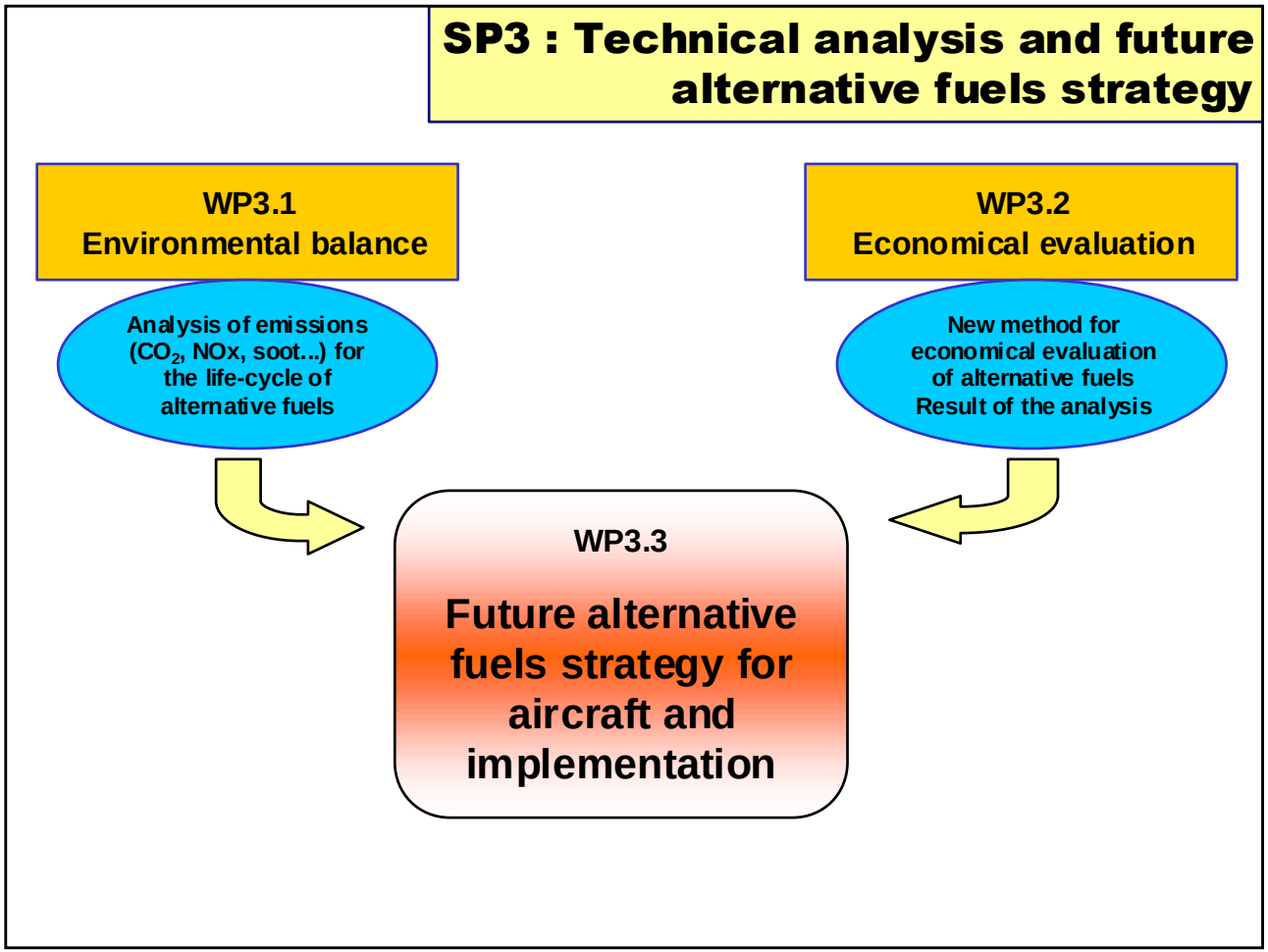
SP1


SP1 : Overview of potential alternative fuels
WP1.1 Fuel survey and economy
Selection of ~ 10 alternative s fuels
WP1.2 Analysis and characterisation
WP1.3 Analysis of the production and distribution chain
WP1.4 New alternative fuel production (new molecules)
Data on fuel behaviour
Recommen-dations / requirements
WP2.1
Definition of production process
SP2
Selection of 3-5 new alternative fuels
based on fuel behaviour and optimal formulation

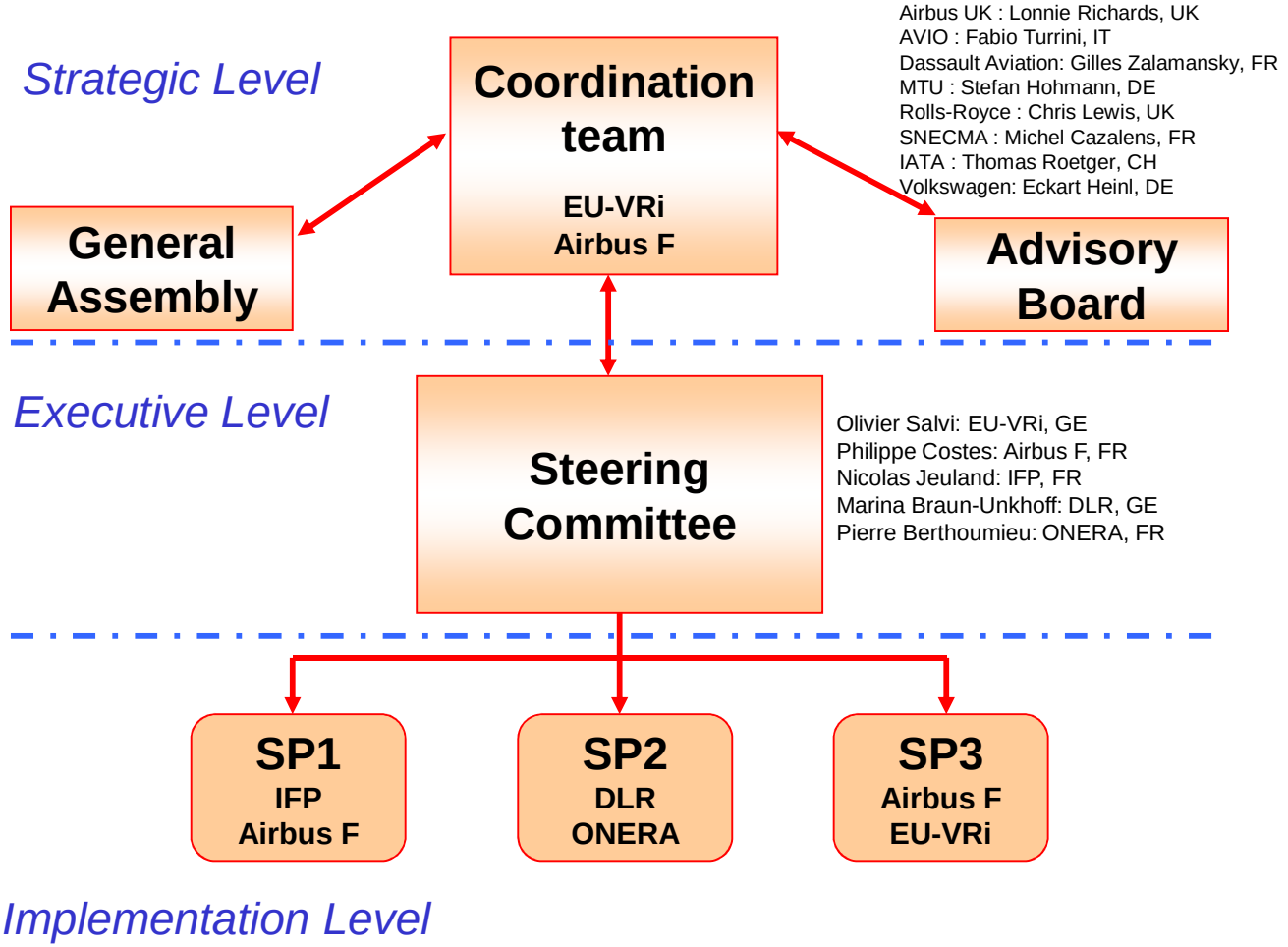
SP2


SP2 : Assessment of the suitability of alternative fuels for aircraft
WP2.1 Experimental tests for injection and combustion
• Existing fuels (CALIN)
• New alternative fuels
WP2.2 Engine system integration
WP2.3 Aircraft system integration
WP2.4 Safety, standards and regulations
Knowledge on real behaviour of fuels in engine
Characteri-sation of material compatibility
Characteri-sation of operational compatibility
Recommen-dations New specifications
Data and knowledge of 3-5 new alternatives fuels for operational use in aircraft
SP3

SP3


SP3 : Technical analysis and future alternative fuels strategy
WP3.1
Environmental balance
Analysis of emissions (CO_2, NOx, soot...) for the life-cycle of alternative fuels
WP3.2
Economical evaluation
New method for economical evaluation of alternative fuels
Result of the analysis
WP3.3
Future alternative fuels strategy for aircraft and implementation

Organization



Features

Total Budget: **9 750 000 €**
EC Grant: **6 820 000 €**

Start: **1st July 2008**
End: **30 June 2012**

Coordinator:
European Institute for Integrated Risk Management (EU-VRi)

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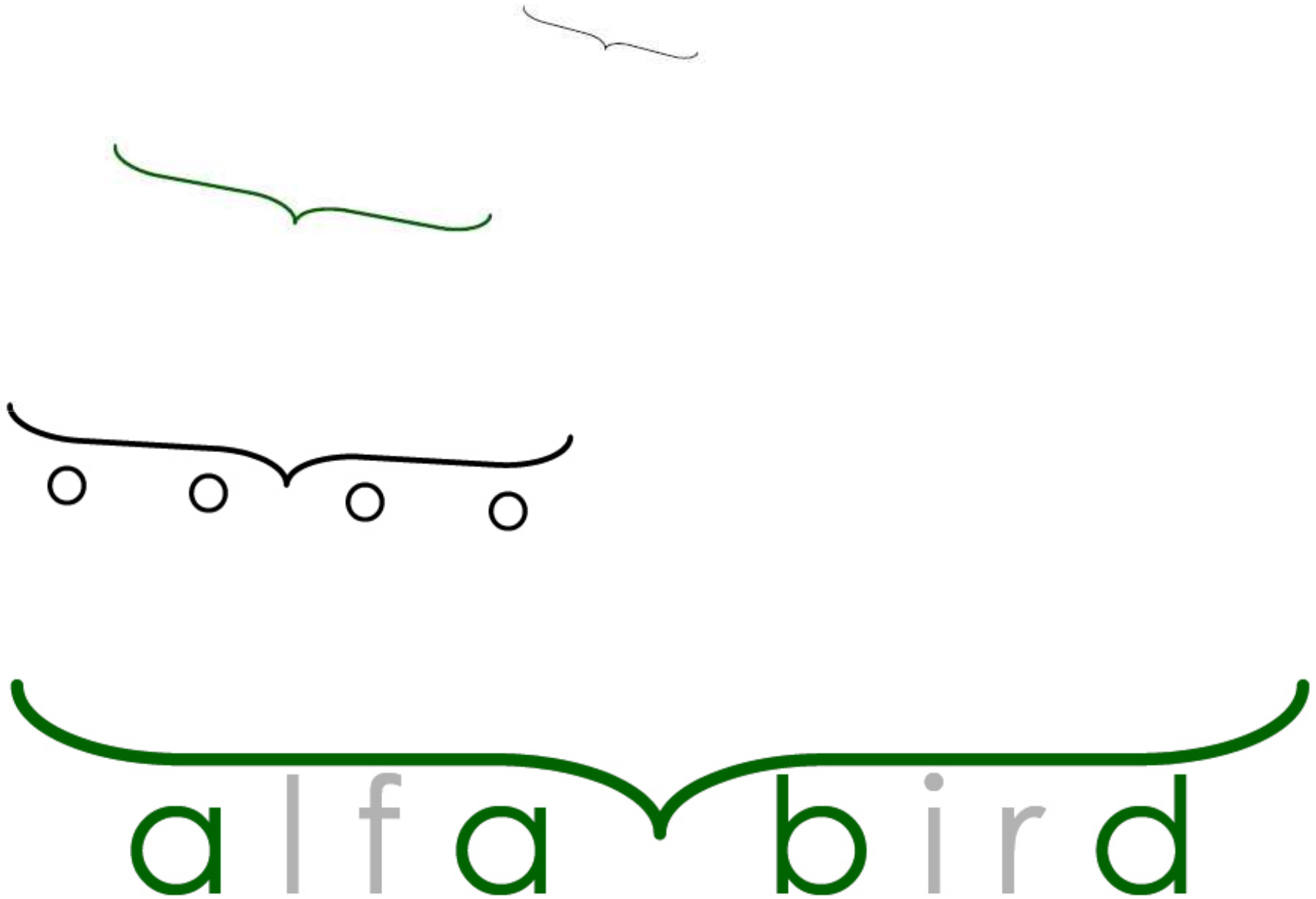
Email: alfabird@eu-vri.eu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