AERONET II – Final Meeting in Garmisch-Partenkirchen

Date: 13rd of January, 2004

Presentation of the project CONSAVE 2050

a) Main objectives and concept
b) Results of Year 1: Four quantified Background Scenarios
c) Review in Athens (April 2004)

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CONSAVE 2050 - Homepage: www.dlr.de/vl/consave

General Aspects

Introduction for the work during the first project year and the related discussions will be given by remembering us again what are the principle features of CONSAVE 2050:

- **Key features and concept**
- **Work packages and Project planning**
- **Contacts to the intended customers of the project results, the aviation community**

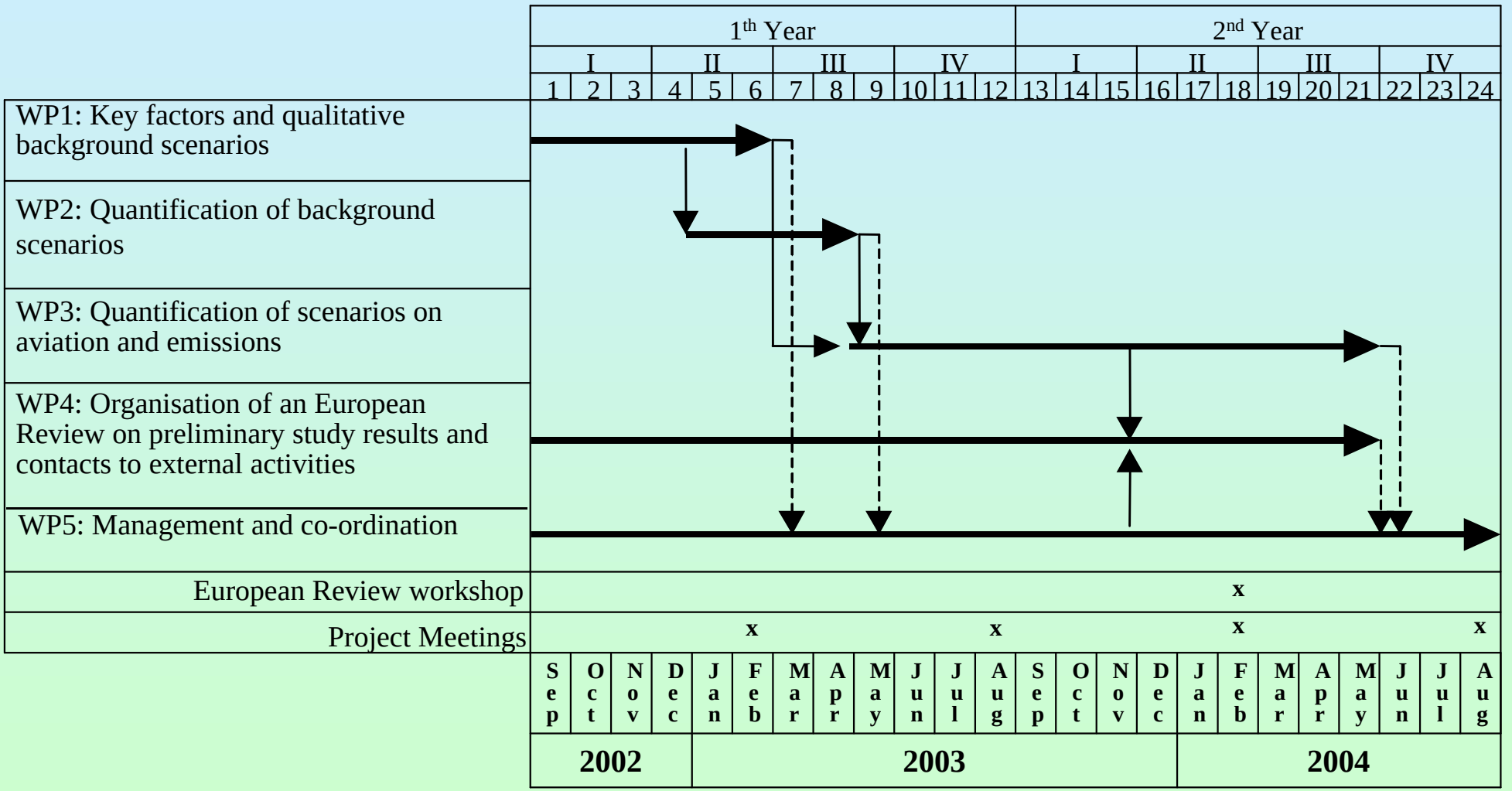
Key features of the project

- **Goal is to design a representative set of robust quantitative scenarios of aviation and emissions with focus on the time horizon year 2050, an intermediate view to years 2020/2025 (esp. relevant for aviation industry planning), and an outlook to year 2100 (esp. relevant for climate models).**
- **The project foresees explicitly and as its most important and innovative topic, the development of constrained scenarios. Most recent information from IPCC/SRES/2000 on assumptions for the development of population growths, economy, and other areas frame-setting for the development in aviation will be used (whereas the IPCC/1999 aviation scenarios were based on now outdated IPCC/1992 background scenarios).**
- **The project addresses - from a European perspective - RTD policy issues (sustainable aviation) and competitiveness and sustainable growth issues in the aviation industry.**

Main objectives (Excerpt)

- **To develop a set of quantitative scenarios which can be used to support the atmospheric science community, the aviation industry, and the policy and regulatory community: These sectors have a need to determine the possible growth of aviation and its emissions to deliver environmental response information, technology response strategies or policy or economic measures,**
- **to achieve a common European understanding on critical issues of aviation scenarios and related emissions by establishing a broad review process,**
- **to (i) strengthen the European aeronautic industry by delivering sound information which can be used to develop *in time* strategic orientation of short-, medium-, and long-term planning and (ii) to ensure sustainable growth of air transportation with regard to environmental issues,**
- **to generate - by the outlook to year 2100 - relevant data for climatology, supporting the improvements of models for the calculation and assessment of global and regional impacts of emissions from aviation and other sources.**

Project Planning



Main steps of the CONSAVE 2050 project in the first year

1. Check of the “background” scenarios developed during two AERONET workshops, especially with respect of the completeness of the list of key descriptors which should be quantified in the study with respect to internal consistency – using information from the results of the IPCC/SRES work;
2. Design of additional qualitative “background” scenarios underpinning constrained aviation scenarios using the outcomes of the IIASA Scenario Workshop in January 2003;
3. Check of the new “background” scenarios with respect to the representativeness and adequate consideration of possible developments and constraints in aviation;
4. “Translation” of the background scenarios to assumptions about aviation developments (i.e. technological development) as input for the AERO-Model;
5. First results of the AERO-model

Process overview about the CONSAVE 2050 project

Developing the basic Scenarios	Review phase for Quantification	Quantification of the Scenarios	Review of the Scenarios
European Network AERONET developed four qualitative scenarios on two workshops	Project start ↓ 1. European Review about outputs and constraints to be quantified in the scenarios	Scenario Modification comparable to IPCC-SRES ↓ Mid-Term Meeting 9/03 in Toulouse ↓ **Start of AERO model Quantification**	European Review on the study results ↓ Final Report ↓ Communicating the study results

2000/2001 → **2002** → **2003** → **2004**

Achievements of the first year

- **Key factors have been selected and a set of qualitative Background Scenario storylines has been designed.** (WP1)
  - *By the inclusion of very extreme scenarios, the path of real developments should be inside the range of the selected set of scenarios.*
  - *Very positive statements to the storylines came from members of the Advisory Committee and from ACARE. The set of the CONSAVE Background Scenarios can be seen as an excellent base for the further work.*

- **Quantification of the Background Scenarios based on the reviewed IPCC – SRES exercise has been developed.** (WP1)
  Those numbers of the quantification which are air transport related have to be regarded as a yardstick for the subsequent detailed quantification with the AERO-model. They will be made consistent to the AERO-models results in an iterative process.

- **Extension of the scenario storylines and their quantification for a more detailed coverage of air transport related features, especially those needed as input for the AERO-model has been started.** (WP2)
  Intensive further work is needed, starting with relatively simple assumptions and going step by step to well checked more sophisticated model inputs.

- **A first shot with the AERO-model has been performed.** (WP3)

Outlook

The main next steps are:

• Further work to complete and verify the extension of the Background Scenario Storylines and its quantifications to a broad coverage of air transport related aspects, needed as input for the AERO model

• Use of the AERO model to calculate quantitative projections of key descriptors of aviation scenarios and its emissions

• Analysis of the effects of relevant external factors – not be taken into account by the AERO model – on key features of scenarios on aviation and its emissions

• Performing the planned European Review Process on the preliminary results of the AERO model calculations (including the performance a Review Workshop to define feasible modifications back-to-back with the AERONET III kick-off meeting in April 2004 - Athens).

• Further cultivation of the contacts to related external activities

• Continuing the documentation and dissemination of project results

Overview of external inputs

Starting with scenario activities within AERONET and additional expert inputs:
- Questionnaire (with AERONET and other experts)
- Workshop (at IIASA in Vienna)
- Advisory Committee (leaded by DLH)

and based upon some of the IPCC SRES emission scenarios (with IIASA as leading author) with consideration of other relevant scenario activities like:
- Shell Energy Scenarios
- Airbus Hydrogen Scenarios
- ASTERA / ACARE
- Global Scenario Group
- Millennium Project Scenarios

the project identified main drivers and assumptions for the background development as well as for the aviation system, focussing on the questions that matter for informing decisions today under special consideration of possible constraints, relevant for the future aviation system.

Contact to Aviation Community

- **AC - Advisory Committee (Covers representatives from all main aviation sectors) :**
  Permanent advise
- **AERONET experts (+ selected others)**
  Questionnaire and European review (Athens, April 2004)
- **Related European external Projects**
  (i.e. ASTERA/ACARE; TRADEOFF; AERO2K; European contribution to CAEP)
  Contacts to exchange information and results
- **Total interested European aviation community**
  European Review of preliminary results (Athens, April 2004)

Contacts so far

- **Two meetings of the co-ordinators of ACARE/ASTERA and CONSAVE**
- **Participation of the ASTERA co-ordinator in the CONSAVE 2050 Scenario Workshop at IIASA in Laxenburg, Austria**
- **Participation of the CONSAVE co-ordinator in the ASTERA questionnaire**

Topics discussed

- **Exchange of information of the respective characteristic features of the projects**
- **As far as useful, mutual participation in activities of the respective other project**
- **Information on the newest results of the projects and as far as relevant comparison of the findings and mutual use of outcomes**
- **Efforts to ensure that the activities and results of the two projects are not in contradiction: the potential customers are very much the same**

ACARE and ASTERA activities

- **ACARE (Advisory Council for Aeronautics Research in Europe) has about 40 members: high ranked experts from of different aviation sectors. Main emphasis of the group is on the development of a Strategic Research Agenda (SRA)**

- **ASTERA is a ACARE project, funded by the EC. Main goal is the development of scenarios for 2020, to be used by ACARE**

Comparison of Scenarios for 2020

- **ACARE/ASTERA elaborated a base-case scenario for 2020 (de facto developed as a forecast of ACARE/ASTERA) and three alternative scenarios.**

  CONSAVE 2050 developed so far four background scenarios of three scenario families.

- **Three of the CONSAVE 2050 scenarios are similar to the three alternative ASTERA scenarios:**

  Unlimited Sky – Business Model Scenario

  Regulatory Push and Pull – Constraint Growth Scenario

  Fractured World – Block building Scenario

  The CONSAVE scenario Down to Earth has no counterpart.

Members of the Advisory Committee

Chairman:

- Karlheinz Haag / DLH

Manufacturers

- Nick Peacock / Rolls-Royce
- Rainer von Wrede / Airbus

Airlines

- Alvaro Middelmann Blome
- A. Hardeman, IATA

Science

- Neil Harris / Univ. Cambridge
- Peter Wiesen / BUGH

Air traffic control, Airports

- Ted Elliff / Eurocontrol
- Arthur Lieuwen / Eurocontrol

Politics

- Gerard Bekebrede

NL-Ministry of Transport, Public Works and Water Management

- Morten Winther

DK- Ministry of Environment and Energy

- Roger Gardner

UK-Ministry of Transport

- Horst Busacker / Ulrich Stoecker

D-Ministry of Transport

External inputs – Advisory Committee

DLR and DLH provides the AC with relevant Information about key parameters of the AERO-Model plus a list of possible constraints

- AC-Meeting 1: discussion about further activities plus comments about the lists of key parameters and possible constraints — DONE

- DLR and DLH provides the AC after the IIASA-Workshop (01/2003) with a set of scenarios including the chosen constraints — DONE
- AC-Meeting 2: discussion about the scenarios and constraints plus comments including preferences and modifications

- **DLR and DLH provides the AC with scenario descriptions and results of the quantification** — Mid of 2004
- **AC-Meeting 3: discussion about the quantification results plus comment including preferences and modifications**

External inputs - Questionnaire

Choice of Constraints possibly affecting the long-term development in Aviation

⇒ **Possible influences, which might cause constraints or absolute limits** (I-IV: external, V-X = internal)

I. Demography (relevant for demand)

II. Macroeconomics (relevant for demand)

III. Energy/Resources (relevant for ability to fit demand and policy regulations and restrictions)

IV. Social Trends, Mobility Pattern (relevant for all possible constraints)

V. Transport (relevant for demand, ability to fit demand, costs and policy regulations and restrictions)

VI. Aviation Effects on Ecology (relevant for policy regulations and restrictions)

VII. Technology (relevant for demand and policy regulations and restrictions)

VIII. Policy / Standards, Regulations (relevant for demand, costs and ability to fit demand)

IX. Air Transport – Supply side (relevant for costs and ability to fit demand)

X. Air Transport – Demand (relevant for ability to fit demand)

External inputs – Questionnaire results

Concerning possible constraints experts expect a strong influence for the aviation system:

A) from external fields:

- Energy availability
- Economics / GDP worldwide
- Globalisation versus Regionalisation
- Legislation in general ("Laissez-faire" versus Regulation)
- Social Values / Individual preferences

B) from Air Transport related fields:

- Air Traffic Management / Air Traffic Control
- Energy Demand
- Aviation effects on climate
- Airport operations
- Policy Making
- Tourism

Scenario work - Key questions

What questions do the long-term scenarios seek to answer?

First, there is an overarching question about the environmental impacts (noise and emissions) of aviation, especially for climate change and local air quality. Which circumstances (demand, regulations to reduce climate impacts) and which technologies (conventional or hydrogen) will have which impact for the environment?

Other key questions (challenges, bottlenecks, constraints) explored in the scenarios and issues addressed in the project include:

- Will airport and airspace capacities be able to meet the rising demand?
- Which distribution of flights from/to different locations is to expect in the future?
- Which technologies could arise in which time to improve the aviation system?
- How will preferences and values of citizens and customers affect aviation demand (business/tourist, safety & security, convenience)?

Scenario work – Development

The CONSAVE long term scenarios explore how the global aviation system may change over the first half of this century. They consider alternative paths focussing different challenges like:

- infrastructure impacts,
- ecological pressure,
- fractured markets,
- low demand.

These paths are influenced by:

- population
- economic growth

Shaping factors

- energy availability, consumption, price
- technologies
- policy regulations
- citizen preferences
- customers values.

Drivers

Scenario work – Workshop results

1.1 Unlimited Skies: This scenario assumes a very high air transport demand highlighting the challenges ahead for the global aviation industry.

1.2 Regulatory Push & Pull: The (hypothetical) ”unconstrained” demand of this scenario is the same as in Unlimited Skies above. However, a number of constraints as well as regulatory actions addressing those are likely to dampen the effect on global transport volume.

2 Fractured World: This fragmented world scenario assumes an absolute decline in international flights and the second lowest GDP-air transport elasticity of all scenarios considered. The available scenario literature provides no equivalent example, making this scenario quantification highly interesting but also challenging.

3 Down to Earth: This scenario of significant lifestyle changes (high environmental consciousness) postulates an entire decoupling of air transport from GDP growth.

4.1 Dynamics as Usual: For this ”middle ground, unconstrained demand” scenario different developments are assumed for the different regions with incremental changes. Ecological concerns are high, but don’t lead to strong regulations.

4.2 Zero Risk Tolerance: Because of several safety and security problems people don’t accept any risks. Additional price increase impacts due to the constraints explored in this scenario should further dampen air transport demand.

Scenario work – starting with 6 scenarios

Scenarios, Constraints and Stakeholder options - Start

Scenarios	High Growth		Patchwork World	Down to Earth	Dynamics as Usual	
	Unlimited Skies	**Regulatory Pull** (after 2020)			**DaU**	**Zero Risk Tolerance**
Main character of constraints	Ability to fit demand	Regulation	High costs & lower demand	Lower demand	Unconstrained	Regulation
Main challenge	Ability to fit fast-growing demand	Ability to fit fast-growing demand with regard to regulation	Regional oriented demand and high energy prices	Aviation ecologically sustainable in regard to low demand	Sufficient flexibility for heterogeneous markets	Safe and secure air transport
Typical strategy	Expansion	Expansion and adaptation	Concentration and efficiency	Concentration and efficiency	Incrementalism	Concentration and adaptation

Scenario work – Reducing number of scenarios 1

Scenarios, Constraints and Stakeholder options – Titel change

Scenarios	High Growth		Fractured World	Down to Earth	Dynamics as Usual	
	Unlimited Skies	Regulatory Push&Pull (after 2020)			DaU	Zero Risk Tolerance
Main character of constraints	Ability to fit demand	Regulation	High costs & lower demand	Lower demand	Unconstrained	Regulation
Main challenge	Ability to fit fast-growing demand	Ability to fit fast-growing demand with regard to regulation	Regional oriented demand and high energy prices	Aviation ecologically sustainable in regard to low demand	Sufficient flexibility for heterogeneous markets	Safe and secure air transport
Typical strategy	Expansion	Expansion and adaptation	Concentration and efficiency	Concentration and efficiency	Incrementalism	Concentration and adaptation

Scenario work – Reducing number of scenarios 2

Scenarios, Constraints and Stakeholder options – Safety/Security move

Scenarios	High Growth		Fractured World	Down to Earth	Dynamics as Usual	
	Unlimited Skies	Regulatory Push&Pull (after 2020)			DaU	Zero Risk Tolerance
Main character of constraints	Ability to fit demand	Regulation	High costs & lower demand	Lower demand	Unconstrained	Regulation
Main challenge	Ability to fit fast-growing demand	Ability to fit fast-growing demand with regard to regulation	Regional oriented demand and high energy prices	Aviation ecologically sustainable in regard to low demand	Sufficient flexibility for heterogeneous markets	Safe and secure air transport
Typical strategy	Expansion	Expansion and adaptation	Concentration and efficiency	Concentration and efficiency	Incrementalism	Concentration and adaptation

"Dynamics as Usual" are no extreme or constrained scenarios, Safety & Security are possible to quantify in the Fractured world => Reduction to four scenarios !

Scenario work – Reducing number of scenarios 3

Scenarios, Constraints and Stakeholder options – from 6 to 4 scenarios

Scenarios	High Growth		Fractured World	Down to Earth	~~Dynamics as Usual~~	
	Unlimited Skies	Regulatory Push&Pull (after 2020)			~~DaU~~	~~Zero Risk Tolerance~~
Main character of constraints	Ability to fit demand	Regulation	High costs & lower demand	Lower demand	Unconstrained	Regulation
Main challenge	Ability to fit fast-growing demand	Ability to fit fast-growing demand with regard to regulation	Regional oriented demand and high energy prices	Aviation ecologically sustainable in regard to low demand	Sufficient flexibility for heterogeneous markets	Safe and secure air transport
Typical strategy	Expansion	Expansion and adaptation	Concentration and efficiency	Concentration and efficiency	Incrementalism	Concentration and adaptation

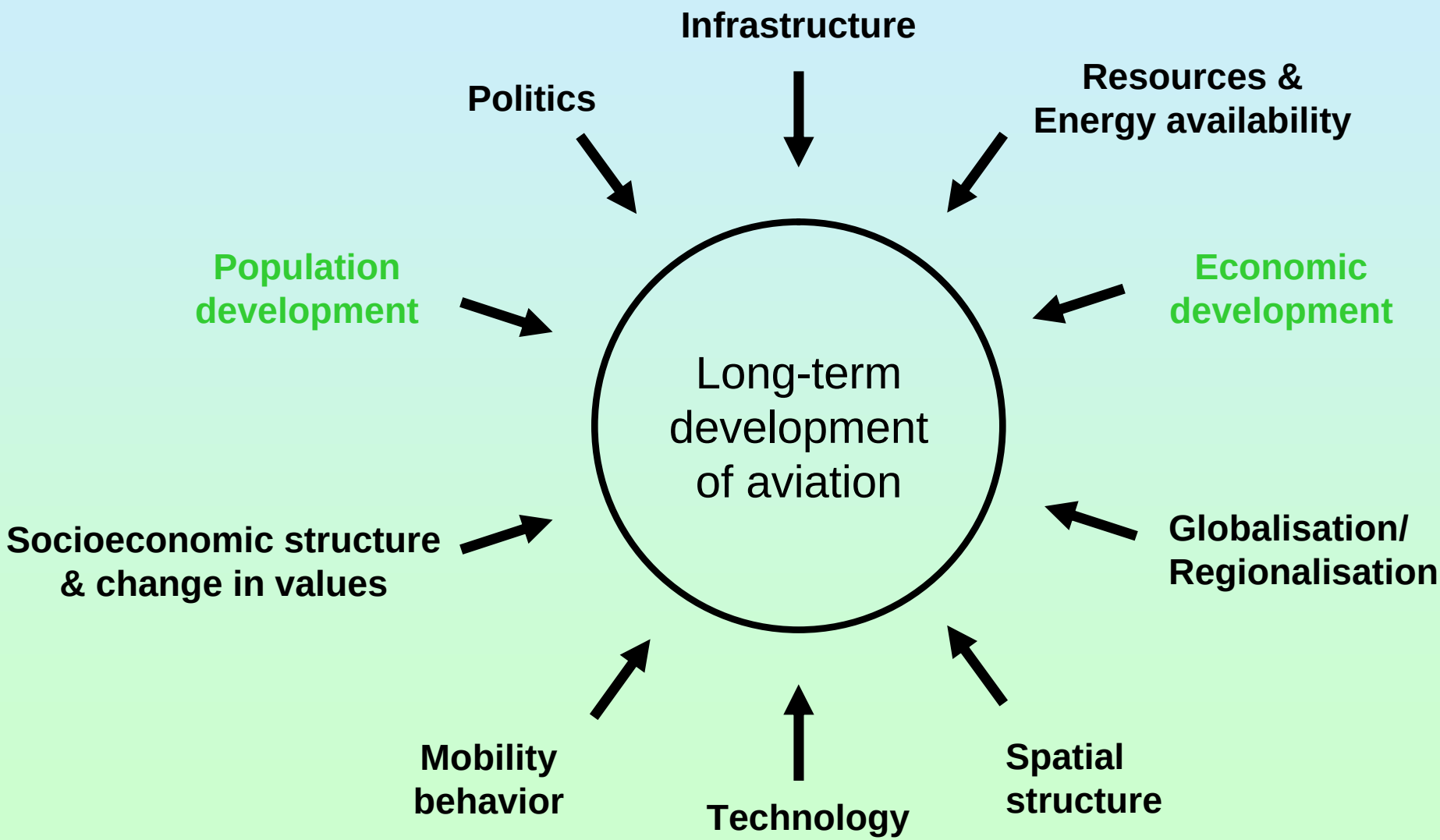
"Dynamics as Usual" are no extreme or constrained scenarios, Safety & Security are possible to quantify in the Fractured world => Reduction to four scenarios !

Scenario work – Reducing number of scenarios 4

Scenarios, Constraints and Stakeholder options – Final set of scenarios

Scenarios	High Growth		Fractured World	Down to Earth
	Unlimited Skies	Regulatory Push&Pull (after 2020)		
Main character of constraints	Ability to fit demand	Regulation	High costs & lower demand	Lower demand
Main challenge	Ability to fit fast-growing demand	Ability to fit fast-growing demand with regard to regulation	Regional oriented demand and high energy prices	Aviation ecologically sustainable in regard to low demand
Typical strategy	Expansion	Expansion and adaptation	Concentration and efficiency	Concentration and efficiency

Factors/Drivers of influence for the long-term development of aviation



Shaping factors - Demography, Economic growth and income per capita

Recent forecasts expect an increase of population up to 8 until 9 billion in 2050, while the World GDP in 2050 is expected to be between 80 and 180 trillion $, based upon an annual GDP growth rate between 2,5% and 2,9%. We took these numbers as basic assumptions for three of four scenarios. In one scenario (fractured world) we assume a lower annual GDP growth rate of 2,3% (leading to a lower income per capita) and further on an increase to over 11 billion in 2050.

All these numbers and assumptions are in accordance with the IPCC SRES scenarios.

2050 Scenario Assumptions	Unlimited Skies / Regulatory Push & Pull	Fractured World	Down to Earth
Population	8,7 Billion	11,3 Billion	8,7 Billion
World GDP	180 Trillion $	82 Trillion $	136 Trillion $
GDP growth	2.9 % per annum	2,3 % p. a.	2,5 % p. a.
Income per capita (10^3 1990 US$ per capita)	20,8	7,2	15,6
IPCC scenario	(SRES A1)	(SRES A2)	(SRES B1)

CONSAVE scenarios vs. IPCC/SRES scenarios

There is good congruence between the CONSAVE aviation storylines and those of IPCC-SRES in terms of demographic and economic development (GDP, Income per capita).

Population:
High growth (2 scenarios): SRES A1
Fractured World (1 scenario): SRES A2
Down to Earth (1 scenario): SRES B1 (identical to A1)

GDP:
High growth (2 scenarios): SRES A1
Fractured World (1 scenario): SRES A2
Down to Earth (1 scenario): SRES B1

Resource and Energy Availability
With exception of one scenario (Fractured World), there is also good agreement between the SRES scenarios and the proposed CONSAVE scenarios with respect to growth in energy demand, resource availability and (to a lesser extent on) resulting energy prices.

Resource availability (peak of world oil production):
High growth - ”Unlimited Skies”: SRES A1G (2080)
High growth - ”Regulatory Push & Pull”: SRES A1T (2050)
Fractured World: SRES A2 with modifications
Down to Earth: SRES B1 (2020)

Energy prices, especially oil.
The two High growth scenarios will rely on the scenarios of energy prices as reported in the SRES report. For the constrained scenarios (not treated in IPCC SRES), additional price mark-ups are necessary.

Drivers (Environment, Energy, Technology)

• **Environment**

While in the scenarios “Unlimited Skies” and “Fractured world” we are assuming no relevant changes, environment is a critical driver in the scenario “Regulatory Push & Pull”, leading to strong regulations in environmentally relevant activities.

• **Energy availability, price and consumption**

Energy scarcities are not expected until 2050 on the global level. However, in a “Fractured world” resources are distributed unequally and every region has to take care for their own future energy supply, leading to different “regional” technologies (Asia: syn. Fuels from coal; NA+SA: unconv. Oil; Africa: biomass, Mid-East oil + gas; Eurasia: electricity + hydrogen) and comparably to the other scenarios high energy costs. The energy consumption in 2050 is in line with the recent Shell scenarios - except the high value for the scenario “Unlimited Skies”, where also an optimistic assumption was chosen for the future availability of oil.

• **Technology development**

Technological innovations are expected in all scenarios, but while in the both “High Growth” scenarios “Unlimited Skies” and “Regulatory Push & Pull” the development is more traditional, the paths in the other scenarios are very different. In the “Fractured world” technologies are driven by regional resources. In “Down to Earth” we assume a rapid diffusion of post-fossil technologies, driven by a change of values and preferences in the light of a strongly required sustainable development.

Drivers (Environment, Energy, Technology)

	Unlimited Skies	Regulatory Push & Pull	Fractured World	Down to Earth
Environment	no catastrophic change	significant change; main problems 2052-2058	little change	some alarming, but no catastrophic change
Energy availability	available	available	depending to regions; scarcity after 2050 expected	available, scarcity after 2050 expected
Peak of world oil production (incl. artificial oil)	2080	2050	2020	2020
Energy use / EJ	1350	1100	970	810
Energy price (1990 = 1)	2	4	8	4
Technology development	dynamism of technological innovation is broad-based; communication and transportation growth		heterogeneous, partly incompatible, interchange problems	rapid diffusion of post-fossil technologies - no solution for noise reduction

Drivers (Policy, People)

• **Political development**

Policy as a consequence of circumstances is a different driver in all scenarios.
Representing a market philosophy in “Unlimited Skies”, policy is “soft” in this scenario: liberalisation if possible, compensation of negative impacts if necessary, combined with pragmatic choice of effective solutions.
In “Regulatory Push & Pull” environmental pressure leads to limits of fossil fuel consumption and noise plus support of non-fossil technologies.
In the “Fractured world” regions, blocks and nations are looking for themselves, decreasing chances for global policy approaches.
In “Down to Earth” citizens and customers with post-industrial lifestyle and values are playing a major role for policy, so that any pollution sources are tightly controlled.

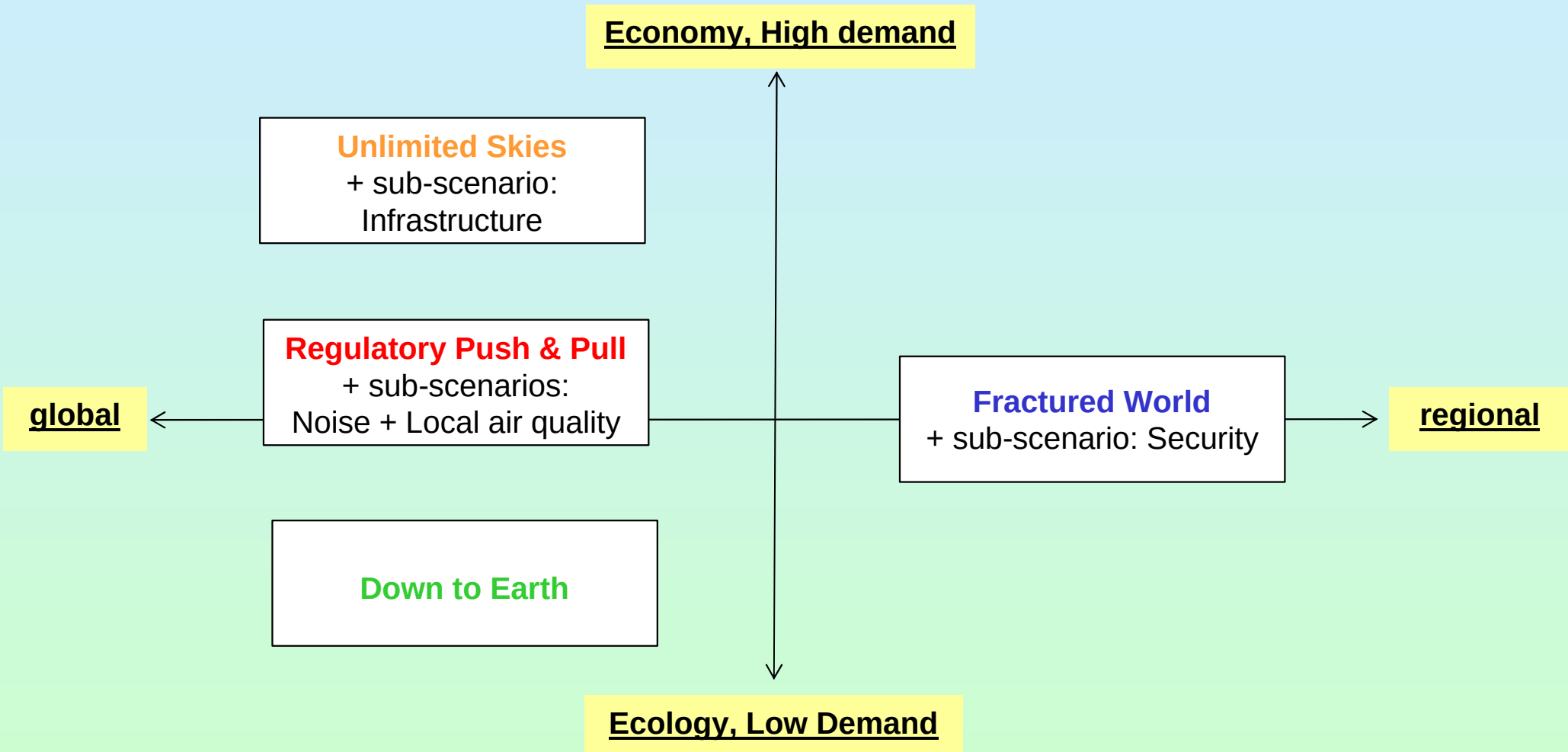
• **Changing citizen preferences and customers values**

Depending to the potentials, goals and threats people have different preferences and values in the four scenarios, leading to different challenges, travel patterns and demand for the aviation system.
While in “Unlimited Skies” their focus lies on fast and convenient intercontinental travel, in “Regulatory Push & Pull” mobility is more limited because of higher costs and environmental restrictions. In a “Fractured world” with confrontations between regions, terrorist activities increase as well as security concerns. In “Down to Earth” people prefer a slow and regional lifestyle, including a stigmatisation of "fast" and international patterns.

Drivers (Policy, People)

	Unlimited Skies	Regulatory Push & Pull	Fractured World	Down to Earth
Political development	market philosophy	emission regulations	regional differences	pollution sources tightly controlled
Citizen preferences	global orientation, pragmatic solutions	regulatory approach in environmental issues	autarky, regional orientation	environmental and safety concerns
Customers values	convenient and flexible service and mobility	cheap and environmentally okay	security concerns	stigmatisation of "fast" and long-range patterns

Scenario Structure Overview



Remark: Aspects like Infrastructure + Noise + Local air quality + Security will be quantified in sub-scenarios

Additional assumptions and interpretations from storylines

Unlimited Skies	Regulatory Push & Pull	Fractured World	Down to Earth

I.E.:

- **Costs for Airport usage in general**
- **Landing charges**
- **Costs for airspace usage**
- **Navigation and ATM costs**
- **Maintenance costs**
- **Passenger/Cargo costs on each flight stage**
- **Surface competition**
- **Speed of technological innovation**
- **Compensation of externalities (noise, airspace use and land buy around airports)**
- **Emission trading**
- **Carbon Tax (if for aviation, more NOX)**
- **Ban of domestic flights < 500 km**
- **Night bans**

Actual list with possible outputs generated by the AERO-Model (1/2)

1. **Fuel use and emission characteristics by Aircraft type and Technology level**
2. **Aircraft purchase prices because of price developments and possible measures**
3. **Air transport demand and traffic (passengers/ freight transported, flights by Aircraft type and Technology level, fares and freight rates) Forecast**
4. **Aircraft operating costs (by Aircraft type, Technology level and region pair)**
5. **Unit operating costs (per passengers and kg freight by Aircraft type, Technology level and Flight stage)**
6. **Unit composite costs**
7. **Aircraft flights (by Flight stage, Aircraft type and Technology level)**
8. **Extent and composition of Airline fleets (by Carrier Group/IATA region)**

Actual list with possible outputs generated by the AERO-Model (2/2)

9. **Airline related employment**
10. **Airline contribution to gross value added**
11. **Government income from charges** (if applicable)
12. **Changes in Consumer surplus and Consumer expenses** (by Carrier Group/IATA region)

13. **Fuel use and emissions (CO2, NOx, SO2, CxH, CO, H2O) in 3-dimensional space**
    (5° by 5° horizontal grid cells and 15 equidistant Altitude bands of 1 km
    plus 1° by 1° by horizontal grid)
14. **Concentrations of CO2, NOx and O3** (36x24 horizontal grid cells and 19 layers)
15. **Effective UV radiation**
16. **Change in global warming potential**

Process – important future project steps

Developing the basic Scenarios	Review phase for Quantification	Quantification of the Scenarios	Review of the Scenarios
European Network AERONET developed four qualitative scenarios on two workshops	Project start ↓ 1. European Review about outputs and constraints to be quantified in the scenarios	Scenario Modification comparable to IPCC-SRES ↓ Mid-Term Meeting 9/03 in Toulouse ↓ Start of AERO model Quantification	**European Review on the study results** ↓ Final Report ↓ Communicating the study results

2000/2001 → **2002** → **2003** → **2004**

Review meeting back-to-back with AERONET III (Athens, April 2004)

Concept – Summary:

1. **DLR will provide experts (mainly from AERONET) with results of the scenario quantification – 6 weeks before the meeting by mail**
2. **Meeting with manageable size - perhaps 25 to 30 people**
3. **experts for input; stakeholders for buy-in**
4. **1,5 days in a pleasant or easy access place**
5. **Well-defined workshop "Terms of Reference":**
    - **Look for scenario inconsistencies, real behaviour-check**
    - **Faith in "numbers" (assumptions and outputs)**
    - **Questionnaire**
    - **Agree changes to assumptions at end of workshop**

Review meeting back-to-back with AERONET III (Athens, April 2004)

Draft Outline Agenda:

- **Opening remarks (DLR or "key figure")**
- **The 4 Scenarios (DLR/IIASA) – 15 minute presentation + 30 mins discussion**
- **Assumptions presentations (DLR, NLR, QinetiQ) – 3 x 5 minutes**
- **The AERO model output (NLR) – 10 minutes**
- **Where did we go wrong? (QinetiQ) – identifying the issues to be addressed**
- **Initial break out groups**
  - *** Background scenarios and general constraints - DLR-lead**
  - *** Technology assumptions - QinetiQ-lead**
  - *** Airports and infrastructure - NLR-lead**
- **Feedback from break out groups, Discussion, Summary and next steps (DLR)**
- **Afterwards: CONSAVE team and available AERONET experts for one-to-one discussions and problem resolution**

Thank you for your attention - see you again in Athens