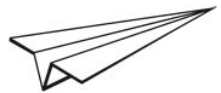




100 YEARS

Aerospace Research in Germany



Air Transport System of the Future

Are we ambitious enough in our goals?



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für Luft- und Raumfahrt e.V.
in der Helmholtz-Gemeinschaft

Joachim Szodruch
DLR



Deutsche Gesellschaft
für Luft- und Raumfahrt
Lilienthal-Oberth e.V.

„Airlines Pressure Airbus, Boeing For Single-Aisle Replacement Plans,,

- KLM chief executive Peter Hartman: urging the two rivals to clarify their single-aisle replacement strategies,
- citing the need to replace aging aircraft before the airline's operational integrity is jeopardized
- he wants "to know now exactly what will be the most likely delivery dates of these aircraft and a little bit more about the final specifications."
- US Airways has called for them both to develop a Boeing 757 successor.



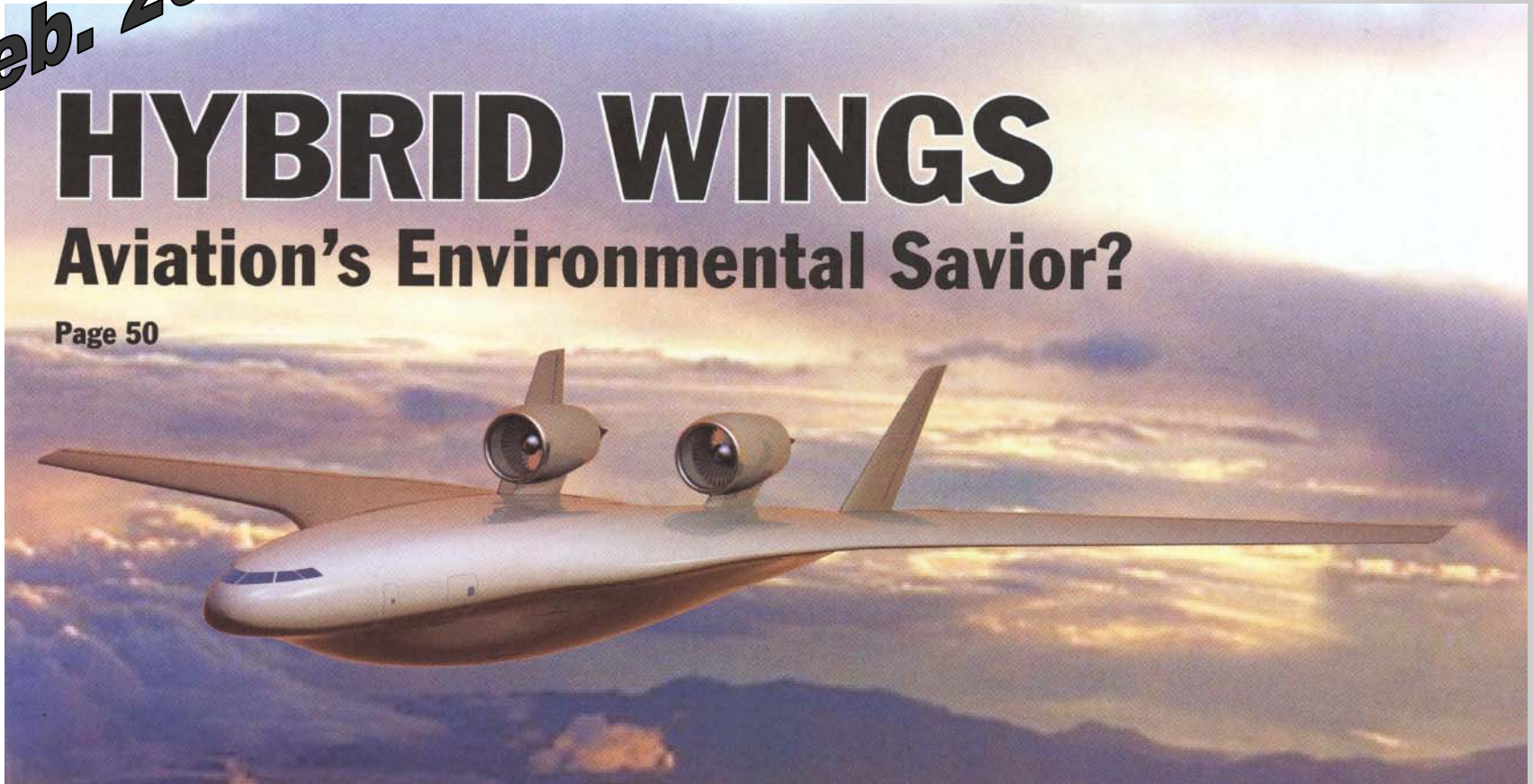


Aviation Week
Feb. 2009

HYBRID WINGS

Aviation's Environmental Savior?

Page 50

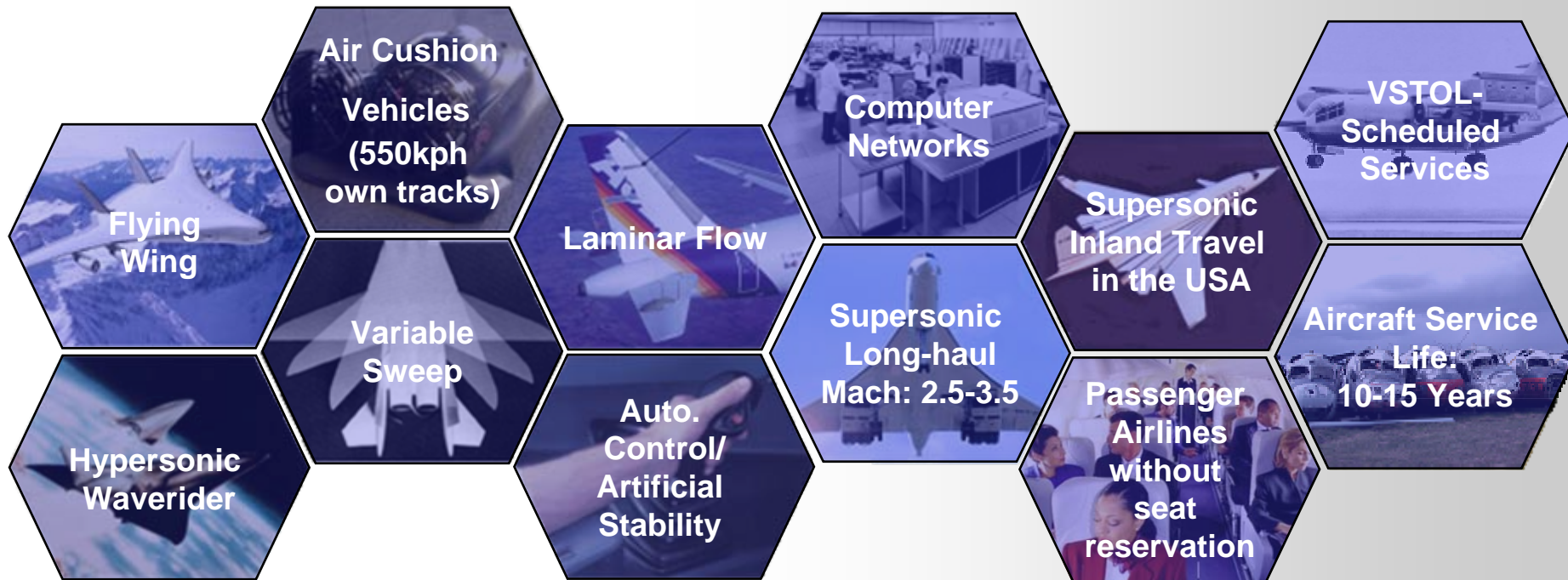


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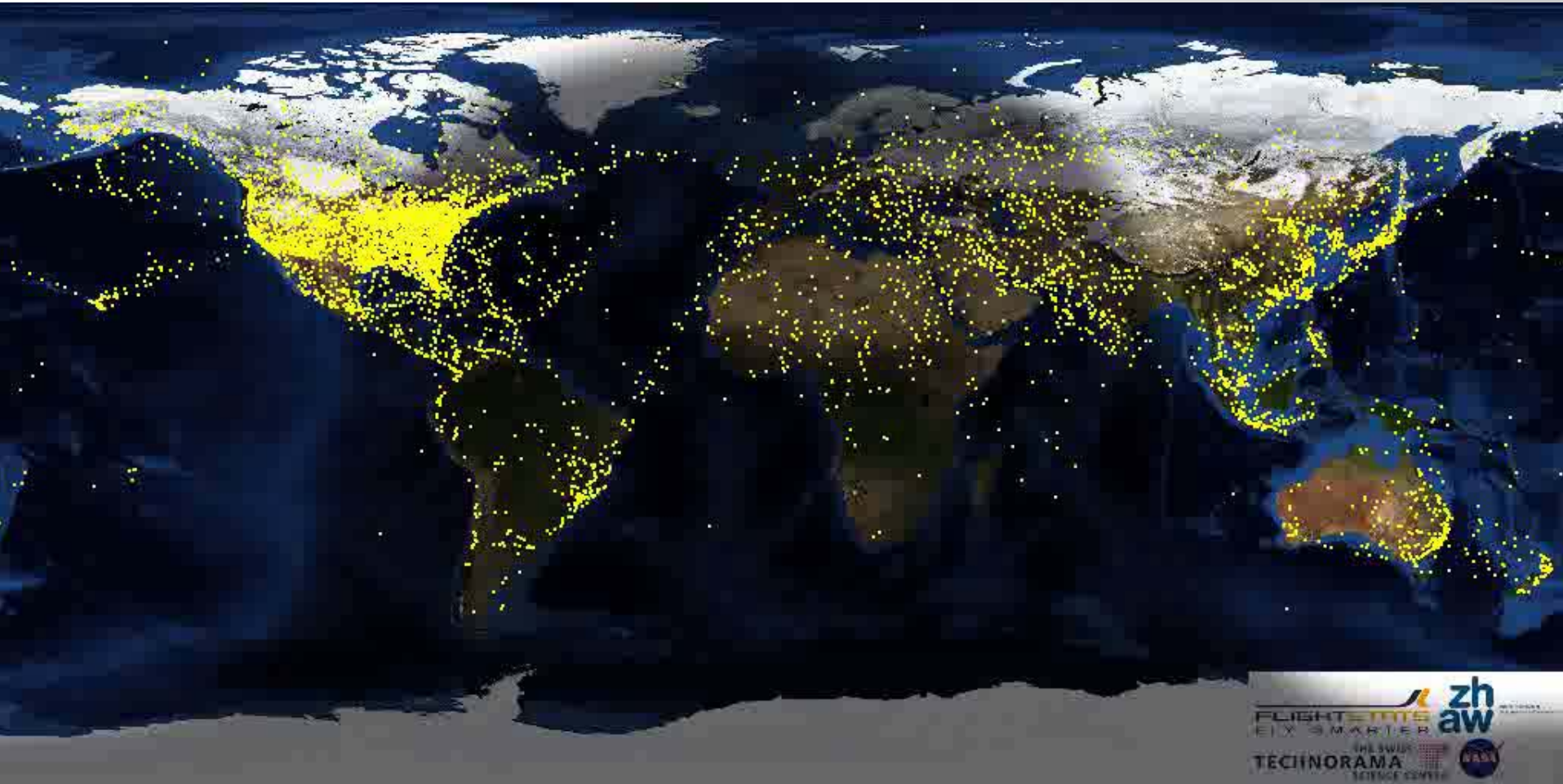
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In the past everything was better even the future

The world in 1985 from view of experts in 1964



The Air Transport System



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Air Transport System

A complex system with opposing interests of the various stakeholders



Air Transport System

A complex system with opposing interests of the various stakeholders



Challenges and Associated Goals

Group of Personalities

Pedro Argüelles

John Lumsden

Manfred Bischoff

Denis Ranque

Philippe Busquin

Søren Rasmussen

B.A.C. Droste

Paul Reutlinger

Sir Richard Evans

Sir Ralph Roberts

Walter Kröll

Helena Terho

Jean-Luc Lagardère

Arne Wittlöv

Alberto Lina

■ Quality and Affordability

- *Reduced passenger airfares*
- *Increased passenger choice*
- *Modernized freight operations*
- *Reduced time to market by 50%*

■ The environment

- *Reduction of CO₂ by 50%*
- *Reduction of NO_x by 80%*
- *Reduction of external noise by 50%*
- *Substantial progress towards 'Green MMD'*

■ Safety

- *Reduction of accident rate by 80%*
- *Drastic reduction in human error and the consequences*

■ The Efficiency of the Air Transport System

- *3X capacity increase*
- *99% of flights within 15 min of schedule*
- *Less than 15' min waiting time in the airport for short distance flights*

■ Security

- *Airborne – terrorism prevention*
- *Airport – prevention of unauthorized access (persons or products)*
- *Air navigation - safe control of hijacked aircraft*

Opportunities

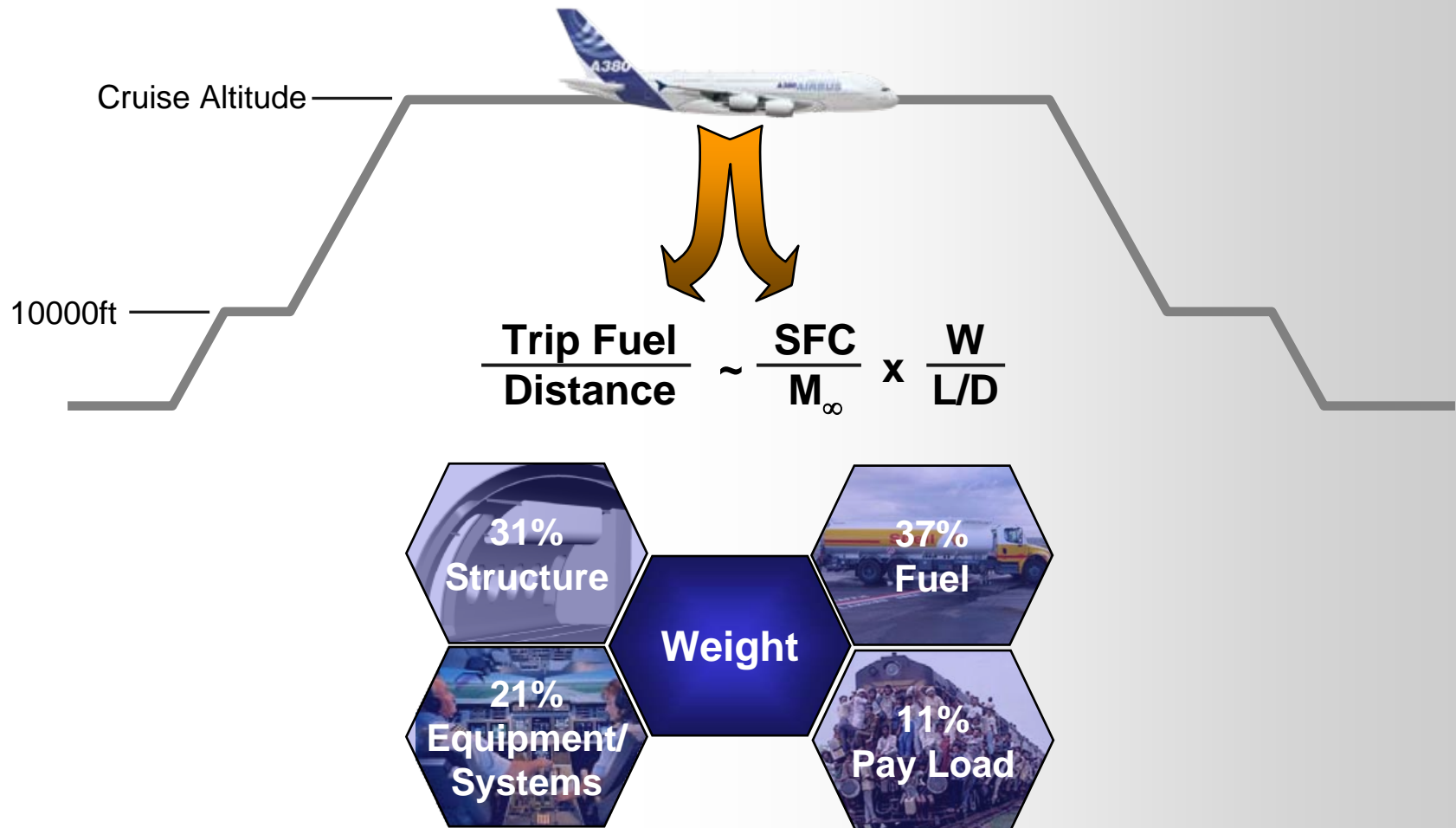


Ecological Challenges



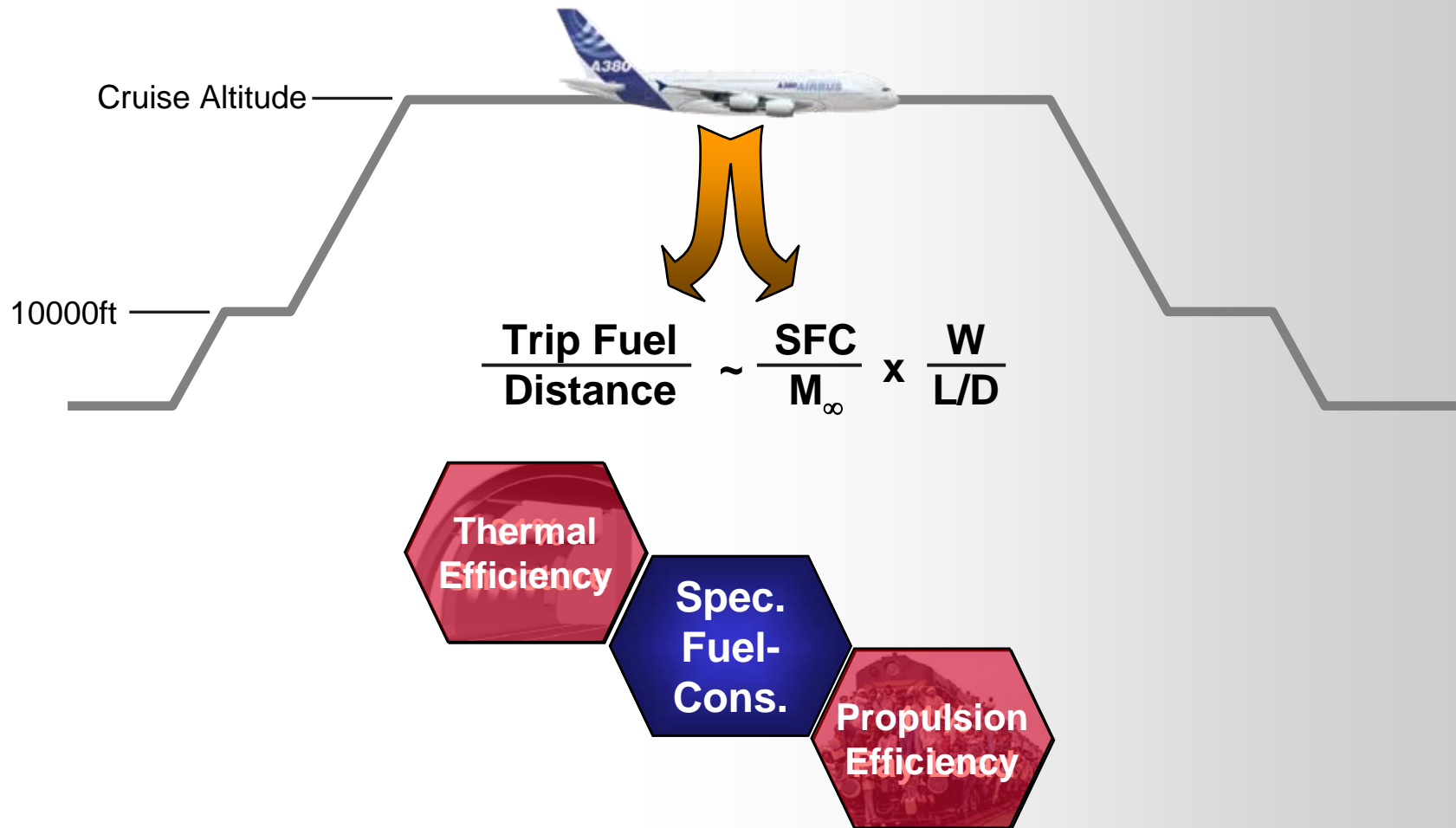
CO₂-Reduction: Parameters of Influence

Medium Flight Efficiency



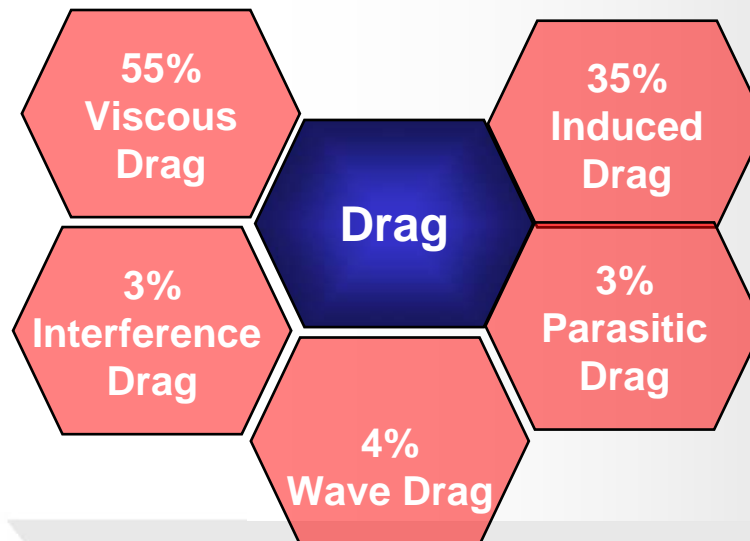
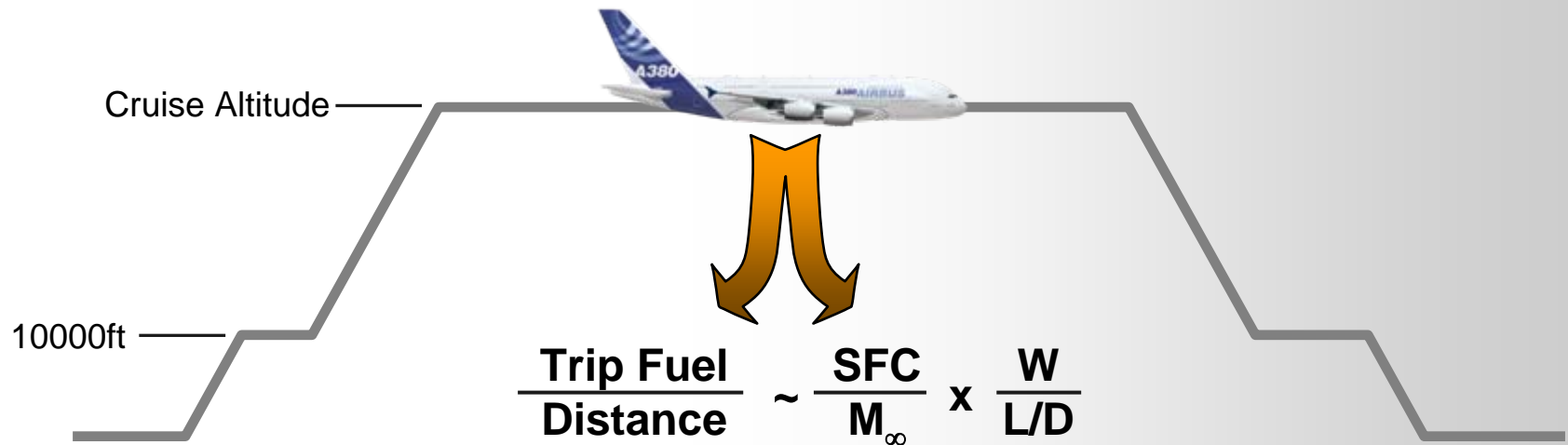
CO₂-Reduction: Parameters of Influence

Medium Flight Efficiency

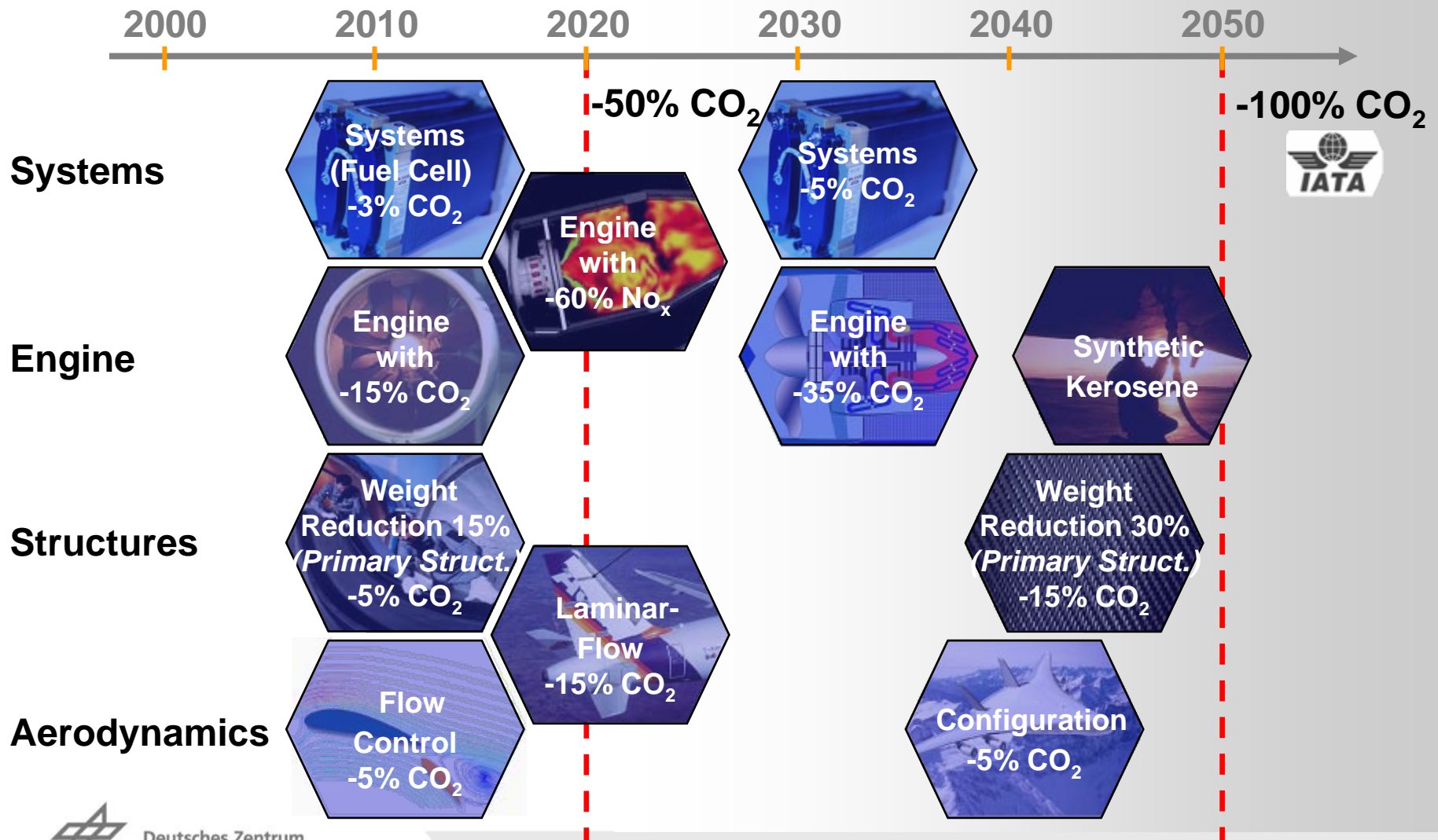


CO₂-Reduction: Parameters of Influence

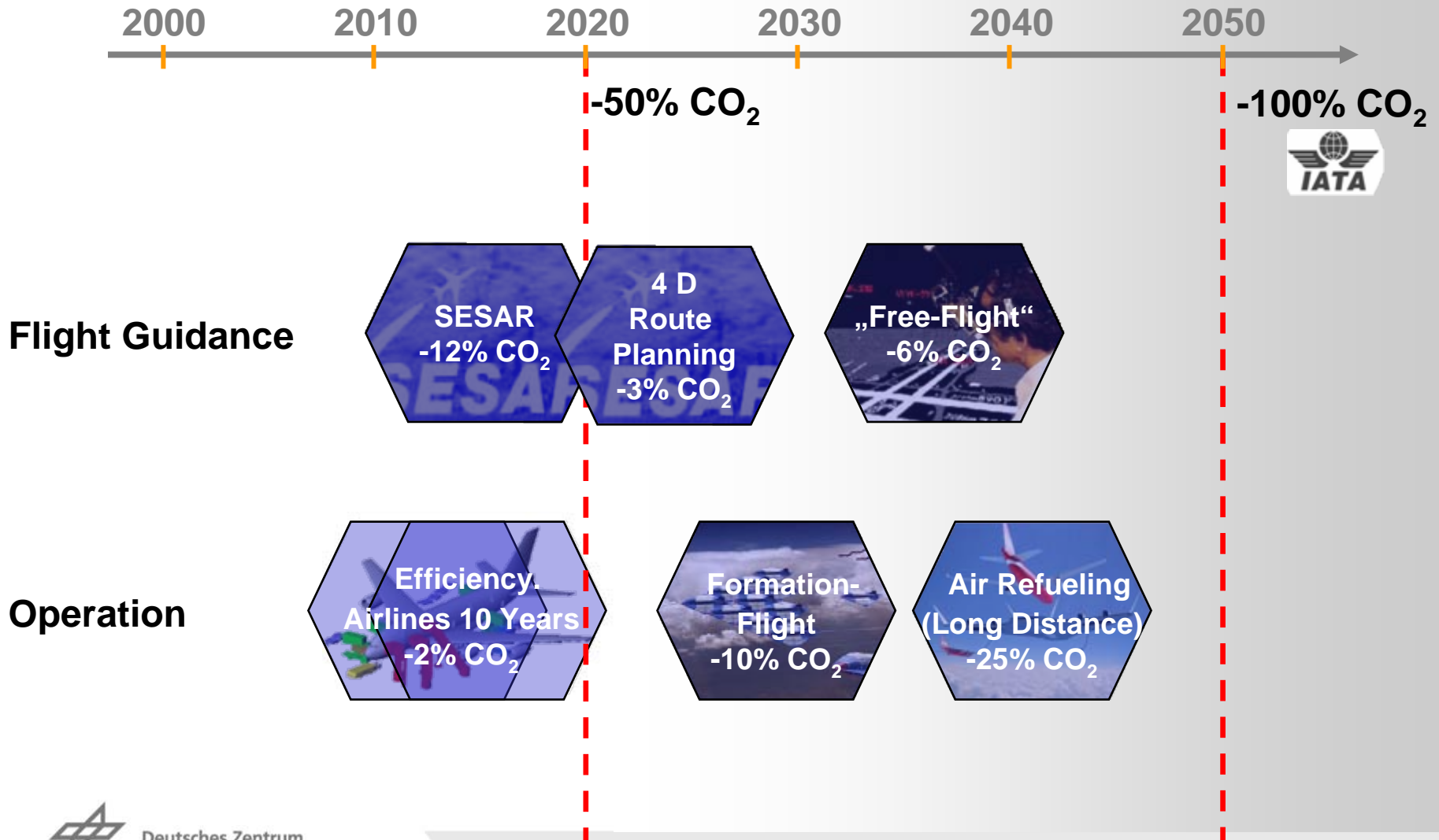
Medium Flight Efficiency



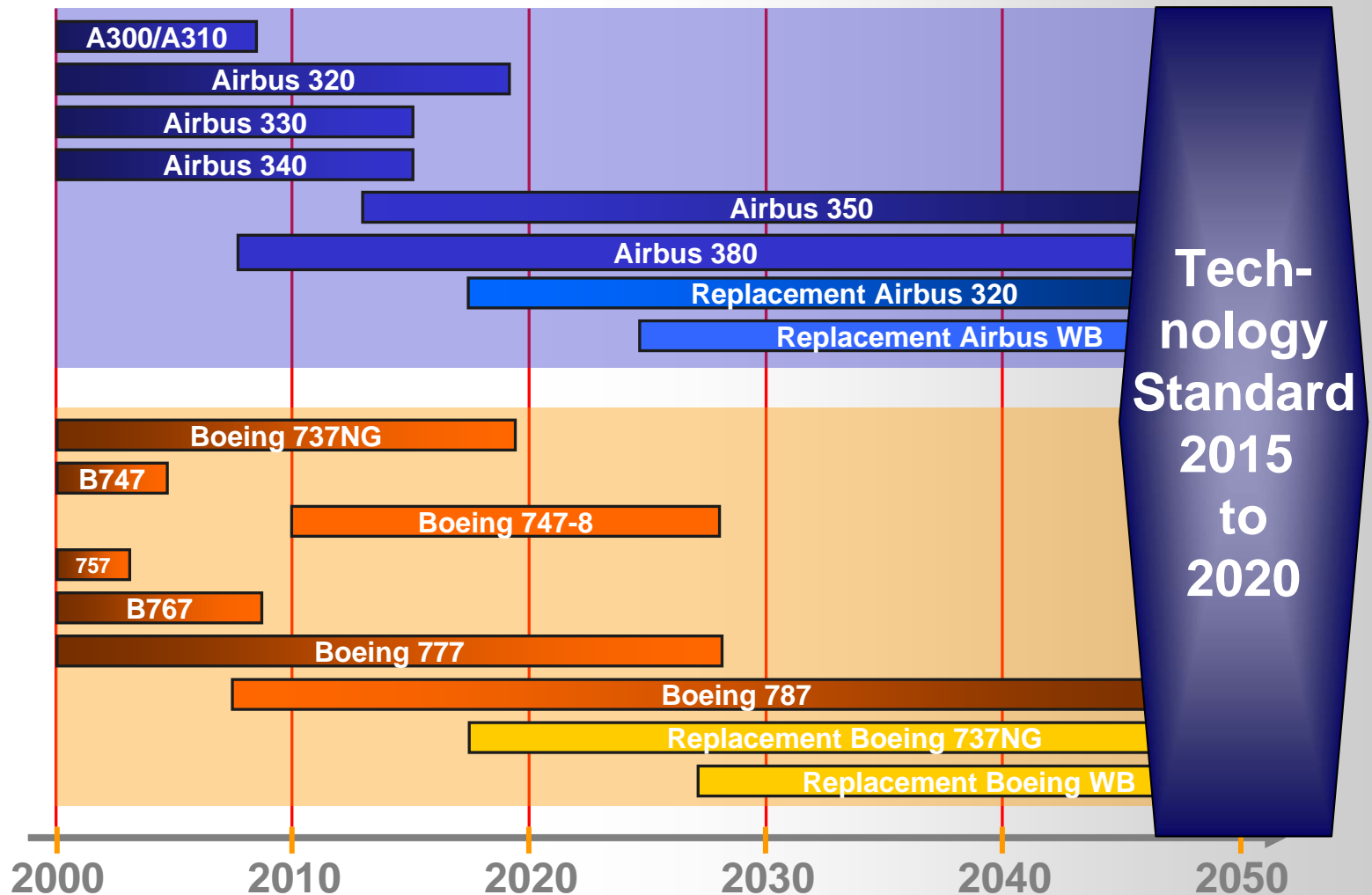
Aircraft Specific Technology



Operation Related Technology



Principal Timeframe of Aircraft Production 2000 - 2050



How much technology do we really need?

Prognoses

- Traffic Growth between 5% and 3,5%
- Load Factor
- Service Life
- PAX / Freight and Combi-Aircraft
- Blockfuel
- Average Seat Calculation
- Distance pro hour
- Flight-hours per Aircraft
- Considered Aircraft Types:
 - Classic and New Generation,

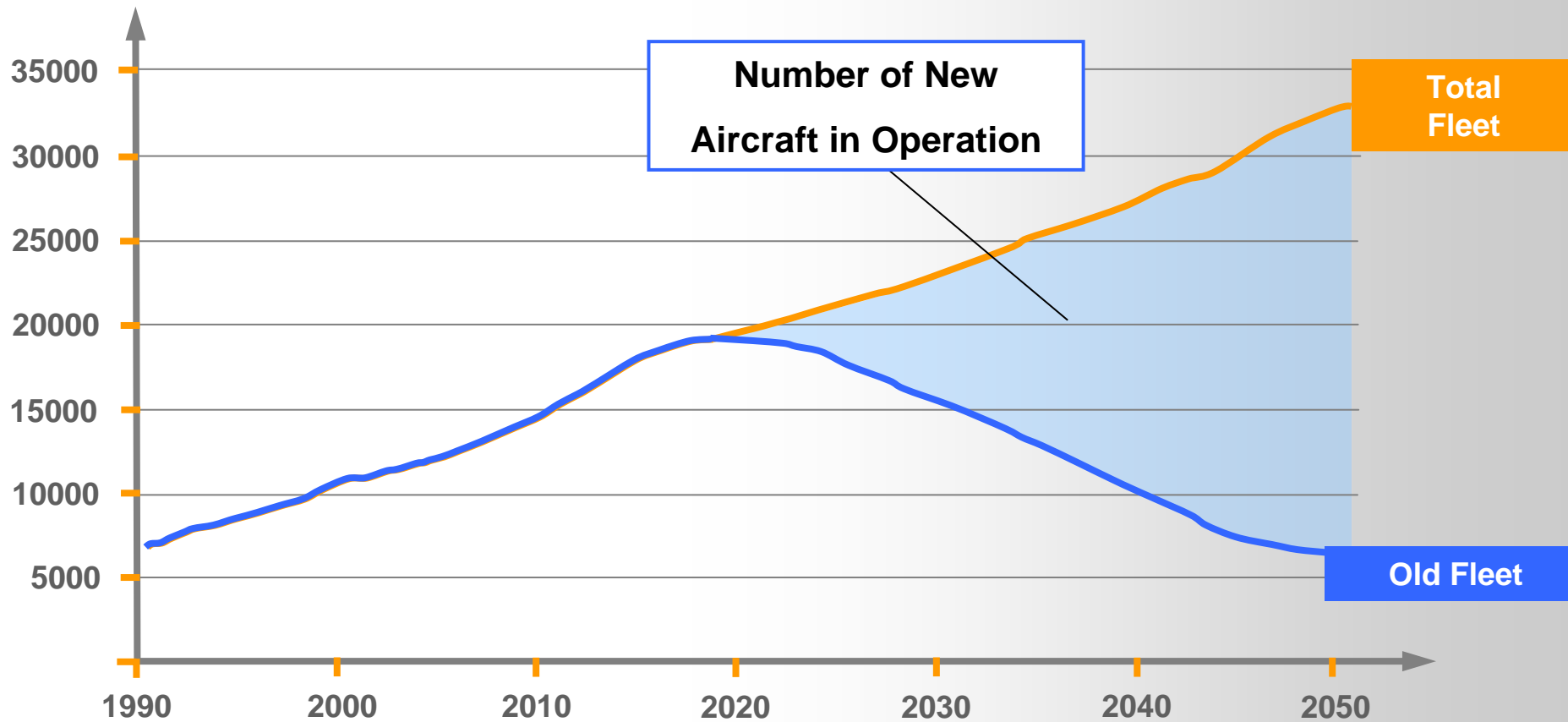


Mathematics
&
Statistics



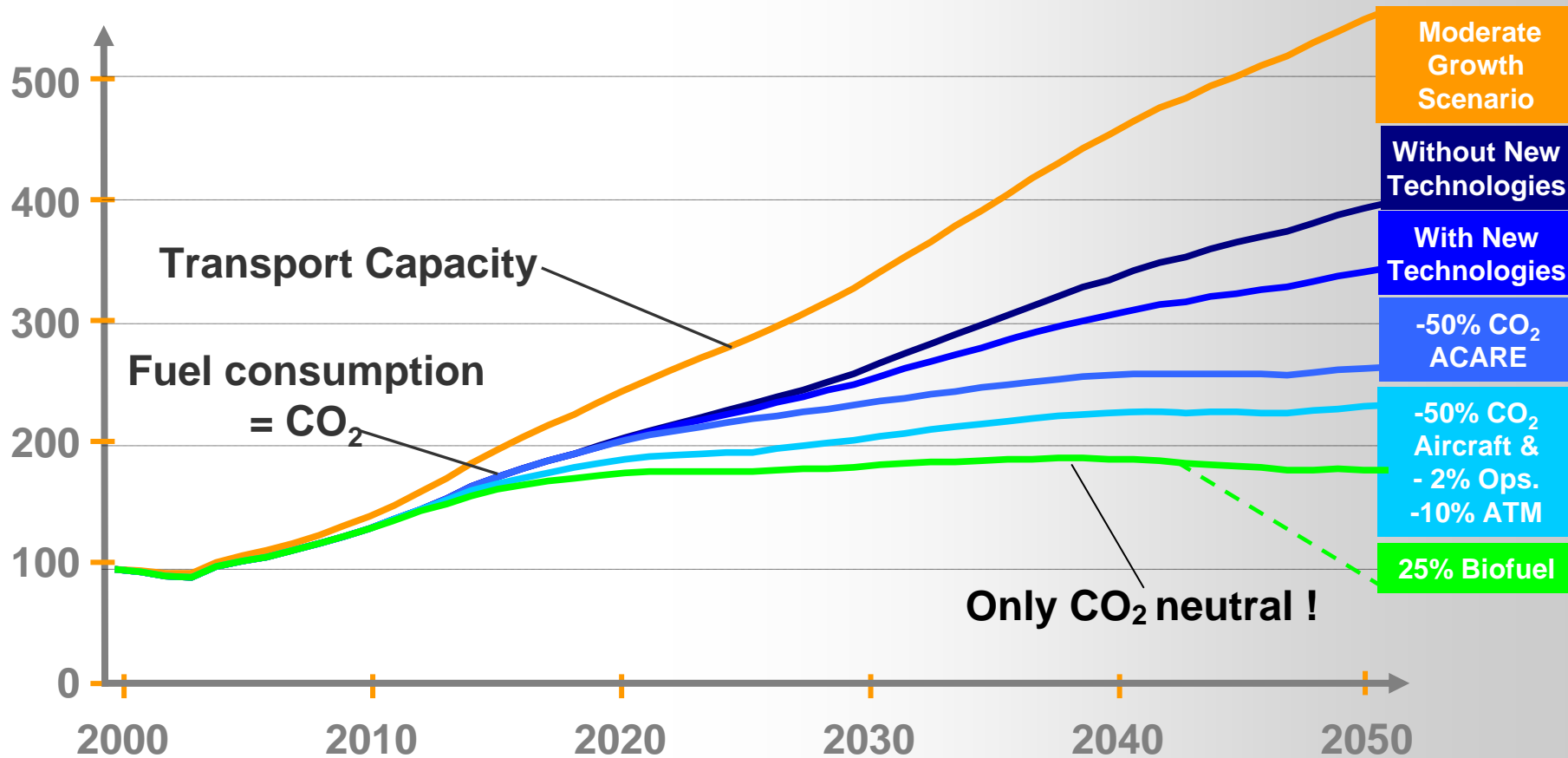
Prognoses
&
Predictions

Fleet Development 1990 - 2050



Technology Impact – Extrapolation 2000 - 2050

Index (100 = Year 2000)





Noise



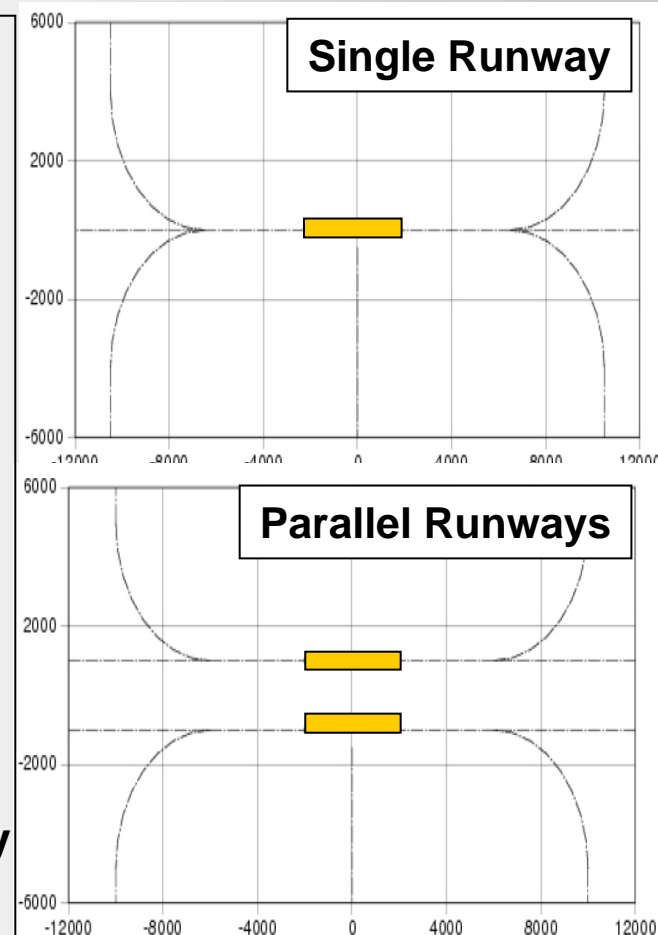
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Noise Study for Generic Airports

- Two generic airports in 2005 and 2020
- 2020 three cases with equal aircraft movements
 - No „ACARE-Aircraft“
 - Realistic 30% ACARE-Aircraft for LR and 5% for SR- and MR*
 - Optimistic case with 100%-ACARE-Aircraft
- Growth rate of aircraft movements
 - 1,9% p.a. for parallel runways
 - 3,2% p.a. for single runway
 - Equals average levels of EUROCONTROL Medium Term Forecast
- Calculation according to German AzB-Methodology

(*includes B787 / A350)



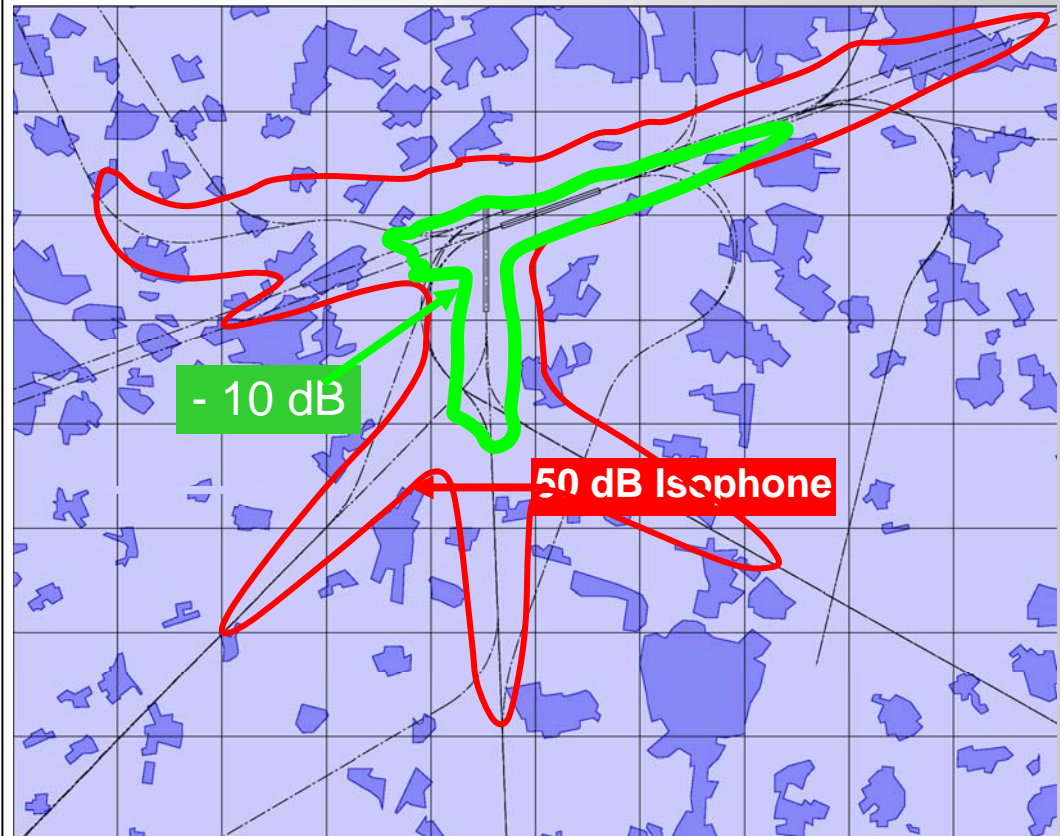
Overall Results for 2020

ACARE aircraft can half the noise carpet even in a traffic growth scenario.

However, the aircraft must be available and introduced into the market.

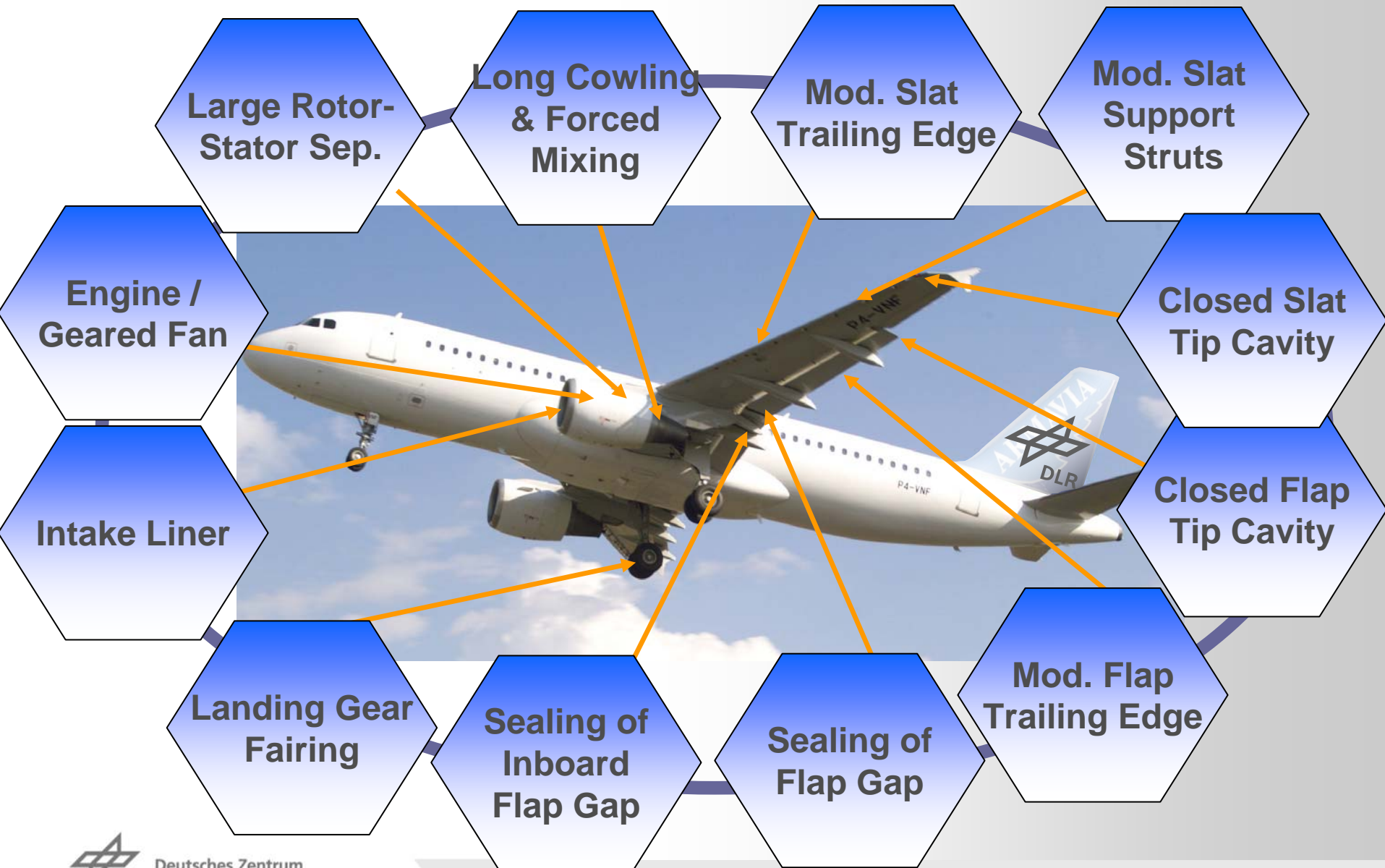
Operational procedures can fill the gap when older aircraft are still operated.

Average Noise Intensity at Frankfurt Airport

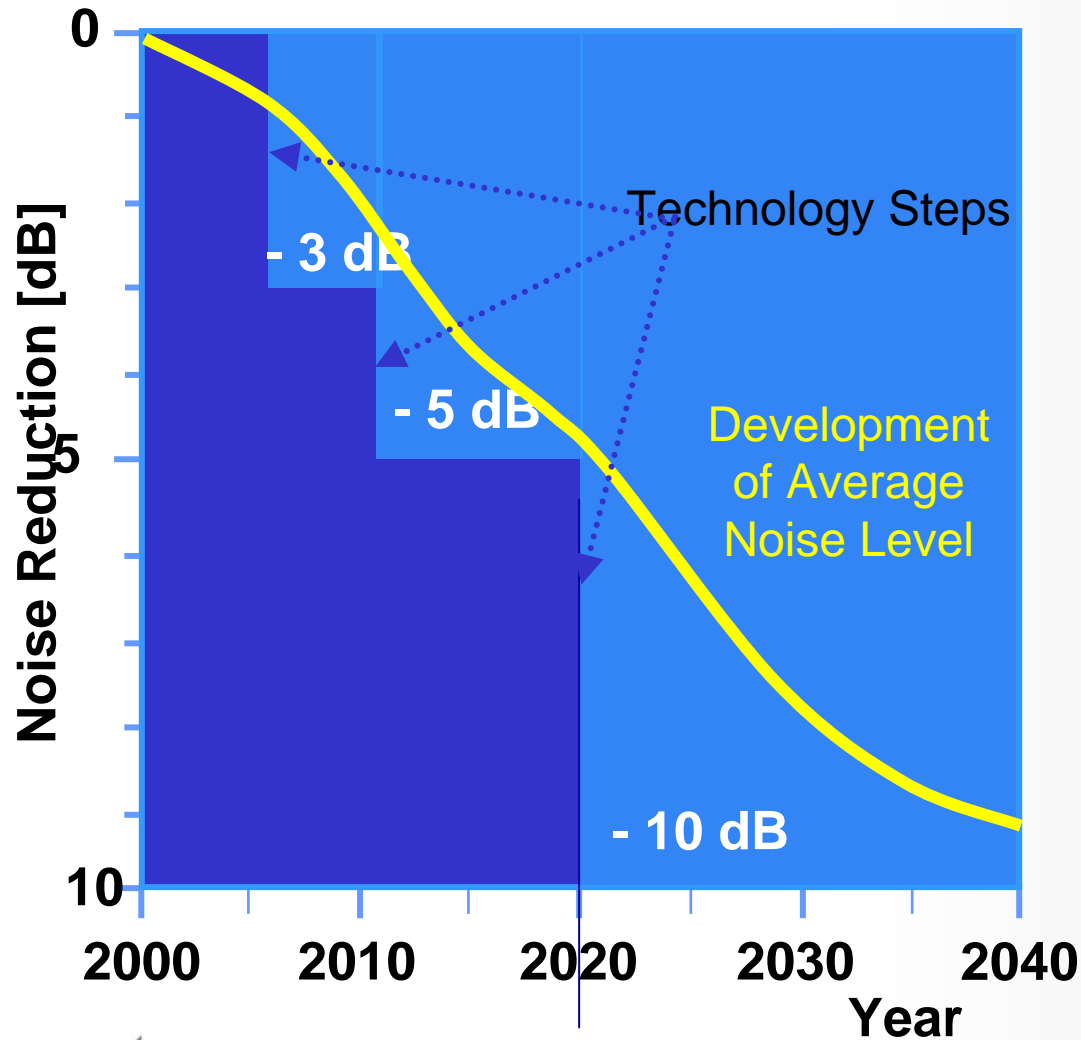


Technology Impact Noise

Modification of Noise Sources



Noise Technology development



Technologies (2013)

Fan Design	2dB
Slat and Edges	3dB
Chevron Nozzles	3dB
Active Noise Contr.	?dB
Geared Fan	5dB
Oper. Proc. (CDA)	3dB
Configuration	5dB



ACARE Strategic Research Agenda

October '04 : The SRA-2

High level Target Concept

**Very Low
Cost ATS**

**Ultra
Green
ATS**

**Highly
Customer
Oriented
ATS**

**Highly
time-
efficient
ATS**

**Ultra
Secure
ATS**

**22nd
Century**



Summary and Outlook

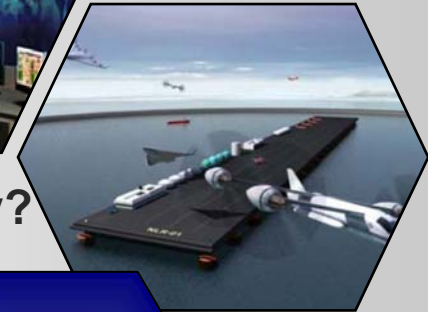
The ACARE Vision goals for future air transport

- are very ambitious,
- but not sufficient in the long-term „green scenario“.
- They do not de-coupled traffic and fuel consumption
- and further related technologies are not readily available.
- Further noise reduction technologies are available

Vision 2020

We need to foster creativity and innovation

- Focussed research activities required for critical issues
- Enabling technologies
- Infrastructure
- Pioneering research
- Education / Young Professionals



Can we afford ...

-not to wait for the technological window of opportunity?
-to miss the economical window of opportunity?
- not to develop a sustainable air transport system?



“In light of the fact that humanity is not able to learn from past mistakes we can not afford to make mistakes in the future.” -

Ernst Ferstl



**Thank you for
listening**

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