



Clean Sky JTI Workshop

Green Regional Aircraft Platform

Brussels – June 1st , 2006

JTI-060601

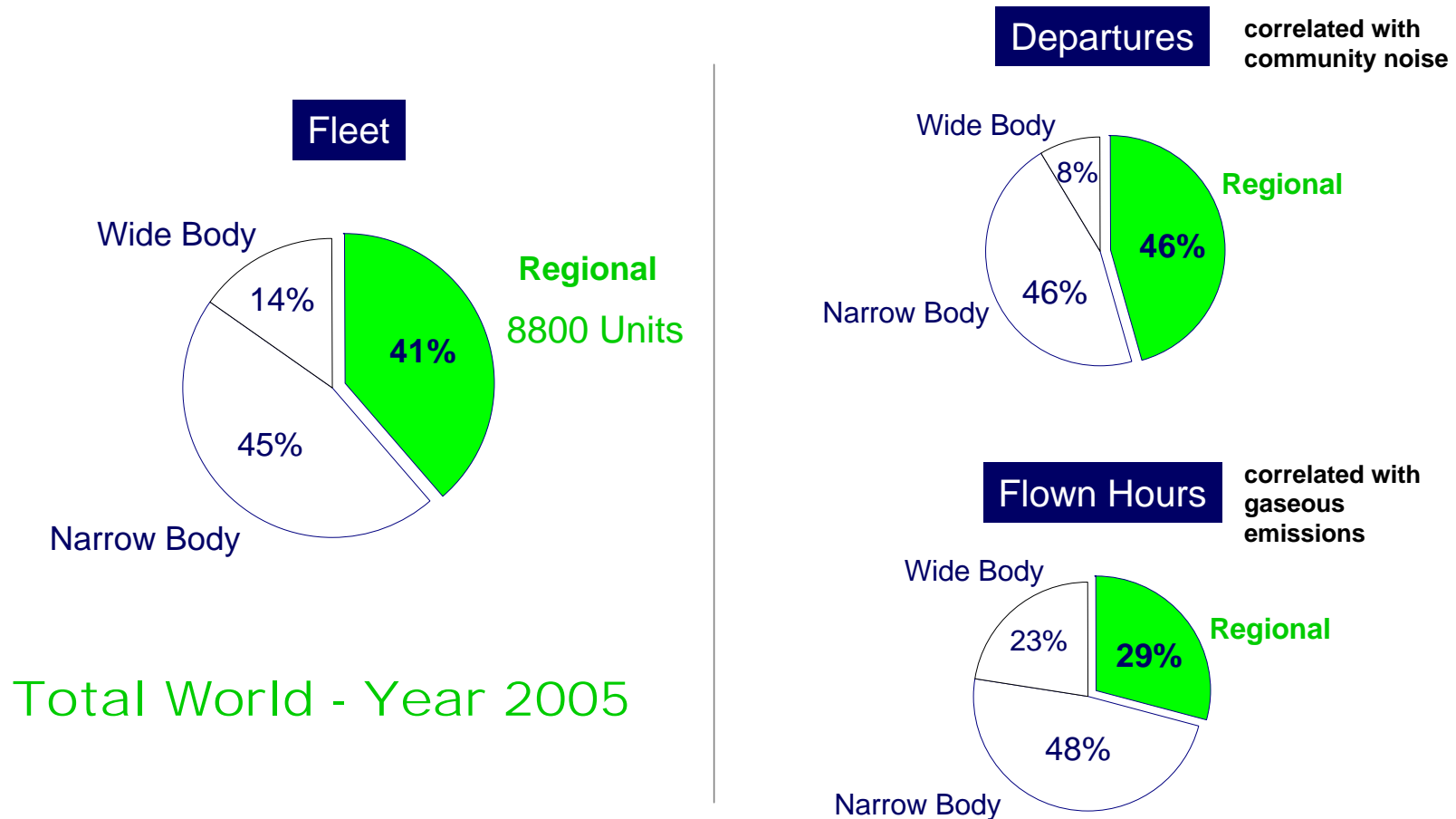
 **Alenia**
AERONAUTICA
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Carmelo LATELLA - V.P. Marketing

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Regional Aircraft: Important Role in ATS

Regional air transport plays an important role in the air transport system by serving medium and small density markets, providing a vital lifeline for the surrounding small communities and bringing a substantial flow of economy down to the local level.

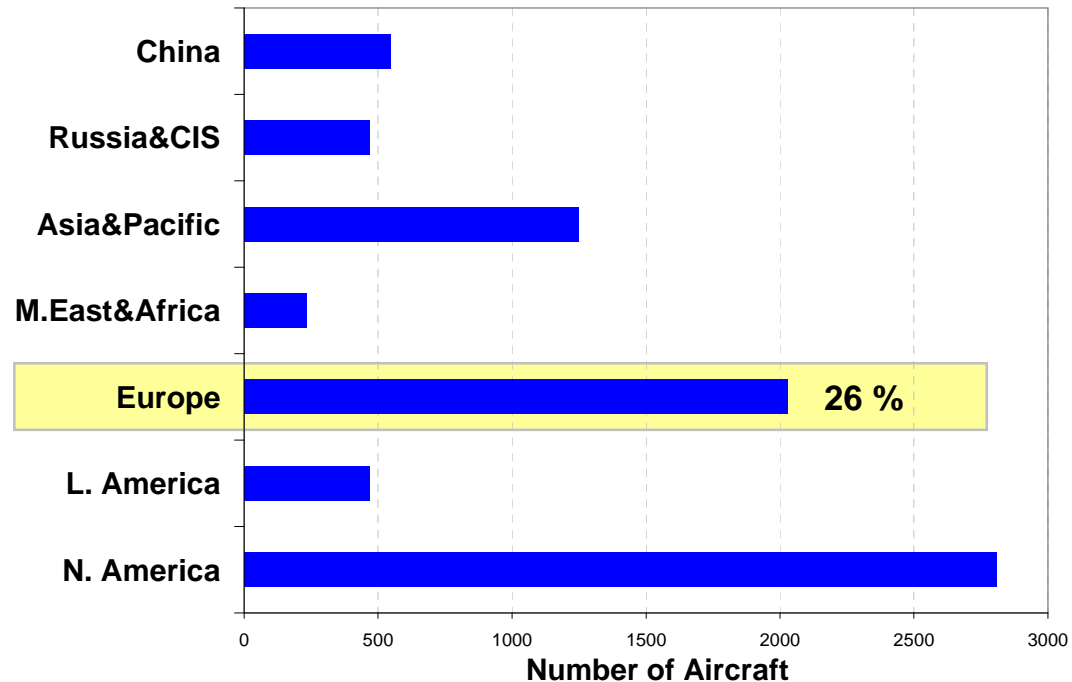


- European regional fleet represents 20% of current worldwide regional fleet
- Fully 60% of airports with scheduled service are served only by regional aircraft.

Regional Aircraft: High Worldwide Demand

- | Regional traffic is forecast to triple in 20 years.
- | The potential demand for the next 20 years foresees 7800 new aircraft for a corresponding value of 200 billion dollars (\$ 10 billion per year).

**Delivery Forecast by
geographical area
Next 20 years**

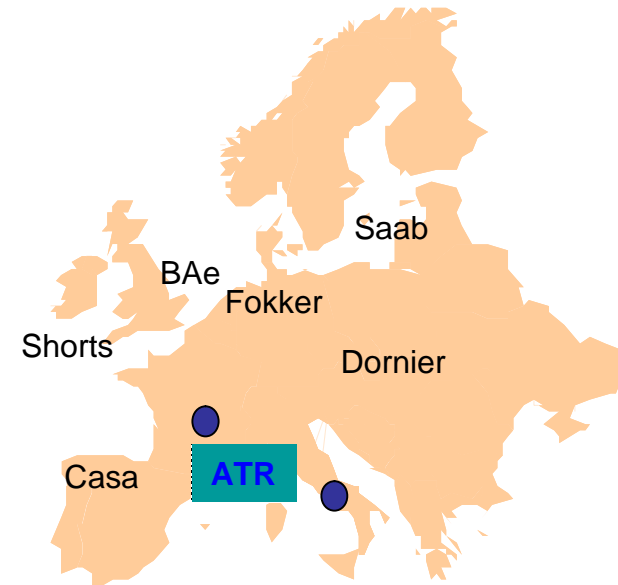


- | Regional market is changing:
 - 2 airlines are becoming less dependent from Majors (more efficient aircraft required, economically driven choice)
 - 2 low cost airlines are entering regional market (37% of 2005 regional sales)
- | More than 40% of new connections opened in the last 5 years are operated only by regional aircraft.

Regional Aircraft: New Offer Opportunity

Regional market, even if promising, **is a very competitive market.**

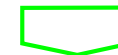
Many manufacturers, mostly European, have withdrawn from the regional aircraft market in the past years, including Fokker, Shorts, Saab, Dornier and BAE Systems as well as US companies Fairchild, Beech.



	Turboprop	Jet
ATR	ATR42 ATR72	
Bombardier	DHC8-200 DHC8-300 DHC8-400	CRJ-200 CRJ-700 CRJ-900
Embraer		ERJ-135 ERJ-140/145 ERJ-170/175 ERJ-190/195
On study or development (Russia, China)		RRJ-75 RRJ-95 RRJ-110 ARJ-21 ARJ-21 Str

Currently the regional aircraft offer is represented by three manufacturers:

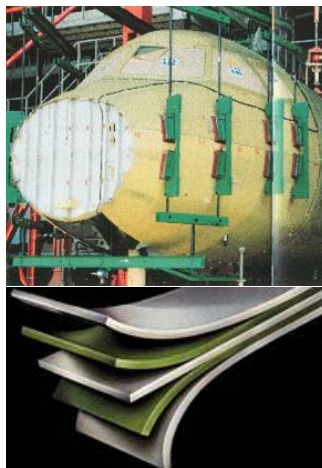
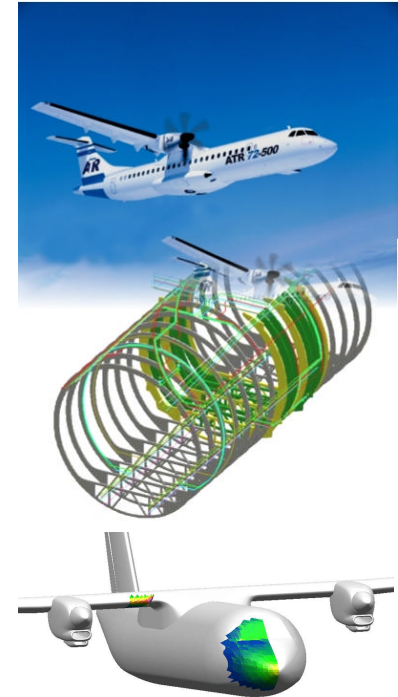
- | ATR (Italy-France)
- | Bombardier (Canada)
- | Embraer (Brasil)



- | Only one European manufacturer with incomplete offer (turboprop)
- | Opportunities for new offer with competitive products and proven leadership.

Green Regional Aircraft: The Challenges

- I The Platform will demonstrate and validate specific technologies and concepts for a new future generation “green” regional aircraft aimed at reaching ACARE environmental goals in gaseous emissions and noise through:
 - 2 Low weight advanced/sensorised structures
 - 2 Low aerodynamic noise configuration
 - 2 All-Electric configuration and integration of electrical and thermal management
 - 2 Aerodynamic solutions for low fuel consumption and low pollution
 - 2 Load alleviation
 - 2 Advanced aircraft and engine configurations, including prop-fan architectures.
 - 2 Mission management and trajectory control



- I At the same time the next generation regional a/c must:
 - 2 Meet evolving regional airlines requirements
 - 2 Offer highest standard in quality, reliability and safety
 - 2 Introduce cost/effective innovative technology in all other domains
 - 2 Be most competitive (DOC).

Aim: Bring Europe again to leader role in regional air transport

Green Regional Aircraft: The New Network

- | The Regional Platform is open to the contribution of European Entities with expertise and capabilities applicable to the Platform objectives, including: Universities, Research Centres, Small and Medium Enterprises.
- | The Platform is particularly suited, in dimension and scope, for participation and development of NMS aeronautical industries.
- | Several contacts already made through National Workshops and direct meetings.
- | Other contacts are planned and will be set after this Workshop.
- | Foreseen activities distribution will follow criteria of openness and transparency and will be in the following range:

2 Platform Leaders (with Affiliates)	30-40 %
2 Associates	25-30 %
2 Partners (CfP)	18-25 %
2 SME (CfP)	12-15 %

Technical Approach and Content

Green Regional Platform Targets

Efficiency

Aerodynamics: **+ 6%**

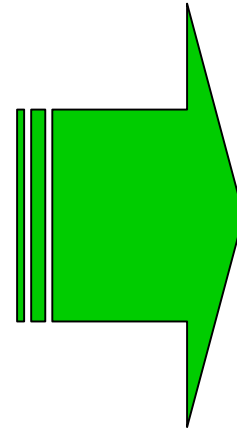
Fuel Consumption

Engines: **- 10%** (w. propfan: **- 30%**)

All-electric: **- 4%**

Weight

Structures & Load Alleviation: **- 10%**



CO₂

-20% / -38%

NO_x

-45% / -55 %

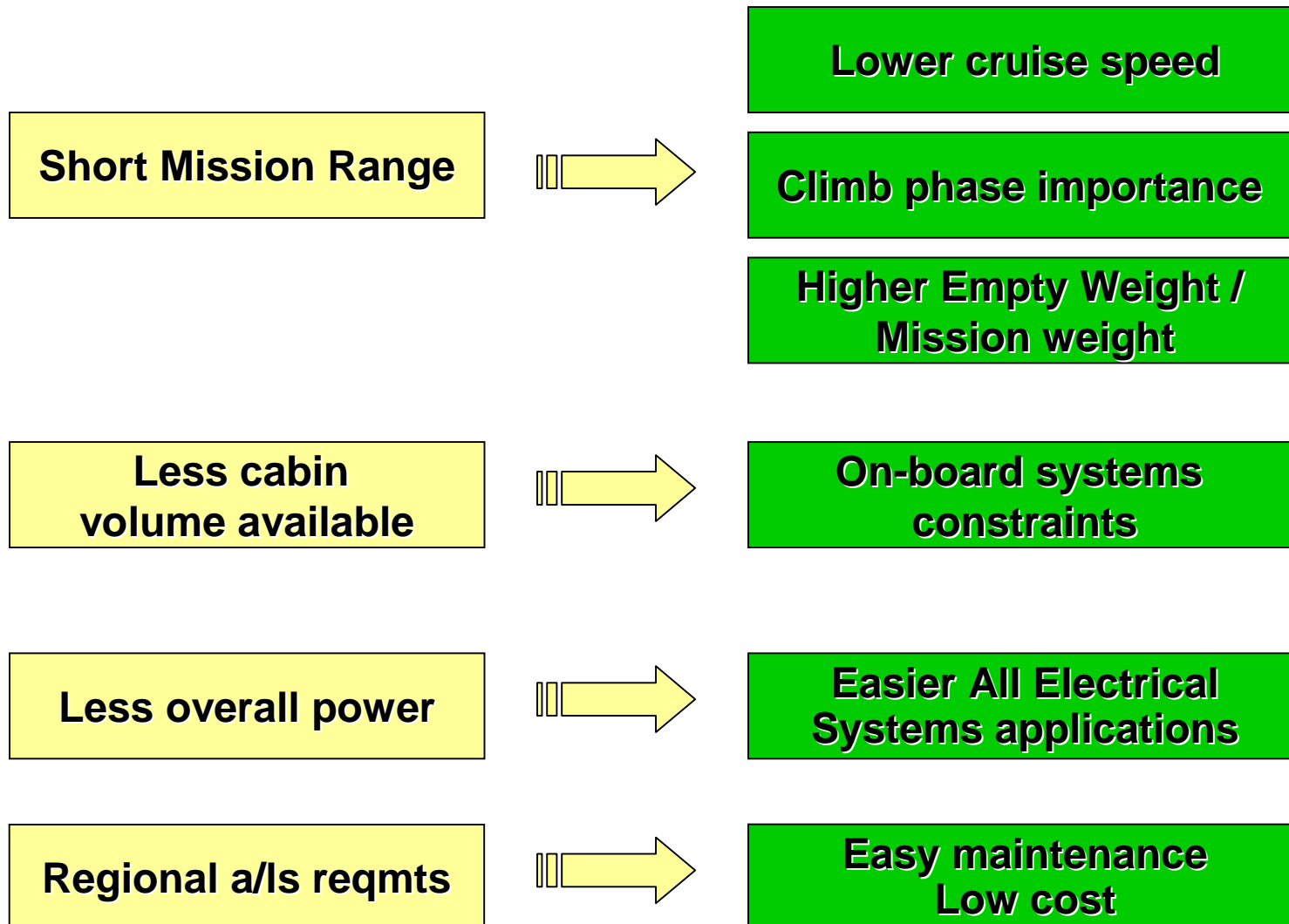
External Noise

-3 / -4 dB

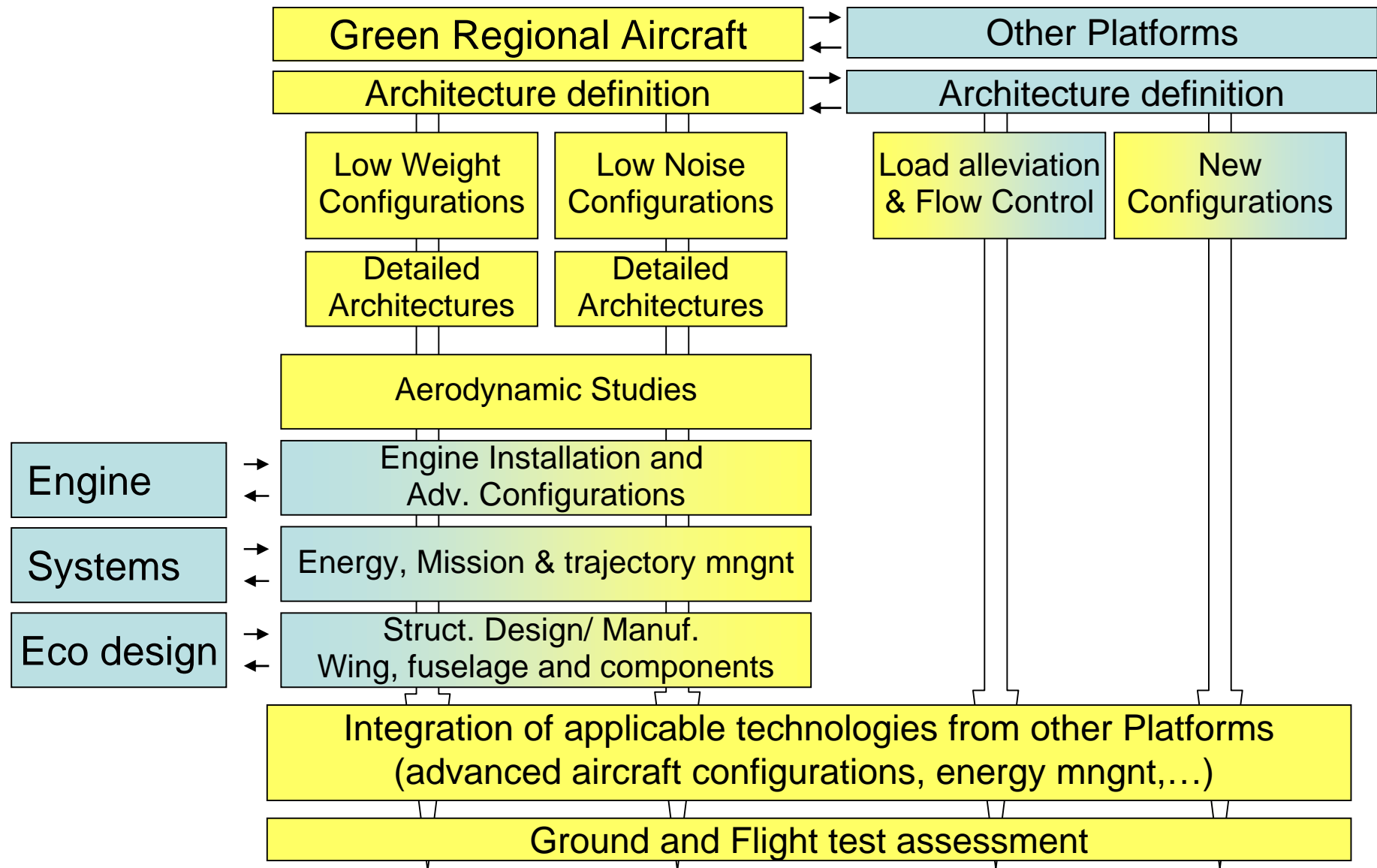
Ref. Stage 4

Peculiar Characteristics of the Regional Platform

The regional aircraft peculiar features will drive the down selection of applicable technical solutions



Integration with other Platforms



Low Weight Advanced/Sensorised Structures - 1

- A central focus is given in the JTI Regional Aircraft Platform to develop technologies addressed to lowering the weight of the airplane structure.

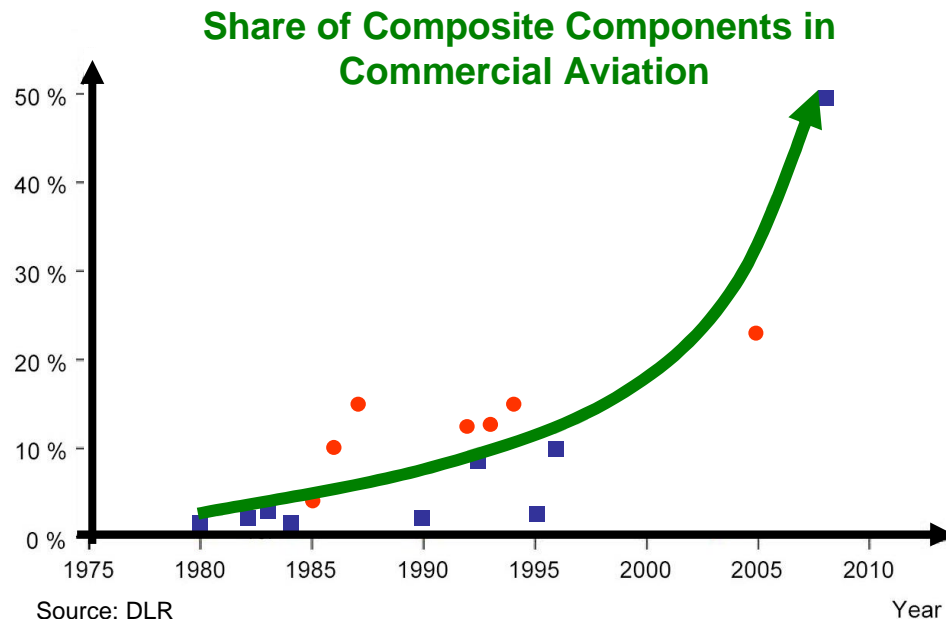
Short mission range
(normally < 500 nm)
OEW / Mission Weight
higher than larger aircraft



Focus to reduce
weight of aircraft structure



Less fuel consumption
Less pollution
Less noise

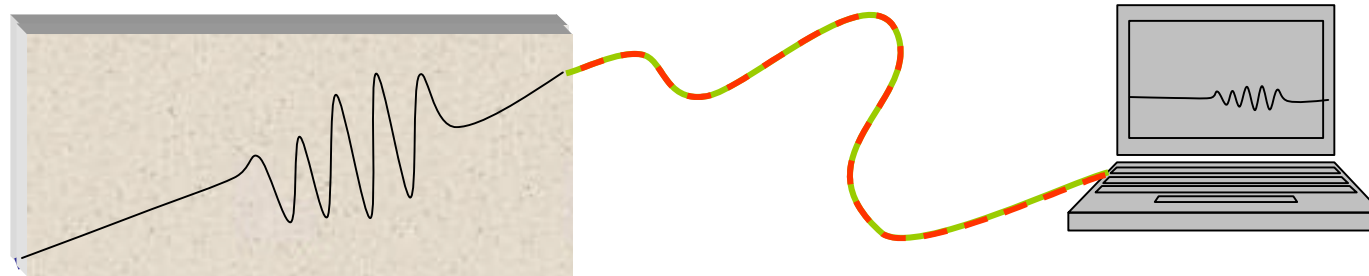


- Advanced lightweight materials :
light sensorised composite and
multi-layer / multi-function structures
- New structural design and
simulation methodologies

Low Weight Advanced/Sensorised Structures - 2

The objectives of the research activity are to develop lighter composite structures in which:

- | sensors are integrated in order to continuously control accidental damage, environment effects, and consequently in service structural degradation.
- | multi layer/multi-function architectures are used to decrease the negative impact on weight deriving from ancillary functions requested to the structure (lightning protection, electrical grounding, thermal insulation, ...).



The following sensors technologies are envisaged for consideration:

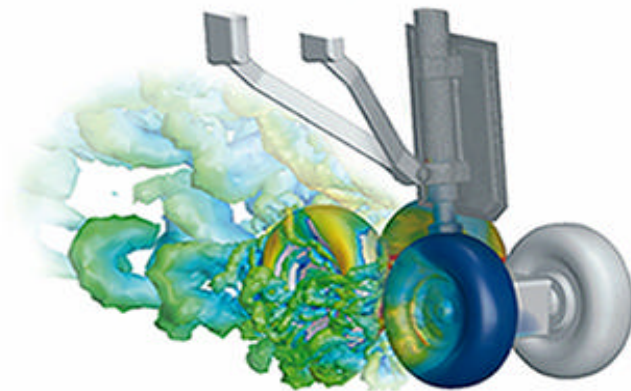
Fibre Bragg-grating (FBG), sensitive coatings (SCS), environmental degradation monitoring sensors (EDMS), micro-wave sensors ($\bullet W$), acoustic-ultrasonic (AU), acoustic emission (AE), imaging ultrasonic (IU).

Potential 25% weight reduction for certain structures

Low Noise Configuration

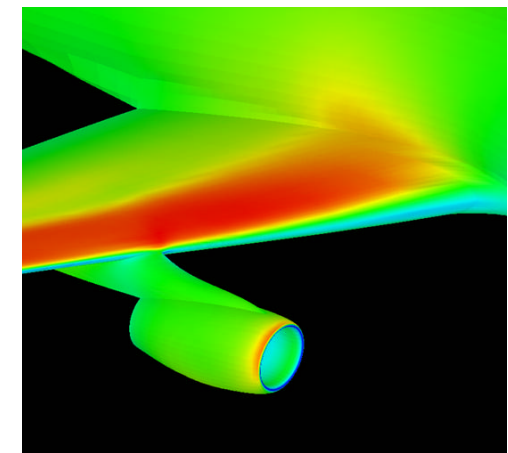
The high frequency of regional operations at most airports implies relevant contribution to community air quality and noise degradation.

Strong effort need to be devoted to technologies and architectures for reducing Airframe Noise which at approach flight condition is a major source of annoyance perceived by airport communities. Main noise source are:



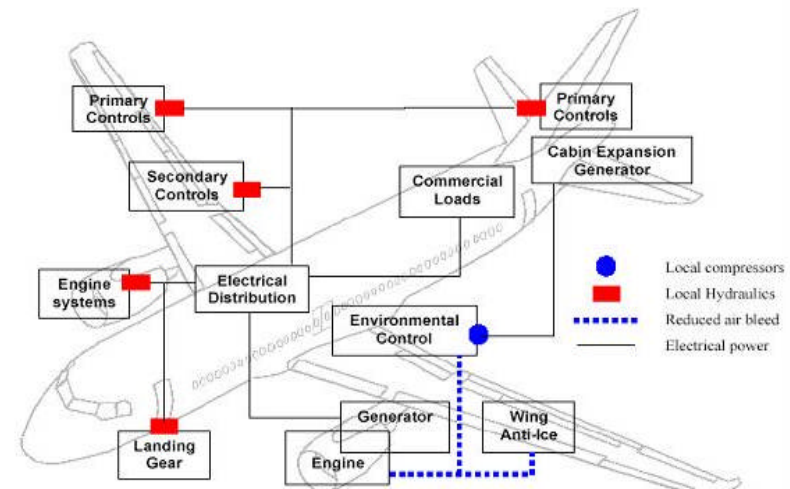
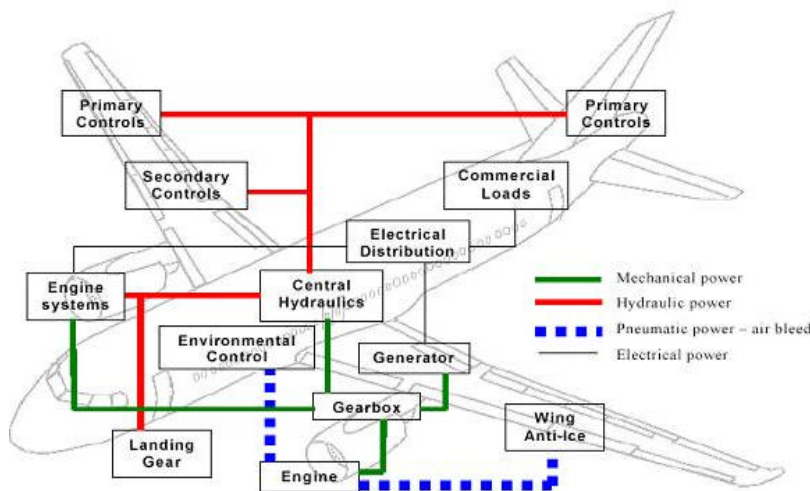
- | Kinematics tracks of wing high-lift systems - Wing slots - Flow separation downstream other wing movable control surfaces
- | Flow separation triggered by wires and pipes of landing gear device - Wakes generated by the undercarriage wheels - Vortex flows around the undercarriage bay doors

- | Design of low-noise wing high-lift systems will be especially strongly linked to aerodynamic performance requirements and to technologies for flow control and load alleviation
- | Design of low-noise landing gear configuration/installation will be especially strongly linked to technologies proposed by the Systems Platform



Energy Management

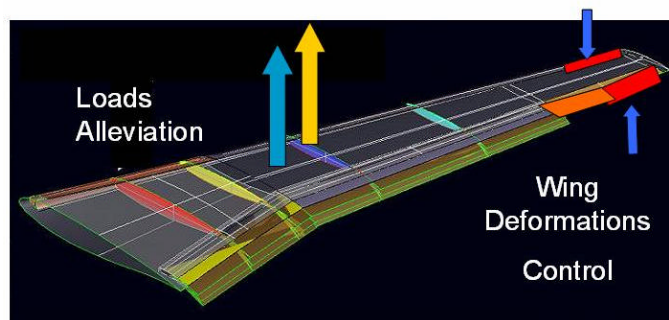
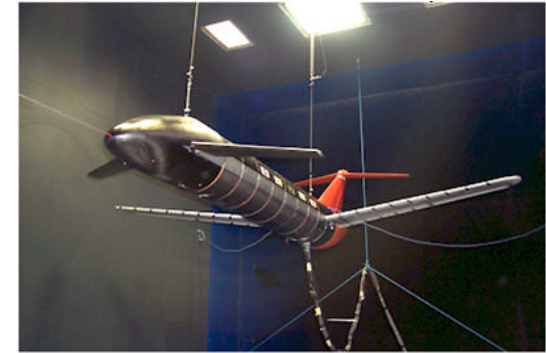
- I The objective is to reach an All Electric Regional Aircraft configuration to reduce pollution by more efficient aircraft and engine operation.
- I This approach implies:
 - 2 implementation of bleed less technologies capable to supply electrical energy to on board systems which on today aircraft are hydraulically and pneumatically powered
 - 2 Integration and control of high power electrical generation driving flight controls electrical actuators, landing gear and brakes electrical actuation, electrically driven environmental control system, electrical ice protection.
 - 2 Thermal management, to reduce secondary power usage and installed power.



Source: POA Consortium

Enhanced Aerodynamic Efficiency / Load Alleviation

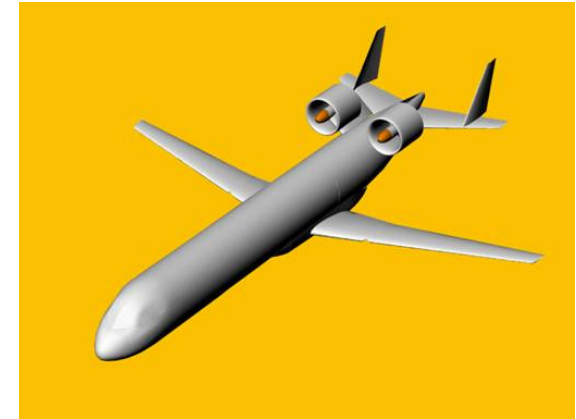
- | The objective is to use control surfaces of a low-cost regional a/c wing to adapt its configuration to the various phases of the flight mission for increased efficiency and to gust and maneuvers for reduced loads
- | The goal will be pursued by control laws fed by specific sensors and related to wind tunnel tests / aerodynamic analysis results and to actual flight conditions.



- | Aerodynamic configurations and architecture of mobile surfaces will be investigated for an efficient load alleviation system, comprising however the requirements for low aerodynamic noise generation.
- | The demonstration in wind tunnel and in flight will be a central part of this research chapter.

Advanced aircraft configurations

- I Increasing cost of fuel and searching for lower pollution aircraft and engine configurations require that novel architectures be considered, to the purpose of assessing their benefits and their drawbacks.



- I Open rotor (propfan), very high bypass ducted rotors engine configurations and noise shielding by aircraft surfaces are the basic concepts around which to analyse aircraft architectures and maximize their benefits

Validation and Demonstration on ground and in-flight

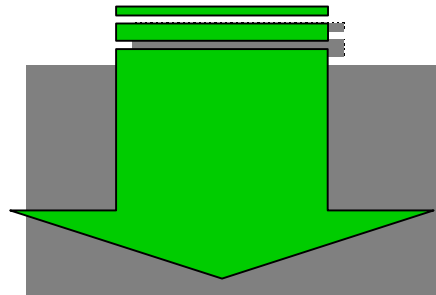
- | Wind tunnel tests of low noise and high efficiency aerodynamic configurations, and of electrical ice protection
- | Energy management and Mission and Trajectory management demonstration on ground, using as much as possible on going research rigs, largely based on simulation.
- | Small scale and large scale lab tests of low weight configurations

A flight test campaign is essential to validate these technological advancements

- | A modified existing European regional aircraft will be utilized for the in-flight demonstration of specific “regional” technologies.
- | Final feasibility assessment and validation will consider also aircraft operation, regulations and certification implications, flight safety and regional airlines requirements.

Green Regional Aircraft Platform

- | Very promising market
- | Green advanced technologies
- | The right organization and participation
- | Most talented people



Enlarging European Leadership in Commercial Aviation