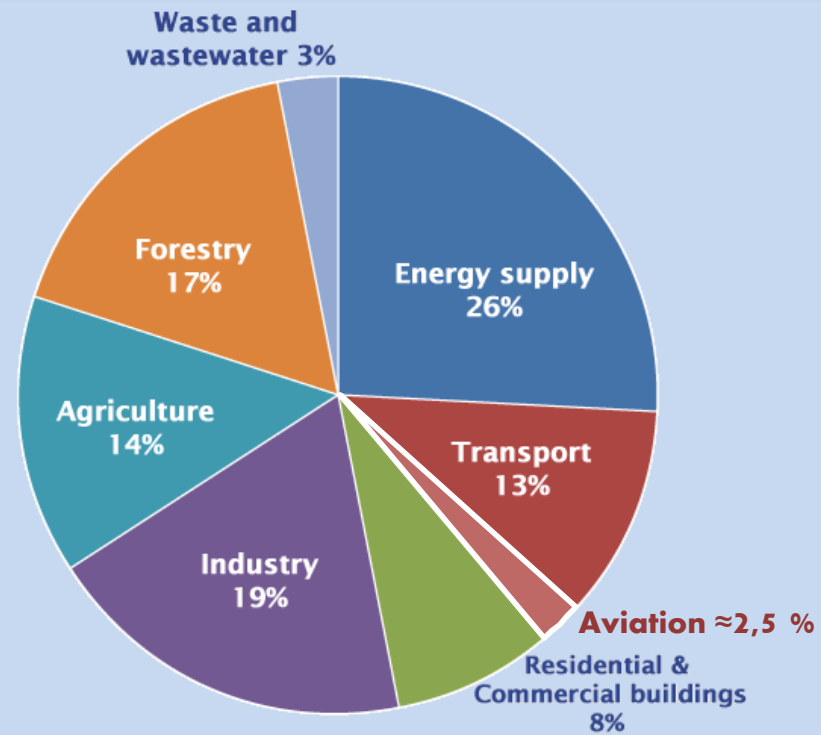
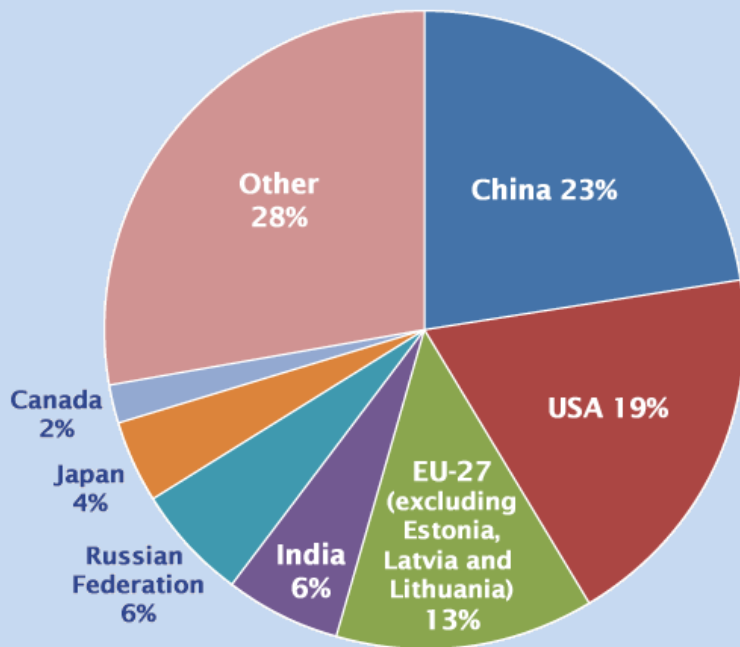
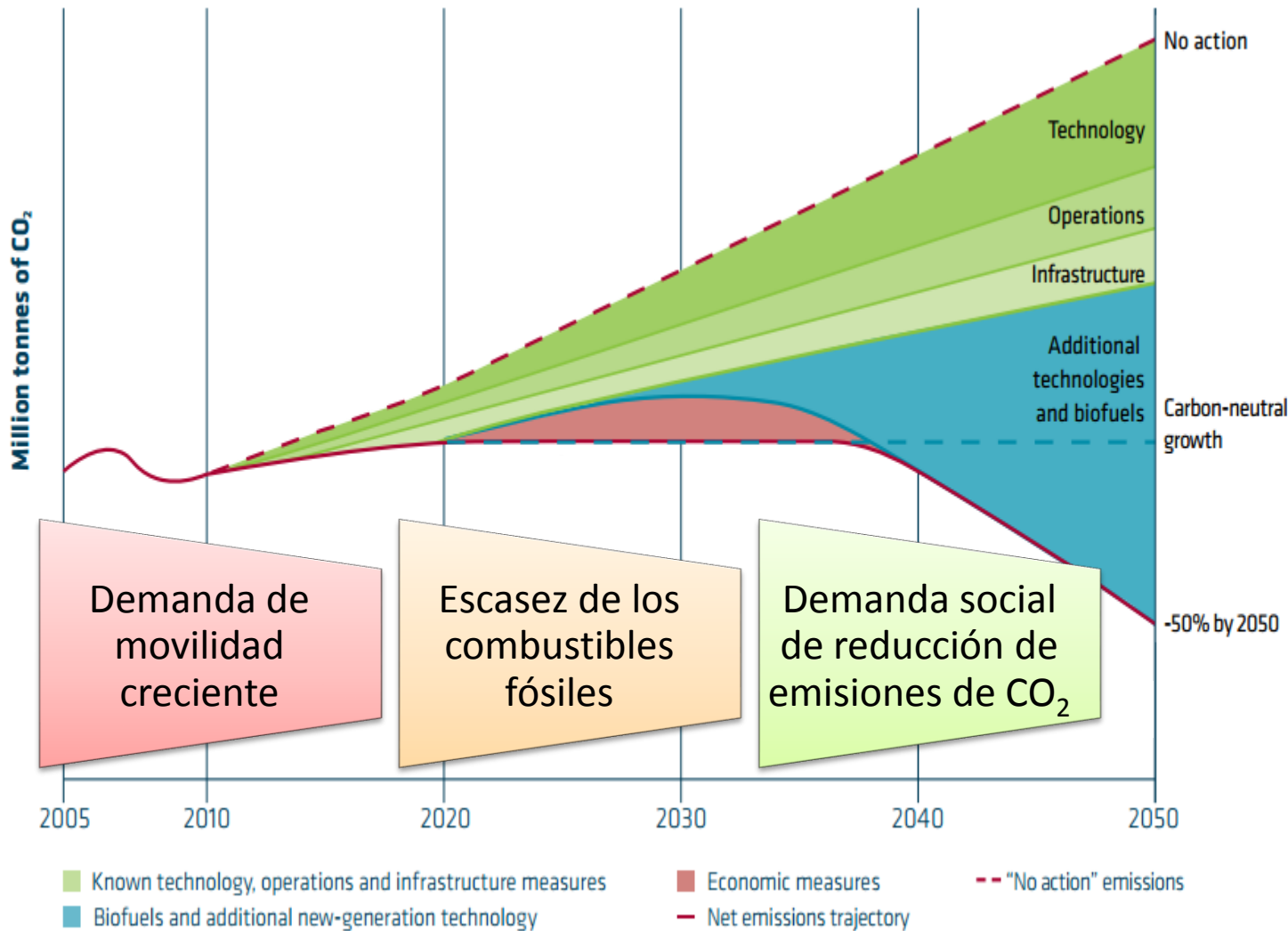


AERNNOVA Y EL ECODISEÑO EN CLEAN SKY 2 PARA EL HORIZONTE 2020

DR. MIGUEL ANGEL CASTILLO ACERO
AERNNOVA AEROSPACE







Se precisa de una poderosa iniciativa económica para desarrollar tecnologías que hagan de la aviación una realidad más escalable, sostenible, neutra en emisiones de carbono y al mismo tiempo más económica

Air Traffic Action Group, “A sustainable flightpath to reduce emissions. UNFCCC Climate Talks, Doha,” Nov. 2012.

2 Substantive Principles

- Qty., Sfty., Environmental impacts accountability
- Respect to Human Rights and Consumer Rights
- Just and Safe Business and Labour Practices
- Good Corporate Governance Principles
- Involvement on Community

1 General Principles

- Respect to the Rule of the Law
- Respect to the Rights of the Parties

3 Operational Principles

- Transparency
- Rendering of accounts
- **Mastery of the activity (Life Cycle)**
- Preventive planning of our commitments with the parties
- Proportionality in the operative control

ISO 26000
GUIDE TO INTEGRATE
CORPORATE SOCIAL
ACCOUNTABILITY



Determination and revision of requirements and risks associated to the Quality and Safety of Products and Services



Determination and revision of environmental aspects (Product Life Cycle)



Determination and revision of aspects and risks on Health and Safety

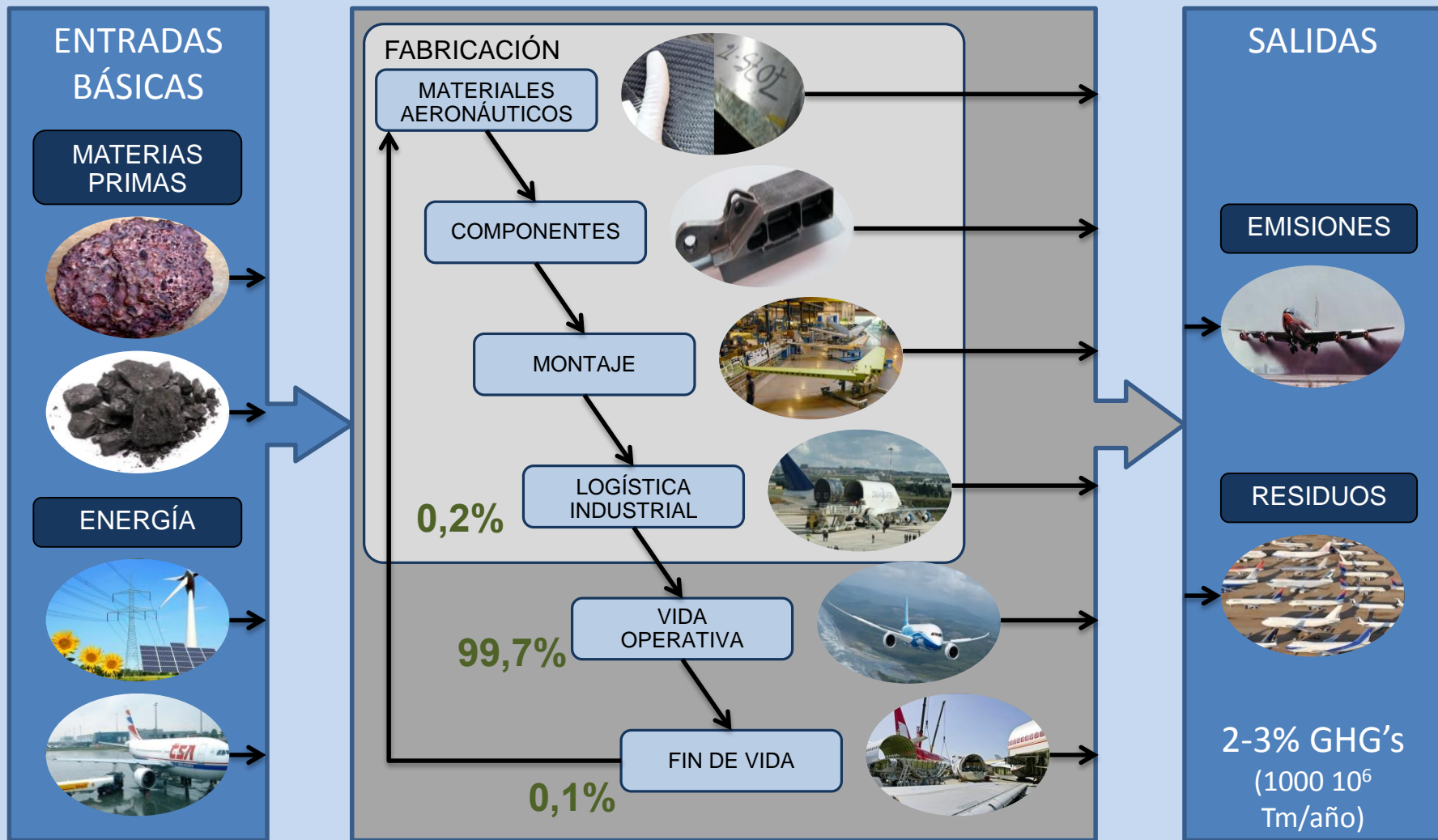


Determination and revision of Labour and Social aspects

Relevant Aspects and Characteristics

(Those that could make a significant change on products, services, environment, H&S, community)

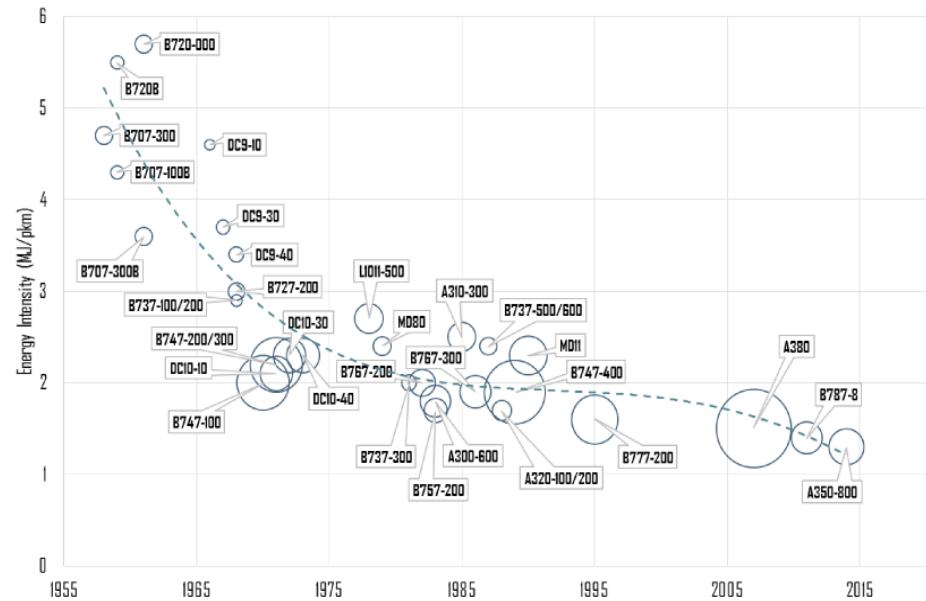




Ecuación de Breguet simplificada para velocidad y configuración aerodinámica constantes:

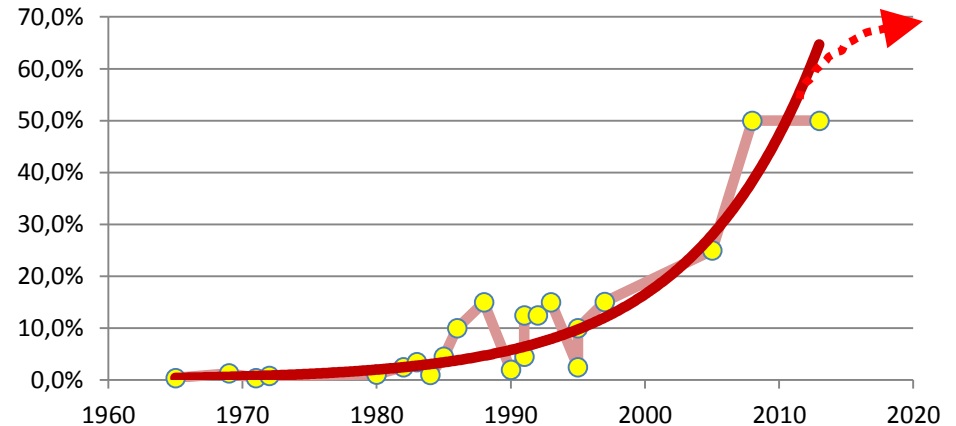
$$\text{Radio de acción} = \frac{\text{Velocidad}}{C_e} \times \frac{\text{Sustentación}}{\text{Resistencia}} \times \ln \left(1 + \frac{P_{comb}}{P_{cp} + P_{vacio}} \right)$$

↑ Propulsión
↑ Aerodinámica
↑ Estructura y materiales



composite % structural weight

Composite structural weight % evolution



ACARE GOALS

(2001 → 2020)
(2015 → 2050)

Technology Domains

- Power plant
- Loads & Flow Control
- New Aircraft Configurations
- Low weight
- Aircraft Energy Management
- Mission & Trajectory Management

75%

50% CO₂
81% NO_x

90%

Reduced fuel consumption
(CO₂ & NO_x reduction)



65%

50% noise

External noise reduction



- Power Plant
- Mission & Trajectory Management
- Configurations
- Rotorcraft Noise Reduction

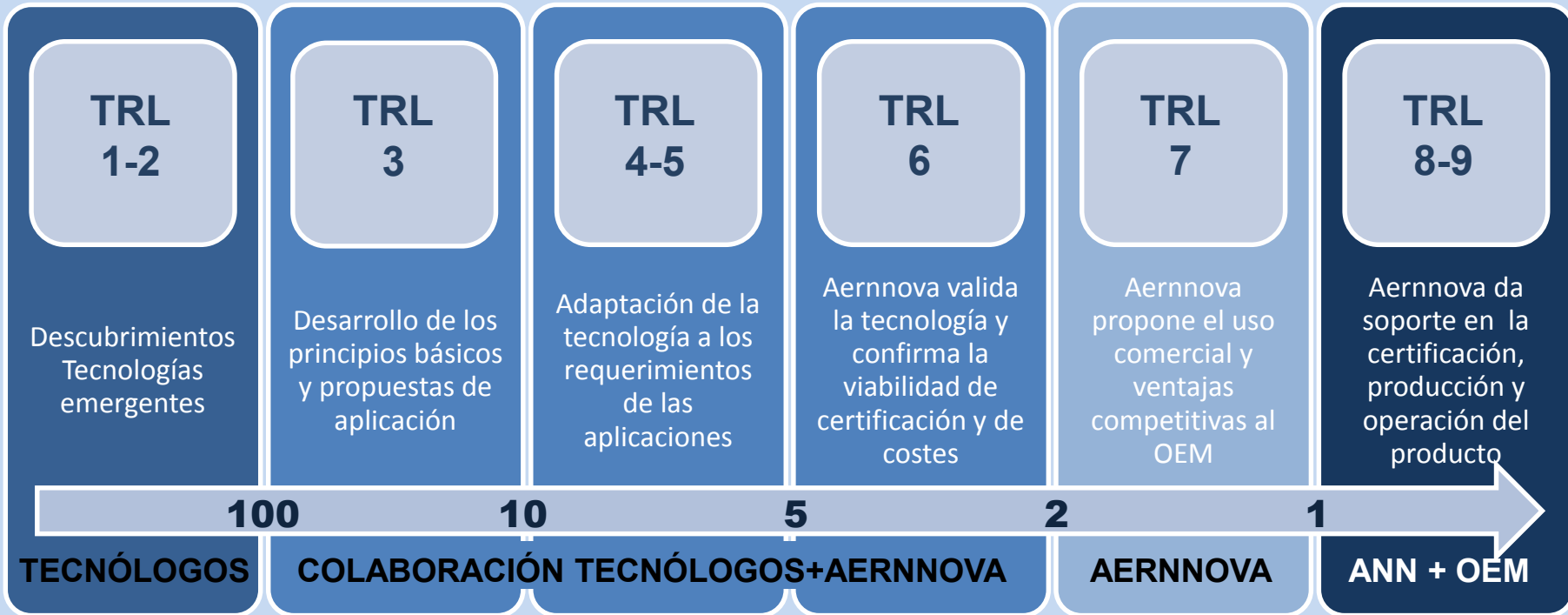
Green design..

"Economic" life cycle



Aircraft Life Cycle





CPW1:

- * HLFC HTP
- * REAREND (with FIDAMC)

Aernnova Clean Sky 2

CPW4: (approved 18sept2017)

- * HLFC WING (DLR, Onera, SONACA)

Vehicle
IADPs

Fast Rotorcraft
Augusta
Westland
Airbus
Helicopter

Large Passenger Aircraft
Airbus

Regional Aircraft

Alenia
Aermacchi

Eco-Design
Fraunhofer Gesellschaft

Airframe ITD

Dassault – EADS-CASA – Saab

Engines ITD

Safran – Rolls-Royce – MTU

Systems ITD

Thales – Liebherr

Small Air Transport
Evektor – Piaggio

Large
Systems
ITDs

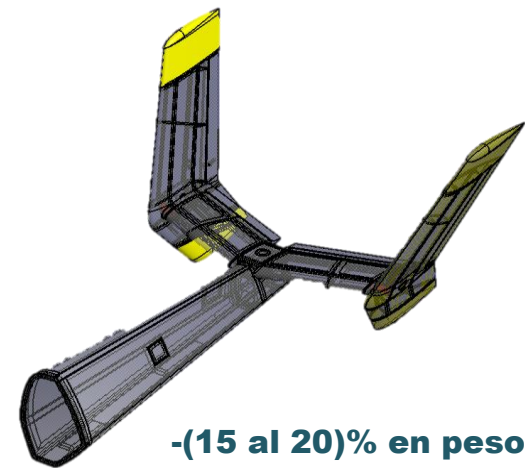
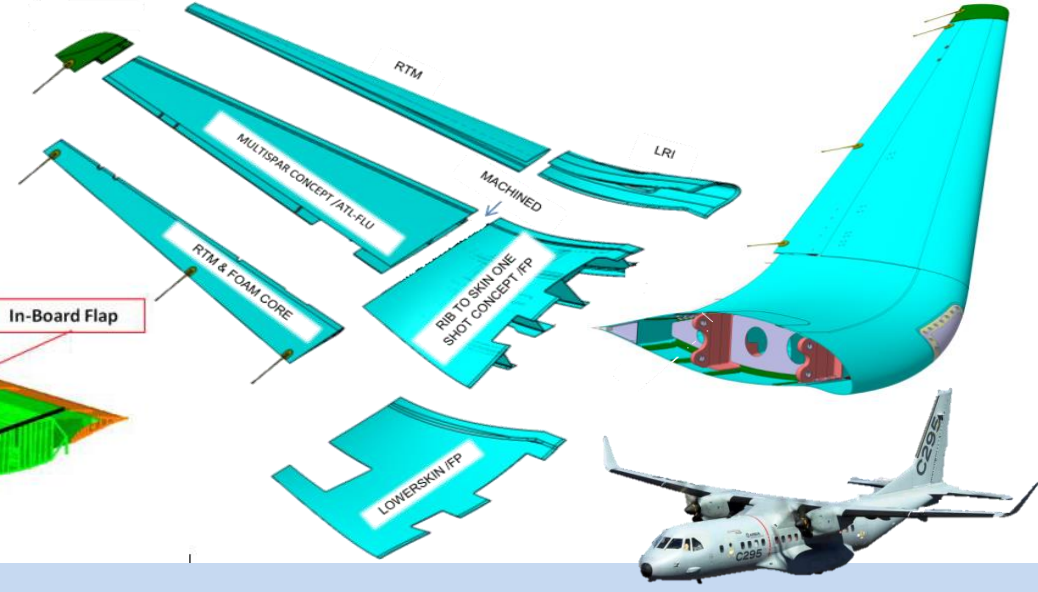
Technology Evaluator (TE)
German Aerospace Center (DLR)

CPW1:

- * OUTCOME (with TECNALIA+ FIDAMC+ CATEC+ CTA+ CT Ingenieros)

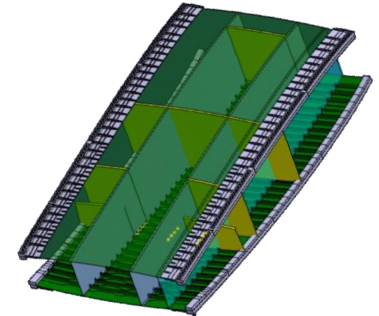
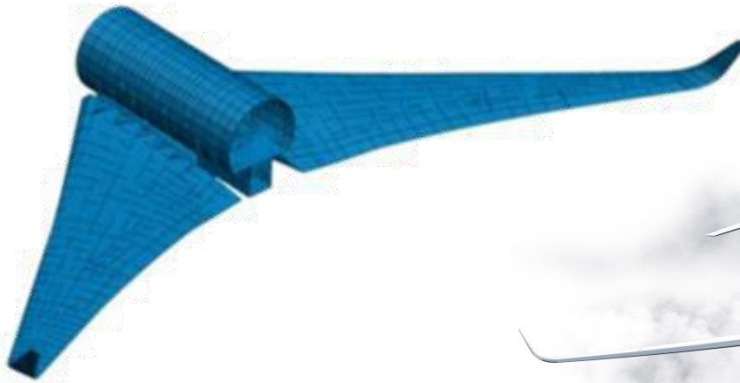
Aernnova @ITD Airframe: OUTCOME

-(15 al 20)% en peso



-(15 al 20)% en peso

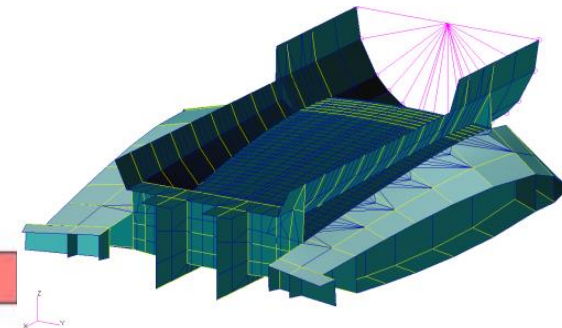
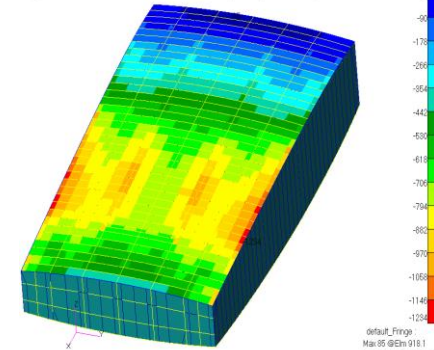
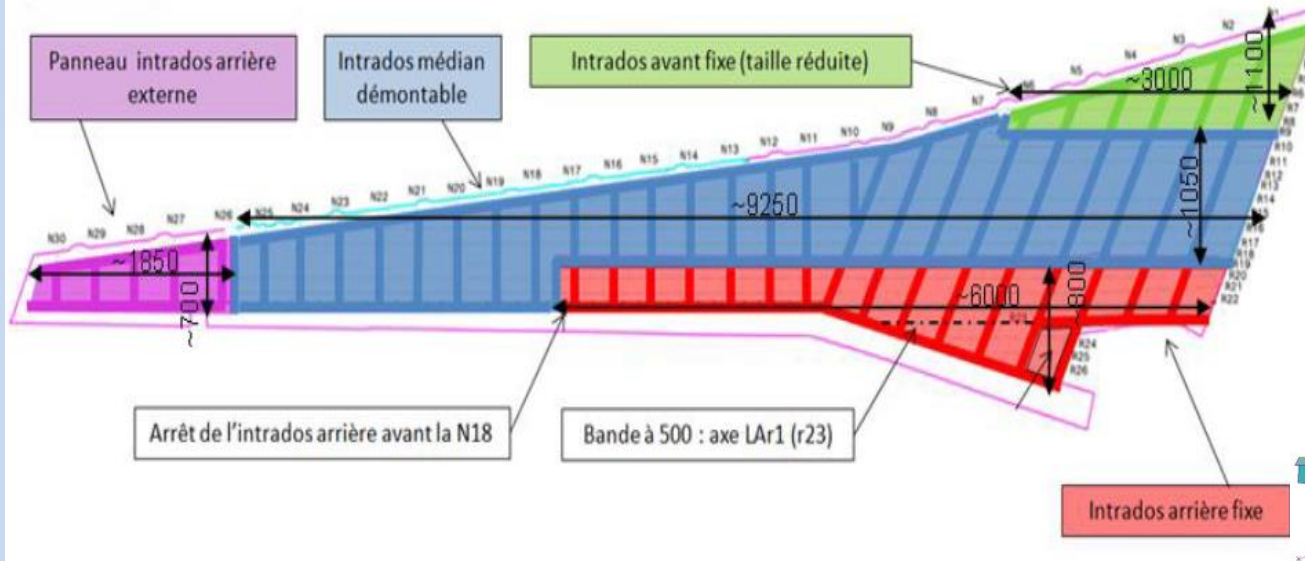
Aernnova @ITD Airframe: OUTCOME



Pfeifen 2018 1 2 64-Bit 16-Jan-17 15:15:11
Fringe_LGE_Static_Subcase_Shell_Forces_Force_Resultant_X_Component_(NON-LAYERED)

Intrados :

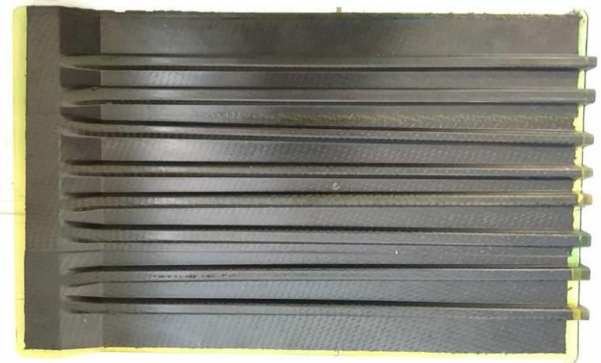
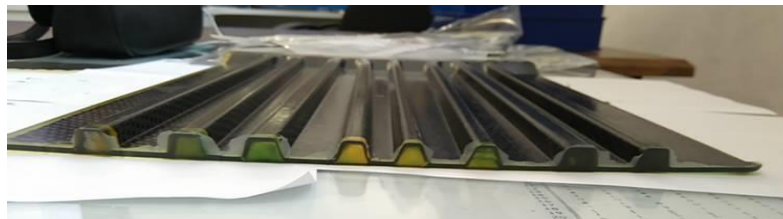
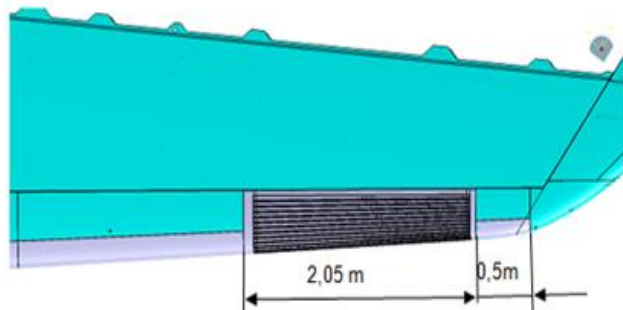
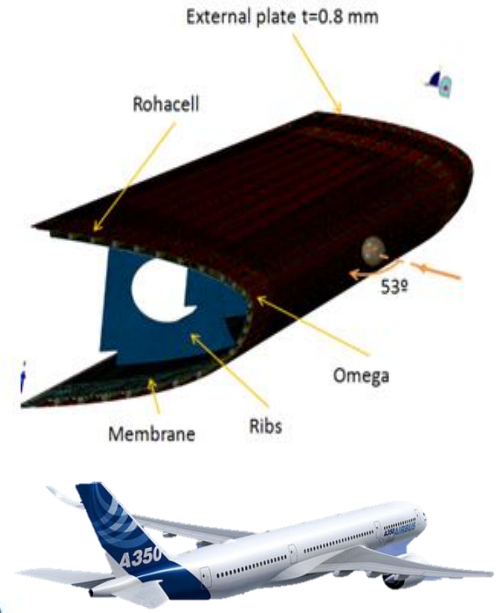
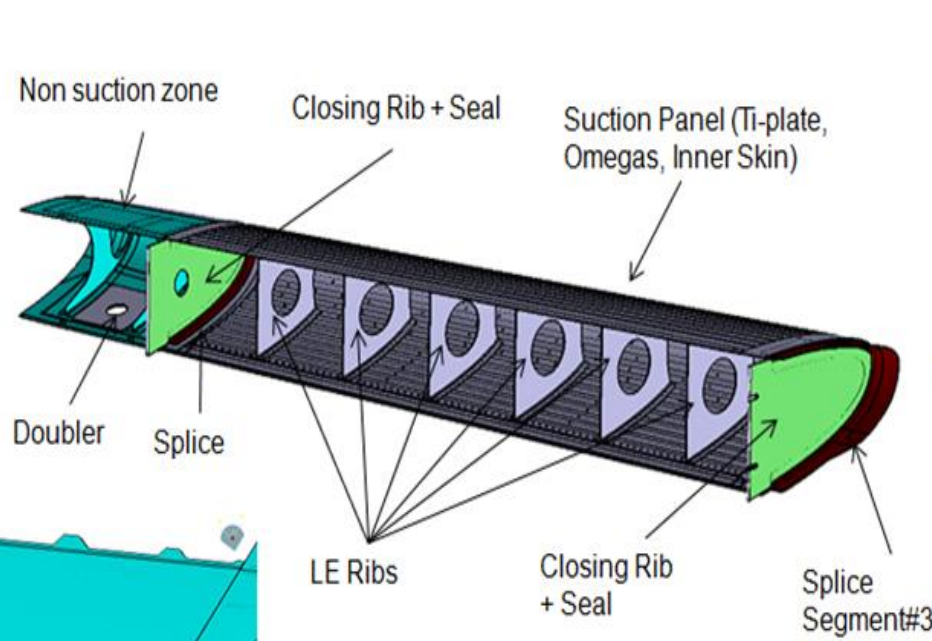
-(15 al 20)% en peso



Aernnova Composites @LPA: HLFC HTP

DMU Overview

-2% en resistencia aerodinámica
-2% en consumo




Aernnova Composites @LPA: Rear End



Aernnova @LPA HLFC: WING (approved 18 sep 2017)



Aernnova incorpora anualmente 650 Tm (2016) de estructuras de CFRP, en las aeronaves de nuestros clientes, las cuales pesarían unas 780 Tm empleando tecnologías convencionales (lo que supone un ahorro de 130 Tm anuales en peso a la flota mundial).



MODELO	LIFE	TYPICAL FC	AVERAGE WEIGHT	FUEL BURN	FUEL BURN PER WEIGHT
ERJ145	60.000 FCs	1.25 h/FC	18.500 kg	1.075 kg/h	4.350 kg fuel/kg AC
A380	19.000 FCs	10 h/FC	410.000 kg	11.500 kg/h	5.330 kg fuel/kg AC
AERNNOVA MIX					4.650

El ahorro de 130 Tm anuales en el peso de las aeroestructuras de CFRP de Aernnova, supone un ahorro de $604,5 \cdot 10^6$ Kg de combustible a lo largo de su vida operativa.





- 604,5·10⁶ Kg

1 kg Jet A-1 → 2,87 kg CO₂

- 1.734.915 Tm/año 



20.000 km/año → 3,2 Tm CO₂

-542.160
coches



1 Alcornoque ≈ 2 Tm CO₂

867.457 árboles

Un beneficio ambiental equivalente a un bosque de 28,5 km² = 15 PTA



