



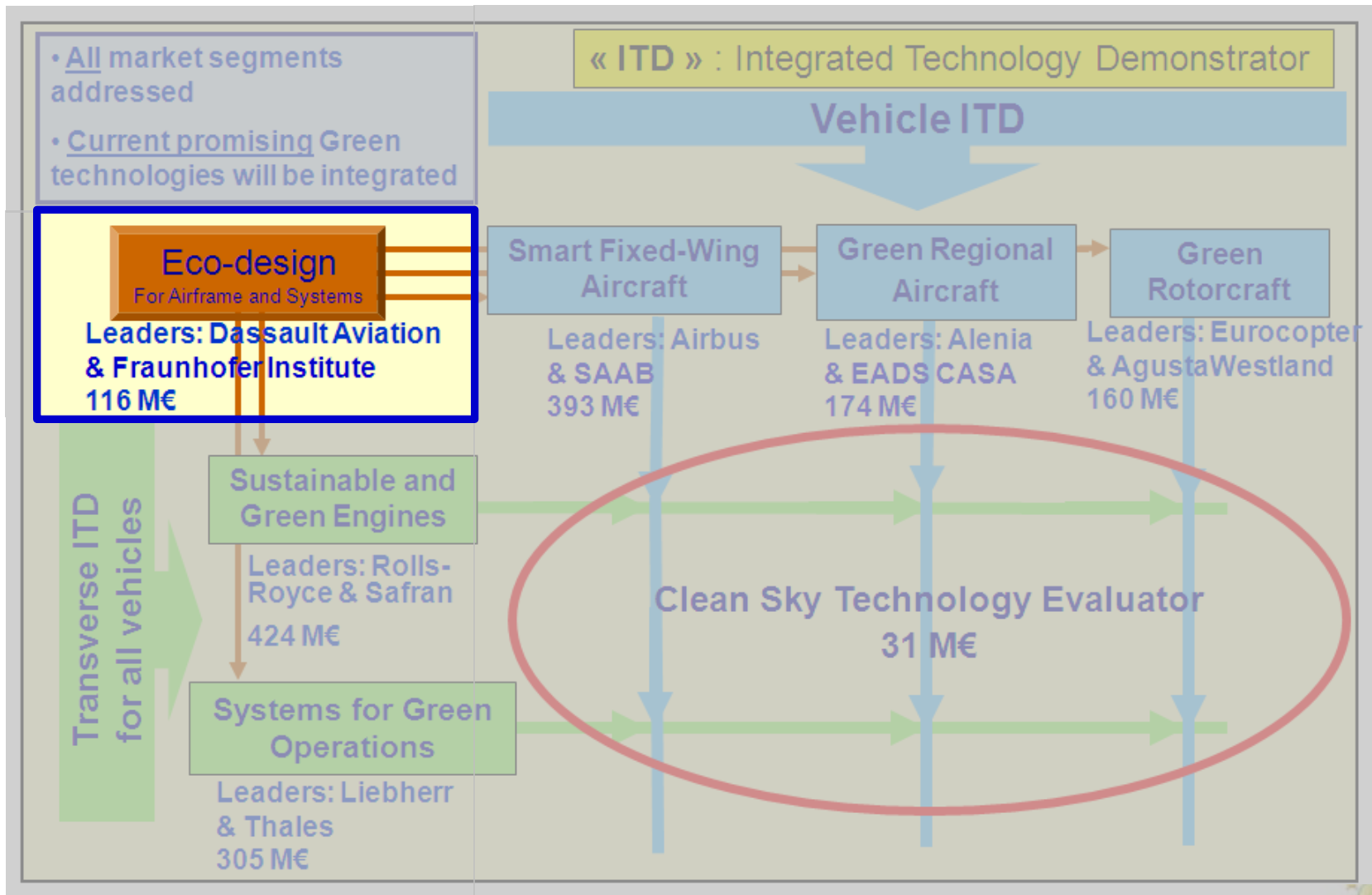
Eco-Design ITD

V. Selmin, CSJU Project Officer

Clean Sky Call 11 Info Day

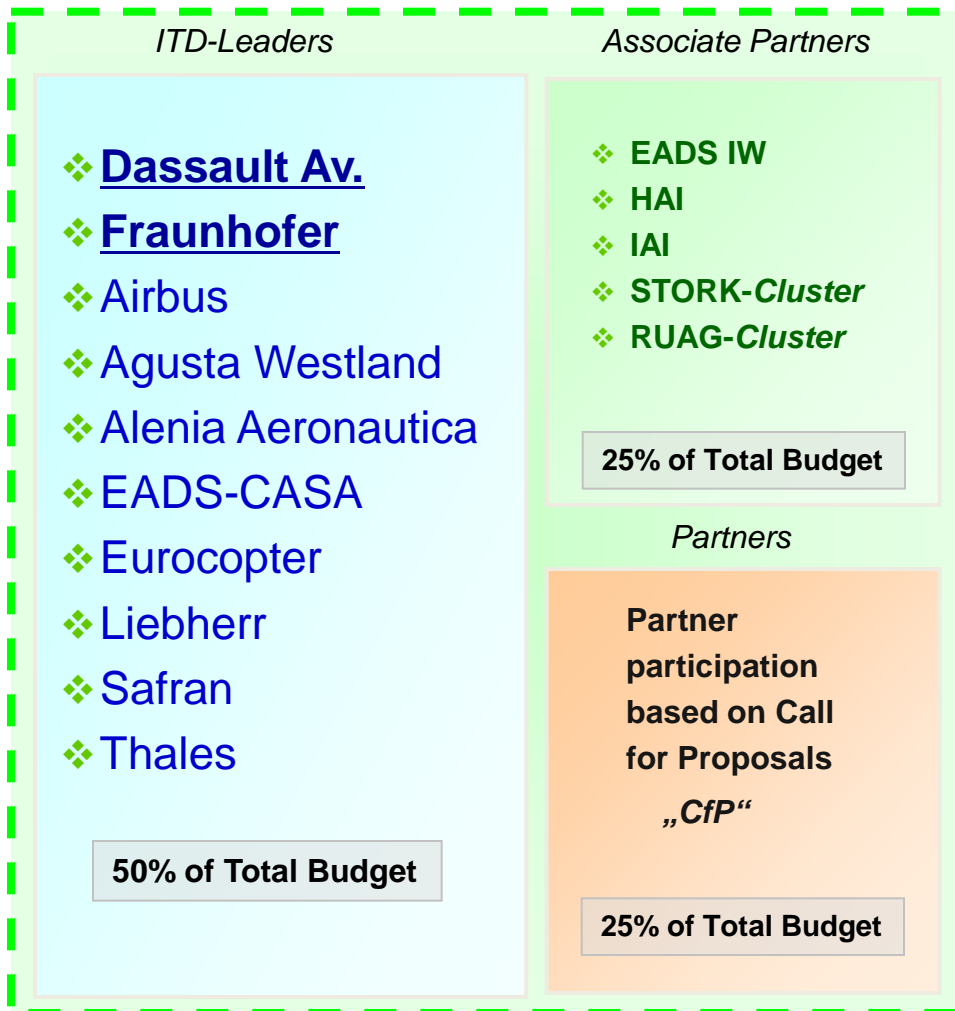
Brussels, 20th January 2012

Clean Sky ITD Organisation and Eco-Design Setup



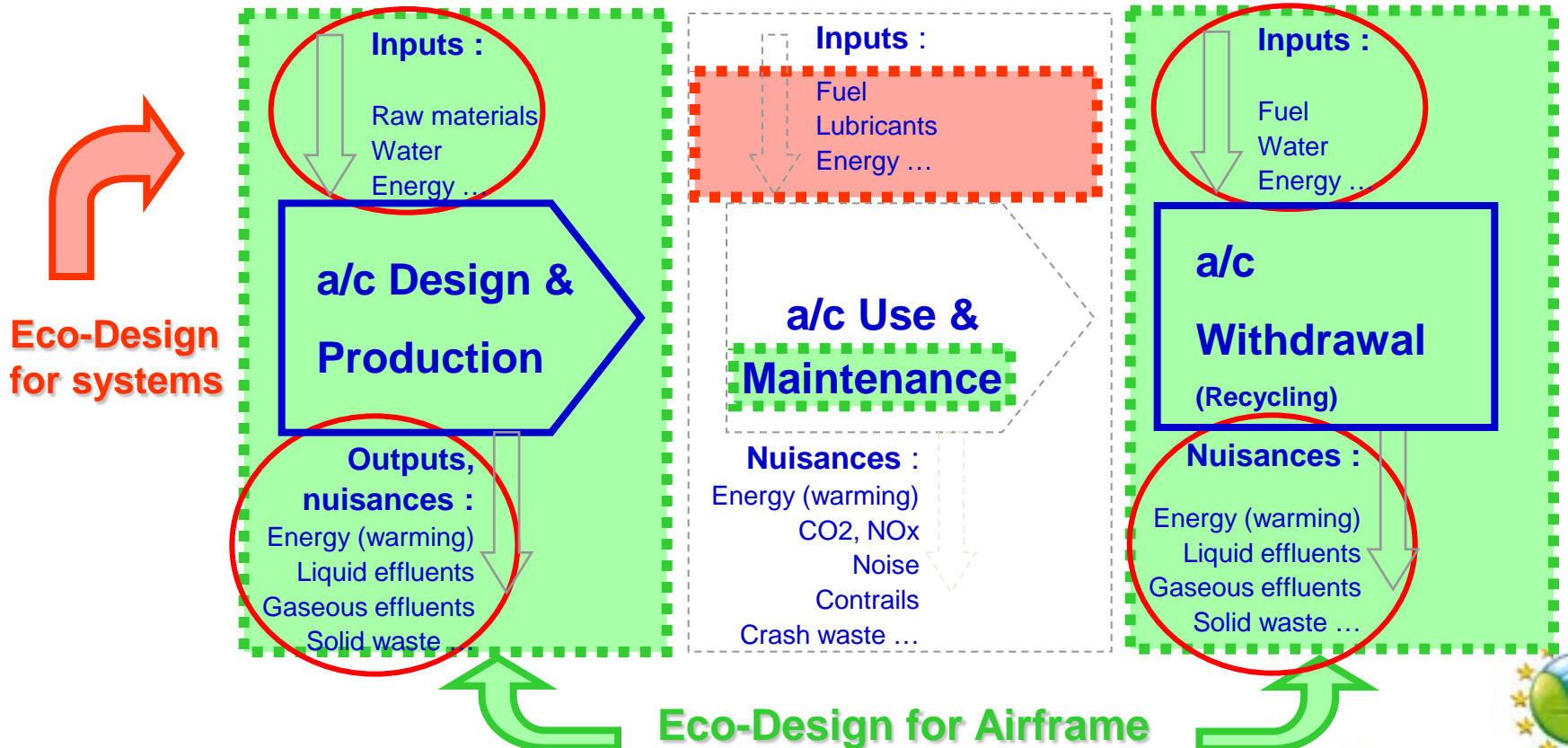
Eco-Design ITD Participants and Global Share

116M€ Total Budget

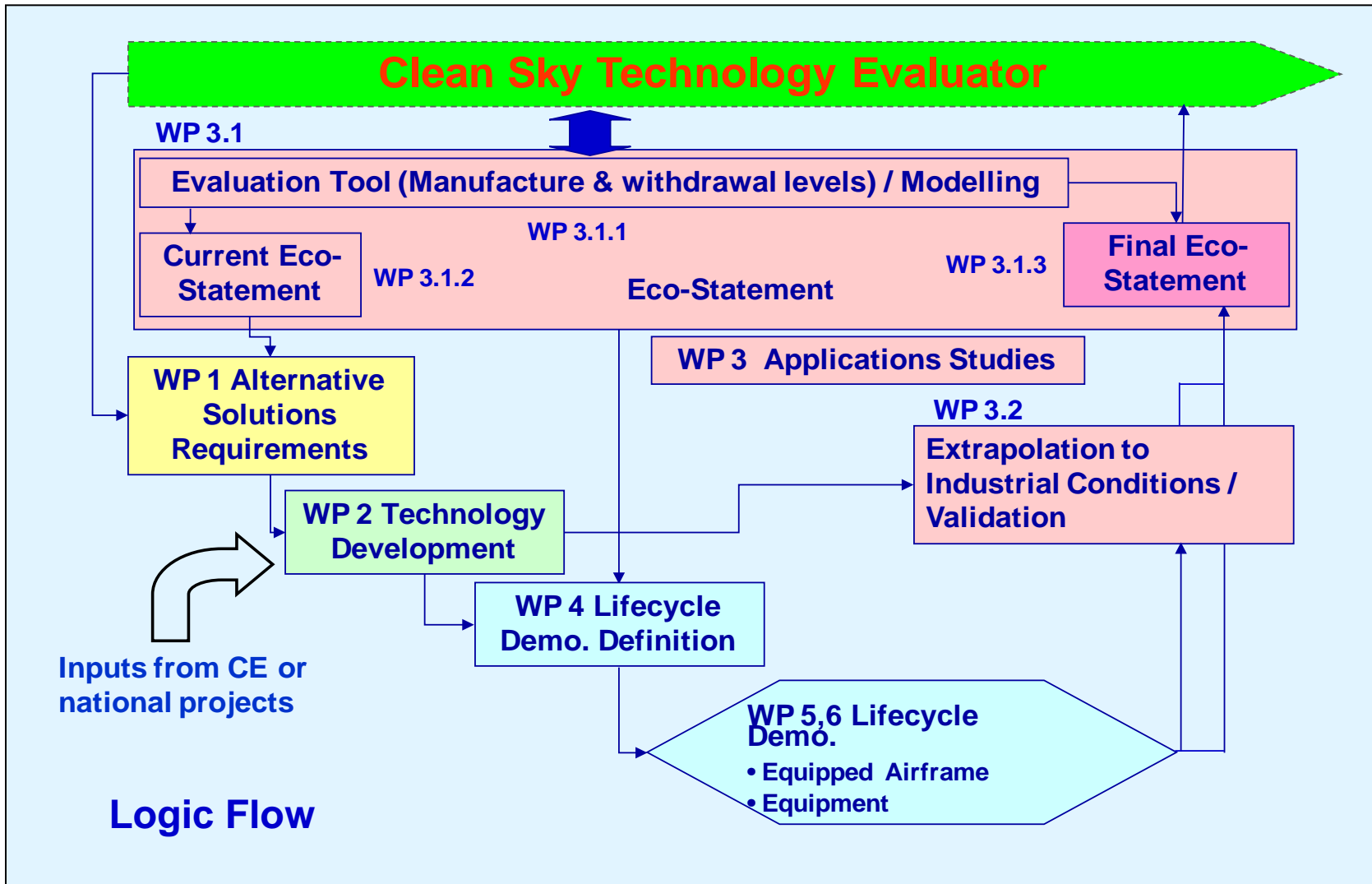


Eco-Design for Airframe & Systems

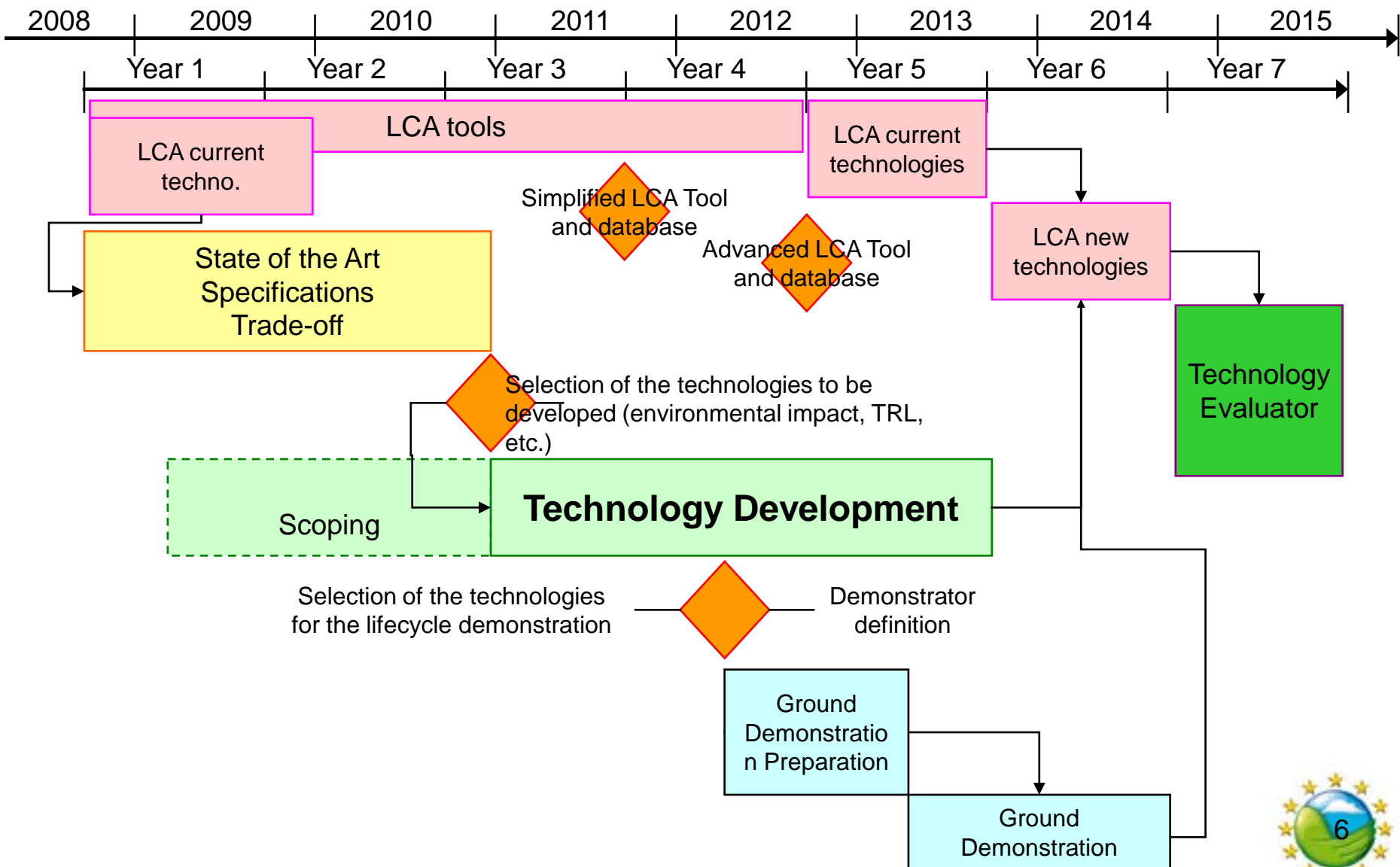
- To design airframe for decreasing inputs, outputs and nuisances during a/c design & production and withdrawal phases: **for Airframe Application (EDA)**
- To design architectures of a/c systems, towards the more/all electrical a/c, with the objective of reducing use of non-renewable and noxious fluids/ materials during operations and maintenance: **for Systems Application (EDS)**



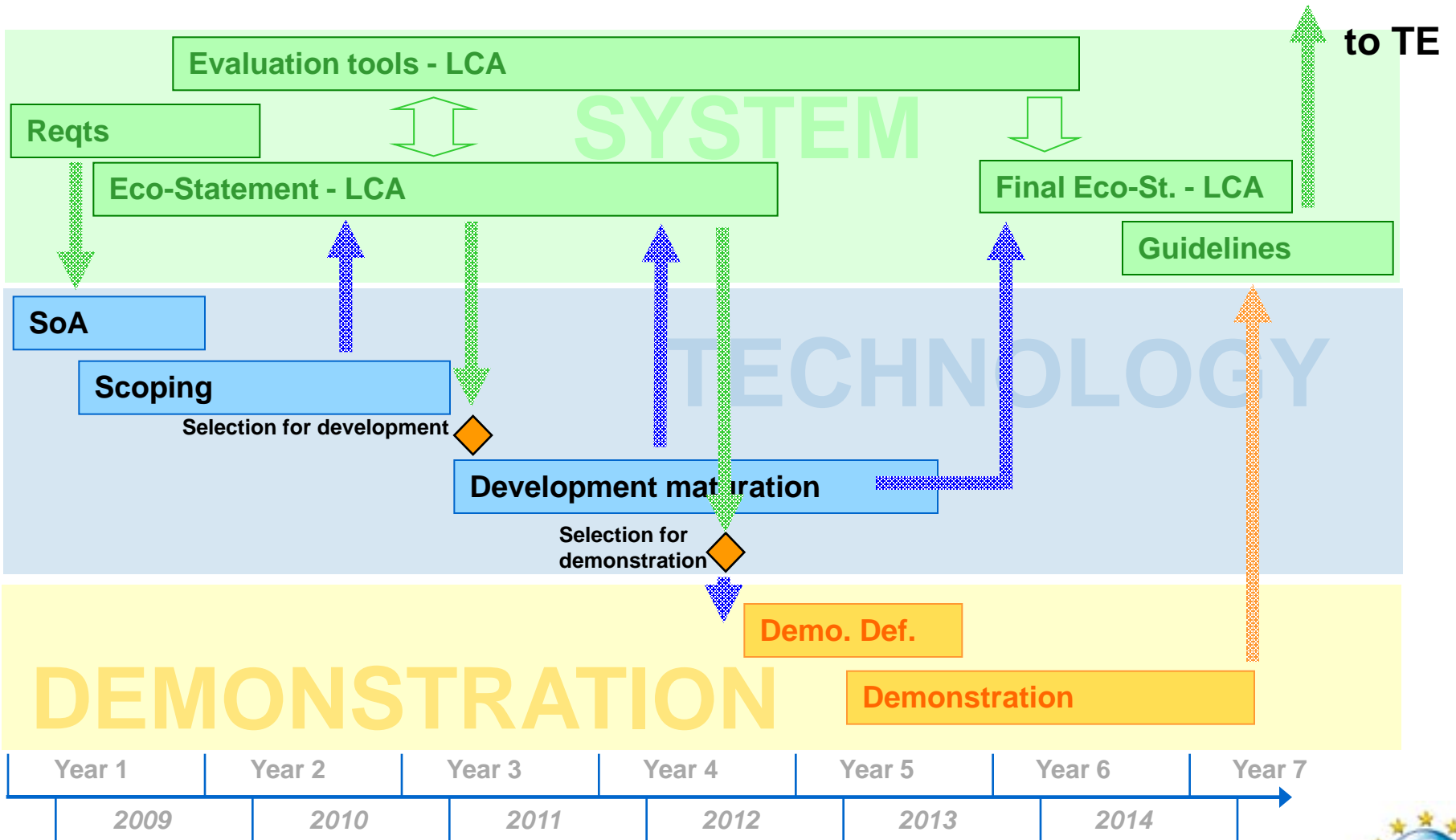
EDA Overview



EDA Logical Flow and Scheduling



EDA Overall Logic



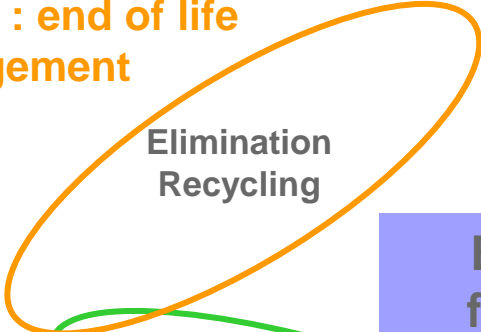
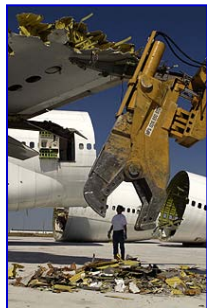
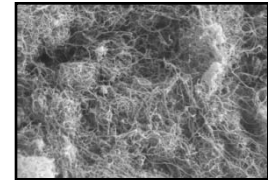
EDA Technical Areas



Area 4 : end of life management



Area 1 : new materials & surfaces



Eco-Design for Airframe

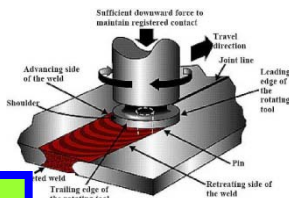
Raw Materials



Area 2 : green manufacturing



Area 3 : long life structure



General objectives : Eco-Design and Green Manufacturing

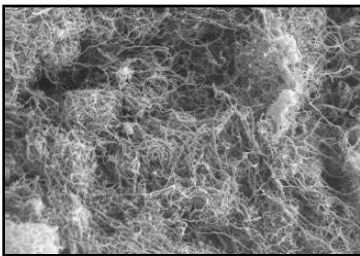
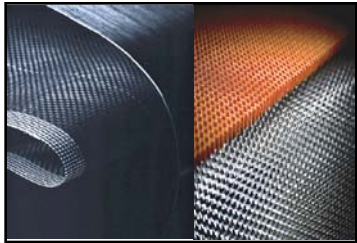


EDA Area 1: Materials

New materials – Requirements

❖ Structural function

- ▶ Performances : weight saving
- ▶ “Renewability” products
- ▶ “Recyclability”
- ▶ REACH (CMR...)
- ▶ Materials production processes : energy, cost, pollution



New materials – Requirements

❖ New functions

- ▶ Anti icing
- ▶ Low friction coating
- ▶ Self healing, self cleaning
- ▶ Electrical conductivity
- ▶ ...

Modelling

New emerging materials

❖ Composite

- ▶ Resins and fibres made from agriculture
- ▶ nanotechnology, molecular design
- ▶ Thermoplastics
- ▶ Others

❖ Metallic

- ▶ New light alloys
- ▶ Surface treatment, protection



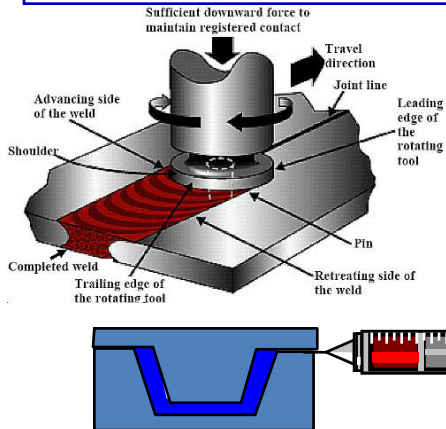
EDA Area 2: Manufacturing

New processes – Requirements

❖ Industrial

- ▶ Optimised Work Flow
- ▶ Highly integrated processes
- ▶ One shot process
- ▶ Dry process
- ▶ Low energy
- ▶ Low emissions (noise)
- ▶ Increased automation
- ▶ Recycling of ancillaries

❖ Societal



Materials – Requirements

❖ Current

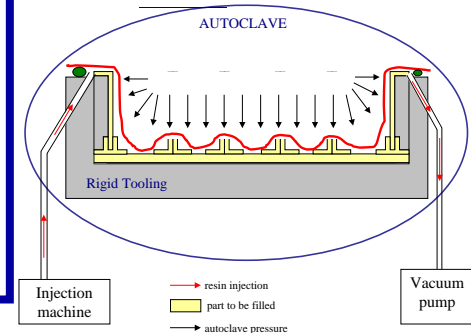
- ▶ Composite, metallic

❖ New

- ▶ Green Composites, metallic
- ▶ Low emissions (VOC, dust)
- ▶ Low production waste and scrap
- ▶ Recyclability

Green Factory

- ❖ Direct manufacturing
- ❖ Energy management
- ❖ Virtual Reality
- ❖ Manufacturing waste management



Modelling



EDA Area 3: Long Life Structure

Structural Diagnostic / Prognostic

- ❖ Health Usage & Monitoring
- ❖ Real time monitoring
- ❖ Smart sensors
- ❖ Non Destructive Testing

Green Repair Solutions

- ❖ Repair solutions for Thermoplastics
- ❖ Rework technologies
- ❖ Low energy techniques (Inductive devices, IR- devices, oil heated devices, ...)
- ❖ Repair of severe damages
- ❖ Testing and qualification of the repairs

Test Procedures

- ❖ Relevant vs in field experience
- ❖ Short testing cycle
- ❖ Ease of structure repair



EDA Area 4: End of Life Management

Dismantling processes

- ❖ Low energy
- ❖ Dry Processes
- ❖ Low effluents and waste



Materials end of life treatment for reuse, elimination, storage

❖ Metallic

- ▶ Separation, purification
- ▶ Storage of end products

❖ Organic

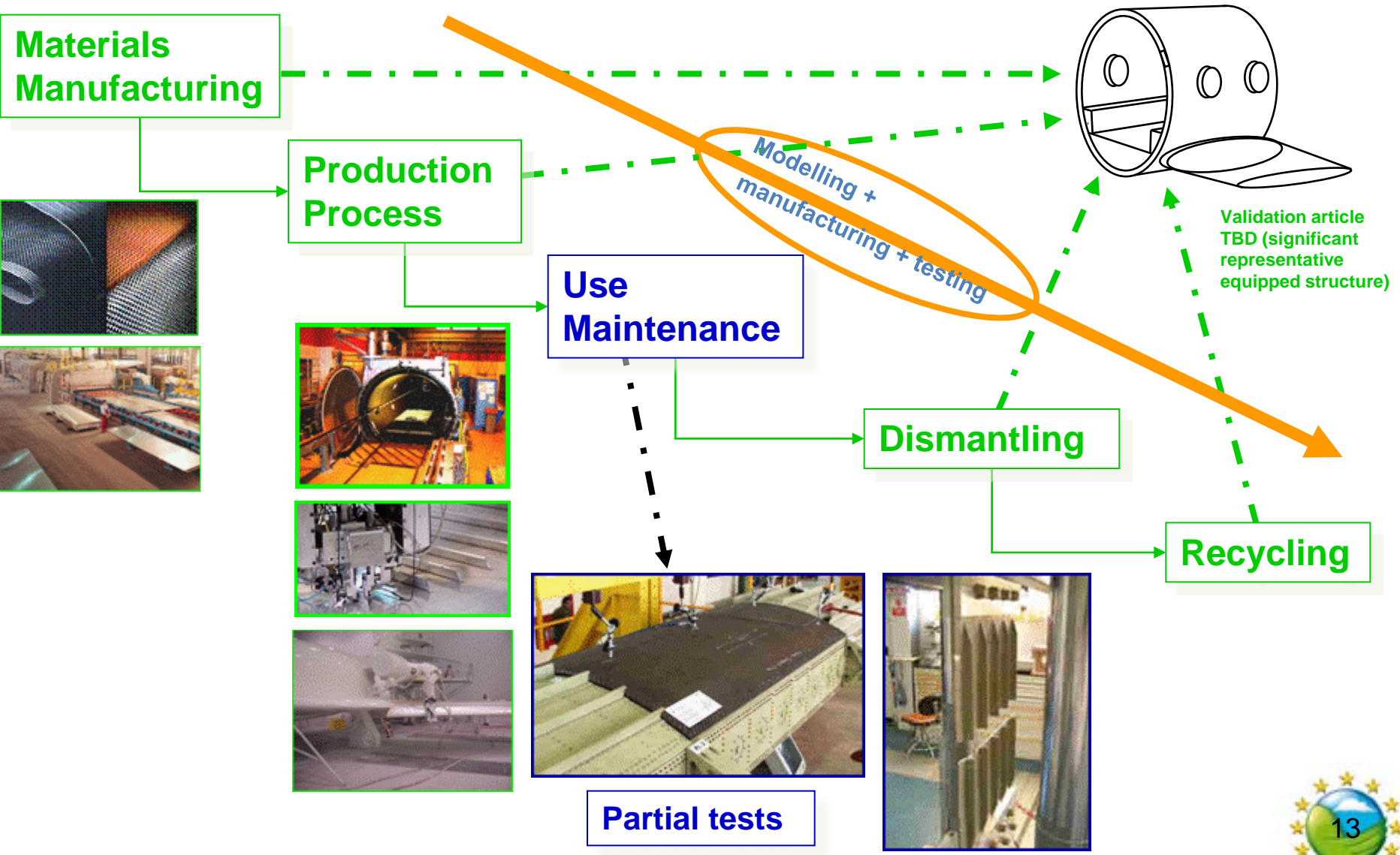
- ▶ Physical processing
- ▶ Chemical processing
- ▶ Biological processing
- ▶ Energy
- ▶ Storage of end products

❖ Equipment

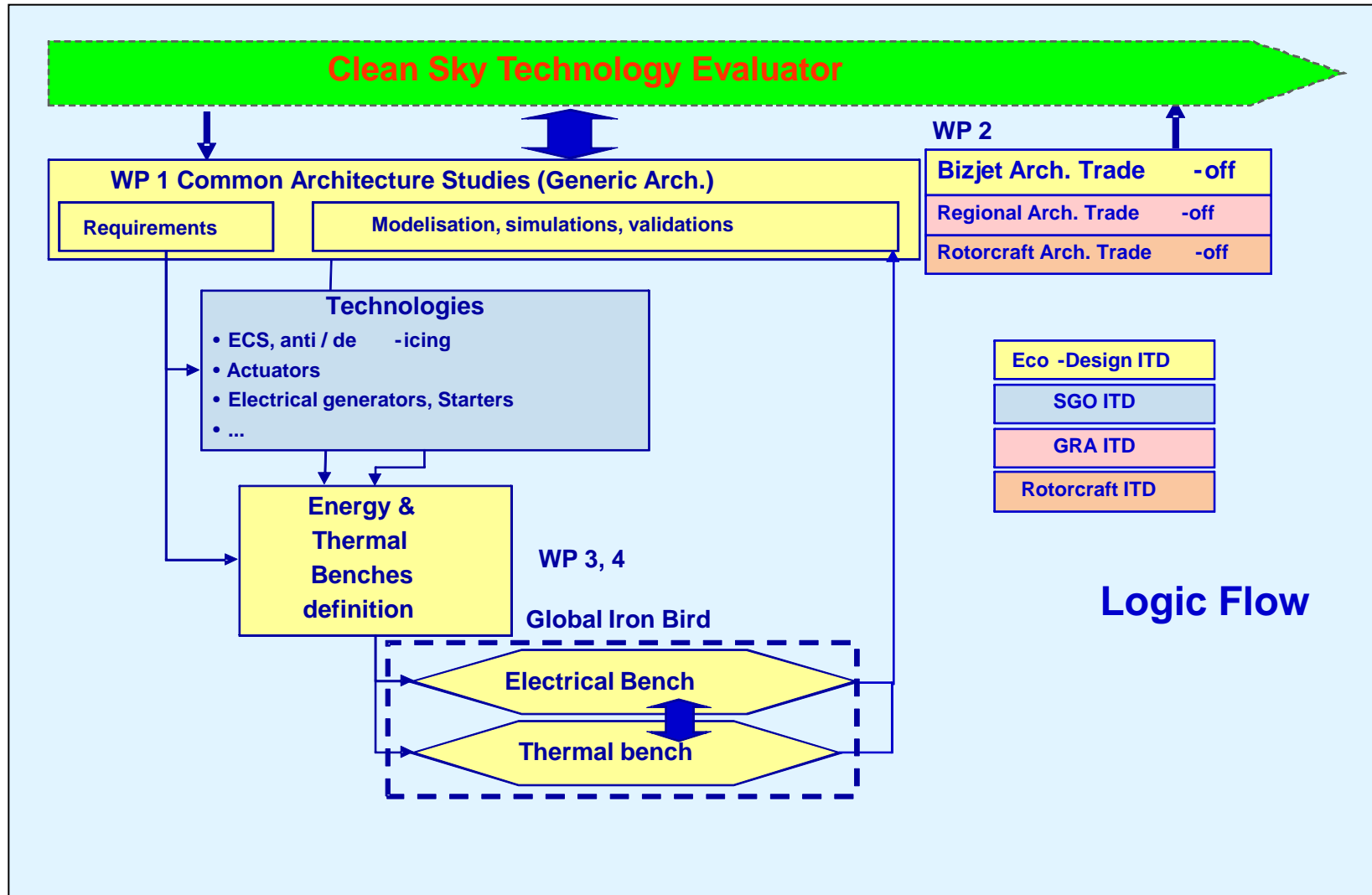
- ▶ Traceability all along the supply chain



EDA Lifecycle Demonstration



EDS Overview



EDS Demonstration

Ground demonstration for the All Electric Small Aircraft

- Electrical: high power network
- Thermal: on board aircraft heat transfers

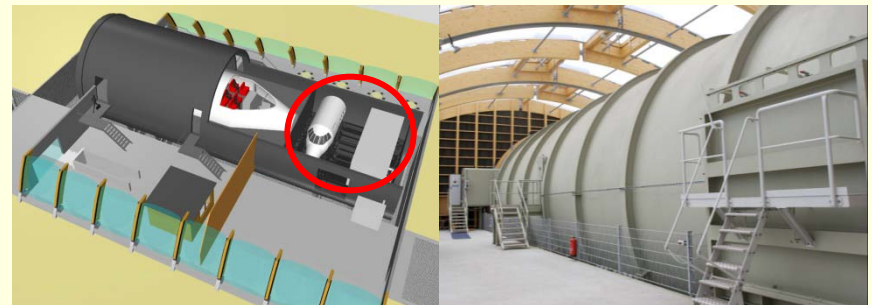
Electrical Ground Test

Hispano-Suiza (Colombes)

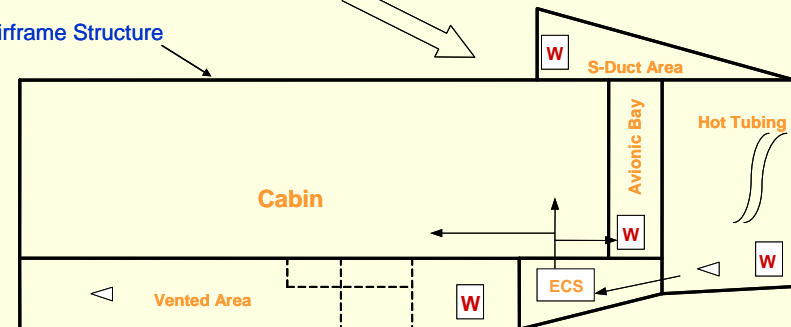


Thermal Test Bench

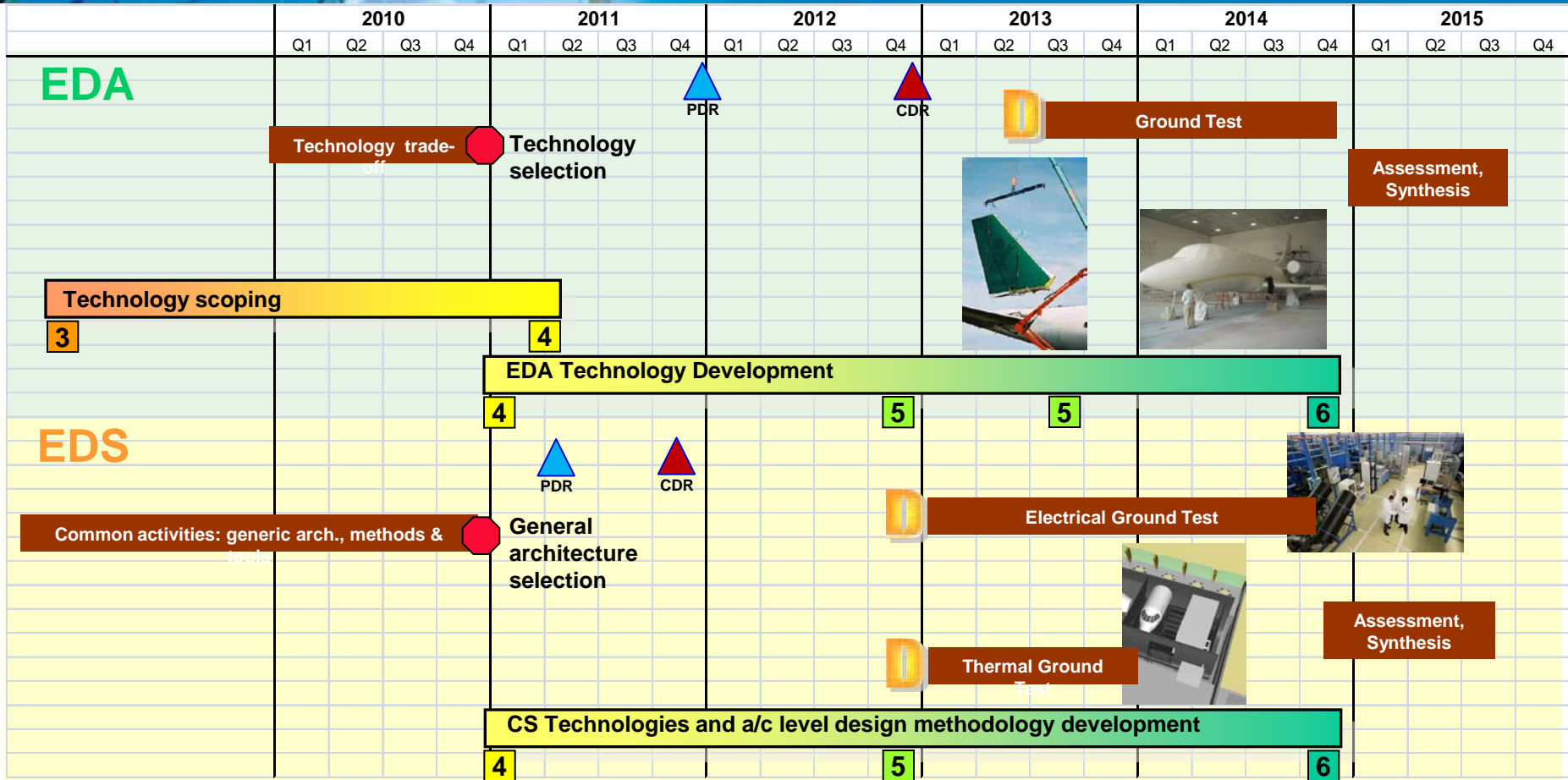
Fraunhofer (Holzkirchen)



Airframe Structure



Eco-Design ITD Master Plan



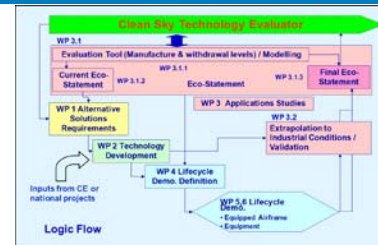
- CoDR
- PDR
- CDR
- Decision gate
- Review meeting
- Event
- Demonstrator

Bar of activity

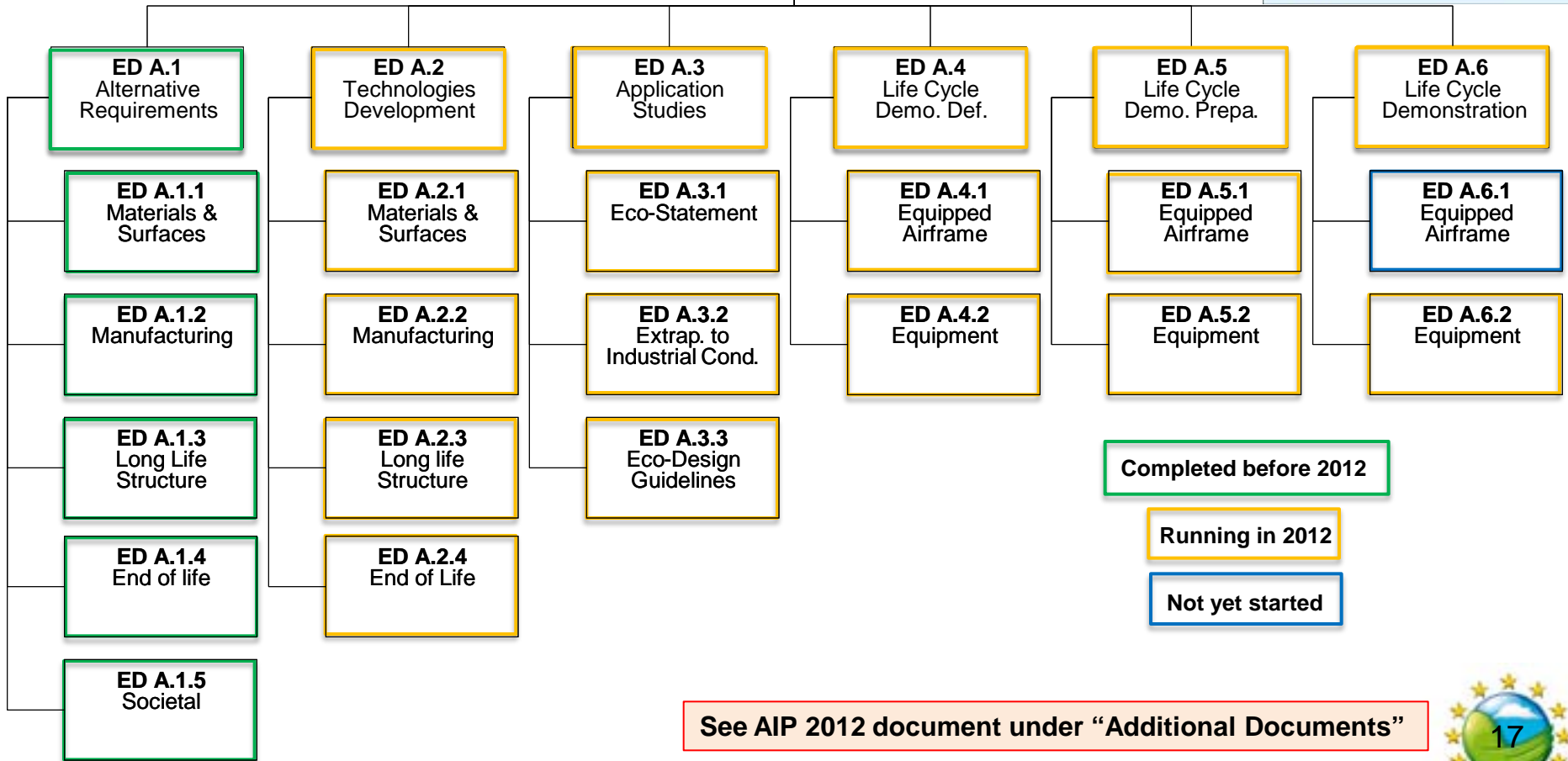
TRL scale 0 1 2 3 4 5 6 7 8



EDA Work Breakdown Structure – 2012 active WPs



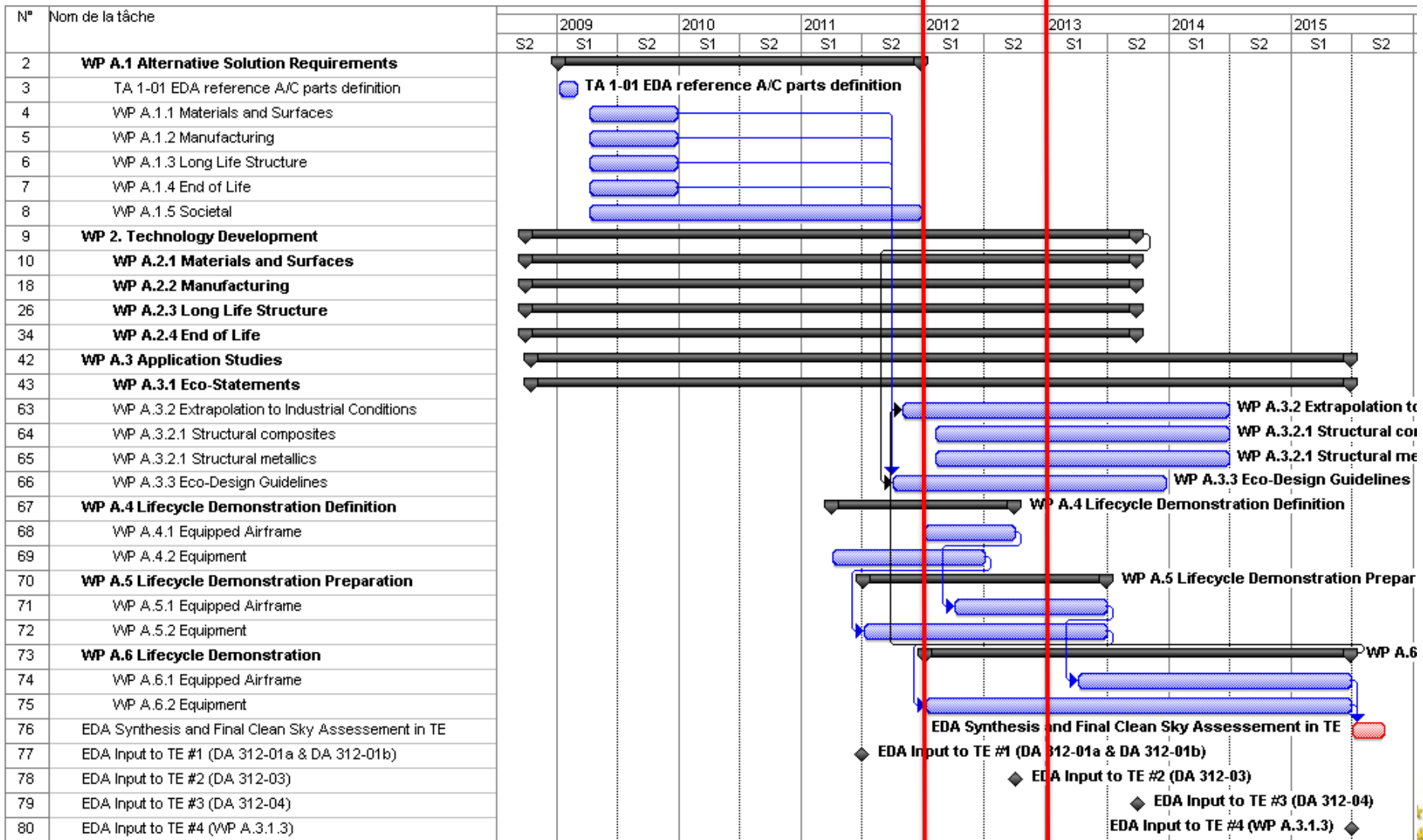
ED A Eco-Design for Airframe



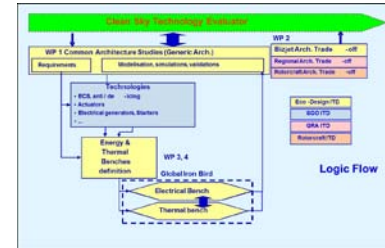
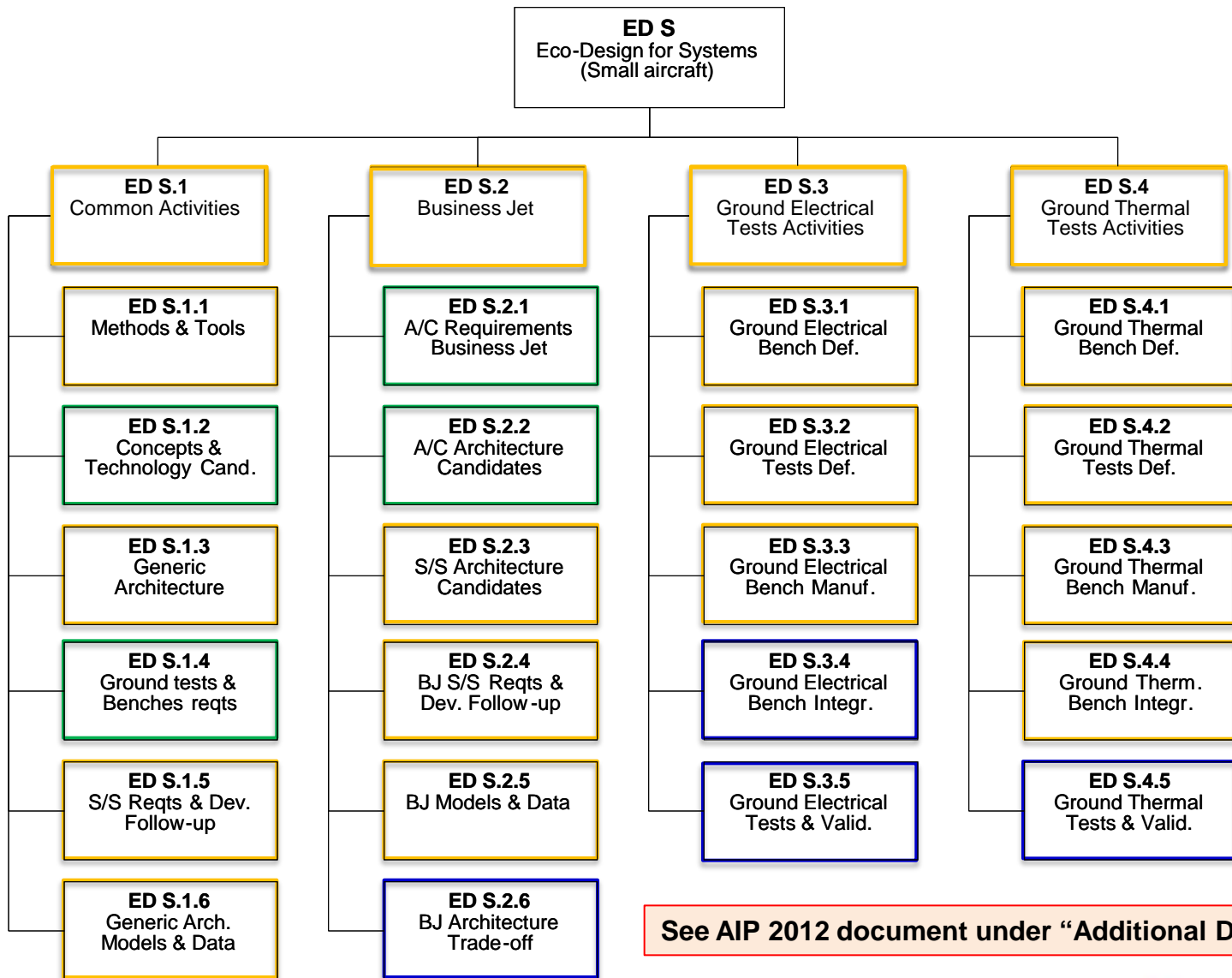
See AIP 2012 document under “Additional Documents”



EDA Master Plan



EDS Work Breakdown Structure – 2012 active WPs



Completed before 2012

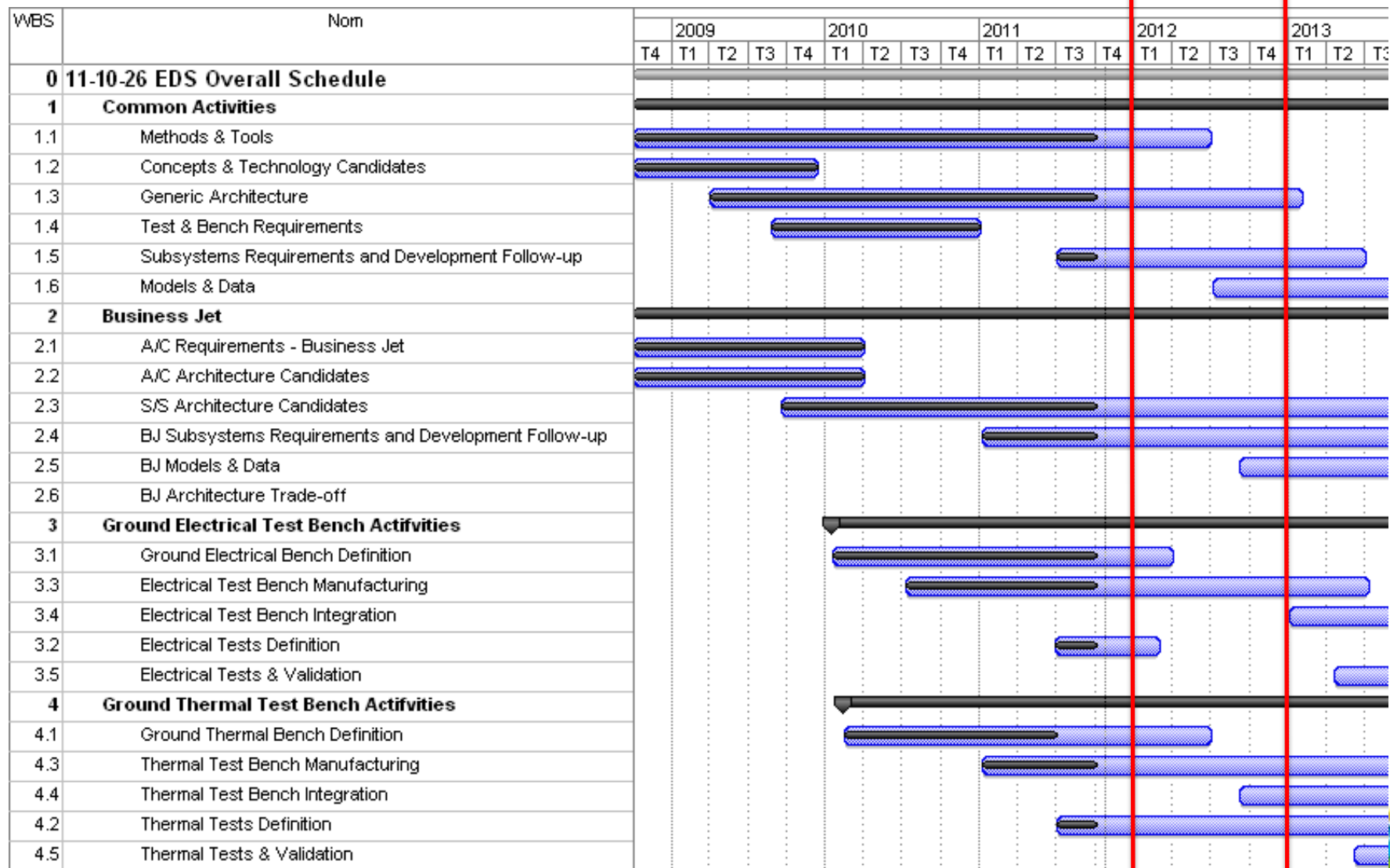
Running in 2012

Not yet started

See AIP 2012 document under “Additional Documents”



EDS Master Plan

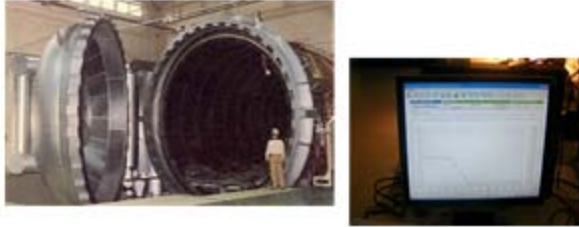


ED Call 11 CfPs in 2012

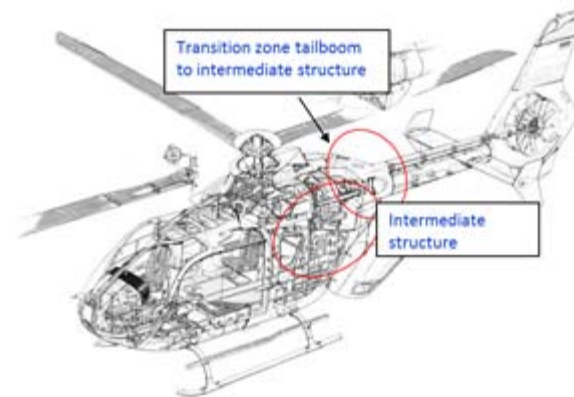
JU Ref.	CfP Title	Est. budget [k€]
JTI-CS-ECO-01	Area-01	
JTI-CS-2012-1-ECO-01-041	Autoclave cycle optimisation	100
JTI-CS-2012-1-ECO-01-042	Technology Development for CFRP recovery/recycling	150
JTI-CS-2012-1-ECO-01-043	Process Investigations for Liquid Resin Impregnation (LRI) and Out-of-autoclave (OoA) curing of composites for high temperature applications	500
JTI-CS-2012-1-ECO-01-044	Methodology Toolbox for Accelerated Fatigue Testing of Fiber Reinforced Laminates	200
JTI-CS-2012-1-ECO-01-045	Process scale up for recovery and recycling of glass-fiber a/c insulation material in pilot scale	220
JTI-CS-2012-1-ECO-01-046	End of life aircraft material identification and material ageing characterization by Raman Spectrometry. Proof of concept of Ramanbased method for industrial use in recycling industry.	250
JTI-CS-2012-1-ECO-01-047	End of life aircraft material identification and thermal damage characterization by Fourier Transform InfraRed. Demonstration of FT IR-based method for industrial use in recycling industry.	150
JTI-CS-2012-1-ECO-01-048	End of life aircraft material identification by Laser-Induced Breakdown Spectroscopy. Proof of concept of LIBS-based method for industrial use in recycling industry.	150
JTI-CS-2012-1-ECO-01-049	Direct Manufacturing of stator vanes through electron beam melting	150
JTI-CS-2012-1-ECO-01-050	Metal recycling: Recycling routes screening and design for environment	280
JTI-CS-2012-1-ECO-01-051	Environmental friendly ancillary materials development	160
JTI-CS-2012-1-ECO-01-052	Development of a fully automated preforming line for the production of 3-D shaped composite dry fiber profiles by using the energy efficient chemical stitching process	300
JTI-CS-2012-1-ECO-01-053	Disintegration of fibre-reinforced composites by electrodynamic fragmentation technique	435
JTI-CS-ECO-02	Area-02	
JTI-CS-2012-1-ECO-02-013	Generic Architecture Electrical Network Analysis Model	250

EDA 2: Manufacturing

ECO-01-041: Autoclave Cycle Optimisation



ECO-01-043: Process Investigation for LRI & Out-of-autoclave curing of composite for high temperature applications



ECO-01-042: Technology Development for CRFP Recovery/Recycling



Recovery of uncured composite

ECO-01-049: Direct Manufacturing of stator vanes through electron beam melting (WP6.2)

Type of part to be manufactured



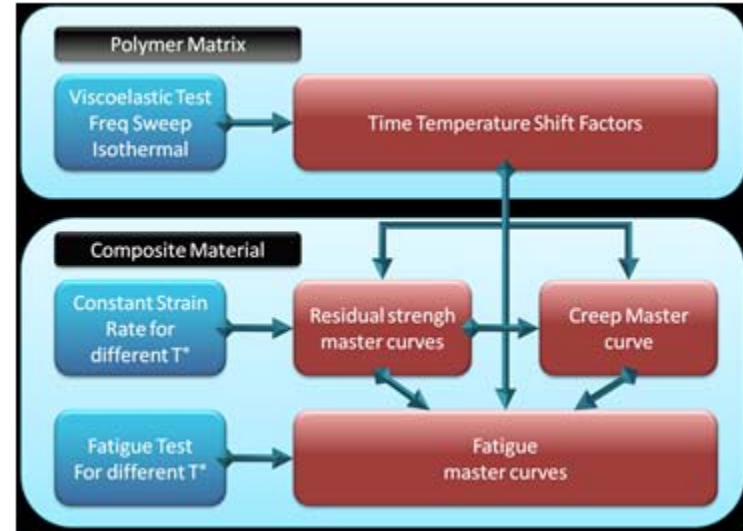
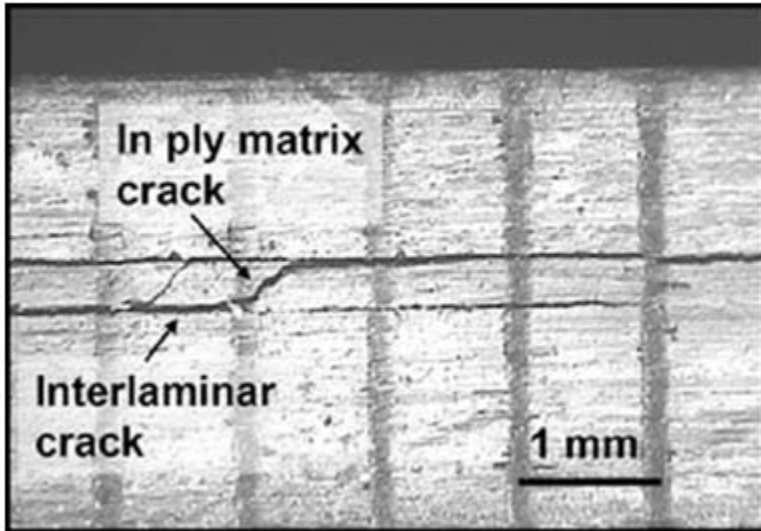
ECO-01-052: Development of a fully automated preforming line for the production of 3-D shaped composite dry fibre profiles by using the energy efficient chemical stitching process



Prototype to evaluate the Chemical-Stitching approach in lab scale

EDA 3: Long Life Structure

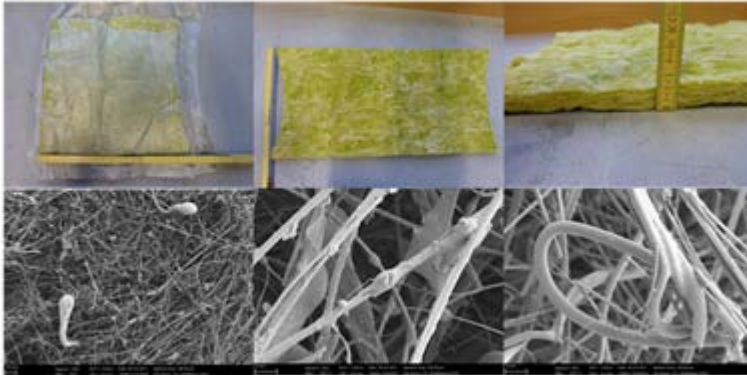
ECO-01-044: Methodology Toolbox for Accelerated Fatigue Testing of Fibre Reinforced Laminates



EDA 4: End of Life Management

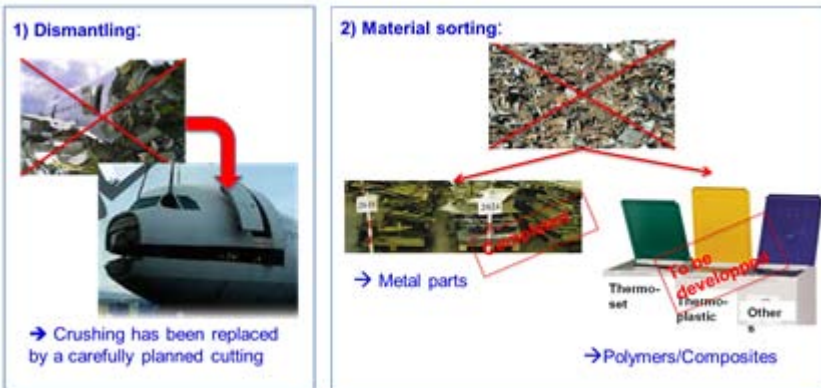
ECO-01-045: Process scale up for recovery and recycling of glass-fibre a/c insulation material in pilot scale

A/c insulation material



Microscope pictures of glass wool from a/c insulation bag

ECO-01-046/47/48: End of life a/c material identification & material ageing characterisation by Raman Spectrometry/ Fourier Transform Infrared/Laser Induced Breakdown Spectroscopy



ECO-01-050: Metal recycling: Recycling routes screening & design for environment

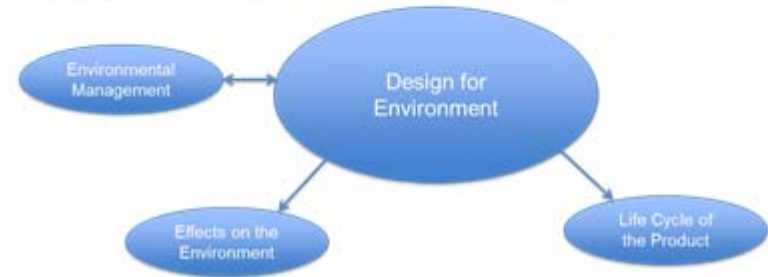
Melting and reshaping to alloys



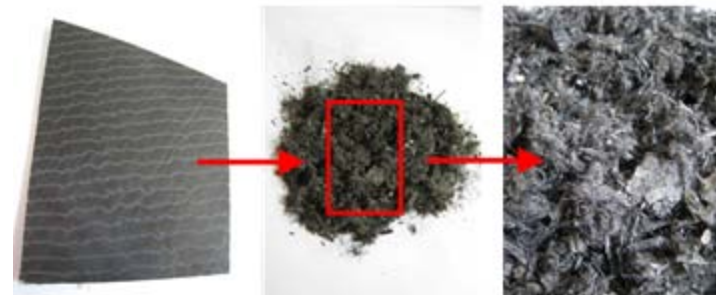
Aircraft graveyard in the US desert



Bicycle frames



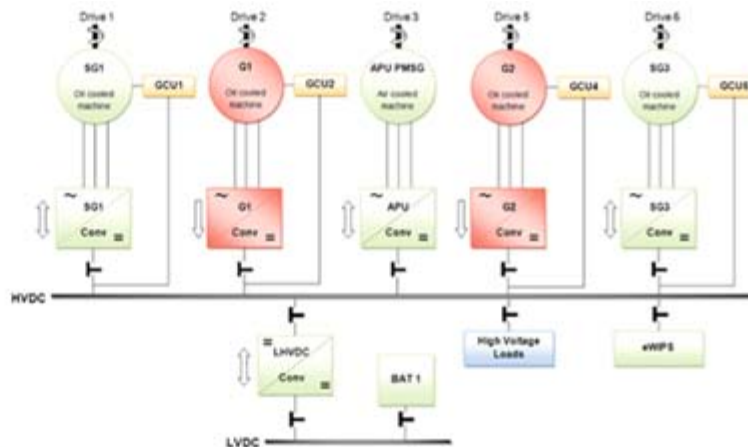
ECO-01-053: Disintegration of fibre-reinforced composites by electrodynamic fragmentation technique



Test specimen with carbon and glass fibres before and after electrodynamic fragmentation

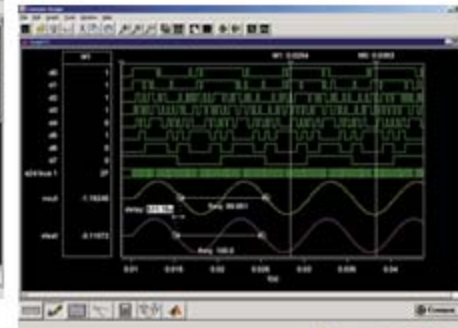
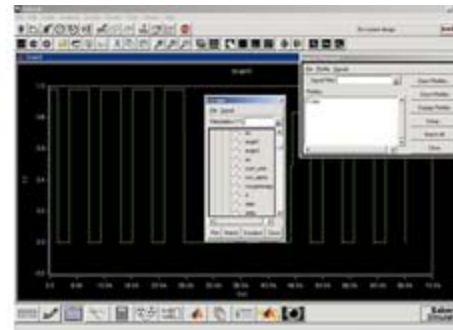
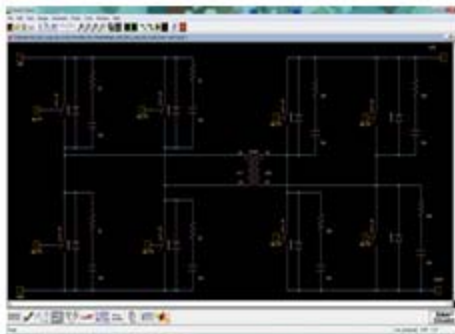
EDS 1.6: Generic Architecture; Models & Data

ECO-02-013: Generic Architecture Electrical Network Analysis Model



Example of a typical electrical network to be modelled

Electrical Network Analysis Model (ENAM) to be delivered in SABER format



ED Call 12 & 13 CfPs

Topic Description			
ID or N°	Title	CfP 12	CfP 13
ECO-01-xxx	TBD WP A.3.1 - Eco-Statement	290	
ECO-01-xxx	TBD WP A.3.2 - Extrapolation to industrial conditions	900	
ECO-01-xxx	TBD WP A.3.3 - Eco-Design guidelines	300	
ECO-01-xxx	TBD WP A.5.1 - Lifecycle demonstration preparation - Airframe	1200	
ECO-01-xxx	TBD WP A.5.2 - Lifecycle demonstration preparation - Equipment	200	
ECO-01-xxx	TBD WP A.6.1 - Lifecycle demonstration - Airframe	1500	
ECO-01-xxx	TBD WP A.6.2 - Lifecycle demonstration - Equipment	300	



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