SYSTEMS Demonstration Programmes in Clean Sky and Clean Sky 2

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System Demonstrations - Context

- Direct contributions to environmental objectives
- Smart answers to market demands
  - Increased Equipment performance for extended A/C needs
- Enablers for A/C innovations
- Enablers for Air Transport System optimisation

- Clean Sky Joint Undertaking
Clean Sky Mission and Trajectory Management

Main Demonstrators

- Optimized Departure Procedure – Pilot in the loop ground tests
- Advanced Weather Radar & EFB Trajectory Optimizer tests – test on Regional A/C Simulator
- Smart Operation on Ground – Full scale dynamometer tests
- Time and Energy Managed Operations Flight Tests
- FMS functions: Final test on simulator

Timeline:
- 2014-Q2
- 2015-Q2
- 2015-Q4
- 2015-Q4
- 2016-Q3
Focus : FMS functions

Demonstration of Trajectory optimisation function in Ground simulator :

- **Multi-criteria departure procedure** : optimisation according to mission condition  Q2-2014
- **Multi-Step Cruise** : real-time computation of optimal flight levels  Q4-2015
- **Adaptive-Increased Glideslope** : slope according to mission constraints  Q4-2014

Representative test environment

Pilot-in-the-loop validations
Clean Sky Management of Aircraft Energy
Main demonstrators

2012-Q4
Icing Wind Tunnel tests of 3 WIPS technologies

2014-Q3
Skin heat exchanger (LSHX) – A320 ATRA Flight Test

2015-Q2
Smart Electrical Power Distribution Center – Ground test

2016-Q1
Helicopter Electro-Mechanical Actuation System (HEMAS) System demonstration tests

2016-Q2
Electrical Environment Control System Flight tests


2012-Q4
Icing Wind Tunnel tests of 3 WIPS technologies

2014-Q3
Skin heat exchanger (LSHX) – A320 ATRA Flight Test

2015-Q2
Smart Electrical Power Distribution Center – Ground test

2016-Q1
Helicopter Electro-Mechanical Actuation System (HEMAS) System demonstration tests

2016-Q2
Electrical Environment Control System Flight tests
Skin heat exchanger (LSHX) - FLIGHT TEST in September 2014
Focus: electrical Flight Test Demonstrator (Q2-2016)

CLEANSKY 1 perimeter
Opportunities

CLEANSKY 1 perimeter
Opportunities
From *Clean Sky* towards *Clean Sky 2*

**Systems ITD follows and expands Clean Sky SGO activities**

- Management of Trajectory and mission will be included in wider, more integrated cockpit & mission demonstrations.

- Management of Aircraft Energy will carry on in WPs dedicated to innovative wing, electrical chain, ... new activities will address other issues in aircraft power management. Demonstrators and test rigs used in Clean Sky will be continued in Clean Sky 2 and completed with new integration environments.

- Systems ITD will focus on demonstration and tight integration with IADPs.

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**Systems ITD**

**IADPs**

**TRL up to 5**

**5/6**
Systems ITD main demonstrations (1/2)

Integrated Cockpit

Innovative Electrical Wing

Landing Gears Systems
Systems ITD main demonstrations (2/2)

Power Generation & Distribution

Major Loads

Systems for Small Air Transport

Cabin and Cargo
Project Members

Clean Sky – Systems for Green Operations ITD

... and more than 100 Partners

Clean Sky2 – SYSTEMS ITD

... and more to join soon
Thank you for your attention

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