



Systems for Green Operations ITD



Annual Implementation Plan 2009

ITD Systems for Green Operations

Annex 1E

RECORD OF REVISIONS

Revisions	Date	Description
Issue 0	29/09/2008	Creation of the document
Issue 1	27/11/08	Update for 2009
Issue 2	17/12/08	Update for 2009 with modifications proposed by Galileo Avionica in the description of their activities within WP3.3.
Issue 3	23/4/09	<p>WP 3.2.2 “Analysing the above results to derive implementable constraints for on board systems” activity postponed to 2010 (thus removed)</p> <p>WP 3.3.1 list of functions postponed to mid of July</p> <p>WP 3.3.2 activities postponed to 2010 (thus removed from this issue)</p> <p>WP 3.5 Tests performed on GATAC restricted to validation support instead of GRA model integration</p> <p>WP3.7 : Clarification of Safran’s activity for 2009</p>

Glossary

A/C	Aircraft
AEA	All Electrical Aircraft
ATRU	Auto Transformer Rectifier Unit
ATS	Air Transport System
ATU	Auto Transformer Unit
AW	AgustaWestland
BJ	Business Jet
CfP	Call for Proposal
CfP	Call for Proposal
CROR	Counter-Rotating Open Rotor engine
Ecg	Eurocopter Group
ED	Eco-Design ITD
FTI	Flight Tests Instrumentation
FTR	Flight Tests Request
G/T	Ground Test
GRA	Green Regional Aircraft ITD
GRC	Green Rotorcraft ITD
H/C	Helicopter
ITD	Integrated Technology Demonstration
ITD	Integrated Technology Demonstrator
IVV	Integration Validation Verification
L/G	Landing Gear
LN	Low Noise
LW	Low Weight
MTM	Mission and Trajectory Management
MTM	Management of Trajectories and Mission
NB	Nota Bene
OAD	? (in SFWA)
RRD	Rolls-Royce Deutschland
RRUK	Rolls-Royce UK
S/S	Sub-system ? (in ED)
SAGE	Sustainable and green Engine ITD
SFW	Smart Fixed Wing
SFWA	Smart Fixed Wing Aircraft ITD
SFWA	Smart Fixed Wing Aircraft



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SGO	Systems for Green Operations ITD
SGO	Systems for Green Operations
SOG	Smart Operations on Ground
TBC	To Be Confirmed
TBD	To Be Defined
TE	Technology Evaluator
TRA	Technology Readiness Assessment
TRL	Technology Readiness Level
V&V	Validation & Verification
V&V	Validation and Verification
W/T	Wind-tunnel
WP	Work Package

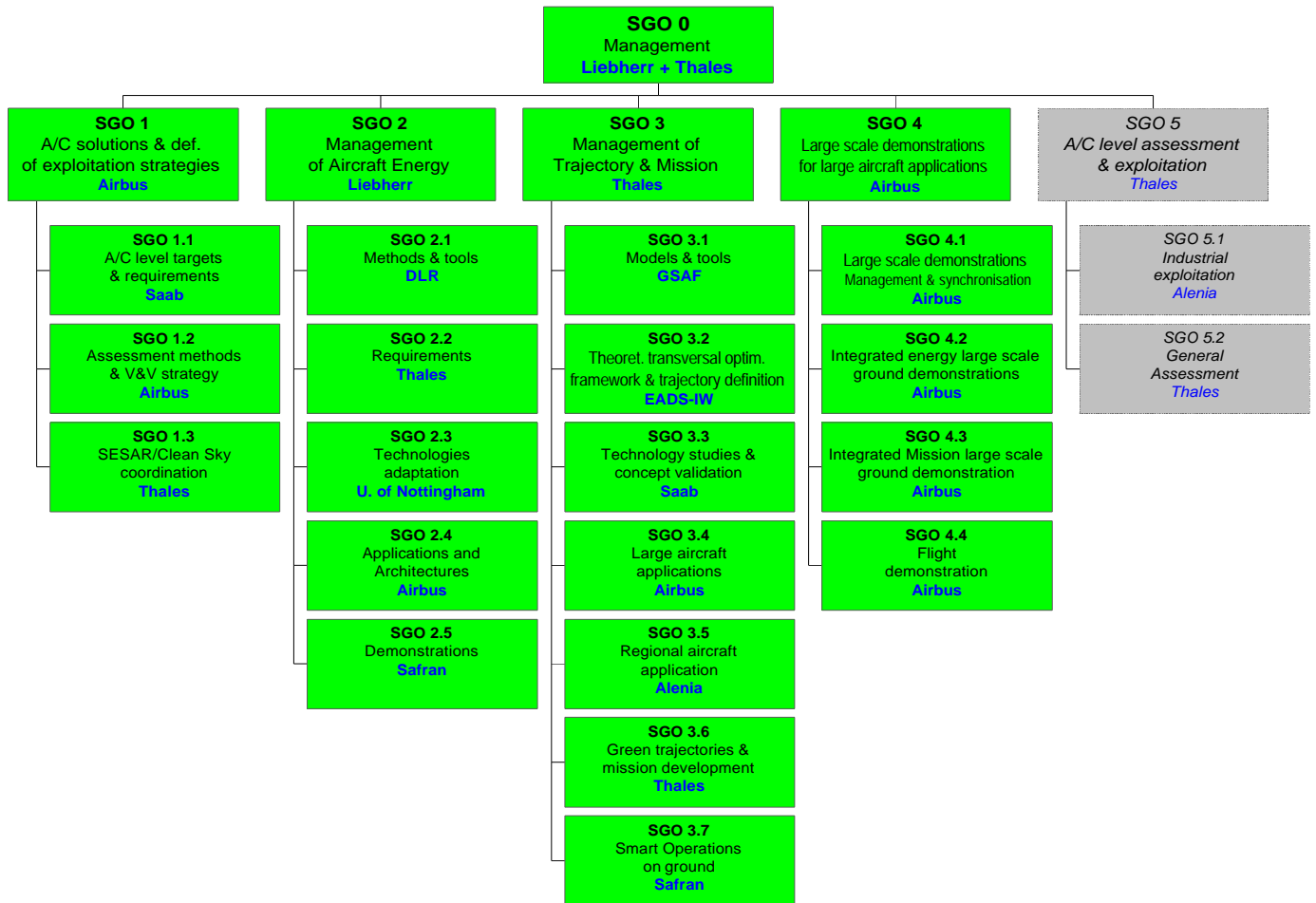
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1 WBS

The WPs starting this year or already started are in green color in the WBS below.

The detail of the activity is described in the other part the document.





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2 WP0 MANAGEMENT

This workpackage aims at managing the ITD SGO down to the low level of the organization.

This activity is co-chaired by Thales and Liebherr in 2009.

This activity is performed according to the management principles defined within Clean Sky.

3 WP1 DEFINITION OF AIRCRAFT SOLUTIONS AND EXPLOITATION STRATEGIES

3.1 WP1.1 - AIRCRAFT LEVEL TARGETS AND REQUIREMENTS

During this period, based on the results of previous projects, WP1.1 will set the framework by defining the working assumptions for cycle 1 as well as the baseline for comparison including aircraft data (type, size, configuration, propulsion, ...) and operational scenarios (operational context in which the aircraft will operate)..

For MTM and MAE, both reference and working architectures will be defined. This work package will proceed to a down select a set of technical priorities for MAE and of promising functions for MTM to be further investigated. These priority items will be allocated with environmental targets as design objectives.

Eventually, a review of the current regulations will be performed in this timeframe.

3.2 WP1.2 – ASSESSMENT METHODS AND V&V STRATEGY

WP1.2 aims at defining a common design environment for JTI-SGO as well as defining the overall V&V strategy for the solutions to be developed in this project. It will also establish the methodology and process for the management of the Technology Readiness Levels (TRLs).

In 2009, this work package will concentrate on the collection of common requirements for a design infrastructure (Requirements management, modelling and simulation, configuration management and design of interfaces) and the development of the relevant infrastructure.

The V&V plans for the products to be developed will be delivered. The way to manage the TRL process in JTI will be elaborated after discussion with partners.

3.3 WP 1.3 – CLEAN SKY-SESAR LIAISON OFFICE

SESAR and Clean Sky projects have as common objective to contribute, and develop solutions to reduce the impact of the air traffic on environment. In 2009, the coordination with SESAR will be put in place.

4 WP2 MANAGEMENT OF AIRCRAFT ENERGY

In 2009, the work consists of the continuation of the work packages 2.1 to 2. and the initiation of 2.5:

4.1 WP2.1 – METHODS AND TOOLS.

The work in this period will be focused on using workshops to define the requirements of the design environment, and determining the 'use cases' and models which will be required in order to later validate this environment.

4.2 WP 2.2 – REQUIREMENTS.

The WP will begin to collect the requirements information coming from WP1 in order to assess it.

4.3 WP 2.3 – TECHNOLOGY ADAPTATION.

This is the core of WP2. In this period, a number of third level WPs will begin to use the results of previous European and national projects to determine the requirements for demonstration at TRL 6 in about 3 years' time. The technological areas involved are:

- WP 2.3.1 – Main and auxiliary energy generation
- WP 2.3.2 – Electrical energy generation and conversion
- WP 2.3.3 – Electrical energy transport
- WP 2.3.4 – Environmental control, Ice Protection, Actuation
- WP 2.3.5 – Electrical energy control
- WP 2.3.6 – Thermal management

The middle of the year should see a focusing of the design possibilities, based on the work initiated in WP 2.4. A final design will be chosen and frozen in late 2009. Most of these WPs will produce a report in this period detailing the most likely alternatives to be chosen in terms of technology.

In order to assist these WP with the technologies required for these systems, a number of Calls for Proposal have been planned to be launched from this WP.

4.4 WP 2.4 – APPLICATIONS AND ARCHITECTURES

Participants from WP 2.3 will meet together with the aircraft manufacturers to determine the shape of future aircraft system architectures. These will be documented in 2009.

5 WP3 MANAGEMENT OF TRAJECTORY AND MISSION

For the period from January to December 2009, the work consists in :

- the continuation of the work packages 3.1 to 3.3 and 3.7
- the initiation of the work packages 3.4 to 3.6

5.1 WP3.1 – MODELS AND TOOLS

During this period, the work will focus on:

- Completion of the need analysis initiated in 2008
- Adaptation and development of models of the GATAC optimisation framework
- Development of off-line post processing numerical models emissions and noise to be used in the assessment of environmental performance for the various demonstrations in work package 3
- Initiation of the development of the simulation models to be included in real time flight simulators and
- Initiation of development/adaptation of reduced complexity numerical models of emissions for use in conjunction with on-board real time optimization algorithms.

Concurrently, an analysis of the various airlines business models will be initiated in order to extract features which could be used to balance environmental performance against standard operational / business considerations.

5.2 WP3.2 – THEORETICAL TRANSVERSAL OPTIMISATION AND TRAJECTORY DEFINITION

WP 3.2.1 (Development of the transversal optimisation framework), started in 2008, will continue its work with:

- Definition of the overall architecture of GATAC tool and tool integration framework, core optimizer, and modules specification
- Issuing a preliminary and formal version release of GATAC tool v1 (to be used for trajectories generation within Cycle 1)
- Beginning of development of GATAC tool v2 benefiting from an increased portfolio of models (to be used for trajectories generation within Cycle 2)

WP 3.2.2 (Optimum trajectory design) will be initiated. Activities will consist in:

- Taking existing and identified future ATM constraints to produce typical missions
- Using the GATAC v1 tool to compute theoretical trajectories between city pairs which are optimal with regard to chemical emissions and perceived noise reduction

WP3.2.3 (ATM operation context), kicked-off in 2008, will proceed with the collection of constraints stemming from concept of operations of SESAR on the definition of trajectories. The companies



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that have a stake in SESAR and Clean Sky will perform this collection. A summary of these constraints will be performed in a general scenario before submitting it to the Clean Sky-SESAR liaison office (WP1.3).

5.3 WP 3.3 – TECHNOLOGY STUDIES & CONCEPT VALIDATION

For WP 3.3.1 (Technology studies), the activities for 2009 are as follows :

- The list of functions to be studied in cycle 1 shall be released by mid July 2009
- Thales will begin the assessment and development of basic algorithms for green FMS functions to be integrated in the frame of large and regional aircrafts
- Saab will start work on its high performance trajectory optimisation systems by year end
- GSAF and the DLR will work together on the development of their solutions for flight management algorithms through so called Multi Parameter guidance, using the optimal trajectories determined in WP3.2,
- Galileo Avionica will start their work on advanced weather radar processing capabilities to allow a smarter avoidance of weather hazards: a synthetic weather radar simulator will be released, and derivation of a weather modelling based on synthetic data will be initiated; work will also be accomplished on the quasi artificial intelligence agent to provide decision aids to the flight crew (requirement issuing)

5.4 WP3.4 – LARGE AIRCRAFT APPLICATIONS

WP 3.4 dedicated to Large Aircraft Applications will be kicked off.

First work themes will consist in analyzing green trajectories and green missions with the following orientations:

- Feasibility against commercial aircraft operational constraints and preliminary estimation of benefits
- Flight crew acceptance of operations concept and cockpit interfaces impacts through man machine interface simulations
- Derivation of aircraft functional and performance requirements with functional requirements allocation to aircraft functions
- Establishment of aircraft FMS performance optimization functions specification, performance database generation and simulation preparation

5.5 WP3.5 – REGIONAL AIRCRAFT APPLICATIONS

WP 3.5 dedicated to Regional Aircraft Applications will be kicked off.

First work theme will consist in testing activity of first release of the GATAC tool. The aim of this activity is to provide GATAC developers with a feedback. Tests will be performed using generic aircraft models provided by GSAF..

5.6 WP3.6 – GREEN TRAJECTORIES AND MISSION DEVELOPMENT

WP 3.6 (Green trajectories and mission development) will be kicked off by end of the year. Thales will start specification of an architecture mock-up for large aircraft and begin developing a prototype FMS with the algorithms studied in technology studies.

Diehl Aerospace will concentrate on assessment of the needed display hardware components for the platform.

5.7 WP 3.7 – SMART OPERATIONS ON GROUND

This work package will provide innovative solutions for Green A/C Operation on Ground:

- Autonomous taxi on ground without the use of main engines
- Low noise emission brake cooling fan

Selected solutions will be validated and tested in order to assess their maturity.

Environmental impacts due to integration of such innovative solutions within airports structure will be also assessed.

The WP is broken down in tasks as follows (only tasks active in 2009):

- T 3.7.1 : SOG Method, Models & Tools
- T 3.7.2 : SOG Requirements & architecture
- T 3.7.3 : Technologies for Smart Operation on Ground
- T 3.7.6 : SOG Results & Reporting

During year 2009, WP 3.7.1 (SOG Method, Models & Tools) is aimed at:

- Developing an integrated Multi Physic simulation tool for concurrent work based on MODELICA language
- Developing a More electrical system Model based design methodology & tool
- Modeling airport infrastructures thanks to an environmental assessment tool, defining operational scenarios and identifying baseline environmental impacts of the airport

During year 2009, WP 3.7.2 (SOG Requirements & Architecture) is aimed at:

- Issuing the SOG specification document based on functional analysis results
- Starting work on ON-Board solution architecture by the use of developed More electrical Model Based Design Tool
- Starting V&V activities which consists in definition V&V strategy and plan
- Starting of Assessment on Safety, Maintainability and Certification issues

During year 2009, WP 3.7.3 (Technologies for SOG) is aimed at:

- Starting work on Electro-mechanical drive motion technology
- Starting work on low Noise Brake cooling Fan (modeling and architecture definition)
- Starting Work on Energy recycling and storage



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- Starting Work on Autonomous motion precision control & monitoring

During year 2009, WP 3.7.6 (SOG Result & Reporting) is aimed at:

- Defining the TRL policy to follow the Systems/Equipments/Tools maturity along development process
- Following the Systems/Equipments/Tools maturity

6 WP 4: LARGE SCALE DEMONSTRATION FOR LARGE AIRCRAFT APPLICATION

6.1 WP 4.1 – LARGE SCALE DEMONSTRATION MANAGEMENT AND SYNCHRONISATION

The objective is to plan, coordinate, monitor and assess all the large-scale ground and flight demonstration activities to be performed in WP4.2 and WP4.3 along the V&V plans for large AC applications. In 2009, this work package will concentrate on the elaboration of the planning of demonstration activities.

6.2 WP 4.2 – INTEGRATED ENERGY LARGE SCALE GROUND DEMONSTRATION

The objective of this work package is to prepare and execute large-scale ground demonstration activities for Management of Aircraft Energy. In 2009, the activity will consist in the analysis of the validation & verification plans and the definition of the relevant ground test means to perform the tests on the equipment and systems delivered from WP2.

It will also initiate a virtual rig for integrating and testing models of energy systems.

6.3 WP4.3 INTEGRATED MISSION LARGE SCALE GROUND DEMONSTRATION

This work package aims at setting up and adapting the ground test means for cockpit operations in order to demonstrate new functions to optimise trajectories with regard to environmental impact. In 2009, the activity will mainly consist in analysing the requirements for V&V in order to define the relevant ground test means to validate the technical solutions developed in WP3.



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7 WP5 AIRCRAFT LEVEL ASSESSMENT AND EXPLOITATION

No activity foreseen for 2009