Annual Implementation Plan 2011
Publishable version
Green Rotorcraft ITD (GRC)
Summary Project Description for Period P4: Jan-Dec 2011

Revision Table

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1	27/4/2011	

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GRC0 – ITD Management Package

The GRC management structure and procedures aim at ensuring timely achievement of high quality technical demonstrations, and at providing proficient contractual and budgetary support and coordination of the projects. It also intends to ensure that knowledge management and other innovation-related activities are coordinated at ITD level.

All tasks of the management package will be active in Period 4 and will consist in implementing and improving the GRC management procedures and tools in compliance with Clean Sky JU common rules.

GRC1 – Innovative rotor blades

Objectives

To continue
- development of the active twist concept from project FRIENDCOPTER;
- parametric study of active and passive blade lay-out for global rotor benefits;
- development of methods necessary for the optimisation of blade design, actuation system integration, sensory data transmission, power transfer and control algorithms;
- development of open loop control algorithms to manage the active system behaviour and initiate development of closed loop control algorithms.

GRC1 Active tasks

The following WP and tasks will be active in Period 4

GRC 1.1 - Technology Evaluation and Basic Development

GRC1.1.2: Detailed Technology Development of Full Scale Active Twist

Shape design-optimisation of swash plate fairings by means of CFD. Given the baseline configuration of a light helicopter of the ECg family, different fairing shapes will be compared, in order to minimize the interference drag without worsening the helicopter stability. Simplified rotor hub geometry will be accounted for.

GRC1.1.4: Detailed Technology Development of Reviewed GRC Technology

Detailed development of technologies selected from GRC1.1.1 (Technology Review) for bench and/or 2D wind tunnel testing in GRC1.1.5 will continue.

GRC1.1.7: Performance Assessment of Advanced Rotor Configurations

Detailed development of technologies selected from GRC1.1.1 (Technology Review) for bench and/or 2D wind tunnel testing in GRC1.1.5 (Testing of GRC Technology) will continue.

GRC1.1.8: Method development

Development of methods necessary for the optimisation of blade design, actuation system integration, sensory data transmission, power transfer and the formulation of control algorithms will continue.

GRC1.1.9: Open-loop control algorithm development

Develop open-loop control algorithms for active rotor technology to achieve low power and/or low acoustics rotors, whilst checking for impact on helicopter handling qualities and vibration.

GRC1.1.10: Closed-loop control algorithm development

Develop closed-loop control philosophy for active rotor technologies to achieve low power and/or low acoustics rotors, whilst maintaining helicopter handling qualities and containing vibration.

GRC 1.2 - Model Rotor Design and Testing

GRC1.2.1: Variation of design parameters for innovative model rotor blades

Design parameter variation for passive model rotor blades to identify the most promising parameters to meet the GRC goals using state-of-the-art numerical technologies and methods. This task includes passive elements of the subsequent active blade design.

This task will continue throughout Period 4 and beyond.

GRC 1.3 - Full Scale Blade Design

GRC1.3.5: Full scale design of innovative rotor blades

Apply the design and optimisation methods to full scale rotors with the objective of transferring the model scale benefits shown in GRC 1.2 to full scale. Full blade development activity including detailed design, strength analysis, structural lay-out, and aerodynamic contour optimisation. Includes preliminary and critical design reviews (PDR, CDR).

This task starts in Period 4 and will continue in the following period.

Calls for Proposals

The Calls for Proposals foreseen for Period 4 are:

#	Description
1	Design and manufacturing of scaled systems representing the GRC1 technologies to be tested at wind tunnel facilities

2	Development and manufacture of moulds to account for temperature effects on model rotor production during the curing process for passive and active model rotor in order to assure 3D geometry precision of the blade
3	Develop and supply the actuation system for integration into the active model rotor blade
4	Wind Tunnel Testing of Active Rotor
5	Design and Manufacture of innovative power transfer system to power active system on whirling full scale blade
6	Design and Manufacture of innovative data transfer system to provide feedback from the active system on a whirling full scale blade

GRC2 – Drag Reduction of Airframe and Non Lifting Rotating Systems

Objectives

Aerodynamic characterisation of the rotor heads of two light helicopters, two medium and two heavy ones.
The wind tunnel campaigns about rotor head and fuselages will be specified in detail.
The wind tunnel model of the blunt fuselage to be used for measuring the effect of synthetic/ pulsed jets will be manufactured and first wind tunnel entries will be conducted without and with the pulsed jets devices.
The inlet and exhaust geometries of the ERICA tilt-rotor will be numerically optimised.

GRC2 Active tasks

The following WP and tasks will be active in Period 4.

GRC 2.1 - Hub Drag Reduction

GRC2.1.2 - Analysis of Hub Drag Reduction

Aerodynamic study (e.g. CFD) of the most significant hub geometries of helicopters with the objective of analysing the drag breakdown of each component, identifying area of improvement and verifying the improvement margin with respect to drag and stability.
In 2011, the aerodynamic characterisation of the rotor hubs of the selected helicopters will be finalised and the passive optimisation tasks will start.

GRC2.1.3 - Confirmation of Benefit by Wind Tunnel Test

Each partner will test in wind tunnel the improvements studied in GRC2.1.2 on the hub geometry, which has been selected in GRC2.1.1. The wind-tunnel tests are to state whether the numerically predicted improvements have been achieved.
In 2011, the wind tunnel model of the starting configuration will be manufactured.

GRC 2.2 - Fuselage Drag Reduction (H/R-Tilt Rotor)

GRC2.2.2- Helicopter: Blunt Fuselage Optimisation

Shape optimisation of blunt rear fuselages and fuselage tail junction. Numerical study of active devices for drag minimisation of blunt fuselages.
In 2011, the shape optimisation tasks about the common helicopter platform as well as of the ECg light and AW heavy helicopters will start.
GRC2.2.3 - Tilt rotor: Body Components Optimisation

Numerical optimisation through CFD of body components of the ERICA tilt-rotor (nose, landing gear fairing, wing junctions).

In 2011, the shape optimisation tasks about the common tilt-rotor platform (ERICA) will start.

GRC2.2.4 - Confirmation of Benefit by Wind Tunnel Tests

The passive and active devices aiming at reducing the drag of blunt helicopter fuselages and wing body junction on Tilt-rotor, which have been studied numerically in GRC2.2.2 and GRC2.2.3, will be here tested in wind tunnel. Each partner of GRC2.2.4 will test the effect of a selected solution. Different low cost wind tunnels will be used for this purpose.

In 2011, the wind tunnel specification activities will be closed. Moreover, model manufacturing and first wind tunnel tests will be performed.

GRC2.2.6 - Implementation Study of Synthetic Jets or Pulsed Jets Critical assessment

In this task an active system for drag reduction will be modelled. A system level performance simulation will be than performed with the objective of proving that such active approach is feasible and to identify system requirements in view of actual implementation.

GRC2.2.7 - Common Platform Helicopter Empennage

Design, model manufacturing and testing of an empennage with movable control surfaces. CFD computations will provide distributed loads, given the trim settings coming from flight mechanics simulations, then a multi-body dynamic analysis of the empennage including servo-command and control efficiency will be addressed. The specifications for actual manufacturing of the empennage with movable surfaces will be provided. The manufacturing of a wind tunnel model with actuation system will be started

GRC 2.3 - Engine Installation (H/R - Tilt Rotor)

GRC2.3.2- Analysis of Installation Efficiency, Pressure-losses and Noise Emission

Numerical analysis, via CFD tools, of different air intake and exhaust configurations of a light and a heavy class helicopter fuselage will be conducted. Particular emphasis on the inlet pressure losses, flow distortion and inlet/exhaust noise radiation in several flight conditions from hovering to cruise will be given. The effect of jet exhaust configuration on the extinguishing system will be assessed as well. The study of the air intake and exhaust integration into a tilt-rotor nacelle will start in period 4.

GRC 2.4 Optimised Design (H/R - Tilt Rotor)

GRC2.4.1- Clean Sheet Design Studies for an Optimised Green Helicopter

Assess the possibility of combining several of the suggested drag reduction methods to produce a range of optimised helicopter fuselages, including rotor head and empennages, depending on aircraft weight and role.
Establish the link with the Techno Evaluator for Rotorcraft (GRC7).
In 2011, the data requested by GRC7 about the helicopter 2000 fleet will be provided.

Calls for Proposals

No Call for Proposal foreseen in Period 4.

GRC3 – Integration of Innovative Electrical Systems for Rotorcraft

Objectives

Period 4 will complete the launch of the primary technology development programs via the CfP program.

There will be an emphasis throughout the main technology packages in establishing and utilising modelling. Consumer behaviour and technology characteristics will be captured as component models, and tools will be established to model the key system architecture and distribution behaviour characteristics. These will be combined to enable establishment of dynamic capability to assess effective component and system real time energy flow and waveform behaviour.

The initial architecture and technology assessment will be used to define a general architecture implementation and the key capability characteristics that will be exploited.

System technology has been focussed on three primary aspects, architectural system storage system techniques, intelligent power conversion and system distribution functionality.

A series of CfPs establishes and demonstrates the core technologies which will either components or example users demonstrating the key capabilities of an innovative approach to airborne energy management power distribution systems.

GRC3 Active tasks

The following WP and tasks will be active in Period 4.

GRC 3.1 – Reference Helicopter

During Period 4, the final issue of the Reference Helicopter Description document will be issued. This will include the data for the extended TE classes.

GRC 3.2 – Power Management

This work package defines high level electrical power system architecture and associated technology options. These are used as the starting point for the development of lower level

requirements in selecting technologies and scheming new architectures for the on board power management system.
In Period 4 the preferred options will be identified from the electrical technology to enable improved power usage efficiency, power systems mass impacts and support the exploitation of new technology opportunities.
A final architecture recommendation report will be issued.

GRC 3.3 – Electrical Network

Building on the requirements defined a more detailed specification for the helicopter electrical network will be prepared in work package during Period 4. This will identify preferred options for power system distribution architectures, primary bus voltages, control, and monitoring and redundancy provision. It will include support for all electric control actuator systems and identify architectural provisions to enable power systems extension and capability support to all electric tail rotor systems.
A number of candidate network architectures will be defined, for assessment. Leading candidate options, or a single option, will be selected as the basis for defining the technologies that should be addressed and demonstrated in the later programme activities.
Modelling, simulation and system study work programs will be initiated in Period 4 based on first models from SGO/EDS and CfP.

GRC 3.4 – Electrical Technologies

This work package determines the key new technologies and exploitation techniques, developing critical technology gaps for demonstration of the key technology capabilities that are needed to deliver the programme objectives.
The primary set of technology CfPs will be issued in period 4 including Main rotor brake, energy storage, power conversion, energy recovery and management. Any further CfP intentions planned will also be identified in Period 4.
Thermal energy management (issued a dedicated CfP) will commence its work program on completion of full selection and negotiation with the selected proposal consortium.
During Period 4 the work package will establish technology modelling for the effective development and use of technologies via the CfP programs and to support system power distribution performance assessment. This will be developed in common with SGO and EDS system modelling where viable.
During Period 4, the electrical and mechanical interfaces of the key technologies will be defined for EDS bench and internal benches.
A new task 3.4.6 ”Thermal Energy Recovery” has been created for supporting elements in two CfPs launched in the previous period.

GRC 3.5 – Electromechanical Actuators

This work package addresses the replacement of hydraulic actuators with electromechanical actuation (EMA). The activity encompasses three main areas:
i) EMA for flight controls for very light helicopter application, utilising the potential of mechanical back up. This task will establish a light weight actuator system for very small helicopters. The potential for demonstration application in a helicopter will be reviewed.
ii) EMA for flight controls on the reference helicopter application. This is a joint work program with the Systems for Green Operations (SGO) HEMAS program.Early in Period 4 all contributors will participate in a preliminary review of EMA for flight controls for a (GO/NOGO) decision

iii) EMA for utility consumer systems (CfPs will be raised in Period 4).The work package has been revised to achieve the utility EMA focus on the two actuators programs “EMA for landing gear” and “EMA for electrical rotor brake” that will be commenced in Period 4. Partners will be selected through the CfP process.

GRC3.6. – Electrical Tail Rotor

This work package has been revised into two sections. The first one will provide a full demonstration of a conventional tail rotor configuration electric motor drive. The second one will assess the potential application of electric motor drives to Fenestron configuration tail rotor systems. This will not include a system demonstration.
CfP selection was finalised and launched in the 4th quarter 2010. GRC3 will work with the selected CfP response organisation throughout Period 4 assisting the identification of critical characteristics requirements and supporting the analysis and development of design application options for effective exploitation of the technology. The work will include modelling, design and manufacture of a technology demonstration system via a project specific test rig.

GRC 3.7 – Energy for Piezo Actuators

This package aims to develop an energy efficient, new architecture compatible power supply system that will support the implementation of piezoelectric actuators on helicopter platforms. It will be done in two steps:

- Definition of requirements for energy supply to piezo actuators in airborne system
- Demonstration and test of an energy supply system on the EDS Common Test Bench

GRC 3.7 has the following objectives:

- Measure electrical characteristics of the piezo actuators and their variation due to different physical factors.
- Validate the performances and adjustability of the HPAS system for different piezo actuator configurations.
- Exploit full capability of new 270VDC onboard network and assess impact of piezo actuation.
- Optimize power management.
- Implement monitoring and safe fail features for external and internal failure modes.
- Address common specific aircraft integration issues (i.e. weight, dimensions, environmental conditions…).

During Period 4 (2011), GRC 3.7 will conduct a preliminary study.
The preliminary study will enable to perform a benchmark of the current technologies available on the market and compare different design solutions. This first step is necessary to define an optimized Piezo Power Supply Module as well as the characteristics of the piezo actuators to be integrated in the Piezo Actuator Bench.
The outputs will enable to freeze the definition of the Piezo Power Supply module and launch its development. The interface definition for the whole GRC 3.7 system will be updated based on the components specifications as well as by new information provided by GRC 3.8 on the EDS Common Test Bench.

GRC 3.8 – Ground demonstration with Eco Design Common Test Bench and Internal Benches

This package prepares and co-ordinates GRC3 requirements for potential demonstration on the common test bench.
GRC3 will define the interfaces for each equipment, identify test requirements and issue the requirements to the EDS test program.
The adaptation kit requirements will be issued when identified via the CfP programs arising during period 4.

Calls for Proposals

The Calls for Proposals foreseen for Period 4 are:

#	Description
1	EMA for landing gear
2	EMA for Rotor Brake
3	Innovative Power Converter
4	Innovative Energy Storage System
5	HEMAS Adaptation Kit
6	HPAS Adaptation Kit
7	Energy Recovery Adaptation Kit
8	Drive stand for e-APU; Resubmitted

GRC4 – Installation of a Diesel engine on a light helicopter

Objectives

To take advantage of the extremely low specific fuel consumption which can be obtained thanks to turbocharged Diesel engine technology developed in the automotive industry in order to integrate this technology on helicopters and drastically reduce their gas emission level.

A two stream approach is implemented: firstly, the study of the ideal Diesel engine and optimisation of the helicopter to be powered; secondly, the integration of flying helicopter demonstrator based the adaptation to helicopter specifications of an aeronautical Diesel engine and transformation of a turbine powered light helicopter. The synthesis of both parallel streams will allow to define the way forward for future helicopter products.

GRC4 Active tasks

The following WP and tasks will be active in Period 4:

GRC 4.2 – Pre-design of ideal diesel-powered H/C

The aim of this work package is to define the best possible helicopter on the base of the selected engine and selected mission profile, in terms of architecture and general sizing. The result comes from a trade off study with Tasks 4.2.1, 4.2.2 and 4.2.3 as loop.

All tasks GRC4.2.1 to GRC 4.2.3 will be active

GRC4.2.1 - Definition of the design points and of the design mission and preliminary sizing of the overall characteristics

On the base of the selected engine and on the weight class of the helicopter, definition of a typical mission profile and of the typical point performance that characterise the helicopter.

Preliminary sizing of the optimal helicopter with the aim to define weight, main rotor and tail rotor solidity, main rotor radius, and other typical preliminary information.

GRC4.2.2 - Configuration definition

Definition of the general architecture to allocate space provisions and systems, general lay-out.

GRC4.2.3 - Performance Analysis

On the base of the results of 4.2.2 and of the mission selected in 4.2.1 performance analysis and evaluation in the full flight envelope, advantages against turbo shaft configurations (pollution, productivity costXseatXmile).

GRC 4.3 – Definition of optimal H/C architecture for diesel engine

The aim of this work package is to carry out the necessary study to integrate a diesel engine on the optimal helicopter configuration and to define the engine and sub-systems technical specifications.

Tasks GRC 4.3.1 to GRC 4.3.3 will be active

GRC4.3.1 - System integration detailed studies on the platform

To define: the structure general lay-out, avionic architecture and design, rotor design, electrical and hydraulic system architecture, the transmission items;

To identify loads for systems.

GRC4.3.2 - Engine model description

To define engine interfaces, to issue engine interface control document and installation manual, to define engine dynamics requirements

GRC4.3.3 - Engine Integration: Cooling and vibration reduction specification

Study thermal exchange, engine bay cooling method; define limits of engine vibration.

GRC 4.4 – Pre-design/General sizing of demonstrator

The aim of this WP is to determine the flight envelope and compute loads due to the new power-pack integration

Tasks GRC 4.4.1 to GRC 4.4.3 will be active

GRC4.4.1 - Targeted flight envelop and characteristics definition

Determination of: MTOW, Weight & Balance diagram; Ratings, Spectra

GRC4.4.2 - Airframe loads

Computation of airframe loads (static and dynamic) for flight and landing cases. General loads diagrams for critical loads cases.

GRC4.4.3 - Transmission loads

Computation of dynamic components (static and fatigue) loads.

GRC 4.5 – Pre-design/Architecture of demonstrator (EC120)

Definition of demonstrator integration concepts and weight & balance.

Tasks GRC 4.5.1 to GRC 4.5.3 will be active

GRC4.5.1 - Integration concepts (phase 1)

Definition of preliminary integration concepts for demonstrator

GRC4.5.2 - Integration concepts (phase 2), and new items pre-sizing

Definition of integration concepts for demonstrator, and new items design and pre-sizing.

GRC4.5.3 - Weight & Balance

Weight & Balance definition.

GRC 4.6 – Demonstrator power-pack integration

Aimed to freeze the power-pack specification, select the supplier, define the interfaces, define the engine installation and manufacturing, define the fuel system modification and manufacturing.

Tasks GRC 4.6.1, GRC 4.6.2, GRC 4.6.3 and GRC 4.6.5 will be active

GRC4.6.1 - Power-pack specification, supplier selection

Supplier selection.

GRC4.6.2 - Power-pack and fuel system installation preliminary design and integration

Preliminary definition of engine installation and fuel system modification.

GRC4.6.3 - Power-pack and fuel system installation final design and integration

Final definition of engine installation and fuel system modification.

GRC4.6.5 - Set up activities

Set-up activities, reporting, organisation of partnership.

GRC 4.7 – Demonstrator airframe

Aimed to define the changes in airframe parts, substantiate changed airframe parts, and manufacture them, design and manufacture cowling, exhaust nozzle and firewalls.

Tasks GRC 4.6.1, GRC 4.6.2, GRC 4.6.3 and GRC 4.6.5 will be active

GRC4.7.1 - Airframe parts changes definition

Define airframe parts to be modified.

GRC 4.8 – Demonstrator transmission

Aimed to optimize torque chain architecture, specify transmission items, integrate transmission items-

Tasks GRC 4.8.1, and GRC 4.8.2 will be active

GRC4.8.1 - Torque chain architecture optimization and transmission items specification

Torque chain architecture optimization from the engines to the rotors; Specification for MGB, clutch system and engine to MGB connexion; Interfaces definition airframe parts to be modified.

GRC4.8.2 - Integration and interfaces management

Interfaces management; Integration management.

GRC 4.9 – Demonstrator controls

Aimed to define the flight controls and the auxiliary controls modifications, as well as the engine controls definition and the clutch controls one, in order to integrate the power-pack on existing light helicopter

Tasks GRC 4.9.1 to GRC 4.9.3 will be active

GRC4.9.1 - Flight controls

Flight controls modification; Flight controls substantiation, Manufacturing

GRC4.9.2 - Engine controls

Engine controls modification; Engine controls substantiation; Manufacturing

GRC4.9.3 - Clutch and auxiliary controls

Controls definition; Controls substantiation; Manufacturing

GRC 4.10 – Demonstrator controls

Aimed to define the adaptation needed for the vehicle management displays and the modification concerning the electrical generation.

Tasks GRC 4.10.1 to GRC 4.10.4 will be active

GRC4.10.1 - Interfaces definition

Power-pack interfaces with demonstrator avionics; Define avionics architecture

GRC4.10.2 - VEMD modification

Adaptation of VEMD for engine, transmission, fuel system and electrical parameters.

GRC4.10.3 - Sensors and warnings (spec and follow-up)

Specify and follow-up sensors and warnings

GRC4.10.4 - Electrical integration

Harnesses definition; Sensors, warning and harnesses implementation

GRC 4.11 – General Engineering Studies

Aimed to analyse the impact of modifications due to the Diesel engine on aerodynamic and dynamic behaviours, impact on safety and environment and verify the compliance with specifications and regulations, and then, control the weight and balance.

Tasks GRC 4.11.1 to GRC 4.11.4 and GRC 4.11.6 will be active

GRC4.11.1 - Aerodynamics and acoustics studies

Performance and loads analysis; External noise assessment

GRC4.11.2 - Dynamics studies

Torque chain stability; Air and ground resonance analysis;Transmission analysis, Vibrations analysis, Rotor dynamics analysis, Tests, Internal noise analysis.

GRC4.11.3 - Environment studies

Emissions types analysis; Regulation trends; Methodology definition

GRC4.11.4 - Emissions studies

Temperature analysis; EMI/EMC; MGB and cooling analysis; External environment analysis

GRC4.11.6 - Weight and balance control

Weight and balance control

Calls for Proposals

No Calls for Proposals are foreseen for Period 4

GRC5 – Environmentally-Friendly Flight Paths

Objectives

- Requirements and specifications analysis will be completed.
- Emissions database will be completed by end of the year, to be ready in Period 5 for the optimization of flight paths.
- Development of the on-board system will continue with the aim to create in Period 4 a first operative version.
- HELENA development of database and code will continue: in addition to EC155 Period 3 flight tests, EC145 flight tests will be performed in Period 4 to include data in the database.
- Moreover acoustic passive radar will be extended to multi helicopter event and an acoustic database of several types of helicopters will be created to allow 3D stereo synthesis of the sound perceived from a helicopter.
- Low noise procedures will be developed in Period 4 with the objective to complete the design of approaches and departures by end of the year; development of low level / narrow IFR routes will start and will be completed in Period 5.
- Main objective of task 5.5.6 (Mission Profile Optimisation and Validatio) for Period 4 is to start the optimization of low noise procedures and pilot-in-the-loop simulations; moreover some flight test campaigns, needed to tune algorithms and to evaluate methodologies, will be prepared

GRC5 Active tasks

The following WP and tasks will be active in Period 4.

GRC 5.1 - Analysis of Existing Requirements and Definition of Specifications for Environment-Friendly Flight Paths

Requirements and specifications, will be completed in Period 4. From this WP tasks which are active in Period 4 are: 5.1.5, which has been extended to 2011 due to ATM Partner schedule, and 5.1.6, which started with a small delay in the last part of Period 3. Both tasks will be completed in Period 4; 5.1.5 by end of March, whilst 5.1.6 by end of the year.

GRC 5.2 - Analysis and development of specific methodologies to evaluate the engine emissions and GRC5.3 Green Mission Profiles

Suffered a small delay in Period 3 mainly due to Calls for Proposals, and **GRC 5.3** will make important progress. EMICOPTER numerical tool will be tuned with ground/flight tests and it will be used to populate the database; in addition, emissions measurements will be used to validate the results. Emissions database will be completed by end of the year, to be ready in Period 5 for the optimization of flight paths.

GRC 5.4: Development and updating of optimisation tools and test methodologies for H/C noise

In 5.4.1, the development of the on-board system will continue with the aim to create in Period 4 a first operative version; the acoustic algorithm developed by CIRA will be tuned with dedicated flight tests and integrated in the on-board system. Moreover FMS modifications will be applied to provide the required compliance.

In 5.4.2, HELENA development of database and code will continue: in addition to EC155 Period 3 flight tests, EC145 flight tests will be performed in Period 4 to include data in the database. Moreover acoustic passive radar will be extended to multi helicopter event and an acoustic database of several types of helicopters will be created to allow 3D stereo synthesis of the sound perceived from a helicopter.

GRC 5.5 Low Noise Procedures

Low noise procedures will be developed in Period 4 with the objective to complete the design of approaches and departures by end of the year; development of low level / narrow IFR routes will start and will be completed in Period 5. Main objective of task 5.5.6 for Period 4 is to start the optimization of low noise procedures and pilot-in-the-loop simulations; moreover some flight test campaigns, needed to tune algorithms and to evaluate methodologies, will be prepared.

Calls for Proposals

The following Calls for Proposals are foreseen for Period 4:

#	Description
1	Support to the integrated ATC/TR simulation of low-noise procedures and to the evaluation of the impact on operators

GRC6 – Eco-Design Demonstrators for Rotorcraft

Objectives

Take existing design solutions for the demonstrator components and assemblies and redesign new detail solutions incorporating alternative technologies. Re assess the compatibility of the assembly with the external interfaces
Launch long lead time items for manufacturing. Perform manufacturing planning for the next period.

GRC6 Active tasks

The following WP and tasks will be active in Period 4.

GRC 6.1-Door and cabin floor structures

Objectives for WP GRC 6.1 in Period 4

- Identification of the technical and ecological requirements for new materials and technologies to be used on the demonstrators;
- Selection of materials, manufacturing and end-of-life technologies;
- Start preliminary investigations into manufacturing and integration of subcomponents;
- Define the demonstrator designs.

GRC 6.2- Thermoplastic Structural Parts

The main targets of GRC 6.2 are the Design, Manufacturing, Joining technology selection, NDI (Non Destructive Inspections), of high-level Structural Thermoplastic demonstrator for rotorcrafts, in accordance with the GRC 6 strategy of design, manufacturing and testing typical rotorcraft components, based on activities performed within the Eco Design ITD.

The activities being supported during 2011 are the following

- Design of the High-Level thermoplastic composite demonstrator
- Joining Technology selection
- Manufacturing of the components (to be continued in 2012)

A specific activity on Design and Manufacturing of three Low-Level Thermoplastic Structural parts, namely

- Upper Panel Rear Fuselage Demonstrator
- Sponson Fairing Demonstrator
- Radome Demonstrator,

was launched with the Call for Proposal GRC 006-02: the required activities will be carried out by an external Partner.

GRC 6.3 – Tail rotor transmission and main rotor mast

The aim is to design and manufacture a demonstrative complete tail gear box and a main helicopter rotor mast, following the current helicopter transmission technologies and implementing for demonstrative purposes newly developed technologies necessary to override the use of materials and processes appearing in the ASD list of “Priority Declarable Substances” (PDSL).

The objectives for 2011 are to complete the design phase and procure the long lead items.

GRC 6.4- Intermediate transmission

Objectives for the Period 4 are:

- Collect data considering design manufacturing;

- Identification of the technical and ecological requirements for new materials and technologies to be used on the demonstrators;
- Selection of materials considering ecological, economical need;
- Preliminary investigation on manufacturing;
- Call for proposal for recycling activity;
- TGB investigation and preparation (Find an old BTI, clean it and prepare it);
- LCA pre-investigation in order to validate the relevant aspect of the list impacted part;
- Dimensional analysis of some impacted parts;
- Start preliminary investigations into manufacturing and integration of subcomponents.

Calls for Proposals

Calls for Proposals foreseen for Period 4 are:

#	Description
1	Common call for Dismantling and Recycling of components.

GRC7 – Technology Evaluator for Rotorcraft

Objective

Subproject GRC7 is the interface between the GRC-ITD and the Technology Evaluator (TE). GRC7 is preparing rotorcraft fleet data; mathematical models that predict the noise and emissions of rotorcraft flying typical mission profiles; and generic rotorcraft design definitions that represent all of the commercial rotorcraft operating in the Year 2000, plus concept designs for the Year 2020+ with, and without, Clean Sky technology.

The main goal in 2011 for GRC7 is deliver a PhoeniX black box model for the first TE mid-term assessment that is due to happen in July 2011.

GRC7 Active tasks

The following WP and tasks will be active in Period 4

GRC 7.1 - Fleets

Completion, approval and final delivery of the Y2000 Baseline and Y2020+ Reference (without Clean Sky) fleet databases

GRC 7.2 - Software Development and Validation

Continued maturity of the PhoeniX platform

7.3 Rotorcraft Synthesis & Input Data Prep

Delivery total 15 generic models representing:

- 4 Weight classes (SEL,TEL,TEM,TEH) for each of the 3 assessment points; (Y2000 baseline,Y2020+ Ref without CS,Y2020+ Conceptual with CS)- (12)
- Tilt Rotor (Y2020+ Ref without CS, Y2020+ Conceptual with CS)- (2) and Light Single diesel engine (Y2020+ Conceptual with CS)- (1) for the(TE) Technology Evaluators first assessment

7.4 Mission and Operations

Development of mission profiles and rotorcraft operation environment for the (TE) first assessment.

7.5 Assessments and Trade-Off Studies

Final agreement of the Clean Sky noise and emission metrics.

Trade off studies at GRC(i) and TE levels.

Calls for Proposals

No call for Proposal planned in GRC7.