Decision of the Governing Board adopting the Amended Bi-annual Work Plan and Budget 2016 - 2017

THE GOVERNING BOARD OF THE CLEAN SKY 2 JOINT UNDERTAKING,

Having regard to the Council Regulation n° 558/2015 of 6 May 2014 establishing the Clean Sky 2 Joint Undertaking;

Having regard to the Statutes of the CSJU as annexed to Council Regulation (EC) No 558/2014 of 6 May 2014 and in particular Article 8.2 (h);

Having regard to Regulation (EU) No 1290/2013 of the European Parliament and of the Council laying down the rules for participation and dissemination in 'Horizon 2020 — the Framework Programme for Research and Innovation (2014-2020);

Having regard to Commission Delegated Regulation (EU) No 624/2014 of 14 February 2014 establishing a derogation from Regulation (EU) No 1290/2013 of the European Parliament and of the Council laying down the rules for participation and dissemination in 'Horizon 2020 with regard to the Clean Sky 2 Joint Undertaking;

Having regard to Financial Rules of the Clean Sky 2 Joint Undertaking and in particular Articles 15.1 and 31.4;

Having regard to Regulation (EU, EURATOM) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the Financial rules applicable to the General budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002, in particular Article 128;

Having regard to the Decision of the Governing Board of 18 December 2015 adopting the Bi-annual Work Plan and Budget 2016-2017[1] ;

Having regard to the consultation with the Scientific Committee and the States Representatives Group their positive outcome;

[1] *Ref. CS-GB-2015-12-18 Doc7b WP & Budget 2016-2017*

WHEREAS:

1) The Statutes of the Clean Sky 2 Joint Undertaking confer on the Governing Board the powers to adopt the Work Plan;
2) In the light of the status of implementation of the Programme, it is deemed appropriate to adopt the scope of the activities covered by the Work Plan for the years 2016 and 2017
3) The Bi-annual Work Plan and Budget 2016-2017 adopted by the Governing Board on 18 December 2015 needs to be amended in order to include the budget updates and the list and full description of topics of the third Call for Proposals in the Annex II
4) The scope of the Work Plan is mainly to inform potential beneficiaries in a transparent manner about the CSJU planned financial support and actions to be co-financed in its field of activities in accordance with its founding Regulation and applicable legal provisions;
5) The Work Plan provides on a multi-annual basis the authorisation for the operational expenditure of the CSJU comprising the detailed technical objectives and expected results including performance indicators, the description of the actions to be co-financed and an indication of the amount allocated per each ITD/IADP/TA and through the implementation of calls;
6) In accordance with Article 9(5) of the Regulation (EU) No 1290/2013 of the European Parliament and of the Council, the Work Plan provides for additional conditions for participation, in the form of admissibility conditions, in relation to the calls for proposals and the calls for Core Partners as set out in the General Annexes of the Work Plan;
7) In the light of the specific structure of the Programme and the governance framework of the JU, the specific legal status and statutory entitlements of the "Members" of the JU and in order to prevent any conflict of interest and to ensure a competitive, transparent and fair process, "additional conditions" within the meaning of Art 9(5) of the Horizon 2020 Rules for Participation shall apply to the calls for proposals and calls for Core Partners in the form of admissibility conditions, as laid down in Section B.I(6) and B.II(3) of the General Annexes of the Bi-annual Work Plan 2016-2017;
8) The grants to be awarded by the CSJU shall be subject to the prior adoption by the Governing Board of the Work Plan, to be published prior to its implementation;
9) In the interest of legal certainty and clarity, the Decision of the Governing Board of 18 December 2015 adopting the Bi-annual Work Plan and Budget 2016-2017 should be repealed and an amended Bi-annual Work Plan and Budget should be adopted.

HAS DECIDED:

Article 1

Decision of the Governing Board of 18 December 2015 adopting the Bi-annual Work Plan and Budget 2016-2017 is repealed.

The amended Bi-annual Work Plan and Budget 2016-2017 set out in the Annex is adopted.

Clean Sky

Article 2

The Executive Director shall make the Amended Bi-annual Work Plan and Budget 2016-2017 publicly available on the CSJU website.

Article 3

This decision shall enter into force on the date of its adoption.

On behalf of the Governing Board, through written procedure No. 2016 - 02

Brussels, Date 14/3/2016

Eric Dautriat
Executive Director
Clean Sky 2 Joint Undertaking

Enclosures:
- Amended Bi-annual Work Plan and Budget 2016-2017;

(ref. CS-GB-Written *Procedure 2016-02 Amended WP & Budget 2016-2017)*

CLEAN SKY 2 JOINT UNDERTAKING

AMENDED

BI-ANNUAL WORK PLAN and BUDGET

2016-2017

In accordance with the Statutes of the CSJU annexed to Council Regulation (EU) No 558/2014 of 6 May 2014 establishing the Clean Sky 2 Joint Undertaking and with Article 31 of the Financial Rules.

The information contained in this Work Plan (topics list, budget, planning of calls) may be subject to updates. Any further amendments of the Work Plan will be will be made publicly available after its adoption by the Governing Board.

~ Page intentionally left blank ~

Revision History Table			
Document Title	**Version nr.**	**Date**	**Reason for change**
Bi-annual Work Plan and Budget 2016-2017	P1	08/01/2016	- published on CSJU website - adoption by the GB on 18/12/2015
Amended Bi-annual Work Plan and Budget 2016-2017	P2	03/02/2016	- published on CSJU website - adoption by the GB on 14/03/2016

Contents

1. INTRODUCTION

Clean Sky is a Joint Technology Initiative (JTI) that aims to develop and mature breakthrough 'clean technologies' for Air Transport. By accelerating their deployment, the JTI will contribute to Europe's strategic environmental and social priorities, and simultaneously promote competitiveness and sustainable economic growth.

The following work plan (and its accompanying budget plan) sets out the main highlights of the activities to be covered across the 2 largest aeronautics research programmes ever funded by the European Union budget over the period 2016 and 2017. As the Joint Undertaking enters its eighth year of existence, it can draw on some invaluable lessons learned and experience gained. The joint efforts of the private and public members, together with the JU programme office, have led to a successful start and use of this novel instrument in aeronautics research at EU level.

2. MULTI-ANNUAL PROGRAMMING

2.1. Multi-annual objectives

The CS2 regulation and the JU's financial regulation specifically outline the possibility to split multi-annual commitments covering large scale actions into annual instalments. This specific measure is introduced to reduce the uncertainty which may exist if the annual budget does not allow the JU to financially commit the entire funds covering the full action in the first year of the action. In both programmes the objectives set could not be achieved within one financial year. Some of the research activities started in 2008 and 2009 are maturing now in 2016 during the last phases of technical activity. These activities have contributed to the overall and high level CS objectives as set out in the regulation.
Clean Sky 2, as was the case in Clean Sky, will contain activities spread over several years and this flexibility will be used on a regular basis in order to accommodate the needs of the programme while taking into account the annual budget constraints.

As many activities are interlinked with previous years' work and tests performed, there are mentions of other years throughout this document in order to give the complete picture to the reader.

2.2. Multi-annual programmes

The remaining Clean Sky Programme full-scale, ground and in-flight demonstrations will be taking place in 2016. Based on the multi-annual commitments approach of Clean Sky 2 under its new legal basis, this work plan includes the description of remaining activities for the years 2016-2017. All Integrated Technology Demonstrators (ITDs) will experience an intense activity:

- Most key technologies that have been completed for integration in demonstrators will enter the phase of detailed design, manufacturing and testing.

- Should however some ITDs fail to use in due time the full funding available, due to any technical contingencies, some further technologies may be introduced in several integrated demonstrators.
- It is already clear that in the ITDs SFWA and SAGE at least, a substantial private investment is committed to delivering the needed demonstrators, well beyond the available union funding. Depending on the timing of the respective activities and reporting provisions, these may further increase the in-kind contributions to the funded programme beyond the current 50% principle provided by the Clean Sky programme funding model. The JU will further expand on this aspect as appropriate once the final planning of the actual related technical activities is more defined.

The leaders' activities are described in the following chapters; for CS2 these activities will later be complemented by the core partners as they join the programme. The commitment appropriations of the year 2016 will be sufficient to entirely cover the grant agreements with the leaders for 2016 and 2017.

2.3. Human and financial resource outlook

The JU has 42 statutory staff planned in its establishment plan for both periods. It is expected, as was already the case in the second half of 2015, that there will be a significant increase in the administrative actions needed to complete the work plan and achieve the KPI targets set out here. The parallel running of the 2 programmes, one in closure phase and one in ramp-up phase, implies plenty of final reporting to be processed on the one hand while many new grant agreements also need to be finalised. As outlined in section xx, the JU will now have to face a bigger than expected number of members of the Joint Undertaking – some of which are new to EU research funding. This will imply an investment of resources to train the new core partners. This coupled with the fact that the period 2016-2017 will be the heaviest in terms of final reporting to the JU for the first programme, will require a careful management of resources.

The first core partner call has produced the JU's biggest number of beneficiaries from just one call when compared to the number of 'associates' in the entire Clean Sky programme, i.e. 75 core partners compared to 63 associates. This figure will only increase as there are a further 3 core partner calls to be processed – the next wave being processed during 2016 already.

3. BI-ANNUAL WORK PLAN 2016-2017

3.1. Introductions to the programmes

Clean Sky Programme

Joint Technology Initiatives are purpose-built, large scale research projects created by the European Commission within the 7th Framework Programme (FP7) in order to allow the achievement of ambitious and complex research goals. Set up as a Public Private Partnership between the European Commission and the European aeronautical industry, Clean Sky pulls together the formidable research and technology resources of the European Union in a coherent, €1.6 bn programme.

The Clean Sky goal is to identify, develop and validate the key technologies necessary to achieve major steps towards the ACARE (Advisory Council for Aeronautics Research in Europe) Environmental Goals for 2020 when compared to Year 2000 levels: fuel consumption and carbon dioxide (CO_2) emissions reduced by 50%, Nitrous oxides (NO_X) emissions reduced by 80%, reduction in perceived external noise of 50% ; another goal is to improve the environmental impact of the life cycle of aeronautical products (manufacturing, operation, maintenance and disposal).

Simultaneously, the programme aims to strengthen and anchor industrial competitiveness in the European Aeronautical industry by enabling an accelerated development and validation of differentiating technology, enduring networks of research collaboration and innovation, and a stable platform for integration and synthesis of technology into viable development platforms.

Clean Sky activities cover all sectors of the Air Transport System and the associated underlying technologies.

Clean Sky is built upon 6 different technical areas called Integrated Technology Demonstrators (ITDs), where preliminary studies and down-selection of work will be performed, followed by large-scale demonstrations on ground or in-flight, in order to bring innovative technologies to a maturity level where they can be applicable to new generation "green aircraft". Multiple links for coherence and interfaces are ensured between the various ITDs.

A "Technology Evaluator", using a set of tools at different levels of integration, from the single aircraft mission to the worldwide fleet, provide for independent evaluation of the environmental achievements. The innovative technologies developed by Clean Sky cover nearly all segments of commercial aviation.

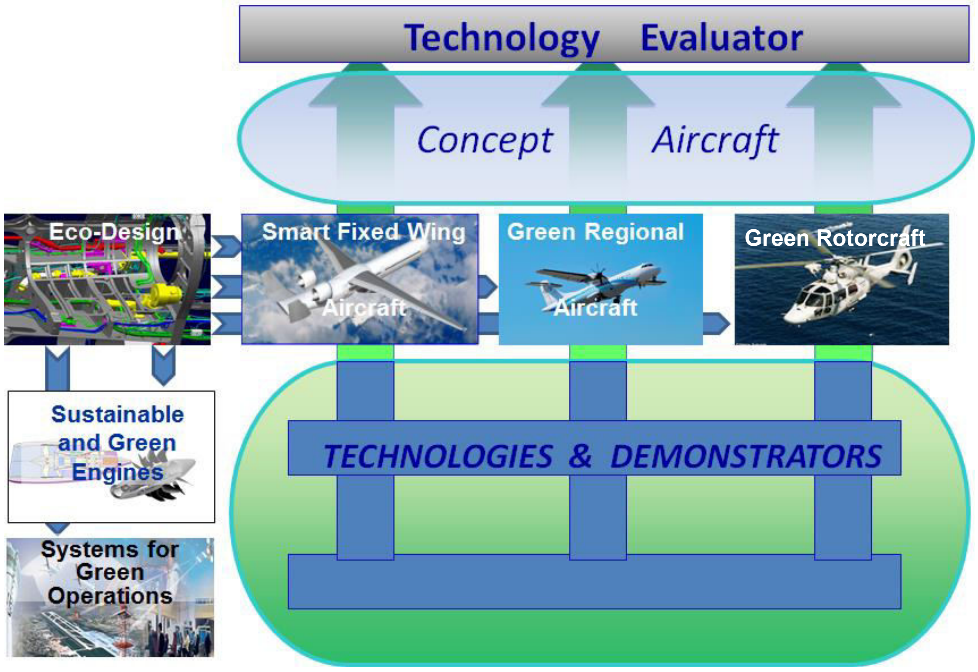
Innovative technologies, Concept Aircraft and Demonstration Programmes form the three complementary instruments used by Clean Sky in meeting these goals:

- Technologies are selected, developed and monitored in terms of maturity or 'Technology Readiness Level' (TRL), the ultimate goal of Clean Sky is to achieve TRLs corresponding to successful demonstration in a relevant operating environment (i.e. TRL 6). This is the highest TRL achievable in research.

- Concept Aircraft are design studies dedicated to integrating technologies into a viable conceptual configuration. They cover a broad range of aircraft: business jets, regional and large commercial aircraft, as well as rotorcraft.

- Demonstration Programmes include physical demonstrators that integrate several technologies at a larger 'system' or aircraft level, and validate their feasibility in operating conditions. This helps determine the true potential of the technologies and enables a realistic environmental assessment. Demonstrations enable technologies to reach a higher level of maturity (TRL).

The Clean Sky Programme is shown schematically in the following figure:



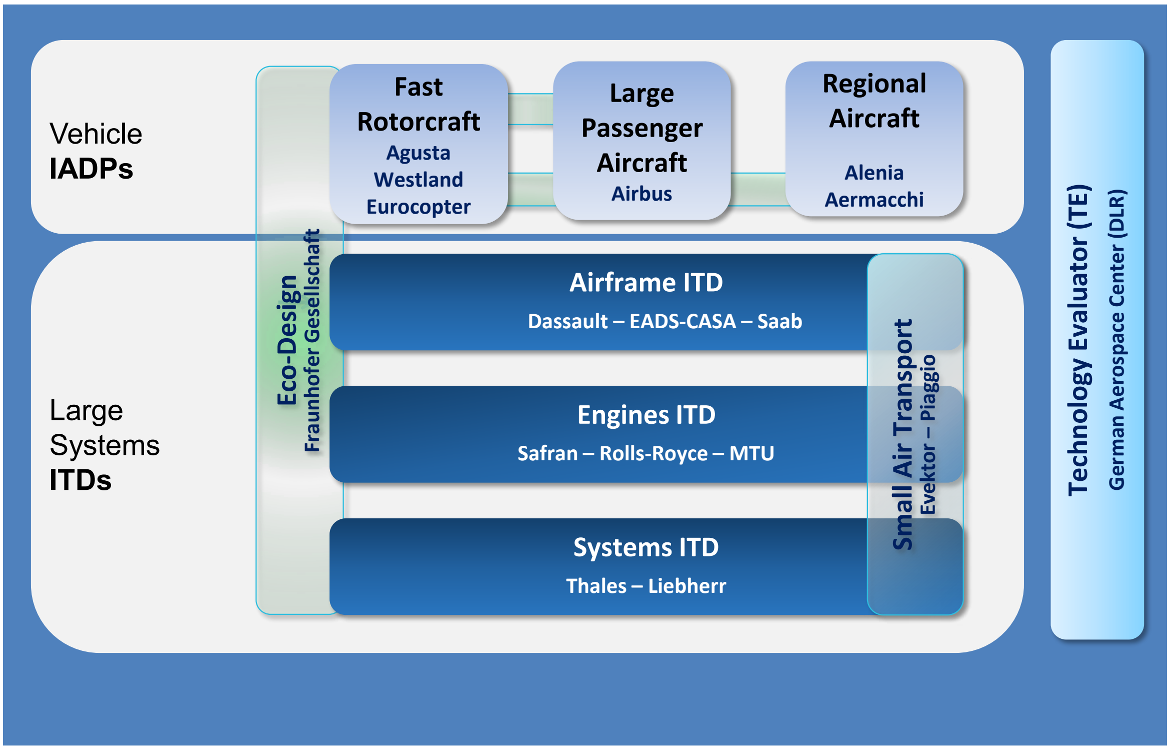
Clean Sky 2 Programme

The *Clean Sky 2* Programme is jointly funded by the European Commission and the major European aeronautics companies, and involves an EU contribution from the Horizon 2020 Programme budget of €1.755 bn. It will be leveraged by further activities funded at national, regional and private levels leading to a total public and private investment of approximately €4 bn. These so-called 'additional activities' will be enablers for the demonstrators or parallel research work necessary to develop an operational product in due time.

The *Clean Sky 2* Programme consists of four different elements:

- Three Innovative Aircraft Demonstrator Platforms (IADPs), for Large Passenger Aircraft, Regional Aircraft and Fast Rotorcraft, operating demonstrators at vehicle level;
- Three Integrated Technology Demonstrators (ITDs), looking at Airframe, Engines and Systems, using demonstrators at system level;
- Two Transverse Activities (Eco-Design, Small Air Transport), integrating the knowledge of different ITDs and IADPs for specific applications.
- The Technology Evaluator (TE), assessing the environmental and societal impact of the technologies developed in the IADPs and ITDs;

Activities of the programme will go up to, and not beyond, TRL 6. They are considered to fall into the 'Innovation actions' category according to H2020 rules. Accordingly, they shall be funded at 70% of the eligible costs.
This includes some additional activities which are not formally part of the *Clean Sky 2* Programme as described here, but which are contributing to the objectives –
The structure of the *Clean Sky 2* Programme can be summarized as set out below.



The 16 *Leaders* are Members of Clean Sky 2 that will commit to deliver the full Clean Sky 2 Programme throughout its duration.

The *Core Partners* will make substantial long-term commitments towards the Programme and bring key competences and technical contributions aligned to the high-level objectives. They will contribute to the global management of the demonstrators and contribute with significant in-kind contributions. Core Partners will be selected on the basis of Topics for Core Partners which will be launched through the Calls for Core Partners. Applicants wishing to become Core Partners in the Clean Sky 2 Programme shall submit proposals against one or more Topics. The proposals will be evaluated and the highest ranked proposals will be selected for funding by the JU.

The selected Core Partners will negotiate with the JU their accession to the Grant Agreement for Members (by signing an accession form) which will be already signed, where appropriate, between the JU and the Leaders of the relevant IADP/ITD/TA. The negotiation and accession stage will include the integration of the proposal, the work packages and technical activities of the Core Partner into the Annex I (Description of work and estimated budget) of the relevant IADP/ITD/TA Grant Agreement for Members. The Annex I will be subject to updates and revisions based on the multi-annual grant agreements framework in line with the multi-annual commitments and the programme management decision-making rules and governance framework under the CS2 Regulation.

The technical activities of the Core Partners will have to be aligned with the Programme objectives and strategic direction laid down in the Development Plan of the Clean Sky 2 Programme which will derive from the “Clean Sky 2 Joint Technical Programme” and will be referred to in the Grant Agreement for Members.

Based on the above and in the light of the specific role of the Core Partner in the implementation of the Programme and JU governance structure, other activities in addition to the technical proposal of the topic may be performed by the Core Partners and be funded by the JU.

The JU will define on one hand, when the capabilities required and other areas of activities to be performed in an IADP/ITD/TA may be covered/absorbed by the existing level of capabilities at IADP/ITD/TA Members level, subject to a technical assessment of the JU and based on the Members multi-annual grant management process, and on the other hand when the capabilities required necessitate a call to be launched by the JU.

The *partners* will carry out objective driven research activities aiming at developing new knowledge, new technologies and solutions that will bring a contribution to one of the actions as defined in the Programme and developed in one of the IADP/ITDs/TAs.

The Partners' activities will be defined through topics proposed by the private Members of the JU to complement their research activities where appropriate. The list of topics will be defined in the Work Plan with information such as the related IADP/ITD/ TA, the title of the topic, its duration and an estimate of the topic budget value without setting a maximum threshold. The nature and value of the Topics for Partners will be smaller in terms of magnitude and duration from the Topics for Core Partners.

The private Members of the JU will propose the scope, the objectives, the duration and the estimated budget associated to the Partners' activities that will be launched through Calls for Proposals (CfP) organised by the JU. The Partners' activities will consist of tasks limited in time and scope and they will be performed under the technical monitoring of the private Member acting in the call for proposal process as topic manager (the person representing the private Member in charge of the topic).

The Calls for Proposals will be subject to independent evaluation and will follow the H2020 rules on calls for proposals. Upon selection, the Partners will sign a Grant Agreement for Partners with the JU and its contribution will be made to either the final demonstrator or the set of activities which are performed by one or several CS2 Members in the frame of the Grant Agreement for Members. Partners will not become members of the JU and will not be expected to contribute to the administrative costs of the JU. Similarly, they will not participate in the steering committees of the IADP/ITDs.

3.2. Operations

3.2.1. Objectives, indicators, risks and mitigations

Clean Sky Programme

As the Clean Sky programme approaches its final phase, the objectives covering the remaining period are shown below.

The overall objectives for this period are:

- To run all the demonstrators (ground or flight demonstrators)
- To achieve the environmental targets.

The two tables below give respectively the list of the demonstrators and the environmental forecasts:

DEMONSTRATORS

ITD	Demonstrator / Technology Stream
SFWA	High Speed Smart Wing Flight Demonstrator • Airbus A340-300 flight test
	Advanced load control for Smart Wing • Ground test bed for large transport aircraft • Flight test for vibration control for bizjet

ITD	Demonstrator / Technology Stream
	Smart Wing High Lift Trailing Edge Device • Full scale demonstrator, ground test only
	Innovative afterbody • Full scale demonstrator, ground test only
	Innovative Empennage Demonstrator • Full scale demonstrator, ground test only
GRA	Static & Fatigue Test • Full Scale Ground Demonstration
	Large scale Wind Tunnel Test Demonstration • Acoustic & Aerodynamic WT Test - Turbo Prop 90 pax • NLF wing aerodynamic & aeroelastic design WT Tests - 130 • Geared Turbo Fan configuration
	Ground Laboratory Test (COPPER BIRD and other)
	Flight Simulator on ground • Green FMS Final Demonstration on GRA Flight Simulator
	Integrated In-Flight DEMO • ATR Integrated In-Flight Test - ATR 72 FTB
	Cockpit ground demonstrators MT1 & MT2
GRC	Innovative Rotor blades, passive and active (AGF), on Ground and in Flight
	Drag reduction on Ground / in Flight
	Medium helicopter electrical system demonstrator
	Lightweight helicopter electromechanical actuation
	Electric Tail Rotor Prototype
	Diesel powered flight worthy helicopter Demonstrator
	Flightpath operational Demonstrations
	Thermoplastic composite faring demonstrator
	Thermoplastic composite tailcone demonstrator
	Surface treatments for tail gearbox and rotor mast
	Surface treatments and welding technology for intermediate gearbox
	Thermoplastic composite drive shaft for intermediate gearbox
SGO	VIRTUAL IRON BIRD
	COPPER BIRD • Ground Test (Nacelle Actuation System, Power Generation and Conversion, Generators, Power Rectifiers, Electrical ECS Demonstrator, HEMAS)

ITD	Demonstrator / Technology Stream
	PROVEN (Ground test rig at Airbus Toulouse) • Flight Test (Environemental Control System Large Aircraft - Ice Protection and Ice Detection Systems) • Ground Tests (Power Generation and Conversion S/Gs, PEM - Eletrical Power Distribution System/Power Center) • Flight Tests (Thermal Management Skin Haet Exchanger) • Ground Tests (Thermal Management Vapour Cycle System inlcuding Compressor)
	AIR LAB, MOSAR & GRACE simulations
	Electric systems integration • Ground Tests (Power Generation and Conversion EDS ITD)
SAGE	Geared Open Rotor • CROR Ground Test Demonstrator
	Advanced Low Pressure System (ALPS) Demonstrator
	Geared Turbofan Demonstrator • Ground Test - Engine demonstrator based on a GTF donor engine
	Large 3-shaft Turbofan • Ground tests Demonstrator (to study aero-performance, flutter, blade integrity and bird impact capability for the composite fan system and low pressure turbine). • Flight test Demonstrator (in-flight operability of the composite fan blades). • Outdoor ground testing (to determine composite fan system flutter behaviour under cross-wind conditions and noise performance. • Icing tests (to determine ice shedding behaviour of blades and impact damage tolerances of new liners).
	Lean Burn Demonstrator • Ground Test - Lean Burn Combustion System demonstrator engine
ECO	Electrical Ground Test (Copper Bird®) • High power, High Voltage Large electrical network for validation of the All Electrical Concept for small aircraft. It includes power generation, power distribution and consumers (actuators, ECS simulation, etc)
	Thermal Ground Test • Simulation of thermal exchanges of 3 sections of an aircraft in a representative environment. Main objective is the validation of the thermal modeling process of an overall aircraft.
	Clustered technologies airframe and equipment demonstrators • 12 demonstrators related to Airframe (e.g. Fuselage panel, Cabin furniture) • 6 Equipment demonstrators (e.g. Cables, connectors, part of air cooling unit)

Environmental forecasts

The following figures, summarized here for a limited number of air transport segments, are based on the initial estimates and have been refined during 2011-2012. For a clarification of the Concept Aircraft please refer to Appendix 2 of the Clean Sky Development Plan. The ranges of potential improvements result from the groupings of technologies which are expected to reach the maturity of a successful demonstration within the Programme timeframe. All environmental benefits are related to a Year 2000 reference.

Aircraft	CO_2 [%]	NO_X [%]	Noise area difference ratio at take-off (%)
Low Speed Bizjet	-30 to -40	-30 to -40	-60 to -70
Regional turboprop	-25 to -30	-25 to -30	-40 to -50
Short/ Medium Range / CROR	-25 to -35	-25 to -35	-30 to -40
Light twin engine rotorcraft	-15 to -30	-55 to -70	-40 to -50

Indicators

The Key performance Indicators set up for the CS2 programme are presented in Annex I.

Objectives for 2016/2017

Clean Sky annual objectives are linked to the completion of the planned operational tasks, the progress towards the technologies readiness, the environmental benefits assessment, the control of expenditures, the satisfactory scheduling and outcome of calls for proposals and the further improvement of the JU's quality management and internal control system.
The objectives for this period are set out below:

- Smart Fixed Wing Aircraft Natural Laminar Flow “BLADE” wing demonstrator Critical Design Review performed
- Low Sweep Bizjet Vibration Control Ground Test, Critical Design Review performed
- Green Regional Aircraft Fuselage Barrel and Wing Box demonstrators finalized
- ATR72 Flying Test Bed, Flight Test Readiness Review performed
- Rotorcraft Active blades tested on ground (wind tunnel and whirl tower preparation)
- Rotorcraft Diesel engine tested on ground
- Open Rotor Ground Demonstrator Critical Design Review held
- Large 3-shaft engine Composite Fan Blade Ground test campaign performed
- Engine Build 2 Turboshaft Performance tests performed
- Power generation and electrical distribution systems tested on ground
- Green Flight Management System tested in simulator
- Thermal Test Bench tests for Eco Design performed

- GRA cockpit demonstrators testing & data analysis completed (with MT2 and MT1/MT2 cross testing)
- Fully-fledged Technology Evaluator assessment available at mid-year.

The JU has implemented various tools to monitor the execution of the programme in terms of productivity, achievements, planning and risks of the operations:

- Quarterly Reports of the ITDs, which inform on the resources consumption, the achievements and the resulting forecasts for level of project implementation
- Steering Committees at ITD level with involvement of the CS project officers
- Annual Reviews of the ITDs' performance organised by the JU with the involvement of independent experts.
- This monitoring information is summarized and reported regularly to the Governing Board.

Risk Management

The JU is continuously monitoring risks at various levels. Below is a brief summary of the critical and important risks as currently judged by the JU. This chapter will be further updated once the end of year reporting takes place.

Critical risks:

Risk Description	Comments on mitigation of risk
The delays incurred for developing the BLADE demo could result in missing the 2016 objective	The BLADE demonstration program is based on an A340 FTB, whose problems of availability has been discussed at length; the contribution of the different actors in the supply chain (both ITD associates and Partners) to the wing parts of the demonstrator is still being finalized. The project requires a constant attention to avoid more slippage. The JU is having periodic meetings with the ITD coordinators in order to monitor the remaining activities and the related budget impact.
The initial delay and slow ramp-up of Counter Rotating Open Rotor (CROR) demo resulted in missing the 2016 deadline in CS; the feasible target remains the Ground test of the demonstrator engine (SAGE2).	Being the Ground demonstrator now confirmed end 2015, the preparatory phase for the flight testing has slowed down and shifted to CS2. The revised plan clearly shows the flight tests being postponed to CS2, after 2016.

The JU is actively following the updated roadmap for the BLADE Laminar Wing demonstrator with the aircraft industry and its full supply chain members.

Risk assessment

Risk Description	CS-process	Action Plan Summary
A late availability of ITD aircraft models for the Technology Evaluator (lack of prioritization or lack of technical inputs) could prevent the environmental benefits assessment to be efficiently performed.	*Manage the Programme*	Tightly monitor the work progress on this item through the Project Officers and the GAMs. Have preliminary models implemented where needed.
Conflicts of priorities may happen within industrial companies, or change of strategy, resulting in a lack of resources available for Clean Sky and delays in the completion of the activities.	*Manage the Programme*	Have an early warning capability through quarterly reports and alert at Governing Board level. Propose re-orientations when needed and possible.
The “share of the pie” logic could result in a lack of focus on the major, critical activities.	*Manage the Programme*	Challenge the ITDs in order that they focus on optimising the global output.
Delayed closure of some work packages and therefore late information on final spend in some	*Manage the Programme*	Ensure regular reporting on final cost estimations and timely delivery of final reports;

Risk Description	CS-process	Action Plan Summary
ITDs may result in delayed decision making with regard to leftover funding which could be redirected to other ITDs' needs		Immediate proposal for re-distribution of funding to ITDs allowing technical activity to proceed
There is a risk that lack of pro-activity in dissemination of result may result in vague information to the end-user/interested party and therefore compromise the JU reputation	*Communicate*	Harmonize the dissemination plans of ITDs Monitor the dissemination actions
The lack of experience in European Research Programmes from many Partners (SMEs) could result in a difficult and late closure process of their projects.	*Run the Programme Office*	Reinforce the information, mainly through relevant Information Days and Web conferences; reinforce the role and the awareness of Topic Managers
The ramp-up of Clean Sky 2 in parallel to final reporting of Clean Sky could result in a scattered and delayed response from the Programme office towards beneficiaries	*Run the Programme Office*	Revise the processes and ensure adequate priorities management to cope with the closing phase of CS1 while complying with the specificities of H2020 / CS2

Clean Sky 2 Programme

The overall objectives for the Clean Sky 2 Programme for the period 2016-2017 are:

- To refresh / refine the technical content of the overall programme in the course of the accession of the core partners, and ensure this is adequately incorporated in the *CS2 Joint Technical Programme, the Clean Sky 2 Development Plan* and the Grant Agreements [including any re-evaluation of elements where appropriate];
- To further define and refine the requirements for the Demonstration Programme – as the accession of the full complement of members through the core partner selection will involve adjustments in the schedule, scope and definition of demonstrators;
- To conduct Launch Reviews for 100% of technical activity commencing in the 2015-2017 period, enabling the JU to adequately test the level of definition, of preparation and resourcing geared towards each major activity. The state of play of the relevant CS projects will be a key consideration in these reviews, in order to ensure an effective and appropriate transition from CS to CS2;
- To refine the Technology Roadmaps as elaborated in each of the sections of the CS2 Joint Technical Proposal related to the IADPs, ITDs and TAs, including where necessary a review and revision of content and priorities (for instance as a consequence of the review of former "Level 2" projects);
- To implement solutions for leveraging Clean Sky 2 funding with Structural Funds;
- To implement an effective and efficient management and governance through the Clean Sky 2 Management Manual;
- To define and implement an appropriate model for each transverse area that allows for the transversal coordination to be executed and technical synergies to be extracted;
- To select the Programme's Core Partners as planned in four Calls for Core Partners;
- To widely disseminate the information about the Calls for Proposals (for partners), in order to reach a participation from SMEs higher than 35%. To proceed with the selection of participants through these calls;
- To define the reference framework for the TE (including performance levels of reference aircraft against which the progress in CS2 will be monitored); and to elaborate the assessment criteria and evaluation schedule for the TE for each technical area. To launch the CS2 TE and complete the selection of its key participants; to conduct within the timeframe of the Work Plan the first TE assessment of CS2;
- To ensure a time-to-grant no greater than 8 months for the Calls for Proposal;
- To execute at least 90% of the budget and of the relevant milestones and deliverables;
- To ensure a high level of technical and process integrity in the execution of the Programme, including the Calls and their resulting selection of CS2 participants; and a maximum relevance of research actions performed towards the Programme's goals: thus ensuring a strong positive perception of the Programme throughout the mid-term assessment.

Clean Sky 2 Demonstrators and Technology streams

ITD/IADP	Technology Areas	Demonstrator / Technology Stream
Large Passenger Aircraft	**Advanced Engine Design & Integration for Large Passenger Aircraft**	CROR demo engine flight test demo
		Advanced engine integration driven fuselage ground demonstrator
		Validation of dynamically scaled integrated flight testing
Large Passenger Aircraft	**Advanced Laminar Flow Rig Reduction for Large Passenger Aircraft**	HLFC large-scale specimen demonstrator in flight operation
		High speed demonstrator with hybrid laminar flow control wing
Large Passenger Aircraft	**Innovative Aircraft Confirguration and Operation**	Innovative Flight Operations Next generation cockpit and MTM functionalities
		Demonstration of advanced short-medium range aircraft configuration
Large Passenger Aircraft	**Innovative Cabin & Cargo Systems and Fuselage Structure Integration for Large Passenger Aircraft**	Full-scale advanced fully integrated fuselage cabin & cargo demonstrator
		Next generation lower centre-fuselage structural demonstrator
		Next generation large module fuselage structural demonstrator with fully integrated next generation cabin & cargo concepts and systems
Large Passenger Aircraft	**Next Generation Cockpit & Avionic Concepts and Functions for Large Passenger Aircraft**	Integrated systems and avionics demonstration Full 4D - flight capability; fully parameterized green trajectory capability
		Next Generation Cockpit ground demonstrator Development and validation suite for: - New MMI functions - Advanced IMA´s - Networked data link and functions Fully integrated next generation avionics simulation & test lab
		Flight demonstration Next Generation Cockpit & flight operation features Coordinated with Systems and Equipment ITD
		"Pilot case" demonstration in flight Qualification and validation of next generation cockpit features sensible to a highly realistic environment
		Maintenance service operations enhancement demonstrator Demonstration of the technical and economic maturity and performance of a value and service oriented architecture and its enablers
Regional Aircraft	**Highly Efficient Low Noise Wing Design for Regional Aircraft**	Air Vehicle Technologies – Flying Test Bed#1 (FTB1) Low noise and high efficient HLD, NLF, Active LC&A, Innovative wing structure and systems

ITD/IADP	Technology Areas	Demonstrator / Technology Stream
Regional Aircraft	**Innovative Passenger Cabin Design & Manufacturing for Regional Aircraft**	Full scale innovative Fuselage and passenger Cabin
Regional Aircraft	**Advanced for Regional Aircraft: 1 Power Plant 2. Flight Simulator 3. Iron Bird**	WTT for Configuration of Next Generation Hi-Efficient Regional A/C with Innovative configuration, advanced powerplant integration, efficient technologies insertion at A/C level
		Flight Simulator with New cockpit interaction concepts, advanced avionics functionalities (including pilot workload reduction) , MTM (green functions in a global environment)
		Iron Bird with Innovative systems integration, Next generation flight control systems (H/W and pilot in the loop)
Regional Aircraft	**Innovative Future Turboprop Technologies for Regional Aircraft**	High Lift Advanced Turboprop – Flying Test Bed#2 (FTB2)
Fast Rotorcraft: Tiltrotor	**Advanced Tilt Rotor Structural & Aero-acoustic Design**	D1: Mock-up of major airframe sections and rotor D2: Tie-down helicopter (TDH) D3: NextGenCTR flight demonstrator (ground & flight)
		D4: Prop-rotor components and assembly
Fast Rotorcraft: Tiltrotor	**Advanced Tilt Rotor Aerodynamics and Flight Physics Design**	D6: NextGenCTR's fuselage assembly
		D7: NextGenCTR's wing assembly
		D8: Engine-airframe physical integration D9: Fuel system components
Fast Rotorcraft: Tiltrotor	**Advanced Tilt Rotor Energy Management System Architectures**	D5: NextGenCTR's drive system components and assembly
		D10: intelligent electrical power system and anciliary/ auxiliary components D11: Flight control & actuation systems and components
Fast Rotorcraft: Tiltrotor	**Tiltrotor Flight Demonstrator**	Tiltrotor Flight Demonstrator
Fast Rotorcraft: Compound R/C	**Innovative Compound Rotorcraft Airframe Design**	Airframe structure & landing system *NB: Wing and tail addressed in Airframe ITD dedicated WPs (1.8, 1.11)* To include: – advanced composite or hybrid metallic/composite structure using latest design and production techniques – Specific landing system architecture & kinematics
Fast Rotorcraft: Compound R/C	**Innovative Compound Rotorcraft Power Plant Design**	Lifting Rotor & Propellers Integrated design of hub cap, blades sleeves, pylon fairings, optimized for drag reduction; Rotor blade design for combined hover-high speed flight envelope

ITD/IADP	Technology Areas	Demonstrator / Technology Stream
		and variable RPM; Propeller design optimized for best dual function trade-off (yaw control, propulsion);
		Drive train & Power Plant Engine installation optimized for power loss reduction, low weight, low aerodynamic drag, all weather operation; New mechanical architecture for high speed shafts, Main Gear Box input gears, lateral shafts, Propeller Gear boxes, optimized for high torque capability, long life, low weight. REACh-compliant materials and surface treatments.
Fast Rotorcraft: Compound R/C	**Innovative Compound Rotorcraft Avionics, Utilities & Flight Control Systems**	On board energy, cabin & mission systems Implementation of innovative electrical generation & conversion, high voltage network, optimized for efficiency & low weight; advanced cabin insulation & ECS for acoustic and thermal comfort.
		Flight Control, Guidance & Navigation Systems Smart flight control exploiting additional control degrees of freedom for best vehicle aerodynamic efficiency and for noise impact reduction.
Fast Rotorcraft: Compound R/C	**LifeRCraft Flight Demonstrator**	LifeRCraft Flight Demonstrator Integration of all technologies on a unique large scale flight demonstrator, success & compliance with objectives validated through extensive range of ground & flight tests
Airframe	**High Performance and Energy Efficiency**	Innovative Aircraft Architecture Noise shielding, noise reduction, Overall Aircraft Design (OAD) optimisation, efficient air inlet, CROR integration, new certification process, advanced modeling
		Advanced Laminarity Laminar nacelle, flow control for engine pylons, NLF, advanced CFD, aerodynamic flow control, manufacturing and assembly technologies, accurate transition modelling, optimum shape design, HLF
		High Speed Airframe Composites (D&M), steering, wing / fuselage integration, Gust Load Alleviation, flutter control, innovative shape and structure for fuselage and cockpit, eco-efficient materials and processes
		Novel Control Gust Load Alleviation, flutter control, morphing, smart mechanism, mechanical structure, actuation, control algorithm
		Novel Travel Experience Ergonomics, cabin noise reduction, seats & crash protection, eco-friendly materials, human centered design, light weight furniture, smart galley

ITD/IADP	Technology Areas	Demonstrator / Technology Stream
Airframe	**High Versatility and Cost Efficiency**	Next Generation Optimized Wing Box Composite (D&M), out of autoclave process, modern thermoplastics, wing aero-shape optimisation, morphing, advanced coatings, flow and load control, low cost and high rate production
		Optimized High Lift Configurations Turboprop integration on high wing, optimised nacelle shape, high integration of Tprop nacelle (composite/metallic), high lift wing devices, active load protection
		Advanced Integrated Structures Highly integrated cockpit structure (composite metallic, multifunctional materials), all electrical wing, electrical anti-ice for nacelle, integration of systems in nacelle, materials and manufacturing process, affordable small aircraft manufacturing, small a/c systems integration
		Advanced Fuselage Rotor-less tail for fast r/c (CFD optimisation, flow control, structural design), pressurised fuselage for fast r/c, more affordable composite fuselage, affordable and low weight cabin
Engines	**Innovative Open Rotor Engine Configurations**	Open Rotor Flight Test Ground test and flight test of a Geared Open Rotor demonstrator: - Studies and design of engine and control system update and modifications for final flight test - Manufacturing, procurement and engine assembly for ground test checking before flight Following on flight test planned in LPA IADP and test results analysis
Engines	**Innovative High Bypass Ratio Engine Configurations I : UHPE Concept for Short/Medium Range aircraft (Safran)**	UHPE demonstrator
Engines	**Business Aviation/Short Range Regional Turboprop Demonstrator**	Business aviation/short range regional Turboprop Demonstrator Design, development and ground testing of a new turboprop engine demonstrator for business aviation and short range regional application

ITD/IADP	Technology Areas	Demonstrator / Technology Stream
Engines	**Advanced Geared Engine Configuration**	Advanced Geared Engine Configuration (HPC and LPT technology demonstration) Design, development and ground testing of an advanced geared engine demonstrator: improvement of the thermodynamic cycle efficiency and noise reduction
Engines	**Innovative High Bypass Ratio Engine Configurations II: VHBR Middle of Market Turbofan Technology (Rolls-Royce)**	VHBR Middle of Market Turbofan Technology Design, development and ground testing of a VHBR Middle of Market Turbofan
Engines	**Innovative High Bypass Ratio Engine Configurations III:** VHBR engine demonstrator for the large engine market **(Rolls-Royce)**	VHBR engine demonstrator for the large engine market Design, development and ground testing of a large VHBR engine demonstrator
Engines	**Small Aircraft Engine Demonstrator**	Small Aircraft Engine Demonstrators - reliable and more efficient operation of small turbine engines - light weight and fuel efficient diesel engines
Systems	**Integrated Cockpit Environment for New Functions & Operations**	Extended Cockpit Demonstrations for: – Flight Management evolutions : green technologies, SESAR, NextGen, interactive FM – Advanced functions : communications, surveillance, systems management, mission management – Cockpit Display Systems: new cockpit, HMI, EVO, etc. – IMA platform and networks
Systems	**Innovative and Integrated Electrical Wing Architecture and Components**	Innovative Electrical Wing Demonstrator (including ice protection) for: - New actuation architectures and concepts for new wing concepts - High integration of actuators into wing structure and EWIS constraints - Inertial sensors, drive & control electronics - New sensors concepts - Health monitoring functions, DOP - WIPS concepts for new wing architectures - Shared Power electronics and electrical power management
		Optimization of ice protection technologies and control strategy
Systems	**Innovative**	Advanced systems for nose and main landing gears

ITD/IADP	Technology Areas	Demonstrator / Technology Stream
	Technologies and Optimized Architecture for Landing Gears	applications for: - Wing Gear and Body Gear configurations - Health Monitoring - Optimized cooling technologies for brakes - Green taxiing - Full electrical landing gear system for NLG and MLG applications - EHA and EMA technologies - Electro-Hydraulic Power Packs - Remote Electronics, shared PE modules - Innovative Drive & Control Electronics
Systems	**High Power Electrical and Conversion Architectures**	Non propulsive energy generation for: - AC and DC electrical power generation - AC and DC electrical power conversion - SG design for high availability of electrical network Integrated motor technologies, with high speed rotation and high temperature material. Equipment and Systems for new aircraft generations
Systems	**Innovative Energy Management Systems Architectures**	Innovative power distribution systems, (including power management) for: - Electrical Power Centre for Large Aircraft – load management and trans-ATA optimization - High integrated power center for bizjet aircraft (multi ATA load management, power distribution and motor control) - Smart grid, develop & integrate breakthrough components to create a decentralized smart grid, partly in non-pressurized zone. - Electrical Power Centre – load management optimization Health Monitoring, DOP compliant
Systems	**Innovative Technologies for Environmental Control System**	Next Generation EECS, Thermal management and cabin comfort for: - New generation of EECS including a global trans ATA visionable to answer the needs for load management, Inerting systems, Thermal Management, Air quality & cabin comfort - Development / optimisation of Regional A/C EECS components for full scale performance demonstration - New generation of cooling systems for additional needs of cooling
Systems	**Advanced Demonstrations Platform Design & Integration**	- Demonstration Platform – PROVEN, GETI & COPPER Bird® - To mature technologies, concepts and architectures developed in Clean Sky 2 or from other R&T programs and integrated in Clean Sky 2

ITD/IADP	Technology Areas	Demonstrator / Technology Stream
		- For optimization and validation of the thermal and electrical management between the main electrical consumers
Systems	**Small Air Transport (SAT) Innovative Systems Solutions**	Small Air Transport (SAT) Activities - Efficient operation of small aircraft with affordable health monitoring systems - More electric/electronic technologies for small aircraft - Fly-by-wire architecture for small aircraft - Affordable SESAR operation, modern cockpit and avionic solutions for small a/c - Comfortable and safe cabin for small aircraft *Note: budget has been identified for specific SAT work inside Systems. However, synergies with main demonstrators and specific work still have to be worked upon*
Systems	**ECO Design**	ECO Design activities Refers to ECO Design chapter
Technology Evaluator (TE)	**A systematic overall approach to the TE process and monitoring activity**	- Progress Monitoring of *Clean Sky 2* achievements - Evaluation at Mission Level of particular ITD outputs - Impact Assessments at Airport and ATS Level
Eco-Design Transverse Activity	**An overall innovative approach and "agenda" for Eco-Design activity in the CS2 Programme**	Eco-Design activities are embedded in all IADPs and ITDs. They are detailed in Chapter 13. Thus, a dedicated funding for Eco-Design is reserved inside each IADP's and ITD's funding. The co-ordination of all Eco-Design activities will be established in the Airframe ITD. The list of technology areas and "story boards" and demonstrators will be established during the 2014-15 period.
Small Air Transport (SAT) Transverse Activity	**An overall innovative approach and "agenda" for Small Air Transport activity in the CS2 Programme**	Small Air Transport (SAT) activities are part of Airframe, Engines (WP7) and Systems ITDs and are detailed in Chapter 14. The co-ordination of all SAT activities will be established in the Airframe ITD. The planned demonstrators are included in the above descriptions of the Airframe, Engines and Systems ITDs.
LEGEND		
IADP/ITD/TA	***Technology Area***	***Demonstrator / Technology Stream*** *Text highlighted as indicated relates to demonstrators foreseen within the CS2 Programme for which an ex-ante Technical Evaluation by independent experts is still required. As such they are noted here as conditional - subject to a successful evaluation.*

Environmental forecast

The table below shows the environmental targets of the Clean Sky 2 Programme as defined in the Joint Technical Proposal.

	Clean Sky 2 as proposed*
CO_2 and Fuel Burn	-20% to -30% (2025 / 2035)
NO_X	-20% to -40% (2025 / 2035)
Population exposed to noise / Noise footprint impact	Up to -75% (2035)

* Baseline for these figures is best available performance in 2014

These figures represent the additionality of CS2 versus the 2014 Horizon 2020 Start Date and allow the full completion of the original ACARE 2020 goals (with a modest delay)

Indicators

The Key performance Indicators set up for the CS2 programme are presented in Annex I.

Risk assessment

The following table presents the risk assessment of the Clean Sky 2 programme as defined through the risk assessment exercise performed by the JU's management.

Risk Description	CS Process	Action Plan summary
Conflicts of priorities may happen within industrial companies, or change of strategy, resulting in a lack of resources available for Clean Sky 2, delays in the completion of the activities and/or a need to revise programme content.	*Manage the Programme*	Implement a Launch Review for each Project. Have an early warning capability through quarterly reports and alert at Governing Board level. Propose re-orientations when needed and possible. Actively use CS2DP and GAM Amendment processes to re-orientate where needed
Technical setbacks in one or several IADPs / ITDs / TAs may result in under achievement of milestones and deliverables and/or a significant under-spending of annual budget.	*Manage the Programme*	Review each quarter and advise GB where issues arise. Re-balance the budget across ITDs/IADPs and with Partners if necessary.
The potential introduction of Clean Sky 2 in parallel to Clean Sky may result in a scattering of beneficiaries' resources, a delay in Clean Sky demonstrator's	*Manage the Programme*	Check resources and any critical dependencies in Launch Reviews. Condition the CS2 funding by ITD and by beneficiary to the actual execution of CS budgets and technical progress

Risk Description	CS Process	Action Plan summary
finalization and an overload for the CS team.		
Guidelines for Clean Sky 2 preparation documents may be not clear and/or stable enough, leading to late or incomplete IADP / ITD / TA submissions to the JU.	*Manage the Programme*	Have clear management plan and templates for required documentation. Revise where necessary taking "lessons learnt into consideration from 2014-15 period
Planning for cost and effort for complex, large ground and flight demonstrators (10 year programme) may lack accuracy	*Manage strategic planning risks* *Deploy lessons learned project*	Each IADP / ITD to deploy an individual, tailored risk management and to completion plan. CS2DP process to highlight "through to completion" plans, budgets and risks, allowing due assessment and revision opportunities.
Negotiation processes with Core Partners may be lengthy, leading to delayed start of technical activities	*Manage the Programme / Manage the Calls*	Ensure appropriate guidance and instructions / training for Winners and WALs; have a close follow-up of all negotiations and early warning / escalating process for solving issues.
Efforts for interfaces and cooperation of partners for flight worthy hardware and complex flight demonstrators may be initially underestimated	*Manage strategic planning risks* *Deploy lessons learned project* *Systematic Design Reviews*	Have clear descriptions of work in Call texts for such activities directly related to flight worthy hardware, including requested skills and agreements. Deploy an individual, tailored risk management for interfaces of members and partners for large demonstrator activities Prepare more conservative back-up solutions in advance to mitigate the risk
Competences and resource to successfully enable flight testing may be insufficient	*Manage the Programme / Manage the ITDs*	Clearly identify the required competences and resources and closely monitor thru PDR/CDR and milestone management. Enforce consistent and robust risk management; implement early-warning system to avoid late discovery of critical path related risks Check relevance of cost and schedule wrt airworthiness issues at Launch Reviews (and further reviews)
Some costs may be overrun, and some participants may be unable to carry on until completion.	*Manage the ITDs*	Manage priorities: abandon non crucial technology development and integrate only the crucial ones in the demonstration. Consider the implementation of a contingency margin.

3.2.2. CALLS FOR CORE PARTNERS AND CALLS FOR PROPOSALS

Calls for core-partners

Core Partners will be Members of the JU. They will have a strategic and long-term commitment to the Programme, and will perform core tasks and bring key capabilities to implement the Programme through the research actions in which they are involved. Core Partners will bring a significant level of in-kind contribution that is consistent with the indicative total value of each Topic and further activities which may be performed, where applicable, in the relevant IADP/ITD.

Core Partners' responsibilities will include:

- Performing technological research activities, reflecting the core activities of the programme, aimed at a significant advance beyond the established state-of-the-art, including scientific coordination;
- Contributing to the preparation and management of integrated demonstrators, proving the viability of new technologies with a potential economic advantage, up to TRL 6
- Sharing other key activities such as work package management, dissemination of research results and the preparation for their take-up and use, including knowledge management; and activities directly related to the protection of foreground. This will also include acting where appropriate as a Topic Manager in the Calls for Proposals within the relevant Work Package for which they are responsible, and consequently, monitoring the activities of the relevant Partner(s) selected by the JU by the Calls for Proposals;
- Participate to the relevant Steering Committees of the IADP/ITD and be represented in the Governing Board of the JU
- Co-determine the direction of the Programme through its governance entitlements.

Core Partners will be selected on the basis of topics launched through the Calls for Core Partners. Applicants wishing to become Core Partners in the Clean Sky 2 Programme shall submit applications against one or more topics describing their key capabilities and competences and a description of the work to be performed in response to the topics. The funding shall be allocated following evaluation of proposals by independent experts, the ranking list submitted to the Governing Board for acceptance and the highest ranked applicants subsequently invited to commence negotiations which, upon successful conclusion will lead to a formal application for membership of the JU to the Governing Board. On accession as member the applicant's agreed activity will be absorbed in the Grant Agreement for Members and will become eligible for funding by the JU.

The selected Core Partners will negotiate with the JU their accession to the Grant Agreement for Members (by signing an accession form) which will be already signed, where appropriate, between the JU and the Leaders of the relevant IADP/ITD/TA. The negotiation and accession stage will include the integration of the proposal, the work packages and technical activities of the Core Partner into the Annex I (Description of work and estimated budget) of the relevant IADP/ITD/TA Grant Agreement for Members. The Annex I will be subject to updates and revisions based on the multi-annual grant agreements framework in line with the multi-annual commitments and the programme management decision-making rules and governance framework under the CS2 Regulation.

The technical activities of the Core Partners will have to be aligned with the Programme objectives and strategic direction laid down in the Development Plan of the Clean Sky 2 Programme which will derive from the “Clean Sky 2 Joint Technical Programme” and will be referred to in the Grant Agreement for Members.

Based on the above and in the light of the specific role of the Core Partner in the implementation of the Programme and JU governance structure, other activities in addition to the technical proposal of the topic may be performed by the Core Partners and be funded by the JU. In the course of the implementation and updates of the multi-annual Programme when the implementation of other areas of the Programme require the specific key capabilities of the Core Partners and its level of technical involvement in the implementation of the ITD/IADP/TA objectives.

The JU will define on the one hand, when the capabilities required and other areas of activities to be performed in an IADP/ITD/TA may be covered/absorbed by the existing level of capabilities at IADP/ITD/TA Members level, subject to a technical assessment of the JU and based on the Members multi-annual grant management process, and on the other hand when the capabilities required necessitate a call to be launched by the JU.

Definition of Topics for the Calls for Core Partners

The description of the Topic will define the key capabilities and capacity required to the applicants to implement the Programme in the relevant IADP/ITD area and the scope, goals and objectives of the activities to perform the topic. The indicative average total value of a Topic for the selection of Core Partners will be approximately 10 M€ throughout the Programme.1

The description of the overall Clean Sky 2 Programme is the “Joint Technical Programme [first published by JU on the 27th of July 2014][2] which may be regarded by the applicants to clarify the context of the topics within the overall strategic objectives of the Programme and the relevant IADP/ITD area.

---

[1] This indicative average total topic value of 10M € is set in a way to achieve at global and individual level a real strategic contribution and level of investments of the Core Partners to the Programme in the light of the total budget of the Programme (1,755 B€), the level of in-kind contribution to the Programme to be brought by the Core Partners as Members of the CSJU (Article 4 of the Statutes) and the 30% maximum share of funding envisaged for Core Partners as set out in the CSJU Regulation.

[2] The Clean Sky 2 “Joint Technical Programme” is the high-level programme as published by the CSJU following the independent evaluation performed on the work packages, technology streams and demonstrator projects proposed by the Leaders via the “Joint Technical Proposal.” *The Joint Technical Programme” will be implemented and updated across the duration of the Programme and of the CSJU in the form of a “Development Plan » to be formally approved by the CSJU which will* define and update the full roadmap of the Programme.

Content of the Core Partner Topic description:

- IADP/ITD or TA containing the activity and of the CS2 Leader launching the topic;
- topic area and its relation to the strategic objectives of the IADP/ITD;
- indicative funding value of the topic over its foreseen full duration;
- expected scope of work and contributions of the core partner within the IADP/ITD;
- short/medium term objectives/milestones; required output; timeframe, major deliverables;
- key capabilities, operational capacity and competences required to implement the Programme and to adequately deal with the risks associated to the activity under the topic and the Programme area (both at IADP/ITD and applicant level);
- requirements related to the operational capacity (level of competences, level of technical capabilities, availability and capacities of specific resources, equipment, machineries track record etc.) and any specific requirement such as (e.g.) Design Organization Approval [DOA], Production Organization Approval [POA], etc.;
- any specific legal, intellectual property, confidentiality and liability aspects in line with the provisions under the JU Model Grant Agreement for Members[3] and with the IADP/ITD Consortium Agreement[4];
- Specificities related to Transversal Activities (TAs) where contributions stemming from the topic are relevant to one or more of the IADP/ITDs in addition to the TA itself.

Complementary Activities[5]

Applicants may propose complementary activities and innovative solutions within the general topic area related to the topic(s) for which they are applying and within the scope of the IADP/ITD where they can demonstrate that their capabilities and these activities as proposed:

- would be in line with the Programme's key goals and objectives;
- would represent an enhancement or improvement of the content of an IADP/ITD;
- would lead to a demonstrable additional move beyond the state of the art in the general area of the topic as published.

Calls for proposals

The third Calls for Proposals is foreseen for launch in January 2016. A fourth, fifth and sixth Calls for Proposals (for Partners or 'complementary grants') are foreseen to be launched in July 2016; January and July 2017 respectively.

Partners

[3] To be published by the CSJU at the launch of the call

[4] To be published by the CSJU at the launch of the call or in due time before the start of the negotiation

[5] Applicable to calls for Core Partners only. Complementary activities shall not be misunderstood with the additional activities defined in Article 4.2 of CSJU Regulation.

Partners will carry out objective driven and applied research activities aiming at developing new knowledge, new technologies and solutions that will bring a contribution to one of the actions as defined in the Programme and developed in one of the IADPs/ITDs/TAs. The Partners' activities will be performed under the technical monitoring of the private Member acting in the Call for Proposal process as Topic Manager [see general annexes].

The Partners' activities are defined through open topics proposed by the private Members of the JU for the Calls for Proposals. Upon the validation of these proposed topics by the JU in terms of innovation and/or new knowledge to result, they are launched by the JU in the Calls in order to support and complement the Programme's research and innovation activities where appropriate. Special consideration is given by the JU to the appropriate balance of lower TRL and longer-term research actions versus innovation-oriented efforts called for in the topics, and the leverage and supply chain access made available to SMEs.,

The lists of Call topics and their short summary and indicative budget form part of the JU Work Plan; their descriptions are defined in the Call Fiche. Topics for Partners will be smaller in terms of magnitude and duration than the Topics for Core Partners.

The Calls for Proposals will be subject to independent evaluation governed by the rules appended to this Work Plan and/or published with the topics on the participant portal. Upon selection, the Partners will sign a Grant Agreement for Partners with the JU and their contribution will be made to the research activities which are performed by one or several CS2 Members in the frame of their Grant Agreement for Members. Partners will not become members of the JU and will not be expected to contribute to the administrative costs of the JU. Similarly, they will not participate in the management of the IADP/ITDs/TAs concerned.

Definition of Topics

Partners will be selected on the basis of Topics which will be launched through the Calls for Proposals (CfP). Applicants interested in becoming Partners in the Clean Sky 2 Programme must submit proposals against one or more Topics. The proposals will be evaluated and the highest ranked proposals will be selected for funding by the JU.

The description of Topics will define the scope, goals, objectives and estimated duration of the activities to be performed by the successful applicant upon being selected a Partner.

The Topic description will be described in the call text.

Content of the Topic description:

- The name of the IADP/ITD to which the activity is linked;
- the proposed scope of work and tasks outputs as required within the IADP/ITD;
- an indicative total action value, no maximum value will be set;
- the alignment with strategic objectives of the IADP/ITD;
- a clear description of the areas or fields where the applicant is requested to bring new knowledge, new technologies or solutions
- the expected overall contribution: output, timeframe, deliverables and milestones;

- the competences required to run the action (expertise and skills, capabilities and track record) and to deal with risks associated to the activity (both at project and applicant level);
- the requirements related to the operational capacity (level of competences, level of technical capabilities, availability and capacities of specific resources, track record etc);
- any specific legal, intellectual property and liability aspects in line with the provisions of the JU model Grant Agreement for Partner and with the IADP/ITD Consortium Agreement or Implementation Agreement;
- Any specific confidentiality and competitive issues and any specific requirement (e.g holding a valid Design Organization Approval [DOA]; Agreement, Production Organization Approval [POA], etc.);

Technical implementation of the Partner's actions within the IADP/ITD - Access rights between private Members and Partners

The contribution of the Partner to the activities of the private Member and the objectives of the relevant IADP/ITD requires a close cooperation between the Topic Manager and the Partner selected by the JU to execute the work and implement the action under the Grant Agreement for Partner.

When assigned as Topic Manager in a Call for Proposals, the private Member shall monitor that the activities of the selected Partner are properly technically implemented and meet the objectives of the IADP/ITD and to provide a timely technical feedback/opinion to the JU which is in charge of the validation and approval of reports and deliverables.

In order to ensure an adequate framework for the cooperation between the private Member and the Partner, the latter is requested either to accede to the Consortium Agreement of the IADP/ITD, where applicable, or to negotiate and sign an implementation agreement with the private member which will define the framework of the cooperation.

In order to ensure the correct implementation of the action, a mutual access rights regime shall apply to the Topic Manager and the selected Partner. The access rights regime shall apply at action level. More specifically the Topic Manager and the selected Partner shall grant mutual access rights under the same conditions to the background for implementing their own tasks under the action and for exploiting their own results. Specific provisions will be laid down in the respective Model Grant Agreement for Members and Model Grant Agreement for Partners[6].

[6] Under the conditions set out in Articles 25.2 and 25.3 of the H2020 model grant agreement

3.2.3. Call management (planning, evaluation, selection)

Fourth Call for Core Partners JTI-CS2-2016-CPW04

The JU foresees a fourth call for core partners to be launched in the third quarter of 2016. The indicative funding value of this call is 75M Euro. Further information on the topics to be opened for this call will be available at a further update of this work plan and in time before the call is launched according to the JU's process.

Third Call for Proposals (for Partners) JTI-CS2-2016-CfP03

The third Call for Proposals for Partners is foreseen to be launched in February 2016. The indicative funding value of this call is ~58M Euro. The Call topics and their brief summaries and indicative values are appended in Annex II: 3rd Call for Proposals (CfP03): List and Full Description of Topics of this Work Plan and made available on the Participant Portal.

- Indicative Publication date: 29 February 2016
- Indicative Deadline for submission (call closure date): 30 May 2016
- Overall indicative funding value: 58 M Euro

Fourth Call for Proposals (for Partners) JTI-CS2-2016-CfP04

The fourth Call for Proposals for Partners is foreseen to be launched in May/June 2016. The indicative funding value of this call is 40M Euro. The Call topics and their brief summaries and indicative values will be appended to further updates to this Work Plan.

Fifth Call for Proposals (for Partners) JTI-CS2-2017-CfP05

The fifth Call for Proposals for Partners is foreseen to be launched in January 2017. The indicative funding value of this call is 45M Euro. The Call topics and their brief summaries and indicative values will be appended to further updates to this Work Plan.

Sixth Call for Proposals (for Partners) JTI-CS2-2017-CfP06

The sixth Call for Proposals for Partners is foreseen to be launched in July 2017. The indicative funding value of this call is 45M Euro. The Call topics and their brief summaries and indicative values will be appended to further updates to this Work Plan.

Synergies with the Structural funds

The European Structural and Investment Funds (ESIF) will invest approximately 100 billion Euros in innovation and research in the period 2014-2020. Article 20 of the Horizon 2020 Regulation and Article 37 of the Rules for Participation encourage synergies between Horizon 2020 and other European Union funds, such as ESIF. The Clean Sky 2 JU is called by its founding Regulation to develop close interactions with ESIF.
Synergy does not imply replacing the private contribution to be brought in the CSJU action by ESIF or combining them for the same cost item in a project although a CSJU project can benefit from additional funding from ESIF at national or regional level for complementary or additional activities not covered by the CSJU grant. Synergy means to expand the scope and

impact of a CSJU project through ESIF funds in terms of scientific excellence and contribution to the Clean Sky 2 Programme objectives.

In the framework of its calls, the CSJU encourages the submission of proposals containing a separate and clearly identified Work Package (ESIF WP) that is independently funded or eligible for funding through ESIF under the applicable national/regional funding scheme/call. Activities proposed under the ESIF WP, where applicable, should be of complementary nature to the core scope of the Call topic, should contribute to the overall objectives of the Clean Sky 2 Programme but are or may be exclusively funded through ESIF. In the context of the calls for proposals, the complementary activities will be assessed by the JU outside the call for proposal framework, its evaluation and applicable rules.

The CSJU encourages also synergies with ESIF also by amplification of the scope, parallel activities or continuation of a CSJU co-funded project through ESIF in synergy with the Programme and by stimulating the use of ESIF to build capacity and capabilities in the fields related to the Programme.

3.3. ITD/IADP/TA OPERATIONS

3.3.1. CLEAN SKY PROGRAMME

SFWA – Smart Fixed Wing Aircraft

Multi-annual overview and strategic planning

The strategic objectives of SFWA-ITD remain unchanged and the route to the end in 2016 is well defined for all Technology Streams (TS). Some of them are almost closed such as Hybrid Laminar Flow, Buffet Control and SFWA-ITD's contribution to the CleanSky Technology Evaluator.
In the frame of Natural Laminar Flow (NLF) TS, the BLADE flight test campaign is now planned to start in September 2017, the year 2016 being dedicated to outer wing components installation into the A340 MSN1 at Tarbes, targeting the first A/C "Power on" by end 2016. Critical paths remain on both Upper Cover panels from SAAB and GKN.
For the BLADE project and according to the 2015 Consortium Plan, due to Romaero missing parts for the manufacturing of some outer wing components, the technical perimeter has evolved for some members such as Aernnova, Airbus and INCAS through either new activities or subcontracts until mid-2016.
For Business jet demonstrators and in the frame of the Fluidic Control Surfaces TS, we can note the consolidation of the High Sweep Bizjet Smart flap Aerodynamic Wind Tunnel tests in 2016 between Dassault, ONERA and CMA Vallet (CfP V-TAIL). It leads to:

- A new work sharing dedicated to the model manufacturing and instrumentation between ONERA and CMA Vallet
- An optimization of the HSBJ test plan to reduce the facility occupation, the integration of the manufacturing of part of the model for the same tests. No change vs global objectives and budget needs as described in 2014.

For Open rotor related studies, there are remaining de-risking activities with a new time frame for noise, safety and technology maturation. A smooth transition into Clean Sky 2 is insured towards economic viability studies.

Description of main activities for the year 2016
<u>WP 1.1 Flow Control</u>: This work package covers passive and active flow control technologies for drag reduction and separation control. The aim is to bring these technologies to a sufficiently high readiness level so that they can be progressed within work package 2 and flight tested within work package 3. Activities were completed at end 2015.
<u>WP 1.2 Load Control</u>: Active (via control surfaces) and passive solutions (improved and multi objective structural or aerodynamic design). It covers loads estimation, control and monitoring functions. In 2016, an increase of maturity for load alleviation with data analysis of Ground vibration tests and preparation of development plan for phase 2 (ground or flight test depending on maturity in managing vibration control complexity) will occur.
<u>WP 1.3 Integrated Flow and Load control system</u>: The overall objective is to provide a system solution to support the implementation of load & flow control concepts in future A/C's; for this objective, development of specific sensors and actuators are necessary.
In 2016, closure of integration tasks for a Flap Fluidic Actuator into the Integrated Active Component Demonstrator (IACD) also called "Iron bird".

WP 2.1 Integration of Smart Wing into OAD: In 2016, activities are two-fold:
1) Simulation and validation for:
- LS flow and load control technologies (tests at ON F1 and RANS computation)
- HS flow and load control technologies (tests at ETW and ON S1MA with associated CFD)
- Structural and Systems (wing integration of actuator systems)

2) Wind tunnel tests at ONERA on a laminar wing integrated in a Low Sweep Bizjet (LSBJ) (CfP Eulosam) as well as V-tail concept and innovative control surfaces in a High Sweep (HSBJ) model (CfP V-Tail).

WP 2.2 Integration of other Smart Component into OAD: For Bizjets, the activities are focused on simulation and tests preparation for innovative after bodies configuration assessment. For Open Rotor related activities, closure of certificability related studies (shielding concepts, propeller blade release threat reduction) and, according to the economic viability of such a concept, aeroacoustic characterization in Wind Tunnel at DNW (via CfP's) on an Unducted Single Fan puller engine.

WP 2.3 Interfaces and Technology assessment: Ready to be delivered to the TE, the evaluation of the noise, local emissions, weight and performance impacts of SGO, SAGE and SFWA-ITD technologies for Large A/C and Bizjets are terminated in 2015. Nevertheless, until completion, a continuous cooperation and interfacing is planned with other ITD's as well as inside SFWA.

WP 3.1 Low Drag Demonstrator: The major objective of this work package is to demonstrate on an A340 test aircraft that a structural concept is viable in terms of cost and quality, while fulfilling surface quality requirement for the laminar flow.

Major tasks for 2016 are dedicated to the delivery of wing metallic components, working parties on test A/C and permit to fly related tasks.

WP3.2 Low Speed Demonstrator: The objective is to validate the aero efficiency and loads of innovative control surfaces (smart flap). Global and partial force measurements will be used combined with detailed pressure distribution. A secondary objective is to measure the impact of the innovative configurations on propulsion efficiency, through an inlet rake.

Based on CfP V-Tail, high and low speed wind tunnel tests are planned in 2016 on High Sweep Bizjet concept at ONERA. In the frame of Natural Laminar wing assessment, a low speed test is planned at ON in 2016 on Low Sweep BJ concept.

WP 3.5 Aft body demonstrator: The objective is to demonstrate noise shielding performances and structural feasibility of an innovative U-tail bizjet configuration, via far field noise shielding measurement, acoustic, fatigue and thermal characterization (metallic and composite panel installed on the U-tail). The ground tests on Flacon F7X will be completed by Q3/2016 (TRL 5). Aeroelastic tests for flutter characterization are also planned at ONERA by mid-2016.

a) ***Major milestones planned for 2016:***

Milestones				
Ref. No. WP 3.1		***Title – Description***	***Type***	***Due Date***
Pre-FAL and FAL activities	M1.1	Completion of wing assembly at Aernnova	D	T0+6
	M1.2	Transition zone installation	D	T0+6
	M1.3	Delivery of Aernnova wings	D	T0+7

Milestones				
Ref. No. WP 3.1		***Title – Description***	***Type***	***Due Date***
	M1.4	Start of painting phase in pre-FAL Toulouse	D	T0+8
A/C mofidication	M2.1	Completion of A340 wing removal	D	T0+3
	M2.2	Wing join-up (not financed by SFWA)	D	T0+9

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

b) ***Major deliverables planned for 2016:***

Deliverables				
Ref. No.WP3.1		***Title – Description***	***Type***	***Due Date***
Delivery of outer wing metallic components	D1.1	Preliminary flight clearance dossier	R	T0+6
	D1.2	Flight Readiness review : feeder review	R	T0+6
	D2.1	Assembled wings delivery to FAL by Aernnova	D	T0+4
	D2.2	Aerofairing	D	T0+3
	D2.3	Ailerons	D	T0+10
	D2.4	Plastrons	D	T0+7
	D4.0	*Project final assessment document*	*R*	*T0+36*

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

Description of main activities for the year 2017

WP 3.1 Low Drag Demonstrator
Activities are dedicated to the BLADE project only with ground tests and wing bending tests, Flight Test Instrumentation assessment and 1rst flight test phase with flight domain opening and laminarity identification (45 flight hours).

a) ***Major milestones planned for 2017:***

Milestones				
Ref. No.		***Title – Description***	***Type***	***Due Date***
A/C Ground test and V&V	M1.1	End of Ground tests and wing bending tests	D	T0+4
1rst Flight test phase and analysis	M2.1	1st flight test started	RM	T0+9

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

b) ***Major deliverables planned for 2017:***

Preliminary deliverables:
-FTI check-up finalization by T0+8
-1st flight test analysis report by T0+12

GRA – Green Regional Aircraft

Multi-annual overview and strategic planning

Future green regional aircraft will have to meet demanding weight reduction, energy and aerodynamics efficiency, a high level of operative performance, in order to be compliant regards to pollutant emissions and noise generation levels. Objective of the Green Regional Aircraft ITD is to mature, validate and demonstrate the technologies best fitting the environmental goals set for the regional aircraft that will fly in 2020+.

The project has 5 main domains of research, in which several new technologies are under investigation in order to entirely revisit the aircraft in all of its aspects. The GRA technological areas structure is as follows:

- GRA1 - Low Weight Configuration (LWC)
- GRA2 - Low Noise Configuration (LNC)
- GRA3 - All Electric Aircraft (AEA)
- GRA4 - Mission & Trajectory Management (MTM)
- GRA5 - New Configuration (NC)

GRA will continue the work packages defined in the baseline program, with internal review of the technologies to be further enhanced. Main GRA ITD activities, in the period 2016 – 2017, will be largely involved in the conclusion of final testing of the demonstrators, according to the description given below.

Description of main activities for the year 2016

GRA1 – Low Weight Configuration (LWC) domain activities will be totally involved in the completion of the Testing of the Full Scale Ground Demo:

- **Fuselage Ground Demonstrator:** Completion of Fuselage Barrel tests set-up. Execution of 90.000 Pressurization Cycles and Residual Strength at Ultimate Load. Introduction of damages. Execution of 9.000 Pressurization Cycles (first phase of the second life) and respective inspections. Residual Strength at Limit Load execution. Execution of with vibro-acoustic tests
- **Inner Wing Box Ground Demonstrator:** Completion of Inner Wing Box test set-up. Execution of Fatigue Tests and monitoring by the installed SHM system.
- **Cockpit Ground Demonstrator:** Completion of Fatigue Phase (30.000-60.000 flights) on second demonstrator MT2. Damage introduction on demonstrator. Execution of damage tolerance test. Execution of Static Test up to Ultimate Load and respective inspections.

For all Ground Demonstrators and for the In-Flight fuselage panel demonstrator, Tests Results analyses and correlation will be performed. Relevant Test Reports will be issued.

GRA2 – Low Noise Configuration (LNC): domain activities will concern the completion of the preparation phase and the execution of the technologies Wind Tunnel major Demonstrations, and the overall assessment of the LNC domain project results.

- Experimental demonstration (WTT2) of the transonic NLF wing design tailored to the GTF 130-seat GRA and of load control performances in high-speed steady conditions through aerodynamic WT tests (Mach ≈ 0.7 – 0.8) on a 1:3 half-wing elastic model, scheduled October-November 2016, in the frame of project ETRIOLLA (under CfP JTI-CS-2012-01-GRA-02-019), and analysis of relevant results;

- Experimental demonstration (WTT8) of the Gust Load Alleviation strategy tailored to the GTF 130-seat GRA through aerodynamic WT tests (Mach ≈ 0.2), with gust profiles generated at proper scaled frequencies, on a 1:6 aero-servo-elastic half-model, scheduled May 2016, in the frame of project GLAMOUR (under CfP JTI-CS-2013-01-GRA-02-022), and analysis of relevant results;
- Experimental demonstration (WTT4) of the GTF 130-seat GRA high-lift performances and S&C data set at low speed through aerodynamic WT tests (Mach ≈ 0.2) on a 1:7 complete A/C powered model, scheduled May 2016, in the frame of project ESICAPIA (under CfP JTI-CS-2012-02-GRA-05-007) within NC domain, and support to the analysis of relevant results;
- Experimental assessment/ demonstration (WTT5) of the GTF 130-seat GRA airframe noise impact/ HLD low-noise solutions through aeroacoustic WT tests (Mach ≈ 0.2) on the same model above, scheduled June 2016, in the frame of project EASIER (under CfP JTI-CS-2013-02-GRA-05-008) within NC domain, and support to the analysis of relevant results;
- Experimental demonstration (WTT6) of the TP 90-seat GRA high-lift performances and S&C data set at low speed through aerodynamic WT tests (Mach ≈ 0.2) on a 1:6.5 complete A/C powered model, scheduled August 2016, in the frame of project LOSITA (under CfP JTI-CS-2013-01-GRA-02-020), and analysis of relevant results;
- Experimental assessment/ demonstration (WTT7) of the TP 90-seat GRA airframe noise impact/ HLD low-noise solutions through aeroacoustic WT tests (Mach ≈ 0.2) on the same model above, scheduled September 2016, in the frame of project WITTINESS (under CfP JTI-CS-2013-02-GRA-02-025), and analysis of relevant results;
- Experimental demonstration (WTTA2) of the MLG low-noise configuration tailored to the TP 90-seat GRA through aeroacoustic WT tests (Mach ≈ 0.2) on a full-scale model of the MLG installed architecture (gear, bay, part of fuselage lower surface), scheduled March 2016, in the frame of project ARTIC (under CfP JTI-CS-2013-01-GRA-02-021), and analysis of relevant results;
- Final part of the overall assessment of the outcomes of the LNC domain, addressing the results of the relevant technologies demonstrations and the main project achievements against targets, for the maturation of advanced aerodynamics, LC&A and airframe noise reduction technologies toward future green regional air transport.

GRA3 – All Electrical Aircraft (AEA): main activities in the year 2016 will concern the execution of the A/C flight demonstration and the overall assessment of the outcomes of the AEA domain.

GRA4 – Mission and Trajectory Management (MTM): no activities are planned in year 2016.

GRA5 – New Configuration (NC): main activities in the year 2016 will concern the analysis and final reporting of the outcomes of the NC domain.

a) ***Major deliverables planned for 2016:***

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
	D1.1	Completion of all the technologies demonstrations, through aerodynamic, aeroacoustic and aeroelastic WT tests, tailored to both 130-seat GTF and 90-seat TP GRA configurations;	D	2016
	D1.2	Completion of A/C Ground Tests (Fuselage, Cockpit and Wing Demo's)	D	2016
	D1.3	Final assessment of the outcomes of the LNC domain;	R	2016
	D1.4	Final assessment of LWC A/C Ground Tests;	R	2016
	D1.5	Final assessment of the outcomes of the NC domain;	R	2016
	D1.6	Experimental Permit to Flight	D	2016
	D1.7	Final assessment of the outcomes of the AEA domain	R	2016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

Description of main activities for the year 2017

No technical activities are planned in year 2017.

GRC – Green Rotorcraft

Multi-annual overview and strategic planning

The Green RotorCraft (GRC) ITD gathers and structures all activities concerning the integration of technologies and demonstration on rotorcraft platforms. It combines seven domains.

GRC1 - Innovative Rotor Blades addresses the design, manufacturing and testing of new blade devices including both active and passive systems, and the methodology and tools necessary to carry out parametric study for global rotor benefits.

GRC2 - Reduced Drag of Airframe and Dynamic Systems addresses the design of optimised shape, the manufacturing and testing of helicopter sub-parts such as the air inlet and engine exhaust, rotor hub cap and fuselage aft body for several rotorcraft configurations including the tilt-rotor.

GRC3 - Integration of Innovative Electrical Systems is focused on new architectures for more electrical helicopters including new technologies such as electric tail rotor, brushless starter generator, electro-mechanical actuators, electric regenerative rotor brake and the management of energy recovery.

GRC4 - Installation of a High Compression Engine on a Light Helicopter consists in the development and testing of a specific high compression engine power-pack demonstrator to be installed on a modified EC-120 helicopter.

GRC5 - Environment-Friendly Flight Paths focuses on helicopter flight path optimisation, relying on both new procedures in take-off and landing phases (IFR based) and new flight envelope definition to reduce noise (steep approach) and pollutant emissions.

GRC6 – Eco-Design Rotorcraft Demonstrators is related to manufacturing and testing helicopter sub-assemblies such as a double-curved fairing, a tail unit section, an intermediate gear box, a main helicopter mast and a tail gear box. It also addresses the implementation of new eco-friendly materials and processes (thermoplastic composites, metallic alloys with “green” surface protection).

GRC7 - Technology Evaluator for Rotorcraft is related to the packaging of results obtained for the different rotorcraft subsystems and the delivery) of consistent behavioural models representing the future helicopter fleet for the Technology Evaluator (TE) to assess their environmental impact as compared to the fleet operated in 2000.

Strategic planning

GRC ITD activities have been performed since 2008, leading to a number of satisfactory results, including innovative technologies brought up to TRL 5 or 6, with a potential for industrial applications. The project technical activities will be completed in 2016.

High level-objectives for 2016

- Flight testing of a full scale active Gurney flap (AGF) blade
- Whirl tower testing of a passive optimised blade
- Flight testing of a passive optimised blade (if funding available)
- Completion and testing of the electrical tail drive demonstrator
- Completion and testing of the helicopter electro-mechanical actuation system (HEMAS)

- Flight demonstration of low-noise VFR and IFR procedures for a helicopter
- Flight demonstration of low-noise IFR procedures for a tilt-rotor
- Completion of models and software delivery to TE

Description of main activities for the year 2016

GRC1 - Innovative Rotor Blades

GRC 1.1 - Technology Evaluation and Basic Development: Performance Assessment of Advanced Rotor Configurations. Bench testing of full scale Active Twist blade section.

GRC 1.2 - Model Rotor Design and Testing

Active Model Rotor Wind tunnel testing and analysis. Scale rotor systems embodying the Active//Innovative systems will be designed, fabricated and tested using dedicated rotor rigs. The AGF related tests will be conducted in a wind tunnel at Politecnico Di Milano.

GRC 1.4 – Whirl Tower and Testing: Completion of passive Blade Manufacture. Whirl Tower Testing of Passive blade.

GRC 1.5 – Flight Testing: Flight Testing of Active Rotor Helicopter. Flight testing of passive blade (if funding available)

GRC2 – Drag Reduction of Airframe and Non-Lifting Rotating Bodies

GRC 2.3 – Engine Installation: Flight test of new side air intake for EC135. Wind tunnel testing of an air intake for tilt-rotor

GRC3 - Integration of innovative electrical systems

GRC3.5 - Electromechanical Actuators: Bench testing of the helicopter electro-mechanical actuation system

GRC3.6 – Electric tail rotor: Stand alone and integrated system tests to include simulated flight, performance and faulted conditions. Electrical supply and tail drive control components refinements to be evaluated, to enable overall system optimisation based on Clean Sky objectives. Summary review of each electrical technology, analysis and final reports.

GRC4 – Integration of High Compression Engine in Light Helicopter

GRC4.12 – Integration and demonstration: Completion of the flight test campaign

GRC5 - Environment-friendly flight paths

TP1 – Echo-flight VFR procedures for H/C and T/R: Final in-flight demonstration of the procedures (Biella airport, with acoustic measurements). Assessment of estimated noise abatement achieved.

TP2 – Echo-flight IFR procedures for H/C and T/R: Final in-flight demonstration of IFR routes and IFR terminal procedures compatible with Performance Class 1 (Venegono airport, with acoustic measurements). Assessment of estimated noise abatement achieved.

GRC6 – Eco-Design Demonstrator

GRC6.2 – Thermoplastic structural parts: Flight test of a roof panel

GRC7 - Technology Evaluator for Rotorcraft

GRC7.2 – Software development: Complete the PhoeniX platform and deliver the Phoenix Black Box to TE.

GRC7.3 – Rotorcraft synthesis and input data preparation: Complete incorporation of Turbomeca engine decks in the Phoenix platform. Complete incorporation of GRC5 benefits and take into account weight benefits that may come from GRC 6. Review of GRCi technologies to ensure that the GRC7 generic rotorcraft reflects the updated benefits as the TRL of their technologies advance.

GRC7.4 – Missions and operations: Model existing and Clean Sky conceptual trajectories to be used by TE.
GRC7.5 – Assessment and trade-offs studies: Perform an internal trade-off or assessment with the PhoeniX models to evaluate impact of GRCi individual technologies and combinations. Optimize the choice of technologies applied on Conceptual Rotorcraft delivered in 2016.

a) *Major milestones planned for 2016*

Milestones				
Ref. No.		Title – Description	Type	Due Date
GRC1	M113-3	Active Twist Blade TRL Review	RM	Sep 16
	M145-1	Passive Blade TRL Review	RM	Sep 16
	M151-2	First Active rotor flight test	R	Mar 16
	M152-1	Passive Blade flight testing started	D	June 16
GRC3	M3.6.3.1C	ETRDF Commissioned Electric Tail Rotor (conventional development)	D	Mar 16
	M3.6.3.3B	All Testing Complete Electric Tail Rotor (conventional with enhanced control development)	R	Sep 16
GRC5	M5-TP2.4.1	H/C eco-IFR route implementation on full-scale realistic problems	D	Mar 16
	M5-TP2.4.2	H/C eco-IFR procedure implementation on full-scale realistic problems	R	Mar 16
GRC6	M6.2.13	Permission to Flight for thermoplastic Roof panel	R	Feb 16
GRC7	M7.2.6-9	Delivery of Phoenix platform v7.1 to the (TE)	D	Feb 16
	M7.2.6-10	Delivery of Phoenix platform v8.1 to the (TE)	D	May 16

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

b) *Major deliverables planned for 2016*

Deliverables				
Ref. No.		Title – Description	Type	Due Date
GRC1	D113-3	Active Twist Test Specimen Ready	D	Apr 16
	D145-1	Passive Blade Whirl Tower Test Report	R	Sep 16
	D151-2	Summary report on active rotor flight test	R	Jun 16
	D152-1	Summary of Passive Blade flight testing	R	Aug 16
GRC2	D236-1	Summary on the flight test results for the AH light H/C with the new air intake.	R	Apr 16
GRC3	D3.6.3.3B	Electric Tail Rotor (conventional with enhanced control development) test report	R	Nov 16
	D3.5.2.4	HEMAS Final Report	R	Mar 16
GRC4	D4.12.5.1	Flight test report	R	Jun 16
GRC5	D5-TP1.7.2	Final demonstration report	R	Mar 16
	D5-TP2.4.2B	AW139 demonstration of low-noise IFR procedures: test proposal	R	May 16

Deliverables				
Ref. No.		Title – Description	Type	Due Date
GRC6	D6.2.3.2	Evaluation & Validation results	R	Mar 16
GRC7	D7.3.1.3	SELU2- Data package	R & D	Feb 16
	D7.3.3.2	TEMU1-Data package	R & D	Feb 16
	D7.3.6-2	HCEU1- Data package	R & D	May 16

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

c) Implementation – Risk

Risk Description	Action Plan Summary
GRC1: Tight schedule and budget for whirl tower and flight testing of full scale active blades. High complexity of task	Reconsider need for Whirl tower testing. Consider using resource on extended aircraft ground testing instead
GRC1: Tight schedule and budget for design, manufacturing and whirl tower testing of full scale passive blade	Budget might be redistributed from other subprojects
GRC1: Not enough funding available for passive blade flight testing	Project will stop with whirl tower tests. Only TRL 5 achieved
GRC3: Electric Tail Rotor: Non-Ecolonomic solution	Establish electric technology capability and Identify future design critical development requirements
GRC5: Delay in optimised procedures delivery to GRC7	Start with Friendcopter and Optimal trajectories, use existing results in the literature
GRC6: Difficulties in scaling up thermoplastic process	To be defined during the year 2016.
GRC7: Incorporation of SAGE models into future GRC generic rotorcraft New personnel within Turbomeca significantly longer lead times for Engine models causing delay	Proceed with existing engine model and do not include updated TM benefits

Description of main activities for the year 2017

No technical activities are planned in the year 2017.

SAGE – Sustainable and Green Engines

Multi-annual overview and strategic planning

2016 will be the completion year for all activities of the SAGE programme. The last engine demonstrators will be delivered and tested either on the ground or in flight leading to TRL increases for the Open Rotor, Geared Turbofan and Lean Burn.

Description of main activities for the year 2016

WP: SAGE1 – Geared Open Rotor: All SAGE 1 activities were completed in 2015. Therefore, there will be no activities in 2016.
WP: SAGE2 – Geared Open Rotor Demonstration: After the reception of the parts, the assembly and the instrumentation of the SAGE2 demonstrator started in 2015 and finalized in 2016, the year 2016 will be the year for the Ground Test Demonstration of the Geared Open Rotor Demonstrator. The objectives are to assess open rotor architecture feasibility through validating the developed technologies and materials and the integration of such breakthrough architecture. After the Ground Test, on the basis of prediction and test data obtained from the engine, the assessment will be conducted of the improvements of gaseous and noise emissions that may result from an open rotor propulsion system and thus confirm the environmental benefits.
WP: SAGE3 – Large 3-shaft Turbofan Demonstrator: The Large 3-shaft Turbofan engine project will complete all SAGE3 test activities towards the end of 2015 except the CFS2 build test#2 which will is postponed to Q2 2016 and the other activities in 2016 will be limited to supporting Call for Proposal Partners in the final stages of their projects and completing project close out reviews and reports.
WP: SAGE4 – Geared Fan engine Demonstrator: After a successful test campaign in Oct/Nov 2015 of the Geared Turbofan (GTF) Engine Demonstrator SAGE4 as an essential element of SAGE platform in which numerous state of the art engine technologies have maturated to TRL5/6, the activities in 2016 are focussed to complete post-test inspection and data evaluation. Some specific technology developments, like rig testing of High Speed Low Pressure Turbine technologies are independent on engine environment and will continue. The Integral Drive System validation on the GeT FuTuRe test rig shall be completed in 2016 and remaining CfP topics will be finalised.
WP: SAGE5 – Turboshaft engine Demonstrator: Finalisation of results analysis of engine demonstrators performed during 2016 if not completed end 2015.
WP: SAGE6 – Lean Burn: The Lean Burn engine demonstrator ALECSys (Advanced Low Emissions Combustion System) will commence ground testing in Q1 2016 in one of the Rolls-Royce Civil Large test beds. Especially water ingestion and some of the more complex operability experiments are planned in a second test block during Q2. Based on the results from these tests potential software modifications will be provisioned and validated through an extended pass-off test on ground before the 2nd ALECSys engine will be mounted onto the wing of the Rolls-Royce flying test bed B747 by Q3 2016. Flight testing will take place in Tucson USA for validation of the system across the full flight envelope. Further ground testing will be accomplished in parallel at the outdoor noise test bed in Stennis by Q3 2016. Icing tests at Manitoba/Canada during the seasonal icing slot are planned in Q4 to complete the route to TRL6.

a) ***Major milestones planned for 2016:***

Milestones				
Ref. No.		*Title – Description*	*Type*	*Due Date*
SAGE2	M2.1	Start of the Ground Test	D	Sep 16
SAGE3	M3.1	Final Review Presentation	RM	Dec 16
SAGE4	M4.1	Module disassembly and inspection reports	RM	Mar 16
	M4.2	Finalization of IDS validation on the GeT FuTuRe Rig and post-test analyses	RM	Dec 16
SAGE6	M6.1	Pass to Test of ground test engine	D	Mar 16
	M6.2	Pass to Test of noise test engine	D	Aug 16
	M6.3	Pass to Test of flight test engine	D	Sep 16

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

b) ***Major deliverables planned for 2016:***

Deliverables				
Ref. No.		*Title – Description*	*Type*	*Due Date*
SAGE2	D2.1	Ground Test report	R	Dec 16
SAGE4	D4.1	Final SAGE 4 technology validation report	R	Jun 16
	D4.2	IDS test report	R	Dec 16
SAGE6	D6.1	Ground test report	R	Oct 16
	D6.2	Noise test report	R	Dec 16
	D6.3	Flight test report	R	Dec 16

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

c) ***Implementation – Risk***

Risk Description	**Action Plan Summary**
Availability of build capacity and testbeds due to high production load on RR facilities	Escalation through senior management within RR (regular high level reviews)
CfP Project GeT FuTuRe not performing in line with the current contract and integration issue between IDS and Rig	Dedicated team and tracking process on-going
SAGE2 demonstrator Assembly: Under-estimation of handling & assembly complexity	Adaptation/optimization of the assembly sequence

Description of main activities for the year 2017

No technical activities are planned in the year 2017.

SGO – Systems for Green Operations

Multi-annual overview and strategic planning

The purpose of the SGO ITD is to assess, design, build and test up new aircraft systems technologies and architectures in the two areas of Management of Aircraft Energy (MAE), and Management of Aircraft Trajectory and Mission (MTM).
CO2 benefits are expected both from mission and trajectory and optimization of on-board energy. Noise reductions are linked to the trajectory management, for approach/landing on the one hand and take off on the other hand. Additional benefits are also expected, e.g. suppression of the use of hydraulic fluids and reduction of persistent contrails formation.
The SGO ITD will conclude its technical development by end 2016, with the final major demonstrations in both targeted areas.

Description of main activities for the year 2016

<u>*Management of Aircraft Energy*</u> (MAE) aims at two major objectives. The first one is to develop and demonstrate More-Electric Aircraft System Architectures (*bleedless* aircraft, power by wire architectures), involving energy users to facilitate the implementation of advanced energy management functions and architectures. This also entails the suppression of hydraulic fluids and related negative environmental impacts. The second objective is to adapt and demonstrate the control of heat exchanges (partly necessary due to the more-electric concept) and reduction in heat waste within the whole aircraft through improved system efficiency with respect to power electronics and advanced Thermal Management.

In order to support those objectives, the following steps will be achieved in 2016 for each technology thread:

- Electrical energy management architecture: The Power Distribution Center ground test campaign on the Proven Test rig (campaign G3) will be finalized in 2016;
- Systems using electrical power (ice protection, environmental control systems, etc.)
  - The technology demonstration of the electrical environmental control system will be completed through the e-ECS flight tests on the Airbus A320 MSN1 (reduced pack size of 50kW) first semester of 2016.
  - The flight test campaign of an innovative Ice detection system will take place in 2016 (the FT could happen already in 2015 by opportunity as the system has already been installed on A320 MSN1).
  - For Helicopter Electro-Mechanical actuation, the final system tests will take place in 2016
  - Technology demonstration of an electrical ECS for Regional Aircraft application conducted through flight test campaign by Alenia/ATR in Q1-2016
  - Overall thermal management solutions of aircraft systems: The final target for SGO will be reached in June 2016 with a pre-TRL4 review of the Thermal management solution.

<u>*Management of Aircraft Trajectory and Mission*</u> (MTM) is based on two main concepts. First, the ability to fly a green mission from start to finish, with management of new climb, cruise and descent profiles, based on aircraft performances database allowing multi-criteria

optimization (noise, gaseous emissions, fuel, and time). This also encompasses the management of weather conditions, which could negatively impact the aircraft optimum route and result in additional fuel consumption. Then, on the airfield itself, Smart Operations on Ground uses new systems solutions, so as to allow airplanes to reduce use of main engines for taxi operation.

The developed technologies will reached their final demonstration stages in 2016.

- Flight management & guidance algorithms and functions for climb, cruise & descent phases:
- In the field of FMS Optimised trajectories, the departure and cruise functions will achieve TRL6 in 2016, with final tests of the FMS on a representative bench. In parallel, the function targeting the final approach phase will be assessed for TRL5, taking into account dome results from associated Sesar projects.
- Technologies for electrical taxi via an on-board wheel actuator system will reach their final stage of maturity.

a) Major milestones planned for 2016:

Milestones				
Ref. No.		***Title – Description***	***Type***	***Due Date***
Management of A/C Energy	TRL5	Integrated Power Electronic Module for EPDC	TRL	Q3 2016
	TRL6	Ice Detection	TRL	Q4 2016
	TRL5	Electrical ECS flight test demonstrator development and test – Regional A/C	TRL	Q2-2016
	TRL4	Electrical Environmental Control System for large aircraft application (50kW for FT)	TRL	Q1 2016
	TRL5	Electrical Environmental Control System for large aircraft application (50kW for FT)	TRL	Q4 2016
	TRL4	Helicopter electro-mechanical actuation system HEMAS	TRL	Q3 2016
Management of Aircraft Trajectory and Mission	TRL5	TRL5 for Adaptive Increased Glide Slope (A-IGS)	TRL	Q4 2016
	TRL6	TRL6 Multi Criteria Departure Procedure	TRL	Q4 2016
	TRL6	TRL6 Multi step Cruise	TRL	Q4 2016

b) Major deliverables planned for 2016:

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
Management of A/C Energy	D_2.3.4.1.1_3	Mid-Size pack, pack controller, power electronics and associated cooling system to large aircraft	D	Q1 2016
	D_2.3.3_4	Cycle 2 final report	R	Q3 2016
	D_2.3.4.1.1_5	Final assessment report	R	Q2-2016

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
	D_2.3.4.2_3	HEMAS: Report on tests results	R	Q3 2016
	D_2.3.6.2_2	Thermal management function as rapid prototype hardware for integration into test rig – Pre-TRL4	R	Q4 2016
	D_2.4.2_8	Report on test results of the prototype for the integrated electrical machine and drive technology	R	Q4 2016
	D_4.2.1_4	Ground Test report for G3	R	Q4 2016
	D_4.4.2_1	Validated Flight Test results for F.0	R	Q4 2016
	D_4.4.2_2	Validated Flight Test results for F.1	R	Q4 2016
Management of Aircraft Trajectory and Mission	D_3.6_24	Final report on A-WXR and Q-AI system refinement based with Call for proposal output	R	Q2 2016
	D_3.6_26	FMS updated implementation and test report	R	Q4 2016
	D_3.7_10	SOG Final Progress Report	R	Q4 2016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

c) ***Implementation - Risk***

Risk Description	Action Plan Summary
Additional costs due to unforeseen complexity of developements with potential impact on reduction of demonstration objectives	Request for additional funding justified towards JU, in particular to cover eECS additional development costs. JU to confirm in 2016 if additional funding can be made available. Internal rebalancing of budget in SGO to secure most critical demonstrations
Delay in TRL reviews due to unclear objectives for technology maturation at each TRL gate.	TRL owner to clarify the criteria to be met for each TRL review. Scheduling of TRL reviews to be fixed as soon as possible in 2016.

ECO – Eco Design

Multi-annual overview and strategic planning

The Eco design ITD is due to be completed in 2015 for both airframe/equipment technology (EDA) and electrical/thermal systems modelling and validation (EDS) projects and so no technical activity is foreseen in 2016.

A project extension in 2016 is limited to cover management activity to consolidate the ITD outcomes. A final ITD review is planned in April 2016, together with final reporting.

Description of main activities for the year 2016

ED0 (Management) - Management activity limited to some partners to consolidate the final reporting in view of the programme closure.

b) ***Major milestones planned for 2016:***

Milestones				
Ref. No.		***Title – Description***	***Type***	***Due Date***
	M0.1-11	Final Review	RM	April 2016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

c) ***Major deliverables planned for 2016:***

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
	D 01-51	Final Activity report	R	April 2016
	D 01-52	Final review	RM	April 2016
	D 01-55	2015 Annual Activity report	R	April 2016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

d) Implementation - Risk

Risk Description	**Action Plan Summary**
Issues to consolidate all technical outcomes, synthesis and reporting	Timely submission of deliverables and reports schedule, close partners monitoring
Incomplete LCA data base sharing	Proper agreement at consortium level
Partial transfer of data to TE	Close monitoring of LCA consolidation

TE - Technology Evaluator

Multi-annual overview and strategic planning

The Clean Sky Programme Technology Evaluator (TE) will be completed by end of 2016. Its main objective is to issue the final Clean Sky Programme Environmental Assessment.

This assessment will use the final release of the ITDs aircraft models provided by the airframe ITDs (SFWA, GRA, GRC), as well as the final eco-statements results from EDA.

These aircraft and rotorcraft models will integrate a selection of the best technologies developed in all the ITDs in the Clean Sky Programme.

These simulation models, which figure out the behaviour of future aircraft which would integrate these Clean Sky technologies, will be evaluated into various scenarios at either aircraft level, airport level or world level.

The assessment will be done comparing emission and noise level of the simulated “Clean Sky aircraft” with respect to the reference simulated for the “year 2000 aircraft”.

Also, an estimation of the global environmental improvement over the whole aircraft life cycle will be performed for a limited set of “Clean Sky” and “reference” aircraft.

Description of main activities for the year 2016

The TE activities are split into 5 work packages: WP0 to WP4. The main activities and milestones of these WPs are described hereafter:

WP0: Management and Coordination: The objective of WP0 is to perform the management of the Technology Evaluator at both technical and administrative levels.

WP1: TE Requirements and Architecture: The objective of WP1 in 2016 is the update of the 2016 assessment and trade off studies planning.

WP2: TE Models and validation: The objective of WP2 in 2016 is the improvement and testing of the models to the needs of the TE final assessment.

WP3: TE Simulation Framework: The objective of WP3 in 2016 is the final implementation of the TE Information System, including the final update of the three simulation platforms.

WP4: Assessments and Trade-off studies: The objective of WP4 is to perform and report the final environmental assessments and trade-off studies.

e) Major milestones planned for 2016:

Milestones			
Ref. No.	***Title – Description***	***Type***	***Due Date***
M1	Annual report of 2015 activities	R	15/02/2016
M2	Reception of all ITD models and LCA inputs for 2016 assessment	D	30/04/2016
M3	2016 Assessment Synthesis final report	R	31/07/2016
M4	TE public final report	R	30/09/2016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

f) Major deliverables planned for 2016:

Deliverables			
Ref. No.	***Title – Description***	***Type***	***Due Date***
DJU 0.1-13	2015 annual report	R	15/02/2016
DJU 4.6-5.2	2016 Assessment Synthesis report-V1	R	31/03/2016
DJU 1.1-4-6	Overview of ITDs a/c models and TRL progress	R	15/05/2016
DJU 4.6-5.3	2016 Assessment Synthesis final report	R	31/07/2016
DJU 4.7-5	Final public dissemination report	R	30/09/2016
DJU 0.1-14	2016 annual report	R	15/12/2016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

g) Implementation – Risk

Risk Description	Action Plan Summary
Risk of delay to receive the ITDs a/c models expected in 2016 (Milestone M1).	These risks will be carefully followed and mitigated during the whole 2016 year
Risk of delay in the approval of the final dissemination report.	

Description of main activities for the year 2017

No technical activities are planned in the year 2017.

Partners' activities

The active number of GAPs (Grant agreement for Partners) at beginning of 2016 is 229. Of this number, at least 198 are in completion of technical activities by mid-2016.
The GAPs still running in 2016 and specifically linked to completion of demonstration activities are split in the different ITDs as follows:

- Eco Design: only partners participation where applicable to the final review taking place in Q1-16
- GRA: 6 GAPs active, as linked to the wind tunnel testing planned in Q1-16, as described in the GRA chapter.
- GRC: only 5 GAPs active in 2016, for supporting and closing activities in the reporting phase.
- SAGE: 26 GAPs still active in 2016, across all SAGE projects (except SAGE 5) for the completion of technology maturation studies and demonstration, in some case not directly linked to the large scale demonstrators, but within the work plan of the SAGE leaders and associates.
- SFWA: at least 18 GAPs will remain active in 2016, some of them associated with the finalization of the demonstrators planned in this ITD and critical for the completion and integration of the related technologies or components to be tested. Specific attention will be given to these projects.
- SGO[7]: 30 GAPs will be running in 2016; this is mainly due to the late start of activities (launch of topics in last calls). Also for SGO GAPs, a specific monitoring has taken place already in 2015, to make sure they will be performed and completed as necessary within the timeframe of 2016 (targeting Q3-2016 for closure).

[7] At least 5 SGO projects will run until end of 2016 than closure not before Q4/or Q1 of 2017.

3.3.2. CLEAN SKY 2 PROGRAMME

The following chapter presents the Clean Sky 2 Programme scope of work and the main activities to be performed in the period 2016-2017[8].

IADP LARGE PASSENGER AIRCRAFT

Multi-annual overview and strategic planning

The Large Passenger Aircraft IADP is focussing on large-scale demonstration of technologies integrated at aircraft level in 3 distinct 'Platforms':

- Platform 1: "Advanced Engine and Aircraft Configurations"
- Platform 2: "Innovative Physical Integration Cabin – System – Structure"
- Platform 3: "Next Generation Aircraft Systems, Cockpit and Avionics" also including advanced systems maintenance activities are also part of Platform 3.

LPA Platform 1

One major part of the scope of the Platform 1 "Advanced Engine and Aircraft Configurations" is to provide the development environment for the integration of the most fuel efficient propulsion concepts into compatible airframe configurations and concepts targeting next generation short and medium range aircraft. The considered propulsion concepts range from the CROR engine architecture over advanced Ultra-High Bypass Ratio (UHBR) turbofan to hybrid propulsion concepts. In context with new engine and system architectures studies for Non-Propulsive Energy (NPE) generation will be performed.

Another major part of the scope of Platform 1 is the development of integrated flow control techniques for advanced aircraft performance for the whole operational envelope. The major technologies with respect to this are the Hybrid Laminar Flow Control technology (HLFC) for skin-friction drag reduction and fluidic actuators for high-lift performance improvement. Finally the opportunities and the limits of scaled-flight testing will be investigated. It is overall objective of Platform 1 that all technologies being developed and demonstrated are following consistent target aircraft configurations and concepts, which means that the compatibility between airframe and propulsion technologies is assured.

Note: *The communication to the CSJU regarding the updated CROR FTD roadmap has taken place, 12th November. As a follow-up of this meeting the Launch Review Meeting for the CROR FTD is scheduled on 26th January 2016.*

LPA Platform 2

During the years 2016 and 2017 the work in Platform 2 will mainly focus on the detailed design and architecture definition of the 3 demonstrators.

For the Next Generation Fuselage, Cabin and Systems Integrated Demonstrator (Multifunctional demonstrator), it is planned to achieve the architecture definition at the end of 2016. This activity will be mainly supported by the Core-partner engaged for the multifunctional concept phase (research institute), who will deliver an architecture

---

[8] The list of deliverables and milestones presented in this chapter is a provisional and may be updated at the stage of the preparation and signature of the Grant Agreement for the Members.

definition dossier in Q4 2016. Following this, it is planned to continue in 2017 with the detailed design of the demonstrator and the specifications of the demonstrator test bed.
For the Cabin & Cargo demonstrator, a requirements dossier should be available at the end of 2015. Hence during 2016 it is expected to continue to evaluate and select the technologies to be part of the demonstrator, and to have a well-defined concept by the end of 2016. The Cabin & Cargo demonstrator can then enter the preliminary design phase which should be achieved at the end of 2017. It is also expected from the Cabin&Cargo Core-Partner to deliver a selection list of enabler technologies (including assessment), a definition of Experimental process and trials, and a test infrastructure definition during the 2016-2017 timeframe.
In 2016-2017, the activities regarding the Lower Centre Fuselage demonstrator will mainly focus on the architecture down selection, the estimation of the benefits for the overall aircraft design, the definition of specifications and interfaces, and the business case refinement (for instance regarding cost, weight and risks & opportunities). A first milestone is the end of the concept phase EoY 2016, materialized by a Go/No Go decision (architecture benefits). In 2017 the definition of the manufacturing process will also be part of the objectives, as well as the specific design of the components and the definition of the component assembly process. At the end of 2017 it is also planned to have a full scale test concept definition.

LPA Platform 3

In 2016 and 2017, the IADP LPA platform 3 activities will focus upon launching the Phase 1 of the development of the Innovative functions and technologies towards a TRL4 by early 2018, and to prepare the corresponding enhanced cockpit tests and flight tests to be performed from 2018 onwards.
These activities will be performed with three main objectives:

- First, to feed the enhanced cockpit demonstrators and in flight demonstrations planned from 2018 onwards with Enhanced Flight Operations functions and enabling innovative technologies (WP 3.1 and WP 3.2);
- Second, to prepare the Enhanced cockpit demonstrator configuration (WP3.4) and innovative function and technologies flight tests (WP 3.3);
- Third, to gain in maturity for the technologies to be part of the Disruptive Cockpit demonstrator, and start specifying the platform to be used for this ultimate purpose (WP3.5).

These activities will be performed in collaboration with several key systems suppliers as well as with other aircraft manufacturers (business jet and regional aircraft).
In parallel, the activities started in 2014 for the Maintenance Work Package ADVANCE will ramp up with the introduction of selected Partners from wave 1 call.

Description of main activities for the year 2016

LPA Platform 1

<u>WP1.1 CROR demo engine flight test demonstration</u>

Integration of main results from SAGE II Ground Test Demonstrator in gap analysis & preliminary design of the engine flight test. The detailed demonstrator schedule and work plan will be reviewed and updated early 2016.

WP1.2 Advanced Engine Integration Driven Fuselage

Development of Project Plan for the rear-end demonstrator. Preliminary down selection of technology solutions to be developed and integrated in ground demonstrator, main activities

WP1.3 Validation of Scaled Flight Testing

Define test procedures, prepare test aircraft, software and ground station.

WP1.4 Hybrid Laminar Flow Control large scale demonstration

Assessment of down selected HLFC structure concept for HTP application in terms of weight, costs and drag, certification requirements and prediction by analysis of the bird impact simulations

WP1.5 Applied technologies for enhanced aircraft performance

Definition of the baseline configuration including engine specifications & positioning in *Identification & selection of UHBR related technologies in WP1.5.2 provisional, pending review.* Active flow control system integration and structural design and analysis, safety in analysis for operational cases, hardware design and development to prepare wind tunnel and ground tests.

Validation of preliminary active systems design and mock-up configuration & instrumentation.

WP1.6 Demonstration of radical aircraft configurations

Define alternative aircraft architectures considering alternative energy propulsion concepts Develop & build hybrid-power bench, select advanced technology bricks. Definition of preliminary Ultrafan FTD specification based on technology selection.

LPA Platform 2

WP2.1 Next Generation Fuselage, Cabin and Systems Integration

The concept phase of this WP is scheduled to take place through all year 2016 and end in 2017.

- Definition and collection of future concepts for advanced fuselage architectures for assessment and down selection in 2017. Criteria to be addressed are weight saving, reduction of production cost, Eco optimized lifecycle, improved efficiency during operation.
- The concept for an integrated demonstrator design will be defined in 2016 and 2017
- Partners emerging from CfP03 are joining end of 2016 to start work on structural energy storage technologies. Assessment and evaluation of collected ideas and pre-concepts with respect to multifunctional future's fuselage aspects will be done. Experimental tests with detailed analysis on coupon- and element level will start as well as detailed numerical simulation.

WP2.2 Next generation Cabin and Cargo Functions

- Movable Passenger Service Unit (MPSU), Definition of requirements, concept evaluation and initial design of first technology concept demonstrator (Micro-PSU), definition of safety and certification concept
- Environmentally Friendly Fire Protection (EFFP), development of concepts and architectures for the fire knock-down and long term fire suppression system based On-Bord Inert Gas Generating System, conduct of modelling and Computational Fluid Dynamics (CFD) to support the architecture design phase. Activities with Call for Proposal partners will be kicked off early 2016.

- Fuel Cell Powered Galley (FCPG), demonstrator design and development, system integration and FCPG Lab/Ground tests and thermal integration to the aircraft cabin and design optimization

WP2.3 Next generation lower center fuselage demonstrator

Four Partner to be selected from open call CfP#02 are provisionally scheduled to start activities at the end of Q1/2016 as major contributors in WP 2.3.2 attributing to R&T on main components. These activities will correspond to next generation lower centre fuselage demonstrator concept phase.

WP 2.4 – Non specific cross functions / interface to ITD Airframe

Maturation of innovative non-specific technologies to feed into the platform 2 demonstrators.

Definition of demonstrator needs in the area of material & processes, also interfacing with ITD Airframe WP B3.3.2. Assemblies technology development, in particular associated with two CfP projects, continuation of innovative high performance blind fastener technology. Development of innovative structural test conditions with optimized lead time. Focus on thermal stress analysis integration in association with CfP partner activities. Launch of the predictive virtual testing activities, correlation of data between virtual design and testing activities in connection with partner activities in AIRFRAME B-3.3.2. Launch of a dedicated work package to prepare future automated manufacturing factories and assemblies associated with three partner topics. Definition and launch of the EcoDesign work package, internal evaluation of LPA topics selection of representative use cases Future factory and conceptual work related to final assembly line, with focus on mobile lightweight assembly units and manipulators.

LPA Platform 3

WP 3.1 Enhanced flight operations and functions

Functions for "Always easier flight"

The functions for « always easier flight » are planned to be developed by a Core Partner to be selected in the open call wave 2 both for Business jets and large aircraft. Following the release of the high level requirements corresponding to the functions the specifications will be prepared and reviewed. Functions addressed for large passenger aircrafts will be:

- Collision avoidance on ground
- Head Worn Display
- New navigation sensor and hybridization
- Pilot monitoring system
- Guidance approaches and landing systems

Functions for Efficient and Easy Systems Management

The concept definition phase for the technologies for Pilot Workload Reduction will be finished mid 2016 by delivering the final version of high level specifications and concept of operation for cockpit functions, essential work shares shall be taken by a Core Partner wave 2 yet to be defined. Following technologies are planned to be integrated in the on ground demonstrator for the enhanced cockpit with focus on Regional Aircraft:

- Enhancement of light weight eye vision
- System failure cockpit
- Pilot data acquisition prognosis and diagnosis system
- Voice Command

Functions and solutions for man-machine efficiency

Main activities shall be taken by a wave 02 - Core Partner CfP#2 Partners, an additional package is underway in CfP#03 Partner wave 03 activities. Functions to be addresses are ”voice to system” and multimodality, pilot monitoring system, touchscreen control panel for critical system management functions, flight crew oxygen mask concept for prolonged use in civil aircraft, human-machine interface - AGILE development, pilot monitoring system, Head-Up system integration in next generation cockpit.

WP 3.2 Innovative enabling technologies

Flexible communication

The Innovative enabling technologies for “flexible communication” shall be taken by a wave 02 Core Partner, requirements and specifications will detailed with the core partner. Activities in 2016 will focus on Modular radio avionics and ATN/IPS router.

Aircraft Monitoring Chain for Ground Support

In 2016 the definition of a system specification for aircraft monitoring technologies targeting for a chain of system for ground support considering nominal and degraded conditions. A major share shall be taken by a core partner to be selected in CP wave 02 and complementary partner activities.

Avionic components update & security

Main activities in 2016 will be to specification the targeted features required for business jet aircraft and to prepare a virtual avionics platform methodology architecture and deployment document. 2016 activities are addressing mainly definitions of electronics modules / platform modules, operating system and services applications, tool framework and the integration of a first set of single system applications for virtual avionics platform tests Avionics platform emulator methodology. Further subjects will be the definition of synergetic requirement for large passenger aircraft and business aircraft avionic components and associated simulation scenarios as well as the definition and the development of secured and performant wireless connection based on light (LiFi, targeting for CfP-partner work).

WP 3.3 Next generation cockpit functions flight demonstration

In 2016, the flight tests needs for large passenger aircraft innovative functions and technologies will be reviewed, challenged, and the tests requirements will start to be prepared.

WP 3.4 Enhanced cockpit demonstration with innovative functions & technologies

In 2016, a first version of the Large passenger aircraft Enhanced cockpit functions and technologies Validation &Verification plan will be prepared, to enable the specification of further tests and tests means requirements

WP 3.5 Disruptive cockpit ground demonstration

Activities in 2016 are related to preliminary studies for the large passenger aircraft disruptive cockpit demonstrator:

- Review of the scope of the demonstrator
- Review of V&V objectives and associated means
- Preparation of necessary Partnership via Core Partner and/or Call for Proposals

WP 3.6 ADVANCE

Activities in 2016 will encompass activities for the development of operational and business scenarios based on airline and major industry actors will be performed to support the completion of the Maintenance E2E Architecture specification. In the course of an iterative development approach, the IHMM platform providing the aircraft and ground segregated functions for data collecting, transmission and analysis will be developed and its performance demonstrated for the first iteration loop. The E2E Architecture and IHMM Platform development will be complemented by the use case selection and specification work for the enabling technology bricks for Structure Health Monitoring and System Prognostic Solutions. Specifications and first low scale demonstrator platforms for mobile tool solutions (augmented and virtual reality) developments will be launched. First functional software modules for maintenance tool applications will be developed. The backbone specification of the collaborative environment and communication infrastructure for mobile tools application will be provided.

a) Major milestones planned for 2016:

LPA Platform 1

Milestones				
Ref. No.		***Title – Description***	***Type***	***Due Date***
WP1.2 Advanced engine integration driven fuselage	M1.2-1	Project plan consolidation and preliminary techno down selection review	RM	12/2016
WP1.3 Validation of scaled flight testing	M1.3-1	Basic test A/C ready.	D	Q3 2016
WP1.4 Hybrid Laminar Flow Control large scale demonstration	M1.4-1	Preliminary Concept Review (PCR) for aerodynamic performance and structure concept of HLFC HTP	RM	Nov 2016
WP1.5 Applied technologies for enhanced aircraft performance	M1.5-1	TRL3 for UltraFan powerplant integration technologies	RM	Dec 2016
	M1.5-2	TRL3 for flow control actuation at pylon wing	RM	10/ 2016
WP1.6 Demonstration of radical aircraft configurations	M1.6-1	Review for component selection for hybrid electric propulsion test bench.	RM	Q4 2016
	M1.6-2	Review for technology selection to start the concept design of the UltraFan FTD.	RM	Dec 2016

LPA Platform 2

Milestones				
Ref. No.		***Title – Description***	***Type***	***Due Date***
WP2.1 Next Generation Fuselage, Cabin and Systems Integration	M2.1-1	Preliminary document on future fuselage architecture available	R	Apr 2016
	M2.1-2	Preliminary document on advanced manufacturing technologies available	R	Apr 2016
WP2.2 Next Generation Cabin &	M2.2-1	Concepts Review / Decision Gate	RM	Mar 2016
	M2.2-2	Hardware Critical design Definition	R	Jun 2016

Milestones				
Ref. No.		***Title – Description***	***Type***	***Due Date***
Cargo Functions	M2.2-3	Engineering Qualification Program Plan for equipment, fuel cell system, galley monument and fuel cell galley	R	Sep 2016
WP2.3 Next generation lower centre fuselage	M2.3-1	KoM of Next generation lower centre fuselage	R	Mar 2016
	M2.3-2	KoM Composite keel beam with partner	R	Apr 2016
	M2.3-3	KoM Main landing gear bay with partner	R	Apr 2016
WP2.4 Future Factory (Non-specific cross functions)	M 2.4.-.1	Requirements and Process Analysis completed	R	Sep 2016

LPA Platform 3

Milestones				
Ref. No.		***Title-/ Description***	***Type***	***Due Date***
WP 3.1. Enhanced flight operations and functions	M3.1-1	Functions for always easier flight KoM with Core Partner Wave 2	RM	2016-Q2
	M3.1-2	Launch design review of cockpit demonstrator (focus business jet)	RM	2016-Q3
	M3.1-3	Innovative functions and enabling technologies KoM with Core Partner wave 2	RM	2016-Q2
	M3.1-4	Functions and Solutions to improve man-machine efficiency KoM (with CfP Partners)	RM	2016-Q2
WP 3.2. Innovative enabling technologies	M3.2-1	Flexible communication KoM Core Partner Wave 2 CP02-LPA03-01	RM	2016-Q2
	M3.2-2	Avionic components KoM with Core Partner Wave 2	RM	2016-Q2
WP 3.3 Next gen. cockpit functions flight demonstration	M3.3-1	Preliminary Flight tests needs review for Large Aircraft	RM	2016-Q3
WP 3.4 Enhanced cockpit demo. innov. Functions & techno.	M3.4-1	Preliminary Enhanced cockpit V&V objectives review	RM	2016-Q4
WP 3.5 Disruptive Cockpit Ground Demonstration	M3.5-1	Preliminary Disruptive cockpit V&V plan review	RM	2016-Q4
WP3.6. Advance	M3.6-1	Decision Gate Milestone: Consolidated ADVANCE Prognostic Concept and Use Cases	RM	2016-Q3
	M3.6-2	E2E Service & Operations Design: E2E business and operational scenario CDR	RM	2016-Q4
	M3.6-3	IHMM TRL4 Review	RM	2016-Q4
	M3.6-4	E2E Maintenance Platform Evaluation E2E evaluation strategy CDR	RM	2016-Q4

b) Major deliverables planned for 2016:

LPA Platform 1

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
WP1.2 Advanced engine integration driven fuselage	D1.2-1	Project plan and preliminary techno down selection review	R/D, FEM, CAD models	Dec 2016
WP1.3 Validation of scaled flight testing	D1.3-1	V&V Plan and test requirements	R	Q3 2016
WP1.4 Hybrid Laminar Flow Control large scale demonstration	D1.4-1	Results of PCR structure concept of HLFC HTP (structure concept)	R/D	Dec 2016
WP1.5 Applied technologies for enhanced aircraft performance	D1.5-1	Results of the TRL3 Ultrafan powerplant integration technologies	R	12/2016
	D1.5-2	Preliminary active system design validation report	Report	Q4 2016
WP1.6 Demonstration of radical aircraft configurations	D1.6-1	Concept analysis of alternative propulsion aircraft configurations	R	Dec 2016
	D1.6-2	Preliminary UltraFan FTD specification	R	Dec 2016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

LPA Platform 2

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
WP2.1 Next Generation Fuselage, Cabin	D2.1-1	Next Generation Fuselage Cabin & Cargo Exploitation plan	R	Apr 2016
	D2.1-2	Enabling Technologies selection list	R	Apr 2016
WP2.2 Next Generation Cabin & Cargo Functions	D2.2-1	MPSU Requirements Definition Dossier	R	Mar 2016
WP2.3 Next generation lower centre fuselage	D2.3-1	Preliminary high production rate report	R	Dec 2016
	D2.3-2	Wing integration with new architecture	R	Dec 2016
2.4 Future Factory (Non-specific cross functions)	D2.4-1	Assessment of low cost fastening solutions	R	Jun 2016
	D2.4-2	Concepts for sensor-guided assembly end-effectors	R, CAD-Models	Sep 2016
	D2.4-3	Concepts for mobile lightweight assembly units and manipulators	R, CAD-Models	Oct 2016

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
	D 2.4-4	Concepts for mobile logistic units	R, CAD-Models	Dec 2016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

LPA Platform 3

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
WP 3.1. Enhanced flight operations and functions	D3.1-1	High level requirements report for functions for "always easier flight" large passenger aircraft	R	2016-Q2
	D3.1-2	High level requirements document for functions for "always easier flight" for business jet	R	2016-Q2
WP 3.2. Innovative enabling technologies	D3.2-1	System Specification Documents (one for each technology project)	R	2016-Q3
	D3.2-2	Documentation to Preliminary Design Reviews	R	2016-Q4
	D3.2-3	High level requirements for enabling technologies (split in one deliverable per technology)	R	2016-Q4
WP3.6 Advance - E2E Based Maintenance	D3.6-1	E2E Service & Operations Design: Operational Scenarios Definition and IVV Plan	R	2016-Q4
	D3.6-2	E2E Maintenance platform Safety & Certification Analysis	R	2016-Q4
	D3.6-3	Load Assessment Solutions System and performance requirement	R	2016-Q1
	D3.6-4	Prognostic Solution Development Prog. solution requirement	R	2016-Q4
	D3.6-5	Knowledge warehouse prototype, 1st issue	D	2016-Q4

Description of main activities for the year 2017

LPA Platform 1

<u>WP1.1 CROR demo engine flight test demonstration</u>

Integration of main results from SAGE II Ground Test Demonstrator, preliminary design of the flight-test worthy engine. The detailed demonstrator schedule and work plan will be reviewed and updated early 2016.

<u>WP1.2 Advanced Engine Integration Driven Fuselage</u>

Down selection of technology solutions to be developed and integrated in ground demonstrator. Decision on the way forward for the ground-based demonstration

<u>WP1.3 Validation of Scaled Flight Testing</u>

Maiden flight and subsequent flight-test campaign with basic scaled flight test vehicle

WP1.4 Hybrid Laminar Flow Control large scale demonstration

Structural concept design of HLFC HTP as well as definition of certification rules and procedures. Qualification plan (based on AFLoNext results) for flight test with HLFC fin available depending on gate decision in 2017.

WP1.5 Applied technologies for enhanced aircraft performance

Aircraft level integration & evaluation of the UHBR related technologies. Maturation of the integration technologies to feed the UltraFan flight test demonstrator concept freeze. Conduct of wind tunnel tests for active flow control systems at high Re-numbers, synthesis of results with outcome of AFloNext. Design and development of hardware for flight tests. Set-up of first real-scale flow control system mock-up. Update of vibration active damping specifications according to the new integration of high BPR engines on the rear fuselage of biz-jet aircraft**.** In-flight transposition of aerodynamic noise source model.

WP1.6 Demonstration of radical aircraft configurations

Define alternative aircraft architectures considering alternative energy propulsion concepts. Development and test of components of the hybrid-power chain. UltraFan FTD concept phase based on selected technologies.

LPA Platform 2

WP2.1 Next Generation Fuselage, Cabin and Systems Integration

2017 activities are related to complete the two year concept phase for the demonstrator. Assessment of future concepts for advanced fuselage architectures proposed in 2016 with respect to weight saving, reduction of production cost, Eco optimized lifecycle, improved efficiency during operation. Down selection of future concepts for advanced fuselage architectures and definition of the integrated demonstrator design including the material selection, filing of the technical roadmap.

WP2.2 Next generation Cabin and Cargo Functions

Movable Passenger Service Unit (MPSU), definition of the Engineering Qualification Program Plan, unit._Design of the second technology concept demonstrator Flexible PSU with interface Concept. Specification, concept development, manufacture, test specimen, integration, test and evaluation._Specification and design of the OBIGGS Fire Extinguisher and Fire Suppression System demonstrator and the conduction of modelling and CFD simulations to predict agent parameters different flight phases and operational conditions. Completion of Fuel Cell Powered Galley (FCPG) demonstrator development, system integration and FCPG Lab/Ground tests and thermal integration to the aircraft cabin. definition of qualification Test Procedures for equipment, fuel cell system and galley.

WP2.3 Next generation lower center fuselage demonstrator

Definition of the design concept of the next generation lower center fuselage demonstrator. Integration to a next generation fuselage architecture and structural concept. Design and development of main components.

WP 2.4 – Non specific cross functions / interface to ITD Airframe
Application of predictive virtual testing on structures, planning and execution as well as correlation between virtual design and testing activities will be done in cooperation with Airframe WP B3.3.2. Testing of innovative high performance blind fastener assembly technology, in combination with the inner surface inspection of fastener holes in parts made from CFRP. Optimization of assembly and test procedure. Definition of automated manufacturing factories and assemblies, including partners selected in 3rd Call for Proposal. Eco-design evaluation of LPA R&T activities (continued from 2016)..Design of mobile high payload assembly units and manipulators for future factory concepts in the area of aircraft systems and cabin system integration into the fuselage. Preparation of lab scale tests human-machine-cooperation and mobile assembly tasks for the use case “cabin & cargo installation”.

LPA Platform 3
WP 3.1: Enhanced flight operations and functions
Functions for “Always easier flight”
In 2017, the functions specified in 2016 will be defined and prototypes development will start based upon achieved trade-offs and technologies selection as follows
- Collision avoidance on ground, decision of detection technology by mid of 2017
- Head Worn Display, design V&V review
- New navigation sensor and Hybridization, selection of best technology to continue
- Pilot monitoring system (Bizjet driven)
- Voice to system and multimodality (Bizjet driven)
- Head Up System integration in next generation cockpits (Bizjet driven)

Functions for Efficient and Easy Systems Management
In 2017 the systems design will be finished and the activities related to implementation and manufacturing of technological prototypes (software & hardware) start in close cooperation with the Core Partners to be selected in wave02. Delivery of a prototype system specification and the prototype system validation plan.
Functions and solutions for man-machine efficiency
In 2017, the functions specified in 2016 will be defined and prototypes development will start based upon achieved trade-offs and technologies selected with core partners and partners to emerge from open calls wave02 and wave03:
- Bench test demonstration that Voice to System is able to understand voice from ATC/AOC
- Touchscreen control panel for critical system management functions, building blocks validation ready to integrate
- New flight crew oxygen mask concept for prolonged use in civil aircraft system definition, concept review and Critical Design Review
- Human-Machine Interface - AGILE development with Partner from CfP call03. Start of means of compliance identification

WP 3.2 Innovative enabling technologies
Flexible communication
In 2017 will take place architecture and components trade off studies and design of the components targeting to mature generic technology bricks to TRL3 (mainly large passenger

aircraft driven). Modular radio avionics, definition of options for alternative modular radio system architectures, synergies between modular radio systems and future aircraft platform systems. ATN/IPS router, definition of an architecture including functional requirements allocation and performance assessment.

Aircraft Monitoring Chain for Ground Support

In 2017 the systems design will be finished and the activities related to the implementation and manufacturing of technological prototype (SW & hardware) will ramp up in close cooperation with the Core Partner to be selected in wave 02. A Final version of prototype system specification and validation plan shall be available at the end of 2017.

Avionic components update & security

Avionics platform emulator technology (Airbus driven): Integrating multiple system applications for virtual avionics platform tests, preparation multi-systems integration, development of the demonstrator. Wireless transmission by light (LiFi, Airbus driven) start of the specification and design of the cockpit LiFi applications and components

WP 3.3 Next generation cockpit functions flight demonstration

In 2017, the flight test requirements will be prepared for the technologies selected for flight tests, and the tests means specification and definition will start.

A significant effort will also address the integration of a HUD system in a bizjet cockpit

WP 3.4 Enhanced cockpit demonstration with innovative functions & technologies

In 2017, the Large aircraft Enhanced cockpit V&V plan will be established, the tests objectives defined and the test requirements elaborated. The tests means preparation will start

WP 3.5 Disruptive cockpit ground demonstration

In 2017, the studies for the large passenger aircraft disruptive cockpit demonstrator will continue

- First release of disruptive cockpit concept V&V plan
- First release of Disruptive Cockpit Demonstrator requirements
- Preliminary definition of the Disruptive Cockpit demonstrator
- Preparation of necessary Partnership via Core Partner and/or Call for Proposals

WP 3.6 ADVANCE

In 2017 the IHMM development and demonstration will be performed for the second iteration cycle and the E2E architecture simulation based evaluation means will be developed. The development of the enabling technologies will be continued and the prototype development and production will be launched. First verification activities will be performed.

a) Major milestones planned for 2017:

LPA Platform 1

Milestones				
Ref. No.		***Title – Description***	***Type***	***Due Date***
WP1.2 Advanced engine integration driven fuselage	M1.2-2	Preliminary Design Review (PDR) for the selected technology solutions and way forward to ground-based demonstration	RM	Dec 2017

WP1.3 Validation of scaled flight testing	M1.3-2	Maiden flight of basic vehicle	D	Q2 2017
WP1.4 Hybrid Laminar Flow Control large scale demonstration	M1.4-2	Hail-test phase 1 and bird-impact test/simulation phase 1 (preliminary structure concept)	RM	Nov 2017
	M1.4-3	Decision gate about continuation of flight test campaign with A320 HLFC fin (connected to AFLoNext)	RM	Oct 2017
WP1.5 Applied technologies for enhanced aircraft performance	M1.5-3	Wind tunnel test with industrial configuration and flow control under realistic flow conditions accomplished	RM	Jun 2017
	M1.5-4	Review of the active systems integration in the test aircraft	RM	Q4 2017
WP1.6 Demonstration of radical aircraft configurations	M1.6-3	Review for configuration down selection step 2	RM	Q4 2017
	M1.6-4	Power-Test Bench available	D	Q3 2016

LPA Platform 2

Milestones				
Ref. No.		***Title – Description***	***Type***	***Due Date***
WP 2.1 Next Generation Fuselage, Cabin and Systems Integration	M2.1-3	Document on Demonstrator Baseline available	R	Jun 2017
	M2.1-4	Final document on future fuselage architecture available	RM	Jul 2017
	M2.1-5	Technology Review TRl2 Downselection of concepts	RM	Jul 2017
WP 2.2 Next Generation Cabin & Cargo Functions	M2.2-4	Proof of Concepts Movable Passenger Unit-Decision/Maturity Gate	RM	Dec 2017
	M2.2-5	Fuel Cell Galley equipment available	D	Sep 2017
WP2.3 Next generation lower centre fuselage	M2.3-4	Next gen. lower centre fuselage gear kit Technology review TRL3	RM	Dec 2017
	M2.3-5	Next gen. lower centre keel beam Technology review TRL3	RM	Dec 2017
2.4 Future Factory (Non-specific cross functions)	M 2.4.-2	Automation in Final Aircraft Assembly Lines and Enabling Technologies Concepts completed	R	Jan 2017
	M 2.4-3	Build-Up of test-setups automation in final assembly line completed	R	Sep 2017
	M 2.4-4	Automated Cargo Lining concepts completed	R	Mar 2017
	M 2.4-5	Build-Up of automated cargo lining test-setups completed	R	Jun 2017

LPA Platform 3

Milestones				
Ref. No.			***Type***	***Due Date***
WP 3.1 Enhanced flight operations and functions	M3.1-5	Ground Collision Avoidance technology decision gate	RM	2017-Q2
	M3.1-6	Equipment requirements and architecture review	RM	2017-Q2
	M3.1-7	Voice to text candidate technology bench tests	RM	2017-Q1
	M3.1-8	Oxygen Mask Critical Design Review	RM	2017-Q3
	M3.1-9	Tactile control panel building blocks TRL4	RM	2017-Q3
WP 3.2 Innovative enabling technologies	M3.2-3	Flexible communication equipment requirements and architecture review	RM	2017-Q2
	M3.2-4	Wireless transmission by light KoM with Core Partner Wave 3	RM	2017-Q1
	M3.2-5	Avionics components update technology compliance review (to bizjet airframer requirements)	RM	2017-Q2
WP 3.3 Next gen. cockpit functions flight demo.	M3.3-2	Flight tests needs review for Large Passenger Aircraft	RM	2017-Q2
WP 3.4 Enhanced cockpit demo. innov. functions & technologies	M3.4-2	Enhanced cockpit V&V plan review	RM	2017-Q4
WP 3.5 Disruptive cockpit ground demonstration	M3.5-2	Disruptive cockpit V&V plan review	RM	2017-Q4
WP3.6 Advance	M3.6-5	Aircraft Level SHM solution - Algorithms prototype of damage assessment design review	RM	2017-Q4
	M3.6-6	Condition based maintenance prognostics progress review	RM	2017-Q4
	M3.6-7	Maintenance Planning and Optimization and Configuration Management Solutions CDR	RM	2017-Q3
	M3.6-8	Maintenance execution enhancement, overall mobile tool development review	RM	2017-Q3

b) Major deliverables planned for 2017:

LPA Platform 1

Deliverables			
Ref. No.	***Title – Description***	***Type***	***Due Date***

WP1.2 Advanced engine integration driven fuselage	D1.2-2	Results of the design review ("selected technology solutions for ground test demonstration")	R/D, FEM & CAD models	Dec 2017
WP1.3 Validation of scaled flight testing	D1.3-2	Flight-test vehicle available.	D	Q2 2017
	D1.3-3	Flight-test results with basic vehicle	R	Q4 2017
WP1.4 Hybrid Laminar Flow Control large scale demonstration	D1.4-2	Results of the low-level tests for structural compatibility	R/D	Dec 2017
WP1.5 Applied technologies for enhanced aircraft performance	D1.5-3	Delivery of first set of actuators for mock-up installation	D	Nov 2017
	D1.5-4	Wind Tunnel Test rig for test of active flow control use at high Re-numbers completed	D	Q3 2017
WP1.6 Demonstra-tion of radical aircraft config.	D1.6-3	Concept analysis of alternative propulsion aircraft configurations "Step 2"	R	Dec 2017
	D1.6-4	Hybrid Power Bench 1 (HGD1)	D	Sep 2017

LPA Platform 2

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
WP 2.1 Next Generation Fuselage, Cabin and Systems Integration	D2.1-3	Definition of Demonstrator baseline	R	Jun 2017
	D2.1-4	Definition of future fuselage architecture	R	Jun 2017
	D2.1-5	Product breakdown structure to show the build concept (preliminary)	R	Jul 2017
WP 2.2 Next Generation Cabin & Cargo Functions	D2.2-2	Movable Passenger Support Unit Test Infrastructure Document	R	Dec 2017
	D2.2-3	Specification of Halon free fire suppression system (OBIGGS)	R	Jan 2017
	D2.2-4	Fuel Cell Galley Demonstrator components available	D	Sep 2017
WP2.3 Next generation lower centre fuselage	D2.3-3	Main landing gear kit intermediate development status	R, D	Dec 2017
	D2.3-4	Next gen. lower centre fuselage industrialisation analysis	R	Dec 2017
2.4 Future Factory (Non-specific cross functions)	D2.4- 5	New structural blind fasteners	R	Dec 2017
	D2.4-6	Automation in final aircraft assembly lines - concepts for adaptive jigs and tools	R, 3D-Visualization	Jun 2017
	D 2.4-7	Automation in Final Aircraft Assembly Lines and Enabling Technologies demonstrators	R, D	Sep 2017

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
	D 2.4-8	Evaluation of demonstration with mobile unit for Cargo Lining Installation	R, D	Dec- 17

LPA Platform 3

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
WP 3.1 Enhanced flight operations and functions	D3.1-3	Evaluation report of prototype navigation functions (partial)	R	2017-Q4
	D3.1-4	"Active Cockpit" definition document for integration and validation of technologies	R	2017-Q4
	D3.1-5	Voice to text preliminary tests report	R	2017-Q2
	D3.1-6	Evaluation report of prototype HMI systems (with partners)	R	2017-Q4
WP 3.2 Innovative enabling technologies	D3.2-4	Modular radio System trade off results and baseline components requirements	R	2017-Q2
	D3.2-5	ATN/IPS Router overall architecture	R	2017-Q2
	D3.2-6	Avionic platform emulator - multi systems demonstration on virtual avionics systems platform	R	2017-Q4
	D3.2-7	Remote Data Power Concentrator Demonstrator specification	R	2017-Q4
WP 3.3 Next gen. cockpit functions flight demonstrator	D3.3-1	Large Passenger Aircraft Flight tests requirements	R	2017-Q2
	D3.3-2	Preliminary evaluation of HUD integration on business jets	R	2017-Q4
WP 3.4 Enhanced cockpit demo.	D3.4-1	Enhanced cockpit functions and technologies V&V plan	R	2017-Q4
WP 3.5 Disruptive cockpit ground demonstration	D3.5-1	Disruptive Cockpit concept preliminary V&V plan	R	2017-Q4
WP3.6 Advance	D3.6-6	E2E Maintenance platform evaluation: E2E Evaluation & Development report	R	2017-Q4
	D3.6-7	IHMM Development / IHMM Demonstration & evaluation TRL5	R	2017-Q4
	D3.6-8	Condition based maintenance solutions: Use on aircraft and fleet level	R	2017-Q4
	D3.6-9	Guided wave based SHM solution specimen and system installation evaluation	R	2017-Q1
	D3.6-10	Maintenance Planning and Optimization and Configuration: Configuration Management prototype	D	2017-Q3

LPA - List of Leaders and participating affiliates

Nr	Leaders	Description of activities
1	Airbus SAS	Airbus SAS has a main share of responsibility to coordinate the LPA project. This includes the coordination of the strategic planning, technical coordination, planning and execution, including the technical lead of main work packages.
8	Dassault Aviation SA	The main activities are related to the physical integration of advanced turbofan engines to innovative aircraft configuration, using synergies of research and development to prepare the integration of a CROR engine to a large passenger aircraft in LPA Platform 1 for advanced engine integration to future business jets. Further focus of activities is laid on research and development of a laminar flow HTP and the definition and development of a future End-to-end maintenance operation concept in LPA Platform 3. As from 2015, Dassault Aviation SA is also contributing to the specifications of cockpit and avionics technologies in LPA Platform 3.
9	Airbus Defence & Space – SAU (CASA)	In the first contractual period, CASA is contributing to definition of radical aircraft configurations aiming to integrate future propulsion concepts which may require severe modifications in the airframe geometry aero dynamical and structural layout. The contribution in the first contractual term is very moderate. As from 2015, CASA is also contributing to the specifications of cockpit and avionics technologies in LPA Platform 3.
10	Fraunhofer	FHG activities are related to contribute to develop engine-mounting architectures to optimize the loads transfer and introduction to the aircraft main frame and fuselage skin structure. A second area of contribution is in the research and development of advanced automated manufacturing and assembly processes associated to a new integrated fuselage cabin-cargo architecture
11	Rolls-Royce plc	Activities are related to integrate advanced and radical engine concepts to a future aircraft configurations which require significant changes in the aircraft architecture
12	Thales Avionics	Focus of the activities is in LPA Platform 3 to take strong contributing share in the definition and development of a future End-to-end maintenance operation concept, the business and operational analysis.

Nr	Participating Affiliates	Description of activities
2	Airbus Operations SAS	Airbus Operations SAS will take a key contributing role research and technology activities in all three platforms respectively all main technical areas of the program, advanced engine and aircraft configuration, innovative physical integration cabin-system-structure, next generation aircraft systems and maintenance.
3	Airbus Operations GmbH	Airbus Operations GmbH will take a key contributing role research and technology activities in all three platforms respectively all main technical areas of the program, advanced engine and aircraft

Nr	Participating Affiliates	Description of activities
		configuration, innovative physical integration cabin-system-structure and maintenance.
3a	Airbus DS GmbH	Airbus DS GmbH will provide support to the LPA program management by providing a comprehensive, dedicated tool for the full life cycle of the program. This includes the development, upgrading and services and support for all parties contributing to LPA.
4	Airbus Operations Ltd	Activities will be associated to the definition and preparation of the test pyramid and to provide key contributions to the specification of component and heavily integrated demonstrators in LPA platform 2 innovative physical integration cabin-system-structure.
5	Airbus Operations SL	Airbus Operations SL will take a coordinating role and key contributions in Platform 1 in work packages advanced engine integration driven fuselage and hybrid laminar flow control large scale demonstration. Activities are also associated in platform 2 to develop technologies for elementary parts, sub components and modules.
6	Airbus Group SAS	Activities in LPA are associated to the demonstration of radical aircraft configuration with focus on hybrid power bench development and testing.
7	Airbus Defense & Space - Germany	Activities in LPA are associated to the demonstration of radical aircraft configuration with focus on hybrid power bench development and testing. Airbus Defense and Space Germany will take a coordinating role.
13	SNECMA (Safran-Group)	Snecma has a main share of responsibility in the LPA Platform 1 to coordinate the FTD CROR Demo Engine project and the Non-Propulsive Energy project .This includes the coordination of the strategic planning, technical coordination, planning and execution, including the technical lead of main work packages.
14	Microturbo (Safran-Group)	Activities related to advanced concepts of Non Propulsive Energy generation in LPA Platform 1. In the first contractual period, Microturbo will contribute to proposals, down selection and engine-aircraft-systems optimizations.
15	Aircelle (Safran-Group)	Aircelle activities are related to develop advanced concepts of nacelle and plug for the FTD CROR Demo Engine project fitting with the pylon configuration of the FTD Aircraft.
16	SAFRAN S.A. (Safran Group)	SAFRAN S.A. activities are related to develop advanced concepts of composite blades for the FTD CROR Demo Engine project fitting with the pylon configuration of the FTD Aircraft (Note: SAFRAN SA is not signatory of the first LPA GAM)

IADP REGIONAL AIRCRAFT

Multi-annual overview and strategic planning

The REG IADP objective is to bring the integration of technologies for Regional Aircraft to a further level of complexity with respect to the achievements of Clean Sky GRA. Retaining GRA outcomes, advanced technologies for regional aircraft will be further developed, integrated and validated at aircraft level, so as to drastically de-risk their integration on future regional aircraft products. All activities in 2016 and 2017 will allow to implement a fully operative REG IADP through the achievement of: the proper and complete transition from GRA (during 2016); the full integration of the Core Partners selected in Wave 1 and 2; the selection of the remaining Core Partners as well as of several Partners through CfPs; and the consolidation of interactions and interfaces with the other SPDs, in particular with the Airframe ITD, the ECO TA and the TE.
During 2016-2017, technical activities will be seamless continued from 2015 to cover further development of technologies, definition of demonstrators and the Overall Aircraft Design (conceptual design, flight physics, architecture definition, etc), in order to progress in the TRL maturation for technologies development as well as to complete trade-offs, demonstrators feasibility studies and to start a detailed definition of technologies integration into each demonstrator. Core Partners will provide key contributions towards the maturation of relevant technologies and the definition of the full scale integrated demonstrators.
The main high-level objectives pursued in this timeframe are:

- down-selection of technologies to be integrated into the Demonstrators
- completion of feasibility activities for Demonstrators
- achievement of Demonstrators PDRs
- starting of a detailed definition phase for the Demonstrators
- deliver of first ASM (Aircraft Simulation Model) to TE for environmental impacts evaluations and agreement of other inputs to be provided for socio-economic evaluations
- deliver of initial data to ECO TA for LCA evaluations

Description of main activities for the year 2016

<u>WP0 – Management:</u> Alenia will ensure IADP coordination, administration and management, assuring proper interactions and interfaces with the JU and other IAs, through the following main activities:

- participation to JU Committees and WGs, organization of SCs, ARs;
- preparation of work plans, GAMs and periodic reporting;
- coordination for CPs and Partners selection;
- communication, dissemination and risk management;
- systems engineering, methods and tools

Airbus DS (CASA) will support Alenia in management and administrative tasks in the same way than in 2014 – 2015 periods, with additional effort focused in CP integration and demonstrators ramp-up. Core Partners (AG2, ASTIB and the others selected in CPW02) will also provide their contributions to the activities of this work package.

WP1 – High Efficiency Regional A/C: Starting from the Top Level Aircraft Requirements and the technological feedback from other workpackages related to regional a/c, preliminary sizing, configuration definition, weight and balance analysis, aerodynamics and aero-acoustic integration studies will be performed for the first design loop for both the innovative architecture and the conventional one. The Core Partner selected in Wave 2 will also perform the planned activities.

WP2 – Technologies Development
WP2.1 – Adaptive Electric Wing: Alenia and CP Airgreen2 work shall complete requirements and start development of design and manufacturing advanced process, start SHM/NDI systems development. Air Vehicle technologies (morphing, high lift, loads alleviation, drag reduction devices) shall continue development of system architectures and relevant aeromechanical design in preparation of first Down Selection session. Calls for Proposal shall be launched supporting experimental validations.
WP2.2 – Regional Avionics: The following main activities are foreseen:
- Definition of Integrated Vehicle Health Management (IVHM) functional requirements
- Starting the definition of IVHM architecture

WP2.3 – Energy Optimized Regional Aircraft: Definition of on-board systems technologies preliminary Verification and Validation Plans. Definition of On-Board Systems Preliminary Requirements and Architectures with preparation of Technical Specifications for the selected advanced technologies in the areas of:
- Wing Ice Protection System (WIPS),
- Electrical Landing Gear System (E-LGS),
- Thermal Management (ThM),
- Advanced Electrical Power Generation and Distribution (A-EPGDS),
- Electrical Environmental Control System (E-ECS),
- Innovative Propeller.
- Starting of relevant CfP projects and Core Partners activities.

WP2.4 – Flight Control System: Starting of activity for Prognostic Health Monitoring solutions to be developed for the Electromechanical Actuators (EMAs) of the FCS. A technology roadmap for EMA Health Monitoring and a report with fault features and operating condition indicators selection will be prepared. Preliminary FCS Basic Configuration Architecture (implementing of Load Alleviation/Load Control capability by movable Winglet/Wingtips only) will be defined. Preliminary Requirement for Winglet/Wingtip EMA will be defined.

WP3 – Demonstrations:
WP3.1 – Airvehicle Technologies Demonstrator (FTB#1): Definition of the Flight Demonstration Program and of the preliminary Flight test requirements. Specification and selection of the Aircraft as FTB#1
Upgrade of the wing structural concept design starting from the first wing concepts developed in WP 2.1.1.
WP3.2 – Fuselage / Cabin Integrated Demonstrator: Definition of preliminary requirements and constraints coming from structural, installation design and stress disciplines for a preliminary fuselage conceptual structural design, based on first fuselage concepts developed in WP B-4.3 of AIRFRAME ITD. Identification of general requirements for

Passenger Cabin based on Key Cabin Drivers for Passenger/Crew and Wellbeing in the aircraft identified in WP B-4.4 of AIRFRAME ITD.
WP3.3 – Flight Simulator: No technical activities will be performed. GRA's flight simulations final results expected.
WP3.4 – Iron Bird: Activities oriented to the Iron Bird concept document preparation and design assessment in collaboration with ASTIB, will proceed with the updating of the top level requirement (HW&SW), mechanical & electrical architecture and of main components, assess the physical constraints, functions and operation defining the goals, typology of testing and the configuration. Electrical & Mechanical preliminary design activities will be performed.
WP3.5 – Integrated Technologies Demonstrator (FTB#2): The Regional FTB#2 major milestone in 2016 is the Preliminary Design Review at Airbus DS (CASA) internal level - M-3.5.4-1. The activities will be focused in aircraft loads and aeroelastic studies - D-3.5.4-9 and D-3.5.4-16; implementation of process for leader – Core Partner design coordination of demonstrator - D-3.5.4-13, and PDR review of external inner wing box, aileron and spoiler components - D-3.5.4-14 and D-3.5.4-15.

WP4 – Technologies Development / Demonstrations Results: Detailed identification and planning of the interfaces with the technological WPs of R-IADP and with the TE, including inputs for the evaluation of environmental impacts and socio-economic benefits. Detailed identification and planning of the interfaces with the technological WPs of R-IADP and with the ECO TA for LCA evaluations.

a) Major milestones planned for 2016:

Milestones				
Ref. No.		Title – Description	Type	Due Date
Management	M0.1	Launch Review with AG2 and ASTIB	RM	Jan 16
	M0.2	Launch Review with CPW02 for FTB#2	RM	Apr 16
	M0.3	Annual Review	RM	Jun 16
High Efficiency Regional A/C	M-1.2.1-01	TLARs for the conventional initial platform -- Loop 1	R	May 16
	M-1.3.1-01	Definition of technologies targets for the conventional initial configuration – Loop1.	R	Oct 16
Technologies	M-2.1-2 (1)	Liquid resin infusion test trials	R, D	Dec 16
	M 2.1-3 (1)	Adaptive Wing Concepts - Technology First Down Selection contributions	R	Dec 16
	M-2.3-01(1)	Collection of available on-board systems preliminary requirements / specifications	R	Dec 16
Demonstrations	M-3.1.1-01 (1)	Demo A/C selected	RM	Dec 16
	M-3.4.2-01	Iron Bird Preliminary Architecture (Electrical & Mechanical)	R	Oct 16

Milestones				
Ref. No.		Title – Description	Type	Due Date
	M-3.5.4-01	Regional FTB2 PDR: Regional FTB2 demonstrator internal Preliminary Design Review with inputs from REG WPs 3.5.1, 3.5.2, 3.5.3, AIR WPs and SYS WPs	RM	Dec 16

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

(1) Numbering Reference as per GAM 2016-2017

b) Major deliverables planned for 2016:

Deliverables				
Ref. No.		Title – Description	Type	Due Date
Management	D-0.1-2016	Amendment of GAM 2016-2017 Annexes 1, 2 for inclusion of Core Partners Wave 2. (Alenia Aermacchi)	R	May 16
	D-0.2-2016	Final inputs for Work Plan 2017-2018. (Alenia Aermacchi)	R	Nov 16
	D-0.3-2016	Annual Report 2015. (Alenia Aermacchi)	R	Mar 16
High Efficiency Regional A/C	D-1.2.1-02[(1)]	TLARs for the conventional initial platform -- Loop 1 (Alenia Aermacchi)	R	May 16
	D-1.3.1-01[(1)]	Definition of technologies targets for the conventional initial configuration – Loop1. (Alenia Aermacchi)	R	Oct 16
Technologies	D-2.1-05 [(1)]	Manufacturing of test trials realized with resin liquid infusion process to be applied to outer wing stiffened panels. (Alenia Aermacchi)	R and D	Dec 16
	D-2.1-06[(1)]	Morphing Winglet architecture and conceptual design (Alenia Aermacchi)	R and D	Dec 2016
	D-2.1-07[(1)]	Innovative Wing Tip conceptual design (Alenia Aermacchi)	R and D	Dec 2016
	D2.2.3-2 [(1)]	Collection of IVHM functional requirements, including P/HM function. (Alenia Aermacchi)	R	June 16
	D-2.3-01[(1)]	Collection of on-board systems technologies preliminary verification and validation plans for Regional A/C. (Alenia Aermacchi)	R	Dec 16
	D2.4-01	Review of Technologies road map for EMA PHM (ASTIB - Polito)	D	Apr 16
	D2.4-02	Preliminary Specification for Winglet/Wingtip EMA (Alenia Aermacchi)	D	Dec 16
Demonstrations	D-3.1.1-02[(1)]	Wing structural concept design upgrade document. (Alenia Aermacchi)	R	Dec 16

Deliverables				
Ref. No.		Title – Description	Type	Due Date
	D-3.2.1-02	Fuselage demonstrator preliminary requirements and conceptual structural design. (Alenia Aermacchi)	R	Jun 16
	D-3.4.2-01	Iron Bird Electrical & Mechanical preliminary design review report (CERTIA)	R	Oct 16
	D3.5.3-11[(1)]	MLA and GLA Implementation Analysis: Evaluation of the existing concepts for manoeuvres loads alleviation and gust loads alleviation. Definition of the selected techniques implementation on the control laws architecture. (CASA)	R	Dec 16
	D3.5.4-13[(1)]	CAD Methods and Interchange for FTB#2 Design: CAD Methods and Interchange protocols for FTB#2 Design for collaboration between Demonstrator leader and Core Partners of different ITDs / IADPs. (CASA)	R	Jun 16
	D-3.5.1-20[(1)]	Systems Safety Assessment of Regional FTB#2: Feasibility: SSA at initial stage for general FCS systems and control surfaces design. (CASA)	R	Jun 16

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

(1) Numbering Reference as per GAM 2016-2017

c) Implementation – Risk

Risk Description	Action Plan Summary
Delay in Core Partners and Partner selections: risks in schedule, resources and costs	CSJU PO and WALs integrated management, monitoring and control up to GAM/GAP signature.
Call for Tender Rules: risks in schedule and costs	To support the finalisation of process securing critical activities, as WTTs,
Delay in inputs from Leader and Core Partner activities in AIRFRAME and SYSTEMS ITDs: risks in schedule and costs	IADP/ ITDs CPs integrated plans
Completion of FTB#2 Preliminary Design Review milestone due to lack of maturity in technologies: Risks in schedule and costs	Technical mitigation actions in identified critical technologies. Back-up solutions of riskier technologies with higher TRL alternatives

Description of main activities for the year 2017

WP0 – Management: Alenia will ensure IADP coordination, administration and management, assuring proper interactions and interfaces with the JU and other IAs, through the following main activities:

- participation to JU Committees and WGs, organization of SCs, ARs;

- preparation of work plans, GAMs and periodic reporting;
- coordination for CPs and Partners selection;
- communication, dissemination and risk management;
- systems engineering, methods and tools

Airbus DS (CASA) will continue to support Alenia in management and administrative tasks. Core Partners (AG2, ASTIB and the others selected in CPW02 and CPW04) will also provide their contributions to the activities of this workpackage.

WP1 – High Efficiency Regional A/C: Part of activities aiming at the second design loop will be performed for both the innovative architecture and the conventional one. All the previous activities will be based on both Top Level Aircraft Requirements and Technologies requirements. The aircraft simulation model, relative to the first loop, aimed at calculating the environmental, noise and cost benefits with respect to a reference configuration will be performed as well.

WP2 – Technologies

WP2.1 – Adaptive Electric Wing: Advanced D&M technologies processes and SHM system development continuation to be completed with verification and validation phase (Structural Ground Tests) in the next period. In parallel, Air Vehicle technologies tasks Core Partners shall complete the first design loop and the first down selection session certifying the first TRL step up to 4, scaled on the Turbo Prop A/C configuration.

WP2.2 – Regional Avionics: As far as WP2.2.3 is concerned the following activities are foreseen:

- Consolidation of IVHM architecture
- Starting of P/HM function SW requirements and HW prototype requirements

WP2.3 – Energy Optimized Regional Aircraft: Completion of on-board systems technologies, verification and validation plans. Completion of the definition of On-Board Systems Requirements and Architectures with final Technical Specifications for the selected advanced technologies in the areas of:

- Wing Ice Protection System (WIPS),
- Electrical Landing Gear System (E-LGS),
- Thermal Management (ThM),
- Advanced Electrical Power Generation and Distribution (A-EPGDS),
- Electrical Environmental Control System (E-ECS),
- Innovative Propeller.

Continuing of relevant CfP projects and Core Partners' activities.

WP2.4 – Flight Control System: Concerning WP 2.4.1, basing on Preliminary FCS Basic Functional Requirement/Architecture defined in 2016 and on Functional Hazard Analysis coming from AirVehicle, a preliminary safety assessment will be prepared in order to verify the architecture adequacy.

Concerning WP 2.4.2, basing on performance requirement relevant to WL/WT EMA's, dedicated Control Law will be prepared and demonstrated trough a preliminary Real time Models. In the same period a final specification of WL/WT EMA will be issued and an Interface Control Document will be defined.

WP3 – Demonstrations: WP3.1 – Air vehicle Technologies Demonstrator (FTB#1). Definition of A/C level requirements for the integration of the experimental Modifications. Feasibility assessment and detailed definition of the experimental modifications and FTI, with final review of the modifications requirements. Structural design studies and Air Vehicle assessment of the wing modified to include morphing Winglet/Wingtip. Start Structural design of the innovative stiffened panels (LRI Technology) and of outer wing box.

WP3.2 – Fuselage / Cabin Integrated Demonstrator: Fuselage demonstrator conceptual lay-out preparation. Start of preliminary structural design of Fuselage components. Design and realization of main manufacturing tools for Fuselage components. Pre-Production Manufacturing trial of representative components of Fuselage realization. Identification and design of main elements for the set-up of Cabin and developing of conceptual lay-out of the Cabin interiors. Start of design integration for the main elements for Cabin setup.

WP3.3 – Flight Simulator: No technical activities will be performed Waiting for GRA flight simulations final results.

WP3.4 – Iron Bird: The activities will be based on the assessment of the Iron Bird requirements referred to the architecture, mechanical & electrical interfaces, functions, operation, the acquisition system path and sensors. The Preliminary Specification will be issued a the Preliminary Design Review will be held.

WP3.5 – Integrated Technologies Demonstrator (FTB#2): The Regional FTB#2 major milestone in 2017 is the Critical Design Review at Airbus DS (CASA) internal level - M-3.5.4-2. The activities will be focused in aerodynamic studies and WT tests - D-3.5.4-5, D-3.5.4-6 and D-3.5.4-7; control laws design - D-3.5.4-12, and CDR review of external inner wing box, aileron and spoiler components - D-3.5.4-17 and D-3.5.4-18.

WP4 – Technologies Development / Demonstrations Results: Continuation of interactions and interface with TE as well as with ECO TA. Delivery of first inputs (ASM) for TE evaluations as well as inputs for Eco Design transversal activities and LCA evaluations.

a) Major milestones planned for 2017:

Milestones				
Ref. No.		Title – Description	Type	Due Date
Management	M0.1-2017	Annual Review	RM	Jun 17
	M0.2-2017	Launch Review for CPW04	RM	May 17
High Efficiency Regional A/C	M-1.2.1-02	TLARs for the conventional intermediate platform -- Loop 2	R	Oct 17
	M-1.3.1-02	Definition of technologies targets for the conventional intermediate configuration – Loop2.	R	Nov 17
Technologies	M-2.1-04	Outer wing box advanced models	R	Dec 17
	M-2.2-01	Preliminary IVHM architecture	R	Sept 17
	M-2.3-02	Collection of final on-board systems requirements / specifications	R	Dec 17
	M-2.4-02	WL/WT EMA Preliminary Design Review	R	Dec 17
Demonstrators	M-3.1-1-03	FTB#1 A/C Modifications Requirements Review (RR)	RM	May 17

Milestones				
Ref. No.		Title – Description	Type	Due Date
	M-3.1-2-01	Air Vehicle modified wing design assessment	RM	Dec 17
	M 3.2.1-01	Fuselage demonstrator conceptual lay-out	R	March 17
	M-3.2.1-02	Conceptual lay-out of the Cabin interiors to be installed into the barrel	R	June 17
	M-3.4-01	Iron Bird Preliminary Design Review Report	R	Sep 17
	M-3.5.4-2	Regional FTB2 CDR: Regional FTB2 demonstrator internal Critical Design Review with inputs from REG WPs 3.5.1, 3.5.2, 3.5.3, AIR WPs and SYS WPs	RM	Dec 17
Technology Development	M-4-01	Delivery to TE of the first regional a/c simulation model (Conventional initial Configuration) -- Loop 1	RM	May 17

b) Major deliverables planned for 2017:

Deliverables				
Ref. No.		Title – Description	Type	Due Date
Management	D-0.1	Final inputs for Work Plan 2018-2019 (Alenia Aermacchi)	R	Nov 17
	D-0.2	GAM 2018-2019 Draft Annexes 1, 2 (Alenia Aermacchi)	R	Dec 17
	D-0.3	Annual Report 2016 (Alenia Aermacchi)	R	Mar 17
High Efficiency Regional A/C	D-1.2.1-03(1)	TLARs for the conventional intermediate platform -- Loop 2. (Alenia Aermacchi)	R	Oct 17
	D-1.3.1-02(1)	Definition of technologies targets for the conventional intermediate configuration – Loop2. (Alenia Aermacchi)	R	Nov 17
Technologies	D-2.1-11	Adaptive Wing Technologies first down selection results-(Alenia Aermacchi)	R	May 17
	D-2.1.16	Coupons, elements and sub-components drawings representative of outer wing box stiffened panels (Alenia Aermacchi)	R	Dec 17
	D-2.2.3-3(1)	Preliminary IVHM architecture defined according to assumption provided by Member Systems. (Alenia Aermacchi)	R	Sept 17
	D-2.3-02(1)	Collection of on-board systems technologies final verification and validation plans for Regional A/C. (Alenia Aermacchi)	R	Dec 17
	D-2.4-01	Final WL/WT Specification (Alenia Aermacchi)	D	Sept 17
	D-2.4-02	EMA for WL/WT – Interface Control, Performance and Design Document (Umbra)	D	Nov 17
Demonstrations	D-3.1.2-01(1)	Wing structural preliminary design document. (Alenia Aermacchi)	R	Oct 17

Deliverables				
Ref. No.		Title – Description	Type	Due Date
	D-3.1.2-02[1]	Modifications Detailed Description Document (Alenia Aermacchi)	R	Nov 17
	D-3.2.1-01[1]	Fuselage demonstrator conceptual lay-out. (Alenia Aermacchi)	R	March 17
	D-3.2.1-02[1]	Conceptual lay-out of the Cabin interiors to be installed into the barrel. (Alenia Aermacchi)	R	Jun 17
	D-3.4.-01	Iron Bird Preliminary Specification Control Document. (Alenia Aermacchi)	R	May 17
	D-3.5.1-05[1]	Regional FTB#2 Low Re Wind Tunnel Test Report: Management of the CfT – S/C for the Wind Tunnel Test in low Reynolds blowing conditions.(CASA)	R	Apr 17
	D-3.5.1-08[1]	Aileron and Spoiler Aerodynamic Performances: Assessment of the aileron and spoiler aerodynamic performances against experimental results from low Reynolds WTT. (CASA)	R	Sep 17
	D-3.5.1-19[1]	Regional FTB#2 Aeroelasticity Studies: Aeroelastic survey (static and flutter) of FTB2 with new concept devices (external wing box, aileron, spoiler, flap and winglet). Final release. (CASA)	R	Jun 17
Technology Development	D-4.1.1-05[1]	Aircraft simulation model green and cost efficient conceptual aircraft for the Conventional initial Configuration -- Loop 1. (Alenia Aermacchi)	R	May 17
	D-4.1.1-06[1]	CS2 aircraft simulation model green and cost efficient conceptual aircraft for the Innovative initial Configuration -- Loop 1. (Alenia Aermacchi)	R	Nov 17

(1) Numbering Reference as per GAM 2016-2017

c) Implementation – Risk

Risk Description	Action Plan Summary
Delay in Core Partners and Partner selections: risks in schedule, resources and costs	CSJU PO and WALs integrated management, monitoring and control up to GAM/GAP signature.
Call for Tender Rules: risks in schedule and costs	To support the finalisation of process securing critical activities, as WTTs,
Delay in inputs from Leader and Core Partner activities in AIRFRAME and SYSTEMS ITDs: risks in schedule and costs	IADP/ ITDs CPs integrated plans
Completion of FTB#2 Critical Design Review milestone due to lack of maturity in technologies: Risks in schedule and costs	Technical mitigation actions in identified critical technologies. Back-up solutions of riskier technologies with higher TRL alternatives

REG - List of Leaders and participating affiliates[9]

Nr	Leaders	Description of activities
1	Alenia Aermacchi SpA	See detailed description in core text
2	Airbus Defence and Space S.A.U. (CASA)	See detailed description in core text

[9] The two leaders of Regional IADP have no affiliated companies.

IADP FAST ROTORCRAFT

Multi-annual overview and strategic planning

The Fast Rotorcraft IADP of *Clean Sky 2* consists of two separate demonstrators, the *NextGenCTR tiltrotor* (leader: Agusta Westland) and the *LifeRCraft compound helicopter* (leader: Airbus Helicopters). These two fast rotorcraft concepts aim to deliver superior vehicle productivity and performance, and through this economic advantage to users.
NextGenCTR aims to design, build and fly an innovative next generation civil tiltrotor technology demonstrator. The configuration will go beyond current architectures of this type of aircraft and will involve tilting proprotors mounted in fixed nacelles at the tips of the wing. The wing will have a fixed inboard portion and a tilting outboard portion to minimize rotor downwash impingement in hover and increase efficiency. Demonstration activities will aim at validating the, technologies/systems and operational concepts. Specific activities will also be launched in Clean Sky 2 to include drag reduction of the proprotor, airframe fuselage and wing and research to reduce proprotor noise emissions. In the period 2016-2017, integration of Core Partners and Partners will occur to achieve a PDR level of maturity.
The LifeRCraft project aims at developing and flight-testing in 2019-2020 a full scale flightworthy demonstrator in the 7 to 8 tons class which embodies the new European compound rotorcraft architecture combining a lifting rotor with two lateral rotors at the tips of a wing Feasibility and conceptual design studies performed in 2014-2015 confirmed capabilities similar to a conventional helicopter in hovering and vertical flight and 50% faster cruise with lower environmental impact. In the period 2016-2017, the involvement of all Core Partners and Partners will allow completing the Preliminary Design phase and freezing the interfaces and specifications of subsystems, then proceed with the detailed design of components up to the Critical Design Review, perform specific technology validation tests and launch the manufacturing of long lead-time parts.

Description of main activities for the year 2016

Activities relevant to the NextGenCTR demonstrator

In 2016, following completion of the NGCTR level System Requirements Review, AW shall complete the requirements definition for the major sub-systems as described by the work package breakdown in WP 1 including cooperation with an engine OEM to cover integration aspects. This activity will lead to a series of System Requirement Reviews of the individual sub-systems to take place during 2016. The major sub-system SRRs shall include the outcome of the pressurized fuselage SRR performed within the Airframe ITD to ensure a consistent requirement set and design criteria is implemented across the design of the demonstrator. During this period system and aircraft modelling tools shall be developed by AW and possible partners previously selected through Call for Proposals and Core Partners launched in 2015. AW and Partners shall perform technology trade-studies of the major systems in preparation of the preliminary design review phase (PDR) in 2017. Other activities to be initiated include, manufacturing planning, tooling definition, test and simulation environment infrastructure planning. A strong interface with the Airframe ITD will be maintained to coordinate the activities that impact on the fuselage and vice-versa.

WP 1.1 NGCTR Demonstrator Management and Co-ordination

This WP includes the Programme Management activities specific to the NextGenCTR demonstrator platform. The activities and objectives in 2016 are to progress the appropriate management infrastructure between AW, CS2 JU and other parties (i.e. Core Partners and Partners) to properly execute the programme. To carry out all tasks needed to coordinate, orient, report and plan the Next Generation Civil Tiltrotor (NGCTR) project specific activities in line with IADP level requirements including Core Partner/Partner coordination. To timely deliver all documents and information as required by the FRC IADP in line with the FRC IADP Management Manual. These activities run continuously for the 2016 period.

WP 1.2 Air Vehicle Design & Development

This WP deals with system integration activities that are needed at aircraft and sub-system level. The concept of NextGenCTR (NGCTR) is developed, including general architecture and integrated system design activities as well as design to manufacture and maintenance aspects. The major activities are split by aircraft system level (Design Integration and TiltRotor System Design) transversal activities and the major sub-system areas (Transmissions, Rotors, Airframe Structures, Electrical & Avionic and Airframe Systems) to work in an integrated project team employing a traceable Systems Engineering approach. The tasks to be performed in the period 2016 will be in anticipation of the aircraft preliminary design review (PDR) foreseen in 2017 following the SRR completion in early 2016. The activities will deal with the requirements definition, studies, modelling and analysis, pre-design and general architecture at global and system level, down-selection of Step Change Technologies, and integrated design of the various sub-systems in accordance with a sound Systems Engineering approach. To reinforce this approach, a System Functional Review (SFR) milestone is envisaged in the beginning of Q3 of 2016 to consolidate the key functional requirements of NGCTR as well as the expectations and integration of Partners in the NGCTR Demonstrator. The integrated project team will continuously support the identification of relevant Call topics and the JU process to incorporate the eventual Core Partners and Partners in to the NGCTR activities.

The main deliverables will be the updated General Requirements and Objectives (GRO) and the NGCTR Configuration documents as well as the necessary Call fiches required to launch Call topics for Core Partners and Partners to join the NGCTR activity. The major Milestones will be the completion of aircraft level SRR and SFR.

WP 1.3 Aircraft Final Assembly

This WP refers to the activities required for final assembly of the NGCTR Demonstrator to include aircraft level industrialisation, jig and tooling design and development, manufacture, assembly and system test activities.

For the period 2016 this WP will contain the activities associated with NGCTR Industrial Engineering at NGCTR level and sub-system level. Their activities will include: performing trade studies to evaluate manufacturing technologies for improved quality and cost reduction, establish the industrialisation strategy across the manufacturing centres and with

Core Partners and Partners, as well as participate in the System Engineering design process. All milestones and deliverables will be covered by WP 1.2.

WP 1.4 Aircraft Test and Demonstration
This WP refers to the activities that include both demonstrator ground and flight tests, including production of mock-ups, Ground Test Vehicle (GTV) and Flight Test. In 2016 no major activity is foreseen, only in 2017.

WP 2A - LifeRCraft Flight Demonstrator Integration
The Preliminary Design Verification Review at aircraft level (M2.1) will be performed early 2016, aiming at checking with Core Partners the consistency of the subsystem specifications and interfaces with the general vehicle specifications.
New topics for Partners or resubmitted topics may be defined for CfP4 and/or CfP5 (D2.1; D2.3) depending on outcome of CfP2 and CfP3.
The LifeRCraft Preliminary Design Review (PDR) will be organized in July 2016 (M2.3; D2.2), after completion of the third wind tunnel test campaign (M2.2).
A first aircraft-level Critical Design Review is planned in December (M2.5).

Activities relevant to the LifeRCraft demonstrator

WP 2B - LifeRCraft Airframe Integration
The fuselage preliminary design phase will continue in collocation on the Airframe Plateau, with the collaboration between the LifeRCraft Project Leader, and the Core Partners in charge of fuselage structure (RoRCraft consortium, WP 2B2.5) and the Partner in charge of doors (selected in AIR-ITD, CfP1). It will be completed with the fuselage Preliminary Design Review in July 2016, shortly before the aircraft-level PDR. Then, the detailed design will start and the Partners selected from CfP2 will join the project and start studies of the canopy and windshields.
The fuselage build roadmap, including the Quality Assurance plan will be delivered in December (D2.4), on time for the first aircraft-level CDR.

WP 2C - LifeRCraft Dynamic Assembly Integration
The Technology Area for dynamic assembly includes all rotating parts from engines (WP 2C.7) to main and lateral rotors (2C.4; 2C.5), through all gear boxes and shafts of the drive system (2C.6) and includes also the actuation system (2C.9). The main technical challenges reside with the gear boxes which are new components with a long development cycle.
The preliminary design phase for Lateral Rotor Gear Boxes (LRGB) and High Speed Input Stage modules (HSIS) will continue in collocation on the Dynamic Assembly Plateau, with the collaboration between the LifeRCraft Project Leader and the Core Partner in charge of these modules (“Mobility Discovery” project, WP2B6.11). It will be concluded with the dedicated PDR in October (M2.4) and the detailed design will progress until end 2016.

WP 2D - LifeRCraft On-board Systems Integration
The Technology Area for on board systems includes the electrical power system (WP 2C8), the avionic suite (2C10) and the flight control, guidance and navigation systems (2C12). The main innovation and challenge resides with the introduction of a High Voltage DC network

on the LifeRCraft demonstrator as the main electrical power, further to research activities performed in the Clean Sky SGO and GRC projects.
The conceptual design of this HVDC system is available beginning of the year and four Partners selected in call CFP1 will develop pieces of equipment meeting the Project specifications (starter/generator, battery, bi-directional converter, master box) aiming to pass critical reviews by mid-2016. The main HVDC generator will develop by a Partner selected in call CfP2 who should become active by mid-2016.
The development of the LifeRCraft Electrical Wiring Interconnection System (EWIS= harnesses and integration hardware) will be under the responsibly to a new Core Partner selected for call CPW3 who should become active by end 2016.

Transversal Fast Rotorcraft Activities

WP 3 - Eco-Design Concept Implementation to Fast Rotorcraft
FRC Leaders will elaborate a specific CS2 collaboration agreement with ECO-TA and other SPD Leaders (M3.1). FRC will proceed with the mapping of its eco-relevant technologies (M3.2; D3.2) and will issue call topic descriptions for CfP4 and/or CfP5, as needed (D3.1; D3.3).
The technologies to be considered for Life Cycle Assessment (LCA) will be reviewed.

WP 4 - Technology Evaluator Methodology for Fast Rotorcraft
Following the definition of the high level objectives of TE for FRC as discussed between leaders, DLR and JU in 2015, the detailed implementation program for the activity will be defined during 2016 and the fundamental metrics and basic mission profiles will be assessed.
During 2016 the applicable scenarios for the Technology Evaluations will be chosen for the different platforms and preparations will be made for the initial simulations to be performed in early 2017, to support the CS2 interim review scheduled for mid-2017.

a) Major milestones planned for 2016:

Milestones				
Ref. No.		Title – Description	Type	Due Date
WP1 – NextGenCTR Demonstrator Project	M1.1	System Requirement Review (SRR)	RM	Jan 2016
	M1.2	CfP 2 Partners on Contract	R	May 2016
	M1.3	System Functional Review (SFR)	RM	Jul 2016
	M1.4	CPW 3 Core Partners on Contract	R	Aug 2016
	M1.5	CfP 3 Partners on Contract	R	Nov 2016
WP2 - LifeRCraft Demonstrator Project	M2.1	Preliminary Design Verification Review	RM	Jan 2016
	M2.2	3rd Wind Tunnel Test campaign completed	RM	Feb 2016
	M2.3	Aircraft level Preliminary Design Review	RM	Jul 2016
	M2.4	LRGB & HSIS Preliminary Design Review	RM	Oct 2016
	M2.5	Aircraft level Critical Design Review 1	RM	Dec 2016

Milestones				
Ref. No.		Title – Description	Type	Due Date
WP3 - Eco-Design Concept Implement. to FRC	M3.1	FRC enters ECO-TA Specific Agreement	Milestone	Mar 2016
	M3.2	FRC Technology Mapping finalized	Milestone	Jul 2016
WP4 - Technology Evaluator Methodology for FRC	M4.1	Implementation Program defined	Milestone	Sept 2016
	M4.2	Scenarios defined and agreed	Milestone	Sept 2016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

b) Major deliverables planned for 2016:

Deliverables				
Ref. No.		Title – Description	Type	Due Date
WP1 – NextGenCTR Demonstrator Project	D1.1	Preliminary General Requirements and Objectives (GRO)	R	Feb 2016
	D1.2	CfP 4 Topic Descriptions for NGCTR	Spec	Apr 2016
	D1.3	NGCTR Configuration	R	Sep 2016
	D1.4	CfP 5 Topic Descriptions for NGCTR	Spec	Sep 2016
WP2 - LifeRCraft Demonstrator Project	D2.1	CfP 4 Topic Descriptions for LifeRCraft	Spec	Apr 2016
	D2.2	Minutes of aircraft level PDR	R	Aug 2016
	D2.3	CfP 5 Topic Descriptions for LifeRCraft	Spec	Oct 2016
	D2.4	Fuselage build roadmap, QA plan	R	Dec 2016
WP3 - Eco-Design Concept Implement. to FRC	D3.1	CfP 4 Topic Descriptions for FRC-ECO	Spec	Apr 2016
	D3.2	FRC/ECO-TA Techno Mapping review	R	Aug 2016
	D3.3	CfP 5 Topic Descriptions for FRC-ECO	Spec	Oct 2016
WP4 - Technology Evaluator Methodology for FRC	D4.1	Implementation Program	R	Oct 2016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

c) Implementation – Risk

Risk Description	Action Plan Summary
R1.1 – Available CS2 EU funding for NGCTR CPW04, CfP03 below required values	JU assurances of EU funding for NGCTR Partners expectations
R1.2 – Delay in formal contracting of Core Partners and Partners from CfP02, CfP03 and CPW 3 Calls	Depending on technical area criticality, adjustment to NGCTR plans to accommodate delays in systems engineering reviews
R1.3 – NGCTR cost forecast beyond available budget in CS2	Focus on solely key activities for achieving the demo flight Reduced scope of performance and innovation

Risk Description	Action Plan Summary
	of demo activity
R2.1 – LifeRCraft cost forecast far beyond available budget in FRC and AIR	Abandon activities not on the critical path of flight demo Take back-up/re-use solutions as nominal ones (possibly to the detriment of innovation and system performance)
R2.2 – Key weight objective not achieved at aircraft-level PDR	Weight saving campaign during detailed design, with possible impact on schedule
R2.3 – Key aerodynamic performance objective not secured at aircraft-level PDR	New preliminary design loop, acting on parameters not compromising structural design. Identify further drag reduction solutions for follow-on activities
R2.4 - Some subsystem(s) failing to pass PDR on time, possibly due to late involvement of Partners or evolution of specs	Depending on subsystem criticality, the overall demo schedule may be shifted to accomodate extension of preliminary design phase for that subsystem.
R3.1 – Agreement delayed or not reached between FRC and ECO-TA Leader	In the meantime, proceed in continuity with Clean Sky GRC & EDA approach
R4.1 – Delayed definition of scenarios, metrics or missions	Potential reprioritization of some supporting technology.

Description of main activities for the year 2017

Activities relevant to the NextGenCTR demonstrator

<u>WP 1.1 NGCTR Demonstrator Management and Co-ordination</u>
This WP includes the Programme Management activities specific to the NextGenCTR demonstrator platform. The activities and objectives in 2017 are to progress the appropriate management infrastructure between AW, CS2 JU and other parties (i.e. Core Partners and Partners) to properly execute the programme. To carry out all tasks needed to coordinate, orient, report and plan the Next Generation Civil Tiltrotor (NGCTR) project specific activities in line with IADP level requirements including Core Partner/Partner coordination. To timely deliver all documents and information as required by the FRC IADP in line with the FRC IADP Management Manual. These activities run continuously for the 2017 period.

<u>WP 1.2 Air Vehicle Design and Development</u>
This WP deals with system integration activities that are needed at aircraft and sub-system level. The concept of NextGenCTR (NGCTR) is developed, including general architecture and integrated system design activities as well as design to manufacture and maintenance aspects. The major activities are split by aircraft system level (Design Integration and TiltRotor System Design) transversal activities and the major sub-system areas (Transmissions, Rotors, Airframe Structures, Electrical & Avionic and Airframe Systems) to work in an integrated project team employing a traceable Systems Engineering approach. The tasks to be performed in the period 2017 will be the execution of the Preliminary Design Review (PDR) phase. The activities will deal with the completion of basic design criteria definition, trade study completion, modelling and analysis, pre-design and general

architecture at global and system level, integration of Step Change Technologies, and integrated design of the various sub-systems to PDR maturity level. The PDR phase will also include the completion of Core Partner and Partner PDRs. The integrated project team will continuously support the identification of relevant Call topics and the JU process to incorporate the eventual Core Partners and Partners in to the NGCTR activities.
The main deliverables will be the updated General Requirements and Objectives (GRO) and the NGCTR Configuration documents as well as the necessary Call fiches required to launch Call topics for Core Partners and Partners to join the NGCTR activity and the Core Partner/Partner interface data sets. The major Milestones will be the completion of aircraft level and major sub-system PDRs.

WP 1.3 Aircraft Final Assembly
For the period 2017 this WP will contain the activities associated with NGCTR Industrial Engineering at NGCTR level and sub-system level. Their activities will include: performing trade studies to evaluate manufacturing technologies for improved quality and cost reduction, establish the industrialisation strategy across the manufacturing centres and with Partners, as well as participate in the System Engineering design process. All milestones and deliverables will be covered by WP 1.2 to PDR level of maturity

WP 1.4 Aircraft Test and Demonstration
This WP refers to the activities that include both demonstrator ground and flight tests, including production of mock-ups, Ground Test Vehicle (GTV) and Flight Test.
In 2017 following the PDR phase, the activity will include the mock-up with the deliverable targeted for December 2017.

Activities relevant to the LifeRCraft demonstrator

WP 2A - LifeRCraft Flight Demonstrator Integration
The second and last aircraft-level Critical Design Review in July 2017 (M2.8; D2.8) will close the detailed design phase for major subsystems involving a high degree of risk. The preparation of demonstrator assembly and Verification & Validation activities will then be accelerated.

WP 2B - LifeRCraft Airframe Integration
The fuselage will undergo a Critical Design Review in April (M2.6; D2.6) based on the work performed by the Core Partners in charge of fuselage structure (RoRCraft consortium). The manufacturing phase will then start. The toolings and jigs for fuselage manufacturing and assembly will then be designed until October.

WP 2C - LifeRCraft Dynamic Assembly Integration
The manufacturing of the long-lead time parts for LRGB and HSIS will be initiated early 2017. The detailed design will continue until the Critical Design Reviews in July, shortly before the aircraft-level final CDR. In parallel, the test rig for LRGB will be designed and the corresponding test plan will be issued in December (D2.9). The LifeRCraft Leader and the Core Partner selected in call CPW3 for design and realisation of the Main Gear Box (WP

2C.6.12) will jointly develop the Main Gear Box, starting from an initial conceptual design provided by the Leader.

WP 2D - LifeRCraft On-board Systems Integration
The Partners will realise prototype models of equipment and submit them to laboratory tests against key airworthiness criteria: TRL5 maturity targeted mid 2017 (D2.7), except for the main HVDC generator (TRL 5 gate in 2018). The Electrical Wiring Integrated System should pass its Intermediate Design Review by mid-2017 (M2.9).

Transversal Fast Rotorcraft Activities

WP 3 - Eco-Design Concept Implementation to Fast Rotorcraft
The evolution of methodology to perform LCA will be defined (D3.4). After selection of technologies (M3.3), input and output data will start being collected from Leaders, Core Partners and some active Partners.

WP 4 - Technology Evaluator Methodology for Fast Rotorcraft
Following the definition of the applicable scenarios, fundamental metrics and basic mission profiles for the Technology Evaluations as discussed between leaders, DLR and JU in 2016, in accordance with the detailed implementation program for the activity the initial simulations will be performed in early 2017.
The high level results of the initial simulations will be available to support the CS2 interim review scheduled for mid-2017.
In depth analysis of the results and verification of the fidelity of the initial models against the evolving platform configuration following design development will be performed in the later part of 2017 to update models and missions as required for the follow on simulation effort.

a) Major milestones planned for 2017:

Milestones				
Ref. No.		Title – Description	Type	Due Date
WP1 – NextGenCTR Demonstrator Project	M1.6	Preliminary Design Review (PDR)	RM	Apr 2017
	M1.7	CfP 4 Partners on Contract	R	May 2017
	M1.8	CfP 5 Partners on Contract	R	Nov 2017
WP2 - LifeRCraft Demonstrator Project	M2.6	Fuselage Critical Design Review	RM	Apr 2017
	M2.7	LRGB & HSIS Critical Design Review	RM	Jun 2017
	M2.8	Aircraft level Critical Design Review 2	RM	Jul 2017
	M2.9	EWIS Intermediate Design Review	RM	Jul 2017
WP3 - Eco-Design Concept Implement. to FRC	M3.3	FRC technologies selected for LCA	M	Jan 2017

Milestones				
Ref. No.		Title – Description	Type	Due Date
WP4 - Technology Evaluator Methodology for FRC	M4.3	Initial simulation round complete	R	May 2017

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

FRC - List of Leaders and participating affiliates

Nr	Leaders	Description of activities
1	Airbus Helicopters S.A.S.	Consolidation of operational requirements and general technical specification. Preliminary architecture and sizing studies of the compound rotorcraft demonstrator. Preliminary investigation of flight physics, preliminary design of dynamic components, on-board energy systems, avionics and flight control system. Preparation of call topics in the corresponding work areas and first collaborative activities with selected Core Partners & Partners.
2	AgustaWestland S.p.A.	Development of complementary conceptual design and architectures for a next generation of civil tilt-rotor in coordination with AW Ltd. Further definition of technical, operational and environmental requirements as well as general vehicle technical specifications with a view to engage core partners and partners.
3	AgustaWestland Ltd.	Development of complementary conceptual design and architectures for a next generation of civil tilt-rotor in coordination with AW SpA. Further definition of technical, operational and environmental requirements as well as general vehicle technical specifications with a view to engage core partners and partners.

Nr	Participating Affiliates	Description of activities
1a	Airbus Helicopters Deutschland GmbH	Contribution to general technical specification and preliminary architecture and sizing studies of the compound rotorcraft demonstrator, in collaboration with AH-SAS. Preliminary design of airframe (architecture, design and sizing), contribution to studies of aerodynamics, on-board energy systems, fuel system, cabin layout, avionics and flight control system. Preparation of call topics in the corresponding work areas and first collaborative activities with selected Core Partners & Partners.
1b	Airbus Helicopters España SA	See description in main text.
1c	Airbus Helicopters Polska (AH-P)	Contribution to FRC Consortium Management (WP0) and to the design of Drive System (WP2.6)
2a	PZL-Swidnik S.A.	Supporting activities foreseen to AW SpA and AW Ltd on airframe and structures topics, following general architecture requirements.

ITD AIRFRAME

Multi-annual overview and strategic planning

Aircraft level objectives on greening, industrial leadership and enhanced mobility, and the fulfilment of future market requirements and contribution to growth cannot be met without strong progress on the airframe.

Due to the large scope of technologies undertaken by the Airframe ITD, addressing the full range of aircraft types, the ITD is structured around 2 major Activity Lines split into Technology Streams:

Activity Line 1: High Performance & Energy Efficiency (HPE); Related Technology Streams are noted “A” hereafter.

Activity Line 2: High Versatility and Cost Efficiency (HVC); Related Technology Streams are noted “B” hereafter.

On the **HPE project**, main objectives of TS A-1 (Innovative Aircraft Architecture) are to assess novel concepts of novel engine integration on rear fuselage, progress on TRL for CROR and UHBR concepts and defined a set of novel aircraft architectures to be studied.

On TS A-2 (Advanced Laminarity) concepts and technologies for NLF and HLFC will be investigated for the nacelle and the wing.

TS A-3 (High Speed Aircraft) will be focused on the demonstration of benefits of a LPA wing and the design of the BJ composite central wing box demonstrator and of an innovative aircraft door. The Eco-Design for Airframe activity will start with a scoping of promising technologies to be developed.

On TS A-4 (Novel Control) project NACOR and GAINS will concentrate respectively on design of control for load and flutter control and on technologies for integration of WIPS on innovative control surfaces.

On TS A-5 (Novel Travel Experience) technology concepts defined along 2015 activity will be studied. Examples of areas are: high modularity equipment for multi-functionality, new concept for passenger seats / divan (ergonomic, weight, modularity, safety).

In HVCE, within Clean Sky, a more efficient wing, optimized control surfaces and control systems, will have been demonstrated. Also novel engine integration strategies will have been derived and tested, and innovative fuselage structures investigated.

All of these directions of progress will be enabled throughout the foreseen execution of 4 major Technology Streams:

- TS B-1 Next Generation Optimized Wing Boxes objectives, to develop the design, preliminary and detail, of new wing concepts improving performance.
- TS B-2 Optimized High Lift Configurations objectives, to progress the design and try to freeze design of wing elements improving aero-efficiency of wing.
- TS B-3 Advanced Integrated Structures objectives, to develop a final design of systems with and optimization of the integration in airframe along applying structural advances. Final definition of concept for improving structures production and manufacturing.
- TS B-4 Advanced Fuselage objectives, to have detail design of new fuselage shapes and structures for rotorcrafts and more affordable, weight optimized structural components, looking for optimized integration of equipment & systems in the structural design.

Description of main activities for the year 2016

A - High Performance and Energy Efficiency

Technology Stream A-0: Management & Interface

WP A-0.1 Overall Management: Within the Different sub-packages general Management activities of the HPE project and support to CASA for the coordination of the ITD and for the transversal activity e.g. to support focused work on partner projects will be performed (**DAv, SAAB**)

WP A-0.2 BJ OAD and configuration management: reference aircraft design was on 2015, a first aircraft project with use of innovative technologies will be designed as an overall aircraft evaluator and as an input for some of the other WP. (**DAv**)

WP A-0.4 Eco-Design TA Link: This work package aims at coordinating and ensuring within the ITD Airframe data provision to the ecoDESIGN Transverse Activity for Eco Design Assessment. This WP defines the link between Airframe and ecoTA T0.1 Transversal Synthesis. Supporting additional eco Design activities performed in Airframe A and especially in the WP A 3.4, for which this work package represents a synergetic complement. (**FhG**)

Technology Stream A-1: Innovative Aircraft Architecture

WP A-1.1 Optimal engine integration on rear fuselage: during 2016, tasks will be to establish a first list of concept candidates. Based on this list, the first milestone will be a short list of concept candidates for the following (DAv). In WP A-1.1.1, two reference aircraft configurations will be considered: one BJ (LSBJ 2000) and one transport. In 2016, the disruptive configurations will be chosen from the down-selection process. NACOR will then redesign the reference aircraft configurations using an OAD approach (**NACOR – ONERA & DLR).**

WP A-1.2 UHBR and CROR configuration: **AIB** is contributing to the TRL3 happening in LPA, Platform 1, WP 1.5.2 with further maturation of enabling technologies up to pre-TRL3.

WP A-1.3 Novel High Speed Configuration: the main goal of 2016 is to define which kind of studies, tests and demos are needed to increase the TRL of the innovative aircraft architecture **(DAv).** In WP A-1.3.1, in 2016, a first selection of innovative aircraft concepts will be chosen from the down-selection process based upon workshops with AI, DAv, DLR & ONERA experts. The reference aircraft configurations will be redesigned and the innovative configuration will be evaluated with the same tools. (**NACOR – ONERA & DLR**).

WP A-1.4 Novel certification processes: After the initial studies on the concepts of operation performed in 2015 for the five sub work packages WP1 to WP5, the 2016-2017 work will be focused on sub WP 4 and 6. Requirements for a set of modelling tools to support certification will be elaborated **(DAv).** Applicable modelling methods for the simulation of thermal aircraft architectures are described and compared with respect to their scales in time and space as well as their parameter identification procedures (**FhG**).

Technology Stream A-2: Advanced Laminarity

WP A-2.1 Laminar nacelle: the design and validation of a structural concept of laminar nacelle for BJ will be carried out with the partner selected through CfP 01 for the topic JTI-CS2-2014-CFP01-AIR-01-06 (Design and demonstration of a laminar nacelle concept for business jet). DAv and the NACOR consortium (ONERA-DLR) will study NLF & HLFC concept (trade-off) for bizjet nacelle shapes based on an aeroshape provided by (**DAv, NACOR – ONERA & DLR**).

WP A-2.2 NLF smart integrated wing: In complement to Clean Sky 1 SFWA-ITD in which outer wings components and assembly tasks are being performed, the aim of the WP is to contribute to the in-flight demonstration, now planned by September 2017 via a full integration of the wings onto the A340 MSN1 test aircraft including systems and associated Flight Test Instrumentation **(AIB).** In addition, the on-going NLF concept will be developed to a more comprehensive design based on continuous feedback from support to the flight test preparations of BLADE **(SAAB).** In WP A-2.2.1, 3 streams will be investigated: 1) support vs. DAv NLF HTP demonstrator; 2) analysis of Clean Sky SFWA-ITD BLADE F/T data; 3) research activities on NLF wings including validation of structural concept on a wing type demonstrator (**NACOR – ONERA & DLR**).

WP A-2.3 Extended laminarity: after the successful flight test in 2015, validating the structural concept of the NLF HTP, including the filler concept and its application (between leading edge and box), the next step is to study in the reporting period surface quality effects on laminarity (roughness, filler shape, 3D disturbances) by flight testing **(AIB).** DAv will develop an innovative HLFC concept applied to a vertical tail plane, design innovative NLF front fuselage (including the parasitic drag reduction) and improve transition criteria in transonic conditions **(DAv).** In WP A-2.3.1, in 2016, NACOR will focus on the aerodynamic and structural design of the “chamber less suction” system (**NACOR – ONERA & DLR**).WP A-2.3.2 Selferosive layer: development and assessment of self-erosive (sacrificial) layer against insect contamination for a clean leading edge during cruise to enable laminar flow. WP A-2.3.3 New multi-functional surface protection system for leading edge: development and evaluation of erosion -resistant functional coating systems (anti-ice and anti-contamination coating), based on organic coatings and DLC-layers for CFRP leading-edge protection **(FhG).**

Technology Stream A-3: High Speed Aircraft

WP A-3.1 Multidisciplinary wing: Preliminary architecture studies of the BJ Wing root box demonstrator will be continued on 2016. Design loads will be elaborated to size the demonstrator **(DAv)**. Demonstration of further benefits, drawbacks and showstoppers of a LPA wing with high aspect ratio and increased wing flexibility will be conducted **(AIB).** In addition, design concept for an innovative large Aileron structure, evolved from the multispar A320 Aileron concept will be done. **(SAAB)**

WP A-3.2 Tailored front fuselage: BJ innovative front fuselage architecture and technology candidates will be defined and evaluated to reduce the parasitic drag by improving the integration of equipment (i.e. pitot tubes and others devices). **(DAv)**

WP A-3.3 Innovative shape & structure: BJ composite central wing box demonstrator will be continued on 2016. **(DAv).** The work on the design concept for an innovative aircraft door structure and its integration will continue **(SAAB).**

WP A-3.4 Eco-Design for airframe: After finalisation of *Clean Sky*/ EDA planned in 2015, a new cycle of technology development for environmental purposes will be launched. New technology candidates will be highlighted, evaluated and the trade-off will be started to the select the most promising candidates. In parallel improvement of the *Clean Sky* / EDA LCA tools and database will be continued (in collaboration with the ECO TA). The activity will be conducted with the CP selected through the CPW02 (**DAv**). In the context of Eco-Design for Airframe – “Re-use of Thermoplastics”, activities will be oriented on supporting the development of new processes, methods, manufacturing & recycling technologies that enable “Green” manufacturing, maintenance and disposal, that will be conducted by the Project RESET “Re-use of Thermoplastic Composite” launched in 2016 (**AIB**). Development of promising technologies will be initiated on 2016 **(FhG)**.

Technology Stream A-4: Novel Control

WP A-4.1 Smart Mobile Control Surfaces: Activity of the ST CPW01-AIR-01-02 (Optimised Ice Protection Systems Integration in Innovative Control Surfaces) will be carried out on Electrical Ice protection technologies **(GAINS).** The activity will be detailed together with the CP selected through the CPW03 on Moveables (**SAAB**).

WP A-4.2 Active load control: enhanced gust load alleviation and flutter control functions will be studied in order to obtain significant gains on the A/C structural weight as initiation of development of control laws (**DAv**). In addition, load control by various means for wing application will be studied for LPA application **(AIB).** In WP A-4.2.1, activities will address vibration control, flight control, gust load control and flutter control (**NACOR – ONERA & DLR**).

Technology Stream A-5: Novel Travel Experience

WP A-5.1 Ergonomic Flexible Cabin: an analyses of key cabin comfort drivers considering all important technical, behavioural, socio-economical and socio-ecological constrains will be conducted for identification and description of cabin items and systems, influencing the passenger life and safety on-board **(FhG).** The objectives of the 2016 activities are on PRM lavatory, crew fatigue investigations and definition of a culture specific cabin catalogue **(AIB).**

WP A-5.2 Office Centred Cabin: technology concepts defined along 2015 activity will be studied. Examples of areas are: high modularity equipment for multi-functionality, new concept for passenger seats / divan (ergonomy, weight, modulartity, safety) **(DAv).**

B - High Versatility Cost Efficient

Technology Stream B-0: Management & Interface

WP B-0.1 Overall Management: General and transversal management activities and coordination in this ITD. **(CASA)**

WP B-0.2 SAT OAD &Config. Mgt: (EVE, PAI) Activities moved into GAM SAT.

WP B-0.3 Rotorcraft OAD & Config. Mgt: (AH-D, AH-E, AW). Coordination between FRC and AIRFRAME. Topic Management for Partner project dealing with LifeRCraft doors calls.

WP B-0.4 Regional OAD & Config. Mgt: Management and coordination activities related with the interdependencies between REG IADP and AIR ITD. **(CASA)**

WP B-0.5 Eco-Design TA Link: This work package aims at coordinating and ensuring within the ITD Airframe B data provision to the eco-design. Transverse Activity for Eco Design Assessment. (**FhG**)

Technology Stream B-1: Next generation optimized wing

WP B-1.1 Wing for lift & increm. mission shaft integration: Design of a compound rotorcraft, in close cooperation with the FR-IADP LifeRCraft demonstrato. Noise emission 1st evaluations by March'16. Pre Design Review by mid of 2016, with the LifeRCraft team. By end of 2016, final designs for the wings and lateral rotors will be completed (**NACOR**). Final the studies and development prior to the manufacturing of the full scale demonstrator (**OUTCOME).**

Support in the fields of design and stress, manufacturing- and material technologies to the CoP (NACOR) activities.. Permit to fly have to be monitored and supported, and the manufacturing phase started. (**AH-D**).

WP B-1.2 More affordable composite structures: Core partner activities selected in CPW2, for finalization of technical content of work on the main wing box. Material and process selection will be completed with some manufacturing trials to support the selection. CfP partner selection for cooperation on developing of methodology for design of precise parts and effective joining methods, within WP thermoplastics in secondary structures of small aircraft. (**EVE, PAI**).

WP B-1.3 More efficient Wing technologies: Morphing winglets concept will be developed by CP (**OUTCOME**), to achieve a PDR by end of 2016 and final design during 2017 and start the manufacturing. **OUTCOME** will finalize Preliminary design and detail design of both the manufacturing tooling and the product will begin. The highly integrated actuation system to control surface tabs with EMAs will finish its design requirements during 2016, with the target to start testing and integration phase at the end of 2017 **(CASA).**

WP B-1.4 Flow & shape control: development of the Loads Alleviation and morphing leading edge (in collaboration with FhG), will spread all along the 2016/17 period, with the aim to start testing and integration phase at the end of 2017 **(CASA).**

Basic requirements of optimized droop nose device in a composite wing will be studied. A ground demonstrator will be realized as hardware and used for experimental analyses (with collaboration with CASA). Morphing activities will be supported by partners through CfP. Fluidic actuators for AFC will be further developed and a first prototype will be manufactured and tested (**FhG**)

Basic studies in AFLoNext show, that flow control at wing trailing edges is a powerful mean to improve the wing performance. Airbus will support partner with industrial aspects. The partner will focus on design concepts for space efficient flow control actuation architectures. (**AIB**)

Technology Stream B-2: Optimized high lift configurations

WP B-2.1 High wing / large Tprop nacelle configuration: the development of the engine mounting and cowling will be performed considering interface requirements from the selected Nacelle. Integration of ice protection based on heat transport devices (Loop Heat pipes) into the engine air intake will be concluded (**CASA).**

WP B-2.2 High lift wing: the selected concept for wing box will continue its development, with the CP (**OUTCOME** focused on the Hot Stamping process and the moulds employed) with the aim to achieve a PDR by end 2016 and final design during 2017. Manufacturing of its components will start. The highly integrated actuation system to control Flaps with EMAs will finish its design requirements, with the target to start testing and integration phase at the end of 2017 (**CASA).** Preliminary design and the detail design of both the manufacturing tooling and the product will begin. (**OUTCOME**).

For **EVE and PAI** starting from the results achieved with the performed trade off study among a CfP shall be prepared and issue for low speed study.

Technology Stream B-3: Advanced integrated structures

WP B-3.1 Advanced integration of system in nacelle: No significant activities (ALA).

WP B-3.2 All electrical wing: The highly integrated actuation system based on EMAs to control aileron and spoiler will finish the design requirements phase, with the target to start testing and integration phase at the end of 2017. The integrated electrical distribution, HVDC (High Voltage Direct Current), selected will continue its development to achieve a final design during 2017. In addition, for SATCOM and Ice protection both embedded in the structure, the design will be concluded (**CASA**).

An innovative electro-thermal heating system based on Carbon Nano Tubes (CNT) will be further enhanced (first simulations and design concepts) regarding performance and processability. CDR will be performed of the ice-protection system. For the network for power supply and information system for AFC a preliminary design (PDR) will be performed. (**FhG)**

WP B-3.3 Advanced integrated cockpit: A design frozen will be done to start manufacturing at the end of 2017. Structural Health Monitoring System (SHMS) will start the development phase, to reach a level of maturity for starting test and integration phase at the end of 2017. All activities linked with CP02 selected (**CASA).**

Processes and materials developments oriented to LPA demonstrators will be reinforced with 3 Projects: NEODAMP "New Enhanced Acoustic Damping Composite Materials" for new enhanced composite material; NEWCORT "Novel Processes and Equipment in Composite Repair Technology" for new structural bonded repair of monolithic composite airframe; and SimCoDeq " Simulation tool development for a composite manufacturing process default prediction integrated into a quality control system" related to on line NDT. LPA demonstrator will require innovative structural test capabilities in the field of optical fibre sensing, linked with CfP02. Support CfP03 for predictive virtual tests and data correlation interfaces with predictive virtual tools test. All those topics are in close connection with LPA Platform 2 demonstrators and WP 2.4 cross function technologies. (**AIB)**

Surveys on the simulation of different materials subjected to extreme conditions (including bird-strike and hail / debris impact and lightning strike). In parallel, lightning strike test facilities and ice impact test facilities will be adapted to meet the requirements. (**FhG)**

WP B-3.4 More affordable small A/C manufacturing: Technical way forward will be decided based on the results from the study on automated processes in low volume. In the 2016, the scope of joints to be optimized will be pinpointed. Consequently, specimens will be designed and tested to assess basic mechanical and electromagnetic behavior of these joints. Decision will be taken based on the specimen testing results of first phase, wether the second phase of tests is necessary or not for 'Non jig' assembling. At the beginning of 2016 it will be finalized first demonstrator produced with developed technology. (**PAI, EVE)**

WP B-3.6 New materials and manufacturing: The activities dealing with technologies related to eco-efficient factories, assisted composite manufacturing, future leakage identification systems, integration of testing systems on iDMU and automated testing technologies will spread with the aim to achieve a sufficient TRL to be applied for the different demonstrators (**CASA**).

Al- test coupons will be manufactured using ALM technology. Quality of manufacturing and the resulting material characteristics will be assessed. First numerical studies on structural optimization and on thermal effects during the manufacturing process are performed. (**FhG)**

Technology Stream B-4: Advanced fuselage

WP B-4.1 Rotor-less Tail for Fast Rotorcraft: During 2016 the PDR phase will performed by AH-E with the engineering support of the CP. The Detailed Design phase will be started and developed by AH-E and its CP and will finish during the following year. It will perform the development of Prototype manufacturing molds for every single part of the Rotorless Tail and also the prototype assembly and transportation tooling. These activities, focused on the tooling, will be done by Partner/s with the supervision of **AH-E** and CP. Also at the end of this year is expected that the first manufacturing trials could be done. Aerodynamic design for the tail unit of the compound rotorcraft will be done, in close cooperation with the FR-IADP LifeRCraft demonstrator. In 2016, NACOR will refine the design of the horizontal stabilizer and fins including flaps based on the activities started in 2015. The objective is to deliver the 1st design by April 2016 and the final one by the end of December 2016.

(**NACOR**). During 2016 activities related to the initial studies will be carried out and the manufacturing process of the tooling and the specimens will begin. (**OUTCOME).**

WP B-4.2 Pressurized Fuselage for Fast Rotorcraft: Following the aircraft level system requirement review (SRR) in early 2016 under the FRC IADP, AW will complete the requirements definition for the pressurized fuselage (front, center and aft sections including empennage and empennage control surfaces) plus main cockpit glazing, cockpit secondary glazing, cabin glazing; aircraft doors and emergency exit. Core Partner selection for each of the three main fuselage sections; cockpit, cabin and tail will be negotiated and contracted allowing completion of requirements phase leading to a pressurized Fuselage sub-system SRR in early 2017. (**AW**)

WP B-4.3 More affordable composite fuselage: Preliminary selection of methodologies/technologies; consolidation of pilot fabrication facilities requirements; test plan definition; design of coupons; performance evaluation of eco compatible surface treatments (**ALA**). Definition of HPC architecture, design of coupons, realization of manufacturing trials. (**SHERLOC**).

In the context of part distortion prediction activities, developments will be focused on topology optimisation accounting for distortion and shape and lay-up optimisation accounting for distortion. In the field of metallic component it will be supported by a new project named DISTORTION "Design against distortion of metallic aerospace parts based on combination of numerical modelling activities and topology optimisation". In 2016 we will support implementation of a call for proposals on composite component distortion prediction (**AIB**).

Improvement of acoustic performance after preliminary analysis of vibration and noise source/paths and acoustic characteristics (**FhG**).

WP B-4.4 Affordable low weight, human centered cabin: Definition of main cabin items and human centered requirements; first development of materials/process for cabin interiors; preliminary definition of small scale test for the material characterization. Preliminary optimization of N&V treatments. Technical description of regional cabin architecture (**ALA**).

N&V identification of scenarios and requirements with actuators for acoustic treatment; description of WP eco-theme technologies (**FhG**).

a) Major milestones planned for 2016:

Milestones				
Ref. No.		Title – Description	Type	Due Date
HPE	M-A-1.1-1	Choice of concepts for more detailed studies (DAv)	R	T0+12
	M-A-1.2.1-1	TRL3 summary on identified UHBR integration technologies (AIB)	R	T0+11
	M-A-2.1-1	CDR of the BJ laminar nacelle demonstrator - DAv/CP	RM	T0+12
	M-A-2.2-1	Design frozen for wind tunnel test object - SAAB	R	T0+12
	M-A-3.1-2	Aileron tooling concept demonstrated on a technology demonstrator level - SAAB	R	T0+12
	M-A-3.3-1	CDR of the BJ central wing box panel demonstrator - DAv	RM	T0+4
	M-A-4.1.1.03	2016 Project Review - GAINS -MPC	R	T0+12

Milestones				
Ref. No.		Title – Description	Type	Due Date
	M-A-5.2-1	High Level Technical requirements written for the new concepts to be studied - DAv	R	T0+12
HVC	M-B-1.1-1	PDR/CDR for Wing Structure and ailerons - **AH**	RM	
	M-B-1.2-2	Selection of material and cost efficient production technologies - **PAI**	R	T0+9
	M-B-1.4-2	Requirements for wing application finalized and agreed with B1.4 consortium - **AIB**	R	T0+9
	M-B-2.2-1	PDR Flap actuation and wing box - **CASA**	RM	T0+12
	M-B-3.2-1	PDR for integration of EMA actuation in the wing structures for Aileron and Spoiler control surfaces and integration of SATCOM – **CASA**	RM	T0+12
	M-B-3.4-1	Production of the fuselage panel subassembly - **EVE**	D	T0+12
	M-B-4.2-1	SRR for Pressurized Fuselage - **AW-SpA**	RM	T0+11
	M-B-4.3-1	Defined HPC based NDI/SHM platform architecture for fuselage design - **ALA**	R	T0+12
	M-B- 4.3-2	Metallic parts (ALM; machining distortion)- Milestone reviews regarding distortion prediction: model development + validation, application to LPA use cases - **AIB**	RM	T0+9
	M-B- 4.3-3	CFRP parts (curing distortion)- Milestone reviews regarding distortion prediction: model development + validation, application to LPA use cases - **AIB**	RM	T0+9
	M-B-4.3.10-1	Structural requirements for fuselage design- **SHERLOC**	R	T0 + 3
	M-B-4.4-1	Definition of cabin interiors HCDA (Human Centred Design Approach) with relevant Innovative Technologies (Acoustic and green material) for regional aircraft - **ALA**	R	T0+9
	M-B-4.4-3	Selection of technologies for eco-themes - **FhG**	R	T0+12

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

b) Major deliverables planned for 2016.

Deliverables				
Ref. No.		Title – Description	Type	Due Date
HPE	D-A-1.1-1	Document with definition of conceptual designs for optimal engine integration on rear fuselage - DAv	R	T0+12
	D-A-1.4-1	First requirements document for modeling tools for support to certification - DAv	R	T0+12
	D-A-2.1-1	Synthesis report on the BJ laminar nacelle - DAv	R	T0+12
	D-A-2.3-1	Flight-test validation results for structural concept of leading edge for NLF HTP - AIB	R	T0+12
	D-A-3.1-1	Synthesis and results of 2016 activities on BJ wing root box demonstrator - DAv	R	T0+12
	D-A-4.1-1	TRL 6 validation of wing leading edge with mixed energy thermal ice protection system - DAv	RM	T0+12

Deliverables				
Ref. No.		Title – Description	Type	Due Date
	D-A-4.2-1	TRL 6 validation of vibration control for business jet application - DAv	RM	T0+12
	D-A-5.1-01	Compilation of Key Comfort Cabin Drivers - FhG	R	T0 + 10
HVC	D-B-1.1-1	PDR/CDR for Wing Structure and ailerons report - **AH**	RM	
	D-B-1.2-1	Wing design concept and preliminary sizing – **PAI, EVE**	R	
	D-B-1.4-2	Industrial wing space constraints to guide design studies of partner for modular, distributed actuation - **AIB**	R	T0+8
	D-B-1.4.4-01	Requirements and specifications for an improved droop nose design - **FhG**	R	T0+7
	D-B-2.2-1	PDR Flap actuation and wing box reports - **CASA**	RM	T0+12
	D-B-2.2.2-2	Technical documentation supporting PDR Multifunctional flap - **OUTCOME**	R	T0+9
	D-B-3.2-1	PDR for integration of EMA actuation in the wing structures for Aileron and Spoiler control surfaces and integration of SATCOM – **CASA**	RM	T0+12
	D-B-3.2.6-01	Report on the Analysis of the Requirements regarding the application of the IPS - **FhG**	R	T0+12
	D-B-3.3-1	Operational requirements on structural composite bonded repair - **AIB**	R	T0+4
	D-B-3.4-1	Revision of the report with fatigue and stress tests of the riveted joints after the second phase - **EVE**	R	T0+9
	D-B-3.4-2	Fuselage panel – report with evaluation of manufacturability, labor intensity and accuracy - **EVE**	R	T0+12
	D-B-4.1-1.2-1	PDR of the Rotor-less Tail MoM - **AH-E**	RM	
	D-B-4.2-1	Fuselage Specification and ICD data - **AW-SpA**	R	T0+4
	D B-4.3.10-1	Structural requirements for fuselage design - **SHERLOC**	R	T0 + 6
	D-B-4.4-1	Multifunctional regional Interior Cabin systems innovative technologies and Cabin System Specification - **ALA**	R	T0+9
	D-B-4.4-2	Preliminary definition of Noise & Vibration technologies - **ALA**	R	T0+12

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

c) Implementation – Risk

Risk Description	Action Plan Summary
A-4.1.1.1 No benefit for mixed thermal ice protection can be demonstrated (GAINS)	Manage risk - set up workshops with WAL
A-4.1.1.3 Provision of good flight or tunnel test data may not be available, there is a risk that there will be insufficient test data to establish a good tool validation (GAINS)	Manage risk - set up workshops with WAL
Precision requirements not met (FhG)	Process variation with contact to surface

Risk Description	Action Plan Summary
B-1.3.1 Winglet - Lightening protection not assurance (OUTCOME)	The influence in lightening protection of part manufacturing process and materials will be analysed. Development tests and simulations will be carried out if needed (CfP).
B-2.2.1 External wing box. Ribs - Required shape of rib cannot be obtained (OUTCOME)	Material characterization at sample level, trials and simulations to be carried out will help obtaining an optimized prototype
B-4.1-2 Challenging Schedule for all the activities to done during this period of time. (AH)	Ensure that the inputs are provided in time. Ensure the harmonization between CP/P with AH-E and the AH-E with AHg (meetings, info exchanging….). Increase the maturity of the works developed during the Pre-desing phase. Work in parallel, launching the activities enough mature for that aim.
B-4.3.10-1 Alya code not applicable to aeronautical problems. (SHERLOC)	A trial analysis of a suitably complex fuselage will be conducted in the first months of the project. A 'Go/No Go' decision gate is introduced at 6 months from the start of the project, whether to proceed with the specific activities related to residual strength assessment of the whole fuselage and CFP issued.

Description of main activities for the year 2017

A - High Performance and Energy Efficiency
Technology Stream A-0: Management & Interface
WP A-0.1 Overall Management: Continuation of 2016 activity (DAv, SAAB)
WP A-0.2 BJ OAD and configuration management: a second loop of definition of aircraft project with use of innovative technologies will be designed as an overall aircraft evaluator and as an input for some of the other WP **(DAv).**
WP A-0.4 Eco-Design TA Link: Continuation of 2016 activity (**FhG**).
Technology Stream A-1: Innovative Aircraft Architecture
WP A-1.1 Optimal engine integration on rear fuselage: For 2017, studies will mainly focus on the structural aspect. Feasibility of the structural integration will be studied **(DAv).** In WP A-1.1.1, the design for the two reference aircraft configurations will be matured by considering high-fidelity tools (**NACOR – ONERA & DLR**).
WP A-1.2 UHBR and CROR configuration: continuation of the 2016 activity for maturation to TRL3 at technology level as well as on aircraft level (technologies integrated into rear-end) **(AIB).**
WP A-1.3 Novel High Speed Configuration: 2017 tasks will be about designing a first BJ aircraft configuration at an OAD level **(DAv).** In WP A-1.3.1, innovative and less "standard-type" configurations will be evaluated such as: C-Wing, Strut-braced wing, Box-wing. In 2017, NACOR will continue the design of disruptive configurations selected during the workshop in 2016 (**NACOR – ONERA & DLR**).
WP A-1.4 Novel certification processes: on sub-WP 4 and 6, requirements for a set of modelling tools will be continued and development of modelling tools to support

certification will be initiated **(DAv)**. The development of applicable modelling methods for the simulation of thermal aircraft architectures will be continued on 2017 (**FhG**).

Technology Stream A-2: Advanced Laminarity

WP A-2.1 Laminar nacelle: In complement of the design activities in continuity of the 2016 activities of the laminar nacelle for bizjet, DAv will perform a flight test demonstration or wind tunnel test for aerodynamic validation (**DAv).** In WP A-2.1.1, in 2017, concepts for integrating access doors will be developed, and their efficiency assessed. For the nacelle nose, a first design of suction system, including optimized suction flow rate, will be proposed. Therefore, preparation of demonstration WT tests will start (**NACOR – ONERA & DLR**).

WP A-2.2 NLF smart integrated wing: In WP A-2.2.1, in 2017, NACOR will precisely study the junction shape between the NLF HTP and the VTP. Last, analysis of structural stability of NLF HTP and wing models will be done to prepare WT tests (**NACOR – ONERA & DLR**). DAv will analyse the BLADE flight tests data **(DAv).** In complement to Clean Sky 1 SFWA-ITD the aim of the WP is to contribute to the in-flight demonstration planned by September 2017 via a full integration of the wings onto the A340 MSN1 test aircraft including systems and associated Flight Test Instrumentation **(AIB)**. Design, construction and manufacturing of wind tunnel reference test object will be conducted using existing and modified BLADE tools **(SAAB).**

WP A-2.3 Extended laminarity: in addition to continuation of 2016 activity on the NLF HTP, another activity on 2017 will focus on the component design and test set-up for a Krueger leading edge device under icing conditions **(AIB).** DAv will develop an innovative HLFC concept applied to a vertical tail plane and continue the design of innovative NLF front fuselage **(DAv).** Dealing with transition criteria for surface imperfections, numerical estimations of critical default size as well as preliminary research-type tests will be conducted. A CFD study of fuselage nose suction equipped with riblets will also be performed (**NACOR – ONERA & DLR**). On WP A-2.3.2 and A-2.3.3 the development and assessment of technologies will be pursued (self-erosive layer and multi-functional surface protection system for leading edge respectively) **(FhG).**

Technology Stream A-3: High Speed Aircraft

WP A-3.1 Multidisciplinary wing: architecture studies of the BJ Wing root box demonstrator will be continued on 2017 **(DAv)**. The preparation of reference configuration and industrial aircraft manufacture requirements for winglet trailing edge will take place **(AIB).** In addition, design concept for an innovative large Aileron structure, evolved from the multispar A320 Aileron concept will be continued **(SAAB)**.

WP A-3.2 Tailored front fuselage: DAv will continue the 2016 activities on BJ innovative front fuselage architecture and technology to reduce the parasitic drag **(DAv).**

WP A-3.3 Innovative shape & structure: The manufacturing of the central wing box panel will start during the first semester of 2016, and will then be followed by a testing phase to support the design of the half central wing box. PDR of the half central wing box is planned at the end of 2017 and the CDR end of 2018 **(DAv)**. The work on the design concept for an innovative metallic aircraft door and its integration will continue, in addition R&T activities into new assembly technologies/methods shall continue (**SAAB**).

WP A-3.4 Eco-Design for airframe: Trade-off on innovative technologies will be continued until the end of 2017, and first concrete activities including tests on samples/specimens will be performed through a "scoping phase". At the end of year, a consolidated list of technologies will be established for further development in the next years **(DAv)**. The activity on "Re-use of Thermoplastics" will continue on 2017 **(AIB)** as well as development of the promising technologies initiated in 2016 **(FhG).**

Technology Stream A-4: Novel Control

WP A-4.1 Smart Mobile Control Surfaces: the activities detailed together with the CP selected through the CPW03 on Movables, will continue **(SAAB).** Ongoing activity of the ST CPW01-AIR-01-02 (Optimised Ice Protection Systems Integration in Innovative Control Surfaces) will be carried out during 2017 **(GAINS).**

WP A-4.2 Active load control: in WP A-4.2.1, in 2017, continuation of CS1 SFWA-ITD activities on vibration control will be pursued, as well as consolidation of demonstration strategy plan including gust generation-alleviation through WT tests, gust load alleviation and active flutter control demonstration (**NACOR – ONERA & DLR**). Based on the first implementation design for a data acquisition system, a hardware demonstrator will be designed and manufactured in order to test the reliability of the data transmission as well as the data storage. The system design shall consider available sensor data transfer requirements from the load control system **(FhG).**

Technology Stream A-5: Novel Travel Experience

WP A-5.1 Ergonomic Flexible Cabin: in WP A-5.1.1, Human Centered Cabin, the 2017 activities will focus on PRM lavatory: Final mock-up build-up and testing and demonstrator definition **(AIB).** The requirements and concepts for flexible cabin design with respect to human response and well-being to the thermal and acoustic cabin environment will be defined and models for the evaluation of comfort and well-being with respect to the thermal and acoustic cabin environment will be developed and evaluated (**FhG**).

WP A-5.2 Office Centred Cabin: The technology concepts defined along 2015 and specified along 2016 at high-level specification will be studied in detail. The development of a cabin evaluation bench for innovative systems evaluation will be started. **(DAv)**

B - High Versatility Cost Efficient

Technology Stream B-0: Management & Interface

WP B-0.1 Overall Management: General and transversal management activities and coordination in this ITD. **(CASA)**

WP B-0.2 SAT OAD &Config. Mgt: (EVE, PAI). Activities moved to GAM SAT.

WP B-0.3 Rotorcraft OAD & Config. Mgt: (AH-D, AH-E, AW). Coordination between FRC and AIRFRAME. Topic Management for Partner project dealing with LifeRCraft doors calls.

WP B-0.4 Regional OAD & Config. Mgt: Management and coordination activities related with the interdependencies between REG IADP and AIR ITD **(CASA)**

WP B-0.5 Eco-Design TA Link: (FhG) This work package aims at coordinating and ensuring within the ITD Airframe B data provision to the eco-design. Transverse Activity for Eco Design Assessment. (**FhG**)

Technology Stream B-1: Next generation optimized wing

WP B-1.1 Wing for lift & increm. mission shaft integration: Start of the manufacturing phase. (**AH-D**). Design of a compound rotorcraft, in close cooperation with the FR-IADP LifeRCraft demonstrator. In 2017, NACOR will perform cross check simulations of the designs. An induced velocity model for the lateral rotors for flight mechanical simulations will be derived and the acoustic assessment of the helicopter will be refined. (**NACOR – ONERA & DLR**). Tasks will be focused on manufacturing the demonstrator and performing the structural tests (**OUTCOME**).

WP B-1.2 More affordable composite structures: Activities from Core partner selected in CPW2. Finalization of technical content of work for the main wing box. Preliminary sizing of the wing box will be developed. For Optimized composite structures, focused for usage thermoplastics in secondary structures of small aircraft will be the activities related to development of methodology for design of precise parts. **(PAI, EVE).**

WP B-1.3 More efficient Wing technologies: Final design of morphing winglets during 2017 and manufacturing start. Start of testing and integration highly integrated actuation system to control surface tabs with EMAs. This will be closely linked with the activities started by the CP(OUTCOME) (**CASA**). Design of the product and the design and tooling manufacturing will finish and the manufacture and assembly process of the product will begin (**OUTCOME)**.

WP B-1.4 Flow & shape control: Testing and integration phase of the Loads Alleviation and morphing leading edge **(CASA).**

Based on design and concept studies in 2016, flow control hardware for distributed actuation will be manufactured for experimental validation in wind tunnels. Airbus will contribute to the wind tunnel test matrix and analyses the outcome regarding industrial applicability. The B1.4 consortium will jointly do the down selection for the most promising fluidic actuation principle and for the most suitable electric modular control to ensure efficient actuation of wing trailing edge flows for space critical applications. **(AIB)**

Assessment of shape optimization for increased lift and reduced noise for high lift devices such as drooped nose and wingtip by means of 3D CFD/CAA computation considering multi-disciplinary requirements and constraints. Study of noise source characteristics. The Fluidic actuators will be further tested and characterized. Studies on basic structural concept including material test, possible actuation systems and concepts for sensing and controlling the leading edge deflection will be completed. **(FhG)**

Technology Stream B-2: Optimized high lift configurations

WP B-2.1 High wing / large Tprop nacelle configuration: Finalization of development of the engine mounting and cowling will be performed considering interface requirements from the selected Nacelle. In addition, final design for the integration of ice protection based on heat transport devices (Loop Heat pipes) into the engine air intake will be concluded (**CASA**).

WP B-2.2 High lift wing: final design of wing box and start of the manufacturing of its components. Start testing and integration phase of highly integrated actuation system to control Flaps with EMAs. This will be closely linked with the continuation of activities started by the Core Partner (OUTCOME) (**CASA).** Completion of the initial studies, during 2017 tasks will be focused on the Hot Stamping process and the moulds employed. Design of the product and the design and manufacture of the tooling will finish and the manufacture and assembly process of the product will begin. (**OUTCOME).**

For **EVE and PAI**, in 2017 the low speed activity with selected partner shall be developed.

Technology Stream B-3: Advanced integrated structures

WP B-3.1 Advanced integration of system in nacelle: No significant technical activities are currently planned to be performed during 2017. (**ALA**).

WP B-3.2 All electrical wing: Final design of the highly integrated actuation system based on EMAs to control aileron and spoiler at the end of 2017. Final design of the integrated electrical distribution, HVDC (High Voltage Direct Current) and for SATCOM and Ice protection both embedded in the structure (**CASA**).

Based on the PDR outcome, the network for power supply and information system for AFC will be further designed. The supply and information system building blocks will be further

discussed, especially with focus on the reduction of the power consumption of the whole system and the link to the HVDC (High Voltage Direct Current) supply systme. (**FhG**)
Based on the intended structural application the target of this period is the determination as well as the calculation and simulation of the preliminary designs for the heating zones and the actuators for the hybrid ice protection system. Based on the requirements thermo-electrical and material investigations will be developed as well as an optimization of the contacting. (**FhG**)
WP B-3.3 Advanced integrated cockpit: A design frozen to start manufacturing at the end of 2017. The aim of this phase is to reach a level of maturity that allows starting test and integration phase at the end of 2017. All this will be closely linked with the continuation of activities started by the Core Partners (**CASA).**
Developments will continue on projects launched in 2016 with the aim to progress on innovative technologies on: New Structural bonded repair of monolithic composite airframe, on line NDT, new enhanced composite material, and net shape composite structure. Expected major outcomes will be in 2018 (**AIB)**
The ice impact test facilities will be up and running. (**FhG**)
WP B-3.4 More affordable small A/C manufacturing: Work content will be specified on results of study on automated processes in low volume production. Reference state of the demonstrator will be validated by mid-2017 and ready to be used in assessing the advancement of the innovative joint development. Numerical analyses of the reference demonstrator will continue. Having the partner selected, the work on development/optimization of the joints will be initiated. In the second half of 2017, production of the reference demonstrator is planned. It will be evaluated design and production of the panel – demonstrator for Non jig assembling. (**PAI, EVE).**
WP B-3.6 New materials and manufacturing: Continuation and validation of the activities dealing with technologies related to eco-efficient factories, assisted composite manufacturing, future leakage identification systems, integration of testing systems on iDMU and automated testing technologies will spread with the aim to achieve a sufficient TRL to be applied for the different demonstrators (**CASA**).
Best practice guidelines for Al-ALM will be derived. Additional work will be done on topology optimization of a generic aviation structure, e.g. a door hinge. Work on the investigation of thermal processes during manufacturing continues (**FhG**).
Technology Stream B-4: Advanced fuselage
WP B-4.1 Rotor-less Tail for Fast Rotorcraft: During 2017 the Detail Design phase will be completed with the holding of the CDR by AH-E and CP. The engineering concurrent activities between CP, Partners (for tooling activities) and AH-E will continue to be done for the issues of Manufacturing, Tooling development and Assembly. During 2017 the manufacturing phase will be performed almost entirely, with all the Rotorless Tail single parts delivery by CP to AH-E and with the reception of them by the AH-E. First Assembly activities will be done by **AH-E** and in parallel, the CP will prepare the starting of the structural test campaign (on ground) for the Rotorless Tail. Aerodynamic design for the tail unit of the compound rotorcraft, in close cooperation with the FR-IADP LifeRCraft demonstrator. Interactions with other helicopter components, e.g. the main rotor or the lateral rotors, will be investigated in detail by numerical simulations to mitigate the risk of adverse flight behaviour. (**NACOR – ONERA & DLR**) Activities related to design and analysis will finish, the manufacturing process will continue and the structural test (physical and virtual) will begin (**OUTCOME**).

WP B-4.2 Pressurized Fuselage for Fast Rotorcraft: **AW.** During 2017 AW and selected Core Partners will complete the System Design definition for the pressurized fuselage for the front, centre and aft sections. This activity will lead to the pressurized fuselage (PDR) in 2017. Structural Design Systems requirements allocation and derivation at sub-system, equipment and Partner workshare levels will be performed considering Certification, general design requirements and operational requirements. The verification approach will be established along with structural and manufacturing technology choices via Trade-studies and cross-functional working groups. (**AW**)

WP B-4.3 More affordable composite fuselage: Manufacturing of coupons; design of elements and sub-components; development of eco compatible surface treatments on alluminum alloys components (**ALA**). Manufacturing and testing of coupons including SHM systems installed. Design of elements (including sensors locations) representative of fuselage structure (**SHERLOC**).

The “Design Against Distortion” study will be focused on topology optimisation accounting for distortion and shape and lay-up optimisation accounting for distortion on both metallic and composite compoennet. DISTRACTION project launched in 2016 will contribute on metallic component. And a new project that will be selected during the 2d call process will contribute to the composite component design optimization **(AIB).**

Development of Actuator; design and development of SHM and LM (**FhG**).

WP B-4.4 Affordable low weight, human centered cabin: Concept definition of main aircraft interiors items and first optimization of N&V treatments and green materials application based on the requirements of human centered approach; manufacturing of material coupon elements and start of small-medium test campaign for relevant characterization (**ALA**).

Development of noise reduction actuators and of materials with process data for the Eco-Design Database and Eco-Hybrid Platform (BoM/BoPs) (**FhG**).

a) **Major milestones planned for 2017:**

Milestones				
Ref. No.		Title – Description	Type	Due Date
HPE	M-A-0.2-1	Document with aircraft second loop definition. This aircraft is defined by integration of innovative technologies from other WP as laminar nacelle or optimal engine integration on rear fuselage - **DAv**	R	T0+24
	M-A-2.2-3	Freeze design and materials for anti- and deicing system- **SAAB**	RM	T0+18
	M-A-2.2-4	Aircraft ready for flight test - **AIB**	D	T0+21
	M-A-2.2-5	A/C Power On - **AIB**	D	T0+15
	M-A-2.3.2-1	Evaluation of optimized topcoat in terms of durability of wettability properties and adhesion of sacrificial layer available- **FhG**	R	T0+20
	M-A-3.3	PDR of the BJ half central wing box demonstrator – **DAv**	RM	T0+24
	M-A-3.3-3	PDR Door concept - **SAAB**	RM	T0+24
	M-A-3.4	Technology trade-off finalized - **DAv**	RM	T0+24

Milestones				
Ref. No.		Title – Description	Type	Due Date
	M-A-4.1.1.0.3	2017 Project Review - **GAINS -MPC**	RM	T0+12
	M-A.5.1.1-13	Internal review of concepts on crew fatigue, culture catalogue and persons with reduced mobility (PRM) - **AIB**	RM	T0+15
	M-A-5.2-1	Progress status report written for the studied concepts - **DAv**	R	T0+24
	M-A-5.2-2	High Level Technical requirements written of the cabin systems evaluation bench - **DAv**	R	T0+24
	M-A.5.1.1-13	Internal review of concepts on crew fatigue, culture catalogue and persons with reduced mobility (PRM) - **AIB**	RM	T0+15
	M-A-5.2-1	Progress status report written for the studied concepts - **DAv**	R	T0+24
	M-A-5.2-2	High Level Technical requirements written of the cabin systems evaluation bench - **DAv**	Spec	T0+24
HVC	M-B-1.2-3	Wing design concept and preliminary sizing - **PAI-EVE**	R	T0+21
	M-B-1.4-3	Conclusions from H/W designs and wind tunnel outcome drawn regarding wing trailing edge lift an drag control - **AIB**	R	T0+23
	M-B-1.4.4-01	Smart Morphing Leading Edge. Adapted concept: Report on first iteration of basic design and architecture based on the requirements and studies of structural concepts and kinematics. **FhG**	R	T0+18
	M-B-2.2-1	CDR Flap actuation and wing box - **CASA**	RM	T0+23
	M-B-3.2-1	CDR for integration of EMA actuation in the wing structures for Aileron and Spoiler control surfaces and integration of SATCOM – **CASA**	RM	T0+23
	M-B-3.2.6-01	Design of the Ice Protection System (IPS) - **FhG**	R	T0+20
	M-B-3.4.2-1	Delivery of demonstrators produced by conventional methods - **PAI-EVE**	D	T0+24
	M-B-4.1-2.1	CDR for LifeRCraft Rotorless Tail - **AH-E**	RM	
	M-B-4.1-3.3-4	Acceptance of the Prototype Assembly Tooling by CoP/**AH-E**	RM	
	M-B-4.2-7	PDR for Pressurized Fuselage passed - **AW-SpA/Core Partners**	RM	T0+19
	M-B-4.3-3	Developed HPC based NDI/SHM platform architecture for fuselage design - **ALA**	D	T0+24
	M-B-4.3-6	Metallic parts (ALM; machining distortion)- Milestone reviews regarding distortion prediction: model development + validation, application to LPA use cases - **AIB**	RM	T0+21
	M-B-4.3-7	CFRP parts (curing distortion)- Milestone reviews regarding distortion prediction: model development + validation, application to LPA use cases - **AIB**	RM	T0+21

Milestones				
Ref. No.		Title – Description	Type	Due Date
	M-B-4.4-6	Concept definition of cabin interiors HCDA (Human Centred Design Approach) with relevant Innovative Technologies (Acoustic and green material) for regional aircraft - **ALA**	R	T0+24

b) Major deliverables planned for 2017:

Deliverables				
Ref. No.		Title – Description	Type	Due Date
HPE	D-A-1.3-1	Document with one aircraft definition (novel high-efficiency configurations) - DAv	R	T0+24
	D-A-2.2-3	Wind Tunnel Test object Manufactured- SAAB	D	T0+18
	D-A-2.2-7	A/C Modification Stage 8: V&V, test & GTR - AIB	D	T0+19
	D-A-3.1-3	PDR Report Aileron concept – SAAB	R	T0+24
	D-A-3.3-1	BJ half central wing box demonstrator PDR report - DAv	R	T0+24
	D-A-3.3-2	Manufacture of AM demonstrator - SAAB	D	T0+24
	D-A-3.3-3	PDR Report Door concept - SAAB	R	T0+24
	O-A-4.1-1-1.4	Report detailing the conclusion of the system level study – GAINS MPC	R	T0+24
	D-A-5.1-01	Compilation of Key Comfort Cabin Drivers - FhG	R	T0+10
	D-A-5.1-02	Outline for the Passenger Human centred cabin design approach - FhG	R	T0+18
	D-A-5.2-2	High Level Technical requirements of the cabin systems evaluation bench - DAv		T0+24
	D-A-1.3-1	Document with one aircraft definition (novel high-efficiency configurations) - DAv	R	T0+24
	D-A-2.2-3	Wind Tunnel Test object Manufactured- SAAB	D	T0+18
	D-A-2.2-7	A/C Modification Stage 8: V&V, test & GTR - AIB	D	T0+19
	D-A-3.1-3	PDR Report Aileron concept – SAAB	R	T0+24
	D-A-3.3-1	BJ half central wing box demonstrator PDR report - DAv	R	T0+24
	D-A-3.3-2	Manufacture of AM demonstrator - SAAB	D	T0+24
HVC	D-B-1.2-5	Wing design concept and preliminary sizing. **PAI, EVE**	R	T0+24
	D-B-1.4.3-02	PDR Actuato design report - **FhG**	R	T0+20
	D-B-1.4.3-03	First actuator prototype - **FhG**	D	T0+20
	D-B-2.2-1	CDR Flap actuation and wing box reports - **CASA**	RM	T0+23
	D-B-2.2.2-3	Technical documentation supporting CDR Multifunctional Flap - **OUTCOME**	R	T0+22
	D-B-3.2-1	CDR for integration of EMA actuation in the wing structures for Aileron and Spoiler control surfaces and integration of SATCOM – **CASA**	RM	T0+23

Deliverables				
Ref. No.		Title – Description	Type	Due Date
	D-B-4.1-2-1	Rotorless Tail Critical Design Review MoM **AH-E**	RM	
	D-B-4.1-2-5	CDR Rotorless tail for fast rotorcraft - **OUTCOME**	R	
	D-B-4.1-3.1-2	Tooling CoC - Tooling Delivery at **AH-E**/CoP facilities	D	
	D-B-4.3-1	Development of Actuator- **FhG**	D	T0+24
	D-B-4.3-4	Final Activity Report on development of tartaric–sulphuric acid anodizing process on alluminum alloys - **ALA**	R	T0+24
	D-B-4.3-5	Final Activity Report on the evaluation of the performance of 'hexavalent chromium-free' chemical conversion coating products on alluminum alloys **- ALA**	R	T0+24
	D B-4.3.10-16	Experimental tests performed on coupons and test report - **SHERLOC**	D	T0+18
	D-B-4.4-1	Technical description of regional cabin architecture - **ALA**	R	T0+18
	D-B-4.4-2	New virtual concepts for noise control for both primary and/or secondary structure and major cabin interior items solutions (FEM simulation based) - **ALA**	R	T0+24
	D-B-4.4-3	Actuators development for full-scale demonstration - **FhG**	R	T0+20
	D-B-4.4-4	BOM/BOPs and technology process data for Eco-Design Database for TA-T2/TA-T5 - **FhG**	R	T0+24

c) Implementation risk

Risk Description	Action Plan Summary
A-4.1.1.1 No benefit for mixed thermal ice protection can be demonstrated (GAINS)	Manage risk - set up workshops with WAL
A-4.1.1.3 Provision of good flight or tunnel test data may not be available, there is a risk that there will be insufficient test data to establish a good tool validation (GAINS)	Manage risk - set up workshops with WAL
B-1.3.1 Winglet – Lightening protection not assurance (OUTCOME)	The influence in lightening protection of part manufacturing process and materials will be analyzed. Development tests and simulations will be carried out if needed (CfP)
B-4.3.10-4 Frequency range of the FO interrogator may not be sufficient to measure the acoustic waves in the hybrid system. (SHERLOC)	Contingency lies in the use of a reduced number of sensors to allow a high-frequency interrogation or to devise a hybrid system where the PZT and FO sensors operate side-by-side as already foreseen.

AIR - List of Leaders and participating affiliates

Nr	Leaders	Description of activities
1	Dassault Aviation	The main Dassault Aviation activity is focused on the design of the composite wing root box demonstrator with definition of manufacturing tools and of partial tests. For the fuselafe wing bos demonstrator a trade-off will be carried out between the composite and aluminium alloy concepts. Other activity will consist in preparation and initiation of activity related to novel certification process, advanced laminarity and novel control. A fonctional analysis of the business jet cabin will be carried out to prepare the future activity on the office centered cabin.
2	Saab	Saabs activities in ITD Airframe will focus on three important WPs in TS2 and TS3. The activities will mainly be devoted to definition of the demonstrators and technology development needed to meet the technology readiness level. Technology development to be started will focus on further development of the novel NLF panel tools and fixtures for advanced manufacturing of high quality surfaces, definition of a test section for a multifunctional leading edge structure, definition of a highly integrated composite aileron demonstrator and definition of a large door structure to demonstrate design for manufacturing technologies, assembly and additive manufacturing.
3	Fraunhofer	The start will focus on the definition of requirements and specifications, along with the industrial partners, for the technology development foreseen. Further, activities like Structural Health Monitoring, enhanced high lift surfaces (morphing concepts for leading edge and specific material application, actuators for active flow control, CFD and CAA,), ice-protection, active acoustics for cabin applications, composite enhancement considering fatigue properties and impact/lightning simulation, laser sintering and eco-friendly anodizing process will be developed considering current and future TRL. All this with the objective of improving their ecolonomic impact by a tight cooperation with Eco-design TA.
5	Airbus SAS	Identification of candidates technologies enabling UHBR Engine efficient integration into the Aircraft. Mature technology candidates enabling a viable CROR Aircraft up to TRL2.
9	Airbus Defence and Space S.A.U. (CASA)	The activities in HVCE Airframe will be devoted to the conceptual and preliminary phases of the different technologies to be developed in CS2, using conceptual design information from RA IADP. Technologies to be started will be OOA external wing box, adaptive winglet, multifunctional flap, more electrical wing and more efficient/ green manufacturing techniques. In addition management of Airframe HVCE part.
11	Alenia Aermacchi	Activities will be devoted to the definition of preliminary requirements of advanced methodologies and technologies addressed to fuselage structures, to the integration of systems in nacelle and to the definition of key cabin drivers for passenger/crew and wellbeing in the cabin of regional aircraft. A preliminary concept design for fuselage and nacelle will be developed. For cabin, small-scale test activities on samples will be executed. Preliminary requirements of pilot fabrication facilities will be also defined.
12	Piaggio Aero	Management of SAT activities incl. CfP. Configuration of ref. SAT A/C.

Nr	Leaders	Description of activities
		Material & Process Selection Low Cost Composite. Innovative high lift device for SAT trade-off and selection.
13	Evektor	Management of SAT activities incl. CfP. Configuration of ref. SAT A/C. Material & Process Selection Low Cost Composite. Innovative high lift device for SAT trade-off and selection. Definition of requirements and trade off studies in Cabin comfort topic.
14	AgustaWestland S.p.A.	Development of complementary airframe and structural concepts and architectures for a next generation of civil tiltrotor, in coordination with AW Ltd and in liaison with FRC IADP requirements, with a view to engage core partners and partners.
15	AgustaWestland Ltd.	Development of complementary airframe and structural concepts and architectures for a next generation of civil tiltrotor, in coordination with AW SpA and in liaison with FRC IADP requirements, with a view to engage core partners and partners.

Nr	Participating affiliates	Description of activities
4	Airbus Operations SAS	Identification of candidates technologies enabling UHBR Engine efficient integration into the Aircraft. Mature technology candidates enabling a viable CROR Aircraft up to TRL2. Plan, prepare and perform for laminar outer wing, the removal of existing wing, the laminar outer wing join up and wing systems and flight test instrumentation equipping. Demonstration of benefits, drawbacks and showstoppers of a wing with high aspect ratio and flexibility. This includes integrated overall design & analysis, structural design and manufacturing concepts to evidence the feasibility of an highly efficient adaptive wing with a realistic industrial business case. Studies of active winglet for load control purposes. Transfer of SARISTU AS03 outcome from regional A/C reference towards large pasenger A/C solution in terms of future industrialisation.
4a	Airbus Group SAS	Contribution to the identification of candidates technologies enabling UHBR Engine efficient integration into the Aircraft. Contribution to mature technology candidates enabling a viable CROR Aircraft up to TRL2. Defintion of business case (reference aircraft, list of requirements), first system layouts for integrated solutions and analysis for multifunctional fluidic trailing edge and multifunctional morphing trailing edge.
6	Airbus Operations Ltd	Mature technology candidates enabling a viable CROR Aircraft up to TRL2. Plan, prepare and perform for laminar outer wing, the removal of existing wing, the laminar outer wing join up and wing systems and flight test instrumentation equipping.
7	Airbus Operations SL	Mature technology candidates enabling a viable CROR Aircraft up to TRL2. Ground testing of modified natural laminar leading edge (LE) on horizontal tail plane (HTP), assembly and filler application. This ground test is a pre-test for the subsequent flight test.

Nr	Participating affiliates	Description of activities
		Furthermores studies on new HTP LE structure concepts.
8	Airbus Operations Gmbh	Identification of candidates technologies enabling UHBR Engine efficient integration into the Aircraft. Mature technology candidates enabling a viable CROR Aircraft up to TRL2. Participation to execution of project multifunctional fluidic trailing edge and multifunctional morphing trailing edge, supporting the consortium with specification of industrial aspects. Plan, prepare and perform for laminar outer wing, the removal of existing wing, the laminar outer wing join up and wing systems and flight test instrumentation equipping. Ground testing of modified natural laminar leading edge (LE) on horizontal tail plane (HTP), assembly and filler application. This ground test is a pre-test for the subsequent flight test. Start of requirements definition for the Human Centred Cabin such as user groups, human factors, use cases, potential restrictions, safety and security analysis. Start of scope and objectives definition of the project “Immersive Cabin Services" together with batch of core partners.
10	Airbus Helicopters España	AH-E will concentrate in HCVE Airframe on the conceptual and preliminary design of the rotor-less tail for a compound rotorcraft based on and closely linked to the conceptual design stemming from IADP FRC. AHE will as well manage the launching of a couple of CfP for the second or third wave.
13a	Evektor Aeroteknik	Production of coupons, subassemblies and prototypes.
14a	PZL-Swidnik SA	Supporting activities foreseen to AW SpA and AW Ltd on airframe and structures topics, following general architecture requirements.
16	Airbus Helicopters Deutschland GmbH	AH-D will concentrate in HCVE Airframe on the conceptual and preliminary design of the wing for a compound rotorcraft based on and closely linked to the conceptual design stemming from IADP FRC. AHD will as well manage several topics for CfP like windscreens and doors for the compound rotorcraft and possibly further topics.

ITD ENGINES

Multi-annual overview and strategic planning

As defined in Clean Sky, the objective of the Sustainable and Green Engines (SAGE) is to build and test five engine ground demonstrators covering all the civil market. The goals aim at validating to TRL 6 a 15% reduction in CO_2 compared to 2000 baseline, a 60% reduction in NO_X and a 6dB noise reduction. This is roughly 75% of the ACARE objectives. Whereas some activities were delayed for the Open Rotor programme for example, the bulk of SAGE objectives remain on track.
ENGINES ITD will build on the success of SAGE to validate more radical engine architectures to a position where their market acceptability is not determined by technology readiness. The platforms or demonstrators of these engines architectures can be summarized as below:

- Open Rotor Flight Test, This activity has now been moved to the Large Passenger Aircraft IADP
- Ultra-High Propulsive Efficiency (UHPE) demonstrator addressing Short / Medium Range aircraft market, 2014-2021: design, development and ground test of a propulsion system demonstrator to validate the low pressure modules and nacelle technology bricks;
- Business aviation / short-range regional Turboprop Demonstrator, 2014-2019: design, development and ground testing of a new turboprop engine demonstrator in the 1800-2000 shaft horse power class;
- Advanced Geared Engine Configuration, 2015-2020: design, development and ground testing of new compression system rigs and an expansion system demonstrator to validate key enablers to reduce CO_2 emissions, noise and engine mass;
- Very High Bypass Ratio (VHBR) Middle of Market Turbofan technology, 2014-2018: development and demonstration of technologies to deliver validated power plant systems matured for implementation in full engine systems;
- VHBR Large Turbofan demonstrator, 2014-2019: design, development, ground and flight test of an engine to demonstrate key technologies for large engines;
- The Small Aero-Engine Demonstration projects related to Small air Transport (SAT) will focus on small fixed-wing aircraft in the general aviation domain and their power-plant solutions, spanning from piston/diesel engines to small turboprop engines.

Description of main activities for the year 2016

WP 1 – Open Rotor flight Test (Snecma): This activity has now been moved to the Large Passenger Aircraft IADP.

WP 2 – Ultra High Propulsive Efficiency (UHPE) Demonstrator for Short / Medium Range aircraft (Snecma): Based on studies of best candidates for High Propulsive Efficiency PPS concepts currently performed, 2016 will be focused on the preliminary studies and choice of one demo concept adequate to mature UHPE concept. Those trade studies will be built according to the Core Patners' proposed concept parts. End of 2016 will be led by the preliminary design study.

WP 3 – Business Aviation / Short Range Regional TP Demonstrator (Turbomeca): *Finalization of the subsystems specifications:* Based on the specification for the Demonstrator, each subsystem will be specified, prior to entering into the detailed design of each IPPS component. *Detailed design of each subsystem:* Each component of the IPPS will be designed: core engine, power & accessory gearbox, controls for the engine and the propeller, new propeller, air intake and nacelle.

WP 4 – Adv. Geared Engine Configuration (HPC-LPT) (MTU): Advanced Geared Engine Configuration (compression/expansion system) (MTU). The key objective of the activities in 2016 is the concept-phase of the entire program. In parallel the development of technologies for the compression system and expansion system will be continued. In 2016 the engineering team will be ramped up further. The conceptual design work will be continued for Engine Demo and Compression System Rigs under the assumptions of the preselected technologies and defined system requirements

WP 5 – VHBR – Middle of Market Technology (Rolls-Royce): Having already established a strong technical management organisation, the ramp-up of engineering resource and work will be significant in 2016 and this is reflected in the budget planned. 2016 will focus on the maturation of architectural scalability studies and power plant level trade studies with Airframer in conjunction with WP1.5 in LPA. This will support the definition of an appropriate demonstrator vehicle in WP6.

WP 6 – VHBR – Large Turbofan Demonstrator (Rolls-Royce): Throughout 2016, an initial demonstrator engine design will be completed (in conjunction with the LPA IADP). Long lead time items will be launched, including specific infrastructure modifications and rig tests to support ground test in 2019 and flight test in 2021. Progress will accelerate significantly through 2016, as the generic architecting and scalability work completes and there is initial definition of the flight test demonstrator engine.

WP 7 – Light weight and efficient Jet-fuel reciprocating engine: The ITD engine Work Package 7 focuses on piston engines burning jet fuels, in the power range suitable for general aviation, from 5 to 19 seats. These technologies will bring new solutions to replace old gasoline leaded fuel piston or small turbines. The scope includes the core engine, but also on equipment (turbocharger), the propeller integration and the aircraft installation optimization. These activities have been prepared by the leader during years 2014-2015. 2016 activities will be mainly performed by the CfP partners.

WP 8 - Reliable and more efficient operation of small turbine engines: (MAESTRO) target is to maintain and strengthen the European competitiveness in Small Air Transport turboprop market by providing next generation turboprop engines and propeller for up to 19 seats aircraft, developing design tools and manufacturing technologies for application in both, spiral development programs as well as new engine architectures, contributing to ACARE SRA goals achievements. 2016 will be focused mainly on the design activities and Test preparation.

a) Major milestones planned for 2016:

Milestones				
Ref. No.		Title – Description	Type	Due Date
Ultra-High Propulsive Efficiency (UHPE) Demonstrator for Short / Medium Range Aircraft	M2A	UHPE demo selection	RM	Sept 2016
	M2B	UHPE demonstrator specifications	R	Dec 2016
Business aviation / short range Regional TP Demonstrator	M3A	IPPS Architecture selection	R	May 2016
	M3B	IPPS CDR	RM	Dec 2016
Adv. Geared Engine Configuration (HPC-LPT)	M4.4.4.1	Concept review of TEC and mixer	RM	Nov 2016
	M4.2.1.3	ICD Rig Concept Review	RM	Apr 2016
VHBR – Middle of Market Technology	M5A	Structural System Toolset - Tool to submit Nastran and/or JM62 runs on local PC's not in a LAN	D	Dec 2016
	M5B	Report that summarises the requirements for Structural 'Load Share'	R	Dec 2016
	M5C	Airframe integration - Report summarising geometry strategy (knowledge base and know how) for use in parallel projects	R	Dec 2016
VHBR – Large Turbofan Demonstrator	M6A	Design Iteration 1 output - Buy off baseline definition for UltraFan™ demonstrator	R	Mar 2016
	M6B	Update UltraFan™ Demo Product Bill of Materials from Verification Strategy	R	Apr 2016
	M6C	Pass PILM Stage 0 Exit – Robust System Level UltraFan™ Demo definition and Verification Strategy.	RM	Jun 2016
Light weight and efficient Jet-fuel reciprocating engine	M7A	Mono-cylinder final report WP7.4	R	Jan 2016
	M7B	PDR core engine improvement WP7.1	R	Jul 2016
	M7C	CDR turbocharger improvement WP7.2	R	Mar 2016
	M7D	CfP WP7.3 selection	R	Apr 2016
Reliable and more efficient operation of small turbine engines	M8A	Target engine characteristics	R	Sep 2015
	M8B	Initial steady state thermodynamic model	R	Sep 2015
	M8C	RGB Concept Design Review	RM	Dec 2015
	M8D	Compressor Aero & Mechanical Preliminary Design Review	RM	Jan 2016
	M8E	Combustor Detailed Design Review	RM	Dec 2015
	M8F	Combustor FANN Rig Test closure	D	Jun 2016
	M8G	PT Aero Detailed Design Review	RM	Dec 2015

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

b) Major deliverables planned for 2016:

Deliverables				
Ref. No.		Title – Description	Type	Due Date
Ultra-High Propulsive Efficiency (UHPE) Demonstrator for Short / Medium Range Aircraft	D2A1	Demo Selection Report	R	Sep 2016
	D2B1	UHPE demonstrator specifications	R	Dec 2016
Business aviation / short range Regional TP Demonstrator	D3A1	Summary presentation of TP Demonstrator	R	May 2016
	D3B1	Technical memo with status on the CDR	R	Dec 2016
Adv. Geared Engine Configuration (HPC-LPT)	D4.2.1.2	ICD Rig Detail Design Documentation	R	Oct 2016
	D4.3.4.1	Summary of ICD rig test concept review	RM	Mar 2016
VHBR – Middle of Market Technology	D5A1	Development of Structural Tools	D	Apr 2016
	D5B1	Report outlining working assumptions for future VHBR programmes	R	Apr 2016
VHBR – Large Turbofan Demonstrator	D6A1	Design Iteration 1 Assumptions Sheet	R	Mar 2016
	D6B1	Design Iteration 3 Assumptions Sheet	R	Dec 2016
	D6C1	Build1 for the Advance3 Core Test Complete	RM	Sep 2016
Light weight and efficient Jet-fuel reciprocating engine	D7A1	SCE final report	R	Jan 2016
	D7B1	Preliminary design review	RM	Jul 2016
	D7B2	Design validation report	R	Mar 2016
Reliable and more efficient operation of small turbine engines	D8A1	Baseline engine and target specification	R	Sep 2015
	D8B1	Engine steady state model	R	Sep 2015
	D8C1	RGB Baseline Concept DEsign	R	Sep 2015
	NAD8D1	Compressor Preliminary Design	R	Jan 2016
	NAD8E1	Combustor Preliminary Design	R	Dec 2015
	D8F1	Rig Modifications for FANN Test	D	Jan 2016
	D8F2	Combustor FANN Testing	R	Jun 2016
	NAD8E1	PT Aero Detailed Design	R	Dec 2015

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

c) Implementation – Risk

The activities in the Engines ITD will be performed following the general principles of the Clean Sky 2 membership and participation.
Safran, Rolls-Royce and MTU, as the ITD Leaders, will perform the main activities related to the technology development and demonstration in the ITD. Significant part of the work will

be performed by Core Partners, supporting the ITD leader in its activities. Finally, another part of the activities will be performed by Partners through Calls for Proposals for dedicated tasks.
Safran, Rolls-Royce and MTU, as the ITD Leaders, will sign the one Grant Agreement for Members (GAM) in order to perform the work. This GAM will cover all the work of the Members in this ITD. The Core Partners are selected through open Calls for Core Partners and the retained applicants will accede to the existing Grant Agreement for Members. Partners will be selected at a later stage through Calls for Proposals and will be signing the Grant Agreement for Partners. They will be linked to the ITD activities through the Coordination Agreement. A key risk with the Call for Proposals process is the requirement in the ENGINES ITD for a front-loaded funding profile (i.e. more funding is required at the beginning of the Clean Sky 2 programme) in order to ensure that the CfP projects have a direct impact on the demonstrators.
The ability to adequately resource the required ramp up remains a key challenge as does the ability to plan and integrate activities across ITD, CfCP and CfP to ensure consistent timescales for delivery. The work being undertaken is by its' nature technically complex and there are multiple technical risks that need to be managed throughout the duration of the project.

Risk Description	Action Plan Summary
WP3- Time delay in core partner action	Preparation of the negotiation phase (analysis of the proposals, preparation of a matrix with inputs/outputs, etc..) KOM and regular meetings to be organized
WP4 – Measurement requirements for rig test-Available Instrumentation precision not sufficient	Early definition of needed precision Adaptation of rig Use of measurement technology of all partners Early verification in Test Concept Review
WP8 - Changes on customers demand regarding engine power/class	PAI involvement (WP8.0 leadership) and robust interaction with SAT GAM

Description of main activities for the year 2017

WP 1 – Open Rotor flight Test (Snecma): This activity has now been moved to the Large Passenger Aircraft IADP.
WP 2 – Ultra High Propulsive Efficiency (UHPE) Demonstrator for Short / Medium Range aircraft (Snecma): 2017 will be focused on the preliminary design study of the UHPE demonstrator. The UHPE PDR is expected on Q3/2017 allowing the Core Partner to perform their own PDR of the main modules before the end of the year. End of 2017 will be led by the critical design study.
WP 3 – Business Aviation / Short Range Regional TP Demonstrator (Turbomeca): Start of manufacturing of parts for the demonstration. The detailed design phase is expected to be completed by end of 2016 in order to launch the phase for components manufacturing. In parallel to the component manufacturing phase, the activity dedicated to the test preparation will start. The Turboprop engine test facility will be upgraded.
WP 4 – Adv. Geared Engine Configuration (compression/expansion system) (MTU): The key objective of the activities in 2017 is the ICD test and the concept-phase of the 2-spool

compressor rig and the engine demonstrator program. In parallel the technologies for the compression system and expansion system will be matured to TRL3.
Concept reviews for the demonstrator vehicles, Engine Demo and 2-spool Compression System Rig, will be performed by end of 2017.
<u>WP 5 – VHBR – Middle of Market Technology (Rolls-Royce):</u> 2017 will see significant rig design and test effort from the WP leader and Core Partner and Call for Proposal organisations in low speed fan/pressure systems, low pressure turbines optimized to high speed operation, the system integration of power gear systems, optimized power plant and nacelle technology, and compressor systems. Preparations will also begin for the manufacture of long lead-time hardware to support delivery to WP6 in 2018.
<u>WP 6 – VHBR – Large Turbofan Demonstrator (Rolls-Royce):</u> Throughout 2017, system and sub-system design will progress at pace, culminating in completion at year end and pass to detailed design and manufacture. There will be continued engagement with WP1.5/1.6 in LPA IADP to ensure programe and technical alignment. Progress will accelerate significantly through 2017, with completion of preliminary design and provisions are made to begin manufacture and procurement of long-lead time items, required for engine test in 2019.
<u>WP 7 – Light weight and efficient Jet-fuel reciprocating engine:</u> The ITD engine Work Package 7 focuses on piston engines burning jet fuels, in the power range suitable for general aviation, from 5 to 19 seats. These technologies will bring new solutions to replace old gasoline leaded fuel piston or small turbines. The scope includes the core engine, but also on equipment (turbocharger), the propeller integration and the aircraft installation optimization. These activities have been prepared by the leader during years 2014-2015. 2017 activities will be mainly performed by the CfP partners in line with 2016 activities.
<u>WP 8 - Reliable and more efficient operation of small turbine engines: </u>(MAESTRO) target is to maintain and strengthen the European competitiveness in Small Air Transport turboprop market by providing next generation turboprop engines and propeller for up to 19 seats aircraft, developing design tools and manufacturing technologies for application in both, spiral development programs as well as new engine architectures, contributing to ACARE SRA goals achievements
2017 will be focused mainly on the technologies and design solutions validation on dedicated test benches.

a) **Major milestones planned for 2017:**

Milestones				
Ref. No.		Title – Description	Type	Due Date
Ultra-High Propulsive Efficiency (UHPE) Demonstrator for Short / Medium Range Aircraft	M2A	UHPE PDR	RM	Oct 2017
Business aviation / short range Regional TP Demonstrator	M3A	Preparation meeting for instrumentation	RM	May 2017
	M3B	Preparation Meeting before Ground Test	RM	Dec 2017

Milestones				
Ref. No.		Title – Description	Type	Due Date
Adv. Geared Engine Configuration (HPC-LPT)	M4A	2SC Rig Preliminary Concept Review	RM	Apr 2017
	M4B	ICD Rig Build 1 RTT	D	Sep 2017
VHBR – Middle of Market Technology	M5A	Perform Short Intake Noise Modelling – Fan Rig Test at AneCOM	T	Mar 2017
	M5B	Perform In cell measurement Noise methods – Concept Design Review (CoDR)	R	Mar 2017
	M5C	Model Oil System Concepts through Model Based System Engineering techniques for UltraFan™	R	Feb 2017
VHBR – Large Turbofan Demonstrator	M5D	Report Oil Variable flow control benefits for UltraFan™	R	May 2017
	M6A	Integrate Sub-System Request for Bids Design Iteration 4 - Sub-System design UltraFan™ definition mature and frozen	R	Jun 2017
	M6B	Demonstrator PILM Stage 1 Exit – Audit review of UltraFan™ Demonstrator in preparation for design and make	RM	Jun 2017
Light weight and efficient Jet-fuel reciprocating engine	M7A	Core engine tests	R	Mar 2017
	M7B	Turbo rig tests	R	Feb 2017
	M7C	Propeller Milestone (TBD wave#2)	D	2017
	M7D	CDR High power density architecture	RM	Jun 2017
Reliable and more efficient operation of small turbine engines	M8A	CDP controlled accel/decel control model	D	Jun 2016
	M8B	Preliminary assessment of installed noise effects	R	Dec 2016
	M8C	RGB Technologies	R	Jun 2016
	M8D	Compressor Test Readiness Review	RM	Jun 2016
	M8E	All Additive Combustor Module Preliminary Design Review	RM	Apr 2016
	M8F	HPT – PT rig hardware delivery	D	Feb 2016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software – T:Test*

b) Major deliverables planned for 2017:

Deliverables				
Ref. No.		Title – Description	Type	Due Date
Ultra High Propulsive Efficiency (UHPE) Demonstrator for Short / Medium Range Aircraft	D2A1	UHPE Preliminary Design Review report	RM	Oct 2017
Business aviation / short range Regional	D3A1	Minutes of Meeting for instrumentation	R	May 2017
	D3B1	Minutes of Meeting for ground test	R	Dec 2017

Deliverables				
Ref. No.		Title – Description	Type	Due Date
TP Demonstrator	D4A	Summary of ICD rig post-test review (DR6)	D	Jan 2018
	D4B	Engine Demo. Final Concept Documentation	R / RM	Dec 2017
VHBR – Middle of Market Technology	D5A1	Rig Test performed	T	Mar 2017
	D5B1	Concept Design Review for proposed rig test	RM	Mar 2017
VHBR – Large Turbofan Demonstrator	D6A1	Design iteration Assumptions Sheet	RM	June 2017
	D6C1	Audit review held for UltraFan™ Demo – recommendations/actions captured	RM	Dec 2017
	D6D1	Build2 for the Advance3 Core Test Complete	RM	Mar 2017
Light weight and efficient Jet-fuel reciprocating engine	D7A1	Core engine result	R	Mar 2017
	D7B1	Turbo rig test result	R	Feb 2017
	D7B2	High power architecture design	R	Jun 2017
Reliable and more efficient operation of small turbine engines	D8A1	Report on engine transient models	R	Jun 2016
	NAD8B1	Report on down-selected low noise technologies	R	Jan 2016
	NAD8C1	RGB technology maturation report	R	Jun 2016
	D8D1	Compressor Mechanical Design	R	Jun2016
	NAD8E1	All Additive Combustor Module PDR	RM	Apr 2016
	NAD8F1	PT rig hardware delivery	D	Feb 2016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software – T:Test*

c) Implementation - Risk

The activities in the Engines ITD will be performed following the general principles of the Clean Sky 2 membership and participation.

Safran, Rolls-Royce and MTU, as the ITD Leaders, will perform the main activities related to the technology development and demonstration in the ITD. Significant part of the work will be performed by Core Partners, supporting the ITD leader in its activities. Finally, another part of the activities will be performed by Partners through Calls for Proposals for dedicated tasks.

Safran, Rolls-Royce and MTU, as the ITD Leaders, will sign the one Grant Agreement for Members (GAM) in order to perform the work. This GAM will cover all the work of the Members in this ITD. The Core Partners are selected through open Calls for Core Partners and the retained applicants will accede to the existing Grant Agreement for Members. Partners will be selected at a later stage through Calls for Proposals and will be signing the Grant Agreement for Partners. They will be linked to the ITD activities through the Coordination Agreement. A key risk with the Call for Proposals process is the requirement in the ENGINES ITD for a front-loaded funding profile (i.e. more funding is required at the beginning of the Clean Sky 2 programme) in order to ensure that the CfP projects have a direct impact on the demonstrators.

The ability to adequately resource the required ramp up remains a key challenge as does the ability to plan and integrate activities across ITD, CfCP and CfP to ensure consistent timescales for delivery. The work being undertaken is by its' nature technically complex and there are multiple technical risks that need to be managed throughout the duration of the project.

Risk Description	Action Plan Summary
WP3 – Turboprop engine test facility not ready	Engine test facility upgrade to start in 2016
WP8 - Components validation HW costs higher than expected	Progressive cost estimation based on updated BOMs

ENG - List of Leaders and participating affiliates

Nr	Leaders	Description of activities
1/6	Rolls-Royce plc	As the leader of work packages 5 and 6, Rolls-Royce will technically lead and manage the R&T programmes for the long range VHBR engine (Ultrafan™). Rolls-Royce will also play a key role in management of the Engines-ITD.
5	MTU Aero Engines AG	MTU takes technical and management ownership for work package 4. The R&T programmes in this work package focuses on the Advanced Geared Engine Configuration. MTU will also play a key role in management of the Engines-ITD.
6/1	SNECMA	As Affiliate of Safran S.A., SNECMA will lead Engines ITD with Rolls-Royce and MTU Aero Engines. SNECMA will also technically lead and manage work package 2 "Ultra High Propulsive Efficiency (UHPE) Demonstrator for short / medium range aircraft". SNECMA will play a key role in management of the Engines-ITD.
17	Safran	Participates through its "Safran Composite" and "Material and Processes" business units on the WP 2 "UHPE Demonstrators" at a later stage.

Nr	Participating Affiliates	Description of activities
2	Airbus Operations SAS	Airbus Operations SAS will participate in term of aircraft integration point of view for the WPs related to mid and large turbofans (i.e WP 2 / WP5 / WP 6).
3	Aircelle	As Affiliate of Safran S.A., Aircelle will play a major role in WP 2 "UHPE Demonstrator", being responsible for Fan Nacelle and Variable Fan Nozzle. These are key modules for the UHPE demonstrator.
4	Turbomeca	As Affiliate of Safran S.A., Turbomeca will technically lead and manage work package 3 "Turboprop ground demo for SR regional aviation". Turbomeca will play a key role in management of the Engines-ITD as WP 3 leader and manage the Core Partners and Partners involved in this TP demo.
4a/6	Hispano-Suiza, SA	Power Gear Box specification, dynamics studies, Technologies,

Nr	Participating Affiliates	Description of activities
a		Concept, Design Support, Planet bearing model, Predictive analysis (Health monitoring) and dynamic modelisation tool.
6b	Techno Space Aero	Study, develop and provide Heat exchangers compliant to the UHPE requirements
7	Rolls-Royce Deutschland	Rolls-Royce Deutschland are providing key systems for the long range VHBR (Ultrafan^{TM}) engine. Specifically they will be providing the power gearbox and whilst this is outside of the Clean Sky 2 programme, interface management will leave Rolls-Royce Deutschland with a critical role in WP 6. Additionally as a key whole engine systems provider in Germany, Rolls-Royce Deutschland are set to lead key work packages in WP 5 (MoM) during the CS2 programme.
8	SMA (SAFRAN)	As Affiliate of Safran S.A., SMA will technically lead and manage work package 7.1 "Light weight and efficient jet-fuel reciprocating engine" for SAT applications. SMA will be responsible for the demo and manage the Partners involved in WP 7.1.
1a	Rolls Royce Corporation	Rolls-Royce Corporation will play a very important role during the early phases of the Rolls-Royce Plc programmes defined in WP5 and WP6 as they have critical knowledge and capability surrounding gearbox and structural technology. This knowledge is held within Rolls-Royce Corporation and therefore represents the most cost and time effective way to bring this capability to the European business (UK and Germany).
1b	Rolls-Royce Controls and Data Services Limited	CDS will support the Rolls-Royce team in the development of the UltraFan demonstrator design at system and sub-system level, with focus on control system definition. This work will be carried out in WP6.4.2 and will support the stage 0 gate review in 2016 and the stage 1 gate review in 2017.

ITD SYSTEMS

Multi-annual overview and strategic planning

Systems and equipment play a central role in aircraft operation, flight optimisation and air transport safety:

- Direct contributions to environmental objectives: for example optimized green trajectories or electrical taxiing have a direct impact on CO_2 emissions, fuel consumption and perceived noise;
- Enablers for other innovations: in particular for innovative engines or new aircraft configurations;
- Enablers for air transport system optimization: improving greening aviation, mobility or ATS efficiency can only be reached through the development and the integration of on-board systems;
- Smart answers to market demands: systems and equipment have to increase their intrinsic performance to meet new aircraft needs without a corresponding increase in weight and volume.

Starting from the *Clean Sky* developments through Systems for Green Operations (SGO), further maturation, demonstration and new developments are needed to accommodate the needs of the next generation aircraft. In addition, the systemic improvements initiated by SESAR and NextGen will call for new functions and capabilities geared towards environmental or performance objectives, and for flight optimisation in all conditions, flight safety, crew awareness and efficiency, better maintenance, reduced cost of operations and higher efficiency. The Systems ITD in *Clean Sky 2* will address this through the following actions:

- Work on specific topics and technologies to design and develop individual equipment and systems and demonstrate them in local test benches and integrated demonstrators (up toTRL5). The main domains to be addressed are cockpit environment and mission management, computing platform and networks, innovative wing systems, landing gears and electrical systems.
- Customization, integration and maturation of these individual systems and equipment in IADP demonstrators. This will enable full integrated demonstrations and assessment of benefits in representative conditions.
- Transverse actions will also be defined to mature processes and technologies with potential impact on all systems, either during development or operational use.

Description of main activities for the year 2016

<u>WP0 Management:</u>

The management activities will monitor and control the running activities and manage in parallel the launch of the CP Wave 4 call and the integration of the CfP Partners from wave 4 and 5.

<u>WP1 Extended Cockpit</u>

2016 work for WP1 will mostly provide the first elements of solutions for answering to the need and specifications issued in 2015.

In WP1.1, Requirements and architecture, the extended Cockpit definition will be completed.

In particular, Airbus will provide a set of high level requirements on the Large Passenger Aircraft cockpit display and flight management systems.

The flow down of the solution specification defined in 2015 to the interfaces between various component of the system will be confirmed.
The overall roadmap for Extended Cockpit demonstrator will be issued.
In WP1.2, mock-ups of new cockpit displays will be matured, some of them reaching TRL5.
Thales will drive partners work on high brightness microdisplay to be integrated in future Head-up displays.
Concepts based on new interaction means, for instance voice, will be matured up to TRL3.
In WP1.3, the FMS functions will be further developed from the 2015 status, with development focusing on the descent profile, a low maturity prototype being target for end 2016.
Fly by Trajectory concept will be further matured from the TRL3 reached in 2015. The detailed definition of the implementation will be developed, and the implementation of a TRL4 maturity mock-up will start
The concept of modular Inertial Reference Unit will progress towards TRL3 by mid-2016, when the mechanical concept will be defined.
WP 1.4 work will focus on the Modular Communication platform, with the refinement of the aircraft level requirements, leading to the first system configuration description document around end 2016.
In WP1.5, the first instance of Extended Cockpit Demonstrator will be initiated with :

- Initial implementation of the common, ITD-level physical demonstrator of the extended cockpit : screens, first functions, IHS means, …
- Definition of operational scenarios and initial implementation of the simplest ones.

WP2 Cabin & Cargo Systems:
2016 work for WP2 “Cabin & Cargo Systems” will be limited to the definition of the Call for Core Partner which will constitute the vast majority of the activity of this WP in future years. The Call will be part of Wave 04, planned to be published by mid-2016. By-end 2016, Project management activity to integrate the workplan of the new Core Partner will be started.

WP3 Innovative Electrical Wing:
Large AC:
The main activity will be the preparation of the demonstrator architecture. There are multiple national funded projects and activities running in parallel (e.g. LuFo, FP7 A2015), which technical outcome could influence the demonstrator architecture (e.g. trade results, test results, problems which occur).
Trade studies and analysis will lead the preliminary system architecture of the Smart Integrated Wing to be set. Future components design is supporting the demonstration.
Regional AC:
The work performed in 2016 will include the following steps:

- Writing of the FCS Global Specification
- System Engineering Methods & Tools (Interface, Safety, EQSW)
- Specification of the system functions and main performances
- Architecture Evaluation at System Level
- System Modeling (Functional, Organic, Performances)
- Wing architecture trade-off
- Functional analysis and description of the functional needs to prepare the equipment specifications

The FCS system will be interfaced to WP 3.1.1 Electrical Network and WP 3.2.2 Sensors Concept and Health Monitoring.
The flight control systems development for the new electrical wing for the Regional Aircraft (FTB2) will be driven by Airbus Defense & Space specifications at the beginning of 2016. Conceptual design is one of the goals to be achieved during 2016 or each electromechanical actuator (Aileron, Spoiler, Flap tab and winglet tab). Detailed design of both Spoiler and aileron is also planned to be finished at the end of 2016 In parallel, all qualification plans and procedures will be drafted at the end of 2016.

WP4 Landing Gear System:

- **WP4.1 Main Landing Gear**

Manufacturing and first tests with the prototype smart braking EMA. Complete trade-off study on the landing gear extension / retraction system architecture. Integration study for direct drive Green Autonomous Taxiing System actuator. Trade-off activities to define the optimal wheel seat/tire angle.

- **WP4.2 Nose Landing Gear:**

The Electro-Hydrostatic Actuation System detailed design phase will start after validation of the preliminary design at the TRL3 planned for the second quarter. Integration of the selected Core Partner for CFRP structural parts will close by year end.

- **WP4.3 Rotorcraft Landing Gear System:**

The Electro-Mechanical Actuation will mature at sub-system level up to TRL3. In parallel, discussions about integration into a flying demonstrator will converge. The Core Partner responsible for the electrical braking system will be integrated in the project as well.

- **WP4 .4 Sensors Systems:**

The objective is to, through a CfP wave 2, define, develop and integrate landing gear loads monitoring sensors into large passenger aircraft landing gear to provide robust, accurate, reliable load measurement and the potential for health monitoring capability.
The Partnership will be set-up, the development plan consolidated, and the design, and manufacturing of the system's components and test rigs will be performed.
In parallel, a modified landing gear and a LG load test bench will be prepared in order to accommodate load tests in 2017.

WP5 Electrical Chain:

Electrical architecture:

For the Electrical architecture, Airbus activities in 2016 will mainly focus upon

- High power electrical network simulation
  - Managing a Partner wave 2 for Electrical simulation model identification method and tool: Partner contract preparation, development plan set-up, requirements elaboration
- Managing a core Partner wave 3 for HVDC Power Management Center and associated commutation, protection, conversion and air cooling equipment,
  - Core Partner GAM accession preparation, development and integration plan set-up
  - Architecture studies, candidate technologies analysis for weight and cost reduction, definition of the HVDC commutation matrix

Generation:
In 2016 period, concerning power generation (WP5.1.1 and WP51.2), the launch of digital GCU development is foreseen in order to reach a TRL4/5 for a demonstrator in 2017. In parallel, technology bricks for these electrical machines will be identified through CfP.
Concerning the conversion work package (WP5.1.3), Ground demonstrators for both power networks will be launched with technical objectives to reach power density requirements.
Concerning energy storage (WP5.1.4) the core partner for this activity will be selected through the wave 4 selection of Core Partners. Technology and maturity road maps on energy storage with core partner collaboration are also planned..

Energy Management:
For Energy management, activities in 2016 will mainly focus on specification of power management center for energy distribution including power electronics and definition of cooling functions:
- Preliminary Power management center specification
- Power management center architecture definition to minimize weight and cost
- Cooling technologies identification to reduce power consumption, reliability, and to ease integration. A focus on air cooling technologies will be addressed
- Preliminary specification of power electronics components
- Commutation matrix – definition dossier with expected performances

For the Innovative Electrical Network (IEN) decentralized architecture concept, activities in 2016 will focus on:
- The study and design of an enhanced distribution control unit (EDCU), based on classical voltage but including new functionalities (power electronic module for new functions as starter generator, motor control etc)
- In parallel to anticipate the future, the specification of the Innovative Electrical Network (in which EDCU will be a component, embedded later in the project).

<u>WP6 Major Loads:</u>
- **WP6.0 Aircraft Loads Architecture:**

In 2016 and 2017, Airbus will provide the aircraft level electrical system architecture for the large passenger aircraft (A320 type). Additional investigations related to certifiability as well as the verification and validation (V&V) strategy will be documented.
- **WP6.1 E-ECS:**

In 2016, the trade-off on new electrical ECS architectures for a single-aisle application, extended to thermal management and with Trans ATA consideration, will be carried out based on the specification provided by Airbus. A focus on installation aspects of the flight test demonstrator will be considered.
This study will enable to define an E-ECS architecture optimized with respect to system impact on weight and power consumption, reliability, drag increase and enhanced engine power efficiency. The optimized EECS architecture to be considered as baseline for demonstration will be selected in end 2016
The development of sensors for ozon and VOCs air quality monitoring in the cabin will be initiated with the support of a CFP partner.
In 2016 Airbus will provide the specification for minimum qualification of the electrical ECS pack integration for experimental flight test. The integration for such an electrical ECS into a

flight test aircraft will be analysed and the criteria for flight tests decision making will be defined..
A call for Proposal (CfP) to develop a flightworthy fresh air intake for the eECS system will be launched in 2016, depending upon the flight tests decision making.
The trade-off study and integration analysis of VOCs filtration system for business jet application will be initiated.

- WP6.1 Cooling/Thermal Management:

In 2016, Liebherr will perform a trade-off study for new generation of supplemental cooling system based on the specification provided by Airbus.
Airbus will provide the specifications for thermal systems comprising vapor cycle system and thermal management function (TMF).

- WP6.1 Adaptive ECS:

For 2016, the Core Partner GAM accession will be finalized, the demonstrator development plan confirmed,
The baselining activity of cabin air quality will start, based on a cabin air quality sampling campaign.
Starting of definition activities for the Adaptive ECS control system architecture and algorithms

- WP6.2 WIPS:

For Wing ice Protection System, the definition of an optimized architecture for Large aircraft based on preliminary work performed in JTI Clean-Sky and with focus on performance, weight, reliability and maintainability will be achieved in 2016. The Ice protection strategy will be refined as well to optimize the power consumption.
A TRL 3 review with new architecture will be planned in end 2016. The development of a full scale demonstrator for performance tests in icing A decision gate to confirm the relevance of flight test demonstration is planned within the TRL3 review.
For Ice detection, the activities will be focused on the development on new generation of PFIDS (ice accretion rate characterization) addressing Appendix 0 and D with the support of a Core partner.

- Support to CP Wave 3 selection and GAM Accession, finalization of the activities planning on PFIDS (ice accretion rate characterization)
- decide upon need for PFIDS flight tests in icing conditions. Elaboration of the System Requirements Document

WP6.4 Integrated Demonstration and Validation:

The WP will develop an Airbus V&V Strategy which shall be agreed with all WP 5 and WP 6 stakeholders.
In 2016 ground test will be specified for the Airbus test rig AVANT in order to carry out integration tests for the thermal and ECS systems.
In 2016 will start test definition and test for concepts evaluation of a fluid cooled power electronic cooling system used for avionics and electronic components in the AVANT test rig. The results of this evaluation will be available mid-2017.
In 2016, the cabin ventilation mock up activities triggered by the CfP Wave 2 will start: Partners contract signature, development plan finalization and start of the technical activities. In parallel, Aircraft systems tests management tool CfP Wave 3 will be supported in the evaluation and contract preparation phase

WP7 Small Air Transport Activities:
WP 7.1 Efficient operation of small aircraft with affordable health monitoring systems (PAI)
EMA test plan and related test bench definition with the partner. Start endurance test on existing EMA to identify mechanical failures.
WP7.2 More electric/electronic technologies for small a/c
WP 7.2.1 electrical power generation and distribution architecture for more electric SAT
Electrical Generation and Distribution preliminary studies: CfP issue wave 4 on electrical distribution
WP 7.2.2 electrical landing gear architecture for SAT: CfP issue wave 4 on electromechanical actuator for landing gear
WP 7.2.3 Low power de-icing system: Initial ice impingement and shape analysis for requirements definition
WP 7.3 Fly by wire for small aircraft. Design and development of the main modules to be used for the next test phase. CfP issue wave 4 on high performance low cost INS
WP 7.4- Affordable SESAR operation modern cockpit and avionic solutions for small aircrafts
Topics will be held and organized by selected CP in CPW2. Detail planning and technical content will be discussed with CP, but areas of work are as follows:
- Affordable SESAR functions in cockpit
- Low-cost navigation and communication systems
- Low-cost computing platforms
- High-integrity electronics
WP 7.5 – Comfortable and safe cabin for small aircraft
WP 7.5.1 Multifunction Thermo-Acoustics insulation of cabin for small aircraft
In year 2016 will start selection of materials for passive noise and heat insulation.
Other insulation method, active insulation technologies, will be investigated.
WP 7.5.2 Advanced structural design of crashworthy configurable seats
In the 2016, manufacturing of seat demonstrator 0 will be started. Dynamic test of the seat demonstrator 0 is scheduled to end of 2016. Then the comparison of test results with simulation will be performed.
WP 7.5.3 Thermal comfort in cabin for small aircraft
In year 2016, computational model for assessment of thermal comfort will be prepared and validated.
WP 100.1 Power Electronics and Electrical Drives:
In 2016, work will begin to establish requirements for the demonstrator topics with the Systems ITD Leaders. In parallel, state of the art reviews and trade off studies will be conducted on key technologies related to power electronics, electrical drives, electrical architectures and reliability and packaging. Links to key demonstrators in the Systems ITD will also be established to obtain a clear idea of where the power electronics technology bricks would be deployed and the specific issues to be investigated.
WP 100.2 Product Life Cycle Optimization: ECO Design:
In the technologies work package activities launched in 2015 will continue in 2016, such as the development of new painting systems and the characterization of a high temperature aluminum alloy. Many development activities of environmental friendly coatings will start. On top of this, activities on additive layer manufacturing will be investigated in order to produce/repair metal and/or plastic parts.
WP 100.3 Model Tools and Simulation:
In 2016, the activities of WP 100.3 will mainly focus on the following aspects:

- Definition of requirements for the toolset, the exploitation path and stakeholders interactions.
- Development of the core modelling and simulation environment targeting a TRL4 deployment.
- Development of the modelling and design environment for actuation and landing gear and the controls architecture.
- Call for partners on Cockpit (TBD) and Aircraft Operations will be launched.

a) Major milestones planned for 2016:

Milestones		
Ref. No.	***Title – Description***	***Due date***
WP1	Mock-up of extended cockpit demonstration	2016-Q4
WP2	Strategic Topic description ready for publication	2016-Q2
WP3	System architecture review	2016-Q2
	System Architecture Trade Off / Specification at System Level	2016
	Preliminary Design Review: EMAs, ECUs and SVHA for FCS (Aileron, Spoiler, Flap and Winglet)	2016-Q3
	Critical Design Review: EMAS and SVHA for FCS (Aileron and Spoiler)	2016-Q4
	Qualification plan and procedures (EMAS and SVHA for FCS (Aileron and Spoiler)	2016-Q4
WP4	End of smart braking EMA prototype manufacture	2016-Q2
	Optimized second generation of Green Autonomous Taxiing System (system and equipment specifications)	2016-Q2
	Premilinary Design Review of Green Autonomous Taxiing System	2016-Q4
	Completion of the trade-off studies for the definition of the optimized angled wheel and tyre application	2016-Q4
	System TRL3	2016 Q2
	Partner wave 2 contract signed	2016-Q2
WP5	Partner wave 2 selection for Electrical simulation tool	2016-Q2
	CP wave 3 selection for HVDC Power Management Center	2016-Q3
	HVDC PMC Commutation matrix design validation meeting	2016-Q4
	Technology bricks selection for AC and DC starter generators	2017-Q1
	Design review for digital GCU demonstrator	2016-Q4
	Preliminary Power management center specification	2017-Q4
	Commutation matrix for Power management center – definition dossier with expected performances	2016-Q4
WP6	CfP Wave 3 Model-Based Development of a Simulation Tool for Aircraft level Energy management function Contract preparation	2016-Q4
	CP Wave 2 GAM Accession	2016-Q2
	TRL3 demonstration for an Electrothermal wing ice protection system in optimized configuration	2016
	CfP Partner Wave 3 partner kick off	2016
	CfP Partner Wave 2 kick off	2016
	Decision gate for flight tests in natural icing conditions	2016
	Selection of EECS optimized architecture	2016
	CfP Wave 2 Analysis, validation and data collection of design and operating parameters for advanced cabin ventilation concepts related to future aircraft energy management systems – Contract signed	2016-Q2
	CfP Wave 3 Aircraft Systems tests management tool– Contract preparation	2016-Q4

Milestones		
Ref. No.	***Title – Description***	***Due date***
WP 7.1	N.A.	
WP 7.2.1	CfP issue wave 4 on electrical distribution	2016-Q3
WP 7.2.2	CfP issue wave 4 on electromechanical actuator for landing gear	2016-Q3
WP 7.2.3	N.A.	
WP 7.3	CfP issue wave 4 on high performance low cost INS	2016-Q3
WP 7.5	Thermal comfort computational model preparation	2016-Q4
WP100.1	Confirmation of Demonstrator Topic Requirements	2016-Q2
WP100.3	Requirements, Interactions and Exploitation Path Defined	2016-Q2
	Software core environment TRL4 prototype complete	2016-Q4

b) Major deliverables planned for 2016:

Deliverables		
Ref. No.	***Title – Description***	***Due date***
WP1	Demonstration strategy for extended cockpit	2016-Q3
	Modular Inertial Reference Unit preliminary design	2016-Q4
WP3	Detailed layout Demonstrator setup	2016-Q4
	Technical Specification for Components	2016
	PDR report: EMAs, ECUs and SVHA for FCS (Aileron, Spoiler, Flap and Winglet)	2016-Q3
	CDR report EMAs and SVHA for FCS (Aileron and Spoiler)	2016-Q4
	Qualification Plan (EMAs and SVHA for FCS (Aileron and Spoiler)	2016-Q4
WP4	Final down selection report of optimized MLG Electrical LGERS architecture	2016-Q4
	Smart braking EMA prototype components	2016-Q2
	Complete specification (Wheel Actuator, Wheel, Landing Gear) based on trade off output and environmental assessment	2016-Q4
	Results of the trade-off studies for the definition of the optimized angled wheel and tyre application	2016-Q4
	Detailed demonstrator system description	2016 Q4
	NLG sensor prototype environmental testing	2016-Q3
WP5	Preliminary Identification & fitting methods applicable to electrical models	2016-Q4
	High power architecture Electrical simulation (MEA): - Reports on validation - Report on optimization potential	2016-Q4
	Energetic simulation: - Validation report for Implementation of reference architecture	2016
	Commutation matrix – definition dossier with expected performances	2016-Q4
	Power Electronics: - Specification of Power Electronic components	2016
	Report on the conception design review (CDR) of the DGCU demonstrator	2016-Q4
	Commutation matrix for Power management center: Trade off dossier	2016-Q4
	Preliminary Power management center architecture definition to minimize weight and cost	2016-Q4
	Report on EDCU Preliminary Design Review (PDR) and associated documentation	2016-Q4
	IEN preliminary specification	2016-Q4
WP6	e-WIPS SRD update	2016
	ETIPS TRL3 Assessment	2016

Deliverables		
Ref. No.	***Title – Description***	***Due date***
	PFIDS SRD update	2016
	Electrical architecture specification	2016
	Flight test Requirements	2016
	Selection of EECS optimized architecture	2016
	Ground test specification thermal testing	2016
	Report Cabin air quality sampling campaign	2016-Q4
WP 7.1	EMA test plan and related test bench definition with partner	2016-Q4
WP 7.2.1	Electrical Generation and Distribution preliminary studies	2016-Q4
WP 7.2.2	N.A.	
WP 7.2.3	Initial ice impingement and shape analysis for requirements definition	2016-Q4
WP 7.3	Design and development of the main modules to be used for the next test phase	2016-Q4
WP 7.4	Affordable SESAR Cockpit Architecture for SAT	2016-Q4
WP 7.5.3	Thermal comfort computational model preparation	2016-Q4
WP100.1	Requirements specifications for 2016-17 Demonstrator Topics	2016-Q3
	Solutions trade-offs for 2016-17 Demonstrator Topics	2016-Q4
WP100.3	Detailed requirements, interactions and exploitation path defined	2016-Q2
	Software core environment TRL4 early adopters deployed	2016-Q4

Description of main activities for the year 2017

WP0 Management:

The management activities will monitor and control the running activities and manage in parallel the launch of the CfP Partners from wave 6 and wave 7.

WP1 Avionics Extended Cockpit:

2017 work for WP1 will progress towards higher maturity of the technology threads, and their integration into the Extended Cockpit, also preparing a potential transfer to IADP for customization when relevant, depending on internal gates.

In WP1.1, Requirements and architecture, The Extended Cockpit concept long term evolutions will be completed, providing the final objective for the SYSTEMS demonstrations.

In WP1.2, a first set of technologies will reached a TRL between 4 and 5. This will be the case for small touch screen displays, large display (18'') and the underlying Cockpit Management software.

The vocal dialog concept will be tested on partial mock-ups, to prepare a TRL4 by 2018.

In WP1.3, the FMS architecture providing the highest level of navigation accuracy will be available as a prototype

Fly by Trajectory concept will reach TRL4 maturity, with integration into the extended cockpit defined.

The concept of modular inertial reference Unit will reach TRL4 with a representative mock up available.

WP 1.4 work on the Modular Communication platform, will issue a preliminary system design document. The development of individual components will start, in the frame of Core-Partner work. The first version of the verification and validation plan will be available.

In WP1.5, the Extended Cockpit Demonstrator will evolve towards a first functionally representative version by end 2017, where only a few technologies and functions – the more mature ones - will be inserted. :

WP2 Cabin & Cargo Systems:

2017 work for WP2 "Cabin & Cargo Systems" will kick off, with the involvement of Core partners in the GAM in S1 2017. The main objectives will be :

- Identification of existing / planned building blocks in the field of Cabin System power, Cargo and Cabin systems, and supporting sensors and network.
- Down-selection of best candidates,
- Definition of high-level specifications.
- Contribution to the harmonization of work with other ITDs/IADPs, in particular to prepare the customization of WP2 solution for target vehicles.

  This work plan will be reviewed with the core partners selected in this WP.

WP3 Innovative Electrical Wing:

Large AC:

The Smart Integrated Wing demonstrator architecture will be detailed further keeping the flexibility, scalability and modularization of the system demonstrator as main focus.

Main challenges will be the signal architecture (e.g. switchable digital Bus communication), the different power supplies (High Voltage Direct Current...), the setup of single systems into a Smart Integrated Wing demonstrator and the system control with visualization.

Regional AC:

After the Item specification in 2016, in 2017, the trade-off will be achieved to select the Items of the FCS architecture with assistance of models and virtualization.

The following technical developments will be achieved:

- Wing Architecture tradeoff
- System specifications of main equipment (FCC/MCU, EMA, DOP)
- EMA Aileron specifications
- EMA Winglet specifications
- Local Health-Monitoring at Equipment Level
- Local Health-Monitoring at System Level
- System Modeling (Functional, Organic, Performances)
- EMAs Bench definition(Components, Sub-Systems, System)
- Sensor type tradeoff (Load Sensors, Strain Gauge, RVDT, LVDT, Temperature, ...)
- Data On Power trade-off
- Electrical Network (Power on demand) trade-off
- ICD definition (System, Equipment)
- System Bench definition (Equipment, Sub-Systems)

The flight control systems development for the new electrical wing for the Regional Aircraft (FTB2) will be driven by Airbus Defense & Space specifications. Detailed design of Flap tab and winglet tab is planned to be finished at the beginning of 2017. In parallel all qualification plans and procedures will be finished in the middle of 2017. For all EMAs (Aileron, Spoiler, Flap and Winglet), manufacturing and assembly of units will cover the rest of 2017.

WP4 Landing Gear System:

WP4.1 Main Landing Gear: End of prototype smart braking EMA tests and design of the optimized distributed braking system demonstrator. The landing gear extension / retraction system will be designed. Verification of the optimized angled wheel and tire architecture by subscale mock-up demonstrator tests. The Green Autonomous Taxiing System will be defined.

WP4.2 Nose Landing Gear: The Electro-Hydrostatic Actuation System will reach TRL4 once components and system design has been verified. Design of CFRP parts will close. Integration for test and demonstration will start at year end.

WP4.3 Rotorcraft Landing Gear System:

The full electric actuation system, including the electrical braking system will be defined and its design will reach TRL3. The validation of components will start in preparation of next level or readiness review.

WP4.4 Sensors Systems: The activities in 2017 will see the finalization of the individual system's components testing preparation and the tests completion. The modified Landing gear load test will take place and the fatigue testing will start. Depending upon the effective Partner contract signature date, TRL5 could be achieved by end 2017.

WP5 Electrical Chain:

- **Electrical architecture:**

For 2017, the activities will mainly consist in:

- Identification of fitting methods applicable to fit electrical models
- Starting of Adaptation or creation of electrical generic models to be used for fitting hardware
- Starting of Toolbox elaboration to perform parameter identification and to fit electrical models according to experimental data
- Follow up of the Partners technical activities
- Delivery of HVDC power management center commutation matrix units for individual tests in other leaders test benches
- **Generation:**

During 2017 period, activities will be planned to pursue the development of technology bricks and demonstrators for generation (WP5.1.1 and WP5.1.2) and conversion (WP5.1.3) work packages. For the end of the year, digital generator control unit (DGCU) is expected with a TRL4/5 maturity level. Concerning energy storage, workshops should allow the definition of relevant energy storage architectures meeting security and safety requirements.

Energy Management:

For Energy management, activities in 2017 will mainly focus on the completion of power management center definition and the analysis of the components and cooling needs :

- Power management center specification completion
- Pursue Cooling technologies analysis to reduce power consumption, reliability, and to ease integration. A focus on air cooling technologies will be addressed
- Specification of power electronics components
- Delivery of Commutation matrix (hardware)

For the Innovative Electrical Network (IEN) decentralized architecture concept, in 2017, EDCU activities will be continued with EDCU detailed design. Then, Critical Design review will take place before starting integration and manufacturing. In parallel and following 2016 results, IEN specification will be further detailed.

<u>WP6 Major Loads:</u>

- WP6.0 Aircraft Loads Architecture:

In 2017, Airbus consolidate the aircraft level electrical system architecture for the large passenger aircraft (A320 type) and associated V&V strategy
After contract signature and development plan finalization, the activities related to the CfP Wave 3 concerning Thermal and Electrical energy management functions will start with Specification of Requirement for Electrical and Thermal Management

- WP6.1 E-ECS:

In 2017, the integration analysis of the selected electrical ECS architecture into the flight test aircraft will be pursued to freeze the main mechanical and pneumatic interfaces.
The development of an airworthy full-scale E-ECS demonstrator will be initiated from 2017 based on the selected architecture. This demonstrator will enable to validate the performance objectives and integration aspects with air intake) in full scale configuration.
The development of sensors for ozon and VOCs air quality monitoring in the cabin with the support of a CFP partner will be pursued and the first prototype will be delivered for testing in Liebherr facilities.
The development of a flightworthy fresh air intake for the eECS demonstrator will be initiated with the support of the CFP partner.
A dedicated filtration system for business jet application to remove VOCs pollutant will be developed.

- WP6.1 Cooling/Thermal Management:

In 2017 a ground demonstrator will be developed to perform performance tests in AVANT thermal test bench.
The integration analysis and the program test to be performed in ZAL facilities' will be defined with Airbus

- WP6.1 Adaptive ECS:

For 2017 the activities will mainly consist in:
Achieving cabin air quality sampling campaign to establish baseline cabin air quality
Completing the Development of the Adaptive ECS control system architecture and algorithms

- WP6.2 WIPS:

For Wing ice Protection System, the development of a full scale demonstrator for performance tests in icing Wind Tunnel test will be initiated based on the optimized architecture selected in end 2016.
The TRL3 of Primary in-Flight Icing Conditions Detection System and of the Ice accretion rate will be prepared and passed

- *WP6.4 Integrated Demonstration and Validation:*

Beginning of 2017, the integration of Vapor Cycle system delivered by WP 6.1 will be prepared with the definition of integration tests. In mid-2017 the system will be delivered and integrated in the AVANT test rig. The tests will start end 2017 and deliver results in early 2018
Airbus will finalize the requirements for flight test installation of an electrical ECS system including fresh air intake and power supply, according to decision gate outcomes.

Planning and design of a fully representative physical cabin mock-up in consideration of future long range concepts (twin aisle) will be performed.

WP6.4 Test facilities:

Tests of integration of specific equipment for business jet application will be carried out (e.g. WIPCU, Li HVDC batteries).

<u>WP7 Small Air Transport Activities:</u>

WP 7.1 Efficient operation of small aircraft with affordable health monitoring systems (PAI)

- Test on existing EMA completed
- Technologies down selection innovative EMA/ECU for small aircraft
- preliminary design on innovative EMA (PDR)
- detail design on innovative EMA (CDR)

WP7.2 More electric/electronic technologies for small a/c

WP 7.2.1 electrical power generation and distribution architecture for more electric SAT

- Virtual and laboratory test bench will be used to identify problems and risk related to the selected architectures.
- Electrical Generation and Distribution preliminary studies completed (PDR)

WP 7.2.2 electrical landing gear architecture for SAT: Preliminary Design of electromechanical actuator for landing gear.

WP 7.2.3 Low power de-icing system: Preliminary design de-ice system and power definition (PDR)

WP 7.3 Fly by wire for small aircraft: Preliminary design of Iron bird selected modules for test campaign (PDR).

WP 7.4- Affordable SESAR operation modern cockpit and avionic solutions for small aircrafts

Topics will be held and organized by selected CP in CPW2. Detail planning and technical content will be discussed with CP, but areas of work are as follows:

- Affordable SESAR functions in cockpit
- Low-cost navigation and communication systems
- Low-cost computing platforms
- High-integrity electronics

WP 7.5 – Comfortable and safe cabin for small aircraft

WP 7.5.1 Multifunction Thermo-Acoustics insulation of cabin for small aircraft

In year 2017, laboratory testing of different materials for noise and thermal insulation will be initiated. Synergy of composite materials in area passive insulation will be designed.

WP 7.5.2 Advanced structural design of crashworthy configurable seats

In 2017, design and calculation of the seat demonstrator 1 intended for manufacturing will be started. First manufactured seat prototype for testing will be ready in the 2017.

WP 7.5.3 Thermal comfort in cabin for small aircraft

The main efforts for year 2017 will be directed towards multidimensional analysis of thermal comfort factors.

<u>WP 100.1 Power Electronics and Electrical Drives:</u>

In 2017, modelling and simulation activities will be performed in response to the Demonstrator Topic requirements to develop further insight into key technologies as an enabler for more electric aircraft. Results of these together with the trade-off studies will be used to conduct Preliminary Design Reviews for the Demonstrator Topics.

<u>WP 100.2 Product Life Cycle Optimization: ECO Design:</u>

In 2017 research activities on coating systems and additive manufacturing will continue and first results should come. The characterization of the high temperature aluminium alloy shall be closed in the middle of the year. Some activities for the development of carbon-fiber-reinforced plastic parts and eventually their functionalization (for example thermal and electrical conductivity) will also start through launched CfP.

WP 100.3 Model Tools and Simulation:

In 2017, the activities of WP 100.3 will mainly focus on:

- Development of the core and simulation environment will be continued targeting TRL5 prototype deployment.
- The aircraft-level optimization platform will be specified and development progressed.
- Development of the modelling and design environments for actuation and landing gear including control and management functions will be progressed and a demonstration will be hold.

a) Major milestones planned for 2017:

Milestones		
Ref. No.	***Title – Description***	***Due date***
WP1	First instance of extended cockpit demonstration	2017-Q4
	TRL4 Modular Inertial Reference Unit	2017-Q2
WP2	Kick off WP2	2017-Q1
	Roadmap of technologies and integration plan	2017-Q4
WP3	Smart Integrated Wing TRL3	2017-Q4
	End of Components Trade Off / Specification at Component Level	2017
	Components Preliminary Design Review	2017
	Critical Design Review: EMAS (Winglet and Flap), ECUs (Aileron and Spoiler)	2017-Q3
	Qualification plans and procedures EMAS (Winglet and Flap) and ECUs (Aileron &Spoiler)	2017-Q3
	Manufacturing and assembly of EMAs (Aileron, Spoiler and Flap), Qualification of SVHA(Aileron)	2017-Q4
WP4	Launch of MLG Electrical LGERS demonstrator design	2017-Q1
	MLG Electrical LGERS TRL3	2017-Q4
	End of smart braking EMA protoptype tests	2017 Q1
	End of smart braking EMA demonstrator design	2017-Q4
	Detailed Design Review of Green Autonomous Taxiing System	2017-Q2
	Manufacturing Review of Green Autonomous Taxiing System	2017-Q4
	Tests results analysis for optimized angled tyre available	2017-Q4
	Launch of MLG Electrical LGERS demonstrator design	2017-Q1
	Load Testing completed	2017-Q3
	System TRL5	2017-Q4
WP5	CP wave 3 kick-off on HVDC Power Management Center	2017-Q1
	Article review for digital GCU demonstrator	2017-Q4
	Specification of power electronics components	2017-Q2
	Commutation matrix delivery (hardware)	2017-Q4
	EDCU CDR	2017-Q3
WP6	CfP Wave 3 Model-Based Development of a Simulation Tool for Aircraft level Energy management function Contract signed	2017-Q1
	Adaptive ECS system leveraging existing technologies and components at TRL 4	2017-Q3
	eWIPS/PFIDS/IWT tests preparation	2017

Milestones		
Ref. No.	***Title – Description***	***Due date***
	Primary in-Flight Icing Conditions Detection System TRL3	2017-Q2
	Ice accretion rate function TRL3	2017-Q3
	eWIPS/PFIDS/IWT tests preparation	2017
	Development of the vapor cycle system	2017
	CfP Fresh air intake PDR	2017
	Preliminary definition of installation constrains for EECS flight test demonstration	2017
	CfP Wave 2 Cabin air ventilation mock up – Specification of requirements for a future long range cabin mock-up	2017-Q2
	CfP Wave 3 Aircraft Systems tests management tool– QG Phase 1 - Definition Freeze	2017-Q2
WP 7.1	Preliminary Design review Critical Design review	2017-Q3 2017-Q4
WP 7.2.1	Preliminary Design review	2017-Q3
WP 7.2.2	N.A.	
WP 7.3	Preliminary Design review Critical Design review	2017-Q4
WP 7.4	Technology Element & System Design and Gate Reviews (Batch 1)	2017-Q4
WP 7.5	Initiation of material testing for active and passive insulation	2017-Q2
	Dynamic material properties database	2017-Q1
WP100.1	Results from the modelling and simulation activities will inform Preliminary Design Reviews for the selected Demonstrator Topics for 2016-17	2017-Q3
WP100.3	Modeling and design environments for landing gear and EMA & EHA demonstrated	2017-Q3
	Software core environment TRL5 prototype complete	2017-Q4

b) Major deliverables planned for 2017:

Deliverables		
Ref. No.	***Title – Description***	***Due date***
WP1	Inegrated Modular Communication preliminary system design document	2017-Q2
	Vocal dialog concept TRL4 evaluation synthesis	2014-Q4
WP2	Preliminary Validation Strategy	2017-Q3
	State of the art and solution down-selection	2017-Q4
WP3	Optimized system architecture report	2017-Q3
	Components preliminary Design	2017
	CDR report EMAS and ECUs (Aileron and Spoiler)	2017-Q3
	Qualification plans and procedures EMAS (Winglet and Flap) and ECUs (Aileron &Spoiler)	2017-Q3
	Manufacturing and assembly of EMAs and ECUs (Aileron, Spoiler and Flap, Qualification Report of SVHA (Aileron)	2017-Q4
WP4	MLG Electrical LGERS system and equipment specification	2017-Q1
	Smart braking EMA protoptype tests report	2017 Q1
	Smart braking EMA demonstrator design dossier	2017-Q4
	Complete prototype	2017-Q4
	Tests results analysis for optimized angled tyre	2017-Q4
	System demonstration plan	2017 Q3
	MLG Sensors functional testing	2017-Q2

Deliverables		
Ref. No.	***Title – Description***	***Due date***
	MLG Sensors environmental testing	2017-Q3
WP5	Preliminary Update of generic electrical SABER model library	2017-Q2
	High power architecture Electrical simulation (MEA): - Reports on validation - Report on optimization potential	2017-Q4
	Energetic simulation: - reports with alternate architectures	 2017
	HVDC PMC - Commutation matrix –(hardware)	2017-Q4
	Air cooling architecture specification in pressurized and unpressurized zones	2017
	Power Electronics: - Modular integration software Specification - Modules definition dossier from Partner	 2017 2017
	DGCU demonstrator	2017-Q4
	EDCU Critical Design review documentation	2017-Q3
	Power management center specification Specification of components Power management center Commutation matrix (hardware)	2017-Q2 2017-Q2 2017-Q4
WP6	CfP Wave 3 Model-Based Development of a Simulation Tool for Aircraft level Energy management function Specification of Requirement for Electrical and Thermal Management	2017-Q2
	IWT test program and demonstrator specification	2017
	Small scale icing wind tunnel tests for validation of the Ice Accretion Rate Function performances (TRL4)	2017-Q3
	Preliminary System Description Document of the Primary in-Flight Icing Conditions Detection System (TRL3)	2017-Q2
	Preliminary System Description Document providing a description of the PFIDS with Ice Accretion Rate Function embeded (TRL3)	2017-Q3
	Certifiability/V&V plan	2017
	Installation Specification	2017
	CfP Fresh air intake Statement of Work	2017
	CfP Fresh air intake PDR document	2017
	Ground test specification vapor cycle system integration	2017
	Report Cabin air quality sampling campaign	2017-Q3
	Report Adaptive ECS control system architecture and algorithms	2017- Q3
	CfP Wave 2 Cabin air ventilation mock up – Planning document for used measurement techniques and test matrix	2017-Q2
	CfP Wave 3 Aircraft Systems tests management tool- QG1 - Specification of Database Tool	2017-Q3
WP 7.1	Test report on existing EMA Technologies down selection innovative EMA/ECU for small aircraft Preliminary design on innovative EMA (PDR output) Detail design on innovative EMA (CDR output)	2017-Q1 2017-Q2 2017-Q3 2017-Q4
WP 7.2.1	Virtual and laboratory test bench will be used to identify problems and risk related to the selected architectures Electrical Generation and Distribution preliminary studies completed (PDR)	2017-Q3 2017-Q4
WP 7.2.2	Preliminary Design of electromechanical actuator for landing gear	2017-Q3

Deliverables		
Ref. No.	***Title – Description***	***Due date***
WP 7.3	Preliminary design of Iron bird selected modules for test campaign (PDR)	2017 Q4
WP 7.4	Technology Element Prototypes & Lab Validation (Batch 1)	2017-Q4
WP 7.5.1	Initiation of material testing for active and passive insulation	2017-Q2
WP 7.5.2	Dynamic material properties database	2017-Q1
WP100.1	Use of paper studies and modelling and simulation work to perform trade off studies for the selected Demonstrator Topics	2017-Q2
WP100.3	EMA & EHA actuation and Landing Gear design platforms demonstration	2017-Q3
	Control and management functions requirements and generic models	2017-Q3
	Software core environment TRL 5 prototype deployed	2017-Q4

SYS - List of Leaders and participating affiliates

Nr	Leaders	Description of activities
1	Thales Avionics	ITD Coordination and management of call for Partners and Core Partners. Extended cockpit demonstrator coordination, development of building blocks for displays, functions, flight management, supporting environment. Test and assessment of demonstrator in simulated operational conditions. Supply of cockpit building blocks and systems to IADPs.
4	Liebherr Aerospace Lindenberg	ITD Coordination and management of call for Partners and Core Partners. Wing system architecture design and HVDC network investigation. Electro-Hydrostatic Actuators for flight control and landing gear design and optimization. System design, kinematics and electrical actuation requirements definition for Tiltrotor landing gear system.
6	Safran Group SA	Stakeholder coordination and management of call for Partners and Core Partners.
10	Airbus SAS	Stakeholder coordination and management of call for Partners and Core Partners.
13	Evektor	Investigation on possible solutions to improve the thermal and acoustic comfort of the cabin on small aircraft.
14	Piaggio Aerospace	Feasibility studies on health monitoring for small aircraft systems. Trade off study for electrical system and fly-by-wire on small aircraft.
15	Dassault Aviation	Investigation on solution to improve air cabin comfort (air filtering and standardization). Maturation of 28 VDC Li-Ion battery and electronics. Initiation of activity on communication (network and SDR). Stakeholder coordination and management of call for Partners and Core Partners.
17	Airbus Defence and Space SAU	See detailed description in core text
18	SAAB	See detailed description in core text

Nr	Participating affiliates	Description of activities
2	Liebherr Aerospace Toulouse	Electrical bay system and cooling design. Electrical Environmental Control next generation system architecture design. Electrothermal Wing Ice Protection System redesign according to new specifications provided by Aiframer. Definition of call for Partners and Core Partners.
3	Liebherr Elektronik GmbH	HVDC Network investigation and power electronics technological bricks development for electrical actuation, high speed bearing machines and power center cooling.
5	Thales electrical systems	Contribution to Partners and Core Partners topics definition. Specification of generation activities and capture of Airframers requirements.
1a	Thales UK Ltd	Participation in WP meetings, contribution to CP and CfP topics, work on communication architecture and Integrated Modular Communication
1b	Thales Training & Simulation SAS	Participation in WP meetings, and contribution to CP and CfP topics, work on cockpit environment and crew interface (IHS, monitoring, simulation)
7	Sagem	Top level specification of the flight control system and architecture level system modeling. Definition of overall system benched and subsystem analysis.
8	Messier-Bugatti-Dowty	Specification and system design for full electrical actuation system for main landing gear, second generation of green autonomous taxiing system and short Turn Around Time braking system
9	Labinal Power Systems	Innovative Electrical network preliminary topology studies and components design. System architecture definition.
9a	Safran Engineering Services	Innovative Electrical network preliminary topology studies and components design. System architecture definition.
11	Airbus Operations SAS	Requirements for LPA enhanced cockpit components studied in ITD Systems
12	Airbus Operations GmbH	No activity foreseen before 2016.
16	Airbus Operations UK	See detailed description in core text
17a	Compañía Española de Sistemas Aeronáuticos (CESA)	See detailed description in core text

SMALL AIR TRANSPORT TRANSVERSE ACTIVITY

Multi-annual overview and strategic planning

The SAT Initiative proposed in *Clean Sky 2* represents the R&T interests of European manufacturers of small aircraft used for passenger transport (up to 19 passengers) and for cargo transport, belonging to EASA´s CS-23 regulatory base. This will include dozens of industrial companies (many of which SMEs), research centers and universities. The New Member States industries feature strongly in this market sector. The community covers the full supply chain, i.e. aircraft integrators, engine and systems manufacturers and research organizations. The approach builds on accomplished or running FP6/FP7 projects. Key areas of societal benefit that will be addressed are:

- Multimodality and passenger choice;
- More safe and more efficient small aircraft operations;
- Lower environmental impact (noise, fuel, energy);
- Revitalization of the European small aircraft industry.

To date, most key technologies for the future small aircraft have reached an intermediate level of maturity (TRL3-4). They need further research and experimental demonstration to reach a maturity level of TRL5 or TRL6. The aircraft and systems manufacturers involved in SAT propose to develop, validate and integrate key technologies on dedicated ground demonstrators and flying aircraft demonstrators at an ITD level up to TRL6. The activity will be performed within the Clean Sky 2 ITDs for Airframe, Engines and Systems with an aim to making the best use of synergies with the other segments of aeronautical design, with strong coordinating and transversally integrating leadership from within a major WP in Airframe ITD.

Description of main activities for the year 2016

- **SAT activities**

From 2016 will continue management activities and configuration management, defined originally in WP 0.2 B in ITD Airframe in newly established and separated SAT activity. This WP will be cancelled in ITD Airframe and further organized in SAT.

<u>WP 1 – Small Air Transport Overall A/C Design & Configuration Management</u>: Transversal coordination activities of SAT will continue with the aim to prepare base for first set of demonstrators. Successfully selected Core Partners in CPW02 will be implemented in SAT CS2 management processes, which will be deeply developed besides of management processes of each ITD. The technical description of the reference and green aircraft shall be provided to TE.

- **ITD Airframe**

<u>WP B 1.2 - Optimized Composite Structures</u>: Activities in 2016 will be mainly provided by Core partner selected in CPW2. It is expected, that during 2016 will be discussed and finalized technical content of work on the main wing box.
During 2016 the material and process selection will be completed. The activity will also include some manufacturing trials to support the selection.

In the work package focused for usage thermoplastics in secondary structures of small aircraft, will be activities focused on finding a CfP partner for cooperation on developing of methodology for design of precise parts and effective joining methods.
WP B 2.2 – High Lift Wing (SAT): During 2016, starting from the results achieved with the performed trade off study among a CfP shall be prepared and issue for low speed study.

WP B 3.4 – More affordable small a/c manufacturing
WP B 3.4.1 Automated assembling of SAT structures: In the end of 2015 will be provided study on automated processes in low volume production. Based on the results of this study will be accommodated decision, how to continue in this sub-WP.
WP B 3.4.2 - Effective Joining Methods of Metal-Composite Hybrid Structures: In the 2016, the scope of joints to be optimized will be pinpointed. Consequently, specimens will be designed and tested to assess basic mechanical and electromagnetic behaviour of these joints.
WP B 3.4.3 - Non jig assembling: At the beginning of 2016, we will make decision based on the specimen testing results of first phase, if the second phase of tests is necessary.
At the beginning of 2016 it will be finalized first demonstrator produced with developed technology.

- **ITD Engines**

WP7 – Light weight and efficient Jet-fuel reciprocating engine: The ITD engine Work Package 7 focuses on piston engines burning jet fuels, in the power range suitable for general aviation, from 5 to 19 seats. These technologies will bring new solutions to replace old gasoline leaded fuel piston or small turbines. The scope includes the core engine, but also on equipment (turbocharger), the propeller integration and the aircraft installation optimization. These activities have been prepared by the leader during years 2014-2015. 2016 activities will be mainly performed by the CfP partners.

WP 8 Reliable and more efficient operation of small turbine engines (19 seats): Work Package 8 (MAESTRO) target is to maintain and strengthen the European competitiveness in Small Air Transport turboprop market by providing next generation turboprop engines and propeller for up to 19 seats aircraft, developing design tools and manufacturing technologies for application in both, spiral development programs as well as new engine architectures, contributing to ACARE SRA goals achievements. 2016 will be focused mainly on the design activities and Test preparation.

- **ITD Systems**

WP7:

WP 7.1 Efficient operation of small aircraft with affordable health monitoring systems (PAI):
EMA test plan and related test bench definition with partner; Start endurance test on existing EMA to identify mechanical failures.
WP7.2 More electric/electronic technologies for small a/c
WP 7.2.1 electrical power generation and distribution architecture for more electric SAT
Electrical Generation and Distribution preliminary studies: CfP issue wave 4 on electrical distribution

WP 7.2.2 electrical landing gear architecture for SAT: CfP issue wave 4 on electromechanical actuator for landing gear
WP 7.2.3 Low power de-icing system: Initial ice impingement and shape analysis for requirements definition

WP 7.3 Fly by wire for small aircraft: Design and development of the main modules to be used for the next test phase. CfP issue wave 4 on high performance low cost INS.

WP 7.4- Affordable SESAR operation modern cockpit and avionic solutions for small aircrafts
Topics will be held and organized by selected CP. Is expected, that Core partner will be selected in CPW2. Detail planning and technical content will be discussed with CP, but areas of work are as follows:
- Affordable SESAR functions in cockpit
- Low-cost navigation and communication systems
- Low-cost computing platforms
- High-integrity electronics

WP 7.5 – Comfortable and safe cabin for small aircraft
WP 7.5.1 Multifunction Thermo-Acoustics insulation of cabin for small aircraft: In year 2016 will start selection of materials for passive noise and heat insulation. Other insulation method, active insulation technologies, will be investigated.
WP 7.5.2 Advanced structural design of crashworthy configurable seats: In the 2016, manufacturing of seat demonstrator 0 will be started. Dynamic test of the seat demonstrator 0 is scheduled to end of 2016. Then the comparison of test results with simulation will be performed.
WP 7.5.3 Thermal comfort in cabin for small aircraft: In year 2016, computational model for assessment of thermal comfort will be prepared and validated.

a) Major milestones planned for 2016:

ITD Airframe Milestones

Milestones				
Ref. No.		***Title – Description***	***Type***	***Due Date***
Management	WP 0.2B	Preparation of the annual reports	R	Q4/2016
Optimized Composite Structures	WP B 1.2	Selection of material and cost efficient production technologies	D	*Q3/2016*
High Lift Wing	WP B 2.2	CfP issue	CfP	Q4/2016
Light weight and efficient Jet-fuel reciprocating engine	M7A	Mono-cylinder final report WP7.4	R	Jan 2016
	M7B	PDR core engine improvement WP7.1	R	Jul 2016
	M7C	CDR turbocharger improvement WP7.2	R	Mar 2016
	M7D	CfP WP7.3 selection	R	Apr 2016
Reliable and more efficient operation of	M8.1.2	Target engine characteristics	R	T0+3
	M8.1.3	Initial steady state thermodynamic model	R	T0+3
	M8.2.5	RGB Concept Design Review	RM	T0+6

Milestones				
Ref. No.		***Title – Description***	***Type***	***Due Date***
small turbine engines	M8.3.3/.4	Compressor Aero & Mechanical Preliminary Design Review	RM	T0+7
	M8.4.4	Combustor Detailed Design Review	RM	T0+6
	M8.4.5	Combustor FANN Rig Test closure	D	T0+12
	M8.5.4	PT Aero Detailed Design Review	RM	T0+6
Electrical power generation and distribution	WP 7.2.1	CfP issue at wave 04	CfP	2016-Q3
Electrical landing gear	WP 7.2.2	CfP issue wave 4 on electromechanical actuator for landing gear	CfP	2016-Q3
Fly by wire	WP 7.3	CfP issue wave 4 on high performance low cost INS	CfP	2016-Q3
Cockpit and avionics solutions	WP 7.4	Affordable SESAR Cockpit Architecture for SAT	D	2016-Q4
Thermal comfort	WP 7.5	Thermal comfort computational model preparation	D	2016-Q4

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

b) Major deliverables planned for 2016:

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
Airframe	WP B 1.2	Definition of mechanical test matrix and technological trials	D	Q2/2016
	WP B 1.2	Selection of material and cost efficient production technologies	D	Q3/2016
Light weight and efficient Jet-fuel reciprocating engine	WP7.4	Mono-cylinder final report	R	2016
	D7A1	SCE final report	R	Mar 2016
	WP7.1	PDR core engine improvement	RM	2016
	D7B1	Preliminary design review	RM	Mar 2016
	WP7.2	CDR turbocharger improvement	RM	2016
	D7B2	Design validation report	R	Mar 2016
Engines	D8.1.2	Baseline engine and target specification	Spec	T0+3
	D8.1.3	Engine steady state model	D	T0+3
	D8.2.3	RGB Baseline Concept DEsign	D	T0+3
	D8.4.2	Rig Modifications for FANN Test	T	T0+7
	D8.4.4	Combustor FANN Testing	T	T0+12
Systems	WP 7.1	EMA test plan and related test bench definition with partner	D	2016-Q4
	WP 7.2.1	Electrical Generation and Distribution preliminary studies	D	2016-Q4

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
	WP 7.2.3	Initial ice impingement and shape analysis for requirements definition	R	2016-Q4
	WP 7.3	Design and development of the main modules to be used for the next test phase	D	2016-Q4
	WP 7.4	Affordable SESAR Cockpit Architecture for SAT	D	2016-Q4
	WP 7.5.3	Thermal comfort computational model preparation	D	2016-Q4

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software – T: Testing*

Description of main activities for the year 2017

- **SAT activities**

WP 1 – Small Air Transport Overall A/C Design & Configuration Management

Transversal coordination activities of SAT will continue in 2017.

- **ITD Airframe**

WP B 1.2 - Optimized Composite Structures

Activities in 2017 will be mainly provided by Core partner selected in CPW2. It is expected, early 2017 will be finalized technical content of work on the main wing box. Preliminary sizing of the wing box will be developed.
More details for 2017 will be added after successful implementation of work content of selected CP in CPW02, based on answer of CP call.
In the work package Optimized composite structures, focused for usage thermoplastics in secondary structures of small aircraft will be the activities related to development of methodology for design of precise parts.
WP B 2.2 – High Lift Wing (SAT)
In 2017 the low speed activity with selected partner shall be developed.
WP B 3.4 – More affordable small a/c manufacturing

WP B 3.4.1 Automated assembling of SAT structures
Work content will be specified on results of study on automated processes in low volume production.
WP B 3.4.2 - Effective Joining Methods of Metal-Composite Hybrid Structures
Reference state of the demonstrator will be validated by mid-2017 and ready to be used in assessing the advancement of the innovative joint development.
In 2017, numerical analyses of the reference demonstrator will continue. Having the partner selected, the work on development/optimization of the joints will be initiated. In the second half of 2017, production of the reference demonstrator is planned.
WP B 3.4.3 - Non jig assembling
In 2017, it will be evaluated design and production of the panel - demonstrator.

- **ITD Engines**

<u>WP7 – Light weight and efficient Jet-fuel reciprocating engine</u>

The ITD engine Work Package 7 focuses on piston engines burning jet fuels, in the power range suitable for general aviation, from 5 to 19 seats.
These technologies will bring new solutions to replace old gasoline leaded fuel piston or small turbines. The scope includes the core engine, but also on equipment (turbocharger), the propeller integration and the aircraft installation optimization.
2017 activities will be mainly performed by the CfP partners in line with 2016 activities.
WP 8 Reliable and more efficient operation of small turbine engines (19 seats)
Work Package 8 (MAESTRO) target is to maintain and strengthen the European competitiveness in Small Air Transport turboprop market by providing next generation turboprop engines and propeller for up to 19 seats aircraft, developing design tools and manufacturing technologies for application in both, spiral development programs as well as new engine architectures, contributing to ACARE SRA goals achievements
2017 will be focused mainly on the technologies and design solutions validation on dedicated test benches.

- **ITD Systems**

<u>WP7 Small Air Transport Activities:</u>

- WP 7.1 Efficient operation of small aircraft with affordable health monitoring systems (PAI)
  - Test on existing EMA completed
  - Technologies down selection innovative EMA/ECU for small aircraft
  - preliminary design on innovative EMA (PDR)
  - detail design on innovative EMA (CDR)
- WP7.2 More electric/electronic technologies for small a/c
  - WP 7.2.1 electrical power generation and distribution architecture for more electric SAT
    - Virtual and laboratory test bench will be used to identify problems and risk related to the selected architectures.
    - Electrical Generation and Distribution preliminary studies completed (PDR)
  - WP 7.2.2 electrical landing gear architecture for SAT
    - Preliminary Design of electromechanical actuator for landing gear.
  - WP 7.2.3 Low power de-icing system
    - Preliminary design de-ice system and power definition (PDR)
- WP 7.3 Fly by wire for small aircraft
  - Preliminary design of Iron bird selected modules for test campaign (PDR).

<u>WP 7.4- Affordable SESAR operation modern cockpit and avionic solutions for small aircrafts</u>

Topics will be held and organized by selected CP in CPW2. Detail planning and technical content will be discussed with CP, but areas of work are as follows:
- Affordable SESAR functions in cockpit
- Low-cost navigation and communication systems
- Low-cost computing platforms

- High-integrity electronics

WP 7.5 – Comfortable and safe cabin for small aircraft

WP 7.5.1 Multifunction Thermo-Acoustics insulation of cabin for small aircraft
In year 2017, laboratory testing of different materials for noise and thermal insulation will be initiated. Synergy of composite materials in area passive insulation will be designed.
WP 7.5.2 Advanced structural design of crashworthy configurable seats
In 2017, design and calculation of the seat demonstrator 1 intended for manufacturing will be started. First manufactured seat prototype for testing will be ready in the 2017.
WP 7.5.3 Thermal comfort in cabin for small aircraft
The main efforts for year 2017 will be directed towards multidimensional analysis of thermal comfort factors.

a) **Major milestones planned for 2017:**

Milestones				
Ref. No.		***Title – Description***	***Type***	***Due Date***
Management	WP 0.2B	Preparation of the annual reports	R	Q4/2017
Optimized Composite Structures	WP B 1.2	Start of activities of partners selected in CfP calls	CfP	*Q1/2017*
		Wing design concept and preliminary sizing.	D	*Q3/2017*
High Lift Wing More affordable small a/c manufacturing	WP B 3.4	Start of activities of partners selected in CfP calls	CfP	Q1/2017
		Delivery of demonstrators produced by conventional methods (WP B 3.4.2.)	D	Q4/2017
Light weight and efficient Jet-fuel reciprocating engine	M7A	Core engine tests	R	Mar 2017
	M7B	Turbo rig tests	R	Feb 2017
	M7C	Propeller Milestone (TBD wave#2)	D	2017
	M7D	CDR High power density architecture	RM	Jun2017
Reliable and more efficient operation of small turbine Engines	M8.1.6	CDP controlled accel/decel control model	D	T0+12
	M8.2.6	Preliminary assessment of installed noise effects	R	T0+6
	M8.2.7	RGB Technologies	R	T0+12
	M8.3.9	Compressor Test Readiness Review	RM	T0+12
	M8.4.6	All Additive Combustor Module Preliminary Design Review	RM	T0+10
	M8.5.7	HPT – PT rig hardware delivery	D	T0+8
Electromechanical actuator with HM design	WP 7.1	Preliminary Design review	RM	2017-Q3
		Critical Design review	RM	2017-Q4
Electrical power generation and distribution	WP 7.2.1	Preliminary Design review	RM	2017-Q3
Fly by wire	WP 7.3	Preliminary Design review	RM	2017-Q4
Cockpit and avionics solutions	WP 7.4	Technology Element & System Design and Gate Reviews (Batch 1)	RM	2017-Q4

Milestones				
Ref. No.		***Title – Description***	***Type***	***Due Date***
Multifunction thermo acoustic insulation	WP 7.5.1	Initiation of material testing for active and passive insulation	T	2017-Q2
Crashworthy Configurable Seats	WP 7.5.2	Dynamic material properties database	DB	2017-Q1

b) Major deliverables planned for 2017:

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
ITD Airframe	WP B 1.2	Material allowable assessment	R	Q2/2017
		Wing design concept and preliminary sizing.	D	Q4/2016
		Production process design and simulation	D	Q4/2017
	WP B 3.4	Methodology for design of precise parts	R	Q3/2017
		Test specification for reference demonstrators	T	Q4/2017
Light weight and efficient Jet-fuel reciprocating engine	D7A1	Core engine result	R	Mar 2017
	D7B1	Turbo rig test result	R	Feb 2017
	D7B2	High power architecture design	R	Jun 2017
ITD Engines	D8.1.5	Report on engine transient models	R	T0+12
	NA	Report on down-selected low noise technologies	R	T0+7
	NA	RGB technology maturation report	R	T0+12
	D8.3.5	Compressor Mechanical Design	R	T0+12
	NA	All Additive Combustor Module PDR	RM	T0+10
	NA	PT rig hardware delivery	D	T0+8
ITD Systems	WP 7.1	Test report on existing EMA	T,R	2017-Q1
		Technologies down selection innovative EMA/ECU for small aircraft	D	2017-Q2
		Preliminary design on innovative EMA (PDR output)	RM	2017-Q3
		Detail design on innovative EMA (CDR output)	RM	2017-Q4
	WP 7.2.1	Virtual and laboratory test bench will be used to identify problems and risk related to the selected architectures	T	2017-Q3
		Electrical Generation and Distribution preliminary studies completed (PDR)	RM	2017-Q4
	WP 7.2.2	Preliminary Design of electromechanical actuator for landing gear	RM	2017-Q3

Deliverables				
Ref. No.		***Title – Description***	***Type***	***Due Date***
	WP 7.3	Preliminary design of Iron bird selected modules for test campaign (PDR)	RM	2017 Q4
	WP 7.4	Technology Element Prototypes & Lab Validation (Batch 1)	V	2017-Q4
	WP 7.5.1	Initiation of material testing for active and passive insulation	T	2017-Q2
	WP 7.5.2	Dynamic material properties database	DB	2017-Q1

ECO DESIGN TRANSVERSE ACTIVITY

Multi-annual overview and strategic planning

Eco-Design TA will co-ordinate the activity geared toward an improved eco-compliance in air vehicles over their product life cycle. As transverse activity it profits from and builds on the Eco design work developed in Clean Sky with the aim of closing the gaps still not covered by the previous Clean Sky Eco Assessment outcomes and considering new aspects relevant to eco-compliance.
The distinctive features of Eco-Design in CS2 are:
- Eco-Design is fully transversal through all ITDs and IADPs.
- Eco-Design will likely follow up also economic and social aspects; in CS1 those aspects were only marginally addressed.
The activity leader (Fraunhofer Gesellschaft) has the task to guide the ITD/IADPs toward the implementation of the Eco-Design theme to effectively support future aeronautical products technologies with lower environmental footprint, profiting from a common and synergic approach concerning requirements, focus areas, life cycle assessment methods and guidelines. Eco-design TA has the task to properly manage the Eco-relevant activity and budget performed under the ITD/IADPs GAMs. Eco TA will be consolidated by setting up a proper GAM: Eco TA GAM will drive eco-related activities in the SPDs and TAs by coordinating data generation, selection and provision; within Eco TA GAM the data will be analysed by means of suitable eco tools and the eco assessment of selected activities will be provided.
Eco Design in Clean Sky 2 is geared toward excellence, compliance and guidelines for ecological and economic improvements and is based on two domain concepts, namely:

- The **Eco-Design Analysis (EDAS)** activity where all pillars of life value are addressed, beyond the conventional "cradle to grave" philosophy, to stimulate better re-use options and new, best practice service options, embracing all the supply chain and ITD/IADPs priorities. Eco-Design Analysis, directly linked to the development of advanced Life Cycle Assessment tools and methodologies, is a knowledge and responsibility empowerment approach, addressing widened stakeholder interests and enabling a better grasp of the full domain of ground pollution issues.
- The **Vehicle Ecological Economic Synergy (VEES)** activity is driven from Materials, Processes & Resources (MPR) innovations, from the definition of ITD/IADP demonstrators assessed through a novel adaptive Eco Hybrid Platform (EHP) tool. This is "LCA+" (Life Cycle Analysis-plus) design driven in line to develop Design for Environment (DfE) vision, and is an open platform at the level of complete vehicles. It ensures a collective vision to enhance the ITD/IADP technology streams.

Eco-Design in CS2 is related to and split into Eco-Themes; Technologies from the ITDs and IADPs will be evaluated by work units and mapped according to these Eco-Themes (e.g. End-of-Life, Manufacturing, etc.) covering all life cycle aspects.

A proper and structured cooperation with ITD/IADPs and TAs, including a governance framework, interaction model, funding allocation need to be implemented in the next period to address the action objectives, helping to progress from the preparatory work in previous period. A proper scoping and input/output scheme has to be deployed to ensure a wide SPDs involvement, hence recovering from a late start of the action compared with previous plans.

The launch of the first call topics, together with the integration of the already launched ones is also expected in the period. Workshops are also planned to evaluate new proposals.

Description of main activities for the year 2016-2017

The Eco Design TA will be led by Fraunhofer. The *Eco-Design Coordination Committee* will be responsible for the coordination of the interactions and cooperation of CS2 ITDs/ IADPs and Transversal Activities with ecoDESIGN TA. Additionally, other participants through the call processes will be involved. The *Coordination Committee Rules of Procedure* ensure an efficient management of the TA and a strong interaction with CS2 participants.
In 2016-2017 EcoTA structure based on work units will be fully deployed by pushing its transversal feature and broadening the interaction with all possible CS2 contributors: Eco TA will further consolidate technologies screening at SPD-level also considering additional Clean Sky 2 participants through CfP and CfCP processes. Upon definition of suitable selection criteria, technologies proposed by CS2 members and partners will be mapped according to ecoDESIGN Technology Mapping and prioritized: through this process the eco-excellence of CS2 will be identified and properly supported by ecoDESIGN resources.
The interface with all members and partners will be brought at operational level for data preparation, data collection and preliminary data delivery. Eco TA Coordination Committee will be fully operative and operate as core management unit within the TA and CS2 environment.

T0 Transversal Coordination: General Management activities and coordination for the Eco-Design transversal activity. (FhG, Leaders)

- T0.1: Transversal Synthesis: Transversal coordination and innovation process. (FhG)
- T0.2: General Value Activities: General Value Activities like VEES and EDAS, MPR and Data Base. (FhG)
- T0.3: Communication /Visualisation: Transversal Input / Output Communication. (FhG)

T1 Lead in Activities (planned to end in 2016): In 2016 in task T1 EcoDesign TA Leaders will prepare a Technology Mapping and EDAS Mapping for their work packages and topics in the ITDs/IADPs. The Coordination Committee will coordinate the proposed activities after evaluation with the ecoDesign TA criteria set. (FhG, Leaders)

T2 Realization Phase: In T2 (Life Value Technologies) first initiative, technology developments will start in 2016 and 2017 with SPDs. Summary VEES reports for the technologies in the eco themes work units will be produced. (FhG, Leaders)
Call Topics in the call waves of the ITDs will be screened for their eco Design related activities and Theme Calls will be launched to close the gaps arising from the Technology and EDAS Mapping process. (FhG)

T3 Eco Architecture: In this task data made available through virtual modelling and physical validation test benches will be gathered and proofed by applying the LCA tools available in Eco-Design. These activities have a strong link to Airframe WP A 1.4 dedicated to Novel Certification processes. (FhG, Leaders)

T4 Acceptance and compliance testing: In 2016-2017 the activities will support CS2 members and partners by the trade-off process and scoping/mapping of their eco-relevant technologies according to the ED-TA Eco-Themes. T4 main delivery is compliance of technologies and an overall design for compliance concept. This includes as well the evaluation of the acceptance of technology developments. (FhG, Leaders)

T5 Eco statements: First eco-statements will be presented for new proposed technologies for demonstrator parts and processes and if necessary compared with the SoA or benchmarking processes. In 2016 data sets consistency will be carefully checked and prepared for the Eco-Design Database and for the Life Cycle Inventory, which will populate the Eco Hybrid Platform (EHP). In 2017 first available new Bill of Material & Bill of Processes (BOM/BOPs) will be delivered to T6 in a suitable format for further data processing. The data will be analysed for quantifying the environmental footprint. This will allow assessing future environmental trends of the technologies in the ITDs/IADPs and further optimizing their performance at aircraft level. The work will be carried out with the data collection core team (DCCT) with strong link to the ITD/IADP teams for a harmonized data collection. (FhG, Leaders)

T5.2 Big impact technology pathways - Method and data definition

In 2016, the method to be used for the development of big impact technology pathways will be discussed with the other participants and the method will be developed to include the feedback received from the members and partners. (FhG, Leaders)

Prospective LCA of selected innovative technologies will be conducted at an early development stage for industrial application. Selected big impact technologies will be evaluated using the developed new forecasting method. For this the results of the mapping of the big impact technologies will be used. (FhG, Leaders)

T6 Eco-Design Tools & Analysis (incl. Ecolonomic Harmonization): Considering this theme in 2016-2017 new products, components and manufacturing processes to be assessed in CleanSky 2 will be identified, based on the technologies identified for assessment in the Eco Design TA. The analysis will be extended also to the supply chain. (FhG, Leaders)

T6.2 Socio-economic Derivative - Definition and Data: A process will be undertaken to reach an agreement on the definition and on the data necessary for the socio-economic derivative, starting from a methodology to be proposed. Data collection for existing technologies and production processes will be undertaken.

The activities will start in 2016. As first step, the methodology for the definition of central socio-economic requirements for product design will be defined. It will be agreed with the other EDAS activities. Activities at this stage will focus on the effects of new green technologies and processes within industrial production on the European value chain and the necessary qualifications. Especially, socio-technical and socio-economic effects of green process innovations on actual and future production technologies, on the industrial organisation at an operational level and on the job-market in the EU-aircraft industry have to be explored. (FhG, Leaders)

In addition, timely input from Clean Sky Programme conclusion expected in first semester 2016 has to be properly taken into account.

a) Major milestones planned for 2016:

Milestones				
Ref. No.		Title – Description	Type	Due Date
ecoTA	M0.1	Concept review of Eco TA (including interaction with SPDs)	RM	Q1 2016
	M0.2	Topic definition for upcoming calls	R	Q1 2016
	M2.1	Materials, Processes, Resources Workshop	WS	Q2 2016
	M0.3	1st Progress Review	RM	Q4 2016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

b) Major deliverables planned for 2016:

Deliverables				
Ref. No.		Title – Description	Type	Due Date
ecoTA	D0.1	Eco objectives assessment [technology mapping] - Integration of the high level SPD´s Eco objectives, master plan and requirements (FhG)	R	Q1 2016
	D0.2	LCA flow logic - Ecolonomic targets and expected LCA/flow logic methodologies (FhG)	R	Q1 2016
	D0.3	Eco objectives assessment [technology mapping] – 2nd Integration of the high level SPD´s Eco objectives, master plan and requirements (FhG)	R	Q2 2016
	D0.4	CS2 Eco objectives assessment [technology mapping] - Final Integration of the high level SPD´s Eco objectives, master plan and requirements (FhG)	R	Q4 2016
	D5.1	Ecolonomic KPI definition	R	Q4 2016
	D0.6	Progress report	R	Q42016

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

c) Implementation – Risk

Risk Description	Action Plan Summary
Topic proposals from participants with not adequate eco content	Revise GAM content and set up specific theme calls
Too much and not well distributed topics along the eco themes	Apply criteria for evaluation of the proposals

Description of main activities for the year 2017

a) Major milestones planned for 2017:

Milestones				
Ref. No.		Title – Description	Type	Due Date
ecoTA	M0.4	Topic definition for upcoming calls	R	Q1 2017
	M0.5	EHP/LCA logic review	R	Q3 2017
	M6.2	Socio Economic Statements - Workshop on Socio Economic Statements and Services (FhG)	WS	Q3 2017
	M0.6	Annual review	RM	Q3 2017

b) Major deliverables planned for 2017:

Deliverables				
Ref. No.		Title – Description	Type	Due Date
ecoTA	D0.7	Dissemination and Communication Plan (FhG, all)	R	Q1 2017
	D1.1	Eco Design Technologies scoping - Eco Design Technology screening, scoping and mapping synthesis (FhG)	R	Q1 2017
	D2.1	Life Value Technologies - First activity report on life value technologies (FhG)	R	Q4 2017
	D3.1	Eco Architecture - First activity report on eco architectures (FhG)	R	Q4 2017
	D4.1	Acceptance and Compliance Synthesis (FhG)	R	Q3 2017
	D5.2	Eco Design Tools, Eco Statement planning and global output including values for the KPI (FhG)	R	Q4 2017

c) Implementation risk

Risk Description	Action Plan Summary
Participants have difficulties to gather consistent data for LCA	Set-up workshops to train the partners

TECHNOLOGY EVALUATOR 2

Multi-annual overview and strategic planning

Technology and Impact Evaluation is an essential element of the Clean Sky JTI. Cross-positioned within the Clean Sky 2 Programme, the Technology Evaluator (TE) has the key role of assessing the environmental and socio-economical impact of the technologies developed in Clean Sky 2 and their level of success towards the ACARE FlightPath 2050 goals.

The Technology Evaluator covers of three major tasks:

- Monitoring of *Clean Sky 2* achievements vs. defined environmental and socio-economical objectives;
- Technology evaluation by integrating selected ITD outputs into TE concept aircraft for longer-term assessments;
- Technology impact assessments at airport and air transport system level using the IADPs' and ITDs' results as well as TEs concept aircraft.

For the 2016 to 2017 period the main objective will be to perform a 1st assessment in 2017 reaching the following milestones:

- The definition of Call mechanisms to be used for the TE and launch of first Calls; Conclusion of Grant Agreements and/or Tender contracts [whichever applicable] and start-up of activity of participants joining the TE via calls launched in 2015
- The coordination with IADPs, ITDs and TAs to define Clean Sky 2 TE's integrated planning including scheduling the exchange of results
- The delivery of CS2 reference aircraft models from IADPs to the TE

Description of main activities for the year 2016

In 2016 the following work packages will be covered:

WP0 TE management: WP0 performs the management of the TE at administrative level.

WP1 TE scope and set up: WP1 covers the overall scope and set-up of CS2 TE. It defines the TE assessment metrics to be applied in view of the environment and mobility objectives as well as selected socio-economic aspects. TE inputs and outputs will be defined. The timing and integrated planning over the whole Clean Sky 2 duration with respect to the SPDs inputs to the TE will be started.

WP2 TE Interfacing with IADPs, ITDs and TAs: WP2 covers the interfacing between the TE and the IADPs and ITDs, i.e. Airframe, Engine and Systems, Large Passenger Aircraft, Regional Aircraft and Fast Rotorcraft. Regular meetings with all IADPs, ITDs will be held during 2016 to settle the TE requirements and work plan.

WP3 TE integration at Mission level: WP3 covers mission level modeling activities. In 2016 and in coordination with the IADPs, ITDss the requirements for the CS2 reference and concept aircraft models will be defined. Additionally a set of technologies will be defined as preparation for future TE long term concept aircraft models.

WP4 TE airport impact assessment: Airport fleet traffic scenarios will be defined for the 2017 interim assessment. This assessment will only deal with LPA aircraft models input.

WP5 TE ATS impact assessment: ATS fleet and traffic scenarios will be defined for the 2017 interim assessment using for consistency reasons the CS1 TE 2020 forecast. Definition of other long term scenarios will be initiated.

h) ***Major milestones planned for 2016:***

Milestones			
Ref. No.	***Title – Description***	***Type***	***Due Date***
M1	Reception of IADP LPA reference aircraft models	D	T0+15

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

i) ***Major deliverables planned for 2016:***

Deliverables			
Ref. No.	***Title – Description***	***Type***	***Due Date***
D 1.1	TE inputs/outputs	R	T0+9
D 1.4.1	TE integrated planning 1st version	R	T0+12
D 3.1	TE reference and concept aircraft specifications	R	T0+8

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

j) ***Implementation – Risk***

Risk Description	**Action Plan Summary**
Delay to receive the IADP LPA reference a/c models	Close communication in order to mitigate the risk

Description of main activities for the year 2017

In 2017 the following work packages will be covered:
WP0 TE management: WP0 performs the management of the TE at administrative level.
WP1 TE scope and set up: WP1 covers the overall scope and set-up of CS2 TE. It defines the TE assessment metrics to be applied in view of the environment and mobility objectives as well as selected socio-economic aspects. In 2017 updates of TE inputs and outputs and integrated planning will be done.
WP2 TE Interfacing with SPDs and transversal activities: WP2 covers the interfacing between the TE and the IADPs, ITDss, i.e. Airframe, Engine and Systems, Large Passenger Aircraft, Regional Aircraft and Fast Rotorcraft. Regular meetings with all IADPs, ITDs will be held during 2017 to discuss TE outputs and work plan.
WP3 TE integration at Mission level: WP3 covers mission level modeling activities. In 2017 preparation activity for future TE long term concept aircraft models will be continued.
WP4 TE airport impact assessment: In the framework of the 2017 interim assessment, airport level impact assessments will be performed with the new IADP LPA reference aircraft.
WP5 TE ATS impact assessment: In the framework of the 2017 interim assessment, ATS level impact assessments will be performed with the new IADP LPA reference aircraft.

a) ***Major milestones planned for 2017:***

Milestones			
Ref. No.	***Title – Description***	***Type***	***Due Date***
M2	2017 TE assessment	R	T0+21

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

a) ***Major deliverables planned for 2017:***

Deliverables			
Ref. No.	***Title – Description***	***Type***	***Due Date***
D 1.4.2	TE integrated planning 2nd version	R	T0+30
D 3.6	Mission level assessment report for LPA aircraft results	R	T0+21
D 4.4	Airport aircraft assessment report	R	T0+19
D 5.4	ATS assessment report	R	T0+19
D 7.1	2017 assessment synthesis report	R	T0+21

**Type: R: Report - RM: Review Meeting - D: Delivery of hardware/software*

b) ***Implementation – Risk***

Risk Description	**Action Plan Summary**
Delay to receive the IADP LPA reference a/c models	Close communication in order to mitigate the risk

3.3.3. Dissemination and information about projects results

The JU will continue to adapt and exploit the common FP7 and Horizon 2020 IT systems available in the Commission. Besides continuous monitoring of the dissemination activities related to the projects performed by the members and the Partners , during their implementation (according to the applicable periodicity and certainly at the final reporting), the JU (the Project Officers inside the Operational Team) will ensure that the requirements of the grant agreements in this regard are met. The JU also intends to have an SNE which could take a more strategic view at dissemination arising from the Clean Sky programme in particular in a first instance. He/she would also help the JU to maintain a JU database of publications and related KPIs, based on integration of the dissemination plans and register by the ITDs; He/she will also ensure the collection of the list of patent applications. The JU also plans to improve its website and this SNE can contribute to that effort, in collaboration with the Communication function. He/she will explore and implement solutions for search and access of project information, deliverables and reports with data mining and visualisation tools capabilities. The JU will further consider the aspect of exploitation and a means to monitor the implementation of the results after the end of the actions.

3.4. Call management rules

The process related to the submission of proposals as Core Partner is explained in the JU *"Rules for the submission of proposals, evaluation, selection, award and review procedure of Core Partners"* available on the CSJU website: http://www.cleansky.eu/
The rules applicable to the Calls for Proposals (for Partners) are the *H2020 rules for participation,* the derogation on the application from single entities (so called mono-beneficiary) is a specific derogation applicable to CSJU under EC Delegated Regulation (EU) No 624/2014 of 14 February 2014.

The call for proposals process will be conducted in line with H2020 applicable guidance documents for calls for proposals, any specificity in the submission and selection process is set out and described in the JU *Rules for submission, evaluation, selection, award and review procedures for Calls for Proposals* which pursuant to CSJU Regulation n° 558/2014 of 6th May are to be approved by the Board and published on the JU website and on the Participant Portal.

On a practical level, both the Calls for proposals and Calls for Core Partners will make use of the European Commissions' participant portal:
http://ec.europa.eu/research/participants/portal/desktop/en/home.html

3.5. Support to Operations

3.5.1. Communication and events

Key communication activities will include increasing the visibility and reputation of the organisation by conveying JU's achievements, successes and the promotion of Clean Sky 2 Calls for proposals. We will sharpen our message, expand our networks and make our brand visible, consistent and reputed

Clean Sky 2 JU will rely on multipliers and ambassadors:

- Clean Sky 2 Members: industrial leaders and European Commission;
- Local multipliers in the Member States such as States Representative Group (SRG) reaching out to potential applicants;
- Clean Sky project coordinators and participants, who will communicate the successes of Clean Sky to various national and European audiences;
- Clean Sky management and staff and Clean Sky communications network;
- ACARE, reaching out to policy makers inside ACARE companies;

Actions

a) <u>Attract the best technology in Europe to apply for Clean Sky 2 projects</u>

TARGET GROUPS:	**Potential applicants**: IADP/ITD leaders, Large, Small and Medium Enterprises, academia
MESSAGE:	Benefits of participation in Clean Sky 2 projects
ACTIONS:	**Promotion of Calls** • Brand new web site expanding on the Clean Sky 2 section; • Info Days sessions around Call launch • Open Webinar • SRG promotion in each country • Clean Sky management and staff active participation at events • Partnership with SMEs European organisations **Clean Sky visibility at key events:** • Paris-Le Bourget in 2017 • Clean Sky Forum in 2016 and 2017; • ILA Berlin and Farnborough Air Shows in 2016; • ASD Annual event • Clean Sky 2 national events

b) <u>Keep decision makers aware by demonstrating progress of Clean Sky 2</u>

TARGET GROUPS:	**Policy makers** in the area of research, innovation, transport, and environment, and SMEs in industry and public institutions.

MESSAGE:	**Success** of demonstrators in on-going technical projects
ACTIONS:	• **High-level meetings** with national and European policy-makers; • **Targeted meetings/invitations to Demonstrator-related events to** representatives of the European Commission, the European Parliament, EU Permanent Representations, and the business community; • **High-level media coverage** through press work, press releases, and opinion articles in leading and specialised media.

c) <u>Internal enabler: Support IADP/ITD/TA coordinators and project officers</u>

TARGET GROUPS:	**CS ITD coordinators, CS2 IADP/ITD/TA coordinators, project officers**
MESSAGE:	**Ex-ante and post-project interaction** with communications to optimise visibility, advocacy and influence of Clean Sky
ACTIONS:	Provide **communications guidance** and support for their contributions to the web site, events, printed and digital publications as well as other communication tools available.

d) <u>Maximise efficiency and effectiveness of Clean Sky communications efforts.</u>

TARGET GROUPS:	**ITD leaders communications professionals, Clean Sky management and staff**
MESSAGE:	Maximise internal information and coordinate well external actions while aligning messages and timing
ACTIONS:	• **Align messages** to speak with a single voice at events, high-level meetings and when doing media relations. Improve narrative to reach out various audiences • **Coordinate communication activities** with Communications network group • Conclude **contracts** with external communication suppliers where more efficient and needed

3.5.2. Procurement and contracts

For the years 2016-2017 the JU will assign the necessary funds for the procurement of the required services and supplies in order to sufficiently support its administrative and operational infrastructures.

From its autonomy, the JU has efficiently simplified the procurement process by establishing multi-annual framework contracts and Service Level Agreements for the supply of goods and services and by joining inter-institutional tenders and joint tenders with the European Commission and other Joint Undertakings to reach optimization of resources.

In 2016-2017 a few new calls for tenders are expected to be launched due to the fact that some framework contracts started at end of 2013 for a 3 or 4 year duration. The tenders planned to be launched in 2016-2017 are expected to support some core activities mainly in the field of communication for specific events and activities and in the IT field.

A summary table is made available below listing the tenders planned for 2016-2017 and the procurement procedure expected on the basis of the information currently available which may be subject to modifications.

Contracts to be tendered in 2016-2017 [10]

Title *indicative*	**Expenditure (EUR)** *Indicative*	**Type of procedure**	**Schedule** *indicative*
2016			
HR related activities and events			
Team building activities	max. 15.000	Negotiated procedure for low-value contracts	2016
Programme management related			
Dissemination of research results. Repository for CSJU website	< 134.000 EUR	Negotiated procedure	1st quarter 2016
Communication related activities and events			
Organisation of stand at Farnborough Air Show	max.50.000	Negotiated procedure for low-value contracts	2nd half of 2016
Clean Sky Forum	max. 20.000	Negotiated procedure for low-value contracts	1st half of 2016
Demonstration Events	max. 30.000	Negotiated procedure for low-value contracts	1st and 2nd half of 2016

[10] Estimate

Title *indicative*	**Expenditure (EUR)** *Indicative*	**Type of procedure**	**Schedule** *indicative*
3AF/CEAS Greener Aviation 2016-Clean Sky breakthroughs	max. 144.000	Negotiated procedure for low-value contracts	2nd half of 2016
Media partnerships	max 25.000	Negotiated procedure for low-value contracts	1st half of 2016
New Clean Sky website	max 60.000	Negotiated procedure for low-value contracts	2nd half of 2016
Clean Sky Book	max 60.000	Negotiated procedure for low-value contracts	1st half of 2016
Total:**488.000 EUR**			
2017			
HR related activities and events			
Team building activities	max. 15.000	Negotiated procedure for low-value contracts	2017
Communication related activities and events			
Organisation of stand at Paris Air Show	max.50.000	Negotiated procedure for low-value contracts	1st half of 2017
Organisation of Conference at ILA Air Show	max.20.000	Negotiated procedure for low-value contracts	1st half of 2017
Demonstration Events	max. 30.000	Negotiated procedure for low-value contracts	1st and 2nd half of 2017
Clean Sky Forum	max. 20.000	Negotiated procedure for low-value contracts	1st half of 2017
Media partnerships	max 25.000	Negotiated procedure for low-value contracts	1st half of 2017
Total: **160.000 EUR**			

3.5.3. IT and logistics

The biggest item on the ICT agenda for 2016-2017 is the replacement of our servers, tape backup system, telephone exchange and other core ICT infrastructure. The core equipment dates form 2010 and some items are even older.
Moreover, it was dimensioned in size and lifespan for initial Clean Sky programme under FP7. Therefore, a renewal is required and this opens fundamental questions about the ICT architecture which will be brainstormed in technical workshops with options then presented to management (in-house servers, external data centre, cloud solutions etc.).
For 2016, the JU has to complete the upgrade of our encrypted connection to EC systems (s-Testa to Testa-NG) and to re-new/upgrade/expand work stations and office equipment when needed.
On the issue of applications, in 2016 CSJU will move into new workflows in the H2020 grant management tools which will require customisations and staff training. Also, in 2016 the JU will decentralise the access rights management, team composition specifications and role definitions in the H2020 tools from the European Commission to Clean Sky. The ability to do this will increase the overall levels of efficiency and effectiveness.

3.5.4. JU Executive Team – HR matters

According to the Council Regulation 558/2014, the Staff Regulations of officials of the European Union and the conditions of employment of other servants of the European Union will apply to the staff of the CSJU and its Executive Director.

The JU team of statutory staff consists of 38 positions currently. The team will be complete in early 2016 with the final recruitments taking place being the total filled positions to 42. At the beginning of 2016 the JU will manage 229 grant agreements for partners in addition to the 7 grant agreements for members in Clean Sky programme (consisting of 198 beneficiaries financial reports and 7 annual technical reports) and 7 grant agreements for members of the Clean Sky 2 Programme (consisting of approximately 69 financial reports from leaders, up to 75 financial reports from Core Partners and 7 annual technical reports). In addition, the first GAPs will have been signed in 2015 and some reporting from these will be due in 2016. As foreseen, the ramp up of the number of grant agreements with partners in place brings a significant burden to the JU to monitor, control and finalise. As the JU moves closer to the demonstrators, the remaining grant agreements need to be closed as they deliver the technical activities foreseen. Of the 38 positions currently recruited, 25 positions are involved in the grant management area (excluding senior management tasks).

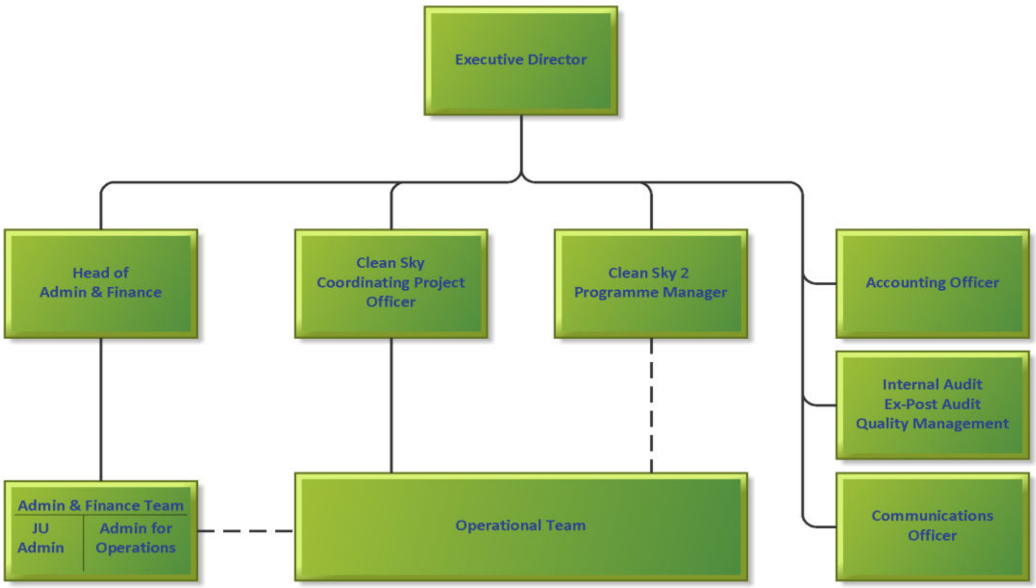
While 2015 was the seventh year of existence for the JTI, it was also the first year of the implementation of the reclassification exercise for JU staff. The JU will implement its next phase of this exercise in 2016. The necessary update to enable this to take place has been foreseen in the establishment plan 2016.

SNEs – meeting the unexpected challenges

The JU proposes to use the possibility granted to it in the CS2 regulation, to complement the staff of the JU with Seconded National experts (SNEs) to ensure adequate coverage of the tasks which cannot be absorbed by the existing staff. The JU has planned for the secondment of 2 national experts with 2 different primary objectives in mind.

The first SNE will deal with the increasing number of links between Clean Sky 2 and the European Structural and Investment Funds and the European Regional Development Fund (for details see section 3.2.3). The JU, when requesting its current 42 staff did not contemplate the significant interest already shown in complementing Clean Sky 2 activities through synergies with these funds. This SNE will ensure an appropriate and timely follow-up to the implementation of the various MOU which the JU has already entered and will help to set up but more importantly implement further MOU as appropriate. This will include identifying appropriate projects with the regions whose work on innovative technologies can be assisted by being associated to Clean Sky 2. The SNE will enable the JU to streamline the process associated with these actions so that both parties can best benefit from this cooperation. In this dedicated resource, the JU intends to extend its approach to reach out to more participants in the area of research funding and in so doing, shall bring the CS2 objectives more to the forefront of regional authorities and industry, including as specific targets, SMEs.

The second SNE will assist the JU to meet the challenge of ensuring the vital role of monitoring the use and dissemination of the research results of Clean Sky. As the largest EU aeronautics research programme, the output already being delivered needs to be disseminated to as wide a public as possible. While the current tools are constantly being improved, it is proving difficult to adequately resource the list of various actions which the JU would like to follow up in this regard. As these aspects are among the issues which the JU needs to use best 'market' itself and the success of FP7 funding, this SNE could play a pivotal role in expressing this achievement.
The staff plan of the CSJU is set out in the "Staff establishment plan" (see chapter 4.2).
The organisational structure of the JU is shown below. The structure shows how the 'administration and finance' team works for the most part on the 'operational' files of the JU, i.e. with and for the grant agreements of beneficiaries. The administration of the administrative costs is a minor task for this team. The structure also shows the functional link from the operational team to the CS2 programme manager.



3.5.5. Budget and finance

The Clean Sky 2 Joint Undertaking manages 2 programmes and therefore, having provided the individual programme budget in the previous chapters, the consolidated annual budget of the Joint Undertaking is set out below. These figures are the addition of the 2 programme elements above. The administrative costs are shared between the 2 programmes based on the available payment appropriations coming from the EU subsidy.

The detailed Annual Budget for the years 2016-2017 is summarized as follows:

Budget 2016	Commitment Appropriations	Payment Appropriations
Title 1 Expenditures	4.500.000	4.777.334
Title 2 Expenditures	2.540.316	4.326.694
Title 3 Expenditures	35.033.639	64.309.472
Title 4 Expenditures	216.064.240	214.157.392
Title 5 Unused Appropriations	561.662	184.856
Total Budget	**258.699.857**	**287.755.748**

Budget 2017	Commitment Appropriations	Payment Appropriations
Title 1 Expenditures	4.590.000	4.590.000
Title 2 Expenditures	2.404.848	2.404.848
Title 3 Expenditures	0	22.220.588
Title 4 Expenditures	197.566.872	182.068.300
Title 5 Unused Appropriations	168.955	168.955
Total Budget	**204.730.675**	**211.452.691**

3.5.6. Data protection

In 2016-2017, the JU will continue to ensure that personal data are protected and that Regulation (EC) No 45/2001 is complied with, by implementing the following actions:

- ✓ The JU Data Protection Officer will allocate time in advising and /training the staff in particular in relation to the implementation of the accountability principle and to the follow-up in specific fields of the thematic guidelines issued by the European Data Protection Supervisor;
- ✓ The JU will continue to implement the internal procedure for handling internal notifications under Article 25 of Regulation (EC) No 45/2001 related to administrative processing operations by the JU's staff and, where applicable, to the prior checking notifications to the EDPS under Article 27 of Regulation (EC) No 45/2001.
- ✓ The JU will implement the data protection aspects related to the launch and management of the calls for proposals in accordance with the rules and procedures of Horizon 2020.

  In the light of the General Monitoring Report for the year 2014 carried out by the JU in a comprehensive way and duly notified to the EDPS, the JU will ensure adequate follow up to any pending notification or any complement of information requested by the EDPS in the light of the latest prior checking notifications submitted to EDPS by the end of 2014 such as the notifications on procurements, grants and experts, on the treatment of health data and on the conflicts of interest and the related declarations of interests.
- ✓ The JU will also take note of the EDPS Report expected in 2015 and of any recommendation addressed to the JU.
- ✓ Follow-up in EDPS meetings on the EU legal framework for data protection and potential impact on EU Institutions/Agencies/JUs of the data protection package proposal, along with any guidelines and training provided by EDPS on specific areas such as the impact of technological developments on personal data protection, IT, websites etc.

3.6. Governance

The Governance of the Clean Sky 2 Joint Undertaking is ensured by the Governing Board. Other bodies are:

- the Executive Director;
- the Steering Committees;
- the Scientific Committee;
- the States Representatives Group.

The **Governing Board (GB)** gathers the Commission's representative, the Industry Leaders [16], the Associates [6] and the Core Partners [1][11] representatives, with the Commission holding 50 % of the voting rights. Decisions are taken by a majority of at least 80 % of all votes in its ordinary meetings or by written procedure. The Governing Board has the overall responsibility for the strategic orientation and the operations of the Clean Sky 2 Joint Undertaking and supervises the implementation of its activities. Some of the GB annual tasks as per Article 8 of the CSJU Statutes include:

- assessment of applications for membership
- adoption of annual budget including the staff establishment plan
- providing guidance to and monitoring the performance of the Executive Director
- adoption of the work plan
- approval of the additional activities plan and providing its opinion on the private members declaration on the in-kind contribution
- approval of the annual activity report, including the corresponding expenditure;
- approval of the calls' ranking lists produced by a panel of independent experts;

The **Executive Director** is the legal representative and the chief executive for the day-to-day management of the CSJU in accordance with the decisions of the Governing Board and in line with Article 10 of the Statutes. The Executive Director is supported by three managers: the Coordinating Project Officer, the Clean Sky 2 Programme Manager and the Head of Administration and Finance. The ITDs/IADPs/TAs (SPDs) Project Officers allows the Executive Director to play its coordination role. The JU's management acts on the basis of its quality system documents, which are listed in the Quality Manual. Interactions with the SPDs are mainly governed by the CS Management Manual.

The **Steering Committees (SC)** are responsible for technical decisions taken within each ITD/IADP, specifically for:

- guiding and monitoring the technical functions of its ITD or IADP and taking decisions on behalf of the CSJU on technical matters specific to the relevant ITD or IADP in line with the grant agreements or decisions;
- reporting to the Executive Director on the basis of defined reporting indicators
- providing all necessary data to the Technology Evaluator

[11] Currently, the GB has only 1 appointed CP representative for Engine ITD, the remaining 5 will join in the course of the year 2016.

- establishing the detailed annual implementation plans for the ITD or IADP in line with the work plan and proposing the contents of the calls for proposals;
- proposing to the Executive Director changes of the budget allocation within its ITD or IADP.

Technology Evaluator and other Transverse Activities

Technology Evaluator, as a Transverse Activity, monitors and assesses the environmental and societal impact of the technological results arising from individual ITDs and IADPs across all Clean Sky activities, specifically quantifying the expected improvements on the overall noise, greenhouse gas and air pollutants emissions from the aviation sector in future scenarios in comparison to baseline scenarios. The Executive Director chairs the TE Coordination meetings.
Eco-Design and Small Air Transport Transverse Activities are in charge of the coordination of their activities in cooperation with ITDs and IADPs.

The **Scientific Committee (SciCo)** is an advisory body to the Governing Board. It will meet at least twice. The Scientific Committee will be consulted on the Work Plans, will advise on Call texts and will participate to interim reviews. Based on the legal framework, the Chair of the Scientific Committee may now participate to the meetings of the Governing Board on issues of specific interest to the Committee.

The **States Representative Group (SRG)** is an advisory body to the Clean Sky 2 Joint Undertaking. Article 14 of the Council regulation5 outlines that it will be consulted and, in particular review information and provide opinions on the progress made in the programme of the Clean Sky 2 Joint Undertaking and towards achievement of its targets; updates of strategic orientation; links to Horizon 2020; work plans; involvement of SMEs, monitoring of the Calls for Proposals. It shall also provide information to, and act as an interface with, the Clean Sky 2 Joint Undertaking on the status of relevant national or regional research and innovation programmes and identification of potential areas of cooperation, including deployment of aeronautical technologies; specific measures taken at national or regional level with regard to dissemination events, dedicated technical workshops and communication activities.
It consists of one representative of each EU Member State and of each other country associated to Horizon 2020 Programme. It is chaired by one of these representatives. To ensure that the activities are integrated, the Executive Director and the Chairperson of the Governing Board or his representative attend the SRG meetings and the Chair of the SRG attends as an observer at the Governing Board. At least two meetings of the States Representatives Group are foreseen every year. The Chair will participate in Governing Board meetings.

3.7. Internal Control Framework

3.7.1. Financial procedures

Since 2014, the JU has been actively working on the improvement of its financial procedures, as well as the integration of new rules emerging from the H2020 guidance and new specificities compared to FP7. Therefore, the financial procedures and the workflows in place follow the financial rules and the general control framework applicable in the Commission.
Further awareness of beneficiaries on financial and administrative aspects is raised through the development of guidance materials as well as dedicated workshops organized on a regular basis.
For Grant Agreement with Members, the CSJU has developed an internal IT tool (GMT) for the reporting and validation of costs claims under FP7 and H2020.
For Grant Agreement with Partners, the reporting and validation of costs is done via the EC IT tools for FP7 and H2020. In both cases, payment to beneficiaries is executed via the ABAC IT tool (EC accounting system).

3.7.2. Ex-ante and ex-post controls

Ex-ante controls:

During 2016-2017, the finance and operational teams will continue to work closely together in their day to day activities of initiation, verification and payments of invoices and cost claims, creation of commitments, recovery orders, validation of financial and technical reports and following-up on other financial and administrative aspects of the projects. These activities will be conducted in a timely manner that will be monitored through the defined set KPIs, in particular, the time to pay, the budget and work plan execution. Best practice and highest quality standards will be ensured through the availability of the Manual of Financial Procedures, Clean Sky Management Manual and Quality Manual that are under regular revisions.
For the next two years, the JU will continue to face the additional challenge to perform the ex-ante control while monitoring two programmes in parallel, each having their own financial and operational specificities.

Ex-post controls:

The Ex-post audit (EPA) process represents a significant element of the Internal Control System of the JU.
The main objectives of the audits are:
1) Through the achievement of a number of quantitative targets, ensure the legality and regularity of the validation of cost claims performed by the JU's management
2) Provide an adequate indication on the effectiveness of the related ex-ante controls
3) Provide the basis for corrective and recovery activities, if necessary

FP7 programme

On the basis of the Clean Sky Ex-post audit Strategy for the FP7 programme, as adopted by the CS Governing Board, audits will be performed in the years 2016-2017 at the JU's beneficiaries covering mainly cost claims pertaining to the execution of FP7 GAMs of the years 2011 to 2015. The audit activities may also cover FP7 GAPs validated by the JU since the year 2012.

A sample of validated cost claims will be selected covering the following elements:

- Most significant cost claims
- Representative sample selected at random
- Risk based sample

The JU aims to achieve a coverage of 20 to 25% of the operational FP7 expenditure through the ex-post controls.
Audits will be assigned to external audit firms, on the basis of the existing framework contract between the 3 JUs IMI JU, FCH JU and CSJU. In addition the JUs may make use of a new framework contract, which has been established by the Commission for ex-post audits.
To ensure correct and consistent audit conclusions and results, the JU will closely monitor the execution of the agreed standard audit procedures through the external audit firms. The internal EPA processes of the JU, comprising of planning and monitoring of the audits and implementation of the audit results, will require the input of 3 FTE.
Reported audit results may be (1) qualitative - concerning the internal controls applied by the beneficiaries - and (2) quantitative - expressed in error rates. The ex-post control objective of the JU is expressed in the target of an overall residual error rate[12] for the entire programme period (FP7) of maximum 2% of total budgetary expenditure.
In order to prevent errors in future cost claims of the JU's members the input of the ex-post audit team into the ex-ante validation process will be an important task.
For the final reports of projects under the FP7 programme, the ex-post audit team will develop appropriate audit procedures to cover the specific situation during the operational and financial termination of projects.
The accumulated results of the EPA process during the years 2015 and 2017 will be described in the Annual Activity Reports and will be considered for the assurance declarations of the Executive Director for the two years.

H2020 programme

The first audits of H2020 grant agreements are not planned before 2016. Until then, the JU Ex-post Audit Strategy needs to be developed in reconciliation with the Commission. A specific monitoring and review process regarding the methodology applied for the evaluation of the in-kind contribution reported by the JU Members and Core Partners will be developed.

3.7.3. Audits

The European Court of Auditors will carry out its annual audit on the JU activities in accordance with the Statutes. The result of this work will be published in its annual report.
The JU will continue to work with the Internal Audit Service of the Commission on areas identified in its Strategic Audit Plan for the JU.

[12] The residual error rate represents the remaining level of errors in payments made after corrective measures.

4. BUDGET 2016-2017

4.1. Budget information

The years 2016 and 2017 will be particularly challenging in terms of budget monitoring. The JU will have to closely follow-up the closure of the CS programme at the same time as the ramp-up of the CS2 operational activities. Due to some, as yet unknown influencing factors such as amounts granted and number of reporting periods, the forecasting of the budget figures is made on a certain hypothesis as a basis. This may need to be revisited as the real implementation becomes clear.

The budget 2016-2017 presented below contains the following sections:

- **Statement of revenue:** The revenue received from the Commission, from the industrial members and amounts carried over from previous years (unused) as well as bank interests.
  The subsidy from the Commission is a sum of the EC plus EFTA Contribution (with EFTA contribution calculated at 2,94% for 2015 and at 2,73% for 2016 and 2017). The 2015, 2016 and 2017 Commitments Appropriations provided by the EU Commission are shown with administrative costs included.

- **Statement of expenditure:** The expenditure includes the JU staff expenditure and the infrastructure expenditure (administrative costs) as well as the operational activities under FP7 programme (Title 3 – CS Programme) and operational activities under H2020 (Title 4 – CS2 Programme). The unused appropriations are appropriations that are not used in the current year but are shown here for full transparency of the credits available to the JU for future use in accordance with Article 6§5 of its Financial rules.

Amendment nr. 1 to Clean Sky 2 Joint Undertaking Budget 2016 - 2017

Statement of Revenue and Expenditure for the Clean Sky 2 Programme for the financial year 2016 - 2017

STATEMENT OF REVENUE

Title Chapter	Heading	Financial year 2016	Financial year 2016	Financial year 2017*	Financial year 2017*
		Commitment Appropriations	Payment Appropriations	Commitment Appropriations	Payment Appropriations
1 0	SUBSIDY FROM THE COMMISSION	202,788,445	222,035,100	200,601,589	197,766,312
2 0	CONTRIBUTION FROM MEMBERS (NON-EC)	3,520,158	3,520,158	3,497,424	3,497,424
3 0	CARRY OVER FROM PREVIOUS YEAR (executed and estimated)	52,299,491	62,108,726	561,662	10,118,955
5 0	FINANCIAL REVENUES (BANK INTEREST)	91,764	91,764	70,000	70,000
	TOTAL REVENUE	**258,699,857**	**287,755,748**	**204,730,675**	**211,452,691**

STATEMENT OF EXPENDITURE

Title Chapter	Heading	Financial year 2016	Financial year 2016	Financial year 2017*	Financial year 2017*
1	**STAFF EXPENDITURE**	Commitment Appropriations	Payment Appropriations	Commitment Appropriations	Payment Appropriations
1 1	STAFF IN ACTIVE EMPLOYMENT	3,800,000	3,800,000	3,900,000	3,900,000
1 2	MISCELLANEOUS EXPENDITURE ON STAFF	320,000	460,221	300,000	300,000
1 3	MISSIONS AND DUTY TRAVEL	320,000	381,564	330,000	330,000
1 4	SOCIOMEDICAL INFRASTRUCTURE	60,000	135,549	60,000	60,000
1 5	SOCIAL MEASURES	0	0	0	0
1 7	RECEPTIONS AND EVENTS	0	0	0	0
	TITLE 1 - TOTAL	**4,500,000**	**4,777,334**	**4,590,000**	**4,590,000**

2	INFRASTRUCTURE EXPENDITURE	Commitment Appropriations	Payment Appropriations	Commitment Appropriations	Payment Appropriations
2 0	RENTAL OF BUILDINGS AND ASSOCIATED COSTS	565,000	566,098	580,000	580,000
2 1	INFORMATION TECHNOLOGY PURCHASES	172,062	398,186	150,300	150,300
2 2	MOVABLE PROPERTY AND ASSOCIATED COSTS	10,000	17,026	4,460	4,460
2 3	CURRENT EXPENDITURE FOR RUNNING COSTS	55,000	95,047	55,000	55,000
2 4	POSTAGE AND TELECOMMUNICATIONS	40,000	43,968	40,000	40,000
2 5	EXPENDITURE ON FORMAL AND OTHER MEETINGS	525,000	591,878	310,000	310,000
2 7	COMMUNICATION ACTIVITIES	350,000	674,808	300,000	300,000
2 8	EXTERNAL SERVICES AND SUPPORT	267,378	897,466	311,212	311,212
2 9	COSTS ASSOCIATED WITH CALLS	555,876	1,042,217	653,876	653,876
TITLE 2 - TOTAL		**2,540,316**	**4,326,694**	**2,404,848**	**2,404,848**
TOTAL ADMINISTRATIVE EXPENDITURE (Title 1 & Title 2)		**7,040,316**	**9,104,027**	**6,994,848**	**6,994,848**

3	OPERATIONAL EXPENDITURE CS	Commitment Appropriations	Payment Appropriations	Commitment Appropriations	Payment Appropriations
3 0	SMART FIXED WING AIRCRAFT	8,943,698	7,747,191	0	3,919,541
3 1	GREEN REGIONAL AIRCRAFT	0	2,791,372	0	1,051,268
3 2	GREEN ROTORCRAFT	1,568,831	5,388,701	0	1,913,684
3 3	SUSTAINABLE AND GREEN ENGINES	13,664,578	13,403,039	0	7,755,226
3 4	SYSTEMS FOR GREEN OPERATIONS	8,166,972	7,247,713	0	3,304,268
3 5	ECO-DESIGN	558,573	1,074,760	0	216,039
3 6	TECHNOLOGY EVALUATOR	2,054,698	1,600,064	0	1,137,868
3 7	CALLS FOR PROPOSALS	76,289	25,056,633	0	2,922,693
TITLE 3 - TOTAL		**35,033,639**	**64,309,472**	**0**	**22,220,588**

4	OPERATIONAL EXPENDITURE CS2	Commitment Appropriations	Payment Appropriations	Commitment Appropriations	Payment Appropriations
4 0	LARGE PASSENGER AIRCRAFT	42,300,000	26,100,000	9,500,000	17,000,000
4 1	REGIONAL AIRCRAFT	0	3,500,000	6,500,000	11,500,000
4 2	FAST ROTORCRAFT	0	8,700,000	12,000,000	17,500,000
4 3	AIRFRAME	84,100,000	41,600,000	19,500,000	33,000,000
4 4	ENGINES	0	21,400,000	24,500,000	59,000,000
4 5	SYSTEMS	55,100,000	32,150,000	13,000,000	24,000,000
4 6	TECHNOLOGY EVALUATOR	0	77,000	600,000	200,000
4 7	ECO-DESIGN TRANSVERSE ACTIVITY	1,000,000	500,000	1,000,000	500,000
4 8	SMALL AIR TRANSPORT TRANSVERSE ACTIVITY	400,000	200,000	500,000	200,000
4 9	CALLS FOR PROPOSAL / CALLS FOR TENDER	33,164,240	79,930,392	110,466,872	19,168,300
TITLE 4 - TOTAL		**216,064,240**	**214,157,392**	**197,566,872**	**182,068,300**
TOTAL OPERATIONAL EXPENDITURE (Title 3 & Title 4)		**251,097,879**	**278,466,865**	**197,566,872**	**204,288,888**
5 0	UNUSED APPROPRIATIONS NOT REQUIRED IN CURRENT YEAR	561,662	184,856	168,955	168,955
TOTAL BUDGET		**258,699,857**	**287,755,748**	**204,730,675**	**211,452,691**

*The amount of 2017 Subsidy from Commission is mentioned as indicative and represents the Clean Sky 2 Joint Undertaking request of contribution to the Commission

4.1.1. Private contribution to the programme and to the JTI objectives

Based on the current information at hand, the minimum estimated in-kind contributions from operational activity are the unfunded 30% of the total eligible costs for the members in 2016/2017. As the funding value (70% funding rate) for members is currently estimated at 91,156,375 € for 2016, the corresponding unfunded value (remaining 30%) is **39,067,018 €**. In 2017, the funding value (70% funding rate) for members is currently estimated at 92,428,571 €, and therefore the corresponding unfunded value (remaining 30%) is **39,612,245 €.** In addition to this, the JU expects some members to report further in-kind contributions for these periods and additional activities. These estimates will be further elaborated when finalising the Work plan 2016/17 before the end of 2015.

4.2. Staff Establishment Plan

Category and grade	Establishment plan 2016
AD 16	
AD 15	
AD 14	1
AD 13	
AD 12	
AD 11	2
AD 10	3
AD 9	10
AD 8	1
AD 7	5
AD 6	10
AD 5	
Total AD	**32**
AST 7	1
AST 6	
AST 5	
AST 4	3
AST 3	
AST 2	
AST 1	
Total AST	**4**
TOTAL TA	**36**
CA FG IV	1
CA FG III	2
CA FG II	3
CA FG I	
TOTAL CA	**6**
SNE	**2**
TOTAL STAFF	**44**

5. ANNEXES

5.1. General Annexes of the Work Plan

A. List of countries eligible for funding

I. Calls for Core Partners

Legal entities established in the following countries and territories will be eligible to participate and receive funding as Core Partners of Clean Sky 2 JU selected through calls for Core Partners:

- The Member States (MS) of the European Union (EU), including their overseas departments;
- The Overseas Countries and Territories (OCT) linked to the Member States[13]:
  - Anguilla, Aruba, Bermuda, Bonaire, British Indian Ocean Territory, British Virgin Islands, Cayman Islands, Curaçao, Falkland Islands, French Polynesia, French Southern and Antarctic Territories, Greenland, Montserrat, New Caledonia, Pitcairn Islands, Saba, Saint Barthélémy, Saint Helena, Saint Pierre and Miquelon, Sint Eustatius, Sint Maarten, South Georgia and the South Sandwich Islands, Turks and Caicos Islands, Wallis and Futuna.
- The associated countries (AC): the latest information on which countries are associated, or in the process of association to Horizon 2020 can be found in the online manual[14].

International European interest organisations[15] will also be eligible to receive funding from Horizon 2020.

II. Calls for Proposals (for Partners)

Legal entities established in the following countries and territories will be eligible to receive funding through Clean Sky 2 JU grants:

- The Member States of the European Union, including their overseas departments;
- The Overseas Countries and Territories (OCT) linked to the Member States[16]:

---

[13] Entities from Overseas Countries and Territories (OCT) are eligible for funding under the same conditions as entities from the Member States to which the OCT in question is linked

[14] http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/international-cooperation_en.htm
http://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2016-2017/annexes/h2020-wp1617-annex-ga_en.pdf.

[15] These are international organisations, the majority of whose members are Member States or associated countries, and whose principal objective is to promote scientific and technological cooperation in Europe.

[16] Entities from Overseas Countries and Territories (OCT) are eligible for funding under the same conditions as entities from the Member States to which the OCT in question is linked

- Anguilla, Aruba, Bermuda, Bonaire, British Indian Ocean Territory, British Virgin Islands, Cayman Islands, Curaçao, Falkland Islands, French Polynesia, French Southern and Antarctic Territories, Greenland, Montserrat, New Caledonia, Pitcairn Islands, Saba, Saint Barthélémy, Saint Helena, Saint Pierre and Miquelon, Sint Eustatius, Sint Maarten, South Georgia and the South Sandwich Islands, Turks and Caicos Islands, Wallis and Futuna.

The associated countries: the latest information on which countries are associated, or in the process of association to Horizon 2020 can be found in the online manual[17].

- Any application from the following third countries, except where this is explicitly excluded in the call text, will be assessed based on H2020 rules for participation

  Afghanistan, Algeria, American Samoa, Angola, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, Belize, Benin, Bhutan, Bolivia, Botswana, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Chile, Colombia, Comoros, Congo (Democratic Republic), Congo (Republic), Costa Rica, Côte d'Ivoire, Cuba, Djibouti, Democratic People's Republic of Korea, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Ethiopia, Fiji, Gabon, Gambia, Georgia, Ghana, Grenada, Guatemala, Guinea, Guinea-Buissau, Guyana, Haiti, Honduras, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Kiribati, Kosovo*, Kyrgyz Republic, Lao, Lebanon, Lesotho, Liberia, Libya, Madagascar, Malawi, Malaysia, Maldives, Mali, Marshall Islands, Mauritania, Mauritius, Micronesia, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Palau, Palestine, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Rwanda, Samoa, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Solomon Islands, Somalia, South Africa, South Sudan, Sri Lanka, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Sudan, Suriname, Swaziland, Syrian Arab Republic, Tajikistan, Tanzania, Thailand, Timor-Leste, Togo, Tonga, Tunisia, Turkmenistan, Tuvalu, Uganda, Uzbekistan, Vanuatu, Uruguay, Venezuela, Vietnam, , Yemen, Zambia, Zimbabwe.

(* This designation is without prejudice to positions on status and is in line with UNSCR 1244/99 and the ICJ Opinion on the Kosovo declaration of independence).

---

[17] http://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2016-2017/annexes/h2020-wp1617-annex-ga_en.pdf"
http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/international-cooperation_en.htm

B. Standard admissibility conditions and related requirements

I. Calls for Core Partners

1. To be considered admissible, an application for Core Partner must be:

   a) Submitted in the electronic submission system before the deadline given in the call conditions;

   b) Readable, accessible and printable.

2. Incomplete applications for Core Partner may be considered inadmissible. This includes the requested administrative data, the application description, and any supporting documents specified in the call.

3. Operational capacity – requested inputs

The following will be required to determine the operational capacity of an applicant for Core Partner, unless otherwise specified:

- curriculum vitae or description of the profile of the persons who will be primarily responsible for carrying out the proposed research and/or innovation activities;
- the applicant[18] reports of research and development activities, products, services executed in the same relevant area;
- a lists of previous projects and activities performed and connected to the topic and Programme area;
- a description and evidences of the key capabilities of the entity, significant infrastructures, technical equipment, design and test tools, facilities, design offices patents and other IP rights at the disposal of the applicant;
- Other inputs to assess the operational capacity as requested in the topic description in the Call;
- A description of any third parties (including affiliates[19]) and their contribution to the action that are not represented as applicants, but who will nonetheless be contributing towards the work (e.g. providing facilities, computing resources).

4. Applications for Core Partners shall include a draft plan for the exploitation and dissemination of the results. The section on exploitation shall be showing and committing on a clear exploitation path of the results brought by their participation in the Programme showing the contribution to European competitiveness of the sector. The JU will check this aspect at evaluation stage and reserves the right to check this aspect also during the implementation stage.

5. Page limits will apply to applications for Core Partners. The limits will be clearly set out in the electronic submission system. If a submitted application exceeds the limits, the applicant will receive an automatic warning, and will be advised to re-submit a version that conforms. After the relevant call deadline, excess pages in any over-long application will be

[18] In the case of legal entities forming one applicant (cluters) the above requirements apply to the Cluster as such and to those entities composing the cluster.

[19] See the definition under Article 2 of H2020 Rules for Participation

automatically overprinted with a "watermark". Expert evaluators will be instructed to disregard these excess pages.

6. In the light of the specific structure of the Programme and the governance framework of the JU, the specific legal status and statutory entitlements of the "Members" of the JU and in order to prevent any conflict of interest and to ensure a competitive, transparent and fair process, the following specific admissibility rules shall apply to the calls, in accordance with Article 9.5 of the H2020 Rules for Participation:

- The **16 Leaders of JU listed in Annex II to Regulation n° (EU) No 558/2014 and their affiliates**[20] may apply to Calls for Core Partners and Calls for Proposals only in another IADP/ITD where they are not involved as Members. In case of selection of Leaders and their affiliates as Core Partners or Partners in the Programme, their participation will be accounted by the JU within the **40% budget share of the programme allocated to the Leaders** thereto Article 16.1 a) of the Statutes, therefore without any impact on the 30% budget share allocated to the Core Partners thereto Article 16.1 b) of the Statutes.
- **The Core Partners and their affiliates** may apply in subsequent waves of Calls for Core Partners in all IADP/ITD. They may apply to Calls for Proposals only in another IADP/ITD where they are not involved as Members.
- **The Partners** selected by Call for Proposal may apply to Calls for Core Partners and Calls for Proposal in all IADP/ITD.

All applicants will be requested in the application submission forms to:

- officially state whether they are an affiliate[21] to a Member of the JU;
- to issue a declaration of absence of conflicts of interest[22] that will determine its admissibility.

The above criteria and the declarations will be checked by the JU which will determine the admissibility of the applicants for Core Partners. The CSJU reserves its right to request any supporting document and additional information at any stage of the process.

Special condition for participation applicable to Core Partners

7. Pursuant to Article 4 of the Statutes, Annex I of Regulation n. 558/2014, a legal entity may apply to become a Core Partner provided that that it contributes to the funding referred to in Article 15 of the Annex I of the Regulation to achieve the objectives of the CSJU set out in Article 2 of the Regulation and it accepts the Statutes of the CSJU.

Based on the above, applicants to the Calls for Core Partners shall declare, at the application stage, a commitment to endorse the Statutes and its provisions. The formalization of the

[20] See the definition under Article 2.1 of H2020 Rules for Participation

[21] Applicants shall check the definition based on Article 2.1 of H2020 Rules for Participation

[22] As part of the declaration, the legally authorized representative of the applicants entities will be requested to declare whether the representative(s) of the entity participate to the IADP/ITD steering committees and whether they representative(s) of the entity was involved in the preparation, definition and approval of the topics of the calls.

acceptance of the Statutes by formal endorsement letter will be made upon selection of the applicants as part of the negotiation stage.

II. Calls for Proposals (for Partners)

1. To be considered admissible, an application must be:

   a) Submitted in the electronic submission system before the deadline given in the call conditions;

   b) Readable, accessible and printable.

2. Incomplete applications may be considered inadmissible. This includes the requested administrative data, the application description, and any supporting documents specified in the call.

3. Operational capacity – requested inputs

The following will be required to determine the operational capacity of the applicant(s), unless otherwise specified:

- curriculum vitae or description of the profile of the persons who will be primarily responsible for carrying out the proposed research and/or innovation activities;
- the applicant[23] reports of research and development activities, products, services executed in the same relevant area;
- a lists of previous projects and activities performed and connected to the topic and Programme area;
- a description of the capabilities of the entity, significant infrastructures, technical equipment, design and test tools, facilities, design offices patents and other IP rights at the disposal of the applicant;
- Other inputs to assess the operational capacity as requested in the topic description in the Call.
- A description of any third parties (including affiliates[24]) and their contribution to the action that are not represented as applicants, but who will nonetheless be contributing towards the work (e.g. providing facilities, computing resources)

1. The Proposals must include a draft plan for the exploitation and dissemination of the results, unless otherwise specified in the call conditions. The section on exploitation shall be showing and committing on a clear exploitation path of the results brought by their participation in the Programme showing the contribution to European competitiveness of the sector. The JU will check this aspect at evaluation stage and reserves the right to check this aspect also during the implementation stage and the reporting on exploitation.

2. Page limits will apply to proposals. The limits will be clearly set out in the electronic submission system. If a submitted proposal exceeds the limits, the applicant will

[23] In the case of legal entities forming one applicant (clusters) the above requirements apply to the Cluster as such and to those entities composing the cluster.

[24] See the definition under Article 2 of H2020 Rules for Participation

receive an automatic warning, and will be advised to re-submit a version that conforms. After the relevant call deadline, excess pages in any over-long proposals will be automatically overprinted with a “watermark”. Expert evaluators will be instructed to disregard these excess pages.

3. In the light of the specific structure of the Programme and the governance framework of the JU, the specific legal status and statutory entitlements of the “Members” of the JU and in order to prevent any conflict of interest and to ensure a competitive, transparent and fair process, the following "additional conditions" in accordance with Article 9.5 of the H2020 Rules for Participation:

- The **16 Leaders of JU listed in Annex II to Regulation n° (EU) No 558/2014 and their affiliates**[25] may apply to Calls for Core Partners and Calls for Proposals only in another IADP/ITD where they are not involved as Members. In case of selection of Leaders and their affiliates as Core Partners or Partners in the Programme, their participation will be accounted by the JU within the **40% budget share of the programme allocated to the Leaders** thereto Article 16.1 a) of the Statutes, therefore without any impact on the 30% budget share allocated to the Core Partners thereto Article 16.1 b) of the Statutes.
- **The Core Partners and their affiliates** may apply in subsequent waves of Calls for Core Partners in all IADP/ITD. They may apply to Calls for Proposals only in another IADP/ITD where they are not involved as Members.
- **The Partners** selected by Call for Proposal may apply to Calls for Core Partners and Calls for Proposal in all IADP/ITD.

All applicants will be requested in the application submission forms to:

- officially state whether they are an affiliate[26] to a Member of the JU;
- to issue a declaration of absence of conflicts of interest[27] that will determine its admissibility.

The above criteria and the declarations will be checked by the JU which will determine the admissibility of the applicants. The CSJU reserves its right to request any supporting document and additional information at any stage of the process.

[25] See the definition under Article 2.1 of H2020 Rules for Participation

[26] Applicants shall check the definition based on Article 2.1 of H2020 Rules for Participation

[27] As part of the declaration, the legally authorized representative of the applicants entities will be requested to declare whether the representative(s) of the entity participate to the IADP/ITD steering committees and whether they representative(s) of the entity was involved in the preparation, definition and approval of the topics of the calls or had any privileged access information related to that.

C. Eligibility criteria

I. Calls for Core Partners

An application as Core Partner will only be considered eligible if:

1) its content corresponds, wholly or in part, to the topic description against which it is submitted, in the relevant work plan part;
2) submitted by a legal entity established in a Member State or H2020 associated country;
3) submitted by a Consortium[28] of legal entities established in a Member State or H2020 associated country jointly applying to become individual Members.
4) submitted by a Cluster as single legal entity established in a Member State or H2020 associated country. [29]

II. Calls for Proposals (for Partners)

An application as Partner will only be considered eligible if:

1) its content corresponds, wholly or in part, to the topic description against which it is submitted, in the relevant work plan part;
2) it complies with the eligibility conditions set out below, depending on the type of action.

	Eligibility conditions[30,31]
Research & innovation action	At least one legal entity established in a Member State or associated country
Innovation action	At least one legal entity established in a Member State or associated country
Coordination and support actions	At least one legal entity established in a Member State or associated country

[28] When a group of legal entities apply jointly as Consortium, its members are all requested singularly to become a Member of CSJU and sign the Grant agreement for Members. In this case, all entities become beneficiary in the sense of the Grant agreement for Members and are bound directly by its provisions.

[29] See section Joint applications by legal entities in the *Rules for submission, evaluation, selection, award and review procedures of Calls for Core Partners.*

[30] The eligibility criteria formulated in Commission notice Nr. 2013/C 205/05 (OJEU C 205 of 19.07.2013, pp.9 11) shall apply for all actions under this Work Plan, including with respect to third parties receiving financial support in the cases where the respective action involves financial support to third parties by grant beneficiaries in accordance with Article 137 of the EU's Financial Regulation, notably Programme Co-Fund actions.

[31] Some entities from third countries are covered by the Council sanctions in place and are not eligible to participate in Union programmes. Please see: the consolidated list of persons, groups and entities subject to EU financial sanctions, available at http://eeas.europa.eu/cfsp/sanctions/consol-list_en.htm.

[32] Eligible costs for all types of action are in accordance with the Financial Regulation and the Rules for Participation. In addition, as training researchers on gender issues serves the policy objectives of Horizon 2020 and is necessary for the implementation of R&I actions, applicants may include in their proposal such activity and the following corresponding estimated costs that may be eligible for EU funding:

D. Types of action: specific provisions and funding rates[32,33]

Research and innovation actions[34]

Description: Action primarily consisting of activities aiming to establish new knowledge and/or to explore the feasibility of a new or improved technology, product, process, service or solution. For this purpose they may include basic and applied research, technology development and integration, testing and validation on a small-scale prototype in a laboratory or simulated environment.

Projects may contain closely connected but limited demonstration or pilot activities aiming to show technical feasibility in a near to operational environment.

The activities performed will not exceed TRL 6.

Funding rate: 100%

Innovation actions

Description: Action primarily consisting of activities directly aiming at producing plans and arrangements or designs for new, altered or improved products, processes or services. For this purpose they may include prototyping, testing, demonstrating, piloting, large-scale product validation and market replication.

The activities performed will not exceed TRL 6.

Funding rate: 70% (except for non-profit legal entities, where a rate of 100% applies)

Coordination and support actions

Description: Actions consisting primarily of accompanying measures such as standardisation, dissemination, awareness-raising and communication, networking, coordination or support services, policy dialogues and mutual learning exercises and studies, including design studies for new infrastructure and may also include complementary activities of strategic planning, networking and coordination between programmes in different countries.

Funding rate: 100%

---

[32] Eligible costs for all types of action are in accordance with the Financial Regulation and the Rules for Participation. In addition, as training researchers on gender issues serves the policy objectives of Horizon 2020 and is necessary for the implementation of R&I actions, applicants may include in their proposal such activity and the following corresponding estimated costs that may be eligible for EU funding:

i. Costs of delivering the training (personnel costs if the trainers are employees of the beneficiary or subcontracting if the training is outsourced);

ii. Accessory direct costs such as travel and subsistence costs, if the training is delivered outside the beneficiary's premises;

iii. Remuneration costs for the researchers attending the training, in proportion to the actual hours spent on the training (as personnel costs).

[33] Participants may ask for a lower rate.

E. Technology readiness levels (TRL)

Where a topic description refers to a TRL, the following definitions apply, unless otherwise specified:

- TRL 1 – basic principles observed
- TRL 2 – technology concept formulated
- TRL 3 – experimental proof of concept
- TRL 4 – technology validated in lab
- TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 7 – system prototype demonstration in operational environment
- TRL 8 – system complete and qualified
- TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

F. Evaluation

I. Calls for Core Partners

Selection Criteria

a) *Financial capacity:* In line with the Financial Regulation, at the proposal stage, applicants for Core Partners will be invited to complete a self-assessment using an on-line tool. The CSJU may perform a risk assessment based on the financial information provided by the applicant. This will apply also to the entities composing a grouping in case of applications submitted by groupings jointly applying as a one entity[35].

b) *Operational capacity*: As a distinct operation, experts will indicate whether the participants meet the selection criterion related to operational capacity (as described in section B 3 above), to carry out the proposed work, based on the capabilities, competence and experience of the individual participant(s).

[35] See footnote 44.

Award criteria

Experts will evaluate the applications on the basis of the criteria 'excellence', 'impact' and 'quality and efficiency of the implementation'. The aspects to be considered are set out in the table below, unless stated otherwise in the call.

Type of action	Excellence The following aspects will be taken into account, to the extent that the proposed work corresponds to the topic description in the work plan.	Impact The extent to which the outputs of the project should contribute at the European and/or International level to:	Quality and efficiency of the implementation The following aspects will be taken into account:
Research and innovation; Innovation;	- Relevance and adequacy of the required key capabilities, competences and track record in the relevant topic area and experience with respect to the Topic (e.g. capability to efficiently contribute to a permit-to-fly application) and the overall level of key capabilities required to implement the Programme; - Clarity and pertinence of the objectives; - Credibility of the proposed approach; - Soundness of the concept, including trans-disciplinary considerations, where relevant; - Relevance and adequacy of proposed work and results as compared with the Topic description; - Extent that proposed work is ambitious, has innovation potential, and is beyond the state of the art (e.g. ground-breaking objectives, novel concepts	- Level of technical contribution and key capabilities brought to the IADP/ITD and Programme objectives - The expected impact as described under the relevant topic and the strategic contribution brought to the Programme and the; - Enhancing innovation capacity and integration of new knowledge; - Strengthening the competitiveness and growth of companies by developing innovations meeting the needs of European and global markets, and where relevant, by delivering such innovations to the markets; - Demonstrating the environmental and socially important impacts as relevant for the CS2 Programme; - Performance of the "core research" activities within Europe and Associated Countries;	- Consistency of the proposed activity with the background, skills and competences as described; - Coherence and effectiveness of the application, including appropriateness of the allocation of tasks and resources; - Appropriateness of the management structures and procedures, including risk and innovation management; - Match of technical capabilities and skills with the Topic and Programme objectives; - strategic ability to work in the topic area; - Coordinating capability in the supply chain and ability to work effectively both with a supply base and into an equal or higher tier industrial organization as integrator/leader; - Capability and

Type of action	Excellence The following aspects will be taken into account, to the extent that the proposed work corresponds to the topic description in the work plan.	Impact The extent to which the outputs of the project should contribute at the European and/or International level to:	Quality and efficiency of the implementation The following aspects will be taken into account:
	and approaches) - Suitability of the technologies, approaches and solutions proposed, including the complementary activities, where applicable, with respect to the Topic description and the IADP/ITD area and objectives.	- Plan on exploitation of results showing the contribution on the European competitiveness in the sector; - Effectiveness of the proposed measures to exploit and disseminate the project results (including management of IPR), to communicate the project, and to manage research data where relevant; - Level of strategic contribution and key capabilities brought to the IADP/ITD and Programme objectives; - Level of new capabilities and skills brought to the Programme compared to the ones already existing within the Membership; - Probability of application/valorization of technology results, including soundness of the exploitation plan and its ability to contribute to the competitiveness of the sector.	management skills for Calls for Proposal coordination, when acting as Topic Manager (where applicable); - Clear demonstration of adequate level of financial and operational resources (committed) based on the Topic value indicated in the call and the overall Programme needs; - Best "value for money" on the activities proposed and efficiency of the allocation of resources; - Complementarity of the participants within the consortium or cluster (where applicable); - Capacity of the cluster or consortium or leader to efficiently coordinate activities of the participants (where applicable).
Coordination & support actions	Clarity and pertinence of the objectives; Credibility of the proposed approach; Relevance and adequacy of proposed work and results as compared with the Topic	The expected impacts listed in the work programme under the relevant topic Effectiveness of the proposed measures to exploit and disseminate the	Coherence and effectiveness of the work plan, including appropriateness of the allocation of tasks and resources; Complementarity of the

Type of action	Excellence	Impact	Quality and efficiency of the implementation
	The following aspects will be taken into account, to the extent that the proposed work corresponds to the topic description in the work plan.	The extent to which the outputs of the project should contribute at the European and/or International level to:	The following aspects will be taken into account:
	description; Soundness of the concept; Quality of the proposed coordination and/or support measures.	project results (including management of IPR), to communicate the project, and to manage research data where relevant.	participants within the consortium (when relevant); Appropriateness of the management structures and procedures, including risk and innovation management.

Note: Unless otherwise specified in the call conditions:

Evaluation scores will be awarded for the criteria, and not for the different aspects listed in the above table. Each criterion will be scored out of 5. The threshold for individual criteria will be 3. The overall threshold, applying to the sum of the three individual scores, will be 10.

Complementary activities

If an applicant as Core Partner considers that it has different applications or different technologies or innovative solutions to propose in relationship to one topic, the applicant should present them in the same single application as "complementary activities" in the relevant section of the submission forms (description and budget).

If the applicants indicate complementary activities and innovative solutions within the general topic area related to the topic for which they are applying and within the scope of the IADP/ITD, they should demonstrate that these activities would:

- be in line with Clean Sky 2 Programme key goals and objectives;
- represent an enhancement or improvement of the content of an IADP/ITD and lead to a demonstrable additional move beyond the state of the art in the topic's general area.

Complementary activities will be evaluated by the independent experts in the framework of the topic evaluation process as indicated by the evaluation criteria mentioned above. However, the inclusion of these complementary activities in any subsequent grant will be subject to the CSJU Governing Board approval and CSJU funding availability.

Priority order for applications with the same score

Unless the call conditions indicate otherwise, the following method will be applied.

As part of the evaluation by independent experts, a panel review will recommend one or more ranked lists for the applicants under evaluation, following the scoring systems indicated above. A ranked list will be drawn up for every indicative budget shown in the call conditions.

If necessary, the panel will determine a priority order for applications which have been awarded the same score within a ranked list. Whether or not such a prioritisation is carried out will depend on the available budget or other conditions set out in the call text. The following approach will be applied successively for every group of *ex aequo* proposals requiring prioritisation, starting with the highest scored group, and continuing in descending order:

(i) Applications that address topics not otherwise covered by more highly-ranked applications will be considered to have the highest priority.

(ii) These proposals will themselves be prioritised according to the scores they have been awarded for the criterion *excellence*. When these scores are equal, priority will be based on scores for the criterion *impact.* In the case of Innovation actions, this prioritisation will be done first on the basis of the score for *impact*, and then on that for *excellence*.

If necessary, any further prioritisation will be based on the following factors, in order: size of budget allocated to SMEs; gender balance among the personnel named in the proposal who will be primarily responsible for carrying out the research and/or innovation activities.

If a distinction still cannot be made, the panel may decide to further prioritise by considering how to enhance the quality of the project portfolio through synergies between projects, or other factors related to the objectives of the call or to Horizon 2020 in general. These factors will be documented in the report of the Panel.

(iii) The method described in (ii) will then be applied to the remaining *ex aequos* in the group.

II. Calls for Proposals (for Partners)

Selection Criteria

a) *Financial capacity:* In line with the Financial Regulation and the Rules for Participation. At the proposal stage, coordinators will be invited to complete a self-assessment using an on-line tool.

b) *Operational capacity*: As a distinct operation, carried out during the evaluation of the award criterion 'Quality and efficiency of the implementation', experts will indicate whether the participants meet the selection criterion related to operational capacity, to carry out the proposed work, based on the competence and experience of the individual participant(s).

Award criteria

Experts will evaluate on the basis of the criteria 'excellence', 'impact' and 'quality and efficiency of the implementation'. The aspects to be considered in each case depend on the types of action as set out in the table below, unless stated otherwise in the call conditions.

Type of action	Excellence The following aspects will be taken into account, to the extent that the proposed work corresponds to the topic description in the work plan.	Impact The extent to which the outputs of the project should contribute at the European and/or International level to:	Quality and efficiency of the implementation The following aspects will be taken into account:
All types of action	Clarity and pertinence of the objectives; Credibility and demonstrated excellence and ambition of the proposed approach.	The expected impacts listed in the work programme under the relevant topic	Coherence and effectiveness of the work plan, and the allocation of tasks and resources; Efficient and well justified application of resources for the expected outcomes and impacts Appropriateness of the management structures and procedures, including risk and innovation management.
Coordination & support actions	Soundness of the concept; Quality of the proposed coordination and/or support measures.	Effectiveness of the proposed measures to exploit and disseminate the project results (including management of IPR), to communicate the project, and to manage research data where relevant.	

Type of action	Excellence The following aspects will be taken into account, to the extent that the proposed work corresponds to the topic description in the work plan.	Impact The extent to which the outputs of the project should contribute at the European and/or International level to:	Quality and efficiency of the implementation The following aspects will be taken into account:
Research and innovation; Innovation;	Soundness of the concept and approach, Extent that proposed work is ambitious, has innovation potential, and is beyond the state of the art. Suitability of the technologies, approaches and solutions proposed, with respect to the Topic description and the IADP/ITD area and objectives.	The expected impact towards the objectives as described under the relevant topic; Enhancing innovation capacity and integration of new knowledge; Demonstrating the congruence with and progress towards the environmental and socially relevant impacts stated for the CS2 Programme; A clear and credible path towards the exploitation of results showing a demonstrable contribution towards European competitiveness Effectiveness of the proposed measures to disseminate the project results (including management of IPR), to communicate the project, and to manage research data where relevant.	Match of technical capabilities and skills with the Topic description and congruent with the Programme objectives embodied in the topic; Demonstrated ability to work in the topic area; Ability to work effectively within a supply chain and into an equal or higher tier industrial organization; Evidence and quality of the operational resources Ability and efficiency to commit financial resources against the indicative topic value and based on the proposed content and JU funding request; Capacity of the cluster or consortium leader to efficiently coordinate activities of the participants (where applicable).

Note

Unless otherwise specified in the call conditions evaluation scores will be awarded for the criteria, and not for the different aspects listed in the above table. Each criterion will be scored out of 5. The threshold for individual criteria will be 3. The overall threshold, applying to the sum of the three individual scores, will be 10.

Priority order for proposals with the same score

Unless the call conditions indicate otherwise, the following method will be applied.

As part of the evaluation by independent experts, a panel review will recommend one or more ranked lists for the proposals under evaluation, following the scoring systems indicated above. A ranked list will be drawn up for every indicative budget (for each topic) shown in the call conditions.

If necessary, the panel will determine a priority order for proposals which have been awarded the same score within a ranked list. Whether or not such a prioritisation is carried out will depend on the available budget or other conditions set out in the call fiche. The following approach will be applied successively for every group of ex aequo proposals requiring prioritisation, starting with the highest scored group, and continuing in descending order:

(i) These proposals will themselves be prioritised according to the scores they have been awarded for the criterion excellence. When these scores are equal, priority will be based on scores for the criterion impact. In the case of Innovation actions, this prioritisation will be done first on the basis of the score for impact, and then on that for excellence.

If necessary, any further prioritisation will be based on the following factors, in order: size of budget allocated to SMEs; gender balance among the personnel named in the proposal who will be primarily responsible for carrying out the research and/or innovation activities.

If a distinction still cannot be made, the panel may decide to further prioritise by considering how to enhance the quality of the project portfolio through synergies between projects, or other factors related to the objectives of the call or to Clean Sky 2 Programme in general. These factors will be documented in the report of the Panel.

(ii) The method described in (i) will then be applied to the remaining ex aequos in the group.

G. Budget flexibility

Budgetary figures given in this work plan are indicative and are based on an estimate of the topic values and the CSJU funding per topic. Unless otherwise stated, final funding may vary following the evaluation of the applications and the negotiation/grant preparation stage.

The funding values shall not be confused with the total topic value. The funding value corresponds to the average funding calculated by the JU based on the experience in the Clean Sky programme. The final funding value per topic will entirely depend on the cost structure of the winning entity, the funding rate, and the scope of work proposed in their application.

5.2. Annex I: Key Performance Indicators

TABLE I Horizon 2020 Key Performance Indicators common to all JUs				
		Key Performance Indicator	**Definition/Responding to Question**	**Target CSJU**
INDUSTRIAL LEADERSHIP	**1**	SME - introducing innovations of participating SMEs	Number and % of participating SMEs that have introduced innovations to the company or to the market	50%
	2	SME - Growth and job creation in participating SMEs	Turnover of company, number of employees	*The target will be defined based on FP7 final assessment results and first feed-back from H2020 projects*
	3	Patent applications and patents	Number of patent applications by theme; Number of awarded patents by theme (awarded in the area of the JTI)	*The target will be defined based on first realistic results. For FP7 projects, CSJU beneficiaries were not focusing on patenting in the first half of the program.*
	4	Demonstration activities	Number of demonstration activities	18-20
EVALUATION	**5**	Time to inform (TTI)	Number and % of information letters sent to applicants within target (=153 calender days).	80%
	6	Redress after evaluations	Number of redresses requested	<2% of proposals (excluding PP submission related redress requests)
GRANTS	**7**	Time to grant (TTG)	Number and % of grants signed within target (=243 calendar days) measured from call deadline to signature of grants	80%
PAYMENTS	**8**	Time to pay (TTP) Operational budget	% made on time: - pre-financing (30 days) - interim payment (90 days) -final payment 90days	95%
HR	**9**	Vacancy rate (%)	% of post filled in	0%

		Key Performance Indicator	Definition/Responding to Question	Target CSJU
JU EFFICIENCY	**10**	Budget implementation / execution	1. % CA to total budget 2. % PA to total budget	100% in CA 95% in PA
	11	Time to pay (TTP) Administrative budget	% made on time (30 days)	> 95%

TABLE II Indicators for monitoring Horizon 2020 Cross-Cutting Issues common to all JUs (based on Annex III to Council Decision 2013/743/EU)				
		Definition/Responding to Question	**Type of Data Required**	**Target CSJU**
Widening the participation	**12**	Country distribution (EU Member States and Associated countries) - ***numbers***	Total number of participations by EU-28 Member States and Associated countries	EU 28: 95% Associated: 5%
	13	Country distribution (EU Member States and Associated countries) - ***financial contribution***	Total financial contribution of EU-28 Member States and Associated countries	EU 28: 95% Associated: 5%
SMEs participation	**14**	SME participation -financial contribution	Share of EU financial contribution going to SMEs (Enabling & industrial tech and Part III of Horizon 2020)	17.5%
Gender	**15**	Gender balance - Program participation	Percentage of women participants in Horizon 2020 projects	*to date, the JU does not have data available to consolidate and feed the KPI; the JU will endeavour to collect such data*
		Gender balance - Project coordinators	Percentage of women project coordinators in Horizon 2020 projects	
		Gender balance - Advisors and experts	Percentage of women in EC advisory groups, expert groups, evaluation panels, individual experts, etc.	
International cooperation	**16**	Third-country participation	% in numbers and attributed contribution	*No target set*
Bridging from discovery to market	**17**	Innovation Actions (IAs)	Share of projects and EU financial contribution allocated to Innovation Actions (IAs)	Leaders: 100% Core Partners: 100% Partners: 70%
		Demonstration activities within IAs	Within the innovation actions, share of EU financial contribution focussed on demonstration and first-of-a-kind activities	70%
	18	Scale of impact of projects (High Technology Readiness Level)	Number of projects addressing TRL8 between (4-6, 5-7)	*No target set in the period: TRL objectives can be considered on a longer term in line with the CSDP.*

		Definition/Responding to Question	Type of Data Required	Target CSJU
Private sector participation	**19**	Horizon 2020 beneficiaries from the private for profit sector - number of participants	Percentage of participants from the private for profit sector of the total Horizon 2020 beneficiaries (classified by type of activity and legal status)	75%
		Horizon 2020 beneficiaries from the private for profit sector - financial contribution	Share of EU financial contribution going to private for profit entities (Enabling & industrial tech and Part III of Horizon 2020); classified by type of activity; corresponding EU contribution	80%
Funding for PPPs	**20**	EU financial contribution for PPP	EU contribution to budget of CS2	Mill Euro 425[36]
		Private sector contribution including leverage effect	Total amount of funds leveraged through Art. 187 initiatives, including additional activities, divided by the EU contribution	On program level (not applicable as annual target): 125%
Communication and dissemination	**21**	Dissemination activities	Number of dissemination activities in conferences, workshops, press releases, publications, exhibitions, trainings, social media, web-sites, communication campaigns	100 papers
Participation patterns of independent experts	**22**	Distribution of proposal evaluators by country	% of individual nationalities of proposal evaluators	<33% from one country
		Distribution of proposal evaluators by type of organisation	% of individual type of organization from which evaluators are stemming	< 66% of one sector

[36] CA for the period 2016-2017

		Definition/Responding to Question	Type of Data Required	Target CSJU
Participation of RTOs and Universities	**23**	Participation of Research and Technology Organisations and Universities in PPPs (Art 187 initiatives)	Number of participations of RTOs and of Universities and their share of the total % of budget allocated to RTOs and to Universities	25%
Ethics	**24**	Ethics efficiency	% of proposals not granted because of non-compliance with ethical rules time to ethics clearance for proposals invited to grant (data relate to pre-granting ethics review; the time span runs in parallel to granting process).	0% 45 days
Audit	**25**	Error rates	% of common representative error; % residual error	<2%
	26	Implementation of ex-post audit results	Percentage of audit results implemented	100%

TABLE III Key Performance Indicators specific for CSJU			
	Key Performance Indicator	**Objective**	**Target at the End of Horizon 2021**
27	Reduce aircraft CO2 emissions	Reduce aircraft CO2 emissions compared to "State-of-the-art" aircraft entering into service as from 2014	> 20 to 30%
28	Reduce aircraft No emissions	Reduce aircraft No emissions compared to "State-of-the-art" aircraft entering into service as from 2014	> 20 to 40%
29	Reduce aircraft noise emissions	Reduce aircraft noise emissions levels per operation compared to "State-of-the-art" aircraft entering into service as from 2014	20 to 25%
30	Call topics success rate	Percentage of topics resulting in signature of GA	> 90%
31	WP execution by members - resources	% of resources consumption versus plan (members only)	> 80%
32	WP execution by members - deliverables	% of deliverables available versus plan (members only)	> 80%

5.3. Annex II: 3rd Call for Proposals (CfP03): List and Full Description of Topics

See separate annex

6. LIST OF ACRONYMS

AB: Annual Budget
ACARE: Advisory Council for Aeronautics Research in Europe
ATM: Air Traffic Management
CA: Commitment Appropriations
CDR: Critical Design Review
CfP: Call for Proposals
CfT: Call for Tender
CROR: Counter Rotating Open Rotor
JU: Clean Sky Joint Undertaking/ Clean Sky 2 Joint Undertaking
EC: European Commission
ECO: Eco-Design
EDA: Eco-Design for Airframe
GAM: Grant Agreement for Members
GAP: Grant Agreement for Partners
GRA: Green Regional Aircraft
GRC: Green Rotorcraft
IADP: Innovative Aircraft Demonstrator Platform
ITD: Integrative Technology Demonstrator
IAO: Internal Audit Officer
JTP: Joint Technical Programme
PA: Payment Appropriations
PDR: Preliminary Design Review
QPR: Quarterly Progress Report
SAGE: Sustainable and Green Energy
SESAR: Single European Sky Air Traffic Management Research
SFWA: Smart Fixed Wing Aircraft
SGO: Systems for Green Operation
SPD: System & Platform Demonstrator
TA: Transversal Activity
TE: Technology Evaluator
ToP: Type of Action
TP: Technology Products
TRL: Technology Readiness Level
WP: Work Package/Work Plan