Decision of the Governing Board approving the Additional Activities Plan 2017

THE GOVERNING BOARD OF THE CLEAN SKY 2 JOINT UNDERTAKING,

Having regard to the Council Regulation n° 558/2014 of 6 May 2014 establishing the Clean Sky 2 Joint Undertaking ('Clean Sky 2 JU') and in particular Article 4(2);

Having regard to the Statutes of the Clean Sky 2 JU as annexed to Council Regulation (EC) No 558/2014 of 6 May 2014 and in particular Article 8.2 (i);

WHEREAS:

1) The Statutes of the Clean Sky 2 JU confer on the Governing Board the powers to approve the Additional Activities Plan 2017;

2) The private members of the Clean Sky 2 JU have submitted a proposal for the Additional Activities Plan 2017 which contributes to the objectives of the Clean Sky JTI.

HAS DECIDED:

Article 1

The Additional Activities Plan 2017 set out in the Annex is approved.

Article 2

This decision shall enter into force on the day following its adoption.

Brussels, 16 December 2016

Ric Parker

Chairman of the Governing Board

Enclosures:
- Additional Activities Plan 2017; (ref. CS-GB-2016-12-16 AAs Plans 2017)

Additional Activities Plans 2017
Clean Sky 2 Joint Undertaking
Governing Board Approval
-December 2016 -

MEMBER NAME	Planning Period	Value of Additional activities (excluding Union funding)	Reference to CS2 Programme HLOs	Technology Streams / Demonstrator area in CS1/CS2 (if applicable)	Activity title and relevance
AEROMAC - Aeromac Mecanizados Aeronauticos, SA	2017	240,711.00 €	Industrial objectives to ensure future competitiveness	WP 1.4. Hibrid Laminar Flow Controlled Leading Edge for Horizontal Stabilizator (HLFC)	Manufacturing of LE_HLFC by Additive manufacturing Relevance to CS programmes: Technological back-up and possible future alternative solution to that applied on demonstrator WP 1.4 (HLFC) of CS2. Manufacturing solution for LE_HLFC in CS2: • CFRP internal structure joined to external microperfored titanium skin. Manufacturing solution for LE_HLFC in ADDIFLY: • Titanium additive manufactured internal structure joined to external microperfored titanium skin. Even that these manufacturing technology is far from market due to the current available size of AM machines, the possibilities of weight reductions and system integration makes interesting the manufacturing of a first scale (3:1) demonstrator. TRL: 4 Future developments of additive technologies could allow in next years to manufacture a full scale flight demonstrator in CleanSky. A 100% metallic HLFC Leading Edge demonstrator will be designed and manufactured by Selective Laser Melting. This additive manufacturing technology will allow to integrate the maximum number of structures and systems by an optimized topologic design of the internal structure. • Vacuum systems for HLFC. • Anti-frozen systems • High lift systems • Supports for electrical systems..etc. • Static and dynamic support structures. • Innovative hail and bird Impact resistant lattice structures will be also developed. • Joining and exchangeability join solutions…. In addition welding technologies for joining of Titanium micro perforated sheet to internal additive manufactured structure will be developed.
GKN AERO AB - GKN Aerospace Sweden AB	2017	1,490,000.00 €	Contributes towards reducing Aircraft CO2 emissions and noise. Strengthens the competitiveness of European aviation industry.	WP2 WP2 – UHPE ground demo for SMR A/C WP4 Advanced Geared Engine Configuration WP5 VHBR – Middle of Market Technology WP6 VHBR – Large Turbofan Demonstrator UltrafanTM	Enoval Development of innovative aerodynamic design of the turbine exhaust case. Validation in aerodynamic rig test. Results will be direct input to the higher TRL TEC demo in CS2 WP4. GKN own contribution. SWE DEMO MOTOR National Program SWE DEMO MOTOR. Development of competitive manufacturing technologies for engine structures and rotors. Validation of these novel technologies by manufacturing of GKNs demonstrator parts in Clean Sky-2
AED - Aernnova Engineering Division, SA	2017	275,923.00 €	Industrial objectives to ensure future competitiveness	WP 1.4. HLFC WP 1.2. Rear End	Design and Manufacturing of LE_HLFC by Additive manufacturing Relevance to CS programmes: Technological back-up and possible future alternative solution to be applied on demonstrator WP 1.4 (HLFC) of CS2. - Design solution for LE_HLFC in CS2: - Manufacturing solution for LE_HLFC in CS2: •CFRP internal structure joined to external microperfored titanium skin. - Manufacturing solution for LE_HLFC in ADDIFLY: •Titanium additive manufactured internal structure joined to external microperfored titanium skin. Even that these manufacturing technology is far from market due to the current available size of AM machines, the possibilities of weight reductions and system integration makes interesting the manufacturing of a first scale (3:1) demonstrator. TRL: 4 Future developments of additive technologies could allow in next years to manufacture a full scale flight demonstrator in CleanSky. A 100% metallic HLFC Leading Edge demonstrator will be designed and manufactured by Selective Laser Melting. This additive manufacturing technology will allow to integrate the maximum number of structures and systems by an optimized topologic design of the internal structure. •Vacuum systems for HLFC. •Anti-frozen systems •High lift systems •Supports for electrical systems..etc. •Static and dynamic support structures. •Innovative hail and bird Impact resistant lattice structures will be also developed. •Joining and exchangeability join solutions…. In addition welding technologies for joining of Titanium micro perforated sheet to internal additive manufactured structure will be developed. AED will take responsibility in the design of the proposed solution. Research for new materials and analysis methodology (WP 1.2.) Fatigue numerical models will be validated using simple specimens of composite materials. Experimental tests will be performed on coupon specimens. The new methodology for fatigue predictive models will be compared with experimental tests using aeronautical subcomponent scale structures of composite materials. Technological demonstrator will be tested experimentally under fatigue load. A numerical methodology to predict interlaminar and intralaminar damage and fatigue life will be developed. A methodology to predict the interlaminar and intralaminar damage through cohesive elements' technique incorporating fatigue damage model will be developed. S-N curves for design of aeronautical composite subcomponents will be obatained. Analyzing the subcomponents subjected to cyclic loading and integrating the developed tools in the project and allows the generation of recommended curves for design.

UNOTT - The University Of Nottingham	2017	2,000,000.00 €	Reduction of emissions - the rig will be used for testing aero-engine components that will contribute to lowering Co2 and NOx emmissions resulting from fuel burn efficientices gained due to novel bearing chamber and gearbox designs as an output from WP5.6 Engines ITD.	WP5.6 Engines ITD.	Procurement of equipment Equipment procured for the rig set up including jigs, fixtures, instrumentation and other supporting features.
RR - ROLLS ROYCE Plc	2017	57,000,000.00 €	Up to 23% fuel burn and CO2 emission reduction relative to year 2000 baseline (consistent with 10% reduction relative to year 2014 baseline) Noise levels making a significant step towards to ACARE 2035 targets (- 11 EPNdB per operation relative to 2000 situation) Contribute to delivery of NOX emission reductions through reduced fuel burn and lean burn technology.	WP 5 VHBR Middle-of-Market Demonstrator WP 6 VHBR Large Turbofan Demonstrator	Composite Fan development Other enabling technologies such as the composite fan, journal bearing and variable area nozzle will be developed in parallel to the Clean Sky 2 programme. Power gearbox technology development and testing The power gearbox is a critical element of the UltraFan architecture and although some of the elements of this development is within the scope of Clean Sky 2, some design activities, and most of the testing and validation work, including the development of supporting (but critical) technologies such as the health monitoring of the power gearbox, will be developed outside the Clean Sky 2 programme and supported by national as well as private venture funding. Journal Bearings development Other enabling technologies such as the composite fan, journal bearing and variable area nozzle will be developed in parallel to the Clean Sky 2 programme. Assembly and test resource, including hardware (e.g. tooling, instrumentation, etc.) Specifically for Advance3, the additional activities will be focused on the design and validation of the fan, compressor, turbine, power transmission and control systems that will ultimately be integrated and tested as part of the Clean Sky 2 programme. Lean Burn combustion system The Lean Burn combustion system is integral to the Advance3 core, which in turn, will be the core powering the UltraFan™ engine. The Lean Burn combustion system still requires a number of tests to be performed in order to achieve TRL 6.
ITP - Industria de Turbo Propulsores S.A.	2017	3,924,400.00 €	To contribute to improving the environmental impact of aeronautical technologies, including those relating to small aviation, as well as to developing a strong and globally competitive aeronautical industry and supply chain in Europe. (increasing fuel efficiency)	WP5.2.3 IPT Material Evaluation & Development WP6.1.1 Multi-Stage IPT	Aerodynamic, thermo-mechanic and noise technologies for aircraft gas turbines. Aerodynamic, thermo-mechanic and noise technologies for the low pressure spool of VHBR engines Advanced manufacturing technologies for aircraft gas turbines Advanced manufacturing and repair technologies for the low pressure turbine section and low pressure compressor of aircraft gas turbines Advanced materials technology for low pressure section of aircraft gas turbines Development of new models and simulation tools for high temperature materials lifing, off-limits usage and critical manufacturing processes. Characterisation and modelling of materials for the LPC.
GED - General Electric Deutschland Holding GmbH	2017	850,000.00 €	ENG MAESTRO: Contribute to CO2 emission reductions through higher OPR. ENG TURN: Reduce CO2 emissions. FRC MOBILITY DISCOVERY: Aligns CS2 goals reduction of CO2 emissions	ENG WP2 WP2.4.1 – Turbine Vane Frame ENG WP8 WP8.3 - Compressor. Reliable and more efficient operation of small turbine engines	ENG TURN: TVF aero design study The AA integrates what done in the WP2.4.1 through a more comprehensive investigation of TVF aero designs for the UHBR architecture w/o constraints given by the current UHPE layout (e.g. HPT outlet conditions). FRC MOBILITY DISCOVERY: HSIS AND PROP GBX MODULE DEVELOPMENT 1)Mechanical test rig and the supporting infrastructure is being maintained, safety checked, and upgraded. 2)Novel technology evaluation for improving the performance of the current technology standard were performed. Relevance to CS programmes: 1)The torque test rig serves the base for the future evaluation of the novel torque sensor for RotorCraft GBXs. 2)The results of the technology development outside of CS2 will input relevant data for the torque sensor for RotorCraft GBXs, especially when it comes to understand reproducibility and accuracy at different operating conditions and shafts. ENG MAESTRO: COMPRESSOR RIG TEST FACILITY HW UPGRADE The upgraded rig will serve to increase the test scope of the HPC aero design in WP8.3 from axial stage testing (as in the initial proposal) to the complete compressor (axial + radial). This will provide additional insights wrt performance, ax/rad aero & aero-mechanical matching, stability limits and applicable OPR range for the design.
DAV - DASSAULT AVIATION	2017	4,500,000.00 €	To contribute to improving the environmental impact of aeronautical technologies as well as to developing a strong and globally competitive aeronautical industry and supply chain in Europe (increasing fuel efficiency)	WP A-1.1 Optimal Engine Integration on Rear Fuselage WP A-1.3 Novel High Performance Configurations WP A-1.4 Virtual Modelling for Certification WP A-2.1 Laminar Nacelle WP A-2.3 Extended Laminarity WP A-3.1 Multidisciplinary Wing for High and Low Speed WP A-3.3 Innovative Shapes and Structure WP A-4.2 Active Load Control WP A-3.4 Eco-Design for Airframe WP A-5.2 Office Centred Cabin	Multidisciplinary Aircraft design and aircraft certification process using numerical tools. Impacts to CS2 are weight-to-drag ratio improvements (lift-to-drag ratio, definition and evaluation of laminarity profiles (wing and nacelle), architecture optimisation Design criteria for innovative architecture using composite materials, aeroelasticity design and optimization tools. Impacts to CS2 are weight-to-drag ratio improvements (new materials, architecture optimisation) New manufacturing process Weight to drag, ratio improvement, efficiency and productivity increase. Alternate ideas to CS2 development for eco design New cabin layouts concepts Alternate ideas to CS2 concepts and technology for business Jet Cabin.

CASA - AIRBUS DEFENCE & SPACE SAU	2017	2,000,000.00 €	- Increasing Aircraft Fuel Efficiency, reducing C02 emissions - Competitiveness (lower life cycle costs, lower recurrent costs)	WP3.1.2 Functions for Efficient and easy systems management WP3.4 Active Cockpit	Activities for innovative manufacturing and integration activities to reduce operating and lifecycle costs Electrical Management Distribution Systems FT4B regional flight test bed Electrical Ice Protection Systems Miniaturization and Integration of Antennas Composite Material Fire Resistance Characterization COSSTA Superplastic forming APOLO Infusion process Additive Layer Manufacturing
A-D - AIRBUS OPERATIONS GMBH	2017	20,000,000.00 €	Demonstration of technologies contributing to achieve H2020 HLO / targets with respect to environment & competitiveness	LPA Airbus AA 2017-02 LPA work packages WP1.1, WP1.4, WP1.5 and WP1.6, Airframe WP 2.2	R&T and development of laminar wing manufacturing technologies for large transport aircraft Accompanying activities as well as Research and Technology to develop the required technologies and manufacturing methods for laminar wings, not funded in Clean Sky / Clean Sky 2 Provide facilities, instrumentation and skilled experts for large scale demonstration on aerodynamics and aeroloads Aerodynamics and Aero-loads for large transport aircraft components in large scale demonstration under operational conditions Provide facilities, instrumentation and skilled experts for large scale demonstration on aircraft performance Aerodynamic performance of advanced large transport aircraft configurations in large scale demonstration under operational conditions Provide flight test aircraft, facilities and skilled personnel for integration and testing Integration and performance validation and demonstration with next generation engines
THA - THALES AVIONICS SAS	2017	1,500,000.00 €	Environmental Benefits European Competitiveness	WP1 Extended Cockpit	FMS open architecture and Cockpit HMI interface FMS : analysis, trade off and initial development of 'open core architecture' Flight Management System. HMI : analysis, trade off and initial development of new HMI concepts and interface protocole to core avionics functions.
SAAB - SAAB AB	2017	2,677,000.00 €	Improving the environmentally impact of aeronautical technologies and improve the global competitiveness of the industry sector in Europe	D2-2 Aileron demonstrator D3-2 Door demonstrator WPA 2.2 NLF Smart Integrated Wing WPA 3.1 Multidisiplinary wing for high and low speed WPA 3.3 Innovative shape and structure	Automation Research for increased productivity and manufacturability Manufactoring Research for advanced manufacturing and assembly processes Flight Management Systems HUD Systems, Vision and Awareness studies in rigs and simulators Actuation Electrically powered Control & Actuation activities
AKIRA - Akira Technologies SARL	2017	120,000.00 €	Enable a technological leap in the face of emerging competitors;	WP3.3 Advanced Power & Accessory Gear Box	Test rigs Power regulation and monitoring Relevance to CS programmes: links are in ENGINE ITD at various levels; impact to CS2 is found in the field of environmental benefits, efficiency increase, integrated and large scale validation and demonstration activities.
DMP - Desarrollos Mecánicos de Precisión S.L	2017	475,000.00 €	-Accelerate the progress towards the ACARE SRIA goals for 2020-2050; -Enable a technological leap in the face of emerging competitors; -Accelerate the adoption of new technology into the global fleet	WP3 Business aviation / short range Regional TP Demonstrator	Vibration Health & Reliability Monitoring (VHRM) This project aims to validate a new approach for VHM strategies by incorporating new failure modes (such as misalignment, assembly and manufacturing errors) into reliability models and new sensor technologies. Relevance to CS programmes: links are in ENGINE ITD and FAST ROTORCRAFT IADP at various levels; impact to CS2 is found in the field of environmental benefits (noise and CO2 reduction), efficiency increase, and Life Cycle Assessment and demonstration activities.
SAF - SAFRAN SA	2017	43,850,000.00 €	To contribute to improving the environmental impact of aeronautical technologies, including those relating to small aviation, as well as to developing a strong and globally competitive aeronautical industry and supply chain in Europe.	Eng ITD WP2 UHPE ground test Demonstrator LPA IADP WP 1.1.3 CROR flight test demo Open rotor & UHBR Booster	Open Rotor & UHBR : Ground test of the CROR demonstrator is required to validate mechanical behavior, Demo Open Rotor final acceptance and ground test Open rotor configuration aeroacoustics testing Compressor and Fan modules design with test campaign Combustor test campaign Cowling subsystems studies and novel integration for equipment integration Combustion modelling and studies Turbine combustor interaction activities Power Gear Box technologies maturation UHBR fan and nacelle reduced scale models for tests purpose Relevance to CS programmes: All the activities listed above are needed to support the CROR engine in order to have the right technologies available to be tested and in a second hand to mature the technologies for the UHBR target engine such Power Gearbox technology , Fan & Compressor , Combustor and Subsystems like cowling. High speed Booster aerodynamics New abradable for high speed booster Rotor and blades vibration Booster casing and radial clearances Anti-Ice and Ice crystals Booster ingestions High speed Booster specific technologies maturation: VSV technologies, bearing support,… Oil equipment maturation for UHBR (Oil tank, pump, vanes, heat exchangers) Relevance to CS programmes: All the activities listed above are needed to support in one hand the UHPE ground demonstrator in order to have the right technologies available to be tested and in a second hand to mature the technologies for the UHBR target engine.
UMBRA - Umbra Cuscinetti Spa	2017	267,426.70 €	CO2 and Fuel Burn: -20% to -30% (2025 / 2035) Up to 15% of fuel efficiency improvement vs 2014 reference air vehicles Up to 10% of reduction of total operating costs vs 2014 reference air vehicles	WP2 Technologies Development EMA (Electro-Mechanical Actuation) - WP2.4.2 WP3 Demonstrations WP3.1 Air Vehicle Technologies – Flying Test Bed#1 (FTB1) - Highly Efficient Low Noise Wing Design for Regional Aircraft WP3.4 Iron Bird WP3.5 Integrated Technologies Demostrator for Turboprop Flying Test Bed #2 (FTB2) - Innovative Future Turboprop Technologies for Regional Aircraft - High Lift Advanced Turboprop	Technical and technological enhancement of UMBRA's EMAs for the improvement of their performance. Systems and equipment (actuation systems); Research for new materials and advanced manufacturing processes. The RTD projects under implementation by UMBRA Cuscinetti refer to the design, prototyping and test of new solutions for EMAs in order to increase their performance and reliability. The solutions experimented are in line with the achievement of goals such as the aircrafts' global decrease of weight, the reduction of the volume of their devices and - as a consequence - also the betterment of the operative costs and the improvement of environmental performance. The innovations to be tested in the EMAs refer to both the product features and the production process; among them, for instance: – the introduction of elliptical shafts, allowing to simplify the EMA structure and therefore to save space, to use a minor number of components and to reduce the production costs. Power generation by the conversion of motion from linear to rotational, by using the ball-screw technology. Systems and equipment (actuation systems); Advanced energy management. A further RTD activity under implementation is aimed at generating power by converting linear motion into rotational. Also in this case, the technology for energy generation/conversion is based on Umbra's Ball Screws. Two main types of applications are being studied for the design of energy converters based on Ball Screws: 1) The energy recovery / regeneration from the automotive components (shock absorbers, breaks) 2) The power conversion from renewable energy sources, especially waves (wave energy converters) The gained knowledge on energy regeneration through EMA especially as for the first type of application – can be exploited also in the aeronautics sector, for instance by providing EMAs with the additional functionality of recovering energy during specific phases of EMA operation.
Total 2017		**141,170,461 €**			
Total Planned 2014-2016		**368,043,680 €**			
Total Planned 2014-2017		**509,214,141 €**			