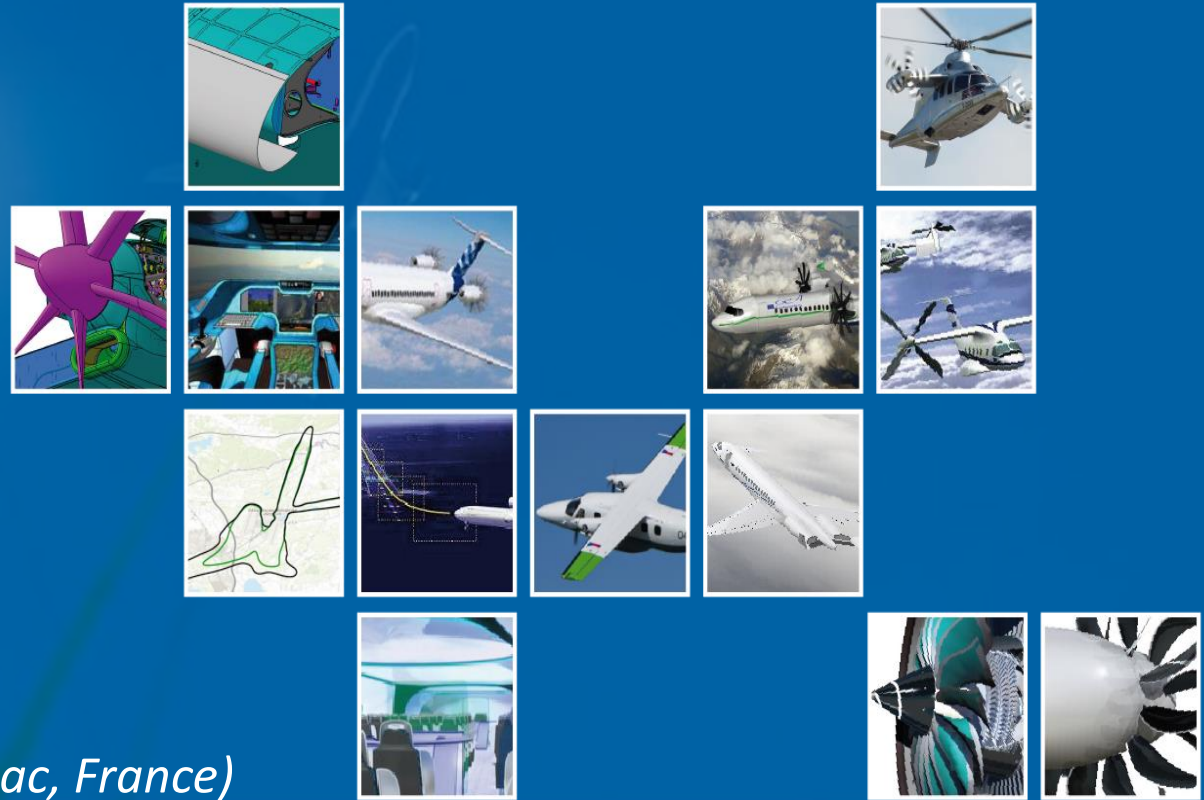


CfP10 Info Day: Technical Session



7th May 2019

Location: CCI Occitanie (Blagnac, France)



JTI-CS2-2019-CFP10-AIR-02-78

Title: Application of graphene based materials in aeronautical structures for thermal de-icing, lightning strike protection, fire barrier and water absorption prevention purposes.

WP Location: AIR ITD - WP B-3.1

Objectives:

The topic aims are to take advantage from electrical, thermal and impermeable properties of graphene and to investigate the benefits of the use of graphene on composite aeronautical structures, in order to identify the most suitable solution (in terms of amount and form of graphene) for thermal de-icing systems, lightning strike protection, fire barrier and water uptake prevention.

The functional properties of graphene based material shall be assured also after damages like scratches or hail impact



Tasks description:

- Task 1: Feasibility study of the use of graphene based materials for de-icing systems, lightning strike protection, fire barrier and water uptake prevention and conceptual material definition for each application
 - It's requested to develop the material, driven by selected property improvement (e.g. de-icing, fire barrier, water absorption prevention, etc.). Additional drivers will be weight and cost reduction and the easy producibility both for the material itself and its application/integration on aeronautical structures.
 - In addition the Applicant shall describe the theoretical working principles and how the proposed solutions can be integrated in aeronautical structure
 - The proposed solutions should be able to stand and to be operative at the following airplane service environmental conditions of temperature and humidity: - 55° C / + 80 °C, from 15% up to 97%



Tasks description:

- Task 2: Graphene based material development and production for thermal de-icing application and integration, with electrical connections included, in aeronautical composite and aluminum panel
- The Applicant will develop the concepts selected in the Task 1 for thermoelectric embedded de-icing applications / systems. The study will be focused on the power characterization of graphene heaters as de-ice device. The development and validation activities have to cover also the applicable electrical circuits and systems required to properly heat up the resistance made up of selected graphene based material



Tasks description:

- Task 3: Graphene based material development and production for lightning strike application and integration in aeronautical composite panel
- The Applicant will develop the concepts selected in the Task 1 for lightning strike applications. In this phase the applicant shall verify the compliance of the material with aeronautical requirements and shall assess if the proposed solution can affect the structural capability of the material through destructive and non-destructive characterization.
- In order to assess the feasibility on a lab scale level, the new graphene based material will be fabricated and coupled with standard toughened epoxy resin composite material for aeronautical structural applications panels. Some test coupons will be cut and tested to evaluate the de-icing and its potential detrimental effect of mechanical properties of composite based material
- A small scale test article, representing a simplified HS or fuselage panel shall be manufactured before performing test aiming at verifying the compliance with lightning strike requirements; the test will aim also to validate the processability of the new material system and to freeze process parameters



Tasks description:

- Task 4: Graphene based material development and production for fire barrier application and integration in aeronautical composite panel
- The Applicant will develop the concepts selected in the Task 1 for fire barrier applications
- In order to assess the feasibility on a lab scale level, the new graphene based material will be fabricated and coupled with standard toughened epoxy resin composite material for aeronautical structural applications panels. Finally, test coupons will be cut and tested to evaluate the fire barrier properties of the new material as per FAR 25853 Appendix F and its potential detrimental effect of mechanical properties of composite based material
- A small scale test article, representing a simplified bulkhead panel shall be manufactured and tested verifying the compliance with fire barrier requirements as per FAR 25853 Appendix F, the test will aim also to validate the processability of the new material system and to freeze process parameters



Tasks description:

- Task 5: Graphene based coating development and production for water absorption barrier and integration in aeronautical composite panel
 - The Applicant will develop the concepts selected in the Task 1 for water uptake prevention applications
 - The applicant shall verify the compliance of the material with aeronautical requirements and shall assess if the proposed solution can affect the structural capability of the material through destructive and non-destructive characterization.
 - The new graphene based material will be fabricated and coupled with standard toughened epoxy resin composite material for aeronautical structural applications panels; the configuration of the panels shall be both in solid laminate and in sandwich



Tasks description:

- Task 6: Application of de-icing system on a subscale component with the possible integration with other GBM functionalities at Topic Manager site
- The present task will target the integration of de-icing system at subscale component to the other functionalities developed and testing in accordance with a test matrix agreed with TM in order to assess the possible combined effect of different solutions
- On the small scale item, representative of the simplified curved leading edge(L = 400 mm, W = 200 mm approx.) with embedded de-icing system, it is also requested to repeat the functionality tests - performed in task 2 at room temperature - in climatic chamber at -30°C and eventually in “in flight” conditions



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Major Deliverables:

Deliverables			
<i>Ref. No.</i>	<i>Title - Description</i>	<i>Type*</i>	<i>Due Date</i>
D1.1	Detailed summary report	R	T0+6
D2.1	Graphene Based Material process instruction	R	T0+10
D2.2	Basic panel lab test report for de-icing system both for composite and aluminum	R	T0+14
D2.3	Functionality test report and procedure of de-icing system management	R/D	T0+20
D3.1	Graphene Based Material process instruction	R	T0+10
D3.2	Basic panel lab test report for lightning strike protection	R/D	T0+14
D3.3	Functionality test report and procedure for lightning strike protection	HW/R	T0+20
D4.1	Graphene Based Material process instruction	R	T0+10
D4.2	Basic panel lab test report for fire barrier applications	R	T0+14
D4.3	Functionality test report and procedure for fire barrier applications	HW/R	T0+20
D5.1	Graphene Based Material process instruction	R	T0+10
D5.2	Basic panel lab test report for water absorption prevention	HW/R	T0+14
D5.3	Functionality test report and procedure for water absorption prevention	R	T0+20
D6.1	Small scale element and functionality test at Topic Manager site	HW/R	T0+27
D6.2	Test report on functional properties	R	T0+30

*Type: R=Report, D=Data, HW=Hardware



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Milestones:

Milestones (when appropriate)			
<i>Ref. No.</i>	<i>Title - Description</i>	<i>Type*</i>	<i>Due Date</i>
M.1	Detailed summary report	R	T0+6
M.2	Functionality test report and procedure of de-icing system management	R/D	T0+20
M.3	Functionality test report and procedure for lightning strike protection	HW/R	T0+20
M.4	Functionality test report and procedure for fire barrier applications	HW/R	T0+20
M.5	Functionality test report and procedure for water absorption prevention	R	T0+20
M.6	Small scale element and functionality test at Topic Manager site	HW/R	T0+27

*Type: R=Report, D=Data, HW=Hardware



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Special Skills:

- Demonstrable competencies and knowledge of graphene material and its main applications
- Demonstrable capability to develop and produce graphene based material for research and production purposes
- Proven competence in management of complex research projects.
- Proven experience in composite material use and fabrication of small/mid components with advanced composite materials.
- Required facilities for coupons and trials fabrication: clean room and autoclave
- Proven experience in composite experimental testing (NDT, visual and dimensional, mechanical, FST, micrographic and chemical-physical analysis) at coupon and sub scale level, laboratory certified per ISO17025.
- Experience in instrumentation data acquisition, recording and monitoring
- Proven experience in the design and development of electro-thermal circuit/system with low power absorption
- Availability of appropriate tools required to optimize Electro-Thermal power consumption and provide associated system architecture definition

Indicative Funding Topic Value: 500 K€

Duration of the action: 30 Months



Any questions?

Info-Call-CFP-2019-01@cleansky.eu

Last deadline to submit your questions:
5th July 2019 (17.00 Brussels Time)

