Novel Processes and Equipment in Composite Repair Technology

Rapports

Informations projet

NEWCORT

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Periodic Reporting for period 3 - NEWCORT (Novel Processes and Equipment in Composite Repair Technology)

Période du rapport: 2019-01-01 au 2019-12-31

Résumé du contexte et des objectifs généraux du projet

The main objective of NEWCORT is to develop and validate novel processes and equipment for the repair of advanced composite airframes. To this end, “Composite Repair Heating and Polymerization Process Monitoring” has been identified as being the most critical issue while having the highest potential for further developments. Novel heating processes and equipment will focus on the polymerization of new types of resins (e.g. starting from M20/M21 variables ranging at curing at 120-140oC), possibly including thermoplastic materials, through application of innovative instruments and methods:
• Design of range of GMI heating blankets adapted to most frequent internal structural configuration specificities,
• Sensing mats with embedded thermocouples and dielectric sensors, for resin curing progress and viscosity monitoring,
• New power supply and control logic of heating consoles for optimized performance and for “driving” the novel heating blankets and sensing mats,
• Introduction of the CONDUCTOR* blanket logic (i.e. consumable heating blankets) to target repair configurations.
• Development of Quick Composite Repair (QCR) kits for most frequent aircraft repair cases.
In addition, “Composite Repair Associated Procedures”, namely material removaland NDT, will be similarly addressed:
• For material removal, main developments include process optimization.
• Optimization of existing U/S NDT application procedures will be studied, together with the development of repair specific calibration specimens.

Travail effectué depuis le début du projet jusqu’à la fin de la période considérée dans le rapport et principaux résultats atteints jusqu’à présent

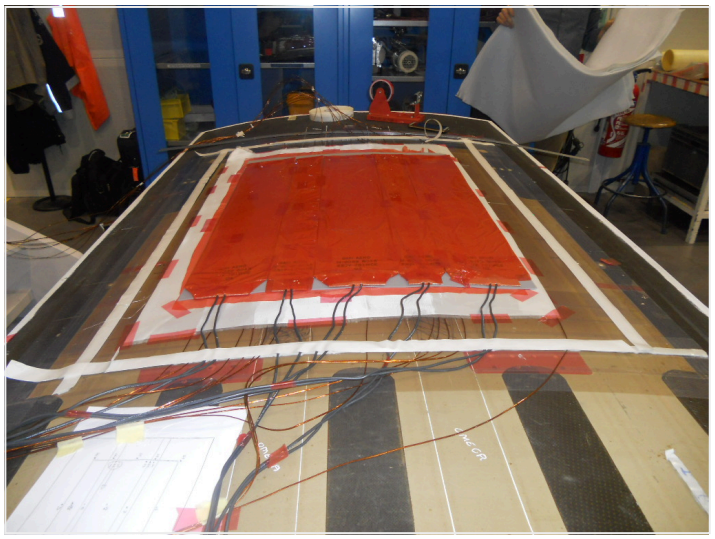
"The following activities have been performed during the 1st Reporting Period:
• Determination of all parameters and constraints related to the operation of equipment, software and procedures and preliminary analysis and design of the novel equipment.
• Definition of the demonstration cases and the exact validation plan for the project technologies.
• Technical work for the development of innovative solutions contained in WP2-WP3, as described in detail within the corresponding Tasks.
The following activities have been performed during the 2nd Reporting Period:
• As within D1.2 ""Preliminary Analysis and Design of Equipment"" it was identified that certain Tasks in WP2 and WP3 were not necessary any more in the context of ITD AIRFRAME WP B-3.3.2 it was agreed that Tasks 2.4 3.1 3.3 and 3.4 should be cancelled. An Amendment has been prepared and approved on 20 December 2017.
• Within Task 1.3 the basic elements of a testing and validation campaign of developed equipment and methodologies were defined, in order to confirm that all critical parameters concerning the performance of the equipment will be covered, proving their compliance to the specification requirements.
• Technical work for the development of innovative solutions contained in WP2-WP3 has been

promoted and concluded in most cases, as described in detail within the corresponding Tasks.
The following activities have been performed during NEWCORT 3rd Reporting Period:
• All Composite Repair Heating and Polymerization Process Monitoring Tasks have been concluded within WP2, mainly including finalization of design of range of heating blankets, development of heating mats, upgrading of multi-zone heating consoles, CONDUCTOR cuttable blankets and QCR kits.
• In a similar manner, within WP3 the analysis of stepping simplification was finalized, while proposed NDT application procedures and associated QC techniques have been optimized.
• WP4 included the demonstration of developed equipment and processes' performance towards the Topic Manager. Design feedback has been produced, as required, and the developed equipment have been upgraded and re-tested accordingly.
• A validation phase of novel equipment and processes has followed within WP5, which also included the preparation of the corresponding equipment manuals.
• NEWCORT partners have participated in several exhibitions, in order to disseminate its technical achievements. In addition, a Continuous Professional Development (CPD) seminar has been in organized just before Le Bourget Air Show in Paris, to promote, among other composite repair related scientific Topics, NEWCORT developments towards the aeronautical community (see https://easn-tis.com/cpd)."

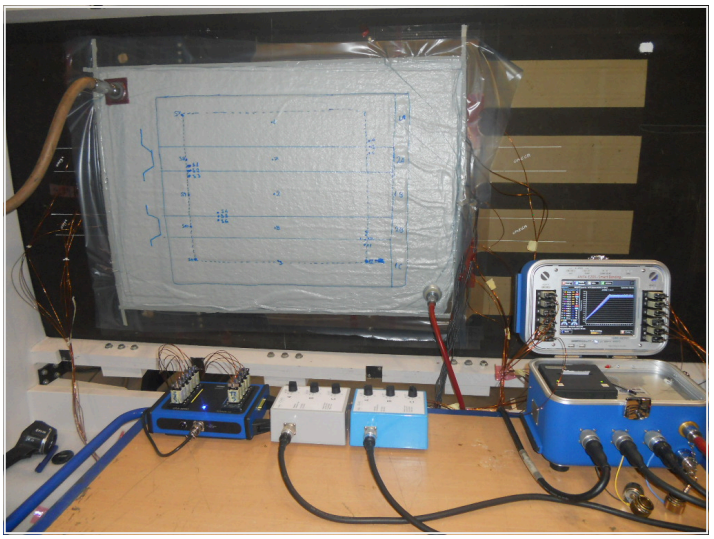
Progrès au-delà de l'état des connaissances et impact potentiel prévu (y compris l'impact socio-économique et les conséquences sociétales plus larges du projet jusqu'à présent)

The overall concept of the NEWCORT is to provide the Topic Manager with a "toolset" of novel processes and associated equipment, so as to enable the development of tailored solutions to address typical damages to be repaired by the whole range of stakeholders of the aeronautical industry (aircraft manufacturers, airlines, MROs etc.), such as lightning strike and accidental impact. As detailed in the following Paragraphs of the NEWCORT proposal, this "toolset", which covers the whole range of the bonded composite repair procedure, (e.g. damage removal, NDT, repair patch polymerization, etc). To this end, structure configurations will be selected by the Topic Manager and the composite repair processes and associated equipment will be commonly selected between the Topic Manager and the NEWCORT Consortium, so that the "toolset" solutions are tailored to those configurations. The selected processes will be characterized, as per a test matrix defined by the Topic manager, against time saving vs. state of the art repair process, mechanical properties of the repair patch, NDI capability of the repair patch, resistance to aggressive media, electrical properties etc.
Socio-economic impact: The major impact of the NEWCORT project will be the reinforcement of the competitiveness of EU aircraft industry and EU aircraft operators. In the year 2011, the European aerospace industry employed 479.600 persons; Europe's airline industry employed approximately 390.000 persons. Both the aircraft production and airline operation industries are active on the most globalized markets; therefore the conservation and future expansion of employment will necessitate a highly increased competitiveness. The project results will play a key role in addressing this issue, both by generating added product value for aircraft manufacturers and reduced cost and time investments for production and ground operations. Additionally the NEWCORT project will assist the development

of high technology SMEs, where job opportunities will be developed for the final industrialization of composite repair and OOA manufacturing techniques as well as future market entry within Europe. Another important aspect will be the increased safety resulting from more reliable components and processes. This is one of the major criteria for the European aerospace industry to belong to the market leaders within this business sector. Technical impact: The innovations aimed at within NEWCORT will have strong technical impacts regarding the knowledge about highly integrated lightweight CFRP structures in all aerospace applications and necessary certification. Due to the development of reliable repair techniques and equipment, the increased integration of innovative materials will be enabled. Novel light-weight design of CFRP structural components will be possible and will lead to weight savings (up to 15%) of the aircraft. Even further weight saving are expected for CFRP integration in interior design and system components. Additionally the delivery of new, reliable bonded composite repair processes and equipment improves the safety and operational capability of aircraft, leading to an increase in operational life.



AdaptHEAT system developed for heating of Omega stiffened structures



AdaptHEAT system developed for heating of Omega stiffened structures

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