Next generation multifunctional and intelligent airframe and engine parts, with emphasis on manufacturing, maintenance and recycling

The main target will be to further advance the design, production and field operation of multifunctional and intelligent airframe and engine parts, with an emphasis on efficient, cost-effective and ecological manufacturing, maintenance and recycling. The proposals should address three or more of the following areas:

- Innovative manufacturing technologies and processes for flexible wing with morphing capabilities, for control surfaces such as leading and trailing edge as well as winglets, which can adapt their shape in low-speed aircraft configurations.
- Innovative joining technologies and damage diagnostics for composites and dissimilar materials in primary and secondary aircraft structures, with high potential to offer substantial benefits towards reduced weight, while allowing for faster and leaner integration and repair.
- Advanced quality monitoring and on-line process control, applied to flexible automation of the manufacturing/maintenance/repair processes for increased rates.
- Manufacturing processes for the production of composite, multifunctional and intelligent airframe parts, as well as high-temperature and complex-shaped engine parts, covering the whole production chain – cf. process planning, manufacturing and assembly, quality control – with a view to support activities such as supervision and multi-disciplinary optimisation (process-product-performance) of production, smart tooling and on-line quality control.
- Multifunctional and intelligent engine parts covering variable geometries in engine structures for optimized performance over the whole cycle, embedded intelligence as well as integrated thermal and electric functionalities
- Integrated technologies and methodologies towards next generation health management and monitoring, together with sensor development, wireless networks and data-driven fault detection.
- New MRO and recycling technologies for Multifunctional and Intelligent Airframe and engine parts.

Proposals may tackle pre-standardisation, development of best-practice guidelines and processes for the certification of airframe and engine components and assemblies, with particular emphasis on simulation-assisted certification issues. The proposals may include an explicit commitment from the European Aviation Safety Agency to assist or to participate in the actions.

The implementation of the proposed areas of this topic may cover TRLs between 2-4.

This topic complements (and should not overlap) retained projects from the 2018 and 2019 topics on "multidisciplinary and collaborative aircraft design tools and processes" and "advancements in aerodynamics and innovative propulsion systems" respectively.

The Commission considers that proposals requesting a contribution from the EU between EUR 3 and 5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting lower or higher amounts.

In order to substantially offer cost-competitive aviation products and services and in line with Circular Economy concepts, it is essential that production, assembly/de-assembly/reuse and operational costs are further reduced. Sustaining and, wherever practicable, further extending European industrial leadership, through high-value manufacturing technologies as well as Maintenance, Repair and Overhaul (MRO) and recycling, addresses the second challenge of the ACARE Strategic Research and Innovation Agenda.

The European aircraft supply chain aims towards competitive and sustainable products with high quality standards. Airframe and engine manufacturers require in addition, a step change in the efficiency, cost-effectiveness and flexibility of industrial processes in order to adapt to high-production rates and the ever-increasing complexity of products.

During the last ten years, European R&I has led to significant advancements in conformal morphing of aerodynamic surfaces, structural health monitoring as well as multi-functional structures. These technologies have the potential to further improve the overall aircraft performance whilst lowering their environmental and noise footprints. However, tailoring such advances to fully respond to the entire spectrum of aeronautical requirements – cf. variable production rates, quality targets, automated assembly processes, smart repair as well as ecological dismantling and recycling – is still work in progress.

- Manufacturing next generation multifunctional and intelligent airframe and engine parts
- New manufacturing paradigm shift with enhanced ecological maintenance and recycling characteristics
- New/updated technologies that will offer a competitive advantage of European MROs.
- Maintaining and extending European industrial leadership.

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