Automation Concepts and Technologies for Aircraft Assembly Lines in the Aircraft Factory of the Future
Assembly of aircraft sections and final assembly of aircrafts including structural assembly, system installation, cabin installation and test nowadays is done mainly manually or semi automated, which is also true for the supporting activities like logistics.

Many of the manual activities involve cumbersome tasks to be performed in non-ergonomic conditions. On the other hand, automation systems currently in use present some remarkable limitations for addressing the vision of the Aircraft Factory of the Future (complex and huge bespoke solutions, long lead time, capital intensive and process specific systems). As a consequence of this situation, in practice automation systems are applied only to a limited number of sub-assemblies with simple geometry and easy access.

In this context the aeronautic sector considers that automation of logistic processes, human-machine collaboration at installation stations and full automated processes for structural assembly, system and cabin installation shall be investigated integrating also possibilities to optimize process chains and to make the current status of the assembly transparent at each time.

ACOTAAL project responds to these needs constituting a research effort whose main objective is to develop new automation concepts for the assembly of aircraft sections and final assembly of aircrafts. The automation systems to be proposed will allow conducting aircraft assembly operations at high production rates with reduced recurring costs, while providing practical strategies for maximum production flexibility, simplified process chains and optimized logistic processes. For achieving this target the automation system concepts to be developed will integrate and combine key enabling innovative technologies in the robotics field.

Develop new automation concepts for the aircraft’s final assembly lines.
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From the whole amount of production activities that are being performed in the targeted aircraft assembly stations, in first place a set of representative production and intralogistics activities for each of the different working areas has been defined in order to be further targeted by the project’s automation concepts to be proposed. These include aircraft and production environment relevant information for the automation concepts like assembly components or systems to be installed, different working or application areas mapping and grouping, as well as assembly processes and means description as they are currently being fulfilled. Moreover Airbus Final Assembly Line (FAL) vision in the Future Aircraft Factory and derivation of implications to the automation systems that will form part of it has been established.

Several automation concepts for inside cabin (upper floor) and cargo (lower floor) as well as inside wing-root working areas, that incorporate advanced enabling technologies, have been developed until a conceptual design phase or basic engineering maturity level. Each automation concept includes a set of individual automation system (IAS) proposals plus the required operators to address all the representative production activities of the application area under analysis.

The elaboration of automation concepts proposals for the production activities regarding the Outside Fuselage application areas is currently underway in the project.
ACOTAAL Clean Sky project will contribute to strengthen the competitiveness of the European aeronautic sector, while meeting society’s needs, in several ways:

- Underpinning the concept of product viability are the cost of production and the cost of acquisition. Without considering the engines, more than 50% of the recurring cost of manufacturing an aircraft is determined by the fuselage, the cabin and cargo equipment and the integration effort performed in the assembly of these components. The entirety of all these aspects constitutes a complex bundle that is decisive for the success of an aircraft programme. Thus advanced manufacturing means and methods able to achieve high production rates with reduced recurring costs such as those being developed in ACOTAAL, should be considered a high-level enabler for achieving this objective.

- The new knowledge generated on automation concepts and technologies will strengthen the position of the European industrial community in the aircraft production and automation sectors

- The adoption of the new automation system concepts addressed in this project and the inherent change that they will provoke in the approach to manufacturing and assembly of aeronautic structures, will strongly contribute to provide a competitive industrial, technologically advanced and economically viable base for the aeronautic sector, and therefore is expected to provide a positive impact in the creation and preservation of quality employment in the aeronautic sector

- The project will impact directly on the working conditions and ergonomics of the aeronautic manufacturing industry shop floor operators, as the new automation systems fostered by ACOTAAL will fulfil the most arduous and unhealthy manual processes involved in the assembly stages

- The elimination of huge and heavy monument machinery from the assembly processes and their simplification will imply important saves on energy required for performing the aircrafts assembly