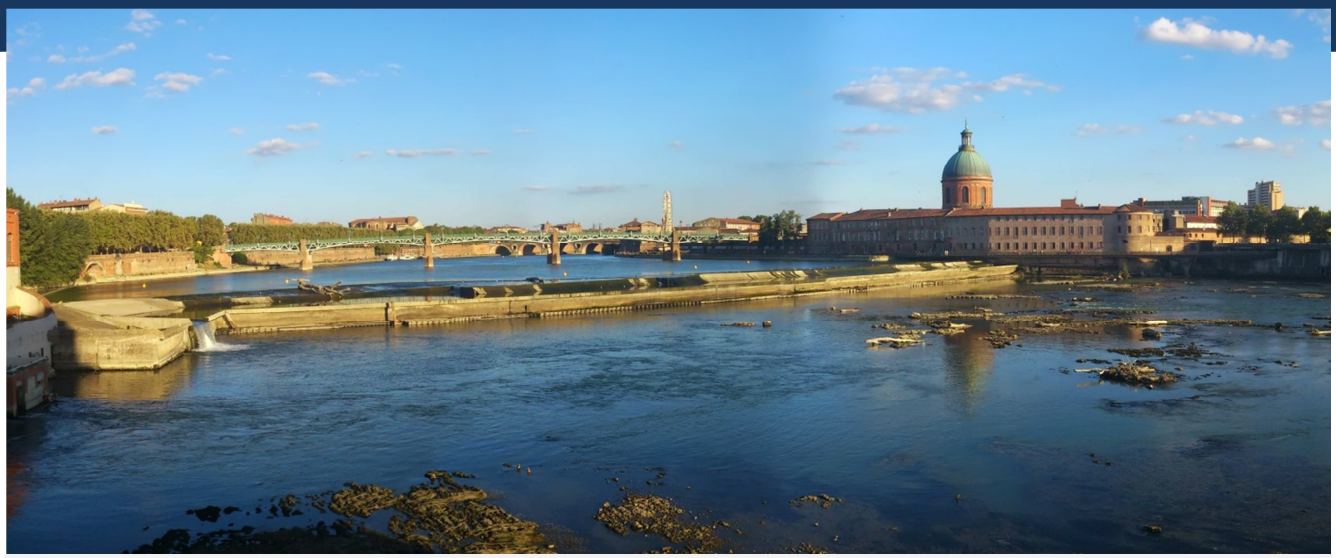

# The 1st International Conference on Cognitive Aircraft Systems – ICCAS

March 18-19, 2020

https://events.isae-supaero.fr/event/2

## Scientific Committee

- Mickaël Causse, ISAE-SUPAERO
- Caroline Chanel, ISAE-SUPAERO
- Jean-Charles Chaudemar, ISAE-SUPAERO
- Stéphane Durand, Dassault Aviation
- Bruno Patin, Dassault Aviation
- Nicolas Devaux, Dassault Aviation
- Jean-Louis Gueneau, Dassault Aviation
- Claudine Mélan, Université Toulouse Jean-Jaurès
- Jean-Paul Imbert, ENAC

**Permanent link :** https://doi.org/10.34849/cfsb-t270

# Thinking aircraft design and its production system design together

Dr POLACSEK, Thomas (ONERA); Dr PRALET, Cédric (ONERA); Dr ROUSSEL, Stéphanie; BOUISSIÈRE, François (Airbus); CUILLER, Claude (Airbus); DEREUX, Pierre-Eric (Airbus); KERSUZAN, Stéphane (Airbus)

## Content

In the design of complex objects, such as aircraft, the definition of the means of production usually begins after the definition of the product. In other words, the product specifications define the requirements for its production system (factory, assembly line, tools, etc.). The limitation of this approach is that the production system can inherit blocking constraints that might easily be removed by changing the design of the product. Moreover, designing an object on the basis that it will be manufactured as usual, without thinking about an associated means of production, does not allow us to take full advantage of new manufacturing means such as robotics or additive manufacturing. Indeed, these new means can open up new possibilities for aircraft design optimization while imposing constraints (like size of what can be printed, materials used, space for the robots, etc.). For all these reasons, it is necessary to integrate manufacturability as soon as possible in the development cycle and, in doing so, to have a holistic design approach.

A first step towards this goal is to design products in such a way as to simplify their manufacture, known as "Design for Manufacturing". This kind of approach allows to take into account the constraints inherent in the means of production, including the potentially prohibitive cost of certain elements or the material impossibility to manufacture certain design solutions. However, we must go further and integrate the opportunities offered by new manufacturing means and processes in terms of design. To do this, we propose a global design approach thinking, thinking together the aircraft design and its production system design.

In this sense, we are conducting work to define a system engineering approach for co-designing aircraft and production systems. Based on a real industrial use case for which significant efforts were provided to collect very heterogeneous data (documents, interviews, plans, etc.), we propose the first conceptual building blocks for such an approach. Firstly, we defined a generic pattern for a conceptual model of aircraft design and assembly line that can be instantiated at different levels of abstraction. For each development step, based on our pattern, a model can be defined, from high-level abstractions based on modules or functions, to low-level abstractions based on parts or screw. Secondly, we developed a prototype to evaluate the impact of a design on an assembly line performance (the production rate). Thirdly, we developed a prototype to design an assembly line based on an aircraft design described at a high level of abstraction.

**Keywords :** Model-based architecture design, Task scheduling, Safety analysis, Other