

# DESIGNING FREEDOM OF FLIGHT

## The Business

Airbus' comprehensive product line comprises highly-successful families of aircraft ranging from 100 to more than 600 seats: the single-aisle A320 Family, the long-range A330 Family, the new-generation A350 XWB Family, and the flagship A380.

## The Challenge

As aircraft systems are getting increasingly complex, Model-based System Engineering (MBSE) is emerging as a solution for faster design of robust products as well as for improving the quality of specifications and communications between teams and suppliers. To support new MBSE processes, Airbus needed an easy-to-use tool to model their systems' functional architectures in an effective way.

## The Solution

Airbus developed a customised tool based on Papyrus to support upstream operational and functional analysis. This tool enables clear definition of the functions needed to operate the system as well as its functional decomposition and its interfaces.

## The Benefit

Papyrus allowed the SysML language to be customized to a form more readily understandable by Airbus System designers. As a result, Airbus was able to deploy the tool at a reasonable cost to appropriate Research & Technology teams in a relatively short time, enabling support for innovative system designs. Modelling the functional architecture of a system, even with limited training, has never been easier.

[ Aircraft Industry ]  
« Papyrus allowed the SysML language to be customized to a form more readily understandable by Airbus System designers. »

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# & The Business & The Challenge



[Airbus A320 © bobmachee / Fotolia]

## « Commercial jetliners and military airlifters »

### The Business

**A**irbus – a division of Airbus Group – is the world’s leading manufacturer of commercial jetliners and military airlifters.

Since the company’s inception, Airbus has established itself as a pioneer in aircraft design, with innovations that include its introduction of fly-by-wire technology in civil airliners, the development of composite aerostructures, and the use of advanced materials and aerodynamics.

From the cornerstone A300 program to the new-generation A350 XWB,

Airbus has long relied on advanced technologies and industry-leading design tools to develop a product line of jetliners that is more economical, highly reliable, and better for the environment.

As a result, Airbus has grown its aircraft product line to offer a complete solution that is highly competitive on every level – reinforced by the company’s expanded service offer, as well as its increased global footprint.

### The Challenge

**I**n 2012, Airbus needed a tool to support new methods based on Model-based System Engineering (MBSE) principles. The intended scope of this tool was to cover the upstream part of the systems development process, which involves specifying how

the system is used (i.e., the operational description) and its functional architecture.

By using a formal language instead of documents, the aim was to improve the quality and the understanding of the specifications and to deal with the complexity of the system. Indeed, formal analyses and verifications can be performed, reducing the number of errors and detecting them earlier in the development cycle.

Previously, Airbus relied on available and well established COTS tools with encouraging results, but their deployment was limited due to their complexity. Consequently, a key requirement for the new tool was that it had to be flexible enough to adapt to the Airbus System Engineering vocabulary and concepts, and to adjust easily to evolving needs, as the processes and methods gradually matured.



# The Solution

[" Papyrus was selected as the backbone of our modelling tool FAST, because it offers the capabilities to build a customised product with System Designer friendly concepts quickly, and at reasonable costs." ]

« Flexibility and velocity »

ARTHUR MAGNET - PROJECT MANAGER  
SYSTEMS METHODS AND TOOLS - AIRBUS

**P**apyrus was selected as the underlying backbone of our tool, called FAST, because it offered the capability to quickly build a customised tool with System Designer friendly concepts at reasonable cost and with enough flexibility to make incremental adaptations driven by process evolution. The upstream part of the Airbus MBSE approach is manifested into two domain-

specific viewpoints, Operational Analysis and Functional Analysis.

These rely on standard SysML diagrams provided natively by Papyrus, the Activity and Internal Block diagrams respectively.

By constraining some of the general SysML capabilities and defining an appropriate profile, users are able to work only with domain-specific

concepts, resulting in radically simpler and more effective development.

FAST has been deployed as a Rich Client Platform (RCP) that includes Eclipse, Papyrus, and the Airbus-specific customisation. The general extensibility of Papyrus also enabled the inclusion of other tools, such as internal consistency checks and automatic document generation.





# The Benefits

«FAST was chosen to support Research projects focusing on innovative systems development.»

[A320 Cockpit © adrados / Fotolia]

In addition to offering capabilities needed to mature their methods and processes, Papyrus enabled Airbus to deploy new MBSE methods easily for practical use cases. FAST was chosen to support Research projects focusing on innovative systems development. The streamlined domain-specific language facilitates communications between the Operations and the System Design teams, and also opens the door to important early design analysis

and verification, such as equipment sizing and system safety. In addition, it significantly reduces the amount of effort needed when compared to earlier document-based approaches. Furthermore, due to its usability, the tool directly supports agile ways of working and, consequently, is being increasingly used by system design teams, especially for drafting early system architectures. Deploying MBSE at Airbus is key to achieving more ambitious lead-time

and cost reduction targets for systems development, and the FAST tool is an important cornerstone of this strategy.

**About Airbus**  
 Web site : [www.airbus.com](http://www.airbus.com)  
 Nature : Industry  
 Domain : Aeronautics  
 Employees : 55 000



## PAPYRUS CASE STUDY SERIES

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**About Papyrus ([www.eclipse.org/papyrus](http://www.eclipse.org/papyrus)) :** Papyrus is an Eclipse project led by List (contact : Sébastien Gérard at [sebastien.gerard@cea.fr](mailto:sebastien.gerard@cea.fr)). Papyrus is also labelled as a solution of the Eclipse industrial working group Polarsys (<https://www.polarsys.org/solutions/papyrus>). Papyrus supports model-driven approaches by providing a standards-based modeling tool that supports, out of the box, both the UML and the SysML international industry standards from the OMG. In addition, Papyrus provides very advanced support for custom UML profiles that specialize UML, which enables users to define and implement their own domain- and project-specific modeling tools and languages (DSMLs). The user interface of Papyrus is highly configurable to support a broad spectrum of user-specific domains and concerns.