CATIA ICEM AEROEXPERT

PERFECTION
IN AERONAUTICAL SURFACE DESIGN

3DS CATIA

Making aerospace design fly

Beyond form and function, good design can change the way people feel about the object or space in question. Where is this more evident than in the design of modern aircraft?
Today, passengers expect a pleasant, comfortable and stylish experience when flying. And the tone is set as soon as they enter the cabin. Soft curves and smooth surfaces on everything from seats to overhead luggage lockers can help create the kind of soothing and attractive environment they are looking for.

Of course, exterior surfaces are also crucial in aeronautical design. For example, slight deviations coulddisrupt the aerodynamics of a wing or nose cone sufficiently to affect the operating efficiency of the aircraft. In the past, these kinds of imperfections in interior and exterior surfaces have been unavoidable, as designers have been forced to choose between quality and accuracy when creating them. However, these limitations are no longer acceptable in the modern aerospace industry. In other words, the ability to address surface quality and accuracy simultaneously is vital when creating optimal surfaces in aeronautical design that really deliver on customer and aircraft owner requirements.

The demands of today's competitive aerospace market also present designers with a wide range of other challenges. Product replacement cycles are shortening, and design precision is increasingly critical. Together, these pressures are making the entire design process more intensive than ever. In the aerospace field in particular, designers need to create complex aeronautical surfaces as quickly and as accurately as possible according to stringent industry specifications. Engineers must incorporate changes more rapidly. And feasibility analysis has to be incorporated into the development of the initial concept.All of these issues significantly increase the importance of the 'virtual' software-based design environment. In the aerospace industry, there is a clear leader in this field: CATIA ICEM AeroExpert.

CATIA ICEM AeroExpert is a comprehensive and intuitive software solution that enables aeronautical designers to create, validate, and modify complex surfaces, particularly those that must adhere to critical aerodynamic specifications.

Uniquely, CATIA ICEM AeroExpert allows surface designers to control the quality and accuracy of surfaces simultaneously – wherever they are located on an aircraft.

For example, CATIA ICEM AeroExpert enables control over how surfaces connect together across the outside of an aircraft. Because the smoothness of these external surfaces can influence how the air flows over them, the ability to define them as precisely as possible helps designers optimize surface aerodynamics. Thus, flying speed and fuel efficiency are also optimized.

Inside the aircraft, aesthetics matter more. The same control over surface connections allows designers to create beautiful free-form surface shapes that capture and reflect the design intent of the interior style concept. They also facilitate the creation of surfaces that are smooth and complex yet still accurate. The result is a consistent design with a high quality look and feel.

Key Benefits

- Fully integrated into CATIA virtual design environment
- Streamlined end-to-end aerospace design
- Comprehensive solution to design complex aeronautical surfaces quickly and accurately
- Improved collaborative working and productivity, accelerating the design process

Total integration, from design to construction

Key Benefits

- One single data format for a streamlined process flow
- Hybrid modeling environment with both explicit and feature-based approaches
- Support of manufacturing processes with Single Cell data output
- Real-time diagnosis, securing surfaces high-end quality
- Easier imported data optimization, with advanced surface smoothing and data reduction

AeroExpert is the first surface-modeling tool created specifically for the aeronautical design, and fully integrated into the CATIA virtual design environment.

A single common data format is used that covers the entire development process chain, maximizing its efficiency and effectiveness. This saves significant amounts of time and money when compared with converting product data into different formats for use in standalone or incompatible systems. In addition, CATIA ICEM AeroExpert embraces and facilitates collaborative working, saving even more time and money with minimized expensive redesigns as the aircraft evolves.

When it comes to specific features, the latest version of CATIA ICEM AeroExpert improves the quality and accuracy of complex lofted surfaces derived from curves designed from mathematical programs.

These are traditionally used to for example, specify the aerodynamic shape of a wing profile. Specifically, the most recent release features improvements that address three of the most important aspects of surface design: surface creation, curve creation, and surface modification. Modification of both surfaces and curves is equally important as designs are iterated. CATIA ICEM AeroExpert allows designers to work in a hybrid modeling environment of both explicit- and feature-based geometry.

Users have the freedom to interactively edit and manipulate explicit geometry though advanced and comprehensive modification tools.

Alternatively, they can choose to work with features that allow them to interactively adjust the parameters of a result such as a rounding fillet radius value, keeping the associativity with the feature's parents.

This approach maintains design integrity and minimizes any necessary redesign of adjacent geometry in order to accommodate the design change.
In turn, this improves productivity and accelerates the design process during modification.

Accelerating design evolution

Perhaps the most powerful aspect of the CATIA ICEM AeroExpert is its diagnostic capabilities. Designers can see the effect of a surface change on the rest of the design in real time.

This allows them to make a fast and accurate judgement on the validity of the outcome in terms of surface quality. The result is greater freedom and flexibility for design professionals, and a faster, more efficient and more cost-effective development process.

Yet the benefits of using CATIA ICEM AeroExpert don't stop there. They also extend into the aerospace manufacturing process. The ability to smooth out surfaces created from imported data is critical. Their complexity can also be refined to help improve system performance and, crucially, their accuracy can be maintained during the entire process – no reconstruction is required.

When it comes to the mathematics behind Class A surface development, CATIA ICEM AeroExpert reduces their complexity, enabling the creation of cleaner, smoother surfaces. The benefits of simplified mathematics also apply to the curve creation process, allowing designers to develop high quality curves that are reflected in the pristine surfaces to which they belong.

In addition, when creating new surfaces, CATIA ICEM AeroExpert provides what is termed 'Single Cell output'. It's this kind of output that is required to support curve creation and the composite material construction used in modern aircraft manufacture.

At the same time, ease of use has been improved with a number of new commands that simplify the completion of various design tasks. The result is increased productivity and an accelerated design process that can, for example, help deliver a faster time to market for new aircraft.

The ultimate benefit of all these features is clear. Aircraft development and manufacturing processes using data produced in CATIA ICEM AeroExpert become simpler, faster and more cost-effective, as well as easier to manage. Put simply, CATIA ICEM AeroExpert is the essential surface design tool for today's aeronautical design professionals.

About Dassault Systèmes

As a world leader in 3D and Product Lifecycle Management (PLM) solutions, Dassault Systèmes brings value to more than 115,000 customers in 80 countries. A pioneer in the 3D software market since 1981, Dassault Systèmes applications provide a 3D vision of the entire lifecycle of products from conception to maintenance to recycling. The Dassault Systèmes portfolio consists of CATIA for designing the virtual product - SolidWorks for 3D mechanical design - DELMIA for virtual production - SIMULIA for virtual testing - ENOVIA for global collaborative lifecycle management, and 3DVIA for online 3D lifelike experiences.

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