DLR software unites aircraft engineers

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Many disciplines are involved in the design and development of an aircraft. To obtain the best combination of wings, fuselage and engines, researchers must work closely together and share their expertise effectively. To support the cooperation of various aviation experts, scientists at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) have developed the software tools CPACS (Common Parametric Aircraft Configuration Schema) and RCE (Remote Component Environment). These bring together aircraft engineers from various disciplines at a virtual table. During a symposium held from the 4–6 December 2012, researchers gathered in Hamburg to deal with the design of future generations of aircraft.

NASA, Boeing, Airbus and Cassidian attended

"One goal of the three-day symposium in Hamburg was to present CPACS and RCE to a larger community of users," says Doreen Seider of DLR Simulation and Software Technology. After an initial meeting in March 2012, where the software was successfully presented to industry partners such as Airbus and Bauhaus Luftfahrt, the context was this time international – scientists from the National Aeronautics and Space Administration (NASA) as well as representatives of Boeing and Cassidian attended the meeting. In addition, numerous universities active in the field of aircraft design were present – including, among others, the Chinese Northwestern Polytechnical University.

Futuristic wing

"Within DLR, CPACS and RCE are already in use in many projects," says Daniel Böhnke of DLR Air Transportation Systems. "Often, more than ten institutions work hand in hand. Everyone brings their particular expertise; aerodynamics engineers calculate the flow around the wing, aeroelastics engineers evaluate the stability of its structure and our institute contributes to the economic assessment. Using the DLR software, a variety of knowledge is collected and combined to achieve a coordinated overall aircraft design." Some pioneering aircraft configurations have already been created using the software. An example of this is the unusual 'box wing' geometry, in which two wings unite above the fuselage.

The Key to Cooperation – a common data format

The software incorporates CPACS as common data format. This is the key to cooperation for aeronautical engineers. "Prior to the application of the data format, results of the various institutions were rarely compatible. The scientists had to make do with simplifying assumptions for the results of the other departments," says Böhnke. He is responsible for the coordination of CPACS and thus for the compatibility of the calculations.

The integration framework, RCE, provides the virtual collaboration environment for the experts from different to collaborate digitally. "The merging of expertise across institutional and national boundaries is very complex. RCE offers an ideal platform for engineers from, for example Europe, Asia and America, to jointly design an aircraft," says Seider, who is responsible for the development of RCE.

Aircraft designs for 2025

DLR provides CPACS and RCE as freely available open source software. Users can incorporate desired modifications directly into the software and adapt it to their individual needs. "This development is flexible," says Seider. Before the next meeting in September 2013, the symposium participants will work on the design of pioneering aircraft configurations for the year

2025. The results will be presented at the Council of European Aerospace Societies (CEAS) Air and Space Conference in Linköping, Sweden.

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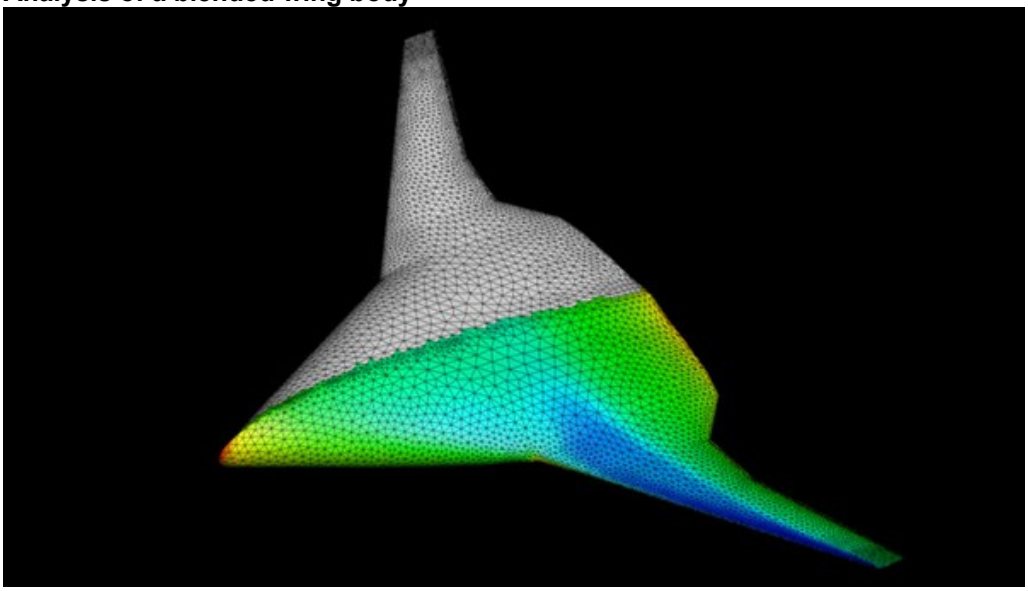
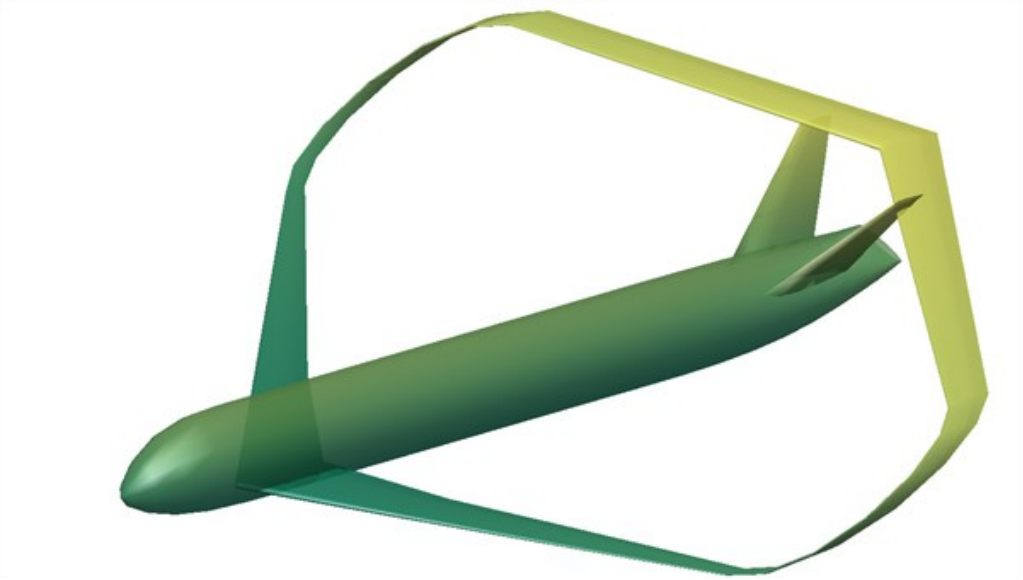
Analysis of a blended wing body



Aerodynamic analysis of a blended wing body; the colours indicate the pressure distribution.

'Box wing' geometry



In the futuristic 'box wing' geometry, two wings unite above the fuselage.

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