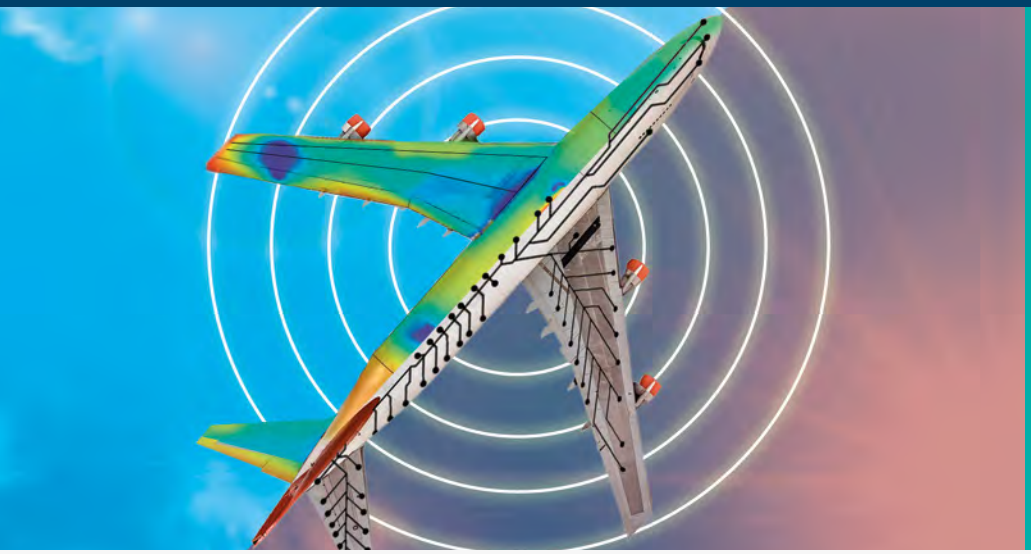

AIRCRAFT COMMUNICATION & DETECTION SYSTEM PERFORMANCE

Aircraft Antenna Placement and Installed Performance

Flight safety is dependent on pilots knowing exactly what is happening around them, both on the ground and in the sky. For this kind of situational awareness, flight crews are dependent on radio links to nearby aircraft and air traffic control, and on radar and transponders to detect other aircraft, terrain and storms. All these systems rely on antennas. Since positioning of the antenna on the aircraft, and interference from other nearby radio systems, can affect the performance of the antenna, engineers installing communication and detection systems need to consider the entire aircraft and all the relevant systems. The electromagnetic (EM) simulation solutions of Dassault Systèmes can calculate antenna performance in realistic environments early in the design process, reducing the risk of critical problems arising during the testing stage.

Several design objectives have to be balanced when designing an aircraft antenna system. Size, weight, robustness and aerodynamic performance are always critical for airborne applications, but the limited space on an aircraft platform puts further limitations on antenna placement. It is critical that the risk of radio frequency (RF) interference events that could lead to device malfunctions is limited, and the device must pass the certification tests required by the legal standards (e.g. EMC compliance standards such as DO-160 (RTCA), EURO CAE/ED-14, DEF-STD-59-411, MIL-STD-461). In some cases it is also important to optimize aircraft detectability by radar systems.

With SIMULIA CST Studio Suite, the EM simulation solution from Dassault Systèmes, aircraft systems engineers can evaluate any configuration of antennas and quickly analyze their installed performance without physical testing. The design tool Antenna Magus offers a large library of antenna designs that can be modeled for specifications such as frequency and polarization. Using Antenna Magus and CST Studio Suite in tandem, application-tailored customized antenna designs can be performed very rapidly.

CST Studio Suite is linked to the **3D**EXPERIENCE platform and can import data directly from CATIA. This means that the antenna system analysis makes use of the latest up-to-date models, and allows real time collaboration between electronic and mechanical designers and efficient communication between departments and with suppliers. Input from a wide variety of sources, including CAD files from the mechanical department, antenna models from Antenna Magus, and measured antenna patterns from suppliers can be integrated into a single simulation model. Real time collaboration between electronic and mechanical designers means that changes can be made to the model in minutes instead of waiting hours or days for updated designs.

By simulating and optimizing antenna performance earlier in the design cycle, radio and radar systems can be integrated into other parts of the design process—for example, antenna radomes can be included in aerodynamic analysis. Characterizing antenna performance in advance also reduces the risk of issues such as interference emerging at the flight testing stage, thus reducing the number of costly prototypes and measurements required to ensure 100% compliance with the required certification and safety standards.

Aviation is set to become even more connected in the coming decades, and the number of antenna systems on aircraft will increase to satisfy not only regulatory requirements but also customer demands for fast, high-bandwidth communication and in-flight streaming. With SIMULIA's electromagnetic simulation tools, manufacturers are better placed than ever to meet these demands and produce the aircraft of tomorrow.

For More Information

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