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kopter

Ensure interference free operation of HF-systems

High frequency interference simulation for antenna positioning on a helicopter

Fig. 1: The SH09 Helicopter developed by Kopter at a test flight.

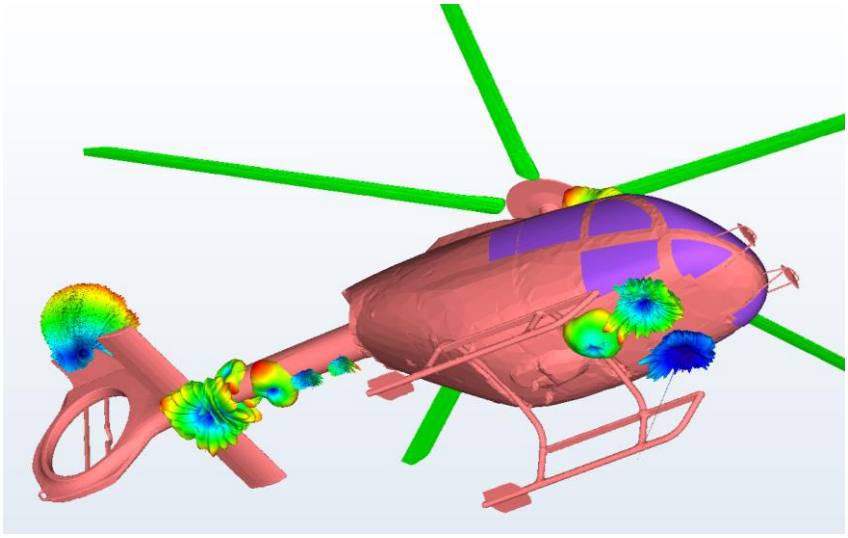

Fig. 2: Installed radiation pattern of the different antennas on the SH09 helicopter.

Task

Kopter Group was founded for developing, building and supporting a new generation of turbine helicopters. With this industrial vision, Kopter Group developed the SH09, guaranteeing to the operator superior operational performance, safety and life cycle economics that make the difference.

A modern helicopter needs a large number of high frequency (HF) systems for communication and other purposes. Malfunctions caused by electromagnetic interferences (EMI) of the different HF-systems, have to be avoided. To save time and costs, an interference analysis was performed using the software ANSYS HFSS (SBR+ solver, formerly Savant; EMIT) in an early stage of the project to choose the best possible positions of the different antennas.

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Solution

To ensure interference free operation for all HF-systems, antennas and radios (including filters) have to be chosen appropriately. The radiation patterns for the antennas installed on the fuselage (Fig. 2) and the coupling matrices for each antenna pair were computed using a shooting and bouncing rays algorithm (Fig. 3). Additionally, the radio types were incorporated in the model, allowing for realistic EMI margins (margin to a disturbing interference event). The EMI margins matrix for every antenna pair was computed (Fig. 4) and compared for several antenna layouts. With this investigation the optimal locations for the miscellaneous antennas could be found.

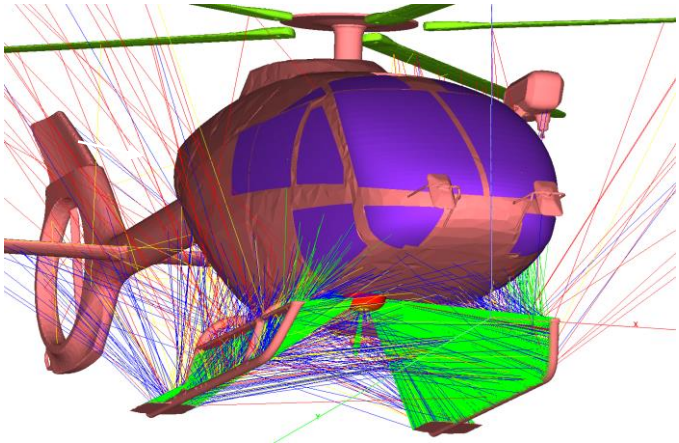
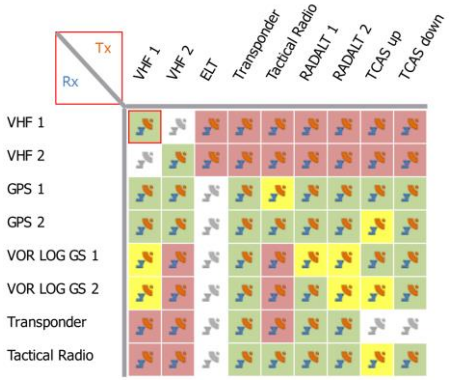


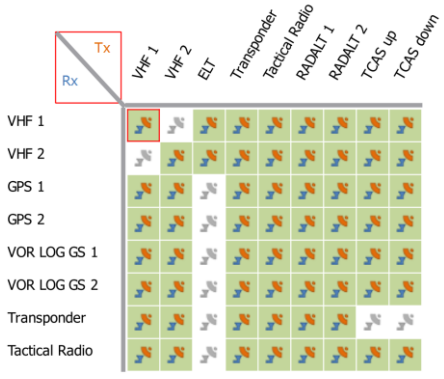
Fig. 3: Visualization of the shooting and bouncing rays for one specific VHF antenna (only electromagnetic rays, which bounce on the helicopter surface are shown).

Customer Benefit

Studying different antenna arrangements, the best possible positioning layout could be identified without the need of lengthy testing and rearranging of the antennas on the fuselage, which would be very costly in terms of time and money. Therewith, the development process could be substantially accelerated by simultaneously minimizing the risk of malfunctions of the HF-systems.



a) initial layout



b) best layout

Fig. 4: EMI Margin Matrix before a) and after b) the optimization (red = interference event present, yellow = no interference event but small margin, green = no interference event and sufficient margin)

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About CADFEM

Founded in 1985, CADFEM provides everything that is required for the success of the simulation from a single source: First-class software and complete, ready-to-use systems; comprehensive services; the latest knowledge. CADFEM is ANSYS Elite Channel Partner.