



CASE STUDY /

## Ansys + Hitachi Kokusai Electric

“Ansys Cloud solved our problem of having a limited amount of Ansys HFSS licenses, which sometimes prevented me from having access to the simulation software when I needed it. Now, with Ansys Cloud, it is available for me to use it whenever I need to run an analysis quickly. It is a very convenient system that allows us to have an ideal machine environment without a huge investment. I will continue to use HFSS effectively in the development of millimeter-wave radars by combining the local Ansys HFSS and Ansys Cloud as necessary.”

**N. Shibagaki**

Senior Engineer / Hitachi Kokusai Electric

### Hitachi Kokusai Electric Increased Airport Safety 20 Times Faster Thanks to Ansys Cloud and Ansys HFSS

#### / Challenge

In 2000, a supersonic Concorde airliner crashed five minutes after taking off from Charles de Gaulle Airport in Paris. The investigation revealed that the cause of the crash was a 42 cm-long metal piece, which had fallen from the preceding aircraft onto the runway. To ensure this tragedy will not happen again, Hitachi Kokusai Electric participated in a government project to develop millimeter-wave radars for detecting foreign objects on runways, using Ansys HFSS and Ansys Cloud.

#### / Technology Used

Ansys HFSS

Ansys Cloud

#### / Engineering Solution

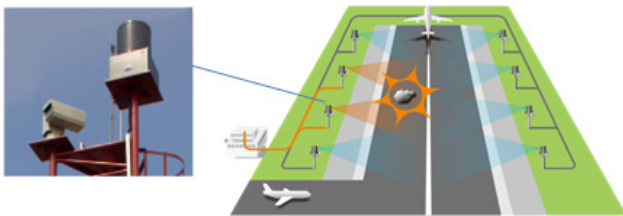
Hitachi Kokusai Electric determined that, given the electrical size of the problem, the most effective solver technologies in the HFSS portfolio for this analysis were the HFSS-IE method of movements-based solver and the asymptotic capabilities of the SBR+ solver, which can handle large models very effectively. HFSS provides multiple solvers for a range of analysis scales in an integrated user interface, allowing for use of different solvers for different analysis purposes.

The study was run on an H16mr virtual machine of Microsoft Azure, featuring 16 Intel Xeon E5 2667 v3 processor cores.

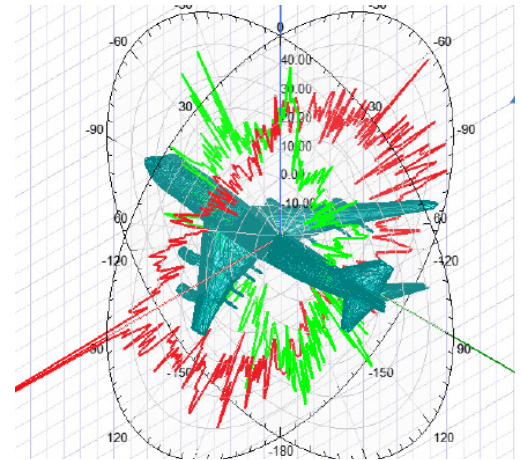
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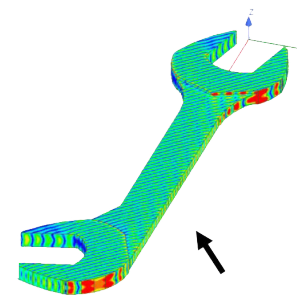
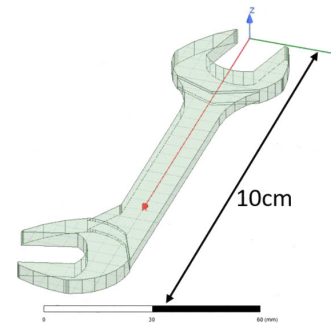
This system immediately captures images with an ultra-high-sensitivity camera and transmits them to the control tower by positioning foreign objects detected by radar. This system takes about 10 seconds from detecting a 3 cm piece of metal on a runway 500 m away to transmitting images.



The foreign object detection (FOD) system is designed to detect small metallic foreign bodies.

The radar cross section (RCS; bistatic) of the airplane is needed to study interferences in the system and frequency sharing with earth exploration satellites that use adjacent frequencies.

The use of the new Shooting and Bouncing Rays (SBR+) solver allows us to simulate large airplanes at 90 GHz.



Example of detected object on the runway. Surface current distribution induced by 100 GHz incident wave.

## / Benefits

- Ansys Cloud was 20 times faster than on-premise simulation (10 hours over 8.5 days)
- Basic performance of foreign object detection (FOD) radar was confirmed in the demonstration system installed at Narita International Airport and Kuala Lumpur International Airport.
- HFSS was used for radar cross section (RCS) calculations necessary for system evaluation.
- Engineers were able to use different analysis methods in HFSS depending on the analysis target.

This work was partly supported by the government project "Research and development of advanced radio frequency spectrum" from the Ministry of Internal Affairs and Communications (MIC) of Japan.

## / Future Work

- Improvement of basic radar performance for practical use
- Study of effective use of electromagnetic field analysis using Ansys Cloud

## / Company Description

In October 2000, Hitachi Kokusai Electric Inc. was formed from the merger of three companies: Kosukai Electric Co. Ltd., Hitachi Denshi Ltd., and Yagi Antenna Co. Ltd. Since that time, we have focused on using our superior technologies to create new value in two fields: video and wireless network solutions and thin film processing solutions. In this way, we have contributed to building the foundation of a safe and affluent society.

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