Custom Optical Assemblies for Visual Awareness

APPLICATION

Thorlabs partnered with Daedalean* to design and produce two custom optical assemblies for use in an AI-enabled visual awareness system. The resulting lens systems exceeded image quality metrics and constraints over a wide range of temperatures and environmental conditions.

QUICK FACTS

- Optical assemblies designed and produced by Thorlabs were integrated into an aircraft-mounted, AI-enabled visual awareness system designed to detect aerial traffic such as planes, birds, drones, etc.

- Machine vision neural networks analyze images by finding patterns in pixel-level details and color aberrations.

- Thorlabs designed the optical assembly and mechanics for two different focal length assemblies to accommodate two different mounting locations on the aircraft.

- This project involved an integrated systems design team comprised of optical, mechanical, and process engineers and leveraged Thorlabs' expertise in manufacturing, assembly, and metrology.

- As a high level of detail and precise colors across the entire field of view are critical to the performance of visual awareness systems, it was important that the optical assemblies performed well at both the edges and center of the field of view.

OPTICAL ASSEMBLIES

Each optical assembly included various optical elements:

- Mid-Wing Assembly: 11 Optical Elements, Including Two Doublets, One Triplet, and an Asphere

- Edge-of-Wing Assembly: 10 Optical Elements Including Three Doublets

The compact design of the optical assembly enables mounting in a pressurized enclosure that is then mounted on the wing of the aircraft.
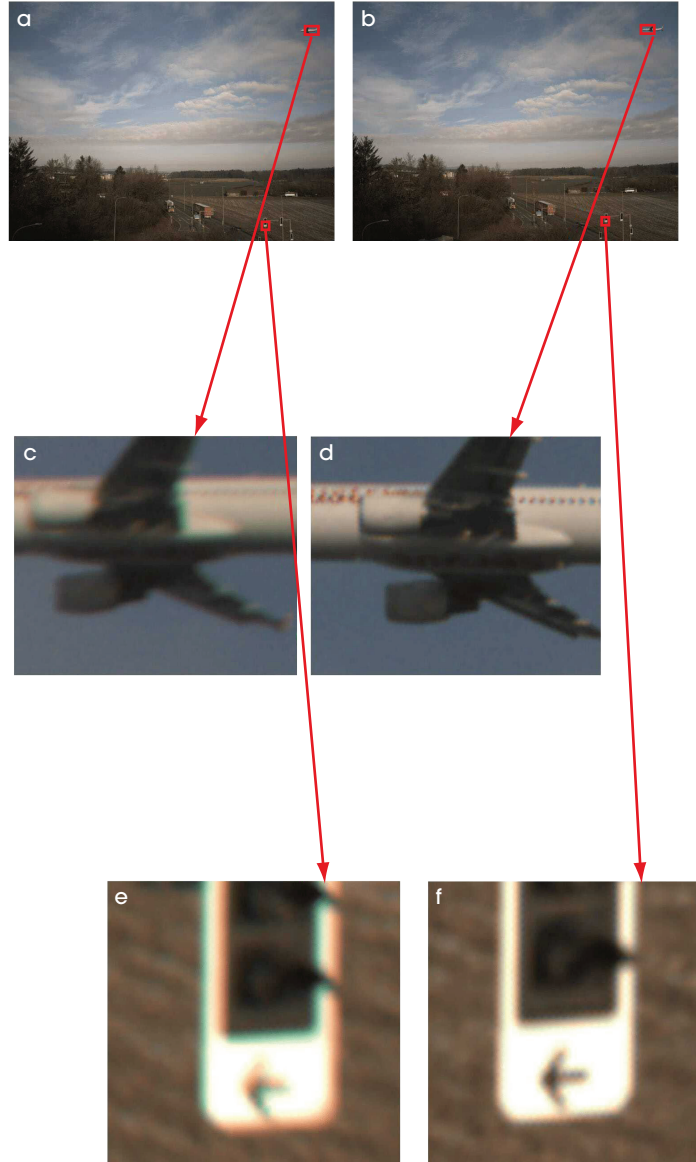
IMPROVEMENT OVER COTS SYSTEM

COTS System   **Thorlabs System**

Images acquired** by a commercial off-the-shelf (COTS) system (left) and the system based on the lens designed by Thorlabs (right): (a, b) initial images, (c, d) image of plane, and (e, f) street sign. Comparing images (d) and (f) to (c) and (e) illustrates the notable improvement of the Thorlabs system over the COTS system. The improvement in image quality shown here enabled increases in the accuracy and range of detection. These increases led to a reduction in the number of false positive and false negative alerts.

* Daedalean is a developer of AI-powered visual awareness systems for aerospace.
** Images provided by Daedalean.

Request a quote! Contact us today at 1.973.300.3000 or techsales@thorlabs.com.