Photo credit: US Navy

partnership opportunity

NASA Langley's

Variable Visibility Glasses for Flight Training

Safer and more comfortable glasses for selectively limiting the view of pilot trainees

NASA Langley researchers have developed active glasses to be worn by a pilot during instrument flight training and certification. Using a novel series of sensors to determine head position, the glasses restrict the view out of the aircraft windscreen but allow the pilot to clearly see the entire instrument panel. Previous methods for restricting a pilot's view during instrument flight training and certification have used a hood draped across the aircraft windscreen or a face mask or blackened glasses worn by the pilot. All current methods create potentially hazardous disorientation and an unnatural environment for the trainee. In particular, the face mask and blackened glasses restrict the pilot's peripheral vision and require uncomfortable and unnatural head positions in order to see the entire instrument panel. The NASA innovation eliminates the hazards of the current methods and provides a safer and more comfortable means for restricting viewing to improve the flight training experience.

Benefits

- Safer – copilot visibility is not impeded, and the system is deactivated below a specified altitude
- Improved comfort – system uses conventional eyeglass frames, which are relatively lightweight and do not restrict the pilot's movement
- Compatible with existing eyewear – system can be easily modified to fit over prescription eyeglasses or sunglasses
- More natural – natural head movements trigger the system to allow unimpeded visibility of the instruments and cockpit displays
- Improved flight experience – reduces potential for pilot disorientation so the trainee can focus on flying the aircraft

Applications

The technology enables improved products for a variety of commercial and military applications:

- Pilot training glasses – for instrument flight training and certification and simulation of reduced visibility conditions
- Military goggles – provide protection to aircrews from lasers or nuclear detonations
- Gaming and virtual reality goggles – restrict or allow selective vision based on user's line of sight

The Technology

The technology described here combines electroactively controlled liquid crystal lenses with a means for determining the pilot's head position. When the pilot's head is positioned to look outside the front or side windscreens, the lenses restrict light transmission. When the pilot's head is lowered to view the instrument panel or other cockpit displays, the lenses allow light transmission so that the view of the instruments is unimpeded.

The lenses consist of integrated polarizers and electroactive liquid crystals mounted on a glass or polycarbonate substrate. Light transmission through the lenses can be selectively controlled by the system, ranging from 0.1% to 10%. The lenses are laminated for safety and are mounted in conventional eyeglass frames.

The frames include infrared (IR) collimator detectors that detect incident IR light from several battery-powered IR sources mounted in the cockpit. The IR detection system is used to determine the position and orientation of the pilot's head. Circuits within the frames activate the lenses to restrict light transmission when the pilot's head is oriented to look out the windscreen. A PC, linked to the aircraft flight computer or altimeter, is also in the control loop. It turns off the system to allow unimpeded visibility when the aircraft is below 200 feet or for other specified conditions.

A prototype has been tested. NASA seeks a development partner to refine the design and commercialize the product. The technology may have additional applications, such as military aircrew eye protection or virtual reality vision systems, among others.

For More Information

If your company is interested in licensing or joint development opportunities associated with this technology, or if you would like additional information on partnering with NASA, please contact:

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