



## EYE TRACKING BRINGS VISUAL PERCEPTION INTO FOCUS

### Why is it important?

For air traffic controllers, pilots, astronauts, and others, the ability to track a moving target amidst many nontargets is essential. Perceptual errors during critical flight maneuvers—such as landing at night or docking with a space station—can lead to a disaster. NASA research into the link between eye movements and visual perception has application for the improved training and safety of anyone who depends on accurate vision and motor control.

### What is NASA doing?

Dr. Leland Stone and other researchers at NASA Ames Research Center adapted computer monitors and infrared video cameras to measure eye movements without having to affect the crewmember. A computer screen provides moving images that the eye tracks while the brain determines what it is seeing. A video camera records movement of the subject's eyes. Researchers can then correlate perception and response. A particular concern is how returning from the microgravity of orbit to Earth can affect an astronaut's ability to fly safely.

Early results challenge the accepted theory that "smooth pursuit"—the fluid eye movement that humans and primates have—does not involve the higher brain. NASA results show that

- eye movement can predict human perceptual performance,
- smooth pursuit and saccadic movement (jerky eye tracking in nonprimates) share some signal pathways, and
- common factors can make both smooth pursuit and visual perception produce errors in motor responses.

### What are the benefits?

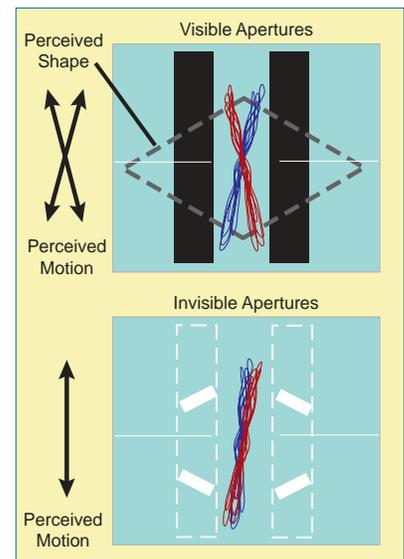
In a complex landing system like those of the Space Shuttle and advanced jetliners and other aircraft with head-up displays, the pilot must watch a computer-generated image superimposed on the view of the outside world and then move the joystick to line up with the target for a safe landing. Understanding how errors might occur will let NASA improve training and displays, and thus will enhance flight safety.

### What is next?

NASA scientists are expanding their studies to include crew responses on joysticks. With advances in the eye tracking techniques, scientists can apply rigorous measurements to human responses and advance our understanding of visual perception.

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Test subjects perceive different images when a moving object is covered by a mask that is visible or invisible (above). Tracking air traffic through a head-up display (below) can be more challenging.

