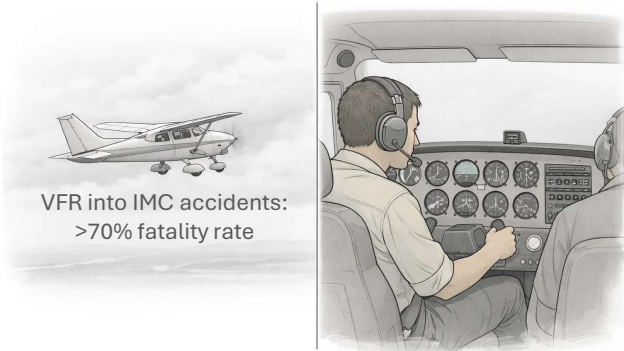


Mixed-Reality Visual Control for Advanced Pilot Training

Concept for a Modernized Electronic In-Flight IFR Hood



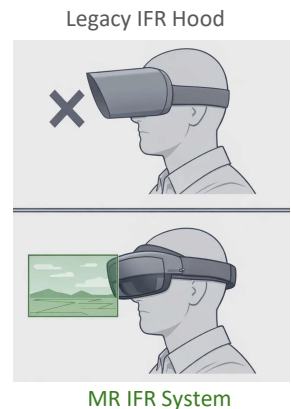
Loss of external visual references remains a persistent contributor to loss-of-control and CFIT accidents. Despite long-standing emphasis on instrument training, inadvertent IMC encounters, spatial disorientation, and startle-induced task saturation continue to challenge pilots during real flight. Ground-based simulators support procedural proficiency, but cannot fully replicate the vestibular and kinesthetic cues of an aircraft in motion—leaving a training gap between simulation and live-flight exposure.



Mixed-Reality overlays are applied only to exterior window regions during instructor-supervised live flight, while full visibility of cockpit instruments, controls, and pilot body references is preserved.

From Binary Occlusion to Adaptive Visual Control

The proposed solution is a Mixed-Reality visual control system designed to enhance established in-flight instrument training practices. Worn during instructor-supervised live flight, the system selectively modifies only the pilot's exterior visual field while preserving full visibility of cockpit instruments, controls, and physical references. By enabling precise, adjustable, and repeatable visual scenarios within the real aircraft environment, this approach extends existing visual-limiting practices beyond binary occlusion and creates new opportunities for controlled exposure to disorientation-relevant conditions while retaining the natural motion cues of actual flight. Exploratory engineering prototyping on commercial MR headsets is underway.

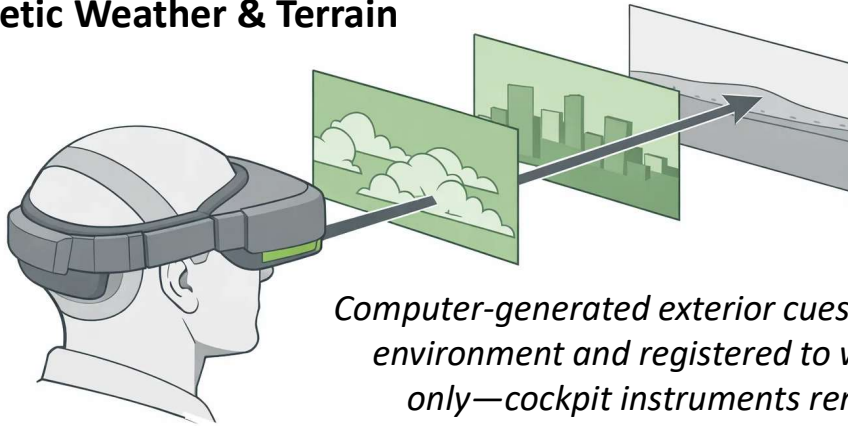


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Mixed-Reality Visual Control for Advanced Pilot Training

Key Capabilities and Advantages

Synthetic Weather & Terrain



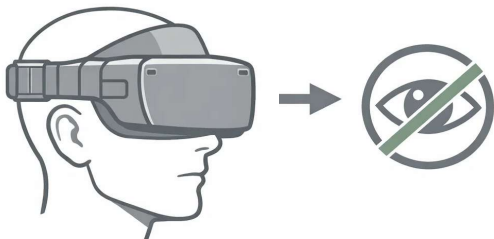
Usable Across All Phases of Flight

MR IFR System may be worn continuously through mission.



No Inadvertent “Peeking”

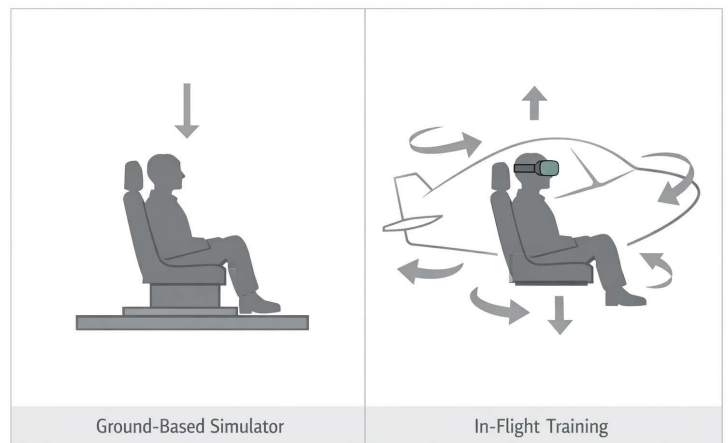
Exterior visibility is controlled independent of head motion.



Fail-Transparent Design

System defaults to full real-world visibility upon any interruption.

Real In-Flight Dynamics & Acceleration



Exposure to actual flight dynamics is essential for building pilot resistance to spatial disorientation.

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