Mixed Reality Flight Deck

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Purpose
Gulfstream Aerospace Corporation builds physical prototypes of conceptual designs for their cockpits. As a result, they waste physical materials, time, and money. Our goal is to move their prototyping process to the digital sphere by creating a mixed reality flight deck.

Solution Overview
To achieve a working simulation, our project links a virtual environment with a cockpit display system. The virtual environment consists of CAD models, images, and a 1st person user experience viewed through several “cameras” within the simulation. The cockpit displays collect flight data from JSBSim and relay that data onto the screens in real time. To further develop this model, coding restrictions may be applied to the displays, allowing them to follow FAA standards. Along with this, the ability to edit the displays while continuously running the simulation could further streamline the prototyping process.

Softwares Being Used
Our project utilizes three main softwares: Unreal Engine, JSBSim, and Meta Quest. Our flight deck is built out in a 3D computer graphics game engine called Unreal Engine. Our cockpit displays flight data gathered from JSBSim, an open source flight dynamics model. This is used as an Unreal Engine plugin. Lastly, our program runs in a Meta Quest 2 virtual reality headset.

UMG Widgets
Unreal Engine contains a visual UI authoring tool called Unreal Motion Graphics UI Designer (UMG). At the core of UMG are widgets, which are a series of pre-made functions that can be used to construct a user interface. We are utilizing widgets to create components of the cockpit display system including maps, instruments, progress bars, etc. to display flight data. The functionality of widgets are edited using blueprints, a visual scripting tool built into Unreal Engine.

VR Setup
Our Program connects the simulation to a Meta Quest 2 virtual reality headset through the Unreal Engine OpenXR plugin.

Sponsor/Client: Gulfstream