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ASTRONAUT TRAINING ON-BOARD THE INTERNATIONAL SPACE STATION USING A
STANDALONE VIRTUAL REALITY HEADSET

Abstract

On-board training (OBT) constitutes an important tool in the training of International Space Station crew members. OBT can be used to supplement ground training and address unforeseen complex tasks. As such, OBT materials can take many forms and can often include graphical renders and animations of complex hardware or crew tasks. As the exploration programme focuses on destinations beyond low earth orbit, training time on ground remains a scarce resource and the need for short notice effective training persists, despite new constraints and technologies. As such, the need to deliver effective and efficient training on-board is growing both in relevance and significance. Unlike other media, immersive Virtual Reality (VR) increases user engagement and enables users to interact with and observe complex three-dimensional objects, phenomena and data. In this regard, the use of VR is seen as a critical enabler to future exploration.

VR-OBT is a joint DLR ESA technology demonstration aiming to deliver on-board training via VR. Specialized training content is under development for a modified first generation Oculus Quest, supplied by the French national space agency, CNES. In this paper we explore the various technical and logistical challenges inherent in developing effective training content for a standalone VR headset. This paper aims

to support and direct future efforts of this kind as the use of VR technologies in space bound environment matures.

VR-OBT focuses on a maintenance activity, RR (Removal Replacement) for the ESA Life Support Rack payload. Starting from the adaptation of the engineering CAD models, this paper details the various technical and logistical challenges inherent in developing effective training content for a relatively low performance VR headset. Corrections to the Quest's positional tracking and localization are also briefly detailed. This work builds upon the developments of CNES, in relation to their PILOTE and Immersive Exercise experiments utilizing a modified gen-1 Quest