Virtual Reality Space Experience

Caleb Christenson[1], Nathan Clapp[2], Mac Grove[2], Faatasina Liufau[1], Tiffany Lovett[2], Spencer Madison[1], Segev Morgan[1], Onterrio Morris[1], Cid Quezada[2], Marieke Spiegleman[2], Shannon Walters-Dorchak[2]
Advisors: Jennifer Jones[1], Barbra Sobhani[2]
[1] Arapahoe Community College, Littleton, Colorado, USA
[2] Red Rocks Community College, Lakewood, Colorado, USA

Abstract

Since its inception in the 1980s, modern virtual reality technology has become more accessible to the general population. The Community Colleges of Colorado (CCofCO) project, Virtual Reality Space Experience (VRSE), will -- to our knowledge -- be the first of its kind: a 360° virtual reality (VR) recording of a sub-orbital flight. This multimedia technology will allow users to experience the excitement and wonder of space exploration from the surface of Earth.

RockSat-X

The RockSat-X program is a year-long, NASA-sponsored program through the Colorado Space Grant Consortium (COSGC), in which collegiate teams purchase payload spots on a Terrier-Improved Malemute sounding rocket, to be launched from NASA's Wallops Flight Facility in August 2020. Teams participate in a rigorous design review and down-select process for space on the rocket. The CCofCO team is manifested for the August 2020 flight. Our team has received special funding and tasking from NASA to design a payload capable of recording 360° virtual reality video footage of the sub-orbital flight.

Virtual Reality in Space

In recent years, space agencies and organizations have begun to integrate virtual reality technology for space exploration. This tech has been utilized to train and prepare astronauts for space flight, both on Earth and in space. It has also been used to connect people on Earth with research being done on both the ISS and Mars. Additionally, these institutions are now looking at the potential benefits of incorporating such technology for combating the negative effects of isolation and confinement on astronauts' mental health. Virtual reality footage of Earth from space allows greater accessibility to the marvels of space flight.

Payload design

The CCofCO team was tasked by NASA to build a payload capable of recording 360° VR footage: this will be accomplished by mounting a 360° camera and an extension arm to our payload deck. NASA engineers at Wallops Flight Facility have partially prototyped a payload intended for a similar task but did so with access to a payload space several times larger than the approximately 650 in^3 slot allotted to VRSE. As a result, this RockSat project's main design challenge has been to build an extendable arm capable of positioning the camera to include Earth and the entirety of the rocket in its field of view. Other significant design challenges include exposure to open vacuum, reentry and splashdown conditions, as well as the accelerations and vibrations associated with the rocket's flight. Due to the high-resolution nature of the recorded video, files will be stored on the payload and cannot be telemetered.

Conclusion

VRSE is currently in the final integration testing phase and will be transitioning to mission simulation later this month and throughout April. The VRSE project will add a unique view of space, allowing for an immersive educational experience not previously possible.