IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
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TRANSFORMING STEAM OUTREACH FROM LOW EARTH ORBIT TO CISLUNAR SPACE: AMATEUR RADIO ON THE INTERNATIONAL SPACE STATION (ARISS) TO THE LUNAR ORBITING PLATFORM-GATEWAY

Abstract

As astronauts and cosmonauts have adapted to life in space, they have found amateur radio and its connection to life on Earth to be an important onboard companion and a substantial psychological boost. Starting with the STS-9 Space Shuttle Columbia mission in 1983, amateur radio has supported crew members and engaged students on the Space Shuttle, the Mir Space Station and the International Space Station (ISS). With the international space agencies poised to take the next step in space exploration—human spaceflight missions on the Lunar Orbiting Platform-Gateway—the amateur radio community is preparing systems to support Science, Technology, Engineering, Arts and Mathematics (STEAM) outreach on Gateway.

The current amateur radio human spaceflight program—Amateur Radio on the International Space Station (ARISS) provides students worldwide the opportunity to experience the excitement of talking directly with crew members on ISS. As a result, it inspires them to pursue STEAM careers and it engages the students and teachers in space and radio science technology through the amateur radio connection. ARISS relies on technical talent from the internationally-based Radio Amateur Satellite Corporation (AMSAT) teams to develop the amateur radio hardware employed on ISS and to support the ARISS radio connections either at the school or via the ARISS international ground station network.

In March 2006, amateur radio operators from AMSAT Germany tracked and received data from Voyager 1—14.7 billion km from Earth. Amateur radio operators have also tracked and received data from spacecraft in lunar orbit as well as missions orbiting Venus, Mars, and Saturn. These achievements demonstrate that extending ham radio from ISS in low Earth orbit to human spaceflight missions in deep space is practical. ARISS and AMSAT are working together to architect an amateur radio system that will support student engagement on the lunar orbiting platform-Gateway. Autonomous educational payloads, 2-way voice, television, pictures and data communications are all being considered on Gateway as logical extensions to what is currently being accomplished by ARISS on ISS.

This paper will provide an overview of the current ARISS program, it will describe the international volunteer team responsible for making this low-cost, high payoff program such a huge success, it will convey the proposed ham radio architecture proposed for Gateway and it will show how the ARISS/AMSAT team will engage students in this lunar exploration endeavor and, in the process, inspire, engage and educate future generations to pursue STEAM careers.