

ISS Advanced Technology Testbeds and Lunar Test Ranges

Alan C. Holt
NASA Johnson Space Center, Code OZ4
Houston, TX 77058
al.holt-1@nasa.gov, 281-244-8394, 281-244-8292 (fax)
advanced, space, technologies

The International Space Station (ISS) is already being used to conduct tests of technology, materials and software for applications in future space platforms and on ISS itself. As the truss structure of the ISS is built up and the ISS nears completion of assembly tasks, new research accommodation capabilities will be added to enable experiments or technology payloads to be mounted externally on the truss network. The Express Pallets (providing 6 experiment sites per pallet) will be mounted on the ISS truss structure in nadir (Earth looking) and zenith (space looking) orientations. These pallets along with other unique attachment sites on the ISS, will be used for a variety of experiments with an emphasis on various advanced technology testing and research and development. Some of these technology tests will involve advanced, high performance propulsion; advanced materials; advanced solar cells and other energy storage systems, advanced communication systems, etc. A subset of these advanced technology tests will address technology which could be, or will be, used later to support or enable human space exploration activities. ISS technology testing and operations development activity related to the assembly and maintenance of station-based, human lunar and/or other exploration transport vehicles is likely to be needed to support a number of human exploration scenarios which will emerge in the future. The ISS technology testbeds and research activities could also take advantage of and support lunar transport and surface activities which are in their start-up phase ("bootstrapping" of ISS and lunar technology and operations). For example, while low thrust tests of advanced, high performance propulsion systems can be accomplished at the station, technology tests involving moderate to high thrusts (and moderate to high energy power sources) would need to be accomplished on platforms deployed from the ISS. Some of these platforms would be capable of translating away from and returning to the station for in-situ technology performance assessments, maintenance and refueling, and for replacements or upgrades of the technology being tested. While some of these tests would be conducted in Earth orbit, the availability of testing corridors circling the Moon provides some unique test opportunities. A greatly extended testing range (out to the Moon) would enable the testing of a broader range of performance parameters for advanced propulsion technologies. Another example of an advanced technology test opportunity is the testing of communication devices (such as optical communication) located on both the ISS and on the Moon. The presence of devices and active links over part of an orbit would enable lunar surface robotics and other technologies to be commanded by or steered by crewmembers on the ISS, with benefits for ISS and a lunar testbed program. The International Space Station will be used extensively as a technology testbed by NASA, other U.S. government organizations, and international partners. The ISS's crew, robotic, power, and extensive logistics support capabilities, and extensive exterior mounting surfaces make it a unique research and operations outpost, which will help us make relatively low cost human space exploration feasible.