

Purpose of Experiment

Bigelow Development Aerospace Division, LLC (“Bigelow Aerospace”) requests experimental authority to operate two uplinks in the VHF band in conjunction with its existing experimental satellite program designed to test the feasibility of an inflatable space habitation module. These Earth stations will be co-located with existing Bigelow Aerospace facilities at North Las Vegas, Nevada, and Fairfax, Virginia.

A more complete explanation of the overall experimental program, as well as the other radio facilities associated with it, are contained in Bigelow Aerospace’s initial experimental license application (FCC File No. 0264-EX-PL-2004), which is incorporated herein by reference. The uplink facilities requested in this application form an integral part of the ground infrastructure for command and control of the spacecraft during all on-orbit maneuvers and testing.

A. Summary of the Program of Research and Experimentation

Bigelow Aerospace has worked with NASA’s Johnson Space Center since 2002 on evaluating inflatable (hereinafter referred to as ‘expandable’) space module technology. It has signed two Space Act Agreements and three licensing agreements with NASA which provide for an ongoing exchange of personnel and technology, as well as the joint testing of Bigelow Aerospace projects at NASA facilities.

NASA’s “TransHab” expandable space module program was cancelled due to budget considerations. Bigelow Aerospace acquired exclusive commercial development rights to the NASA design for TransHab, an expandable space habitat that would be launched in a compressed configuration, and then inflated in orbit. The privately funded efforts of Bigelow Aerospace are keeping alive the promise of expandable space habitat technology. With the announcement of NASA’s new exploration vision that calls for crewed missions to the Moon, Mars, and beyond, expandable space habitats have again become a critical need for the Agency.

Subsequent to TransHab’s cancellation, Bigelow Aerospace has continued to develop this innovative space technology with the key objectives of increasing safety, capacity, and reliability, while significantly reducing costs, thereby advancing Bigelow Aerospace’s ultimate goal of establishing affordable, habitable space platforms that can be utilized for commercial research, manufacturing, tourism, and other activities.

Bigelow Aerospace has previously sought and obtained FCC approval to pursue its development program by testing the systems and subsystems of its initial sub-scale expandable space habitation module, called Genesis, for validation of critical deployment and inflation technologies, as well as evaluation of its long-term performance and durability in an actual, on-orbit environment. (See Call Sign WD2XND). Bigelow

Aerospace hopes to demonstrate the viability of this innovative technology for future commercial and Government use.

In this application, Bigelow Aerospace seeks to add to its testing program two additional ground uplink stations in the VHF band at 145.84 MHz and 145.86 MHz for its existing North Las Vegas, Nevada and Fairfax, Virginia facilities. These will be directionalized tracking antennas used for command and control of the Genesis spacecraft. The antennas will employ circular polarization and variable reactance modulation. The beamwidth at the half power point will be 52 degrees. Additional technical parameters are provided on FCC Form 442.

Approval of this experimental program will enable Bigelow Aerospace to complete the necessary experimentation and tests prior to deploying a full-scale expandable habitation module for commercial and/or U.S. Government use.

B. Specific Objectives Sought To Be Accomplished

1. Validate the design capability of the module to withstand the launch environment and successfully deploy on-orbit.
2. Test the expandable structure design by observing its deployment and long-term performance in orbit.
3. Monitor the long-term radiation, thermal, and pressure conditions of the structure, including:
 - Detect wrinkles with wavelengths greater than 1 cm and amplitudes greater than 5 mm;
 - Measure temperatures at different locations;
 - Measure cumulative ionizing radiation doses at several locations;
 - Measure the internal pressure of the structure; and
 - Demonstrate the capability of the design materials to maintain a pressurization volume for an extended period of time in a low-Earth orbit environment.
4. Develop experience and infrastructure that will support future Bigelow Aerospace missions.
5. Determine the radiation dose that a resident astronaut might receive.
6. Produce video images of the deployed solar panels and inflated structure.

C. Contribution to the Development, Extension, Expansion, or Utilization of the Radio Art.

Through its overall experimental program, Bigelow Aerospace will be able to conduct the necessary tests and validation studies to assess the feasibility of deploying the full-scale, prototype, BA 330 module under an FCC 312 commercial license. The experimental facilities sought in this application for spacecraft control form an integral part of this overall testing program.

NASA has touted the many benefits of its technology transfer and commercialization program at NASA's Johnson Space Center under which space technology developed by NASA is transferred to businesses. The benefits advanced by NASA include stimulation of our economy, increased competitiveness within the private sector, promotion of innovation and creativity with NASA technology, and the use of NASA's vast technical resources.

Other benefits to the U.S. public will accrue from the ongoing research and development activities conducted by Bigelow Aerospace, which will contribute to the body of U.S. technological innovation and will provide a stimulus for the private development, expansion, and utilization of habitable space platforms that are currently only available for use under Government auspices.