Attachment 1
Purpose of Experiment

Bigelow Aerospace, LLC ("Bigelow Aerospace" or "BA") requests experimental authority to operate Earth-to-space communications links and associated fixed receiver Earth stations at X-band in conjunction with its ongoing experimental spacecraft program. This experimental program, already in progress using other spectrum, is testing the development, viability, and uses for expandable space platforms. The spacecraft will operate in low-Earth orbit ("LEO") at an altitude of 550 kilometers. The X-band Earth stations will be co-located with the existing Bigelow Aerospace facilities at North Las Vegas, Nevada, and at new sites being developed in Hawaii and Alaska.

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.

A. Summary of the Program of Research and Experimentation

Founded in the Spring of 1999, Bigelow Aerospace is an entrepreneurial space development company headquartered in Las Vegas, Nevada. BA's goal is to open the frontier of space to all of humanity by drastically reducing the costs and enhancing the efficacy and utility of space-based activities. The company's primary focus is on the development of robust, next-generation expandable space habitats.

As a concept, expandable space habitats were initially suggested in the 1960s. Some study of the possibility of an 'inflatable' space station was done, but the idea was dropped due to a lack of structural strength and integrity. However, with the advent of advanced soft goods, such as Kevlar, inflatable/expandable space habitats became a real possibility. In the 1990s, NASA initiated a program called 'TransHab' which was an attempt to develop an inflatable space habitat and prove that such a system could offer significant benefits, such as decreased mass, increased volume (after deployment), and enhanced protection from secondary radiation. Despite showing great promise, TransHab was canceled by NASA due largely to budgetary concerns. In 1999, Bigelow Aerospace took up the gauntlet of expandable space habitat development and has been pursuing the new technology as a better and more cost effective method of producing an economical, next-generation space habitat for both public and private use. BA's effort has been funded entirely by financing from its founder and President, Robert T. Bigelow.

In order to pursue its primary goal of developing and deploying an expandable space habitat that can safely and affordably support a human presence, BA embarked upon a program of launching a series of subscale technology demonstrators to validate its ideas and engineering concepts. The first of these subscale modules, dubbed, Genesis-1, was successfully launched on July 12, 2006. The Genesis-1 mission goals were to

validate basic design concepts and to conduct the first ever pressurization of an expandable space habitat prototype in orbit. Both the launch and pressurization process were conducted flawlessly and the Genesis-1 succeeded beyond BA's expectations in proving the validity of the underlying technology. Genesis-1 continues to send telemetry, images, and spacecraft health data to BA and such information is helping to prove the long-term durability of expandable space platforms.

In regard to communications, prior to the Genesis-1 launch, BA sought and obtained FCC approval to use frequencies in the UHF and VHF bands in connection with the spacecraft's operation (See Call Signs WD2XND and WD2XWW). BA also makes use of the 2 GHz S-band spectrum for transmitting mission data, including high-resolution photographs, back to Earth. These frequencies are being used with the permission of NASA and are part of NASA's primary mission spectrum in the 2200 to 2290 MHz band. Because these frequencies are not available for use by a private, commercial entity, BA has sought out alternative spectrum that holds the promise of meeting its long-term need for greater bandwidth in bands that are available for non-government use. The X-band frequencies at 8450-8500 MHz are already allocated to the Space Research service on a primary basis for *both* government *and non-government* use. Accordingly, frequencies in these bands may ultimately help meet Bigelow Aerospace's need to employ bandwidth sufficient to permit the space-to-Earth transmission of large volumes of data and communications traffic.

In this application, Bigelow Aerospace seeks to augment its testing program by adding authority to operate high-speed data downlinks in the X-band frequencies at 8482-8492 MHz. In addition to the X-band payload operating on the BA spacecraft, Bigelow proposes to operate three directional tracking antennas used for reception of downlink data from the spacecraft. Additional technical parameters are provided on FCC Form 442.

The innovative technology to be supported by this spectrum use is already proving its potential. The existing experimental authorizations being used by BA are now yielding substantial dividends by validating the capabilities and advantages of expandable space platforms. In addition to critical telemetry and performance data, the Genesis external cameras have captured some stunning images, one of which is included on the following page.

The fully pressurized Genesis spacecraft as it heads into an orbital sunrise

Approval of the small amount of X-band spectrum requested here will facilitate Bigelow Aerospace's experimental program and enable the company to complete the necessary testing prior to deploying its first, full-scale 'BA 330' expandable habitation module that will ultimately bring the concept of expandable space habitats to full fruition. Once proven, expandable habitats could become the cornerstone in a new era of space development, enabling economical commercial LEO activities as well as affordable government exploration of the Moon, Mars, and beyond.

B. Specific Objectives Sought To Be Accomplished

1. Continue to validate and explore the design capabilities and engineering concepts of BA subscale expandable spacecraft in an actual, orbital environment.

2. To conduct long-term testing to validate system durability and longetivity.

3. To monitor the long-term radiation, thermal, and pressure conditions of expandable structures, including but not limited to:

   • Detecting any wrinkles with wavelengths greater than 1 cm and amplitudes greater than 5 mm;
   • Measuring temperatures at different locations;
   • Measuring cumulative ionizing radiation doses at several locations;
   • Measuring the internal pressure of various structures; and
   • Demonstrating the capability of the design materials to maintain a pressurization volume for an extended period of time in the LEO environment.

4. To develop the experience and infrastructure necessary to support future crewed Bigelow Aerospace missions.

5. To determine the radiation dose that a resident astronaut might receive.

6. To produce video images of the deployment process including solar panels and the pressurization of the primary structure itself.

7. To validate the use of X-band frequencies as an alternative to S-band spectrum that is being used in the current stage of experimentation.

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 long-term deployment of the full-scale, prototype, BA 330 module under an FCC commercial license. The experimental facilities sought in this application form an integral part of the overall testing program, and constitute a critical link toward establishing the viability of future robust commercial and public operations.

If successful, expandable habitats will greatly lower the cost of conducting space activities while enhancing their efficacy. This will lead to new and innovative private sector uses such as space tourism, microgravity research and development, and other commercial applications, and will also allow for government agencies such as NASA and

NOAA to bolster their space-based operations and programs. The information gathered and products developed aboard orbital expandable space habitats could someday make life better for all of us here on Earth.