Bigelow Development Aerospace Division, LLC

Exhibit B to FCC Form 442 Application

Question 7: Experimental Description

A. The Proposed Program of Research and Experimentation

1. Bigelow Development Aerospace Division ("Bigelow Aerospace" or "Company"), a U.S.-owned Nevada corporation, headquartered in North Las Vegas, NV, requests FCC experimental authority to construct, launch and operate three experimental satellites to test the feasibility of an inflatable habitation module in space using the Space-to-Earth downlink UHF frequency bands of 401- 402 MHz and S-Band frequency of 2200-2290 MHz and the Earth-to-Space uplink UHF frequency bands of 402-403 MHz and S-Band 2025-2100 MHz. The first Bigelow Aerospace launch of its Genesis module, a one-third scale test version of a future inflatable space habitat called Nautilus, is scheduled for November 2005 from Vandenberg Air Force Base onboard a Falcon V booster, provided by Space Exploration Technologies Corporation (SpaceX). The second launch is scheduled for April 2006 aboard the Russian Dnepr Launch Vehicle.

2. Bigelow Aerospace has worked with NASA's Johnson Space Center since 2002 on evaluating next generation inflatable space module technology. The Company has signed two Space Act Agreements and three licensing agreements with NASA which provide for an ongoing exchange of personnel and technology, the joint testing of Bigelow projects at NASA facilities, and the transfer of numerous NASA patents to Bigelow Aerospace. More specifically, Bigelow Aerospace has acquired exclusive commercial development rights to a NASA design for inflatable space station modules. That design, referred to as 'TransHab', called for a type of expandable space habitat that would be launched in a compressed configuration, and then inflated in orbit. Drawing upon NASA's TransHab program, Bigelow Aerospace has continued to develop and evolve this innovative space technology with the key objective of increasing safety, capacity, and reliability, while significantly reducing costs, thereby advancing the Company's ultimate goal of establishing affordable habitable space stations that can be commercially exploited for research, manufacturing, tourism and other activities.

3. The company now seeks FCC approval to proceed with its development program to test the systems and subsystems of its sub-scale inflatable space habitation module to validate the key deployment and inflation technologies as well as long-term performance in space. Bigelow Aerospace hopes to demonstrate the viability of this innovative technology for future commercial and government use.

The requested Space-to-Earth UHF band of 401-412 MHz will be used for Command and Control telemetry downlink and the Space-to-Earth S-band of 2200-2290 MHz will be used for download of mission data including high resolution photographs and science data. The requested Earth-to-Space UHF band of 402-403 MHz will be used for Command and Control uplink and the Earth-to-Space S-band of 2025-2100 MHz will be used as a backup to the command uplink frequency 402-403 MHz.

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

5. The satellites that Bigelow proposes to use in this experimentation program are carefully designed and optimized for data relay. Excluding antennas, the satellite mass is 1500 kg. At the planned altitude of 550 km, the Genesis experimental satellites are expected to re-enter the Earth's atmosphere and burn up completely in 3-5 years, depending on the intensity of solar activity. The Genesis satellites have no on-board fuels for maneuvering or deorbiting.

6. For Earth-to-Space communications, Bigelow plans to establish a low-gain UHF earth station and 3.5 meter mid-latitude S-band dishes in Las Vegas, Nevada and Fairfax, Virginia as well as a large-diameter high-latitude S-band dish in Fairbanks, Alaska.

B. The 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 inflatable structure design by observing its deployment and long-term performance in space.

3. Monitor the long-term radiation, thermal and pressure conditions of the structure, including:

- Detect wrinkles with wavelength greater than 1 cm and amplitude greater than 5 mm;
- Measure temperature at different locations;
- Measure cumulative ionizing radiation dose at several locations;
- Measure internal pressure of the structure;
- 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. How the program of experimentation has a reasonable promise of contribution to the development, extension, expansion, or utilization of the radio art, or is along a line not already investigated.

1. Through its experimental program, Bigelow Aerospace will be able to conduct the necessary experimentation and tests that will enable it to assess the feasibility of deploying the full-scale Nautilus module under an FCC 312 commercial license.

2. Although NASA's TransHab program was cancelled due to budget considerations, the privately funded efforts of Bigelow Aerospace have kept the promise of an inflatable habitat module alive. In the words of The Mars Society: "Developing inflatable technology offers the potential of human habitation structures simultaneously cheaper, lighter, safer, bigger, and more resistant to meteorite damage than conventional systems…lightweight, meteorite-resistant habitation structures that can be used for any purpose in space, including government or commercial space stations, lunar bases, Mars missions and bases, and asteroid missions and bases." Additionally, with the announcement of NASA's new exploration vision, that calls for crewed missions to the Moon, Mars and beyond, inflatable space habitats have again become a critical new technology for the Agency.

3. NASA has touted the many benefits of its technology transfer and commercialization program at NASA's Johnson Space Center, whereby 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.

4. Bigelow Aerospace has been committed to the goal of achieving the promised benefits of TransHab through an experimental program devoted to the development and testing of an inflatable habitation module that can provide the government and private-sector marketplace with a safer and less expensive space station for sustained missions in space.

5. Other benefits to the U.S. public will accrue from the ongoing research and development activities by Bigelow Aerospace, which will contribute to the body of U.S. technological innovation and will provide a stimulus to private development, expansion and utilization of space stations that are now only affordable and available to the government.

D. Technical Information

1. Design, construction and ownership. The Bigelow Genesis communications modules will be designed, built, integrated and tested by SpaceQuest, Ltd., a corporation registered in the Commonwealth of Virginia, United States of America. If an experimental space station license is granted to Bigelow Aerospace, the United States, through the Federal Communications Commission, would be notifying administration to the ITU for the Bigelow spacecraft. Bigelow is the owner of the satellites and is responsible for the successful launch and functional checkout on orbit.

2. Space Station Name: Genesis I, Genesis II and Genesis III

3. **Construction Completion Date for First Launch:** September 2005

4. **Estimated Launch Date:** 1st launch December 18, 2005

2nd launch April 2006

3rd launch April 2007

5. **Purpose:** Experimental, non-Common Carrier basis

6. **Orbital Type:** NGSO

7. **Orbital Requirements.** The desired orbit for the Genesis satellite is 550 km altitude with 65° inclination

Orbital Information

Total Number of Satellites:	3
Total Number of Orbital Planes:	1
Celestial Reference Body:	Earth
Orbit Epoch Date:	TBD
Inclination Angle (degrees):	65°
Orbital Period (seconds)	5739
Apogee	550 km
Perigee	550 km
Right Ascension of the Ascending Node (deg.):	0
Argument of Perigee (degrees):	0
Active Service Arc Range (Degrees)	NA

8. **Initial Satellite Phase Angle**

Orbital Plane No.1, Satellite No.1, Initial Phase Angle: 0°

Orbital Plane No. 2, Satellite No. 2, Initial Phase Angle: 0°

Orbital Plane No. 3, Satellite No. 2, Initial Phase Angle: 0°

10. **Service Area:** CONUS

11. **Satellite payloads.** The Genesis communications payload consists of two transmitters and a video system, consisting of six cameras – two internal view cameras (one at each end of the structure) and four external view cameras (one attached to each of the forward solar arrays) - that can deliver video and telemetry data to ground stations.

12. Principle specifications. The deployed Genesis spacecraft is 7' in diameter and 10.5' long with a total mass of 1500 kg.

13. Radio equipment. Bigelow Aerospace is applying for experimental use of a downlink frequency in the 401-402 MHz band and in the 2200-2290 MHz band. The maximum UHF output power is 6 Watts through a 0 dBi antenna, resulting in a power flux density on the ground of -127 $W/m^2/4kHz$ for a space station altitude of 550 km. The maximum S-band output power is 4 Watts through a -3dBi antenna, resulting in a power flux denist on the ground of -145.7 $W/m^2/4kHz$ for a space station altitude of 550 km. The requested uplink frequency bands are 402-403 MHz and 2025-2100 MHz.

Band	***Frequency (MHz)***	***System***	***T/R Mode***	***System Description***
UHF	401-402	Command Downlink	T	FM GMSK Modulation in 2 56 kHz channel ±9 kHz Doppler band at 6 Watts max output power
S-Band	2200-2290	Data Downlink	T	FM GMSK Modulation in 1 2 MHz channel ±5 kHz Doppler band
UHF	402-403	Command Uplink	R	
S-Band	2025-2100	Secondary Command Uplink	R	

14. Link Budget. The coverage area diameter from their altitude of 550 km is approximately 4,000 km. Each satellite will pass over the U.S. about seven times a day for approximately 15 minutes. The satellite transmitters are only active while communicating with a fixed ground station in Las Vegas, NV, Fairfax, VA or Fairbanks, AK. Below is the Bigelow Aerospace Satellite Link budgets.

Bigelow Aerospace Genesis Link Budget

Parameter	Value	Units

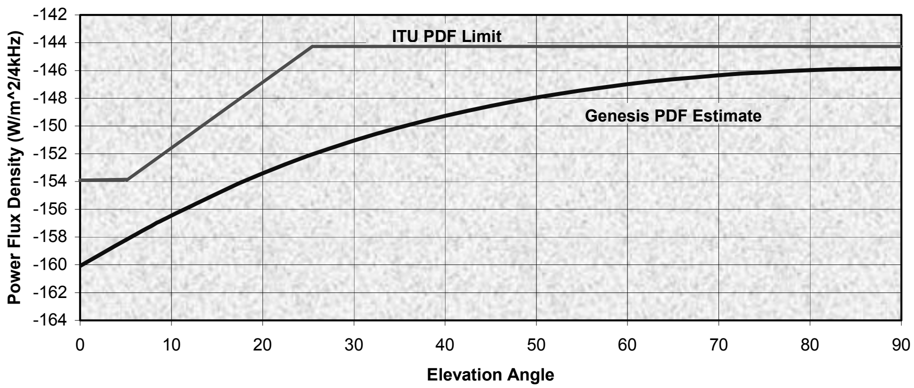
Input Parameters

Maximum altitude	550	km
Minimum altitude	550	km
Minimum elevation	5	deg

Constants and Calculations

Speed of light	3.00E+08	m/s
Boltzmann constant	228.6	dB/K
Earth radius	6378	km
Min angular radius	1.187	rad
Minimum elevation	0.087	rad
Earth central angle	0.306	rad
Maximum range	2078.0	km

Power Flux Density



Command Uplink at UHF

Frequency	402.5	MHz
Wavelength	0.745	meters
Bit rate	9600	bps
Spectrum usage	1.5	
Groundstation EIRP	20	dBW
Pointing loss	-1	dB
Maximum free space loss	-150.9	dB
Atmospheric attenuation	-0.2	dB
Rain fade		dB
Satellite gain	-6	dB
Satellite receiver temp	30	dBK
Boltzmann constant	228.6	dB/K
C/N0	60.51	dB
Bit rate	39.82	dB-Hz
Eb/N0	20.69	dB
Required Eb/N0	9.6	dB
Margin	**11.09**	**dB**

Telemetry Downlink at UHF

Frequency	401.5	MHz
Wavelength	0.747	MHz
Bit rate	9600	bps
Spectrum usage	1.5	
Satellite transmit power	6	dBW
Minimum antenna gain	-6	dB
Maximum free space loss	-150.9	dB
Atmospheric attenuation	-0.2	dB
Rain fade		dB
Ground station pointing loss	-1	dB
Ground station G/T	-10	dB/K
Boltzmann constant	228.6	dB/K
C/N0	66.53	dB
Bit rate	39.82	dB-Hz
Eb/N0	26.71	dB
Required Eb/N0	9.6	dB
Margin	**17.1**	**dB**
Signal bandwidth	6400	Hz
Power fraction in 4 kHz	-2.04	dB
Transmit power in 4 kHz	3.96	dBW/4kHz
Maximum satellite antenna gain		dB
PFD at 5 deg per 4kHz	-139.4	dBW/m^2/4kHz
PFD at nadir per 4kHz	-127.0	dBW/m^2/4kHz

Data Downlink at S-Band

Frequency	2255	MHz
Wavelength	0.133	m
Bit rate	614,400	
Spectrum usage	0.5	Coded BPSK
Satellite transmit power	4	dBW
Minimum antenna gain	-3	dB
Maximum free space loss	-165.86	dB
Atmospheric attenuation	-0.5	dB
Rain fade	-1.0	dB
Ground station pointing loss	-0.5	dB
Ground station G/T	5.5	dB/K
Boltzmann constant	228.60	dB/K
C/N0	67.24	dB
Bit rate	57.88	dB-Hz
Eb/N0	9.36	dB
Required Eb/N0	4.40	dB
Margin	**4.96**	**dB**
Signal bandwidth	1.23E+06	Hz
Power fraction in 4 kHz	-24.87	dB
Transmit power in 4 kHz	-20.87	dBW/4kHz
Maximum satellite gain	4.00	dB
PFD at 5 deg per 4kHz	-158.2	dBW/m^2/4kHz
PFD at nadir per 4kHz	-145.8	dBW/m^2/4kHz