

**INTERNATIONAL SPACE UNIVERSITY
TEAM PROJECT PROPOSAL FORM**

Project Title: Space Olympics

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One-paragraph description: The imminent advent of commercial human spaceflight creates opportunities for non-traditional space activities if they can make a profit. As a single flight could easily cost hundreds of millions of dollars, generating sufficient revenue is challenging. However, major sporting events can generate advertising income in the hundreds of millions or even billions of dollars. For example, the American Super Bowl netted \$245 million in 2012 (<http://www.statista.com/statistics/217122/total-advertisement-revenue-of-super-bowls/>) and the Olympic revenues in the US alone this year were about \$1.2 billion (<http://online.wsj.com/article/SB10000872396390443687504577563452926213234.html>). The announced price of a 60 day stay on a future Bigelow inflatable space station is \$150 million for the whole station plus \$26.25 million per person, including a ride on a Falcon 9/Dragon there and back (<http://www.bigelowaerospace.com/opportunity-pricing.php>). The Dragon is under development using, in part, NASA money to deliver up to seven astronauts to the International Space Station (ISS). This means a Dragon could fly six famous athletes and a cameraman to a Bigelow station for 60 days under \$360 million, well below revenues of large sporting events. Bigelow Aerospace has flown two sub-sized inflatable pressurized modules and is working on the BA 330, a 13.7 x 6.7 m module just large enough for a reasonable sporting event (there are two modules in the proposed station). A 60-day stay allows ample time for training of both the astronauts and the cameraman and one to two weeks of games. The athletes, even very famous ones, need not be paid; a free trip into space should be more than adequate incentive. In addition to ad revenue from televising the games themselves, it may be possible to generate additional revenue with reality-contest shows to pick the athletes and Og sports. Ideally, the games would be sponsored by a recognized international sports organization such as the International Olympic Committee. Of course, if the first games are successful, they could be repeated and expanded with more athletes and bigger venues.

Background rationale: The purpose of the project is to expand human spaceflight and public awareness. The target population, elite athletes, does not currently visit space. In addition, at least the first games will certainly be viewed by vast numbers of people, particularly if famous athletes each with a large following participate. Note that major international sporting events such as the Olympics and the World Cup routinely draw billions of viewers. If successful, the games will provide additional incentive and funding to develop human facilities in orbit. The project should also motivate sports fans to view space as part of their world, increasing the number of individuals supporting space activities. Sports fans are a large fraction of the total world population.

Main issue(s) to be addressed: The primary issues to be addressed are the cost and potential revenues. As most of the revenue is expected to come from live coverage of the games, distributing real-time video is essential and will be a challenge, either requiring TDRSS access, which requires NASA's cooperation, and/or complex scheduling around access to ground stations. Note that in 2014, one minute of TDRSS at 300 Mb/second cost \$139, not a major cost. Other issues involve the feasibility of using near-term expected capabilities, such as Falcon 9/Dragon, Atlas V/Boeing/Sierra Nevada for launch, and the Bigelow line of space stations for sports. In particular, sporting events can be rough, the interior of the arena must be robust enough to handle significant impacts, and critical equipment must be effectively walled off from the competition.

Main tasks to be accomplished: 1) Design Og sports that are interesting and exciting and that can be performed without damaging the spacecraft. 2) Design modifications to systems under development, such as the Bigelow BA 330 module, to serve as a sports arena. 3) Insure video communication, ideally for multiple cameras, for worldwide distribution. 4) Develop marketing strategies to maximize ad revenue both from the

game themselves and related activities. 5) Devise an approach to bring the International Olympic Committee or similar organization on board to provide a recognized sports brand. 6) Devise strategies for selecting athletes who will bring viewers to the project. 7) Insure that the life support and other systems can handle the demands of extreme efforts by the athletes. 8) Optionally, design a later stage sports facility under the assumption the games are sufficiently successful that later games can afford their own custom facilities.

International/Intercultural Scope of the Project: As a large audience is essential to success, wide international participation is absolutely essential. In particular, the athletes should be chosen from around the world to represent different sports fan bases, e.g., a football player, a basketball player, a cricket player (to attract India/Pakistan viewers), perhaps an American football player, and other athletes with a large following different from the others. The athletes should be chosen in part on geographic grounds, although as long as the games are limited to six athletes not every nation can participate directly.

Interdisciplinary Scope - Expected level of involvement by disciplinary area:

	Business Management	Life Science	Policy & Law	Physical Science	Satellite Applications	Systems Engineering	Space & Society
Major	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Minor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Brief explanation of expected involvement by discipline:

Space Business & Management: The proposed games must be part of an international business effort to generate sufficient ad revenue to cover the expense of the facilities and transportation. Particular attention must be devoted to brand development or the games will be a one-time affair. The primary business challenge is to develop as many revenue streams as possible by creative use of access to not just the games themselves, but the supporting activities leading up to and following the games.

Space Life Sciences: While some space activities, particularly EVA, can require very substantial effort, in general the level of physical activity characteristic of world-class athletes in competition has not been seen in space to date. The reaction of the human body to this level of activity in space, particularly with regard to weightlessness, is of at least some scientific interest. As the first games will have only a small number of athletes, few conclusions can be reached, but the data gathered can be reasonably expected to help generate hypothesis that can be tested at later, larger events.

Space Policy & Law: There are liability issues around holding sporting events in space. In addition to the possibility of launch failure or other catastrophic accident, where the issues are similar to space tourism, there is the possibility of athlete injury during the games. However, it appears that these issues are minor and easily resolved with waivers.

Space Physical Sciences: N/A

Satellite Applications: N/A

Space Systems Engineering: All sports require facilities and Og athletics will be no exception. In addition to the games themselves, clean up after intense games may be very challenging. A careful examination of all spacecraft systems is necessary to insure that there are no serious negative effects. Spacecraft are not generally designed to be robust to rough handling by astronauts, an

assumption not necessarily valid during contact sports such as wrestling. Furthermore, the stresses such sports create on spacecraft systems may be different than one might expect from our 1g experience. Finally, if early games are successful there may be an opportunity to develop custom sports facilities in orbit, a significant systems engineering challenge.

Space & Society:

The advent of Space Olympics would fundamentally change the relationship between space and society. The Space Olympics would bring a completely different culture into space, one that has extremely wide spread appeal to the general population, not only those interested in science and technology. Furthermore, Space Olympics may help open the door to other aspects of human culture in space, for example, dance.

Proposed ISU program (MSc, SSP, or SHS-SP): All

Window of opportunity in terms of potential relevance of and interest in the project topic: This topic should be of interest for the foreseeable future.

Potential external interest in or sponsorship of the TP topic: Major sporting organizations, such as the International Olympic Committee, Fédération Internationale de Football Association (FIFA), the American National Basketball Association (NBA), and many others may well be interested in sponsorship.

Prospective impact of the TP: The TP has the potential to lead to a major new activity in space. In any case, it will challenge the students to think about the feasibility of space applications outside of science and technology. This TP should have widespread media appeal outside of space media circles and, if picked up by the media, could result in significant positive ISU media exposure.

Additional comments: This could really be a lot of fun.