Florida High Schools Model United Nations

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UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION

ETHICS OF OUTER SPACE DEVELOPMENT

"Ethics is a fundamental aspect of human society. For those who are involved in space activities, ignoring this debate is not an option." -- Antonio Rodota, Director General, European Space Agency.[1]

Abstract:

Introduction:

Since October 4, 1957,[2] the allure toward exploration and development of outer space has been a cornerstone of the world's interest; garnering attention from numerous countries, the local space in Low Earth Orbit (LEO) quickly became the dominant playing field for the world's various governments, who dedicated a significant amount of time, money, resources, manpower, and technology to launching satellites (including military, civilian, and exploratory) and men into space. With the ignition of the Space Race between the Union of Soviet Socialist Republics (USSR) and the United States of America in the 1960s to place a man on the moon, the potential of space became a universal notion. Space was a way to test new technologies, solidify national interests, and offer a unique avenue to gather information on other nations.

As part of its vested interest in international cooperation, the UN quickly realized the potential offered by space, both for peaceful and militaristic purposes. In December 1958, in preparation for all possible scenarios regarding the use of Outer Space, the UN General Assembly authorized the creation of a special Ad Hoc Committee on the Peaceful Uses of Outer Space (COPUOS) via Resolution 1348.[3] Further commitment to establish international space laws was taken in 1962 with the establishment of the United Nations Office for Outer Space Affairs (UNOOSA). In this way, through the guidance of international space law, Outer Space in the eyes of UN represented a new hope for the world's peoples: a way to cooperate and work together toward a goal greater than militaristic and national dominance.

On July 17, 1975, the potential for peaceful cooperation in LEO was realized when a three person crew in a NASA (National Aeronautics and Space Administration)

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[1] "The Ethics of Outer Space." SpaceDaily: Your Portal to Space. 3 July 2000. http://www.spacedaily.com/news/ethics-00a.html

[2] The first artificial satellite, Sputnik I, was successfully launched into Earth orbit on this date by the USSR, effectively beginning the Space Age.

[3] Text of Resolution 1348. http://www.oosa.unvienna.org/oosa/en/SpaceLaw/gares/html/gares_13_1348.html

Apollo crew module and a two men crew in a USSR Soyuz spacecraft successfully docked to one another, marking the first international docking in history and the first joint US/USSR (later US/Russia) space endeavor. A prominent symbol of détente, the Apollo/Soyuz Test Program represented a commitment to exploration in and of Outer Space and served as the symbolic end to the Space Race which had dominated US and Soviet space endeavors for nearly 20 years.

Now, 36 years after that historic meeting, LEO is filled with satellites (both military and commercial), thousands of pieces of space debris (or "space junk"), dozens of space telescopes, and a premiere scientific laboratory: the International Space Station (ISS), to which the USA, Russian Federation, European Space Agency, Japan Aerospace Exploration Agency, and Canadian Space Agency routinely undertake resupply and construction missions. Yet, as the space community moves into the second decade of the 21st century it finds itself at a crossroads. With the International Space Station (ISS) providing a unique and groundbreaking platform for micro-gravity medical and physical science research, our methods of reaching this truly iconic orbital science laboratory – the first such laboratory built through the cooperation of 15 nations and five space agencies – are set to become limited. With the retirement of the Space Shuttle orbiter fleet in 2011, the world community finds itself asking an important question about space access and exploration: How do we reliably get to space, both LEO and beyond? Where do we go? What do we do when we get there? What are our responsibilities once we're there? And what is each space-fairing country's duty to the continued exploration and utilization of space?

As the space community asks itself these questions, the queries are problems that have been asked throughout the history of space exploration and are, in many ways, symptomatic of larger questions regarding the ethics of outer space development. These questions about the use and development of human outposts in the final frontier speak to larger questions about the balance between our increasing technological capabilities, our hardwired desire to explore the unknown, our militaristic and governmental objectives in the world at large, and our duty to preserve the natural wonders that surround us.

I. The Outer Space Treaty & Military/Government Development of Space:

Coming into effect on October 10, 1967, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies – more commonly known as the Outer Space Treaty – is an agreement among 98 countries (and 27 countries which have signed but not yet completed the ratification process) that forms the basis of international space law. Aimed primarily at the United States and the USSR during the growing escalation of the Space Race, the Outer Space Treaty strictly prohibits treaty participants from placing nuclear weapons and weapons of mass destruction (WMDs) into Earth's orbit or on the moon and

other astral bodies.[4] The treaty also cements the use of the moon and other celestial bodies for peaceful uses, specifically banning the testing of weapons, establishment of military bases, and the conducting of military maneuvers.

While the treaty bans the placement of WMDs and nuclear devices into Earth orbit, it does not ban the placement of traditional, non-nuclear weapons into orbit. This has lead to the use of conventional weapons in outer space for the so-far express purpose of shooting down errant satellite – a tactic both the United States and People's Republic of China have made use of.

Most recently, in January 2007, China shot down their Feng Yun 1C polar orbit weather satellite using a surface to space, medium range ballistic missile. The move garnered much concern from the international community that China was violating the Outer Space Treaty – partly because the country gave little warning that it planned to carry out such an endeavor; the satellite in question was not completely destroyed but rather blasted into thousands of small pieces, pieces of space debris that consequently posed a danger to other satellites and manned space missions (most notably the International Space Station).[5]

Nonetheless, a greater issue here was the fact that while the world community as a whole was concerned by this test, the test itself was completely legal under international space law. Since China did in fact notify international agencies of the planned test and did use a conventional weapon, no laws were broken, though it could be argued that the test undoubtedly demonstrated a severe lack of concern/respect for other space fairing nations and the international crew aboard the International Space Station at the time – a space station program that China has expressed interest in joining.

But the Chinese test is not the only satellite-killing maneuver to be conducted in the last decade. In fact, several prominent space-fairing nations have out-right opposed the banning of such satellite-killing tests, the United States being a notable example. Just one year after the Chinese satellite-killing maneuver, the United States undertook a similar process when it shot-down a failing spy satellite over the Pacific Ocean. While the official line from the United States government was that the satellite was being shot down to eliminate worry of its potential reentry over a populated landmass, the move was widely criticized by the international community as further escalation of satellite-killing technology and a blatant militaristic use of outer space.[6]

Again, like the Chinese operation in 2007, the United States' actions in the Pacific were completely legal, if not disturbing. While these two incidents were isolated, they

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[4] "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies." *UNOOSA*. http://www.oosa.unvienna.org/oosa/SpaceLaw/outerspt.html

[5] "China confirms satellite downed." *BBC*. 23 January 2007. http://news.bbc.co.uk/2/hi/asia-pacific/6289519.stm

[6] "Navy Missile Hits Dying Spy Satellite, says Pentagon." *CNN*. 21 February 2008. http://www.cnn.com/2008/TECH/space/02/20/satellite.shootdown/index.html

represented a growing concern within the space communities of the development of space in terms of state governments and militaries. Highlighting this fear are the recent actions of the Democratic People's Republic of Korea, which has so far attempted to launch two rockets (complete with payload) into space. While both of the these missions failed during the launch process, the fact that the DPRK was willing to undertake a space mission using a military missile proved troubling to many UN member states, specifically the Republic of Korea, Japan, the United States, and the European Union.[7]

While the DPRK's actions may have been peaceful in nature (something county officials have always claimed to the be the case), the use of space technology, specifically medium-range and long-range missiles for space architecture launch, by countries generally recognized as being militant or outside the international norm has caused great concern by the international community at large.[8] During the second DPRK space launch campaign, both the United States and Japan stationed military vessels in the Sea of Japan – with Japan frankly stating that they would shoot down any DPRK space vehicle that they deemed a threat to the their population.[9] In particular, U.S. President Barack Obama "called for a global response and condemned North Korea for threatening the peace and stability of nations "near and far."[10]

Thus attempts at deciphering intent by the world community quite possibly comprise the most important determination of a specific country's action when implementing a space launch. While the UN does intervene with official sanctions that often in the arena of space endeavors, it is imperative for each country to objectively assess the actions and intentions of others in the space community – usually those countries that are just entering the arena of spaceflight.

II. Colonization, Human Health, and Protection of Natural Astral Body Resources:

For nearly 30 years (since April 12, 1981) the US's Space Shuttle Program has been an instrumental resource in orbital science research and unprecedented international cooperation. However, its pending retirement, combined with a drive within the US executive branch to commercialize manned access to and the use of outer space raises serious questions for the global space community.[11]

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[7] "North Korea space launch 'fails.' *BBC*. 5 April 2009. http://news.bbc.co.uk/2/hi/7984254.stm

[8] Crail, Peter. "U.S., Allies Warn Against NK Space Launch." *Arms Control Association*. April 2009. http://www.armscontrol.org/act/2009_04/NKlaunch

[9] "Japan Warns It May Shoot Down North Korean Satellite Launcher." *Buzzle.com*. Guardian News & Media 2009. 13 March 2009. http://www.buzzle.com/articles/256145.html

[10] "No decision from U.N. meeting on North Korea." *MSNBC*. 5 April 2009. http://www.msnbc.msn.com/id/30035197/ns/world_news-asia-pacific/

[11] Clark, Steven. "Senate Approves Bill Adding Extra Space Shuttle Flight." Spaceflightnow.com. 6 August 2010. http://spaceflightnow.com/news/n1008/06senate/ (Based on the 2011 NASA Reauthorization Act passed by both houses of the United States Congress on August 5 and September 30, 2010, the Space Shuttle Program is set for retirement following the addition of one more flight to mission manifest targeted for launch No Earlier Than June 2011).

Currently, only three countries are capable of launching men into Low Earth Orbit (LEO): the United States of America, the Russian Federation, and the People's Republic of China. With China's space program currently in its infancy and aimed almost entirely on the pursuits of the state, only the U.S. and Russia conduct international manned missions to the ISS -- with the Russian Soyuz and U.S. Space Shuttle providing a critical redundancy to one another in terms of manned access to space. With the retirement of the Space Shuttle fleet, the Russian Soyuz will be the world community's only available means for manned access to space until commercial companies in the United States and NASA can develop the needed rocket and crew capsule architectures to once again fly humans into LEO.

While this political jostling continues, plans for the future of manned exploration of the inner solar system have been left on the drawing board, with no rocket architecture currently under funded development to facilitate the expressed goals of either returning to the moon and establishing and international moon base, conducting manned missions to the Earth-Sun and Earth-Moon Lagrangian points, conducting manned missions to nearby asteroids and space bodies (referred to a Near Earth Objects or NEOs)[12], or conducting long-term manned missions to Mars and its two moons[13].

While the timetable for these events remains in flux, the goal, nonetheless, of placing men and women on another body in the inner solar aside from Earth remains a constant for the international space community and space-fairing nations as a whole. This, in turn raises larger questions about how to support and sustain a population of humans living off-world. While the International Space Station (ISS) has provided an invaluable test bed to this effect, the fact remains that in the event of an emergency or the cessation of water producing capability on the Station, a significant stockpile of water is available immediately and assistance from the ground can be as little as two days away. Likewise, in the event of a medical emergency, current Station crewmembers can simply return home within a few hours via the Russian Soyuz crew transportation vehicle.

Therefore the problem of medical emergencies and station system failures is, to some degree, lessened by the Station's proximity to Earth. This would not be the case when potential missions to NEOs and Mars and its moons would take upward of one year to complete with negligible to no opportunity to immediately return to Earth in the event of an emergency (like the Apollo 13 moon mission which suffered a near-catastrophic failure of its oxygen circulation system two days after launch yet could not return to Earth for another six days).

As such, a critical need exists within the world's space communities to address the various medical issues that might arise during a long-duration mission to a NEO or

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[12] Bergin, Chris. "NASA's Flexible Path evaluation of 2025human mission to visit and asteroid." 10 January 2010. http://www.nasaspaceflight.com/2010/01/nasas-flexible-path-2025-human-mission-visit-asteroid/

[13] Bergin, Chris. "Taking aim on Phobos – NASA Outline Flexible Path precursor to man on Mars." 23 January 2010. http://www.nasaspaceflight.com/2010/01/taking-aim-phobos-nasa-flexible-path-precursor-mars/

Mars, included but not limited to severe lacerations of a crewmembers, violent illness, and even death. Gradually, the world's space agencies are working toward addressing this serious issue, with the European Space Agency announcing in 2010 that "Making sure that our astronauts are prepared mentally and physically for the demands of long exploration missions is imperative a mission's success."[14]

To better facilitate this kind of issue, as well as the mental effect of prolonged isolation and contact with only a small group of people, ESA and the Russian Federal Space Agency have both undertaken prolonged isolation experiments in conjunction with the Russian Institute for Biomedical Problems (IBMP) in Moscow – a program called Mars500.

As stated by the program, "When preparing for long space missions beyond the six-month range currently undertaken by Expedition crews on the International Space Station (ISS), medical and psychological aspects become an issue of major importance."[15] Given the hazard posed by the spaceflight beyond LEO, a complete and better understanding of the effects of long-term isolation are needed by all partners who attempt such missions to NEOs and Mars. Through the Mars500 programs, participants will be tasked with daily spaceflight routines such as monitoring equipment, performing repairs and troubleshooting on the equipment, and performing bio-medical experiments – just like a real spaceflight crew. Over the course of the 500 day test, the test crew will also be tasked with the execution of various medical procedures that might be needed during a long-duration mission, all designed to gather as much data as possible for future crews.[16]

But the question of bio-medical knowledge and practices is not the only factor when dealing with prolonged periods of space travel and surface operations on NEOs and Mars and its moons; the question of how to use the resources at these native astral bodies comes to prominence. While a return to the moon is unlikely under the current vision for manned space exploration, a significant period of thought and development was devoted to mankind's return to the moon between January 2004 and February 2010. In the scenarios expressed by NASA there was a constant theme of using the resources available to us on the moon to aid mankind's colonization efforts. Most importantly, this included utilizing the then-theoretical deposits of subterranean water.

In October 2009, the Lunar CRater Observation and Sensing Satellite (LCROSS) – in combination with an expended Atlas V rocket's Centaur upper stage and observational assets of the Lunar Reconnaissance Orbiter (LRO), a fleet of ground based telescopes, and the newly rejuvenated Hubble Space Telescope – impacted the Cabeus crater near the moon's southern pole. Following this impact, the presence of large quantities of water beneath the moon's surface was confirmed, creating the possibility

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[14] "Mars500: study overview." *ESA's participation in mars500.* ESA. 21 may 2010. http://www.esa.int/esaMI/Mars500/SEM7W9XX3RF_0.html

[15] "Mars500:study overview."

[16] "Mars Mockup in Moscow." *Astrobiology Magazine*. http://www.astrobio.net/pressrelease/3445/mars-mockup-in-moscow

that "future inhabitants of a lunar colony could make use of that water, providing valuable lessons on how to use natural materials/substances around the colony – lessons that could be applied to future manned missions into the solar system[17]."

This is good news for the world's space agencies because using natural resources like water already present on astral bodies significantly reduces the amount of resources (water) that would have to be launched to or produced at any manned outpost. Furthermore, it would provide a critical redundancy should water generation equipment and water reclamation equipment experience failures – something that is always a possibility when dealing with technology. But while the presence of water on the moon (and potentially on other bodies in the solar system) is good news and useful information on one front, it opens up a series of ethical question on another: What are our duties toward protecting the natural resources we find on other astral bodies? While a great deal of attention has been given to resolving/dealing with that question in terms of Earth's resources, there has been no conscious effort to ensure these that Earth-bound practices are brought with us in our space endeavors.

While the world's space agencies are generally highly involved in the environmental protection arena, no specific set of rules exist when it comes to the natural resources of the moon, NEOs, and Mars. That is not to say that the world's space agencies are reckless and will strip mine resources at will if international space environmental laws are not established – for strip-mining space-based resources is still a capability confined to the realm of science fiction. Rather it represents quite strikingly where the various space agencies are in the development and planning processes for such missions beyond the orbit of the moon (i.e. further than the manned Apollo missions in the 1960s and 1970s).

Furthermore, the international community must address the concept of the "common heritage of all humanity" when determining how to most expeditiously utilize space-based resources. During the 64th session of the General Assembly Fourth Committee, Pakistan emphasized that "he insistence by States with major space capabilities on incorporating the use of outer space in respective military doctrines was a dangerous trend, which would limit the scope and progress on peaceful uses of outer space, as well as jeopardize common security."[18] Most developing countries, especially the Least Developed Countries (LDCs), are unlikely to develop the capacity to extract and/or refine resources derived from outer space sources in the foreseeable future. Does that automatically disqualify these countries and their respective peoples from realizing the economic, medical, and scientific benefits that these resources might bring? Delegates may wish to examine the precedent of the UN Convention on the Law of the Sea (UNCLOS) to better understand the depth and complexity of this component of the ethical uses of outer space.

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[17] Gebhardt, Chris. "Water on the Moon, Ares I-X, Logistics on ISS - Future Aspirations Mark 2009." 30 December 2009. http://www.nasaspaceflight.com/2009/12/water-moon-ares-i-x-logistics-iss-future-aspirations-2009/

[18] UN General Assembly (UNGA), GA/SPD/433, October 21, 2009.

III. Propulsion Development:

With this desire to conduct manned exploratory mission of and establish manned outposts in the inner solar system (defined at the space between the orbits of Mercury and the inner side of the asteroid belt), the need for new, innovative, and fuel-efficient propulsion drive is another aspect of outer space development that has garnered much attention in the last two decades.

Once confined only to the realm of science-fiction, the world's space communities (most notably NASA and JAXA) have, in some instances, brought science-fiction to science reality. With the launch of Japan's Hayabusa space probe in on 9 May 2003, Japan became the first country to utilize a new form of propulsion called an ion engine, engines which provided the spacecraft with near two continuous years of light propulsion – allowing the spacecraft to conduct the first ever rendezvous, landing on, and sample return of an asteroid.[19]

Similarly, NASA has invested in ion engine propulsion with their Dawn spacecraft which is currently en route to the asteroid belt to conduct detailed analysis of the two dwarf planets Ceres and Vesta. Due to the unique properties of ion engine propulsion, this new technology will allow the Dawn spacecraft to enter orbit of one dwarf planet, remain in orbit for several months, and then travel on to the other dwarf planet – a feat never before accomplished. [20]

Specifically, ion propulsion allows for the ionization of gas, instead of convention chemical rocket fuel, to be used to propel a spacecraft. "Instead of a spacecraft being propelled with standard chemicals, the gas xenon (which is like neon or helium, but heavier) is given an electrical charge, or ionized. It is then electrically accelerated to a speed of about 30 km/second. When xenon ions are emitted at such high speed as exhaust from a spacecraft, they push the spacecraft in the opposite direction."[21] Due to the extremely small amount of xenon necessary to accomplish this task, the use of ion engines represents an enormous weight and cost savings for any space agency willing to make use of this new technology.

But ion technology is, in reality, a first step in the invention of new propulsion techniques – some of which are quite controversial. Among the most controversial is the development of nuclear-based propulsion technology. While nuclear energy source has been used on spacecraft in the past, such as the Cassini probe which currently orbits Saturn, many space agencies are cautious to further develop and use this particular propulsion means because of potential political and cultural fallout. As NASA scientist and former astronaut Roger Crouch stated, "The issue with nuclear engines and nuclear power sources is people are afraid of them. You're dealing with an area where people

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[19] "Space Probe Return to Earth from Asteroid." *CBSNews*. 13 June 2010. http://www.cbsnews.com/stories/2010/06/13/tech/main6578238.shtml

[20] "Welcome to the Dawn Mission: Overview." *NASA*. 4 January 2011. http://dawn.jpl.nasa.gov/mission/index.asp

[21] "Technology." *NASA*. http://nmp.nasa.gov/ds1/tech/ionpropfaq.html

have a fear, but their fear is not grounded on a realistic assessments of the risks involved."[22]

Nonetheless, space agencies are moving forward with proposals to develop this technology further. Most recently, former NASA administrator Sean O'Keefe stated in 2003 that "[NASA is] talking about doing something on a very aggressive schedule to not only develop the capabilities for nuclear propulsion and power generation...."[23] The further importance of nuclear power has been expressed by several scientists and astronauts in terms of the time it would take to conduct a NEO or Mars mission since a nuclear thermal rocket carries the capability to "drastically reduce trip times to and from Mars. This reduces the amount of time that astronauts are exposed to the dangerous solar and cosmic radiation that permeates space."[24]

In the manner, the potential benefits of nuclear-based space propulsion are numerous and encouraging, but the space communities still have several years of research and development ahead of them before they are ready to implement such a propulsion engine.

IV. Conclusion:

The world community sits at an interesting moment in our exploration of the final frontier. While science-fiction generally illustrates the glamour and prestige of space exploration, the realities of our current space endeavors are much more complex. While many pursuits are based on the peaceful exploration of space via technological development and international cooperation, there are underlying fears and prejudices that still have to be addressed – most importantly the role of developed space-fairing nations in ushering those nations that are just achieving the necessary technology into the family of space-capable nations. In this pivotal time, the United Nations must take an active role in the development of international space policies, setting guidelines and offering guidance to the world community and not just reacting to the requests of member nations for emergency meetings. Throughout the space age, outer space has acted as a unique playing field for the world community: one that offers the hopes of understanding and betterment for all those on Earth.

Guiding Questions:

Does your country currently maintain a space program? If so, what ethical issues have your government officials, scientists, military officers, and businesspeople confronted in recent years? If your country does not maintain a space program currently, does it plan to do so in the next 5-10 years?

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[22] Clark, Greg. "Will Nuclear Power Put Humans on Mars?" *Space.com*. 21 May 2000. http://www.space.com/scienceastronomy/solarsystem/nuclearmars_000521.html
[23] Knight, Will and Damian Carrington. "NASA boosts nuclear propulsion plans." *NewsScientist.com*. 20 January 2003. http://www.newscientist.com/article/dn3285-nasa-boosts-nuclear-propulsion-plans.html
[24] Clark, Greg. "Will Nuclear Power Put Humans on Mars?"

Does the international community need to convene a new conference on the potential weaponization of space because of the recent instances of satellite-killing? When countries engage in satellite-killing, are they responsible for paying for damages to the property of other states or businesses?

How does your government view the “common heritage of all humanity” concept in regards to current and future space-based resources? Would your government support developing guidelines that would cover not only the behavior of states but also of corporations?