OUTER SPACE

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INTRODUCTION

In the time period from the end of the American Civil War to the turn of the century, the United States grew exponentially. From the Mississippi River to California and from Canada to Mexico, Americans trod every square foot of soil. The growth was so remarkable, that historians could not help but notice. One of those historians was Frederick Jackson Turner. Turner wanted to know what had caused this growth and what were the impacts on American society. The result of his study was a document entitled "The Turner Thesis." Subsequently, it came to be known as "The Frontier Thesis."

Turner argued that there were some very specific dynamics at work in this time period. Immigration was providing over flows of people in the East which created major pressure on society. In an effort to seek land and employment, the people moved westward. Turner also argued that there were people who sought the space and challenge of unconquered territory. These are the people who paved the way. These are the people who braved the hardships of weather, Native Americans, and subsistence in order to survive and prosper. Turner was convinced that this separated Americans from their European roots. It made Americans brash, optimistic, and democratic. The further west they were, the more brash and democratic they became. Turner's final comment was that as long as Americans faced a frontier situation, this attitude would remain unique to our society.

Since Turner's Thesis, Americans have faced and met many challenges. We are without peer in the world of nations. Our innovation and development is unmatched. This in itself would seem to counter Turner's concept because this is not the frontier of our earlier history. However, when one delves deeper into the psychology of Turner's ideas, you realize that the frontier was a challenge. It was something to be bested and to be made useful for man. In this vein, one can see why as a society, we continue to grow and prosper. It makes understandable the need to make an automobile into something far beyond a simple conveyance. The only question now: is our society ready to take on the next frontier or challenge?

Some would argue we already have. We have been to the Moon and sent machine emissaries deep into Outer Space. We have harvested space technology and made it an every day experience. Others, however, are saying our efforts are just the beginning throes of a conquering movement. These people argue that in the middle and late eighteen hundreds, we did not turn back from the attacks of Native Americans. We did not stand on the east side of the raging river and say we can't go on. We found a way. We made a new path. We conquered. Outer Space is no different. It simply offers different challenges and problems. We have already developed significant technology and theoretical solutions. It is now time to cross the river and get on with it.

What is holding us back? We have had the technology since the late 1960s. We know what it would take. We have a prototype: albeit a tiny one. All we need is the impetus to shove us over the threshold. That impetus may be energy. It is the story of increasing utilization of energy that is the benchmark of our growth. Americans in the electrified

1990s used approximately three times as much energy per capita as their predecessors of the steam and gaslight 1890s, who in turn had nearly tripled the per capita energy consumption of the pre-industrial 1790s. There are dooms dayers who argue this trend is a threat to the world's resources, but, it corresponds directly to our rising living standards. This analogy holds up even when applied to the Third World. Energy is the key to living standard, industrialization, and ultimately, wealth. This will place an extreme hardship on resources as we continue to grow and develop. This is especially true in the face of rising world population. The consumption of energy will continue growing as our population grows and as we continue industrial growth. The demand for energy can only rise astronomically. Scientists argue the demand for energy will out strip resources here on Earth. Robert Zubrin sums up our dilemma in an essay in the book "Islands in the Sky."

> If we compare the energy needs for a growing human civilization with the availability of resources, it is clear that, even if the environmental problems associated with burning fossil fuels and nuclear fission are completely ignored within a few centuries the energy resources of the Earth and the Moon will be effectively exhausted.

Earth people must go into Outer Space and tap into the enormous energy reserves of our solar system. But, before we go, there are some issues to be considered and discussed.

The United Nations Outer Space Treaty is a document modeled on an earlier treaty dealing with Antarctica. It is a non-armament treaty. The signatories agree not to take military weapons into Outer Space. Particularly, weapons of mass destruction are not to be orbited around the Earth, nor installed on the Moon or other celestial bodies. Further, the treaty limits the Moon and other celestial bodies to peaceful purposes. These Outer Space bodies cannot be used for military bases or even military maneuvers. Obviously, the exploration and development of Outer Space should be done in a non-military manner and for the benefit of mankind. Ironically, after the United States and the Soviet Union signed this treaty, they began a collaborative space effort.

It is difficult to separate development into peaceful or military only modes. It is the age old question of do we use it or not? Albert Einstein raised this issue twice as the United States was racing to build an atomic bomb in order to beat the Germans. The United States beat the Germans with conventional weapons, but, used the atomic bomb to subdue the Japanese. Proponents said "See, we needed it." Since then, we have created electricity with nuclear power. We treat cancer with radiation. And of course, we have built the ultimate nuclear weapon; the neutron bomb. This is the march of progress. The point being made, is it is difficult to categorize innovation as purely peaceful or absolutely military.

Another issue that needs to be understood is our space vehicle program. We have yet to find a way to break the hold of gravity without burning massive amounts of fossil fuel. Until we actually get into space permanently, we see no reason to change. Nor can we envision an alternative that would get the job done. Again, we need the impetus of

necessity. We need to build a true space vehicle and we can only do so in space. Is this a conundrum or is it the answer? It is a definite that chemical propulsion will not work in space as a long trip fuel.

Finally, if you need a more practical reason to consider man's permanent entry to Outer Space, we have already benefited significantly by our short space sojourn. There are a myriad of spin-offs produced by space flight that have become part of everyday America. Consider the Hubble Telescope. Initially, the optics were flawed, which led to a hue and cry of waste in NASA. Even with the flawed optics, the Hubble still produced the best images we had to date. The optics were fixed, and we were startled with the results. A spin-off is the use of Hubble's Charged Coupled Device chips to conduct breast biopsies. The CCD chips are so advanced, that they can detect minute differences between a malignant or benign tumor without the need for a surgical biopsy. This saves the patient weeks of recovery time and the cost for this procedure is hundreds of dollars versus thousands for a surgical biopsy. When you consider that 500,000 women annually need a biopsy, you can begin to understand the impact. This of course isn't the only benefit we have reaped from Outer Space. There are so many, that it would be difficult to name them all. Here are a few: enriched baby food, water purification methods, scratch-resistant lenses, golf ball aerodynamics, portable coolers and warmers, athletic shoes, The DustBuster, smoke detectors, flat panel television, the sports bra, self-adjusting sunglasses, and hang gliders. Please don't overlook Velcro.

Is energy enough to take us permanently into Outer Space? Is the Turner Thesis still operative and will we approach space as we did the Sioux Tribes of the Great Plains? Even with President Bush's new mandate to return to the Moon, we do not have a clear initiative. The United States needs to cross the river and get on with it.

COLONIES IN SPACE

In spite of crashes, politics, budget battles, and general opposition, we are on the verge of having fairly inexpensive, very reliable, and reusable spaceships. Given that we can now build reusable spaceships that operate like commercial airliners, what is this going to mean? In one word: revolution. The word revolution means a rapid and radical change in the way of doing things. The introduction and use of the new breed of spaceships meets this definition of revolutionary. When we presume the basic technology to build these spacecrafts exists, we then have to consider how they will be used and their impact on the program. The first and most important realization is it will reduce the cost of space transportation. Secondly, it will change how we conduct operations in the Earth-Moon system. Finally, we have to realize the incredible impact on all allied areas.

One of the areas that has not been discussed much in the space industry until recently is colonization of space. Webster's defines colonization as to found or establish a colony or colonies. We are not talking about the International Space Station. That is an experiment. What we are talking about is establishing colonies on the Moon, on near-Earth asteroids, or even as far away as Mars. We are talking about a permanent settlement of human beings in Outer Space. This should become the priority of our space

program, because, this is what will lead to our utilization of vast resources available in Outer Space.

Energy is a prime consideration. We tend to think about energy in Earth terms. We are still tied to chemical propulsion systems. The most abundant and readily available energy source for colonies is solar. It is unlimited and virtually free. As long as our colonies are built facing the sun, there is no problem. We currently have a body of technological information that indicates we could build energy plants in space and beam power in multiple directions to several colonies. Once this issue is resolved, the sky is the limit. We could even establish a colony on the dark side of the Moon and supply the necessary energy.

Location of our colonies will probably follow one of two patterns. The first of course is money. Can we make a profit in space and then, how much of a profit. I will discuss the vast resources located just in the area of the Earth-Moon system in another section of the paper. But, beyond the consumer elements, are markets that we haven't even conceived of yet. It is a safe assumption to assume the colonies will be located in proximity to the profit making. Scientists argue that we could hollow out a large near Earth asteroid and build a colony in the shell. This would then serve to generate power and serve as a mining factory. Currently, it is believed there are thousands of asteroids in the belt of asteroids just beyond the Moon. It would take decades to extract the resources from those asteroids. It is logical to place colonies in this area. The second type of location for our colonies will be for knowledge or information. Calvin Coolidge once said, "The business of America is business." Certainly we love a dollar, but, we also have an insatiable appetite for knowledge. Just as Turner's pioneers went over the next hill to see what was there so would our space pioneers move to the next rock to see how it was composed. We have technology. We have the vehicles. The logistics of colonization would work themselves out.

MEDICINE IN SPACE

Once we actually get into space, we will be able to pursuer a number of avenues. One of the most promising is medicine. NASA has already made some interesting discoveries and all of them bode well for mankind. Space has something that we on Earth do not: microgravity or lack of gravity. This seems to be the critical difference.

Let us consider the issue of artificial bone implants. There are more than 300,000 hip and knee replacement surgeries annually. Sixty-five percent of hip replacements and seventy-two percent of knee replacements are received by people over the age of 65. Because the United States population is aging, the number of hip fractures is expected to exceed 500,000 annually by the year 2040. The average hospital stay for knee or hip replacement is five days followed by four weeks using a walker. The key is getting the artificial bones to function like the real bones did. Scientists are looking at the materials that are used to construct these artificial bones. One of the most promising compounds is a special ceramic mixture. To understand the significance, you have to look at the structure of real bones. The outside is very hard, but, the inside is very porous. In

experiments, scientists have tried to duplicate the porosity. What they have discovered is that the ceramic material can best duplicate real bone structure when it is formulated and constructed in microgravity. Millions of people will benefit from this process. The experimental ceramics have reduced the number of surgeries to replace the replacement. The making of artificial ceramic bones could become a major space industry.

Thump-thump. Thump-thump. There is nothing more reassuring than the sound of a healthy heart. Gurgles, swishes, and hiccups, on the other hand, are very worrisome. These sounds usually indicate a major problem. Millions of Americans have a heart that is not functioning as it should. Today, heart disease is the single leading cause of death in the United States. Scientists and doctors have been working on this aspect of medicine for a long time. A NASA device which was built to conduct cell studies in space may be the major life saver of all time. The device is called the bioreactor and scientists have used it to grow patches of heart. The exciting news is that the patches have behaved like the real thing. The bioreactor is a chamber that slowly turns. Fluid in the chamber delivers oxygen to cells and then removes cellular waste without vigorously stirring things up. The bioreactor mimics microgravity. Cells free fall gently and slowly connect with other cells to form tissue. These tissues could be used to repair heart defects or to replace damaged tissues. A more immediate use of these tissues is to test new pharmaceuticals. Currently cells are grown in Petri dishes for these tests and the results are not what scientists would like. The ultimate goal of the bioreactor will be to grow entire new tissue systems. Hearts, livers, kidneys, and cartilage could be made from an ill patient's own cells. While these replacements are in the future, getting into space to continue experimenting seems to be a slam dunk.

Along the same lines as the two previous examples is ligament repair and replacement. As any weekend skier or professional athlete will tell you, it is painful. Additionally, being sidelined is no picnic either. An estimated 200,000 ACL surgeries are done annually. The bioreactor can be used to generate new ligaments. Scientists have discovered that they can manipulate the bioreactor to get specific types of tissue. An athlete could donate his or her bone marrow stem cells and have replacement ligaments made and stored. These could be waiting and then used in the event of an injury. Recovery time is reduced radically. You are back on the slopes or the field in record time.

Microgravity became an important factor when NASA studied the production of antibiotics during shuttle missions. What scientists found was that production of antibiotics was enhanced significantly in the absence of gravity. When you consider that the global market fro antibiotics is an annual ten billion dollars, this becomes very interesting. Scientists noted that antibiotic production increased by 200 percent in space. The benefits of such findings could have a widespread application; not only in production, but, in duplicating those conditions on Earth to achieve the same results.

Just for the benefits you have already read going into space to fully develop these ideas and devices would be reason enough. But when you add some impressive ideas in cancer treatment and cure, diabetes treatment and cure, pharmaceutical development, and just

simple surgery, you begin to realize the scope of what could be accomplished in Outer Space. Scientists predict that in the future, your cells will be able to tell you when you are starting to get sick or when the first cells of a tumor begin to grow. NASA is working on just such a project right now. Going into Outer Space will be worth the financial cost just for the medical benefits.

MINING NEAR-EARTH ASTEROIDS

Untold riches can be obtained from Near-Earth asteroids, comets, and other celestial bodies. It staggers the imagination when you realize that Outer Space has everything we need on earth. Vast clouds of water trail comets and could be harvested. Non-solar energy of every kind is rife. Metals and organic compounds could be refined and put to our use quite easily. It is just waiting for mankind. There is enough raw material in the asteroids to support a truly vast population. The asteroid belt contains 825 quintillion tons of iron. That is unimaginable. If we utilized this source we would not have to mine another ounce of iron ore from the earth. Additionally, it is enough iron that every conceivable need of every nation on earth would be satisfied. If you can name a metal, it is found in the asteroids. Nickel is the most abundant after iron. Significant amounts of aluminum are there. Gold, silver, and platinum would be retrieved. In addition to metals, the asteroids contain almost as much silicon and silicates as iron and in each asteroid we would find water and hydrocarbon deposits. Each asteroid would literally be a treasure trove and with an abundance of solar energy, mining would be relatively easy.

One note of interest needs to be inserted at this point. A by-product of mining the asteroids would be soil. Yes, dirt. As human colonies are built, agriculturists or farmers would be a prime factor in the success of those colonies. A great deal of empirical data exists about hydroponics, but, for crops like wheat or corn, hydroponics isn't feasible. You need a field and that means soil. The soil from the asteroids would be a critical part of the mining process.

In the asteroid belt that is just beyond our Moon, scientists estimate there are thousands of asteroids. In fact, these same scientists are convinced that there are more asteroids than they have estimated. In terms of our colonies, this is certainly good news. It is good news for Earth as well. Since our colonies cannot possibly absorb all the materials produce by mining in space, that means the excess can be brought to earth. This would be an economic boon of unprecedented proportions.

SPACE AGRICULTURE

Obviously, space colonies would need to be fed. It would not be practical to be dependent on earth for food sources. Additionally, dependence on earth would raise the cost of food beyond practicality. Instead, colonies will need an agricultural section as an integral part of their society. This is okay. Space would be an incredible venue for agriculture. Think about what they would not have in Outer Space. No weather problems. No insects. No weeds. No energy problems. The purest water known to man is readily available. No pathogens in the soil or air. Space farmers would be able to

regulate the temperature and the amount of sunlight the plants receive. It would truly be a farming paradise. Keep in mind, that just like other aspects of life in Outer Space, a great deal of experimentation has been conducted. Scientists have studied plant cell structure and photosynthesis to determine if plants will be more productive in space. Plant geneticists are trying to breed plants that will be better suited to Outer Space. One such experiment is a bean plant with fewer but larger leaves that will produce more beans per plant. Anything which is grown on Earth can be grown in space. It is absolutely the best of both worlds.

SPACE VEHICLES

As indicated earlier, chemical fueled vehicles are not practical in space. I know this sounds like a contradiction because I have told you about unlimited sources of oxygen and hydrocarbons but it just is not practical because of the way the engines work. Once we get into Outer Space and are living in space, we will be able to build genuine space vehicles.

Two of the most fundamental aspects of exploration are mobility and that true mobility can only be obtained if the resources required to support it can be gotten from the environment being explored. This was the great strength of the sailing ships of our Age of Exploration. Wind was available and very cheap. This same concept will hold true for space. And of course, the most abundant energy source in Outer Space is solar power. Thus, we turn to the solar sail. A vehicle would deploy this device just like our sailing vessels did. It would absorb sunlight and voila, you have movement. Certainly, there is a little more involved; physics and such, but in terms of space technology, it is just like wind power was in the eighteenth century. The only drawback to the solar sail is speed. Vehicles are not going to dash through space like the starship Enterprise. But, slow and steady wins the race and like wind, it is cheap.

If you want a little more muscle, then we might consider nuclear power. It has not been practical up to this point because it would be too difficult overcoming Earth's gravity to get a safe reactor into space. Since everything we need is already in space, we do not have the gravity hurdle. Nuclear power would be safe, affordable, practical, and easily built in microgravity. Nuclear power reactors would work quite for space vehicles.

A third type of relatively inexpensive power in space is the magsail. This is a magnetic sail that basically acts like magnets do on Earth. It is attracted and repelled by electrical charges. Electrical charges exist profusely in Outer Space. The premise is relatively simple. The magsail is attracted or repelled pushing it in the direction you wish to go. Like the solar sail, though, you are not going to be moving at the speed of light.

At this point, the discussion turns to things that are probably everyday for a physicist, but, not clearly understandable for a layman. There are any number of real and theoretical systems for spaceship engines. Everything from impulse power to ion propulsion units could be built. Matter-antimatter engines that are charged by using solar energy to make negatively charged protons would be very practical in Outer Space. The number of

concepts that would work in space is unlimited. The bottom line is we have to be in space in order to truly experiment and build space engines. We can duplicate microgravity to an extent on Earth in order to conduct some tests, but, it is not the real conditions. As long as we are on earth, gravity will be a pesky factor.

SUMMARY

Americans have the technology to move into Outer Space permanently. It may be relatively expensive initially, but, in the long run, it would pay for itself and then some. The investment is no different from other business investments. The adage is: "It takes money to make money." In the case of Outer Space, we are talking about dollar amounts that have not yet been named. That first step should be taken as quickly as possible. A human space colony located between the Earth and the Moon would start the ball rolling. The spin-offs and direct benefits are clearly documented. It is inconceivable that we as a society would not benefit tremendously. Our health would improve. Our pocket books would be fatter. Our sense of adventure would be piqued and this in would awaken a new attitude in America. It is time to cross the river and see what is out there on the Last Frontier.

BIBLIOGRAPHY

Baker, David. Scientific American Inventions for Outer Space: Everyday Uses for NASA Technology. New York: Random House. 2000.

Better Bone Implants. NASA. http://exploration.nasa.gov/articles/300ct_ Hipscience.html. 10-19. 2006

Bijefeld, Marjolin and Robert L. Burke, Jr. It Came From Outer Space: Everyday Products and Ideas From the Space Program. Westport, CT: Greenwood Press. 2003.

Black, William H. A Study of Some of the Economic Benefits to Mankind Resulting from the Investment in NASA Space Research. Maxwell Air Force Base, AL: Air University, 1970.

Chapman, Richard L. et al, An Exploration of Benefits from NASA "Spin Off." Littleton, CO: Chapman Research Group Inc., 1989.

Chapman, Richard L., Loretta C. Lohman, and Marilyn J. Chapman. Aero-Space Spinoffs: Twenty-five years of Technology Transfer. Washington DC: National Aeronautics and Space Administration, Technology Utilization Division. 1988.

Chemical Rocket Transportation. Permanent. http://www.permanent.com/ t-rocket.htm. 10-19-2006.

Colonies in Orbit vs. Colonies on Planetary Surfaces. Permanent. http://www.permanent.com/S-orbit.htm. 10-19-2006.

Crawford, I.A. "Scientific Case for Renewed Human Activities on the Moon." Space Policy. 20:2 (May 2004). 9-12.

Frontier Thesis. Wikipedia. http://en.wikipedia.org/wiki/Frontier.Thesis. 3-22-2007.

Gall, Sarah L. and Joseph T. Pramberger. NASA Spinoffs 30 Year Com-Merative Edition. Washinton DC: National Aeronautics and Space Administration, Technology Transfer Division, 1992.

Growing Your Own Spare Parts. NASA. http://exploration.nasa.gov/articles Aclreplacement.html. 10-19-2006.

Hardersen, Paul S. The Case for Space: Who Benefits from Exploration of The Last Frontier. Shrewsbury, MASS.:ATL Press, 1997.

Javstrat, Niklas: "Lunar Colonization-Why, How and When?" Ad Astra. 14:2 (Mar/Apr 2002). 32-34.

Johns Hopkins University Applied Physics Laboratory. Near Earth Asteroid Rendezvous Mission. Laurel, MD: The Laboratory, 1998.

Kowal, Charles T. Asteroids: Their Nature and Utilization. Chichester, England: E. Horwood; New York, NY. 1988.

Lewis, John S. Comet and Asteroid Impact Hazards on a Populated Earth: Computer Modeling. San Diego, CA: Academy Press, 2000.

Lewis, John S. Mining the Sky. Addison-Wesley Publishing Company, Inc. New York, New York. 1996.

Mining and Processing an Asteroid. Permanent. http://www.permanent. Com/a-mining.htm. 10-19-2006.

Mining the Sky: Untold Riches from the Asteroids, Comets, and Planets. Reading, MA: Addison-Wesley Publishing, 1996.

Monje, O.; G. Stutte; G. Goins; et al. "Farming in Space:Environmental Biophysical Concerns." Advances in Space Research. 31:1 (2003) 151-167.

NASA Spinoffs: Bringing Space Down to Earth. NASA. http://www.the

Spaceplace.com/nasa/spinoffs.html. 3-22-2007.

Outer Space Treaty: Treaty on Principles Governing The Activities of States in the Exploration and Use of Outer Space, Including the Moon And Other Celestial Bodies. United States Department of State, Bureau Of Verification, Compliance, and Implementation. http://www.state.gov/t/ac/trt/5181.html. 3-22-2007.

Patches for a Broken Heart. NASA. http://exploration.nasa.gov/articles/14feb_heart.html. 10-19-2006.

Remo, John L. Near Earth Objects: The United Nations International Conference. New York, New York: New York Academy of Science, 1997.

Schmidt, Stanley and Robert Zubrin. Islands in the Sky. John Wiley & Sons Inc., New York, New York. 1996.

Taylor, Jeffrey and Linda Martel. "Lunar Prospecting." Advances in Space Research. 31:11 (Nov 2003(. 2403-2412.

Transport of Earth, Lunar and Asteroid Materials. Permanent. http:// www. Permanent.com/t-overview.htm. 10-19-2006.

Utilization of Asteroids Near Earth. Permanent. http://www.permanent.com/a-overvw.htm. 10-19-2006.

Zubrin, Robert. "North to Mars>" Scientific American. 284:6 (2001) 66-70.

DEFINITIONS

Exploration: (noun) an act or instance of exploring or investigating, Examination. 2. the investigation of unknown regions. Random House Unabridged Dictionary, 2006.

Exploration: (noun) the act or instance of exploring. The American Heritage Dictionary of the English Language, Fourth Edition. 2006.

Exploration: (noun) 1. to travel for the purpose of discovery 2. a careful Systematic search. Word Net 3.0, Princeton University. 2006.

Outer Space: (noun) space beyond the atmosphere of earth. Random House Unabridged Dictionary, Random House Inc. 2006

Outer Space: (noun) the region of space immediately beyond Earth's Atmosphere. American Heritage Dictionary of the English Language, Fourth Edition, Houghton-Mifflin Company. 2006.

Outer Space: (noun) any location outside the Earth's atmosphere. Wordnet 3.0, Princeton University. 2006

Outer Space: space beyond the atmosphere of the Earth. Webster's New World Dictionary of the American Language, Prentice-Hall. 1976.

Space: (noun) the region beyond the Earth's atmosphere or beyond the Solar system. http://www.m-w.com/. 2007

Space: (noun) 1. the expanse in which the solar system, stars, and galaxies Exist, the universe. 2. the region of this expanse beyond the Earth's Atmosphere. http://www.yourdictionary.com/ahd/s/s0595800.html. 2007.

Space: (Astronomy): 1. specifically, the part of the universe lying outside The limits of the earth's atmosphere. 2. more generally, the volume in Which all celestial bodies, including the earth, move. McGraw-Hill Dictionary of Scientific and Technical Terms. 2007.

RESOLUTIONS

Resolved: the United States federal government should significantly
Increase non-military exploration and development of Outer Space.

Resolved: the United State federal government should significantly
Increase medical development in Outer Space.

Resolved: the United States federal government should significantly
Increase development of energy resources in Outer Space.

Resolved: the United States federal government should establish a
Program to increase non-military colonization of Outer Space.

Resolved: the United States federal government should establish a
Lunar colony.

Timeliness: Space is a topic which will remain current throughout the debate year. With the recent announcement of the goal to return to the Moon and the potential discovery of another Class M planet, even more interest will be generated. The proliferation of space programs on Earth will serve to increase interest in this topic as well. Space is absolutely current and will not become stale in the course of the year.

Scope: Students will discover a broad scope with this topic. They will see how space has already impacted our everyday lives and then they will discover future impacts. Space is cutting edge Science and Technology and when students look at this from the other direction, it will cause even more excitement. The non-military aspects are more than sufficient to sustain the topic and will provide many case ideas.

Range: While the topic may sound like rocket science, it has appeal to both novice and veteran debaters. A novice team will be able to develop an affirmative case and negative arguments quite easily. Experienced debaters will have a rich area to draw from and will be able to run more complex arguments on both sides of the debate.

Quality: This will be an incredible topic in terms of students relating to their other classes. The history of the space program is certainly interesting. They will see direct relationships to Math and Science. This topic will allow students to research and develop cases that genuinely interest them. This will be true of affirmative and negative. Because of the scope of this topic, students will be able to move into new areas throughout the year. This will be a very educational topic for many students.

Material: Most libraries will have an extensive collection of material related to this topic. The internet could be used exclusively to obtain research information. Virtually every search engine will yield vast amounts of material. Additionally, this is a current topic and information will be available from newspapers and magazines. There are very specific websites devoted to different aspects of this topic. These can provide information as well as links to other sources.

Interest: Everyone involved in debate will remain interested in this topic. Judges, coaches, and the debaters will be amazed at how diverse the topic will be and because it will remain fresh, they will continue to listen and to work. During the year, new concepts and ideas will come forth. The enthusiasm of the debaters will be noticeable.

Balance: Both sides of the debate will have equal opportunity. The affirmative will be able to demonstrate a number of advantages to being in Outer Space. Some of these advantages will be medical in nature and will hit very close to home. The negative will have the politics of space and the cost of the space program, both of which provide solid ground. Specific disadvantages and kritiks can be prepared as well.

Affirmative cases: Affirmative teams will literally be able to pick and choose on this topic. Each case will have very distinct advantages. Case areas will include a broad range of medical issues. Some of these are: bone replacement surgery, heart repair, tissue repair, kidney repair, general surgical options, microtechnological medicine, diabetes treatment, and cancer treatment and cure. Microgravity will provide cases dealing with space manufacturing and development of pharmaceuticals. Development of energy sources and mining of asteroids are two very interesting areas to explore. The colonization of space to establish a permanent human presence in Outer Space is a very interesting case idea. Water harvesting and space agriculture have a number of potential topics in them.

Negative: The stock issues can always be developed. Topicality will be an issue. Significance may be run on cases that do not provide a real advantage. Because there is a great deal of activity about space, inherency may be a very good argument. Solvency will certainly be debated, especially when the Negative can demonstrate issues are theoretical and not empirical. There will be plenty of ground for disadvantages. Cost, ownership, national security, taxation, governmental efficiency, business competition, and trade wars are some that can be written. Kritiks can be developed that focus on man-in-space fears; Technology transfer, the military, and power structures. A strong kritik might center on the idea that a permanent presence in space destroys the earth from an ecological standpoint. You could probably even run feminism. Counterplans would focus on the United Nations as an agent of action, on privatization of space development, and on non-government organizations as agents of action.

ADDENDUM

Upon receiving the review of the paper, I would like to address some of the areas brought up.

1. Current International Space Treaties

I discussed the 1967 United Nations Treaty in the text of the paper. It is still the most substantial document regarding Outer Space. Below is an excerpt from a document entitled; "The Outer Space Treat at Thirty-Five."

The current international legal regime on outer space rests on five treaties. Among them are the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including Other Celestial Bodes (the Outer Space Treaty of 1967—this is the treaty I referenced in the text of the paper), the Agreement Governing the Activities of States on the Moon and other Celestial Bodies (Moon Treaty of 1979), the 1972 Convention on International Liability for Damage Caused by Space Objects and the 1975 Convention on Registration of Objects Launched into Outer Space. Each of these treaties underlines the notion that the domain of outer space, the activities carried out therein and whatever benefit might accrue there from should be devoted to enhancing the well-being of all countries and humankind, and each includes elements elaborating the idea of promoting international cooperation in outer space activities.

As you can see, the intent is to development Outer Space for the benefit of all mankind and based on the 1967 Treaty, to do so without resorting to using the military. There are not that many treaties on Outer Space, but the ones that do exist, are very specific in their intent.

2. What role does privatization play in this topic?

This is a very interesting part of the topic in terms of negative ground. NASA is a governmental agency with definite military ties. One of the alternatives to be explored is allowing private enterprises to take over the role of developing Outer Space. Free enterprise is a focus of this concept and could involve economic rights or individual rights as part of the argument. I thin privatization is excellent negative ground and offers a number of areas to develop. This will expand the negative ground for the topic.

3. Does this topic require research/development done in outer space or may affirmatives have cases which only involve earth-based studies?

Definitely, the best results are going to come from space bound work. I discussed a number of medical possibilities in the paper. Common to all of them is a zero gravity atmosphere. We can experiment in a very limited way on earth, and with shuttle launches, but, the real results come from having a facility in Outer Space that allows the real cures and practices to be exercised. I discuss bone replacement in the paper. We

have limited research and the results have been astounding. The gist is that artificial bone manufacturing can only be done effectively in a facility in Outer Space. This is true of the bioreactor, curing the various diseases (one I did not address in the paper, but, which has come up in subsequent research is AIDS. People with AIDS can survive in Outer Space.) Mining of the asteroid belt will best occur in the vicinity of the asteroids. Space agriculture is a whole area that holds some very exciting promise. We can only discover the possibilities in a facility in space. We have been using spin-off technology on earth. The real advances must occur in Outer Space.

Because we have not gone into space permanently, we are using earthbound theories and study. Right now, that is all we have. But, this topic is asking the affirmatives to go into space and demonstrate the advantages of doing so.

4. What are the definitions of development?

a. The American Heritage Dictionary. http;//www.ask.com
Development (noun): a significant event, occurrence, or change.

b. Dictionary.com. http://www.dictionary.reference.com
Development (noun): 1. the act or process of developing, growth, or progress. 2. a significant consequence or event.

c. WordNet.
Development (noun): 1. act of improving by expanding or enlarging or refining. 2. a process in which something passes by degrees to a different stage.

5. Several issues about negative ground?

As I indicated in the NFHS section of the paper, the negative has a large amount of ground. Just because something sounds astounding and great, does it impact a significant number of people. We will always be able to debate the Stock Issues on this topic. Affirmatives will still have to have solvency. I noted a number of disadvantage positions as well. While money for the space program is certainly a negative issue for some, it is not the only issue. As I indicated earlier, privatization is a very interesting negative position with a number of possible arguments. I think this topic has enough negative ground to balance the affirmative options. For those folks who use them, kritiks are an option.

I think when teams and coaches begin to research this topic, they are going to find the negative ground very interesting. Not to go to far into Star Trek, there has always been the issue of our astronauts bringing back something that we cannot beat. There are other issues about space travel health and exposure as well.

6. Most of the remainder of the issues were about the resolutions.

a. I do love a large affirmative topic. I wrote the first resolution with this in mind, but, as I have indicated above, the negative seems as large. I like the first resolution because of the possibility it holds.

b. The reviewer noted that the remaining resolutions were fairly narrow. I was attempting to give the readers some options if the first resolution seemed too large. But, before you conclude that resolution two and three are small, please do some research. They are larger than you might think.

c. The reviewer suggested a resolution with a laundry list. I am not a laundry list type of guy, but, for those who are:

Resolved: the United States federal government should significantly increase its use of outer space resources in one or more of the following areas: medicine, energy, mining, agriculture.