# A Vision for Space

James H. Hughes
*Englewood, Colorado*

New initiatives are needed by the U.S to maintain a strong space program, inclouding the develop of the moon. This program will help the U.S. to build a missile defense system in space.

**Key Words:** Ballistic missile defense, Brilliant Pebbles, Space Based Laser, space transportation, heavy lift booster, the moon, water on the moon.

Our vision for space has changed since Wernher von Braun led the space program and Apollo moonshot.[1] The growth of computers, development of sophisticated infrared, radar, and optical sensors, and innovative use of satellite networks have created new roles for space, especially in telecommunications. But one essential element is missing: the pioneer with the vision, passion, and understanding to develop space.

On July 20, 1969, Neil Armstrong stepped on the moon's surface. But since then, more than 25 years ago, man has yet to return to the moon. In spite of the discovery of water on the moon,

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[1] For him [von Braun], the journey to the Moon would not be an end in itself; rather, it would represent but one chapter in the exciting story of man's space-faring adventures. Unmanned satellites, manned satellites, Earth-to-orbit shuttles, voyages to the Moon, voyages to Mars - it was the beginning of man's reach into space, the transition from *Homo terrestris* to *Homo spatialis*. Operations in Earth orbit, such as rendezvous maneuvers, transfer of propellants, assembly of space vehicles, and also spacecraft modifications and repair, particularly rescue operations, should be developed. For von Braun, each space flight project was part of an organism that grew and evolved almost like a living system. "Let's not consider the journey to the Moon as a 'Kilroy was here' affair, "he would say to his co-workers. "This project will be a milestone in man's space flight enterprise. Each future project will directly benefit from it."

The Earth orbit rendezvous mode would provide an ideal opportunity, almost without extra cost, to develop Earth orbit operational capabilities. They would at first serve the Moon landing project, and then, for all the future, they would be available as proven technologies for many other projects, including space station support, refueling of spacecraft, deep space mission staging functions, maintenance of scientific and commercial platforms, repair and rescue operations, and assembly of manned space vehicles for Mars expeditions. Ernst Stuhlinger, Frederick I. Ordway III, Wernher von Braun *Crusader for Space*, Krieger Publishing Company, 1996, p. 173.

greatly simplifying the development and operation of a manned lunar base, the United States has yet to send a man back to the moon.[2]

We need a vision for space with new horizons, including man in space. A vision for space will help the United States keep ahead of Russia, China, Europe, Japan, and India, who are actively challenging American leadership.[3] A vision for space can lead to a surge of technological and scientific progress, benefiting the U.S. economy and military with long-term improvements in basic technological infrastructure.

A vision for space will develop manned bases on the moon.[4] A vision for space will build various two-stage reusable rocket and Single Stage To Orbit designs to dramatically cut the cost of space launches.[5] The economic and military implications of a Single Stage To Orbit (or two-stage reusable rocket) - lower launch costs - are enormous. It will open wide the door to space.

A vision for space would exploit the technological advantages

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[2] In January 1994, the SDI spacecraft, dubbed Clementine (after the miner's daughter), was sent hurtling to the Moon. Examining the radar reflections from the Moon's south pole, Nozette's team announced that the results were consistent with ice.
Lunar Prospector was launched in January 1998. By March, the mission's principal investigator, Dr. Alan Binder, was ready to announce results. According to Binder and his team, Lunar Prospector's neutron spectrometer had detected water, in concentrations of about 0.5 percent in both of the Moon's polar regions. Robert Zubrin, *Entering Space*, Penguin Putnam, 1999, pp. 92-93.

[3] Today's competitive international space launch environment was anticipated nearly a decade ago: Martha Cosgriff, "The Russian/Chinese Commercial Space Challenge," *The Journal of Practical Applications in Space*, Spring 1993, Vol. 4 No. 3, pp. 211-222.

[4] Lisa Bell, Curt Bilby, John W. Boyd, George Davis, David Korsmeyer, Hans Mark, Todd McCusker, Brendan O'Connor and Elfego Pinon, Andrew Frizzell, and Harlan J. Smith, "The Human Exploration of the Solar System," 42nd Congress of the International Astronautical Federation, October 5-11, 1991.

Lockheed, among other companies, including RAND, did at least twenty-one separate lunar base studies and proposals between 1961 and 1963. Martin J. Collins and Sylvia K. Kraemer, William E. Burrows, *Space Discovery and Exploration*, Hugh Lauter Levin Associates, Inc. 1993, p. 140.

[5] But these space launch vehicles - the only ones used thus far for space operations - were designed and built with old technology based on obsolete ways of thinking. They were and are nothing more than ammunition.... As space visionary Arthur C. Clarke observed more than a quarter of a century ago, operating expendable space transportation vehicles is equivalent to building the ocean liner H.M.S. Queen Elizabeth, sailing it once across the ocean, and scuttling it upon arrival at its first port of call. The basic economics of such an operation mean it's extremely expensive to book passage or ship cargo on such a one-use vessel. G. Harry Stine, *Halfway to Anywhere*, M. Evans and Company, 1996, p. 17.

of deploying ballistic missile defenses in space to meet the growing threat of intermediate and long range ballistic missiles. In March 1999, the House and Senate, recognizing the growing threat of long range ballistic missiles, voted overwhelmingly for deploying a national missile defense.[6]

**Strategy for Space**

There is an essential link between space programs and defense.[7] The German V-2 rocket spawned the American and Russian ballistic missile and space programs. The linkage between space and defense extends to the deployment of ballistic missile defenses in space.

There are inherent advantages to deploying ballistic missile defenses in space: automated operation; continuous, global coverage; higher position compared to ground based defenses or a boosting rocket; long lines of sight especially for high energy lasers; and a boost phase defense capability, which ground-based defenses lack.

A strong space program will deploy ballistic missile defenses in space to control space.[8] A strong space program will also result in spin-offs assisting the deployment of ballistic missile defenses. Improved space launch capabilities such as a heavy lift booster, and faster turnaround at spaceports are key ingredients for a strong space program and the deployment of ballistic missile defenses in space.

A strong space program will require the means to defend itself, lending itself to develop ways to control space, including the destruction of satellites and rocket boosters. The ability to control

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[6] On March 17, 1999 the Senate voted 97-3 for S. 257 to declare it is the "Policy of the United States to deploy as soon as technologically possible an effective National Missile Defense capable of defending the United States against limited ballistic missile attacks (whether accidental, unauthorized, or deliberate)." One day later, on March 18, 1999, the House of Representatives voted 317-105 for H.R. 4 to declare "That it is the policy of the United States to deploy a national missile defense."

[7] When the V-2 made its first successful test launch on October 3, 1942, the commander of the German rocket facility at Peenemünde Walter Dornberger exclaimed, "Today the spaceship has been born!" Ernst Stuhlinger and Frederick 1. Ordway III, Wernher von Braun, *Crusader for Space*, combined edition, Krieger Publishing Company, 1996, p. 29.

[8] It is this requirement for a total national space effort incorporating an innovative new strategy posture that Project High Frontier has identified as a national necessity. The U.S. should learn this lesson before it is doomed to repeat that earlier pattern of failure. Lt. Gen. Daniel 0. Graham, USA (Ret.), *High Frontier Supplemental Report*, High Frontier, 1983, p. 6.

space, essential for a strong space program, will also provide means for intercepting long range ballistic missiles.

The current administration, adverse to deploying ballistic missile defenses in space, is also critical of developing the means to control space. John Hamre, an administration spokesman, is emphatic about not developing ways to control space by intercepting rocket boosters or destroying satellites, seeking instead "soft" solutions, relying on the disruption of satellite communication links.[9]

But Hamre's understanding of space will be prove to be inadequate, unable to cope with self-guided rockets or programmed attack satellites. Robotic satellites or manned space vehicles can operate without satellite communication links.[10] There is more to denying an opponent space than disrupting satellite communication links.

We need vision for space. The Air Force's "Doable" Space plan contains no major initiatives. It advocates primarily the exploitation of commercial space, instead of creating new technologies and initiatives.[11]

While NASA administrator Dan Goldin has worked wonders using spin offs from *Brilliant Pebbles* technology in his program for faster, cheaper, better space probes, neither NASA nor the Air Force have built a heavy lift booster, space transportation system, or even manned lunar bases, a very realistic and exciting prospect given the discovery of water on the moon.[12]

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[9] March 22, 1999 Testimony of John Hamre before the Senate Subcommittee on Strategic Forces, Peterson Air Force Base, Colorado Springs. William B. Scott, "U.S. Adopts 'Tactical' Space Control Policy," *Aviation Week & Space Technology*, March 29, 1999, p. 35.

[10] The Defense Advanced Research Projects Agency has begun and effort aimed at demonstrating in orbit that a satellite can be repaired and refueled by an autonomous, space-based robot.... Robert Wall, "Darpa To Demonstrate New Satellite Concept," *Aviation Week & Space Technology*, December 6, 1999, pp. 30-31.

[11] John T. Correll, "A Roadmap for Space," *AIR FORCE Magazine*, March 1999, pp. 20-25.

[12] The current launch vehicles (Atlas, Titan, Delta) are based on technology that is now thirty years old and should be replaced by more efficient and economical vehicles. New unmanned launch vehicles based on the Shuttle technology using solid rocket boosters and the Shuttle's main engine system should be developed. The solid rocket booster is itself an excellent rocket with sea level thrust of the order of 1.5 M lbs. Several solid rocket boosters strapped together could provide a formidable launch vehicle in terms of payload capacities.

New initiatives can open wide the door to space. A strong space program can help the U.S. quickly build and deploy ballistic missile defenses in space. A grand strategy would link a strong space program with the deployment of ballistic missile defenses in space.

## Space Based Defenses

An effective ballistic missile defense must deploy defenses in space. As early as the late 1950s, researchers realized the importance of using space as a global theater to defeat long range ballistic missiles.[13] Project Argus proposed a space-based defense using high

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Such a vehicle with three solid rocket boosters could put into low earth orbit a payload weighing something like 100,000 lbs. and perhaps up to 20,000 lbs. into geosynchronous orbit with an appropriate upper stage. An important feature of the solid rocket booster is that they are recoverable which means that the cost advantages inherent in that property could be important. This new generation of launch vehicles would not be "expendable" although it would be unmanned. Hans Mark and Milton Silveira, "Notes on Long Range Planning," *NASA*, August 1981, Appendix 4, p. 239.

The U.S. lacks enough booster rockets to orbit a space-based defense system. To develop a low-cost launch vehicle, the Defense Department organized a joint program with NASA and the Air Force. The result is the Advanced Launch System (ALS), a program exploring designs for a heavy-lift booster rocket capable of lifting into orbit a payload in excess of 100,000 lbs. James A. Abrahamson, *Critical Issues: SDI At The Turning Point: Readying Strategic Defenses for the 1990s and Beyond.*, edited by Kim R. Holmes and Baker Spring, The Heritage Foundation, 1990, p. 64.

The *Air Force Magazine*'s 1999 *Space Almanac*, August 1999, pp. 26- 53, lists the payload launch capacities of the current rocket boosters. A heavy booster for Space Based Lasers will not necessarily need to be as large as the Saturn V. Studies have been done illustrating that a medium size Space Based Laser would weigh around 78,000 pounds, requiring a booster with a launch capability between a Titan IVB and Saturn V.

In addition to payload weight, the payload container of the heavy lift booster should be capable of carrying a payload with a diameter of 8.4 meters or greater to accommodate the main mirror of a Space Based Laser (current plans for Space Based Lasers anticipate a main mirror 8 meters in diameter).

[13] Hans Mark, current director of Research and Engineering at the Pentagon, discusses in his 1992 Theodor von Karman Lecture the importance to Project Argus of global coverage derived from deployment in space:

As early as 1957, there were people who began to look at the missile defense problem from a different viewpoint. One of these was Dr. Nicholas C. Christofilos of the University of California's Lawrence Livermore National Laboratory. Christofilos felt very strongly that some kind of a "global" solution to the problem had to be found. He believed that "point defense" systems that could be evolved from anti-aircraft artillery would not be effective in protecting whole populations from missiles that could be launched from anywhere in the world.... He reasoned that placing enough energetic charged particles into

energy particles.[14] BAMBI proposed using interceptors deployed in space to attack ballistic missiles in their boost phase.[15] President Reagan's Strategic Defense Initiative relied heavily on space-based defenses for its basic architecture.[16]

The current administration opposes using space for missile defense. Along with its opposition to using space for defense, the current administration's space program (except for space probes) is based on work developed from the 1970s and 1980s - the Space Shuffle and International Space Station. It is time for new initiatives in space.

We can use space to deploy ballistic missile defenses and undertake new initiatives, especially developing the moon as an economic resource, taking advantage of the discovery of water at the lunar poles. The deployment of ballistic missile defenses in space would be a subset of a broad initiative for space.

Our future lies in space. Former Space Commander Howell Estes III called space an emerging center of gravity equal in importance to the oil of the Persian Gulf, if not more important.[17]

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trapped orbits in the geomagnetic field would create a radiation field strong enough to damage the guidance and control electronics of nuclear warheads passing through that radiation field.

The idea proposed by Christofilos was deemed important enough to warrant an experiment. Plans were made to detonate three small nuclear devices (in the 2 kiloton yield range) above the atmosphere and then to make measurements of the resulting trapped charged particles.... The whole effort was code named "Project Argus."

As things turned out, however, there was a relatively easy countermeasure that could be employed to defeat energetic charged particles trapped in the geomagnetic field.... Progress in hardening electronics was so rapid that the whole Argus idea was quickly abandoned. Nevertheless, the Argus experiment was important because it was, indeed, the first effort to create a global defense system against ballistic missiles. Hans Mark, "Defense Against Ballistic Missiles," 1992 *Theodore von Karman Lecture*, American Institute for Aeronautics and Astronautics, p. 2.

[14] Op. Cit.

[15] Lt. Gen. Daniel O. Graham, USA (Ret.), *High Frontier Supplemental Report* High Frontier, 1983, p. 9.

[16] James A. Abrahamson, *Critical Issues: SDI At The Turning Point: Readying Strategic Defenses for the 1990s and Beyond*, edited by Kim R. Holmes and Baker Spring, The Heritage Foundation, 1990, pp. 57-75.

[17] "... space is emerging as "an economic center of gravity for our country..." Ofto Kreisher, "The Move into Space," *AIR FORCE Magazine*, April 1999, pp. 75-77 [quoting General Estes]. At other times Estes has used the Persian Gulf analogy of space as an economic center of gravity.

If the U.S. does not take the lead in space, others will.

**Ballistic Missile Defense**

Space is the logical location to deploy ballistic missile defenses. From space, a ballistic missile defense looks down on a boosting rocket. A space-based missile defense will also have global coverage. It will be available at all times. Ground-based interceptors take longer to move into position.

Ballistic missile defenses in space can provide a boost phase defense capability with global coverage. High-energy lasers in space would take advantage of the long lines of sight and lack of atmospheric interference in space, and provide a boost phase defense. Space Based Interceptors could also provide a boost phase defense capability, and mid course defense. Other boost phase defenses such as the AirBorne Laser, Raptor Talon, or Navy Theater Wide (Navy Upper Tier) depend on special circumstances, or would be local in coverage.[18]

We need a vision for space that will deploy ballistic missile defenses in space. During the late 1980s and early 1990s, President Reagan's Strategic Defense Initiative developed small, sophisticated Space Based Interceptors capable of detecting and intercepting a ballistic missile in its boost or midcourse phases.

The Strategic Defense Initiative also developed high-energy lasers to where they could be built in a ten-year program, given adequate funding, and streamlined acquisition procedures. While the deployment of Space Based Lasers would require a heavy lift booster, we have long needed a heavy lift booster.[19]

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[18] The AirBorne Laser (ABL) is to equip a Boeing 747 with a high energy chemical oxygen-iodine laser. It would have a range of several hundred miles. Raptor Talon was a program equipping a UAV (ultra-lightweight aerial vehicle) with a miniature interceptor for theater missile defense. Navy Theater Wide is a program for equipping Aegis cruisers with modified Standard interceptors capable of intercepting ballistic missiles outside the earth's atmosphere. The ABL is for boost phase defense. Raptor Talon was also for boost phase defense. Navy Theater Wide could be used for boost phase defense in only special circumstances.

[19] I have advocated the development of a heavy lift booster since 1981 when I was serving as Deputy Administrator of NASA in the Reagan Administration. What I wanted to do was to use shuttle technology. I am enclosing a copy of a short paper that I co-authored with Dr. Milton A. Silveira in which this suggestion was made. This paper was published in August 1981. I am sorry that nothing has been done about this matter. Hans

**Ballistic Missile Defense Program**

To deploy an effective national missile defense, the U.S. needs to:

1. Deploy primarily space-based defenses. Sea-based defenses such as Navy Theater Wide (Navy Upper Tier), and other defenses can supplement space-based defenses.

   Space-based defenses could include Space Based Interceptors like Brilliant Pebbles; high-energy chemical Space Based Lasers; space-based sensors such as SBIRS-High and Low, and other defenses.

   Compared to ground or air-based defense, space-based defenses offer inherent advantages of automated, continuous, and global coverage. Automated operation, using satellites directed by a ground control command, would reduce operational costs by minimizing personnel. Space-based defenses provide coverage continuously, 24 hours a day. In addition, space-based defenses can provide coverage against ballistic missiles launched anywhere on the globe.

   Space-based defenses provide multiple opportunities for intercepting a ballistic missile during its midcourse phase or boost phase. A characteristic of an effective defense is having multiple opportunities for intercepting a ballistic missiles. Space-based defenses have that characteristic. Defensive satellites will cross within range of a missile's trajectory. Finally, space-based defenses can provide a boost phase defense capability. A boost phase defense can intercept a ballistic missile before it releases any decoys, multiple warheads, or clustered submunitions;

2. Fund Space Based Lasers with about $1 billion to test a prototype in space: followed by larger appropriations to build and deploy Space Based Lasers (SBLs) in sufficient number to provide coverage of at least two SBLs over key areas of the globe. A program for a strong SBL defense could cost $25-30

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Mark, letter to Congressman Bob Schaffer, March 2, 1999, p. 2.

billion over a 10-year period;[20]

Space Based Lasers can provide an effective boost phase defense, capable of meeting massed, simultaneous ballistic missile launches better than any other near-term defense. Furthermore, Space Based Lasers can interactively discriminate warheads from decoys and other debris, providing critical target information to other parts of an integrated midcourse ballistic missile defense, supplementing sensors such as SBIRS-Low;

3. Restart the Space Based Interceptors program (Brilliant Pebbles), which the current administration cancelled in 1993. This program may cost about $10-12 billion, using streamlined acquisition procedures. Funding at this level could produce more than a 1,000 Space Based Interceptors, depending on how the U.S. handles 10-year life cycle replacement costs.[21] A crash program could result in deployments in as little as three years;[22]

Before the current administration cancelled Brilliant Pebbles, the Defense Acquisition Board had approved Brilliant Pebbles

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[20] With streamlined management and full funding, a space-based laser system involving 12 space-based lasers could be built in about 10 years and operated for another ten years for about $15 billion to $18 billion. The Heritage Foundation's Commission on Missile Defense (chaired by Ambassador Henry F. Cooper), Defending America: A Plan to Meet the Urgent Missile Threat, The Heritage Foundation, March 1999, p. 39.

The schedule for a subsequent operational deployment would be determined by the funding profile considered realistic, based on the state of threat evolution at the time. Deployment of twelve operational systems [Space Based Lasers] could be accomplished within 6-10 years after the flight demonstration and would cost approximately $15B (FY95$). Letter to Senator Strom Thurmond, dated March 15, 1995, signed by Vance D. Coffman, President of Space & Strategic Missiles Sector, Lockheed Martin; Timothy W. Hanneman, Executive Vice President, Space & Electronics Group, TRW; and Edward T. Gerry, President, W.J. Schafer Associates, Inc.

The figure of $25-30 billion is instead of $15-18 billion to roughly double,the number of Space Based Lasers to provide a stronger defense.

[21] If the *Brilliant Pebbles* program were reinstated under streamlined management and with full funding, deployment could begin within five years for an investment of $4 billion to $5 billion. The total acquisition cost for deploying and maintaining a constellation of 1,000 space-based interceptors for 10 years after deployment would be between $12 billion and $15 billion. Ibid, p. 39.

[22] Caspar Weinberger & Peter Schweizer, *The Next War*, Regnery Publishing, 1996, pp. 264-265. Weinberger (former Secretary of Defense) uses two years. One year was added for conservatism: the program must be rebuilt.

for moving into acquisition. Space Based Interceptors such as Brilliant Pebbles can provide multiple opportunities for intercepting a ballistic missile during its boost and midcourse phases. The U.S. has the technology for building Space Based Interceptors.

The U.S. needs a strong and effective defense against long range ballistic missiles. The qualities of global coverage, continuous, automated operation, and a boost phase defense capability, inherent in space-based defenses, require the deployment of ballistic missile defenses in space.

**Space Transportation**

There is a close connection between the development of a frontier and the development of a transportation system to open that frontier. The opening of North America came with the development of navigation for traveling over broad expanses of ocean. The development of transportation and communication links – postal service, roads, canals, and wagon trails, were instrumental in opening the early American frontier. American economic and territorial expansion grew with the telegraph, railroad, and Panama Canal; and, more recently, the interstate highway system.

Likewise, the development of a space transportation system will open up the frontier of space. A space transportation system will include simplified, low-cost space launch capabilities. It will include building space stations for linking interplanetary space travel with low earth orbit access. It will include developing the moon as a base for interplanetary space flight. It will include developing new rockets for use in space, including ion propulsion and a nuclear rocket.

An investment into a space transportation system will provide long term economic and defense benefits enhancing U.S. control of space. It will open the door to the solar system.

**Heavy Lift Booster**

While the United States is experiencing a surge of small companies developing rapid, low cost transportation into space, this has come about in spite of its official space program, reflecting a revolution against the current system using ballistic missiles as throw-away rockets.

In contrast to this surge in developing low cost transportation into space, the United States has lacked a heavy lift booster since Apollo. There have been many excuses for the lack of development of a heavy lift booster. The U.S. has been reluctant to return to the moon, it has been reluctant to launch large defense payloads, it has been reluctant to rapidly build manned space stations.

The development of a heavy lift booster could be done quickly using current technology. It need not cost much, perhaps $1-2 billion.[23] A heavy lift booster would be invaluable for launching:

1. High-energy, chemical Space Based Lasers;
2. Other directed energy weapons, and neutral particle beams;
3. Components for space stations, and manned lunar expeditions;
4. Components for a nuclear rocket.

To restart the space program and deploy ballistic missile defenses in space, the United States would be well advised to build a heavy lift booster. The U.S. should bring to completion two independent designs to ensure the availability and success of a heavy lift booster program.

Along with the development of a heavy lift booster, the United States should build new missile launch range. While steps can be taken to expand and update launch facilities at Cape Canaveral and Vandenberg, the commercial, military, and NASA space launch schedule is already pushing the limits of the existing space launch facilities.The U.S. also needs to build another spaceport.

**The Moon**

The Moon has been described as a "tank farm.[24] It can become

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[23] Cost figures for a heavy lift booster can be found in "Summary - Space Based Lasers, Status - Capability, Schedules - Costs," 1995, p. 9. SBL attachments to the March 15, 1995 letter to Senator Strom Thurmond from Vance D. Coffman, President, Space & Strategic Missiles Sector, Lockheed Martin; Edward T. Gerry, President, W. J. Schafer Associates, Inc.; Timothy W. Hanneman, Executive Vice President, Space & Electronics Group, TRW.

[24] The lunar mantle contains all essential elements for the full range of manufacturing and construction on a grand scale, plus so much oxygen that some call the moon "a tank farm in space." Smelters could rely less on costly chemical treatments, because heat alone would remove most impurities from many ores in that environment. Waterless cement, specialty alloys, exotic composites (such as glass/metal mixtures stronger than steel, yet as transparent as crystal), powder metallurgy, cold welding, free-fall casting, and

a resource base, a laboratory and manufacturing plant.[25] It is an engine and resource for providing economic inputs to developed economies. With its gravity only 1/6 of the earth's, the moon will be a natural exporter to the developed economies on the earth, or to space stations in Low or Medium Earth Orbit.

The discovery of water on the moon has given a new impetus for its development. The discovery of ice on the moon, at its north and south poles, greatly simplifies its development. Permanent, manned bases can be built on the moon, and the moon can serve as a fueling point for interplanetary spaceflights.[26]

The significance of water on the moon is manifold. It will simplify the provisioning of a manned lunar base. It will enable the manned exploration of the solar system at greatly reduced cost by enabling a lunar base, using solar energy, to break water into hydrogen and oxygen for rockets. It will lead to the mining of other lunar resources, increasing the economic effectiveness of a lunar development program.

The economic development of the moon can serve several purposes. It can start an independent lunar economy. It can develop a transportation base for interplanetary space exploration and development. It can reinforce assets in earth orbit.

In conjunction with the economic development of the moon for refueling, the U.S. can establish active, manned observatories for astronomical and geophysical research. It could develop a lunar mining, processing, and manufacturing economy to promote its role for interplanetary transportation, and other economic uses, including

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superconductors represent a few among many processes and products that plants in space could facilitate. "Sanitation engineers" could dispatch inconvertible waste on trajectories that collide with the sun or disappear into deep space. John M. Collins, *Military Space Forces*, Pergamon-Brassey's, 1989, p. 43.

[25] Haym Benaroya, "Lunar Industrialization," *The Journal of Practical Applications in Space*, Fall 1994, Vol. 6, No. 1, pp. 85-94.

[26] The entire economics of space-flight would alter drastically if it became possible to refuel on the Moon. This may seem a fantastic assumption, and clearly it would not be practical until a lunar colony, with considerable plant and equipment, had been established. But if spaceflight is to be of any value it will lead exactly to this sort of thing. One of the first aims of such a colony would be, in fact, to search for material which might provide rocket fuel. Arthur C. Clarke, *The Exploration of Space*, Fawcett Premier, 1967 [reprinted, copyright 1951 ], pp. 81-82.

the mining of Helium-3 for fusion energy.[27]

**International Relations**

A strong program for space will recognize and encourage the ownership of private property in space. But the U.S. space program suffers from excessive "internationalization," keeping it from using space for defense purposes and opening space to private development. Under the current regime, the development of the moon with private property rights would be considered practically impossible. Yet it will be these private property rights that will create economic incentives for a long-lasting economic boom derived from the development of space.

A program for new initiatives for space will need to defend private property rights in space, including the ownership of interplanetary bodies.[28] If the U.S. is to develop space, there must be ownership and opportunity for developing those assets. Otherwise, an "international" context could eventually lead to countries such as Russia and China taking ownership.

**The Race for Space**

The U.S. must build a vision for space. It is no secret that Russia has long aspired to dominate the world in space. China's successful unmanned test flight of a manned spacecraft - and the uprated booster to carry it - show the Chinese space program has reached a new level of maturity for the design, integration and fabrication of more advanced space systems for both military and civil applications.

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[27] The Moon also possesses scarce, but in principle obtainable, supplies of helium-3, an isotope otherwise naturally nonexistent in the inner solar system. Helium-3 offers a number of potentially important advantages as a fuel for thermonuclear fusion reactors, and thus perhaps could provide a future lunar colony with a cash export commodity. Robert Zubrin, *Entering Space*, Penguin Putnam, 1999, p. 80.

David G. Stephenson, "There's Gold in Them Thar' Lunar Highlands!," The Journal of Practical Applications in Space, Winter 1993, Vol. 4, No. 2, pp. 137143. David G. Stephenson, "Lunar Manufacture of Helium Three," The Journal of Practical Applications in Space, Summer 1992, Vol. 3, No. 4, pp. 87-99.

[28] The 1967 Treaty on Outer Space states that "The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries . . . " The treaty does not affirm private property rights in space and on celestial bodies.

The 7,200-kg. (16,000-lb.) Shenzhou vehicle was launched late on Nov. 20 from the Jiuquan launch site in the Gobi desert in northeast China on board a Long March 2F booster with 1.3 million lb. of thrust. Overall mass of the launch vehicle and payload was about 450,000 kg. (1 million lb.).... The vehicle is a modified version of the Russian Soyuz developed by the Soviet Union more than 30 years ago.

It is also important for internal Chinese leadership reasons - especially between the civilian and military political sectors. Some of that prestige value is "already being tested" by the Chinese military, said Marcia S. Smith, a respected space policy analyst for the U.S. Congressional Research Service.

"It's more than just a project to make them 'feel good' - some in China view it as a step in the evolution of Chinese military capability," Smith said.

The Chinese government-controlled China Business Times also raised the military issue saying the rocket thruster and control technologies developed in Project 921 could help Chinese ballistic missile warheads avoid interception by any U.S. missile defense system ... Chinese industry built the spacecraft and booster, but Russia provided extensive technical help under a largely secret Chinese/Russian manned flight technology agreement administered in part by the Russian Space Agency and Energy.... China's People's Liberation Army played a major role ...[29]

China also is developing anti-satellite weapons. In a July 1998 report to Congress on the military modernization in China, the Department of Defense wrote that Beijing is acquiring foreign technologies that could be used to develop ASAT systems. The report refers to frequency jammer, radar satellite trackers and high-energy lasers, and notes that China already may possess the ability to damage optical sensors on satellites. More recent reports say that China also is working on a microwave warhead to produce a burst of EMP energy to disable a satellite's electronics, and that China last

[29] Craig Covault, "Manned Program Advances Chinese Space Technology," *Aviation Week& Space Technology*, November 29, 1999, pp. 28-30.

September conducted a laser test against a satellite's sensors.[30]

Clearly, the U.S. must pursue an aggressive space program if it is to win this race, including the deployment of a ballistic missile defense in space.[31]

[30] Data emerging from China indicates the orbital module left in space on Nov. 21 [1999] from China's unmanned test of manned spacecraft remained operational after the descent module returned to Earth (AW & ST Nov. 29, p. 28).... illustrates China's multibillion-dollar commitment to new space facilities and technology.... Craig Covault, "Chinese Facilities Show Major Space Buildup," Aviation Week & Space Technology, December 6, 1999, p. 38.

[31] For arguments explaining the urgent need for this see, James Hackett, "No Space Weapons Vacuum," *The Shield*, July/August 1999, p. 7.

# CROSS CULTURAL COMMUNICATION

*By Nicholas Dima Ph.D.*

Although instant international communication and rapid travel is now common, a substantial variety of diverse customs and concepts still survive, and with these treasures unfortunately come cultural barriers to sympathetic understanding. Effective *cross cultural communication* is a necessity in the contemporary world if mankind is to avoid unnecessary conflict and preserve peaceful relations between nations while yet retaining cultural diversity.

"This is absorbing and essential reading for those who MUST COMMUNICATE across cultural and geographic frontiers. It is rich in anecdotes and insight."

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# Should China be Considered an Adversary of the United States?

Frederic N. Smith
*Washington, D.C.*

There is much to suggest that China's posture toward the United States is essentially that of an adversary. The author examines relations with China since 1949 and the various ideas behind the view that "business as usual" is called for with China, and finds that the assumption of normalcy is misplaced.

**Key Words:** China, Chinese foreign policy, United States foreign policy, the Far East, U.S. military strategy, U.S. trade strategy, China's threat to Taiwan.

Today's news is reminiscent of the 1930s when the aggressions of Imperial Japan occupied a prominent place in the news. History does not repeat itself exactly, but there are many similarities. China needs oil for industries as did Japan at that time. America was inundated with Japanese trinkets and toys in the 1930s and now it is flooded with Chinese-made products of every kind. China is badly overpopulated and its efforts to limit each family to one baby have largely failed. Japan in the 1930s was described as being greatly overpopulated and badly in need of oil and raw materials. As Japan invaded Manchuria and later China proper, the United States protested her actions, but it was not until Pearl Harbor was bombed that the United States adopted a tough policy.

One major difference between the 1930s and the present is the blatant way the PRC was able to buy its way into the upper circles of the Democratic Party by way of illegal election contributions. The PRC parlayed these contributions into all sorts of White House connections. Visiting Chinese Generals were photographed with President Clinton and were able to spend time with him in the oval office. Such things are unprecedented. The usual protocol in Washington is that defense visitors pay a call on their opposite number in the Pentagon or field. Thus, the Commandant of the PRC Marines would be received by the U.S. Marine Corps Commandant. The visiting Chinese General officers not only got to see President Clinton but were shown American military installations and how they