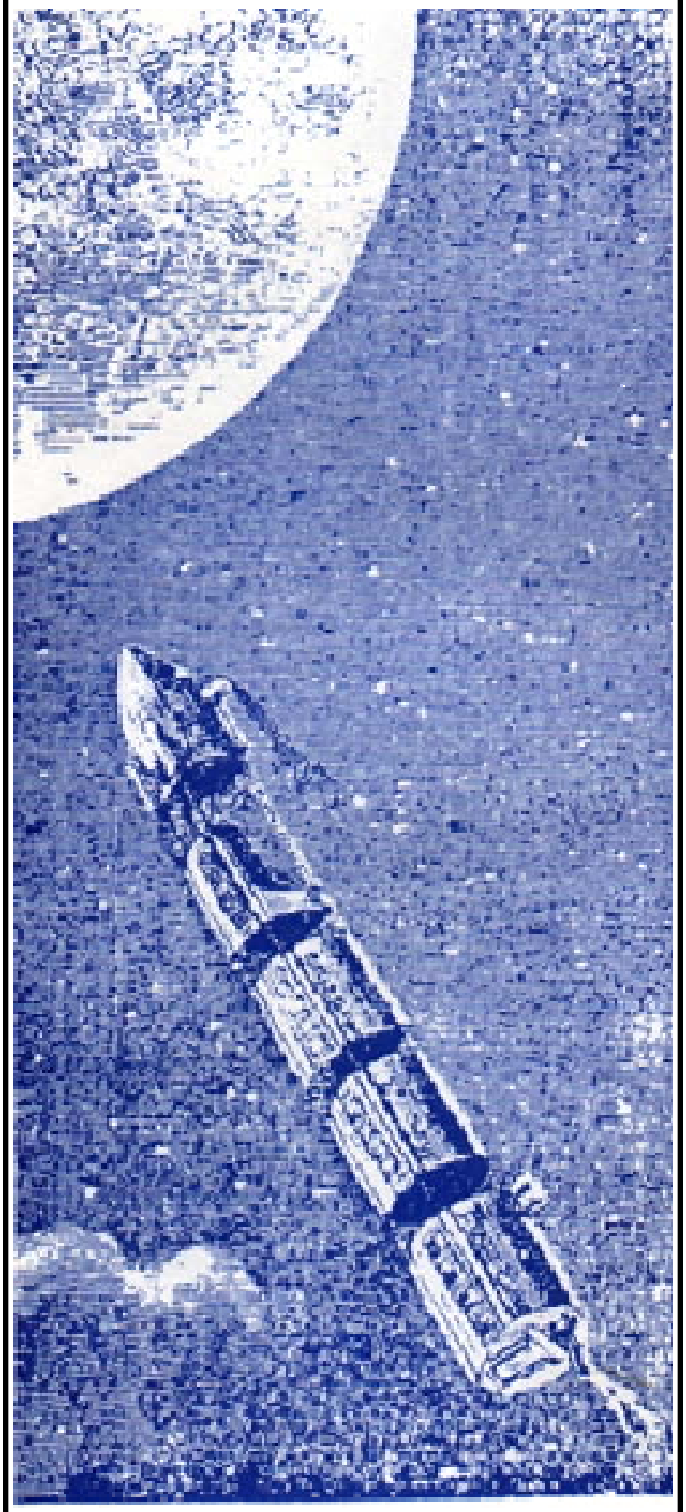
Moon Miners' REVIEW
& Moon Society Journal



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The Need for Police Services in a Lunar Community

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SITUATION: *A deranged individual is holding several tourists hostage in a lunar base habitat module, which he has isolated by depressurizing all adjacent modules but one. He is demanding an immediate flight home, or he will kill himself and his hostages by explosive decompression.*

The need for Security and Police Services off-world will be the same as it is on Earth; communities anywhere are made up of individual human beings, subject to individual human nature. While human technology and human society have developed greatly over the past several thousand years, human physical form hasn't.1 As a result, individual human nature is still such that people do not always act on the basis of reason or for selfless purposes. Now, statistically, the larger the number of people selected to go into space or who pay to go, the larger the probability that one or more might succumb to some form of stress or are simply the "high-risk" antisocial type, prone to act out when properly motivated.2 As noted science/science-fiction writer Ben Bova wrote, "There will always be criminals among us, because there will always be a few men and women who want to bypass the accepted rules of their society, who want to try to break the Second Law of Thermodynamics and get something for nothing-or at least, get something for far less work than they would have to exert to get it legally...It seems to me that once a sizable number of humans begin living and working in space, we will find plenty of such manipulators [those who skirt the edges of the law, pushing and poking and manipulating for financial gain or personal power] out there. After all, the space frontier will be a region where new opportunities arise, and where the usual restraints of the law are far away."3

Security and Police Services are two distinct functions and bear further explanation before discussing why they are necessary. Security Services protect the collective assets of the community such as power plants, banks, hospitals, and hazardous industrial areas. Police Services are more personally community-related and involve responses to incidents including homicide, suicide, assault, theft, and domestic quarrels. The two disciplines are practiced together to deter crime, or if that fails, bring those responsible to justice. As an example, the United States Air Force Security Forces successfully combine these two fields into a single organization, which efficiently protects both the community and the mission of an Air Force base.4

When private companies start to employ people off-world to explore, mine, and build and operate facilities for paying customers, the off-world population will become larger and more heterogeneous and the psychological and social issues will become more complex.5 Combined with an environment where the irrational act of one person could be devastating,6 the establishment and enforcement of the rule of law becomes critical to maintaining the safety of the community. Even now, U.S. Shuttle commanders have authority to enforce order and discipline on board as a matter of criminal jurisdiction under Title 18 of U.S. Code.7 In the future, some type of off-world security/police presence could even be a requirement by a company's insurers.

The importance of further research on the topic of police procedures for this environment has been identified in NASA literature.8 This author disagrees, however, with the proposal in the cited work that security/police force duties rotate among all members of the community to prevent "police/citizen schisms"; other members of the community can be trained to augment in an emergency, but these duties require very specific training and intrinsic human relation skills. Any potential schisms can be dealt with or even prevented by using current community oriented policing philosophies.9

The need for off-world security and police services can be illustrated by asking the questions of who will inhabit the off-world community and what makes the location of this community unique from a Security/Police perspective, then asking a third question of what might go wrong.

Who Will Inhabit the Off-world Community?

Some might argue that, because the only people to go into space will be so carefully selected and screened, there will be no conflicts or incidents; this ignores the difference between a government program and a commercial venture. So far, the only people who have gone into space have done so as part of either the U.S. or Russian space programs, for either research or military purposes. Given the small number of people currently needed in space at any one time, the fact that the military astronauts are already on the government payroll, and the lack of a need for a government program to turn a profit, the U.S. and Russia can afford to have a highly select group of people turning wrenches and operating cranes in orbit. Private companies won't be able to operate this selectively with respect to their employees, much less their customers. We can better gauge the need for security/police in an off-world community by looking at how many there might be, their motivation to go, and what their activities will be once they get there.

Population Size - As an example, these proposed stages of Lunar development10 use the following permanent population figures:

- Initial Lunar Base--6 to 12 people
- Early Lunar Settlements--100 to 1000 people
- Mature Lunar Settlement--1000 to 10,000 people

• Autonomous Lunar Civilization--10,000 to 100,000 people

The previously mentioned authority given to Shuttle commanders might suffice for 6 to 12 people, but at some point the population will exceed any commander's or governor's individual ability to ensure the safety and security of the entire group.

Motivation-Over the last hundred years or so, Earth has run out of physical frontiers in the sense of places into which populations could expand. Prior to this, there was still a New World to explore in the Americas and Australia. Groups of people had the chance to emigrate and establish their own societies. Off-world opportunities will attract the same types of people who built our modern world over the past several centuries, whose motivations include politics (with economic and religious underpinnings), intellectual pursuits, or any combination thereof.

The following quotes from the TV documentary Space Colonies11 illustrate the range of motives:

Dr Robert Zubrin stated:

> "In the 19th century, an idea took hold of people in this country that sent hundreds of thousands of people barreling west in wagon trains and it wasn't just to seek their personal fortunes. It's that they came to understand that they could be part of something grand, the establishment of a continental nation based on principles of progress and liberty and they wanted to be part of it." Regarding a Mars colony specifically "I believe that when it becomes technologically possible to settle Mars as it can be very shortly, there will be any number of people willing to participate in that, however the hardships." "Who will do this? Well, it could be people seeking adventure, it could be people who are driven there as refugees, it could be people who are members of a religious sect who find that they need to have a place where they can go where they can make their own world. Once it becomes possible to go, people will go. I believe that within 50 years after that, you'll probably have more than a million people living on Mars."

Jim Benson, CEO of SpaceDev, was quoted regarding his Near Earth Asteroid Prospector mission: "I'm going out to do this to both open up space for humanity, but also to make money doing it." "I believe that commercial enterprises can make money in space and once we do it then everybody else will see that it can be done and that will open up the vision of the future for all the people who want to go out and build space colonies and mine the asteroids and live on the Moon and Mars."

Activities-Regardless of the motivation, activities will be whatever people a) are paid to do, or b) pay to do:

The employees will cover a wide range of whatever services are required to support the community and the endeavors it's involved in. Like it or not, different jobs will demand different salaries and class distinctions could arise (the gulf between the "Haves" and the "Have Nots" has been a historical factor in crime and will likely continue to be.) Stringent background checks on prospective employees will mitigate this to a degree, but it won't be a guarantee as there is always the "first-time offender."12

The paying customers will be, of course, whoever can afford it (or win it as a prize package on a game show.13) In the context of tourism, following the precedent of airlines and cruise ships, security checks on these people will probably be limited to metal detectors and luggage inspection prior to departure versus more intrusive background checks. The degree of security in this case would be based on a weighing of these factors: potential consequences of an incident, the cost of more thorough checks, and loss of revenue from potential customers simply discouraged by the added inconvenience. Today's problem of "air rage", which the U.S. FAA calls "passenger interference with crew"14, could also arise off-world. Although people probably won't be stuck in the equivalent of coach seating for two to three days outbound to the Moon, it could still be stressful on an individual and trigger unacceptable behavior. Training and certification of customers on pressure suits and microgravity environments can help identify those with unmanageable claustrophobia, space sickness, or other adverse (even psychotic) reactions to space travel, but again, there is no guarantee that this will prevent all incidents.

In addition, the spacefaring nations of the day will still have their personnel engaged in various research or military missions, possibly becoming the first and largest "paying customers" at commercial facilities.

Of course, there will likely be other (competing) companies doing any number of things in space with their own employees and customers, raising the possibility of face to face disputes over who found what first. It is important then, that all the various security/police personnel employed by competing companies be certified as such by a recognized authority at the State, National, or even International level. Their overriding obligation will have to be to the rule of law versus the proprietary interests of their employers, otherwise they would essentially be private armies, potentially misused to unjustly enforce territorial claims at gunpoint.

Finally, as single-stage-to-orbit technology advances, and lower-cost access to space becomes a reality, there will be people in the world such as Iraqi leader Saddam Hussein or Kim Chong-il of North Korea who would want to use that technology to threaten or destroy. Controls on technology trans-

fers, sanctions, weapons inspectors, air strikes, etc. will keep rogue nations in line, however, they do have their terrorist allies and agents who, in the case of Saudi expatriate millionaire Osama bin-Laden, can be very well-funded. Given the opportunity of any other paying customer, there is no reason to expect terrorists not to take their activities off-world. A commercial Lunar base would definitely be a high-visibility target, but a sufficient security/police presence could discourage hostile acts.

The next question is:

What Makes the Location of this Community Unique from a Security/Police Perspective?

Essentially, it comes down to five environmental factors:

Distance from the parent population. This will be a stress factor on people psychologically, especially when families are separated and something goes wrong back home which the person off-world cannot do anything about.15 For the community in general, it will drive self-sufficiency in the sense that it will be more economical to have the support infrastructure of doctors, dentists, cops, lawyers, etc. in place versus shipping people back to Earth for these services.

Reduced gravity environment. Relatively the more benign factor, operating outside of a 1-g "gravity well" still provides numerous opportunities for people to act dangerously, ranging from reckless human-powered flying in open, pressurized habitat domes to deliberately guiding an asteroid onto downtown Tel Aviv.

Zero to partial atmospheric pressure (none of it breathable) with temperature extremes. Probably the least benign factor; various resources will become far more important than they would be on Earth. Anything immediately involved with life support including power production and air handling will require some kind of security safeguards to prevent inadvertent or deliberate tampering. Airlocks will also have to be made as foolproof as possible. As a psychological stress factor, it's the fear that if the technology fails, you die. Habitable space will be a precious commodity, and in an emergency where life support has failed in one area, people could panic16 and overwhelm the life support capabilities of remaining areas. In the research just cited, the probability of panic in an off-world accident is considered remote, however this is in regards to the crew; how would a transient population of less-trained tourists/guests/passengers react?

Radiation hazards. In addition to the fear of dying by suffocation while having one's blood boil, freezing in shadow, and/or burning in sunlight, the fear of death by radiation poisoning (from daily exposure or solar flares) is also stressful. Again, this puts added value on any habitable space capable of protection. Recent developments in solar observation17 have increased warning times for solar flares, so a more organized emergency response will be possible. Lunar Prospector probe data18 indicates localized magnetic fields (approx. 100 km in diameter) on the surface of the Moon capable of standing off the solar wind; if these areas have any shielding potential, they could become prime real estate. Still, there is the same potential in a solar flare emergency for panic amongst the populace or others from outside the immediate community who cannot make it back to their own shelters in time.

Variable light/dark cycles. Another stress factor, although there is more experience with this from space shuttle missions19, submarines, and wintering over at Antarctica. This factor could also drive the need for nuclear power supplies (currently fission) to partially support a lunar-based community since solar power would not be available for 14 days at a time for the vast majority of locations. In addition to their value as a power source for life support, the nuclear materials would have an intrinsic need for security measures. Being able to prove that the nuclear materials will be adequately safeguarded will likely be a requirement before an Earth government would allow the "export" of such a system, assuming no environmentalist protests. Local mining and processing of lunar radioactive ores will overcome the Earth export problems, however local security measures will still be required.

Now, given that the off-world community will represent nearly every walk of life from today's communities, and that it will occupy an environment at best foreign to our experience and at worst unremittingly hostile to life, the next question is:

What Might Go Wrong?

There are numerous examples of crimes that can happen in any community and trying to discuss them all here would simply belabor the point that security/police services are necessary. Here are a few hypothetical scenarios, though, that also show the need for unique procedures or research and development of new operational techniques and technologies. First, the situation used to introduce this paper:

Hostage Situation/Barricaded Suspect: *A deranged individual is holding several tourists hostage in a lunar base habitat module, which he has isolated by depressurizing all adjacent modules but one. He is demanding an immediate flight home, or he will kill himself and his hostages by explosive decompression*. Any kind of emergency response personnel, either security or life-support or medical, will need the ability to move immediately from a pressurized environment to vacuum and back again. Current soft-shell suits require long periods of nitrogen purging and decompression for astronauts because of the

suit's 4.3 PSI internal pressure, necessary to keep the suit flexible. Hard-shell suits, however, with relatively high internal air pressures, can be more immediately employed. The two options would appear to be either use hard-shell suits or keep dedicated response teams on a rotating stand-by (increasing personnel requirements) in a nitrogen-purged 4.3 PSI oxygen environment. In this example, if a police negotiator is not successful and a tactical resolution is deemed appropriate, what are some of the needs of the security personnel in the design of their equipment? Lethal versus non-lethal weapons is the first question, considering the importance of not breaching atmosphere containment. Also, in a security/ police context, the idea is to use the MINIMUM amount of force necessary to do the job and that starts with non-lethal force. However, if the perpetrator is wearing a pressure suit and about to irreparably sabotage the main power supply, non-lethal weapons might be ineffective and unable to neutralize the threat in time. Current firearm designs, lethal or not, will have to be adapted to include the following: special lubricants that won't seize up in vacuum, the need for radiative cooling versus convective cooling (weapons must be allowed to dissipate heat during firing to prevent mechanical failure or ammunition detonation), and vacuum-suitable materials of the proper color to prevent excess heating in unshielded sunlight. "Tactical" pressure suits is another question, where the enhancements might include increased ballistic protection and helmets with built-in night vision and amplified binaural hearing. A tactical entry into a facility is difficult enough already for any modern SWAT team; doing it in pressure suits will surely impose limitations and require the development of new techniques.

Suicide: *A partially clothed body is found blown out of an airlock on the lunar surface. This is initially classified as an "unattended death" pending further investigation which reveals a suicide note in the victim's sent e-mail file; this is supported by the statements of witnesses and security camera records.* An on-site investigation is most practical as it would otherwise require the entire operation be shut down and all personnel returned to Earth. What forensic techniques are required to handle the body and examine both it and the airlock for evidence? What are the effects of vacuum and radiation on fingerprints and DNA samples? Can an accurate toxicology screening be done on a desiccated body?

Domestic Disturbances: *A married couple, who are both employees of the lunar base parent company, have suffered a strained relationship since their arrival, occasionally requiring a police response to break up their arguments. Recently, the couple separated when the wife was found to be having an affair with a co-worker. The husband is a power production technician and has had trouble dealing with the break-up of his marriage.* This is a question of privacy versus the need for official attention and action. Human relationships form and come apart all the time, but the failure of an intimate sexual and romantic relationship, especially when one person then pairs up with someone new, is very stressful. Privacy has to be respected, but privacy has limits if an assault occurs or if an individual is not able to devote all their attention to their job. In an isolated community like this, where people depend on each other for their lives, is it an acceptable risk to let an individual continue to perform sensitive duties, such as power production technician, when their mind is not on their job?

Ration Control/Black Market: *A supply clerk, with advance information on the contents of shipments from Earth, knows that potato chips aren't always considered "essential". Being a rare item to begin with, and knowing when they are coming in, she begins hoarding them as soon as they hit the shelves in the community exchange. Seeing the opportunity for profit, she starts selling them to her friends for twice the retail price.* Goods that still need to be "imported" to the Moon, potato chips simply being a humorous example, must be shipped at relatively high cost. It would be impractical to pass this cost on to the consumers, i.e., the employees and family members, so the cost would be absorbed into the operating budget and only a carefully planned quantity of items for supporting a specific number of people would be shipped. This is similar to the situation at U.S. military bases overseas where many consumer goods have to be "imported". A ration control system, where people are limited as to how much they can spend on groceries per month or how many of a specific item they can buy, could be useful to prevent the hoarding of scarce goods and profiteering from the scarcity.

Customs Violations: *A tourist manages to bring a small piece of fresh fruit carried on their person all the way from Earth. Unfortunately, several fruit-fly larvae are also along for the ride. Once fully grown, they multiply and begin to feed on some of the crops grown for food and air purification.* As the number of transiting people and cargo increases, so does the likelihood of introducing vermin ranging from fleas, to fruit flies to, possibly, rodents? Various sterilization methods might not be practical for all cargo and different companies might not be as careful as others would. How would cockroaches mutate after breeding for ten or so generations in 1/6th gravity? While not mentioned in this example, individual shot records would have to be checked at some point to ensure people have all necessary immunizations; could new strains develop in the enclosed lunar environment? Could an individual, having spent a protracted period

on the Moon, lose their immunity to certain diseases back home? Travelers between these two environments would have to be current in their immunizations for both.

Alarm Responses: *Power for the lunar base is provided by a small nuclear reactor shielded in an adjacent crater. Due to the radiation hazard, human presence is limited and security must rely on sensors and cameras to detect unauthorized access. A first stage alarm has been tripped by something approaching the power conduits leading from the crater. This is followed immediately by vibration sensors on the conduits indicating some form of tampering. Having established a penetration pattern, a human security response is warranted. Visual assessment by camera confirms that an unauthorized individual is tampering with the power supply conduits.* Given the environment, there will be alarms on anything sensitive which, if tampered with, could result in large loss of life. This is in addition to any kind of personal duress alarms or facilities storing drugs, weapons, explosives, or other hazardous materials. How responding personnel get to the alarm depends on distance. If the response is to a separate pressurized facility some distance away, pressure suits will obviously be required, as will some form of vehicle. Most people living and working in this environment will have to be certified in the use of a pressure suit, possibly a smaller number in the use of a wheeled surface vehicle. If the response requires flight, would Security/Police personnel be certified to use some type of suborbital ballistic "hopper"?

Bomb Threat: *For the past three nights, bomb threats have been called into the restaurant at the lunar Hilton Hotel. No devices have been found so far, and suspicion is falling on recently terminated employees awaiting transport back to Earth.* First, the threat has to be taken seriously, no matter how many times it appears to be a hoax. Currently, the best device for detecting explosives has four legs and a cold nose. However, adapting dogs to a low-gravity environment is problematic at best. Would the dog be able to move in a coordinated way? Would the keen sense of smell be dulled by the redistribution of their bodily fluids that would occur in reduced gravity? Electronic chemical sniffers, now in development, would probably be the best option in this situation and in Customs enforcement to find contraband substances.

Prisoner Escape: *An individual awaiting trial on an assault charge is being escorted to see his defense counsel when a brief power failure occurs. He escapes from his guards and is now hiding somewhere in the base complex. He must be found quickly as he could take a hostage or threaten a vital piece of equipment.* Assuming there is a confinement facility at the base, how would this individual be tracked? This again raises the question of privacy where an extensive surveillance system could be put in place with transponders in everyone's ID cards. In the case of an escaped prisoner, a variant of today's electronic ankle bracelet for those on parole could be used to track the prisoner, communicate with them, or even stun them by remote control.

Attempted Theft/Hijack of Spacecraft: *A spacecraft maintenance technician, desperate to return home after learning of a death in his family, decides that he knows enough about the landers he works on to lift one off and pilot it back to Earth-orbit where he assumes he will be rescued and returned to Earth.* Similar incidents have occurred with military aircraft overseas. Assuming that this individual is discovered before he can lift off, one of the first questions is how to safely disable the vehicle. A trained police negotiator can then be used to peacefully resolve the crisis. Failing that, a response team would have to have been trained to board and recapture the vehicle, placing the hijacker under arrest. Again, the question of tactical pressure suit equipment and procedures comes up.

Political Asylum: *A group of scientists from Communist China is visiting the Moon to study hydroponics techniques. During their stay, the senior (and most politically prominent) scientist approaches a security officer and requests political asylum.* Whether the lunar community is independent or not, would the defector be beyond the normal reach of Chinese Communist authorities? If China has its own advanced human or robotic presence in space, would they threaten the community militarily to prevent the defection?

Spacecraft Approach/Landing Denial: *Shortly after the defection of one of their scientists, a Chinese Space Agency spacecraft is enroute to the Moon, requesting permission to land at the lunar base. Western Intelligence sources have informed the head of base Security/Police that this may be an attempt by the Chinese Communist government to take their citizen back into custody, or at least prevent his transfer into the hands of another country back on Earth. It is possible that the spacecraft is laser-equipped and carries armed personnel.* As previously discussed, not everyone with access to a spacecraft will necessarily be friendly. How would the base be able to deny landing to this craft? Denial procedures could include placing obstacles in potential landing areas, however that could be a lot of area. Would defensive weapons using kinetic or radiant energy be a prudent thing to keep on hand?

Defense of Base from Ground Attack: *Failing in their attempt to land at the base, the Chinese spacecraft lands over the horizon (a relatively short distance on the Moon) and delivers a contingent of elite People's Liberation Army (PLA) troops. Their orders are to*

blockade the lunar base against any surface or space traffic. If that pressure fails to produce the defector, they will enter by force. Is the base sufficiently developed as a sovereign state to have a standing military force? If not, how would Security/Police personnel be able to maintain a defense until the arrival of forces from some other country or entity with which they are allied?

Terrorist Acts: *The parent company of a lunar base has funded a two-person mission to a near-Earth asteroid. The spacecraft, launched from the Moon, will rendezvous with and grapple onto a large asteroid. While there are no approved plans to alter the orbit of this asteroid, the spacecraft does have the engine capacity to do so. Because of this potential, security measures are established to ensure only authorized personnel from the lunar base have access to the spacecraft. Several weeks prior to launch, information developed from discrepancies in an employee background check indicates that one of the lunar base ground support crew, a Russian-trained Uzbekistani Muslim, has ties with the terrorist organization of Osama bin-Laden. Further investigation reveals that this individual intended to hijack the spacecraft in order to alter the asteroid's orbit for an impact in Israel if certain demands were not met. This threat was deemed credible as the spacecraft was capable of doing so, including providing last-minute course corrections on descent, and the bin-Laden organization had access to computers capable of modeling the needed change in trajectory.* Any technological capability, regardless of it's original purpose, can be used as a weapon; compare the proposed capabilities of any of today's entrepreneurial single-stage-to-orbit contenders with one of Saddam Hussein's Scud missiles. What problems does this raise about maintaining security for spacecraft, either before launch or in flight, if their intrinsic performance characteristics make them useful as weapons?

First Contact/Discovery of Possible Alien Artifacts: *During a survey mission to the lunar farside, an apparent entrance to a buried facility is discovered. Symbols found match no known language and the construction appears to be too advanced to attribute to any human exploration to date.* Wild speculation? Possibly, but only 12 men have been to the Moon's surface so far and it's a big place, with over 14.6 million square miles of surface area. The further we push out into space, the greater the opportunity for discovery and if something like this were to happen, there would be immediate practical concerns and questions for those involved. What is the lunar base's position on the SETI (Search for Extraterrestrial Intelligence) Institute's Declaration of Principles Concerning Activities Following the Detection of Extraterrestrial Intelligence and what implications does this have for maintaining information, communication, and operational security? On an individual or small-group basis, what kind of people will this draw to the Moon? If the Heaven's Gate cult committed mass-suicide over just the idea that a UFO in the tail of a comet would pick up their souls, what kind of reaction will this provoke?

Conclusion

The preceding scenarios have illustrated the need for a specifically designated and trained Security/Police presence off-world by showing that people will behave just as they do on Earth, only in a far less forgiving setting. The community will need both security for material assets and police services for the people. For efficiency and flexibility of cross-utilization, these two functions can be performed by the same organization. It is recommended that a small research and training cadre of security/police personnel be in place before any large population in order to validate or develop new operational techniques for this environment. Also, the following topics have been identified for further research (and future papers from this author) in the fields of Security and Police Services and/or other disciplines as noted in parenthesis.

- Threshold population at which security/police presence is required
- Adapting pressure suits to tactical use
- Adapting weapons, equipment, and tactics to the off-world environment
- Physical apprehension and restraint of offendors in reduced gravity
- What to do with offendors and where; questions of trial and confinement (Law)
- Blood-borne pathogen hazards in reduced gravity (Medical)
- Collecting, preserving, and analyzing evidence exposed to the environment (Medical)
- Threats to people and crops from pests and disease (Medical, Public Health)
- Monitoring reliability of personnel in sensitive positions, e.g. life support or power production
- Who needs training in flight-capable vehicles? (Needs of Management)
- Suitability of dogs for detection/security work off-world versus development of electronic substitutes (Veterinary Medicine)
- Privacy issues related to tracking movements of individuals for safety or security reasons (Law)
- Political complications: diplomatic immunity, political asylum, etc. (Law)
- Potential military conflicts: spacecraft landing denial and defense from ground attack
- Exploitation of off-world environment and resources by terrorists
- Internal/external security problems dealing with discovery of evidence of extraterrestrial intelli-

gence (Law, Medical, Psychology, Theology)

Notes

1. Ben Bova, The High Road (Boston: Houghton Mifflin Company, 1983), 78.
2. Mary M. Connors, Albert A. Harrison, and Faren R. Akens, Living Aloft: Human Requirements for Extended Spaceflight (NASA: Ames Research Center, 1985), 153.
3. Ben Bova, Future Crime (New York: Tom Doherty Associates, Inc., 1990), 3, 255.
4. United States Air Force Manual 36-2105, Officer Classification, atch 7, p 103 and United States Air Force Manual 36-2108, Airman Classification, atch 27, p 261. These two references outline the duties of officers and enlisted personnel in the USAF Security Forces, including resource security and law enforcement.
5. Mary M. Connors, Albert A. Harrison, and Faren R. Akens, Living Aloft: Human Requirements for Extended Spaceflight (NASA: Ames Research Center, 1985), 3, 16.
6. Mary M. Connors, Albert A. Harrison, and Faren R. Akens, Living Aloft: Human Requirements for Extended Spaceflight (NASA: Ames Research Center, 1985), 7.
7. Nathan C. Goldman, American Space Law: International and Domestic (Ames: Iowa State University Press, 1988), 135.
8. Mary M. Connors, Albert A. Harrison, and Faren R. Akens, Living Aloft: Human Requirements for Extended Spaceflight (NASA: Ames Research Center, 1985), 285.
9. U.S. Dept of Justice http://www.usdoj.gov/cops/news_info/bg_info/bg_definition.htm . Community Oriented Policing, as defined by the U.S. Department of Justice, places an emphasis on building strong partnerships between communities and policing agencies. It is, in actuality, a return to old-style proactive policing where officers and the citizens in their neighborhoods knew and trusted each other. Proactive interaction on a daily basis, regardless of whether any crime has occurred, establishes and maintains more personal connections. The result is that, in each other's eyes, the officer becomes more than just a nameless enforcer behind mirrored sunglasses and the citizens become individual people, not just "the unwashed masses". Strictly reactive interactions, on the other hand, are what lead to "police-citizen schisms" where the police are only known for who they have had to subdue, arrest, or shoot and the community is just known as the place where the criminals are. The reactive model is self-reinforcing, becoming the proverbial "vicious circle".
10. David Buden and Joseph A. Angelo, Jr., "Nuclear Energy-Key to Lunar Development," Lunar Bases and Space Activities of the 21st Century (Houston: Lunar and Planetary Institute, '85), 86.
11. Discovery Channel Video #724419, "Space Colonies", 1999.
12. Mary M. Connors, Albert A. Harrison, and Faren R. Akens, Living Aloft: Human Requirements for Extended Spaceflight (NASA: Ames Research Center, 1985), 284-285.
13. Zegrahm Expeditions, a company currently working on plans for space tourism, provided a $31,000.00 Antarctica prize package to be won on the game show "Wheel of Fortune" in April of 1999.
14. Frances Fiorino, Editor's Perspectives: Passengers Who Carry "Surly Bonds of Earth" Aloft (New York: Aviation Week and Space Technology, December 21/28, 1998), 123.
15. Mary M. Connors, Albert A. Harrison, and Faren R. Akens, Living Aloft: Human Requirements for Extended Spaceflight (NASA: Ames Research Center, 1985), 257.
16. Mary M. Connors, Albert A. Harrison, and Faren R. Akens, Living Aloft: Human Requirements for Extended Spaceflight (NASA: Ames Research Center, 1985), 228-229.
17. Aviation Week and Space Technology; March 15, 1999; p 21. "Solar eruptions that can disrupt satellites, power grids, navigation aids and electronics can now be predicted days before they hit Earth...the formation of an S-shaped pattern on the surface (of the sun) would often lead to a coronal mass ejection"
18. Lunar Prospector Website http://lunarprospector.arc.nasa.gov/science/newresults/mer.html . "Although it was previously believed that the Moon's magnetic field was too weak to repel the charged particles of the solar wind, an intriguing magnetic anomaly on the Moon's surface has been found that can stand off the solar wind, thus creating the smallest known magnetosphere, magnetosheath and bow shock system in the Solar System. While most planets' global fields create a large encompassing magnetosphere around the entire body, the Moon contains magnetized rocks on its upper layers, some of which are magnetized strongly enough to form small dipole magnetic fields scattered on the lunar surface. These mini-magnetospheres, around 100 km in diameter (the Moon is approximately 3500 km in diameter), can stand off the solar wind locally."
19. Mary M. Connors, Albert A. Harrison, and Faren R. Akens, Living Aloft: Human Requirements for Extended Spaceflight (NASA: Ames Research Center, 1985), 135.

<RL>

[Robert Lancaster lives in San Antonio, TX]

http://www.asi.org/adb/02/11/01/needcops.html

http://www.moonsociety.org

Please make NEWS submissions to
David Wetnight at newsmonger@asi.org
Other submissions: KokhMMM@aol.com

The Moon Society was formed in July, 2000 as a broad-based membership organization with local chapters, to spearhead a drive for the further exploration and utilization of the Moon in cooperation with other like-focused organizations and groups.

Artemis Society International was formed in August 1994 as a forum for supporters and participants in the **Artemis Project™** quest to establish a commercial Moonbase as a first step to a permanent, self-supporting lunar community. **ASI** does not engage in any form of commercial business directly, but seeks to build a Project support business team. Registered trademarks of the Artemis Project™ belong to The Lunar Resources Company®

Join/Renew Online at
www.moonsociety.org/register/

Questions? email:
membership@asi.org

The Artemis Project™
http://www.asi.org/

Project LETO™
http://www.projectleto.org/

Please send all mail related to Memberships to:

The Moon Society Membership Services
PO Box 940825, Plano, TX 75094-0825, USA

How to fix MMM Subscription Errors:
www.asi.org/adb/06/09/04/1999/09/news-19990915.html

Moon Society Officers

Elected July 22, 2000

- Gregory Bennett — President
  president@Moonsociety.org
- James L. Burk — Vice President
  vice-president@Moonsociety.org
- Rhoda Bryant — Secretary
  secretary@Moonsociety.org
- R. Scott Gammenthaler — Treasurer
  treasurer@Moonsociety.org

All officers serve two year terms expiring in 2002

Board of Directors

Elected July 22, 2000

- Randall Severy, Chairman,
  elected at a board meeting on July 27, 2000
  (*expires 2001*; Director term expires 2002)
- Gregory Bennett (term expires 2002)
- Dana Carson (*term expires 2001*)
- R. Scott Gammenthaler (term expires 2002)
- Ian Randall Strock (*term expires 2001*)

Moon Flag Contest - see page 11

Find Neighboring Moon Society Members

by Tim Cadell, Moon Soc. Chapters Co-ordinator

If you want to try to start a chapter, or to grow one you have already started, you can get a current list of Moon Society Members who live within a range of a location, given by area code or zip code. Contact me at <tcadell@savageresearch.com>

Moon Society Chapter Rules Approved

www.moonsociety.org/chapters/chapterRules.html

We will print the full text in next month's issue, MMM # 147

Moon Society Special Interest Groups

http://www.moonsociety.org/groups/

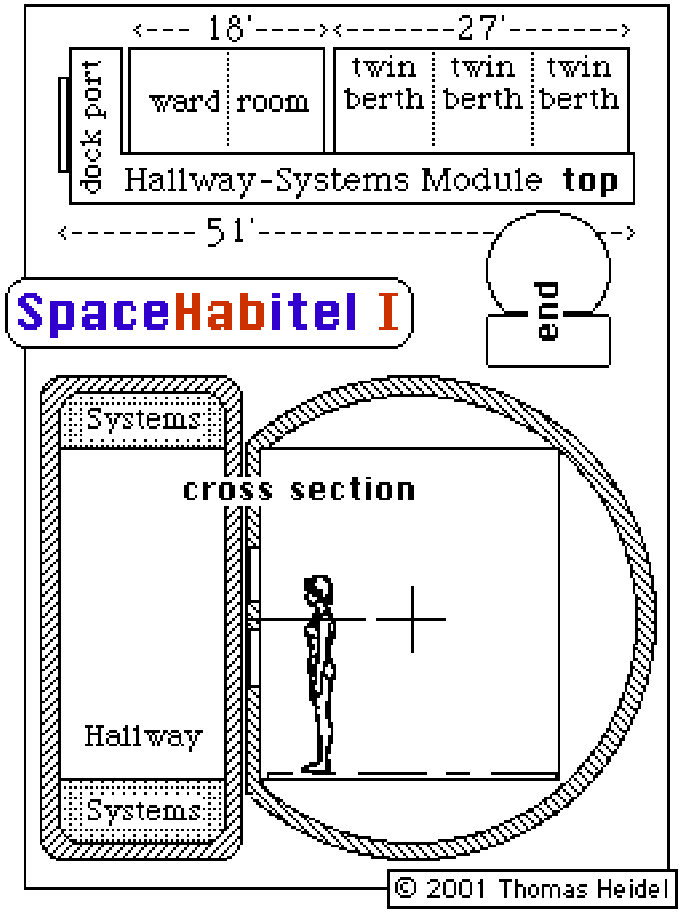
- Chapters Council - one representative from each recognized chapter
- Fundraising Task Force - need those experienced in writing grant proposals
- Leadership Council
- Outreach Commitee - in formation to develop resrources for public, educational, and government outreach
- Web Team - responsible for operation of the Moon Society's Internet resources, including websites, email, discussion forums, the ASI MOO chat rooms, and online publications.

A Near-term ISS Space Hotel for Six • based on Five SpaceHab Modules

Thomas Heidel, Milwaukee

A commercial space hotel unit could be built utilizing the proven SpaceHab module as major component. In this design, two SpaceHab modules are ganged together to provide badly needed ward room or commons space for visitors and crew. Three more SpaceHab modules are ganged together to sleep up to six, double occupancy. I'd have liked to have seen a commercial hotel unit like this attached to Mir, a much friendlier mooring spot than ISS. But it would work even better moored at ISS if the psychobabble about tourist-astronaut conflict comes to an end.

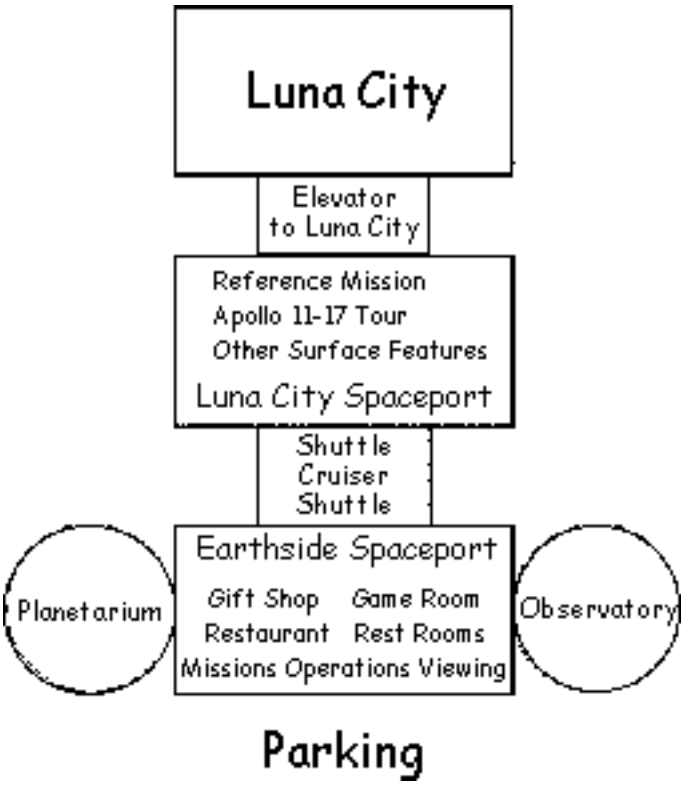
My idea is to ignore the current turf war and advance a viable design to have something ready when the climate changes as it must. Others are welcome to improve on the concept below.



This 51 ft. long hotel assembly could be launched on a Proton, probably the thriftiest, and most reliable choice. The operator could be MirCorp in its afterlife role, Bigelow, Hilton, or a consortium of risk takers. While the capacity of this design is small, additional units could be added allowing the hotel "wing" of ISS to grow with demand. <TH>

One Concept for the Project LETO Research Facility and Visitor Center

Richard Steffens <rsteff@home.com>
[http://members.home.net/rsteff/]



EDITOR: The Moon Society's Project LETO definition is still in a state of active flux, but here is one block diagram sketch that includes many of the elements that have been suggested for the Research-Tourist center to be built in the desert near Las Vegas.

LETO stands for Lunar Education & Tourist Organization - and "Leto" was Artemis' mother in a less known tidbit of Greek mythology. But I must confess that "Leto" conjures up in *my own* mind a male figure, not a female one - i.e. Leto, son of Paul Atreides (Muad'Dib) the saviour of Dune in Frank Herbert's epic Dune novels.

To be decided is what features of the LETO facility should come first in a phase by phase plan wherin income from one helps build the next. Income from tourism not plowed back into building more facility will be used to support research and development that will pave the way for the establishment of a first commercial outpost on the Moon, and its growth into mankind's first settlement beyond our home planet. Many good ideas have come forth, but it is a question of picking the best overall stratagems for producing the biggest research bang for the buck as well as the biggest groundswell of public support.

The Moon Society's MOON FLAG CONTEST

http://www.moonsociety.org/flag/

The Setting: Cities in the Moon

In the year 2101, just a century from now, cities have grown up all over the moon. Some of these cities centered around scientific research laboratories near the lunar poles and astronomical observatories on the far side. Others are mining colonies, providing the riches of Luna for people all over the solar system. Some cities are located just over the hills from the historical landing sites of the Apollo program, and some grew up in places especially selected for the beauty of the surrounding landscape.

Commercial spaceliners make it possible for you to visit all of these places, but your trip across the moon will mostly like start at **Luna City** , located in a special place in the northwest corner of *Mare Crisium*. We call this place *Angus Bay*. Its name is a play on the name of the nearby *Sea of Snakes*, which in Latin is called *Mare Anguis*. Luna City has become the major tourist destination in the moon.

As new generations grew up on the moon, these cities came together to form a confederation for the benefit of everyone living in the moon. This new confederation needs a flag to stand as a pround symbol of everything people have done, and will do, on the moon.

Can you help them design their flag?

The Flag Contest

The Moon Society is sponsoring a contest to design a flag for the people of Luna. Everyone is welcome and encouraged to participate, but

only entries from children between the ages of 6 and 18 will be considered for prizes.

All children who submit entries will receive a Certificate of Appreciation from the Moon Society.

When you design your lunar flag, think about the people who live there:

- How do they live?
- What is important to them?
- What is special about their lives on the moon, compared to living on Earth or anywhere else in the solar system?
- Why do they talk about living *in* the moon, rather than *on* the moon?
- What are they proud of?
- What are they afraid of?
- What do they want people to think about when they see a flag of the Moon?
- And most important, how can you represent these things in colors and symbols that will work on a flag for the Lunar Confederation?

Prizes & Rules: Go to web assress above.

Meandering Through The Universe

A Column on the Cooperative Movement on the Space Frontier © 2001 by Richard Richardson

NASA-ESA Turf Protectionism

I've read lately from a few different sources how NASA top brass and every U.S. elected official who cared to comment has come out breathing fire against the Russians and Dennis Tito for his trip as a tourist to *the* space station. (Of course, if NASA hadn't forced the scrapping of Mir Mr. Tito wouldn't have gone to *the* space station.) According to the quotes given in the articles I've been reading even our staunchest allies in high (political) places have taken a firm stance against Mr. Tito's expensive vacation and all that it stands for. It seems that, of those who have commented, there are two categories: those who are selling baloney, and those who have bought into the baloney and are generously sharing it with the rest of us. The baloney, of course, is being manufactured primarily by turf protectors associated with the U.S. space agency ... and, apparently, the European Space Agency, as well.

Now, when the first real breakthrough in the opening of space in 25 years occurs and it is greeted with hisses and cat calls — even by those most friendly to our goals, then I reckon it is time to start a letter barrage and try to change some attitudes among our political leaders. And I hope you will join me in writing letters, e-mailing, calling, and/or visiting our federal elected officials and making the following points:

1. The time for space tourism is *NOW*.
2. Screened and trained tourists *do not* present any significant increase in risk to the personnel or goals of government space activities.
3. Space tourists can (if allowed) provide a significant revenue stream to help reduce the tax payer burden for conducting useful space activities without reducing the level of scientific, technological, and diplomatic activities in space by paying reasonable fees for the use of government services and infrastructure and also by providing a market for private enterprise to exploit and thereby facilitating the development of a commercial platform upon which many current activities could then piggyback at reduced expense compared with current circumstances.
4. Space Tourism is *THE* breakthrough needed to provide the impetus and financial promise necessary to kickstart every other segment of space commerce which, in turn, if developed, could greatly reduce the expense of conducting government activities in space.
5. We, as voters, want to see space tourism begin now, using the infrastructure in place now — including U.S., European, and Russian hardware

and services and anything else belonging to anyone else as it comes on line — so long as it meets reasonable safety and security standards ... reasonable standards, not arbitrary or unreasonable ones.

6. We want legislation which removes unreasonable roadblocks from the paths of private sector space enterprises and which provides incentives to undertake and invest in private sector space enterprises.

I'm not a big advocate of spending our time lobbying our governments to do things we can do ourselves, but when our governments are choosing to rally for totally arbitrary roadblocks there is little we can do but try to change the human minds of which our governments are composed.

Collaborative Engineering -- a new tool

And speaking of work we can do ourselves, I recently received an e-mail from Mitchell James — a reader of this column — a few days before writing this edition (in June). He wrote to tell me of a website he has developed (a pair of sites, actually) which he characterizes as a "Home base for collaborative engineering." Project management, distributed tasking, and the like are not my forte so I offer no judgment with regard to virtue of Mr. James' implementation. But if you are knowledgeable in these areas and especially if you have a project that could benefit from such a tool or if you would like to work collaboratively on a project over the internet then give these sites a look. Here are the URLs:

http://www.InnerTransit.net

(E-mail distribution for multilevel organizations)

http://www.InnerTransit.org

(Home base for collaborative engineering).

Taking a Page or Two from LINUX

Along similar lines ... I would like to draw your attention to the phenomena of the LINUX development paradigm. LINUX [pronounced LIN ix] is a version of the Unix computer operating system. Unix is sort of like the granddad of the operating systems which run on personal computers. Various versions of Unix have been running on business, educational institution, and research institution computers for a long, long time. Well, some years ago now, a university student in Finland name Linus Torvalds came along and for a school project he developed a version of Unix that could run on personal computers. He called it LINUX and it quickly spread around the world via the internet.

Now, instead of fighting to maintain a stranglehold over his creation, Mr. Torvalds carefully crafted and secured a legal framework around LINUX which allows anyone to contribute to its development, or to create a business around it. This operating system can be freely copied, distri-buted, or changed in any way. Furthermore, the operating system itself cannot be bought or sold. Instead applications which run on it may be deve-loped and sold, services relating to its use may be sold, and it may be used to run a business whose products or services are sold. As mentioned earlier, anyone may fix bugs, update, or add features to the LINUX operating system. However, unless and until a specific change is officially approved by the legally authorized committee responsible for its parameters, no bug fix, update, or feature implementation can be represented as being a part of LINUX. But once it has been approved, it is included in the next official version released, thereby becoming part of LINUX and falling under all of the same legal provisions.

In theory this is a nice idea but doesn't mean that any good will result. Yet, in practice oodles of programmers have labored intensively over this little operating system and numerous entrepreneurs have created businesses based on it. Certainly LINUX is not yet as casual-user friendly as the offerings by its big commercial counterparts but it is rock steady, extremely flexible and has played and continues to play a major roll in the development of and the present day implementation of the internet and world wide web. What's more, day by day LINUX gets easier and easier to use as enterprising individuals and companies create new utilities, overlays, and other software to work with and compliment it.

The LINUX operating system development and enterprise model has brought a new and, so far, very successful paradigm to cyberspace. And, as regards space development/access, LINUX is a very reliable and very secure-able, and a very very powerful, fast, and efficient operating system which provides in one small and convenient package all the best qualities of software to use for space related activities (in my opinion ... and note that I do own 2 shares of Red Hat stock — a LINUX company).

But aside from its computer software qualities, it seems to me that we might be able to take aspects of the cooperative manner in which individuals and businesses work to develop and exploit LINUX and of the framework which was developed around the little operating system to facilitate such a community involvement and effort and apply them to our efforts to open space efficiently, effectively and with maximal participation of those interested. I'm still thinking about what lessons there might be for us and what paradigms and methods, if any, we might borrow from the LINUX model. Though I haven't come to any definite conclusions yet, I feel that there probably is a nugget or two to be gleaned. I hope others will give it a think, also. **<RRR>**

[FOR WHAT IT'S WORTH: We have always maintained a similar non-proprietary "open-source" attitude about ideas expressed in this publication. -- Ed.]

Mars Society President Robert Zubrin testifies before Senate Subcommitte

on Veterans, Housing & Urban Development Appropriations about NASA FY 2002 budget

The Mars Society, PO Box 273 Indian Hills, C0 80454

May 31, 2001 - "Mr. Chairman and Members of the Subcommittee: My name is Dr. Robert Zubrin, President of The Mars Society. I would like to thank you for this opportunity to offer comments regarding the Fiscal Year 2002 budget for the National Aeronautics and Space Administration ("NASA"). As detailed below, we strongly believe that NASA's budget should include a program funded at a level of at least $140 million per year (about 1% of NASA's current budget) within the NASA Human Exploration and Development of Space ("HEDS") organization to develop the technologies necessary to lay the groundwork for future human Mars exploration missions.

I. The Mars Society.

The Mars Society is an international grassroots organization created to further the goal of the exploration of the planet Mars. Our efforts to further this goal have involved broad public outreach to instill the vision of pioneering Mars, support of ever more aggressive government funded Mars exploration programs around the world, and conducting Mars related research on a private basis. Our first major project was building the Flashline Mars Arctic Research Station in the Canadian Arctic last year to serve as a test-bed for technologies and practices that will be needed for human Mars exploration. We recently secured funding for, and are in the process of building, a second research station, which will be located in the American Southwest.

I am the author of the books *The Case for Mars* and *Entering Space*, as well as dozens of tech-nical papers and articles. In the early 1990s, I deve-loped a plan ("Mars Direct") that showed how a robust mission to Mars could be achieved for $20-30 B and in 10 years or less, by maximizing the use of existing technologies and resources found on Mars.

II. Need for Technology Development Funding.

We believe there is no question that eventually this Nation's scientific curiosity and pioneering spirit will lead to a decision to send people to Mars -- a world of spectacular mountains three times as tall as Mount Everest, canyons three times as deep and five times as long as the Grand Canyon, vast ice fields, and thousands of kilometers of mysterious dry riverbeds. The planet's unexplored surface may hold unimagined riches and resources for future humanity, as well as answers to some of the deepest philosophical questions that thinking men and women have pondered for millennia. The discovery last year of surface features that may have been produced by the recent flow of liquid water further supports the idea that Mars once had (may still have) conditions conducive to life. To find evidence of life, though, will likely take more than robotic eyes and remote control. In fact, all that Mars holds will remain beyond our grasp until men and women--agile, autonomous, intuitive beings--walk upon its surface.

Whether the decision to send people to Mars is made tomorrow or in 10 years, there are many technologies that need to be developed in order to conduct such a mission in a safe and cost-effective manner. By investing a modest amount of money now to develop these technologies, both the ultimate cost and the time needed to assemble such a mission could be significantly reduced. In addition, such a program would provide the core of the talent and expertise that'll be required to achieve such an ambitious goal.

Until a few months ago, a very modest amount of NASA funds (primarily agency discretionary funds) were used to fund such a program. However, after the recent disclosure of Space Station cost overruns, an order was issued to stop or eliminate all technology development projects supporting eventual human Mars exploration. While The Mars Society is in full agreement that many hard choices have to be made to remedy the cost overruns relating to the Space Station, we believe that this technology development program is too important to this Nation's future in space to be sacrificed to feed Space Station overruns. In our opinion, Space Station overruns must be dealt with within the Space Station's own budget.

Rather than shut down the tiny amount of human Mars technology development work that was underway, such funding should be significantly expanded. A program should be funded at a level of at least $140 million per year (about 1% of NASA's current budget) within the NASA HEDS organization, to develop the technologies necessary for human Mars exploration missions. When our Nation is ready to make a commitment to send humans to Mars, this modest program will have already laid a portion of the technological groundwork for the mission, saving both time and money.

Below are some of the technologies that should be investigated in such a program.

1. In-Situ Resource Utilization: Cost effectiveness is a necessity for future human space exploration. Mars provides us with a tremendous opportunity to lower the cost of exploration by "living off the land." The atmosphere of Mars, composed largely of carbon dioxide, is the resource that makes this possible. Using a century-old technology, it should be possible to use the Martian atmosphere, as well as a relatively small amount of hydrogen brought from Earth, to create oxygen, water, and all of the fuel (methane) for the return trip. This would dramatically reduce the mission mass and save billions of dollars in mission costs. The cost-cutting potential of this technology certainly justifies further inves-

tigation and development.

2. Propulsion: Using current chemical rocket technology, it would take at least six months for a crew to reach Mars and at least another six months for them to return after their stay on the surface. With improved propulsion systems, transit times could be reduced, which would increase the safety and reduce the cost of human missions to Mars. In addition to improved chemical propulsion systems, we should look at new propulsion ideas, such as plasma technology, ion drives, nuclear rockets, and many other possibilities that have the potential to take months off the voyage. Creating a technology research program would allow us to examine the best way to approach this technological problem.

3. Life support: Without proper life support systems, any future Mars explorers could not survive. We should build on the systems already developed for the Space Station to achieve systems that can more fully recycle wastes and withstand the rigors of a long-duration mission where re-supply from Earth is not feasible.

4. EVA suits: We currently do not have space suits that would be useful on Mars. Our current EVA suits are designed for zero gravity conditions. They would be far too heavy and unwieldy on the surface of Mars. A Mars EVA suit must be light, durable, and allow it's occupant to move around freely and perform such simple tasks as bending over and getting back up without difficulty. Without a new EVA suit design, the astronauts would not be able to leave their habitat.

5. Human habitats for interplanetary transit and surface use: As noted above, The Mars Society is currently using private funds to investigate various aspects of this technology. Although we hope to make significant contributions to habitat design, our projects will not address many of the technological requirements for these habitats. In addition, The Mars Society does not have the means to examine the needs for a habitat during interplanetary transit. A technology program would be able to focus on these critical issues.

6. Human surface mobility systems (manned rovers): While the first humans on Mars would be able to make innumerable discoveries on foot, their range would be limited. Thus, it would be prudent to study various options for a pressurized rover, which would give the astronauts a vastly larger exploration range, allowing them to explore tens or even hundreds of kilometers from their habitat module.

7. Heavy lift vehicles: Such a mission would be much more expensive without heavy lift capabilities. Our Nation has not had a heavy lift vehicle capable of launching such a mission since the Saturn 5 rocket. In addition to a Mars mission, such a vehicle would be useful in numerous civilian and military space-related endeavors. Such a vehicle could be designed to make use of existing Space Shuttle facilities and hardware.

8. Advanced power systems, both nuclear and non-nuclear: We need to determine the best source of power during Mars surface habitation. This is more challenging than any power issue we have had to deal with in the history of the space program. We will be on the surface of Mars for at least a year, so a reliable power supply is a critical technology that will need to be developed.

III. Some Reasons to Support Human Mars Exploration

1. Economic/Social/Technology: Some will say that we need to solve problems at home before we invest in space exploration. In reality, it is just the opposite. Dollar for dollar, the space program has provided more benefits to our Nation and the world than any program in United States history; the largest number of benefits coming as a result of the Apollo program. A Mars exploration program will likely accelerate economic and social benefits as Apollo did. By investing in space, we benefit Earth.

2. Education: Apollo inspired children around the country to pursue science and math careers. They saw that they could participate in events larger than themselves. A human mission to Mars will certainly have the same impact. Inspiring our children to learn is the best education program.

3. Science: The scientific ramifications of a human mission to Mars are enormous. The study of Martian geology and atmospheric conditions will not only teach us much about the future habitability of Mars but also about our own planet. By sending humans to Mars, we will be much more likely to answer the question of whether there was ever life on Mars. In the search for signs of fossilized life on Mars, a human crew could likely achieve in their first few days more than what could be accomplished in many years by any series of robotic probes.

4. Exploration: Without a great history of exploration the United States would not exist. We need to continue our great heritage of exploring the unknown so that we can guarantee that our society will remain vital and will not fall into stagnation. Mars is not just a scientific curiosity; it is a world with a surface area equal to all the continents of Earth combined, possessing all the elements that are needed to support not only life, but technological society. With the International Space Station operational, it is time to lay the groundwork for the next logical step -- the human exploration of Mars.

5. National Optimism: We need to rekindle the national optimism that made the United States the greatest country on Earth. A human mission to Mars is the natural vehicle for this revitalization. A strong sense of national optimism is the best vehicle for continued prosperity.

6. Public Support: A recent Roper poll shows that about two-thirds of the American public support sending a human mission to Mars. The American public has had an enormous appetite for Mars for years. This appetite has fueled countless science fiction accounts of Mars and unprecedented interest in NASA exploration missions to Mars. When Mars Pathfinder landed in 1997, there were over 100 million hits on the Pathfinder website in the first day. There have been well over half a billion hits since. All together, NASA's Mars related websites have received over 1.2 billion hits since 1997.

7. Self Definition: A humans to Mars program would be a forceful reaffirmation of the fundamental nature of America as a nation of pioneers. We Americans owe everything we have today to our predecessors who were willing to go to a wilderness and build where no one had built before, to take on challenges that had never been faced, and to do what had never been done. Were we to abandon that tradition, we would become something less. That is a form of decline that we cannot afford and cannot accept. Ultimately the issue of whether we embrace the challenge of Mars is one of who we are.

IV. A New Direction

Our space program has been literally and figuratively going around in circles since the end of the Apollo Program. Few people under the age of 40 have any direct recollection of our Nation's greatest technological and exploration achievement; landing humans on the Moon. In addition, more people are even beginning to deny that the Moon landing ever took place. While this opinion used to be limited to fringe elements of our society, it has now become main stream. Should we be surprised by this phenomenon? Absolutely not! In the late 1960s and early 1970s, the possibilities in space exploration looked limitless. What should have been "one giant leap for mankind," the Moon landings have turned out to be just a few "small steps." After launching the Nation, and the world, into what looked like our greatest age of exploration and learning, we retreated and have never returned. We now need to engage in a new and great age of exploration and discovery -- an age that will again inspire our Nation and the world.

Conclusion: As the past few years have demonstrated, Mars is an extraordinary planet that yields her mysteries only grudgingly. If we are ever to gain a complete understanding of its complexities, we will need to send human explorers to that world to fill in the enormous gaps in knowledge left by our robotic probes. We urge Congress to establish a modest program (at least $140 M / yr) to develop the technologies necessary to lay the groundwork for what will certainly be the next great Age of Discovery.

Once again, I would like to thank you for the opportunity to present this testimony. **<RZ>**

"INVEST IN SPACE NOW" ACT (HR 2177)
Offers Tax Credit to Investors in Commercial Space Launch Vehicle Companies

WASHINGTON, DC, June 14, 2001 - Rep. Ken Calvert (R- CA) introduced legislation with Rep. Solomon Ortiz (D-TX) to grant tax credits to investors in the emerging commercial space launch vehicle industry. This approach, which ProSpace has been advocating for two years, promises to revolutionize the financing of the next generation of space transportation. GIST:

- investors in companies developing commercial space launch vehicles will receive a tax credit. Two categories of tax credits -for small vehicles and for large vehicles - thereby assuring that the investors in both small start-up aerospace launch vehicle companies and well established aerospace companies benefit.
- For a company to qualify for the tax credit they must demonstrate to the Sec. of Transportation that their approach is designed to develop a vehicle which can result in launch costs significantly below current levels & show commercial viability by raising a minimum of $10 M in equity capital.

Right now, the United States has an embarrassingly small percentage of the global commercial space industry. The U.S. has traditionally been the world leader in space, but not in the commercial space launch vehicle industry. In this field we have lagged behind France, China, Russia and Italy.

"The trick here is to make it financially feasible for the private sector to fund near-Earth, next-generation vessels. Letting tax credits go through a company to their investors gives investors additional incentives to invest in broadening the commercial space industry."

"Cancellation of NASA's X-33/34 signals an end to the old approach of building a space plane for our government (one company working exclusively with NASA on a single design), and inaugurates a new approach," said Rep. Calvert. He estimates the federal tax dollars this industry could generate in just two years after the new vehicles are operational would more than pay the cost of the credit.

"There will be substantial savings to be realized on government launches as well when these new vehicles fly," noted ProSpace President Marc Schlather. "The key is in the process of using some $4 B in indirect government support to create over $12 B in private investment. The systems built using the approach put forward by Reps. Calvert and Ortiz promise to open a whole new frontier for the U.S. in space - new markets, new industries, new jobs and new tax revenues. This is a win-win for all involved."

PROSPACE applauds this approach and thanks Mr. Calvert and Mr. Ortiz for their leadership. Please ask your representative to support HR2177. **<PS>**

Manifesto

We're taking the Moon
Us aged and infirm
Far sighted, deaf, and misshapen
Aside with you Atlas and Mensa
Out of our way politician
Move over warrior and beach kid

Earth's Moon is like us
Gray on its top
Blemished with spots
Cold and hot
Seemingly dead
But hidden beneath an unpromising cover
Are treasures, riches, futures, and lovers

We're taking the Moon
Us aged and infirm
Short sighted, deaf, and misshapen
Welcome to you
All who would come too
But never forget
You're not better than us
You won't shut us out
Or leave us behind

We're taking the Moon
And that's FINAL!

NSS Chapter Project Funding Grants

Greg Allison, NSS VP for Chapter Affairs

The following chapter projects have been reviewed by the Foundry at the 2001 ISDC and passed all the established criteria to merit funding from monies set aside for Chapter Projects by the NSS Board:

1) PROJECT: Student Zero Gravity Recyclable Laundry Get-A way-Special (GAS) Experiment
Chapter: Clear Lake Area Chapter of NSS
Grant: $500

2) PROJECT: Odyssey Lab Student Interactive Exhibit
Chapter: Orange County Space Society
Grant: $500

3) PROJECT: Controlled Ecological Mouse Support System
Chapter: Oregon L5
Grant: $245

4) PROJECT: Display Cover and Reversible Backdrop for Lunar Lavatube Base Model
Chapter: Oregon L5
Grant: $755

MMM News Sources

On May 22nd, 2001, thanks to the facilitation of the Russians, of course, Pizza Hut made its first "home delivery" to the International Space Station. Go to:

http://www.pizzahut.com/news/PressReleases/2001/052201_SpacePizza.asp

In July 2000, the race for space commercialization began as Pizza Hut became the first company in history to place its logo on the world's largest proton rocket, again connecting with the Russians.

March 4, 2001: Russian Aviation & Space Agency, Rosaviacosmos, endorsed the development of the first commercially operated module of the International Space Station, ISS, in the hope of renting the Enterprise spacecraft to its international partners.

Proposed by Spacehab Inc. and developed by RKK Energia, the module will take the place of the Docking & Storage Module, known by its Russian abbreviation as SSM, on the Russian segment of the ISS, according to the agreement reached in Moscow on February 16.

http://www.russianspaceweb.com/news_iss_enterprise_010223.html

Thanks to Ben Husset, MN SFS for both items above!

"Go instead where there is no path, and leave a trail." -- unknown

Amateurs Built the Ark.

Professionals Built the Titanic

Mars Desert Research Station

on Exhibit July 1 - September 3 at Kennedy Space Center Visitors Complex

www.marssociety.org/bulletins/06.13.01.MDRS.KSC.asp

This summer (2001) the Mars Society's second analog habitat, the Mars Desert Research Station (MDRS), is on exhibit at the Kennedy Space Center visitors complex. The exhibit opened July 1 and will run through the labor day long weekend.

The Mars Desert Research Station was fabricated for the Mars Society by Built on Integrity (BOI) of Boulder City Nevada. Founded by Scott Fisher, of the Fisher Space Pen company, a longtime supporter of space exploration in general and the Mars society in particular, BOI has developed a proprietary construction technology combining a steel frame, foam core, and elastomeric skin to produce an ultra lightweight structure with extremely effective insulation properties.

The MDRS used this technology to produce a station that is the same size as the fiberglass honey comb Flashline Station, but which weighs less than half as much. The Mars society intends to take advantage of the lightweight nature of the MDRS to make it mobile, moving it to support exploration at several different desert locations in the course of its operating lifetime. Engineering support for the design of the MDRS is being provided by the University of Nevada in Las Vegas

The Mars Desert Research Station (MDRS) will be deployed in a Mars analog desert environment in the U.S. southwest this September, and will support field operations during the fall, winter, and spring.

In conjunction with the opening of the exhibit we will be launching a new web site dedicated to the Mars Desert Research Station.

http://desert.marssociety.org/

Sponsor opportunities are available. You can have your companies logo on the habitat and we are looking for a signature sponsor to name the habitat.

SOLAR SYSTEM AMBASADORS

Michelle Baker
Princeton/Philadelphia
chaos@cybernet.net

Bill Higgins
Chicago, IL
higgins@fnal.gov

Herald Schenk
Sheboygan, WI
hschenk@excel.net

www.jpl.nasa.gov/ambassador

The Lunar Reclamation Society, Inc.

P.O. Box 2102
Milwaukee
WI 53201

www.lunar-reclamation.org

www.neighborhoodlink.com/org/lunarbase

Ad Astra per Ardua Nostra
To the Stars through our own hard work!

LRS OFFICERS - (area code 414) through 10/'99

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Mark Kaehny* <kaehny@execpc.com> 466-2248
(* LRS Board Members)

LRS NEWS

www.lunar-reclamation.org/page4.htm

• **We now post LRS current news online:** You can keep up with the latest on our Meetings Page, above.

• **We received our first web award:** A White Paper on Steps to Civilian Lunar Home Rule (serialized in MMM) got an award from Backwash.com for content.

• **We helped an amateur radio astronomy effort:** Dave Dunlop and Peter Kokh helped dissasemble six satellite dishes from Time Warner's downtown farm (no longer needed) hopefully to be reoutfitted for radio astronomy research. See our NEWS PAGE above.

LRS JULY Events

Saturday, JULY 28th FIELD TRIP

Plans for a carpool trip to Argonne National Lab SW of Chicago have still not been finalized. Keep in touch online. Those interested will be notified.

Wisconsin Mars Society c/o Matthew Giovanelli
7133 West Wells Street, Milwaukee, WI 53213
414-774-8952 - chooy@execpc.com
http://chapters.marssociety.org/usa/wi/
WMS usually meets at address above on 3rd Sat. 1pm
contact Matt by phone or email address above

U.S. CHAPTERS

NSS Chapter Events

MMM 9 Chapters Strong

Space Chapters HUB Website:

http://www.nss.ac/hub/

WISCONSIN

Sheboygan Space Society

728 Center St., Kiel WI 54042-1034

c/o Will Foerster 920-894-2376 (h) <willf@tcei.com>
SSS Sec. Harald Schenk <hschenk@excel.net>
>>> **DUES**: "SSS" c/o B. P. Knier
22608 County Line Rd, Elkhart Lake WI 53020

☞ We meet the 3rd Tuesday of the month at **7-9pm**

June 19th MEETING at the Stoelting House in **Kiel**
July 17th at Foerster Academy of Dance, **Sheboygan**

OHIO

Cuyahoga Valley Space Society

3433 North Ave. Parma, OH 44134-1252

c/o George F. Cooper III, Phone 216-749-0017
E-Mail: geocooper3@aol.com [new]

☞ Monthly Meetings, the 4th Thursday **7-9:15 pm**, **rm 106**, **Wilker Hall**, **Baldwin Wallace College**, **Berea**
NEXT DATE: **June 28th, July 26th**

MICHIGAN

Ann Arbor Space Society

P.O. Box 130118, Ann Arbor MI 48113-0118

John Wolter (734) 665-1263 johnswolter@provide.net

☞ 2nd Wednesday (**June 13th, July 11th**) **7 pm**,

MEETINGS at members' homes. Contact above

MINNESOTA

Minnesota Space Frontier Society

c/o Dave Buth, 3331 Cedar Ave. S. #2
Minneapolis, MN 55407

612-721-4772 (Dave Buth) 612-375-1539 (Jeff Root)
Email: mnsfs@freemars.org

http://www.FreeMars.org/15/index.html

What's Up at Mn SFS?

June 21, 2001 - Happy Summer Solstice! Remember, today is the day when the Sun rises in the morning over the hele stone at Stonehenge like it's done for the last 4000 years! Amazing isn't it...

Our new Treasurer Kevin Wilson, was finally signed on at the bank 6/19 and I handed over the files (as is) that evening. Good Luck Kevin!

• **Up Coming Events:** CONvergence is is coming! July 6, 7, & 8th and we can use *your* help staffing the Science Room. E-mail me or call (612) 333-1872 if your interested in helping out. 15 hours of volunteer work gets you a free CONvergence T-Shirt!

http://www.CONvergence-con.org

The next event is the Astronomical Society of the Pacific (ASP) will be hold "Universe 2001 Expo" the weekend of July 13, 14 & 15th at the Radisson Riverfront Hotel in St. Paul. This event will include the ASP 113th Annual Meeting and a host of other cool things.MnSFS will have a table there so any help *you* can provide in staffing will be appreciated!

http://www.aspsky.org/meetings.html

• **Past Events:** Congatulations to all on a Great Marscon 2001. Our streamlining efforts have started to pay off. Pictures of the events can be seen at:

www.freemars.org/mnfan/marscon/2001
www.freemars.org/mnfan/marscon/2001/pictures/
More at: http://www.marscon.org

The Great Misfits Picnic on June 2 was excellent, I especially liked the ISS flyover and the presence of the wonderful 'Mighty Janice'. The kids (and many adults) loved the Baking Powder Rockets and the telescopes were well used that evening.

Pictures of the event can be found at:

www.freemars.org/mnfan/convergence/
Picnic-6-2-01-PICTURES/ (case sensitive)
More at: http://www.misfit.org

The last meeting on 6-16 at Radio City was sparcely attended (I was slow on the e-mail, sorry!) but, I got back slides from Rich and will be working on a new slide collection and program list for MnSFS.

Ben, Rich and I discussed the MMM issue in detail and Rich renewed his membership.Thosee who has had MMM troubles should see them clear up soon.

We also talked about Convergence and the up coming events and our need for staffing. *Your* help would be appreciated! Remember the next meeting is at the All Ships Picnic! I hope to see you there!

David Buth, MnSFS Exec. Director

From Ben:

www.FreeMars.org/mnfan/convergence/Picnic-6-2-01-PICTURES/
www.FreeMars.org/mnfan/mas/Aurora-4-18-01

CALIFORNIA

OASIS: Organization for the Advancement of Space Industrialization and Settlement

P.O. Box 1231, Redondo Beach, CA 90278

Events Hotline/Answering Machine: (310) 364-2290
Odyssey Ed: Craig Ward - cew@acm.org

E-mail: oasis-leaders@netcom.com

http://chapters.nss.org/oasis

Odyssey Newsletter Online
http://www.geocities.com/CapeCanaveral/Lab/4005/articles.html

☞ **Regular Meeting 3 pm 3rd Saturday of each month.** Information: OASIS Hotline, 310/364-2290, website.

- **July 21st** -- OASIS Monthly Meeting, Redondo Beach Public Library, Main Branch.

OREGON

Oregon L5 Society, Inc.

P.O. Box 86, Oregon City, OR 97045
voice mail / FAX (503) 655-6189

http://www.OregonL5.org/ *

Allen G. Taylor <agt@transport.com>
Charles F. Radley <Cfrjlr@aol.com>
Bryce Walden <BWalden@aol.com>
(LBRT - Oregon Moonbase) moonbase@home.com

☞ Meetings the **3rd Saturday** of each month at **2:00 p.m.**
Bourne Plaza, 1441 SE 122nd, Portland, **downstairs**

NEXT MEETING DATES: **June 16th, July 21st**

*** NOTE:** The Oregon L5 website is temporarily off the ether. If the problem is not fixed by the time you read this, you can find all the contents available at:

http://www.eugeneweb.com/~oregonl5/

ILLINOIS

Chicago Space Frontier L5

610 West 47th Place, Chicago, IL 60609

Larry Ahearn: 773/373-0349
Call Larry for MEETING INFORMATION

http://www.astrodigital.org/csfs/

PENNSYLVANIA

Philadelphia Area Space Alliance

PO Box 1715, Philadelphia, PA 19105

c/o Earl Bennett, EarlBennett@erols.com
215/633-0878 (H), 610/640-2345(W)

http://region.philly.com/community/PASA

Note NEW WebSite - CAPS required [PASA]

☞ **PASA regular** business luncheon/formal meeting from **1-3 pm**, the **3rd Saturday** of every month, at the **Liberty One** food court on the second level, 16th and S. Market. Go toward the windows on the 17 th street side and go **left**. Look for table sign. Parking at Liberty One on 17th St. Verify meetings with Earl.

NEXT MEETINGS: **SUNDAYS June 15th, August 19th**
Locations to be announced.
Call Earl or Mitch to verify all meetings.

• **Scheduled PASA activities**: Monthly meetings for July and August will be held on the 3rd SUNDAYS (see above). Presentations at **Millennium Philcon** August 30 to September 3rd

Report by PASA President Earl Bennett

• **June 10th Meeting Report:** Gary Fisher discussed the next Mars Society meeting to be held in Palo Alto CA Aug. 23-26, and the possibility of inviting Nader Khalili, an Iranian architect at the CalEarth project, to speak on Moon and Mars architecture. Gary discussed the 6/01 ^Scientific American^ article by Robert Zubrin on Mars Research Station.

Gary also discussed the Desert Research Station exhibit which will be at the Kennedy Space Center this Summer. They are looking for volunteers to act as tour guides for the exhibit for a 2-3 week stint. Info: Maggie Zubrin, mzubrin@aol.com.

Hank Smith discussed Millennium Philcon, being held Thurs.-Mon., Aug. 30-Sept. 3 at the PA Convention Center. Most science programming is on Sun., Sept. 2. Info: www.milphil.org. Science speakers and ideas still needed: call Hank 215-329-3597.

Mitch Gordon discussed our participation at the Future Fest 2001 event to take place Sat., Oct. 20 at the Ethical Society on Rittenhouse Square. Info: Mitch 215-625-0670. Mitch also discussed the World Future Society convention taking place July 20-22, 2002 in Philadelphia. Speakers needed.

NAME _____ ÷

STREET _____ ÷

CITY/ST/ZIP _____ ÷

PHONE #S _____ ÷

○ $35 **NATIONAL SPACE SOC.** dues w. **Ad Astra**

○ $20 NSS dues if under 22 or over 64. *Must state age* ___
NSS, 600 Pennsylvania Ave SE #201, Washington DC 20003
(Make payable to local chapter *for 1st year **free** local dues*)
(Offer not honored by Oregon L5 Society)

○ $35 **MOON Society** dues with **MMM**

○ $25 **Moon Society** dues for those already getting MMM
Moon Soc. Membership, PO Box 940825, Plano, TX 75094

Member Dues -- MMM/MMR Subscriptions:

Send proper amount to address listed in chapter news sections

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=>for those outside participating chapter areas <=

○ $15 **Individual Subscriptions to MMM/MMR: Outside North America** ○ $45 Surface Mail -- Make payable to "LRS", P.O. Box 2102, Milwaukee WI 53201

ANN ARBOR SPACE SOCIETY
○ $10 regular dues

CUYAHOGA VALLEY SPACE SOCIETY
○ $10 presently; Raise to $15 under consideration

CHICAGO SPACE FRONTIER L5
○ $15 annual dues

LUNAR RECLAMATION SOCIETY, INC.
○ $15 regular, ○ $20 family, ○ $12 student / senior cit.

MINNESOTA SPACE FRONTIER SOCIETY
○ $20 Regular Dues

OREGON L5 SOCIETY
NOTE DUES RAISE: ○ $23 for all members

O.A.S.I.S. L5
○ $18 regular dues

PHILADELPHIA AREA SPACE ALLIANCE - PASA
○ Annual dues for all with MMM $16, due in March
or $4 times each quarter before the next March

SHEBOYGAN SPACE SOCIETY
○ $15 regular, ○ $10 student, ○ $1 / extra family memb
"SSS" c/o B. P. Knier, 22608 County Line Rd,
Elkhart Lake WI 53020

Moon Miners' REVIEW # 29

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