



OPS-Alaska

Expanding the Human Ecology
Extreme Environments Research for Oceanic, Polar, and Space Applications

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Dr. Dudley-Rowley and OPS-Alaska are pleased to present:

From the Earth to the Moon and Beyond: Transnationalizing Space

Focus Area: Program Management, Acquisition, and Interfaces

**THE FIRST OF
THREE OPS-ALASKA
RESPONSES TO THE NASA
EXPLORATION SYSTEMS
ENTERPRISE REQUEST FOR
INFORMATION**



The Series of OPS-Alaska Responses Are:

I. From the Earth to the Moon and Beyond: Transnationalizing Space

Focus Area: Program Management, Acquisition, and Interfaces

II. From LEO to the Moon and Beyond: Human Factors Safety Concerns of Space Stations and Other Human Environments Away From Earth

Focus Area: Design Principles, Objectives, and Guidelines

III. To Mars: Assured Communication With Mars (MARSSAT)

Focus Area: Crosscutting Design Drivers and Architecture Elements

From the Earth to the Moon and Beyond: Transnationalizing Space

In this upload, I am passing on to NASA the benefit of what I know about transnational organizations and why I am advocating that NASA explore and expand its link with the International Science and Technology Center (ISTC), an intergovernmental organization headquartered in Moscow, Russia, and whose governing board is chaired by Ronald Frank Lehman II, the Director of the Center for Global Security Research at the Department of Energy's Lawrence Livermore National Laboratory¹ (<http://cgsr.llnl.gov>).

I recommend that NASA "transnationalize" in order to increase its funding base and resources on a scale and continuity adequate to ensure the sustainability of manned spaceflight. This, so that long-duration human missions can become a reality instead of the kind of fanciful and wishful reportage remembered by those of us who learned to read about the same time as *The Weekly Reader* was touting the exploits of the X-planes, the Mercury astronauts, and later programs.

Sustainability is the real issue in establishing a permanent base on the Moon and running sequential human expeditions to Mars and to the terrestrial moons of the outer planets. Until we have sustainability, all we have is the moral equivalent of holding hands and singing Kum Bah Yah. And, after what must surely be at least half a century of more or less seriously thinking about solar system development, that tune is getting a little old.

My senior conference² colleague, Dr. Hans Mark, has argued to me in past that it takes the visionary interest and drive of an American president, a "consensus of one" to fuel manned spaceflight. We have only two instances of that in American history, which leaves us, as scientists, with the problem of paucity of data to support that contention. But, there's another problem with Hans' model. No president has been gung-ho for space, for space alone. Dr. Roger Launius of the Division of Space History at the National Air and Space Museum has said that President John F. Kennedy was not a space exploration advocate in any real sense. Americans view JFK as the bold visionary that got us to the Moon. However, Dr. Launius says that the Cold War realities of the time were the primary vehicle for an expansion of NASA's activities and for the definition of Project Apollo as the premier civil space effort of the nation.

¹ Ronald F. Lehman II, Director, Center for Global Security Research, Phone: (925) 422-6141; Fax: (925) 422-5252, E-mail: lehman3@llnl.gov

² 25-27 Sep 1997, Pushing the Envelope II: Medicine on Mars and in Other Challenging Environments. University of Texas -Medical Branch and the Center for Advanced Space Studies (CASS), University of Houston-Clear Lake.



Even more significant, Launius argued, from Kennedy's perspective the Cold War necessitated the expansion of the military space program, especially the development of ICBMs and satellite reconnaissance systems (Launius 2003). Launius forces us to look behind the romantic image:

...as president [JFK] had little direct interest in the U.S. space program. He was not a visionary enraptured with the romantic image of the last American frontier in space and consumed by the adventure of exploring the unknown. He was, on the other hand, a Cold Warrior with a keen sense of *Realpolitik* in foreign affairs, and worked hard to maintain balance of power and spheres of influence in American/Soviet relations. The Soviet Union's non-military accomplishments in space, therefore, forced Kennedy to respond and to serve notice that the U.S. was every bit as capable in the space arena as the Soviets. Of course, to prove this fact, Kennedy had to be willing to commit national resources to NASA and the civil space program.... An interesting counterfactual question is what might have happened to Apollo had JFK lived to fill out a full two terms. I am just about convinced that he would have turned off the clock on Apollo, telling the public that the crisis had passed and that the Moon landings could be undertaken on a more relaxed schedule. What we might have ended up with in that setting would be something that looks a lot like the space station program, and fraught with as many political, economic, and technical problems.

JFK spoke about "going to the Moon and the other things," and America went to the Moon. The "other things" were left in the hands of those who came after, and George Bush the Elder committed to getting America to Mars. But, in the end, the first President Bush was countered by the hue and outcry of a Congress floored by the "sticker shock" of the Battlestar Galactica model of Mars exploration.

This brings me to the problem of Congress. Or, I should say, the problem of NASA relying solely upon a budget sculpted by the caprice of the U.S. Congress. Let us be frank here. The overarching goal of manned spaceflight is the expansion of the human ecology. How confident can we be of that goal in the face of the changing Congressional budgetary weather?

The expansion of the human ecology depends upon *long-duration space missions*. Long-duration space missions that will take us to Mars with current propulsion technology can run on the order of two years. That is with a minimal stay on the surface of Mars (about 30 sols on an opposition class mission). To maximize science objectives to Mars requires a longer stay (about 470 sols on a conjunction class mission). Can the U.S. Congress be trusted to sustain an agenda of Mars missions that take three or more years each – perhaps longer than a Congressional term -- to play out? I would not take a bet based on those odds.

Someone once said, "No bucks, no Buck Rogers." In the days that that apocryphal saying was uttered, it meant that it took some real money to loft a "flags and footprints" mission. Well, since that time, we have found out that with a few bucks that we can buy a whole lot of "Mr. Rogers," and by that I mean space science. Those who want to distract our eyes off the prize of manned spaceflight, or keep the national space agenda minimally afloat against the critics of manned spaceflight, tout the fruits of "doing science."

But, manned spaceflight requires more than the kind of money that buys "Mr. Rogers" or even "Buck Rogers." It requires an awful lot of money. For, it requires a sustainability factor that far exceeds "flags and footprints" missions. Maybe what we need is the kind of bucks that gets you "Roy Rogers." And, by that, I mean the kind of cowboy diplomacy to rope a lot of different pots of money from inside and outside of the United States so that a change in Congressional budgetary weather won't strand Americans on Mars.

Strand Americans on Mars because of political and budgetary considerations? That seems unthinkable. But, Americans, along with a few other nationals, were stranded in the Canadian high Arctic in the 1880s (the Lady Franklin Bay Expedition) and Alaskans were stranded on Wrangel Island, in Siberia, and in Manchuria following expeditions in the 1920s to Wrangel, not far off the Alaskan coast (see attached "The Outward Course of Empire: The Hard, Cold Lessons from Euro-American Involvement in the Terrestrial Polar Regions.")



Wrangling and roping a lot of different pots of money from inside and outside of the United States is done all the time by transnational organizations. They are able to tap into funds without regard of national boundaries and other limitations because of the nature of being transnational. Peter Drucker³ gave the criteria for an organization that had transnationalized. He said that the transnational organization is characterized by:

- In its own sphere, transcending the nation-state by setting the common interest of the world community ahead of national sentiments and interests;
- Establishing a sovereignty of its own, recognized by nation-states, and directly controlling citizens and organizations within nation-states; and
- Addressing challenges that cannot be tackled within the borders of a national state.

A great many organizations are transnational in nature today. We can debate till the cows come home whether or not any of them pull together an annual budget that run into the billions that NASA requires to operate a non-long-duration spaceflight agenda each year. Probably some of the organized criminal transnationals bring in the kind of money that NASA nets from Congress every year. If only we could get the global consumership of pornography to send their money to the American space industry. But, the thing I am trying to get across is that the transnationals, legit or not, have the right idea. They are capable of tapping into the global mass economy. It is only a matter of time before a transnational approximates the annual budget to sustain long-duration space missions.

And, of the organizations I have been observing as likely candidates, the International Science and Technology Center has my vote. Why? It has the common interest of a world community fearful of terrorist acquisition of weapons of mass destruction expertise and resources. It has a sovereignty of its own, not just recognized by nation-states but contributed to by nation-states, and controls citizens and organizations within nation-states to greater and lesser degree. It addresses challenges that cannot be tackled within the borders of a national state. Moreover, several of the ISTC's partners are NASA, the space agencies of other countries, and Boeing (as the big industry player).

If the ISTC will not or cannot step up⁴, another transnational organization will be required. There is no other way to sustain a permanent base on the Moon or to establish a beach head on Mars. And, until space is transnationalized at significant policy, management, and economic levels, these goals will remain in the wishful province of the space enthusiast – until the Chinese and/or the Indians claim those worlds. More on the latter below.

At this juncture, it is pertinent to lay to rest four bugaboos of the space enthusiast.

Four Wrong-Headed Ideas About Enabling Long-Duration Spaceflight

- 1) The United States can get to Mars by itself;
 - 2) Bob Zubrin's Mars Direct plan will get us to Mars;
 - 3) Spaceflight on the faster, cheaper, better plan is the way to go; and
 - 4) Commercialization of the space industry will save the day
-
- 1) When my Russian colleagues try to convince me that the United States cannot get to Mars without Russian help because we need Russian expertise, I am not convinced, for I have eyeballed the collection of antiques in the rafters of the Institute for Biomedical Problems and I also know the United States has the technological resources and capacity to do the job by itself. However, they are right that the United States cannot get to Mars by itself, but not for the reasons they think. The United States, with a concerted effort, could have had a conjunction class mission of a stay on Mars of about a year and a half in the 1980s. However, the political will wasn't there. The truth is,

³ Drucker, Peter F. 1993. *Post-Capitalist Society*. HarperBusiness: New York.

⁴ Without doubt, there are many obstacles to a wider participation of NASA in transnational organizations that limit what overtures they can make.



- the United States will never have the political will for long-duration space missions. The mathematics of the structure of our politicians' tenures in office does not solve for this problem. The selling point of transnationals is that they are not solely dependent on the political will of one nation.
- 2) Bob Zubrin's mathematics is flawed and his Mars Direct plan will only get any crew that attempts it killed. I didn't make that up; that is the consensus of smart engineers everywhere who have examined the plan. Oh, and by the way, Bob Zubrin did not make up *in situ* resource utilization (ISRU). That is an old concept that stretches back to the German rocketeers of World War II. Transnational input could merge the best ideas about getting to and being on Mars (and getting back) and stay the course.
 - 3) Mars Direct is an effort to chant along with the "faster, cheaper, better" mantra that has been mouthed in the past several years. Now, while tight budgets can indeed drive "workaround" innovation as a response to necessity, the public relations successes of cheap technological marvels are swept away by the large and devastating goose eggs of lost unmanned Mars missions and a broken up space shuttle and dead astronauts. More on the "faster, cheaper, better" concept below.
 - 4) The commercial space enterprise resides largely in the minds of young fellows running two or three space businesses out of their West Hollywood apartments or dreaming big dreams in the Mojave Desert. I know from experience in trying to bring their most marketable concepts to the venture capital stage that they fold when both their ideas and resolve are probed too much in depth. The transnationalization of space would bring to the table those companies and entrepreneurs that have real contributions to the enterprise and which have the sustainable dreams to make profits in new niches. A few are out there like Burt Rutan who designs, builds, and flies viable aerospacecraft.

The Consequences of the Transnationalization of Space

The consequences of what I am proposing are short, intermediate, and long term.

There is absolutely nothing to lose by strengthening the NASA-ISTC tie. It is a harmless transnational effort with a trustworthy partner, nothing more than a gesture at first. NASA gives nothing up. It continues to aggressively pursue its Congressional funding, but at the same time extends some of its functions to other partners through the ISTC fellowship.⁵ In that way, those formerly all-NASA functions are in line to be funded by other sources of money than they normally receive. Doubtless, there will be many other advantages owing to the policy, management, and economic "workarounds" that present with the loosening of the all-federal, all-the-time paradigm.

My goal is to ensure the sustainability of long-duration manned spaceflight. However, there are many other benefits. Over the short term, transnationalization ensures the survival of NASA as an agency of the United States government, while at the same time expanding its reach beyond that limitation. What I am proposing is to give NASA the flexibility that one of its field centers now enjoys – only on a larger scale. I am talking about the Jet Propulsion Laboratory (JPL) in Pasadena, California. Acting in its best interests, JPL has a reputation for donning its interchangeable hats as NASA field center, independent laboratory, or division of the California Institute of Technology.

A stronger NASA in pursuit of long-duration space missions also means that where NASA field centers are located, there will be relatively long term benefits to the communities that host them. I am thinking in terms of employment, local business opportunities, attractor of human capital, education, and other deliverables.

Over the course of the 21st century, the United States, indeed, the entire world, will be faced with Chinese and Indian hegemonic bids. The space programs of those countries are the symbols of the bids that are on the way. Including the Chinese and the Indians in a transnational space effort will help to divert the energies of Chinese and Indian hegemonic

⁵ Accommodating this would expand the ISTC mission.



bids into a moral equivalent that does not undercut the United States and works for everybody. This is an intermediate term benefit of what I propose.

Over the long-term, the transnationalization of space will expand the human ecology into the Cosmos. It is a mathematical certainty. For, sustainability will allow for the kind of long-duration missions that are required for that loftier goal.

Likely there will be some interesting spin-offs that will accrue owing to a transnationalization of space. For example, catching bad guys. OPS-Alaska is a fairly transnational network on a small scale. Last year, we began to advocate using the Karhunen-Loeve Transform (KLT) to catch bad guys. The KLT is an algorithm that has a variety of uses, but so far is something that has been mainly in the special province of radio astronomers looking for unusual signals in the Cosmos. Yet, exploiting our transnational links, we found Claudio Maccone, an Italian mathematical physicist with Alenia Spazio who is one of the few primary experts of the KLT in the world. Claudio, using the KLT, was useful in salvaging data on the NASA Galileo Mission. He was consulted by the FBI in applying the KLT to iterating over their database of faces. Using the KLT to iterate over audio signals for what we have in mind is a harder problem, but not undoable.

The OPS-Alaska and our Navy Spawar partners' interest was using the KLT to obtain actionable intelligence from incoming and archived electronic signals, to replace the Fourier Transform and Fast Fourier Transform bases of analyzing this traffic. Our intuition from this and other experiences tell us that transnationalization enhances knowledge transfer for the betterment of all.

My Experience With Transnationalization

I learned about the awesome power of transnational organizations early in my career. First, during a time from the late 1970s through early 1980s when I investigated with two federal task forces those transnational criminal groups doing business in the Trans-Alaska Pipeline start-up venue. Second, when the world's greatest Afghanistan expert and I paved the way for U.S. State Department relations with Central Asia through our creation of a transnational organization that enacted a transnational project.⁶ Somewhere along the way, I got routed to graduate school and became a social and behavioral scientist who studied problems unique to human groups in extreme environments, which includes those problems unique to long-duration space missions. My experiential background is expanded on in the second document in this upload: *From LEO to the Moon and Beyond: Human Factors Safety Concerns of Space Stations and Other Human Environments Away From Earth*.

My expertise with the behavior and performance of human groups in extreme environments made my acquaintance with a space station simulation being planned by the Institute for Biomedical Problems in Moscow, Russia. This, in turn, led to my familiarity with the International Science and Technology Center.

BELOW: To left, view of the Institute of Biomedical Problem's (IBMP's) space station simulator in Moscow, Russia from the catwalk; to right, me, Marilyn Dudley-Rowley in the hatch of the small chamber module. I played an influential role in the Russian space station simulation study during 1998, in the vein of *pro bono* work for NASA.⁷ As things turned out, the IBMP connection helped me

⁶ The 1981-1982 rescue/relocation of a subpopulation of Kirghiz to Turkey.

⁷ A lot of free work was ounced out of me by the simulation's Senior Project Coordinator, Dr. Vadim Gushin, who initially told me that NASA was fronting American participants. None of my NASA contacts disputed this impression. And, I also edited some documentation for the IBMP that demonstrated the NASA-IBMP interface. As things played out, NASA might have initially been involved, but had backed away from the simulation before crews were contained inside. Among the hats I wore and tasks I performed in service to the simulation were: principal investigator of two projects designed for containment in the Russian simulation, recruiter of non-Russian crewmembers, liaison for inclusion of other principal



in my connection to the International Science and Technology Center, an intergovernmental organization whose mission is to keep WMD expertise and resources out of the hands of rogue states and terror warlords. The organization directs funds from a variety of agencies and companies from several member-countries to scientists and engineers in Russia and its former republics. They receive funding for projects that run the gamut from fighting poultry viruses to designing human missions to Mars. The United States sends funds through the ISTC from Boeing, NASA, the U.S. State Department, *et al.*

(Picture deleted to save KBs)

The ISTC connection is responsible for the various news stories coming from Russia about Russians leading the charge in going to Mars

The Globalization of Space

Transnationalization is a twin phenomenon of *globalization*. Long-duration space policies, management structures, and systems might naturally evolve with the "globalization of space," however, understanding the process permits some degree of tweaking.

I have spoken at length elsewhere on how space exploration has contributed to the globalization phenomenon afoot in the world. However, space exploration does not stand apart from the globalization process. It is part and parcel of the thing it has magnified. The globalization process, therefore, requires us to re-think the exploration of space.

The investigation of the globalization of the use of resources, products, industries, economies, and technologies is a special province of macrosociology, the study of the world system of societies. The macrosociological perspective holds promise in the prediction of social phenomena, to include public policy and the redefinition of public services, by observing how aspects of world populations, organizations, environments, and technologies interact upon each other over time. Special circumstances of increasing organizational complexity (like the emergence of the transnational organization), emerging environments (like "cyberspace" and Low Earth Orbit [LEO]), and the technologies which pertain to these (like the Internet and space stations) are globalizing space.

A salient example of the globalization of space is the International Space Station (ISS). It is widely thought, even among government executives, that the ISS is an American-sponsored project where we "permit" the space agencies of other nations to participate. This is a gross oversimplification. We wouldn't be able to have much of a space station without our Russian

investigators' projects, liaison between the IBMP and IBM and other for-profits and non-profits, author of the medical interrogatories the IBMP used to initially clinical screen simulation subject-candidates from outside of Russia, author of the technical note on hygiene for female participants, liaison between American clinical consultants and the Russian clinical team at the IBMP, and editor of some IBMP-generated articles for the non-Russian scientific press. At some point during my participation, I was unexpectedly asked to be a member of the non-Russian crew on one of the tours-of-duty. I took a cosmonaut physical at the IBMP clinic that was similar to the kind of physical that the *Mir*-NASA astronauts took. I had to decline containment as a crewmember, however, in the end. Mainly, I couldn't participate because the schedule for the start-up of the simulation was time-slipped so badly that my participation would have precluded my academic and research commitments for the academic year 1999-2000. Seeking another favorable time window in the schedule for the participation, I offered to switch tours-of-duty with Judith LaPierre, the Canadian and only other female selected for the simulation, but she was unable to switch. I was also becoming dissatisfied with the Senior Project Coordinator's lack of ability as my interface with the IBMP. Little questions, the type of which are concerns for Americans who work for a living, could not be answered. For example, would I be guaranteed a telephone line inside the simulation to make my monthly credit card payments in time or make financial transfers among bank accounts?



partners. We had to make them crash their beloved *Mir* to focus their effort to help us get the station up and running.⁸

There are a number of historical and economic correlates to the globalization of space. These are: 1) the technological legacies of World War Two, such as advancements in aviation, nuclear energy, computers, and rocketry; 2) the subsequent related historical events following World War Two, like the Cold War and the Space Race; 3) the advanced systems development management procedures which emerged during World War Two which were invented to undertake large one-of-a-kind projects which incorporated significant advances in new technology; 4) the impetus this management protocol gave to the emergence of transnationalization; and 5) the rise of computer technology, especially in the reduction of size of computers and the increase in their functions, and in the birth and expansion of the Internet, its technical infrastructure, and its business paradigm.

These correlates, among others, not only set the stage for the globalization of space, but also for its correlate, the long-duration space mission. In truth, longer duration space missions have been possible for nearly three decades, as the Russians have so adequately shown during three generations of space stations. But, a long-duration space mission was not necessary during the early days of the space program when the primary goal was to beat the Russians to the Moon. It is, however, necessary to almost anything else of value done in space, regardless of it being a robotic or manned mission; that value determined by the globalization of many aspects of populations, organizations, environments, and technologies.

Now, it is a sociological fact that just because societies have on-the-shelf technologies to deploy, it does not follow that they *will* deploy them. Political, economic, and other forces, perceived and actual, have always delayed or denied entrée to some technologies in many societies throughout history. On the other hand, political, economic, and other forces are shaped by technology and technological feasibility. It is the advancements in computer technology that make industrial societies entering the 21st century markedly different than they were five decades ago. The computer and the infrastructure of that technology have combinatorially increased the power of existing space technology by many powers. Microcomputers decrease the reliance of spacecraft on the Earth for telemetry tracking and control. Spacecraft can do far more if they have onboard computation power for stored logic. If, for instance, a communication channel goes down, the spacecraft can move to another channel, or it can go to a backup mode for position, or it might exercise its thrusters to move to another orbit (Karas 1983, p. 33). They are in a sense "self-healing and self-navigating" (p. 33), and this gives spacecraft an autonomy that was not especially necessary for a short-duration mission, but is absolutely essential for a long-duration mission. That is not all. Computers make possible the speedy identification, definition, and solution of simultaneous equations necessary for optimizing individual component performance within advanced systems. It is the advanced system project in its most comprehensive sense that has led to the rise of the transnational organization. The computer and its infrastructure have helped make possible a new complex social organization.

We are making some interesting discoveries now that the Cold War Era and its Space Race are history. What we are finding out is that the space exploration effort is much more than a national demonstration of technology⁹ as once it used to be for the United States and Russia. It is illustrative of:

- 1) very unique engineering solutions ironically engendered by tight budgets and hard economic times; and

⁸ I recognize the political utility of including the Russians as partners in the International Space Station, which many will argue was the only reason for bringing the Russians along. However, technological considerations that the Russians could respond to *cheaply* and relatively quickly were part of the equation.

⁹ However, in the case of China and India, space exploration successes will serve as a booster of national confidence and wide popular support to fuel hegemonic bids mid- and end-of-century, respectively. Their successes in space will translate out to many gains on the ground.



- 2) the invention of new social forms engendered by our entree into long-duration extreme environments and the unprecedented level of international cooperation required for human permanency in space.

As has been outlined many times elsewhere, the survival of the human species, near-term and long-term, depends on expansion into the solar system: to gain the experience of living and working indefinitely in extraterrestrial environments and to locate a breeding population off-planet, among other specific reasons. The late Carl Sagan referred to this as "getting our eggs out of one basket." The United States possesses the resources and knowledge base to foot the first critical steps of the expansion, but has, at least two times, let the opportunity pass: 1) when Congress cut the legs out from under a sustained lunar program and the von Braun Mars plan and 2) when the Space Exploration Initiative (SEI) was dismissed out of hand from "sticker shock".

It is in the common interest of the world community to expand into the solar system. However, it does not seem likely that the United States, the most powerful nation-state on Earth, will be able to transcend "political drag" and other forces to accomplish this. What is needed is a transnational organization that can acquire the expertise and resources to undertake long-duration space research and missions, to command sovereignty, and thus address the challenge of solar system expansion and production. Yet, at the same time, whatever transnational organization emerges has to include NASA, which still leads in space expertise. Its consortial relationships with businesses, non-governmental entities, other federal agencies, and the International Science and Technology Center are important steps. Just as crucial is NASA's relationships and encouragement of other national space agencies, to include the Russian Space Agency.

However, we must be wary of a number of obstacles. For one, unless we are talking about the employment of nanotechnology, small is not all that beautiful in the space enterprise. "Faster and cheaper" is not necessarily better. For, "faster" frequently has come to mean cutting corners like not checking units of dimensional analysis to see if "miles" have been erroneously substituted for "meters". "Cheaper" has meant "deeper" on at least two occasions, as when NASA augered in the *Climate Orbiter* and probably also the *Mars Polar Lander* into the regolith of Mars. This same "on the cheap" policy created the largest aerospace debris field in the history of the world with the *Columbia* disaster. The "faster, cheaper, better" policy was doomed to get NASA into trouble from the start. A cold eye on this policy shows that it has been little more than a public relations slogan mouthed against the backdrop of a large capital project, the largest engineering feat since the Panama Canal and the Trans-Alaska Pipeline, that has been hiding in plain sight over our heads. I am talking about the International Space Station.

Overcoming this and other obstacles require the encouragement of NASA to engage in consortial, transnational relationships that allows it to do a proper job, to include series of long-duration manned missions.

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This concludes the OPS-Alaska information on this solution to a critical consideration of ensuring sustainability of long-term space projects.

Please see our other informational products that respond to this NASA Exploration Systems Enterprise Request for Information:

II. From LEO to the Moon and Beyond: Human Factors Safety Concerns of Space Stations and Other Human Environments in Space

Focus Area: Design Principles, Objectives, and Guidelines

III. To Mars: Assured Communication With Mars (MARSSAT)

Focus Area: Crosscutting Design Drivers and Architecture Elements

Also, you are invited to see our NASA RFI response, re-uploaded at this time, originally dated 12 Feb 2004 and sent to Ms. Lori Conroy (lori.a.conroy@nasa.gov) and Ms. Lisa R. Phillips (lisa.r.phillips@nasa.gov), Reference: 9-BJ4-JKQ-4-001R, PRESOLICITATION SYNOPSIS: AN ORGANIZATIONAL BEHAVIOR ANALYSIS OF THE INTERNATIONAL SPACE STATION PROGRAM OFFICE, NASA-JOHNSON SPACE CENTER – AN EXPERT TEAM APPROACH

Focus Area: Program Management, Acquisition, and Interfaces

Sincerely,

Marilyn Dudley-Rowley, Ph.D
OPS-Alaska, Founding Researcher

cc. Mr. George Abbey, Mr. Ron Lehman, Dr. Hans Mark, Rep. John Culbertson, Rep. Kevin Brady, Rep. Nick Lampson, Rep. Sheila Jackson Lee, Rep. Tom DeLay, Rep. Chris Bell, Rep. Gene Green, Rep. John Carter

The Outward Course of Empire

The Hard, Cold Lessons from Euro-American Involvement
in the Terrestrial Polar Regions

Marilyn Dudley-Rowley



**An Update of a Paper Presented at
the Founding Convention of the Mars Society,
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Abstract

In the late 1800s and the early part of the 20th century, American explorers had a vision of the polar regions as a logical extension of Manifest Destiny. Vilhjaimur Stefansson, however, had a different viewpoint, referring to the entreé into the Arctic by Euro-Americans as "the northward course of empire." Popular history would have it seem as if this vision came true. But, approximately 100 years later, we substantially fall short of these explorers' dreams. Most American claims in the Arctic fell through, not from lack of interest by average Americans, but the lack of government sponsorship, backing, and going back on promises made. Even the purchase of Alaska from Imperial Russia was a transaction that was almost not made. In expedition after expedition, men, women, and children died in the field waiting for pick-up from ships that would never come.

Ironically, what interest there was for the Arctic eclipsed a promising beginning of interest in the Antarctic. American explorers either had to pass themselves off as foreign nationals to join the expeditions of other countries or use their own money to launch expeditions to the southern continent. Interest in aviation caused the government to establish the United States Antarctic Service (USAS) and bases were established to protect territorial claims. However, the onset of World War II drew resources away and the bases were closed, and when the United States returned to Antarctica, it was with a different strategy of scientific investigation. In 1959, twelve nations signed the Antarctic Treaty, agreed to use Antarctica for peaceful purposes, "froze" territorial claims, and forbade new ones. The Antarctic Treaty set the tone for similar agreements among nations which dictated similar use of the entire Cosmos.

This presentation points out that the two polar regions represent two separate kinds of human progress, and reviews lessons from Euro-American polar exploration useful to the Mars initiative, making recommendations for the public outreach and financing of the venture.

The polar regions have had a way of luring people out of a temperate-zone mentality and bringing nations into conflict and cooperation.

In the late 1800s and the early part of the 20th century, American explorers and their supporters had a vision of the polar regions as a logical extension of Manifest Destiny. Broadly speaking, Manifest Destiny meant that Americans were a chosen people ordained by God to create a model society. Specifically, it referred to a conceptualization of American expansionists to extend the boundaries of the United States from the Atlantic to the Pacific; and later, it was used to annex a number of territories and to justify involvement in Mexico, Cuba, and the Philippines (*Encyclopedia Britannica* 1979, p. 567). So confident that Manifest Destiny would legitimize their activities, Euro-American gold prospectors, trappers, and hunters entered Siberia from Alaska in search of life, liberty, and the pursuit of happiness. Following their own expansionist policies, Russians moving eastward stumbled over these Yankees and their influence on many occasions. Russian explorer Innokenty P. Tolmachoff came upon an American prospector and trader, a Mr. Wall, living at Serdze-Kamen Cape on the northern shore of Anadyr Bay, married to a Chukchi woman, during his Siberian expedition



of 1909. A number of Chukchi in this area could speak English fairly well, too (Tolmachoff 1949, pp. 208-209).

Awareness of lands to the south of Magellan Strait seems to have emerged in the 1500s, and by the 19th century, Dutch, Portuguese, French, British, Russian, American, Belgian, German, and Norwegian ships were making exploratory, scientific, whaling, fishing, and sealing voyages to Antarctica. The early 20th century brought a number of heroic interior and aviation explorations of the continent. Territorial claims by several nations were made or implied. Although Germany never made any claim over Antarctic territories, it mapped Antarctica extensively by air in 1938-1939 and used the subantarctic Iles de Kerguelen as bases for resupply during World War II. German ships based there destroyed approximately 193,000 tons of allied ships (Mericq 1987, p. 68). The prospects of aviation and the military significance of Antarctica caused the American government to establish the United States Antarctic Service (USAS) and bases were established to protect territorial claims. The military significance of Antarctica is this: "Control of Antarctica allows a tie between the Atlantic and Pacific oceans and improves the potential logistic support by air and maritime forces (P. 45)."

Ironically, what interest there was for the Arctic eclipsed a promising beginning of interest in the Antarctic. American explorers either had to pass themselves off as foreign nationals to join the expeditions of other countries or use their own money to launch expeditions to the southern continent. American James P. Shetland was on the 1821 voyage of Fabian Gottlieb von Bellingshausen who served Czar Alexander I of Russia and who made it south to the islands which bear his name (p. 7). In 1823, the American Nathaniel B. Palmer in the company of a British crew hunting sea lions discovered the South Orkney Islands (p. 7).

Using the Arctic as an example, Vilhjalmur Stefansson called the Euro-American expansion into the circumpolar world, "the northward course of empire" (Stefansson 1922). The concept of this northward course of empire is part of a larger idea. This larger idea conceives of human progress continually moving away from tropical and temperate-zoned lands. (It is also called "the coldward course of progress".) Stefansson saw the Arctic as one of the new cradles of civilization for humankind. Other authors voiced similar-sounding sentiments in the titles of their books about northern lands: *The Path of Empire* (George Lynch 1903), *Lost Empire* (Hector Chevigny 1944), *Quest for Empire* (Kyra Petrovskaya Wayne 1986). But, they were only depicting Manifest Destiny or the Russian version of it. Stefansson and his antecedents were talking about something else: the breachment of humanity from its lands of origin, and with that, the common use of the Arctic for humanity.

Euro-American efforts in the Arctic seem to have taken after the model of Manifest Destiny, however, than after the "coldward or northward course of progress." Manifest Destiny operated in spite of lack of national commitment to foresight and the future and the politics of the moment, which often translated out into the lack of government sponsorship and backing. Where sponsorship and backing were evident, promises and effort often did not come through. For example, even when the United States had international competition and motives to acquire polar lands, it tended to put its best interests on the back burner. The Alaska Purchase was a case in point. Alaska is an enormously rich and strategic country which was appreciated by a number of 19th century American statesmen and a good portion of the public. A number of presidents prior to the Andrew Johnson administration had considered the purchase of Alaska from Imperial Russia. The stated reasons were many: (1) the profitability of the fisheries of the Pacific Coast; (2) resistance to the occupation of the Northwest Coast by another nation, such as Britain; (3) the establishment of the United States as a Pacific power; (4) to annex British Columbia; (5) to secure unlimited American commerce with China and Japan; and (6) a feeling of friendship for Russia by the United States (Shiels 1967, pp.1-3). The issue went back and forth till the Johnson Administration. When the principals in the second largest land deal in history finally transacted the Treaty of Cession on March 30, 1867, there was much difficulty with the American payment of \$7,200,000. The 19th century version of insufficient funds occurred—in other words, the American check bounced twice. Following the October 18, 1867 formal ceremony turning over Alaska to America, undisciplined American troops abused the Russian citizenry so badly that most returned home (Cohen 1996, p. 48). All those who stayed or came into Alaska from then on out "complained bitterly about the



inefficient and often corrupt Army rule (p. 52)." In 1877, troops in Alaska were pulled out to deal with a rebellion of Nez Perces in Idaho and Montana (p. 51). Although Alaskans were happy about that, they were left unprotected and with no police to enforce any law and order. The street fighting in Sitka, the colonial capitol, and strife between whites and Tlingit got so bad that the British warship *Osprey* steamed into Sitka harbor on March 1, 1879 and turned its guns on the Tlingit village near Sitka. The captain announced that he was staying until the U.S. government did something about protecting its own citizens (pp. 52-53).

The Lady Franklin Bay Expedition in the Eastern Arctic was organized in response to an international polar science project. Officially mandated, it was shabbily put in motion because of Congressional and military mis-coordination. When the expedition got in trouble owing to the bumbling of the pick-up ships under the command of the U.S. Navy, the government simply abandoned 25 healthy expeditioners. As a result, only seven men survived, and Commander Adolphus Greeley has gone down in popular history with the "bum rap" of being an incompetent leader. Digging into the facts of the expedition, however, one finds that it was the efforts of Greeley's wife, who through much networking and private means, got a bounty imposed among international naval, whaling, and trading vessels for the rescue of the party. Without her effort, there would have been no survivors. Fort Conger, the scientific and military post established by Greeley in the Eastern Arctic, does not seem to be ever again used by Americans until Peary and Henson used it for an emergency stopover in the early 20th century.

The Wrangel Island debacle is similarly tragic. And, it is a matter whose issues extended into the latter half of the 20th century. Stefansson had already embraced the concept of "northward course of empire" by the time he organized the Wrangel Island colonizing expedition of 1921. Wrangel is a sizeable island lying about 90 miles off of Cape Jakan off the Chukchi Peninsula and not far from the northwest coast of Alaska. Stefansson launched the Wrangel Island Expedition for several reasons: 1) as part of a continuing campaign to debunk the extreme image of uniform hostility of Arctic regions which was popularly held; 2) because at the time a million square miles of the north polar region was still unexplored; and 3) for a stopover of the fledgling air transport industry (Stefansson 1925, pp. 69-72). However, to attract funding for the expedition, he advanced Manifest Destiny arguments rather than the more intellectual and social evolutionary "northward course of empire" credo.

Wrangel Island was known by Native peoples of the Arctic and was a waypoint on the proto-historic route to Point Hope, Alaska, an early center of Arctic civilization. Native informants told explorer Lieutenant Ferdinand Wrangel the approximate location of the island. Wrangel, in the employ of Imperial Russia, testing the theory of a high northern continent, never actually saw the island. It was the British who found it looking for Sir John Franklin's lost expedition in 1849. At that time, it was taken possession of in the name of Queen Victoria (Stefansson 1925, p. 18), but promptly neglected by the British for the next 32 years. Then, in 1881, an American expeditionary team landed on the island (p. 12), constituting an American claim, particularly in light of the Treaty of Cession which fixed one boundary of the Purchase of Alaska as "to the Frozen Sea." (Wrangel Island lies within the semi-permanent pack ice.) However, by the end of 1916, the Russian ambassador in London had given notice to the United States that territories and islands situated in the Arctic Ocean and discovered by a 1911 visit by Russian icebreakers were being claimed by Russia. Wrangel Island, however, was not specifically named (p. 22).

Stefansson sought funds from Britain and Canada on the basis of their claim of the island. Funds and support promised to him by those countries fell through because of interminable political dickerings, the competing claims of the four nations involved, and by the momentum of world events. The poorly stocked expedition failed in the face of a period of scarce game on the island. By the time a proper rescue could be mounted, only one survivor remained of the Wrangel Island Expedition. It was only through a private network that Stefansson raised enough funds to retrieve the lone survivor (pp. 157-169) and send replacements to the colony. Two families and three bachelors from Alaska were recruited to occupy Wrangel Island (Webb 1981, pp. 85-87). Great Britain and Canada remained disinterested in pursuing their claim on the island in the meantime. Financially at the end of his rope, Stefansson sold his



property and improvements on Wrangel Island to Carl Lomen of Nome, who headed the largest reindeer industry in the United States (pp. 89-90). Lomen traveled to Washington, D.C. to consult with the Secretary of State on his plan to reinforce the United States' claim on the island. Secretary of State Charles Evans Hughes essentially told him to "go and hold it" (p. 91). Shortly thereafter, the British renounced their claim on Wrangel Island and the Soviets sent an armed vessel *Red October*, to the island "to imprison all inhabitants, confiscate all goods and furs, and establish Russian ownership of the island (p. 92)." Once there, while the officers of the *Red October* confiscated the colonists' four gunny sacks of skins and ivory for the Soviet Union, they failed to mention to them that they were under arrest. In fact, they were treated courteously and told they would be returned to Alaska (pp. 94-95). That was not the case, however. They were taken to Vladivostok in the middle of November 1924. The Eskimo members of the colony were permitted to work. The health of the one white man, bachelor Charles Wells, however, began to fail and he had to be supported by a friendly Soviet official and an American trader with a permit to do business in Siberia (pp. 96-97). One of the children died while the Americans and Soviets dickered over the Russia-America boundary referred to in the Alaska Purchase's Treaty of Cession (p. 97). Hampering negotiations was the fact that the U.S. did not then recognize the Soviet Union and had no direct diplomatic relations with them (p. 99).

When it was found that the cost of transporting the colonists from Vladivostok to Seattle would cost \$1,600, Secretary of State Hughes told Carl Lomen that the State Department had no funds available for their relief or transportation (p. 98). When Lomen pointed out that the Eskimos were wards of the United States, the State Department backpedaled from Secretary Hughes' earlier stand, saying that the United States "at no time asserted a claim to Wrangel Island" and that the Lomens should have foreseen complications (p. 98). Both Lomen and Hughes appealed to the American Red Cross for help (p. 99). The Soviets next ordered the colonists to leave Siberia for Harbin. By this time, Charles Wells was ill with pneumonia and could not travel. In crossing the border into China, the American Consulate Officer there told Chinese officials that the Eskimos were not American citizens which led to their being detained in a hotel (p. 99). Another child died in detention. Back in Vladivostok, the Soviets sent word to the Americans that Wells would not be allowed to leave until the United States apologized for a boundary marker placed on the Siberian coast by a United States Coast and Geodetic Survey ship. No apology needed tendering because Wells died three days later on 8 January 1925 (p. 100). On January 10th, the United States Secretary of the Interior acknowledged that the Eskimos were wards of the American government, but also voiced the claim that there were no funds available for their transportation. Finally, the American Red Cross broke down and advanced the money and the Eskimos were permitted passage on a Japanese steamer. In Seattle, waiting for transportation to Alaska, another child drowned (pp. 101-102). Carl Lomen and his family and friends continued to fight for the American claim of Wrangel Island and for reparations. The American and Russian dust-up over Wrangel Island did not abate until 1974 through the Mutual Protocol Agreement which permitted exchange of scientists, which allowed one American ornithologist to do fieldwork on Wrangel.

In Antarctica, World War II would draw resources away and the American bases were closed. However, the United States did not back away from the southern polar continent:

The United States is the chief architect of law and policy for the Antarctic. For over three decades the United States has exerted the political and diplomatic clout necessary to enhance and expand the legal regime governing the Antarctic continent and Southern Ocean. In fact, the legal basis for U.S. involvement in Antarctica stems from the 1959 Antarctic Treaty, an agreement originally called for and substantially forged by the United States (Joyner and Theis 1997, p. 1).

The Antarctic Treaty of 1959 stemmed from an American initiative (p. 1). Its central theme is the international preservation of the continent for scientific and peaceful purposes. It works along the line of consensus led by the duopoly of the United States and Russia (Peterson 1988, p. 212; Joyner and Theis 1997; Vicuna 1988; Suter 1991; Stokke and Vidas 1996; Jorgensen-Dahl and Ostreng 1991; Francioni and Scovazzi 1996; and Klotz 1990). The twelve



nations which signed the Antarctic Treaty acknowledged that there were competing or potential claims among signators but that the Treaty would not settle these, but rather forbid any new ones. As one legal scholar has noted, "...it is no more than the grandest internationally agreed upon 'question begging' that diplomacy has devised (Haley 1963, p. 122)."

The International Geophysical Year of 1957-1958, a year of scientific research and cooperation, led to the Antarctic Treaty of 1959. It also led to the development of the law in space (Haley 1963). The model for the handling of sovereignty over celestial bodies is Antarctica (p. 121). On December 13, 1963, the General Assembly of the U.N. adopted an "Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space" which advocates exploration and use of outer space for the benefit and interests of all mankind; and declares that outer space and celestial bodies are not subject to national appropriation (Jenks 1965, pp. 317-318). When the United Nations Moon Treaty was up for ratification in the early 1980s, the United States backpedaled away from it and its language about lunar resources in terms of "the common heritage of mankind", a phrase found in Antarctic Treaty System (ATS) documents (Simpson 1982, p. 12). A stumblingblock appears to have been the issue of mineral resources, the same issue which has come up in international law concerning Antarctica in recent times (Vicuna 1988).

This notwithstanding, the ATS is a model of progress in human cooperation. Antarctica, its treaty system, and its precedent for the use of the Cosmos appears to be more in line with the model of the northward or coldward course of progress, in spite of its sticking points. The Manifest Destiny model of expansion in Antarctica was effectively nipped in the bud with the expense of World War II and the evolution of the Antarctic Treaty System itself.

Let us now return to the Arctic in its more modern incarnation. The futurist R. Buckminster Fuller's vision of the Arctic had the tenor of Stefansson's "northward course" ideas. Fuller saw the Arctic regions as a kind of world heartland where Arctic rivers could provide hydroelectric power for all of the planet (Fuller 1979). One has only to remember geopolitical theorist Halford MacKinder's maxim: "He who controls the heartland controls the world" to understand how Manifest Destiny proponents would view this. The Fuller vision has not come to pass.

In actual fact, the irony has been, the Manifest Destiny model accounts for the permanent human presence in the Arctic, and its lack of usage in the Antarctic goes a long way in explaining why there are no permanent Antarcitians. (This is not forgetting the relative proximity of overland routes to the Arctic from temperate-zoned centers of population and the lack of a thick ice cover except in Greenland, in contrast to Antarctica.) Everything being equal, there are a number of human features of the Arctic landscape missing from the Antarctic. A few are as follow. An overriding feature found in the Arctic is the presence of people who live and work there for other than scientific reasons. In Antarctica, with perhaps the exception of a couple of Argentine and Chilean bases, families do not make Antarctica their permanent address.

In the Arctic, military bases, installations, and submarine activity which have emerged during World War II and the Cold War have kept a third world war at bay. The Antarctic Treaty restricts a military presence in southern polar lands.

The Trans-Alaska Pipeline (TAPS), the largest construction project since the Panama Canal, keeps the United States from being held hostage by other oil-producing nations. Other countries having Arctic lands also exploit oil and gas there. In fact, Russian experts were consulted in the construction of the TAPS in Alaska and a lot of technology was invented on the spot as a result. Environmental activists also played a role by forcing pipeline builders into upper levels of technology to protect the Alaskan environment. In Antarctica, oil and gas exploration has just begun and is stymied by the ATS, as any mineral exploitation has been. Most authors writing about mineral exploitation in Antarctica cite technological problems anyway. But, the first hurdle is the ATS itself. It has been pointed out that a "third stage" of Antarctic development has dawned (Mericq 1987, p. 31)", but no one seems to know how to proceed.



Highway systems crisscross many of the lands of the northern polar regions. The Alaskan-Canadian Highway (Al-Can) was built in response to Japanese encroachment in the Aleutians during World War II. In an effort to bring their transportation network into the 21st century, Alaskans have even been discussing building a bridge or tunnel over the Bering Strait, not an insurmountable piece of engineering which would bring economic relief to the people of Siberia, cause economic growth in Alaska, and change the world in a landmark way. Regular transportation networks are instrumental to human permanency. Antarctica is a land where no conventional roads are possible. Antarctic workers must depend on aircraft and over-the-ice vehicles for travel from station to station or fieldwork. Perhaps Antarctic tourism will introduce some kind of regular transportation network on the continent, but stauncher supporters of the ATS think that what tourism exists should be curtailed.

It is clear there are two disparate models of human progress operating in the two polar regions respectively. This dichotomy more or less tracks with the dichotomy of *res nullius* and *res communes*. *Res nullius* is a legal and political position which means that lands with no owner can be appropriated and subjected to national sovereignty and jurisdiction. *Res communes* is a legal and political term meaning "belonging to all", and not subject to appropriation and national sovereignty for any purpose, but subject to exploitation for the benefit of all humanity (Mericiq, p. 58). I have identified, for the purposes of this paper, the dichotomy of Manifest Destiny vs. the northward or coldward course of empire. In the Arctic, Manifest Destiny seems to have played a role in bringing population from all parts of the world there and setting up a human infrastructure for them there. The drawback of the Manifest Destiny model is that it was expensive in terms of lives and fortunes lost. The model wavered in whatever political winds happened to be blowing in the world and not all Arctic lands reached the potential of their explorers' dreams.

The northward or coldward course model represented by the Antarctic, exalted science and technology as tools of diplomacy and served as a laboratory for international cooperation. The drawback of this model is that the environmental exploitation necessary to ensure a permanent residence for human populations has not been achieved.

The exploration and settlement of Mars cannot tolerate a loss of too many lives and fortunes. It cannot be held hostage to the winds of world politics. And, it must rely on the exploitation of a fragile and pristine environment for humans to make a go of it there.

1. The first lesson to be learned from these examples is that Mars settlement will require an amalgam of the Manifest Destiny and northward course models. This hybrid model will require international cooperation to set up the human infrastructure on Mars. But, once ensconced, the settlement will need a certain amount of autonomy to exploit the planet for their immediate needs and also for the long-term success of the settlement. Their multinational sponsors must be prepared to allow self-government among Mars settlers and to permit them stewardship over the planet. It will be a frontier society in a very large territory a long way from Earth.

What other lessons can we learn from Euro-American exploration?

2. For any one government to keep a Mars exploration and settlement agenda, a large and serious enough threat must be perceived and Mars must be viewed as a solution to that threat. Several such threats can be imagined. The *first* is the threat of world-wide nuclear war. While the threat of nuclear war between Cold War superpowers have abated, other nations pose risks with their nuclear brinkmanship. Casting about for a moral equivalent of war, the scientific enterprise is a good candidate. What greater scientific enterprise than something so big that many nations, former combatants, have to work toward meeting the goal? Mars is such a goal. Antarctica, but more to the point, the International Space Station project are good exercises in such cooperation necessary to attain Mars. The *second* threat which makes Mars an attractive solution is world overpopulation. One demographic school of thought warns



that world population is growing out of control; another model demonstrates that as nations industrialize, they bring their populations down. The truer picture is probably made up of both predictive models. Industrial nations do bring their populations down, but there are plenty of non-industrial countries whose birth rates are many times those of industrial and post-industrial nations and whose death rates do not cancel out this effect. They enjoy to greater or lesser degree the benefits of the one-world economy. Birth rates are not tempered by old-time horticultural or agrarian agricultural death rates owing to modern medicine, nutrition, and sanitation. In addition, human longevity is on the rise in the world as well. World population stands at about 6 billion persons at the moment, but soon there will be many more billions. Mars can be terraformed (minimally) in almost the same amount of time that petroleum explorers take to ready an oilfield for production.¹⁰ In a few generations, the fourth planet out could be ready to receive the human overflow. The *third* and largest threat to which Mars is a solution is getting "our eggs out of one basket." That phrase has come to be associated with the overwhelming threat of asteroid and cometary impact to Earth. As Gene Shoemaker said, the Earth moves through the Cosmos as in a hail of bullets (National Geographic Films). Implanting a human population on Mars would increase our chances of not becoming extinct following an impact event. Developing the technology for the seeding of Mars with a human genome would in turn produce better technology to protect the Earth. Related to this vein of thought is a *fourth* more exotic threat which is of no immediate relevance, but I will mention it anyway: passive extinction. All species which have ever lived on planet Earth run the risk of losing out over the course of time in the constant adjustments and accommodations made between their genomes and changing planetary environments. The human species is just as vulnerable as any species. Sending a human population to Mars might increase our genetic vigor by allowing this group to differentiate in subtle ways, away from Earth humans for the most part, with little gene flow between.

3. A third lesson from the polar record is that investments will flow into exploration and settlement of Mars if it is presented as a marketable resource. The dawning of the 22nd century could hold in store at least a two-world economy, requiring a re-engineering of systems of supply, demand, capital, and production. Whenever exploration is presented as a business solution, it has gone forward typically. The collective influence of multinational corporations far outweighs the efforts of national governments. We must not bind Mars up too tightly under some kind of treaty system like the Antarctic Treaty System or through some kind of legal lands lock-up such that business opportunities are stymied. Nature will take its course and Mars-grown ecopolitics will prevail as a regulatory mechanism against over-exploitation. Concern over the resources of Mars, which are renewable and which are not renewable, will bring the Green Movement to the Red Planet. Green concerns will feed back into the exploitation and terraforming effort and make for better technology and products.

4. Another obvious lesson that can be gleaned from the polar record is to expect a lot of attempted government intervention in the agenda of exploration and settlement, but to expect very little government help, even in terms of rescue of explorers and colonists.

5. A fifth lesson from the polar record shows that the more overlapping and interconnected networks acting in the interests of the expedition are, the better off it is. Mars exploration and settlement should be more than just a grassroots effort. It needs to be a virtual, if not actual, joint venture with the

¹⁰ The "best case" scenario. It is probably not possible to permanently make over Mars to resemble the Earth.



grassroots organization, with the public, with governments, and with major corporations, with the grassroots consensus taking a proactive, guiding role.

6. In a related vein, the sixth lesson that can be teamed from human activity in terrestrial polar regions is the worth of cultivating private backer networks from among the public. Rather than wait to solicit private backers through a public appeal when the going gets tough, devise and depend on a private resource pool from the beginning, while at the same time cultivating all the other support networks. The media must be harnessed to accomplish this task, with the Internet providing a personal interface with backers. Virtual communities make individuals in large populations powerful, creating a strong collective influence. The polar record shows that the public's imagination is seized by exploration. The task is to convert that imagination into a motivation to provide the resources to explore and settle Mars. There has always been a "reserve army of explorers" in this century. This is nowhere better illustrated than with the Cold War Baby Boomers who thought they would live on the Moon, beneath the seas, and travel to Mars. The *Weekly Reader* told us so. However, few structures were in place to sustain the Boomer interest. As Hans Mark has said, "...the nation's space program has only one important constituent: the President of the United States." He maintains that only John Kennedy and Ronald Reagan cared much about space exploration. He says that he sees no evidence of a voting bloc of Boomers to support a strong space program (Mark 1997). He has a point. Perhaps no voting bloc has existed because no one really presented the Boomers with an opportunity to vote on issues directly relating to space. A Mars initiative must rely on the consensus of backers. It bucks the old presidential consensus-of-one model. And, this is important; the initiative must rely not only on the new generations, but must rekindle the feeling of the Baby Boomers for space exploration. It can be done. I recently gave a lecture on Mars in a Russian commercial fishing camp on a rugged bit of coast along the Sea of Okhotsk. The fishermen were all Baby Boomers. I gave about a 20-minute after-dinner lecture, but they asked enthusiastic questions well into the wee hours of the morning. The captain of the crew said it made him want to leave fishing to go back to school. The Baby Boomers, wherever they are, remember their lost legacy of space very well. They should not be discounted as a voting bloc, either. The time that all political demographers have warned about is upon us: the Baby Boomers are aging. Aging people are an important voting bloc, and there are an enormous number of Baby Boomers in the bloc that is forming. They have longevity, individual autonomy, and discretionary income. They are a force to be reckoned with. The Boomers can put the "Boom" into the rockets to Mars.

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