

“Towards an Earth-Moon Economy – Developing Off-Planet Resources”

Moon Miners’ Manifesto

& The Moon Society Journal

www.MMM-MoonMinersManifesto.com



ABOVE: An early NASA mockup of a Space Station. If this hardware still exists, it could serve well as a serious analog Moon base (at Johnson Houston) where we can practice going beyond a “timid toe in the water” towards an ever growing permanent presence – and a first Mars outpost settlement- analog – at Huntsville

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Another bold plan

What happened to bold?

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About Moon Miners' Manifesto – “*The Moon - it's not Earth, but it's Earth's!*”

- **MMM's VISION:** “expanding the human economy through off-planet resources”; early heavy reliance on Lunar materials; early use of Mars system and asteroid resources; and permanent settlements supporting this economy.
 - **MMM's MISSION:** to encourage “spin-up” entrepreneurial development of the novel technologies needed and promote the economic–environmental rationale of space and lunar settlement.
 - **Moon Miners' Manifesto CLASSICS:** The non-time-sensitive articles and editorials of MMM's first twenty years plus have been re-edited, reillustrated, and republished in 23 PDF format volumes, for free downloading from this location: http://www.MoonSociety.org/publications/mmm_classics/
 - **MMM THEME Issues:** 14 collections of articles according to themes: [.../publications/mmm_themes/](http://www.moonsociety.org/publications/mmm_themes/)
 - **MMM Glossary:** new terms, old terms/new meanings: www.moonsociety.org/publications/m3glossary.html
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- **MMM color online downloadable PDF file version option for Moon Society Members** using their username and password – do write secretary@moonsociety.org if you need help with your password.
 - **For additional space news** and near-term developments, there is a daily RSS feed space news section on <http://www.moonsociety.org>. You can also read **Ad Astra** magazine mailed to **National Space Society** members.
 - **Milwaukee Lunar Reclamation Society** is an independently incorporated nonprofit membership organization engaged in public outreach, freely associated with the National Space Society, insofar as LRS goals include those in NSS vision statement. MLRS serves as the Milwaukee chapter of both **The National Space Society** and **The Moon Society**: – <http://www.moonsociety.org/chapters/milwaukee/>
 - **The National Space Society** is a grassroots pro-space member-ship organization, with 10,000 members and 50 chapters, dedicated to the creation of a spacefaring civilization.
National Space Society 1155 15th Street NW, Suite 500 Washington, DC 20005 (202) 429-1600 – www.NSS.org
 - **The Moon Society** seeks to overcome the business, financial, and technological challenges to the establishment of a permanent, self-sustaining human presence on the Moon.” – Contact info p. 9.
 - **NSS chapters** and **Other Societies** with a compatible focus are welcome to join the MMM family. For special chapter/group rates, write the Editor, or call (414)-342-0705.
 - **Publication Deadline:** Final draft is prepared ASAP after the 20th of each month. Articles needing to be keyed in or edited are due on the 15th, Sooner is better! – **No compensation is paid.**
 - **Submissions by email** to KokhMMM@aol.com – Email message body text or MS Word, Open Office Text files, and pdf file attachments or mailed CDs, DVDs, or typed hard copy [short pieces only, less than 1,000 words] to:
Moon Miners' Manifesto, c/o Peter Kokh, 1630 N. 32nd Street, Milwaukee, WI 53208-2040

In Focus Radical Moon–Mars Differences affect Analog Research Directions

By Peter Kokh

Mars has two things in common with Earth that make it easy to find good locations for “practicing” to be on Mars: (1) **a bright sky** and (2) **a day–night cycle only 39 minutes longer than Earth's**

The differences are negligible. (1) The sun does not shine as bright on Mars sky as it does on Earth. (2) On Mars, you will get up 39 minutes later morning after morning, something that night people will love, but which may produce a mild case of enduring jet lag for morning people (the kind, like the author, who can't wait to jump out of bed and get the new day going, Negligible differences for practical purposes.

At the Mars Desert Research Station – MDRS – in Utah, it is easy to pretend you are on Mars. The terrain and colors are right on. The sky is too bright, and blue, but that can be taken care of with orange-hued sunglasses.

But in Utah, you can “pretend” that you are on the Moon only if you ignore two things about the Moon that will, in practice, govern everything. (1) **The Moon is without atmosphere and so has the black of space for its sky.** (2) **The Sun rises and sets on a 28 day plus cycle, two weeks plus of endless sunlight., followed by two weeks plus without the Sun.** Green sun glasses do gray the landscapes, but you still have a bright sky and Earth-like day/night cycles anywhere on Earth except above/below the Arctic/Antarctic circles.

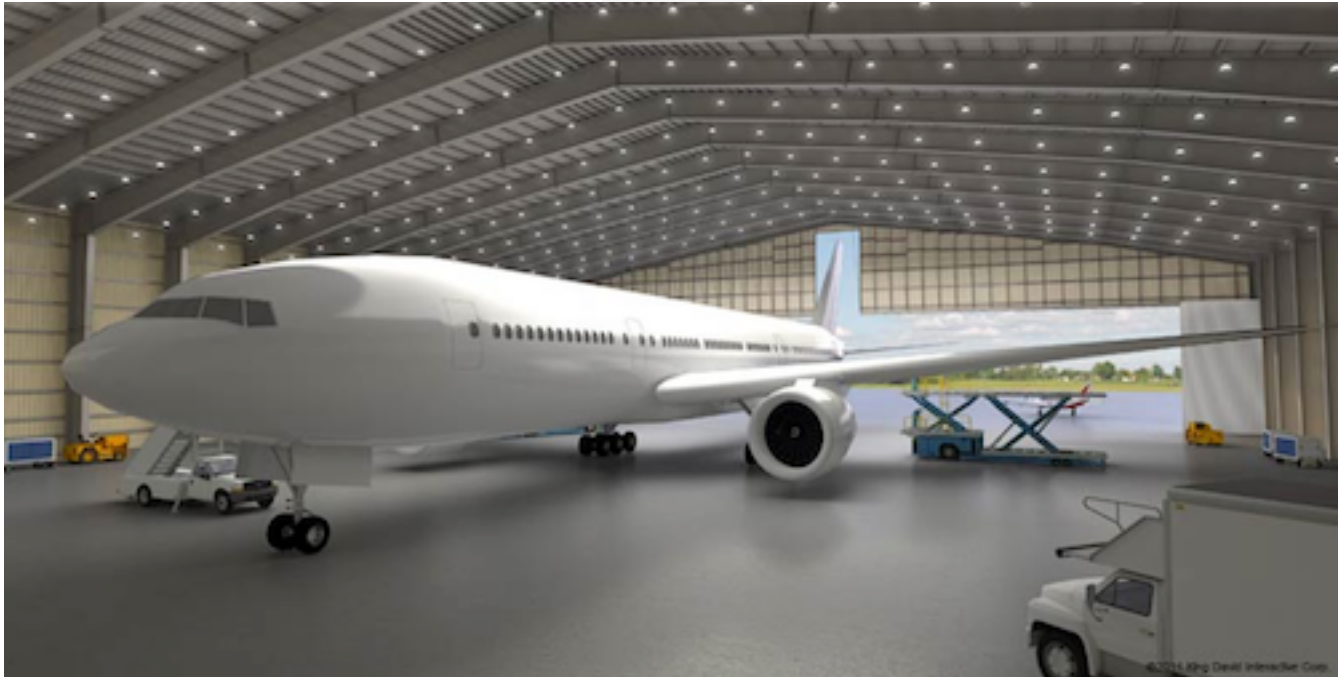
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It is clear that we cannot find or create a proper location to erect a simulated moonbase anywhere **on Earth's sun-exposed**. We have to find – or make – an environment where sunlight is on a lunar schedule.

These things in mind – facts of life on the Moon that we cannot ignore and which we will do well to learn how to deal with head on = demand that **our analog lunar outpost operation needs to be indoors – in a “big indoors,” if we can find one or make one.** Read on. ##

An Analog Moon Outpost inside a modified Airliner Hangar

By Peter Kokh



www.olympiabuildings.com/ac_hangars/

How to make an “analog lunar environment” for an analog “lunar outpost”

- An “unused” “airliner-size” hangar – we want the **height, width, and length**
- **Matte black fabric** attached **taut** to the overhead beams for the black lunar “sky”
- **Same along the sides** with a painted lunar landscape horizon along the bottom half
- A few **low mounds and craters** along the floor for “atmosphere” – lightweight and movable
- A set of projectors to pepper the overhead “firmament” with stars – (helpful but not essential)
- A **projector** to put “Earth” up high on the back wall, going through all its phases over a four week period, even changing cloud patterns, showing nighttime city lights, lightning strikes etc. [Note: the “full Earth” on the Moon is as much as 80 times as bright as the “full Moon” can be on Earth]
- A **projector** to display the “Sun,” sunrise to sunset from one sidewall, over the top, to the opposite sidewall over a 2 week period, repeating every four weeks

Can we find such a hangar, not currently in use, and no longer needed? Anywhere? One at Johnson Space Center in Houston would be ideal. Unlike the practice at MDRS, we will find a way to encourage tourists, using “duck blind” concepts to keep them from interfering with the analog outpost activities.

If we can, assuming that we will not have the funds to build a more ideal structure from scratch, it might provide the ideal setting for a mock lunar outpost with a 4-week “dayspan–nightspace” schedule, and mock lunar heavens, in which to do Moon outpost mission simulation exercises and activities.

Why “indoors?” What works for “Mars” simply will not do for “the Moon”

For Mars, sparsely vegetated other landscapes such as we find in southern Utah, do fine. Like Earth, Mars has a relatively bright sky, and the Sun rises and sets in a 24 hr–like schedule.

On the Moon, the sky is always black, and the Sun shines for two weeks at a time before disappearing for the next two weeks. That fact will govern **what activities can be done when**, on the Moon.

No matter what auxiliary (non-solar) power systems we bring along, there will always be more power available for whatever activities during the 2-week dayspan than during the 2-week nightspan. That suggests:

- > **The most-power-intensive activities be tackled during the dayspan,**
- > **Leaving power-light, manpower-intensive activities for the two weeks before the sun rises again.**

- **Dayspan:** construction, tunnelling, mining, industry production etc.
- **Nightspan:** Maintenance, repairs, change-out of equipment; assembly and finishing; packaging for shipment; paperwork and inventory; arts & crafts, more recreation time.

Upshot: For simulated missions, an open-air setting anywhere on Earth, will just not do.

A Controllable Mock Lunar Setting

Ideal might be a hemispherical domed stadium or inflatable arena, fabricated especially for our needs. Our **second best – and significantly less expensive** – fall-back option would be a pre-existing structure, currently not in use, even if not hemispherical in shape. An available (not currently used) aircraft hangar – if we could get a big enough one, both as to floor size and height, such as a hangar built for passenger/cargo planes with tall tails.

This should be enough for a complex of “Quonset” hut modules and a network of “pressurized” “tubeways” connecting them, yet leaving enough “outside” “moonscape”: area on the hangar floor for “surface” activities.

If the terms of use of the hangar are such that “inflatable” quonset modules and tubes be used instead of steel, that would be doable, though likely more expensive.

The long Lunar Dayspan/Nightspan Cycle

In such a setting, by controlled lighting, it will be relatively easy to simulate the two week long dayspans and two week long nightspans. **Crews could switch at “dawn”** and undertake simulated dayspan activities for two weeks before switching to nightspan activities. If it proved difficult to find volunteers free to spend 4-weeks at the facility, the dayspans and nightspans could be shortened to a week each, still getting the lessons across.

Houston and Huntsville

Fred Becker, with whom I am working on this Moon/Mars Analog Outposts project, suggested two separate sites, one at Johnson Space Center in Houston for the Lunar Analog Outpost, the other outside Huntsville at Marshall Space Center for the Mars Analog Outpost. The latter would be outdoors, in a “red soil” area cleared of vegetation.

Fred had an outdoor site also in mind for the Lunar analog facility at Johnson, but because of the need to provide the special lunar dayspan-nightspan and dark skies environment, I have countered with this idea of using a spare hangar there at the space center’s airport. Whether there is an unused hangar “big enough” to be useful is uncertain. One built for large cargo or passenger planes with their tall tails would be perfect.

Visitor Access

While the Mars Society has discouraged tourists and visitors, we feel that we should do just the opposite if we want to educate the public and inspire young people.

There are ways to control tourists so that they do not interfere with simulations. **A peripheral trail with “duck blind” observation sites**, is feasible. Or crew exercises could be cut to 13 days, with the 14th day open to tourists. But even that concession still drastically cuts tourist opportunities compared to the duck blind approach.

A peripheral “Duck Blind” pathway inside the hangar

A fine matte black “mesh” draped from the ceiling, a few feet inward of the side walls and front and rear walls, with no lighting behind, but lit from within the analog area, the mesh would **allow visitors to see, but not be seen**. The side of the mesh fabric facing inwards (towards the crews) could be painted as a lunar landscape, as suggested above, without interfering with the “see through” mesh feature for visitors walking behind it.



Visitors would wear headphones so the tour leader could explain what they were seeing. Meanwhile, the lunar “crews” would be oblivious to their presence, and able to work undisturbed. We not only want to prepare for the real thing, we want to inspire younger generations so that one day, they can take over where we leave off.

What’s to see

Given the restrictions imposed by the hangar, the lunar outpost will be constrained in two ways; one-floor quonset modules (we can’t dig into the hangar floor!) as opposed to two-floor Quonset over (upside down) Quonset (dug into the soil at Huntsville). And the limited hangar floor space will restrict the mock outpost to fewer modules: # **A dorm/quiet room module**, # **a commons/meetings/meals/table games module**, # **a workshop/utilities module**, # **an agricultural module** with watering and cultivation equipment teleoperated by student volunteers nationwide, and # **a complex of pressurized hallways** essential to recycling and refreshing air and waste waters. (We must live “**downwind and downstream of ourselves**” – lessons that can help us here on Earth. ##

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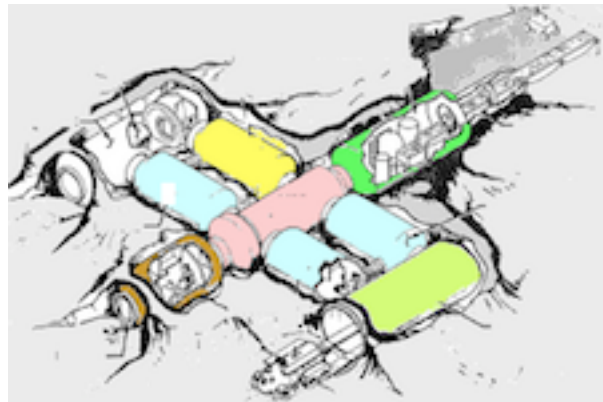
Illustrations for the above article: Quonsets, Module Layouts, and More



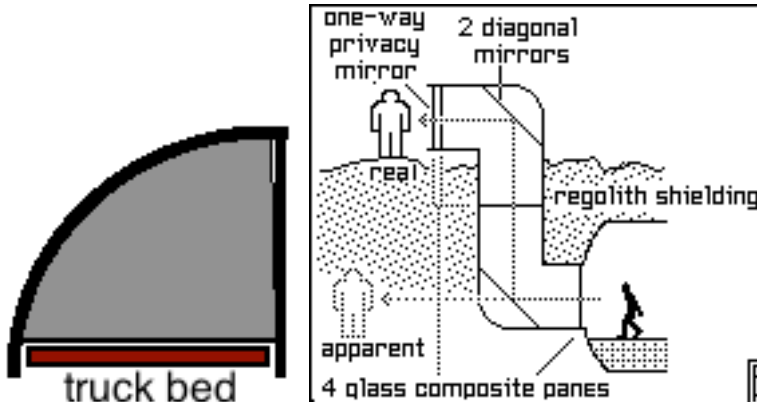
Quonset Interiors



Outpost layout inspirations (artwork)



Inflatables (costly) – Shipping semi-finished units in halves on flat bed trucks – “Z-vue” window



Proposed Moon/Mars Outpost Analog Projects & Earth Day

By Peter Kokh

The proposed Lunar and Martian Outpost Settlement Analog Projects have a “core goal” of developing technologies that will allow us **“to live Downwind and Downstream of ourselves.”** With no breathable atmosphere outside and without large reservoirs of clean water to draw on, we need to develop systems that treat “used air” and “used water” to recycle through a closed system.

This is a tall order. We do not claim to have ready a system that will do this well in small and larger outposts alike. Building these analog Lunar and Martian outposts is an opportunity to try out various systems. Junking those that can't be improved, reworking systems with promising results, and so on.

That these analog outpost facilities will be modular, gives us many opportunities not only to design systems that are grow as the complex of modules grows. But it also gives us the opportunity to test differing systems in the various modules and hallways of the analog outpost.

A starting point: vegetation

Plants can help refresh air. The invention of “Living Walls” (Wikipedia “Green Walls”) allows us to pack a lot of plants in little space. Narrow but tall “Living Walls” can serve as room dividers. They can also line one side of a tubular passageway connecting the various modules. They also give us the opportunity to grow some fruits and vegetables as well as flowers. And a welcome plus is that the water circulation systems at the base of Living Walls work well with some kinds of fish, such as the tasty Talapia.

We are going to want to supplement the Living Wall units in and connecting modules with a special module for growing food plants. These can include dwarf fruit trees, herbs and spices, as well as vegetables. And why not put a picnic table or two inside?

Junking the “monotreme” sewerage system invented in Mohenjo-Daro, back in 2,500 B.C.

Waste water comes in several forms: bath, showers, dishwashing (soap); urine; fecal matter. We are used to dumping all this together which makes treatment that produces clean drinking water unnecessarily difficult. There have been a number of toilet waste water systems developed, none of them perfect, but some definitely better than others. We can test these, but also develop our own. For example, it should be possible to design a toilet which catches urine separately from feces – a built in urinal, if you will. For urine only, we have urinals and “sheinals.”

We will want to identify the most promising systems and tinker with them until they come as close as possible to a level where we can indeed learn to “live downwind and downstream of ourselves.”

This is not “frosting” on the Analog complex experiment. It is essential to have systems like this if we are going to be able to survive on the Moon and/or Mars without constant hyper-expensive shipments of air and water.

Back on Mother Earth

Technologies developed and/or perfected at these facilities can be a tremendous “payback” benefit for our growing populations on Earth. **Let's be up front. We won't learn these lessons here because “living downwind and downstream of ourselves” – while a nice idea – is not as immediately urgent as it will be off-world.**

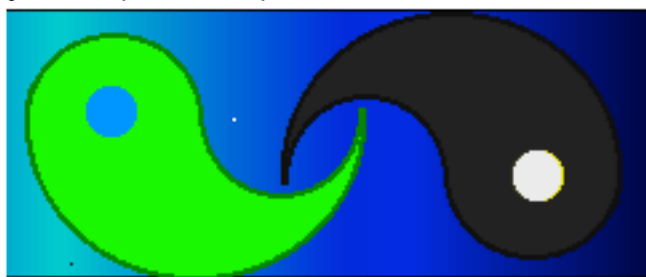
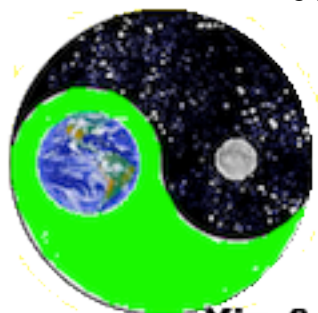
There will always be those hypocrites who don't want to spend money “because we have to think of our children's financial welfare” who apparently don't give a damn about their children's environmental welfare – a sure sign that “our children” are not the real motivator at all.

Mother Earth and Father Sky

Unfortunately, many environmentalists just see one side of the picture. Earth would not exist without the rest of the Solar System, without space, etc. It is not a matter of choosing Mother Earth or Father Sky. Why keep them “divorced.” Let's honor and respect both our parents.

There seems to be some history here. The world's religions seem to be fall into three classes: patriarchal-paternal (Judeo-Christian-Islamic), matriarchal-maternal (a few primitive cultures); and bi-parental (even fewer)

Let's take the lead. These analog projects can pave the way. PK



Yin & Yang - Mother Earth & Father Sky



Yuri's Night – The courage “to go where no man has gone before”

By Peter Kokh

<https://yurisnight.net/events/yuris-night-milwaukee-partymeeting/>

<https://yurisnight.net/events/yuris-night-tucson/>

<https://yurisnight.net/events/yuris-night-los-angeles-2015/>

<https://yurisnight.net/events/yuris-night-chicago-yuris-hillbilly-hideaway/>

On Saturday April 11th, the day before the official 54th anniversary of the first human to orbit Earth, the Milwaukee and other Moon Society and National Space Society chapters will be partying, in different ways. Our hope is to attract potential new members, and with announcements on our Meet-up page, we might just do that.

We are not so much celebrating the first manned orbiting of the Earth as **the courage of individuals “to go where no man has gone before.”** That courage still exists, at least in a few.

Witness those 200,000 who signed up for a chance to get a “one-way” ticket to Mars (and eventually die there) in **the Mars One program**. Whether that project really launches is immaterial. What is most interesting, and encouraging, is that so many people are willing “to go where no man has gone before” even if those who do get to go find themselves in an ill-planned situation with all the odds of survival stacked against them.

Witness also all those who signed up for a chance to go on a 500-day loop around Mars and back. I have met one couple who has signed up for “**Inspiration Mars**,” now apparently in limbo for lack of funds and time.

While most of us are too risk-averse to “be the first” at anything, the stuff of heroes, even though it includes a bit of “apparent insanity,” still exists.

What very-high-risk pioneering adventure, if any, would you be willing to pioneer (be the 1st)?

Moon Miners’ Manifesto would like to know if Yuri’s bravado still exists out there.

Send us a description of the venture you find so appealing and so worthwhile that you would be willing to take the risks, and what it would mean to you to succeed.

Send to: kokhmmm@aol.com – “Yuri’s Night Risk I would take.”

Your real name or a pen name? Your letter should have your real name, but, if you so wish, MMM will keep that secret and you can choose a pen name. Sharing your real name with us, even if we do not publish it, will be your way of saying, “Yes, this is for real.”

Where has no man been before on the Moon?

- **Anywhere on the nearside during other than “early to mid-morning” hours:** No one has landed in time to watch the sun come up, or set, much less to stay a whole month.
- **On the farside surface of the Moon** with Earth out of site, out of contact except by satellite, and with the Milky Way in unimaginable magnificence ruling skies far darker than anyone has yet experienced.
- **Anywhere on the Moon to elsewhere in the Solar System** (You can take a mate and/or pet with you! Tell us what facilities and equipment you will need, etc.)

Destinations where no man been before beyond the Moon

- No one has been farther out, say to Earth-Sun L4 or L5
- And, of course, to any asteroid or comet or planet or moon: Mars, Europa, Titan, etc.
- Me? I plan to describe my dream retirement home on the Moon and “needs” in MMM #301.

3D Printing may not be the instant Boost to Settlement that many hope

By Dave Dietzler

I foresee a combination of traditional manufacturing processes and newfangled 3D printing in space and on the Moon. Some jobs done by robots and some jobs done by human hands. 3D printing has the advantage that we can make anything, any shape, with programs we have and programs that are radioed up to us. While traditional manufacturing processes are well suited to mass production and large runs

3D printing allows production of various complex parts in small numbers as needed..

3D printers using plastic use a plastic wire fed into the machine.

Other 3D printers use powdered metals (titanium, aluminum, steel), glass or ceramics. Lunans will want to look at 3D printing basalt powder, anorthositic highland regolith and meteoric iron-nickel fines. They will just have to size the particles with screening and sieving. Powdering is no small feat. See images attached. Ingots of metal from smelters could be sent directly into rolling mills to make plates, beams and rails. Powdering tons and tons of

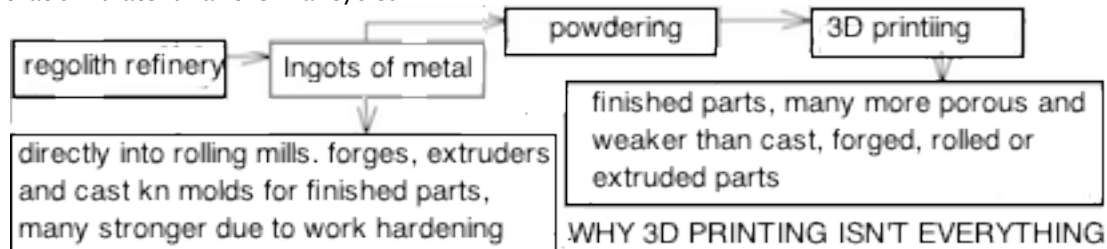
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metal then using 3D printing would be absurd. 3D printed parts can be really intricate, but they can also be more porous and weaker than rolled, cast or forged parts. Forging dies must be solid and hard, so they have to be cast and heat treated. Rolling and forging make parts stronger by what is called work or strain hardening. 3D printing has its place, but so do traditional manufacturing processes. We can also use 3D printing to make elaborate forms to press into wetted sand molds for casting jobs.....this would be easier than trying to carve and/or machine a form by hand...especially when you have no wood!!!!..

See the diagram below and note that each step, each block, requires energy.....

- **First** you have to land equipment to tap solar energy and to extract needed materials from the regolith
- **Then** use all the various manufacturing technologies to expand materials and energy production
- **And then** produce more manufacturing devices from rolling mills to 3D printers.

It is not simple. In articles we can only address the general scheme of things to work out all the details and optimal procedures. We will need a small army of engineers, draftsmen and technicians and develop computer simulations and demonstrations at Earthside analog bases. Then we will have to test all machines in large vacuum chambers that simulate lunar thermal cycles



Just getting this ground work done is going to cost megabucks. But then we go at it with mass production and away we go. R & D [Research and Development] is always the most expensive part. But we could spend hundreds of billions just to put a footprint on Mars and what will we get? Not much!

We have to land equipment to tap solar energy and to extract materials from regolith..... then use all the various manufacturing technologies to expand materials and energy production.....and produce more manufacturing devices from rolling mills to 3D printers It is not simple

In articles we can only address the general scheme of things To work out all the details and optimal procedures we will need a small army of engineers, draftsmen and technicians to develop computer simulations and demonstrations, at Earthside analog bases. And we will have to test all machines in large vacuum chambers that simulate lunar thermal cycles. Just getting this ground work done is going to cost billions. But then we go at it with mass production and away we go!

R & D is always the most expensive part But we could spend hundreds of billions just to put a footprint on Mars and what will we get???? Nothing more than an idol that impresses the naive.

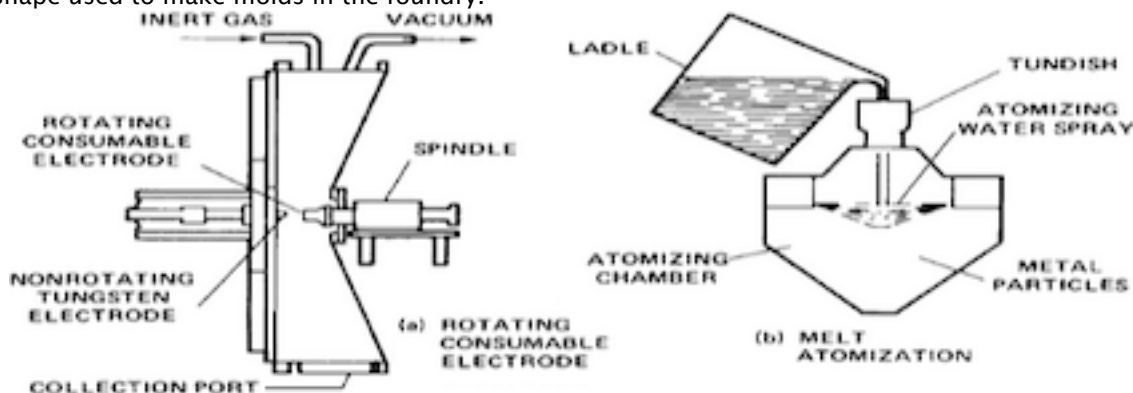
If only more people could see the intricate parts Dave Heck made with electron beam fusing of titanium powder in 3D printers at Boeing St. Louis. Most impressive!

I have no misgivings about 3D printing. I just believe that it will not replace all other forms of manufacturing. That said, It will be a vital adjunct.

We must build factories to mass produce pressure tanks, batteries, solar panels or reflectors and boiler tubes, wires and cable, I-beams, concrete, pipes for gases and water, pumps, compressors, etc.

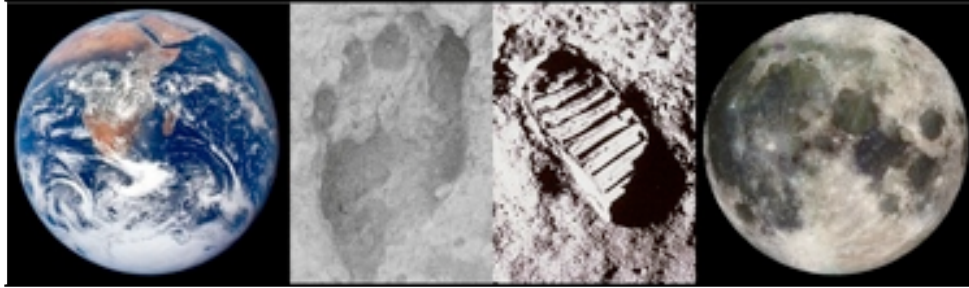
When it comes to **small intricate parts needed in small numbers** it would be absurd to construct a mass production facility just for a few small complex parts. That's when 3D printing and human hands come into play.

- Humans can make molds, cast metal parts, heat treat and machine them in foundries and machine shops.
- 3D printers are great for making items needed in small numbers, as opposed to importing them from Earth. Tools are an example: 3D printers cut out the high transportation costs, and can produce plastic forms in any shape used to make molds in the foundry.



##

From Africa
to the Moon,
the Human
Epic, told in
footprints,
Continues
to the Stars!



Our Goal is
Communities
on the Moon
involving
large scale
industrializa-
tion and
private
enterprise.

The Moon Society Journal Section (pages 9–12)

About the Moon Society

Objectives of the Moon Society include, but are not limited to:

- **Creation** of a spacefaring civilization, which will establish communities on the Moon involving large-scale industrialization and private enterprise.
- **Promotion** of interest in the exploration, research, development, and habitation of the Moon, through the media of conferences, the press, library and museum exhibits, and other literary and educational means
- **Support** by funding or otherwise, of scholarships, libraries, museums to study the Moon and related technologies
- **Stimulation** of the advancement and development of applications of space and related technologies and encouragement their entrepreneurial development
- **Bringing together** persons from government, industry, educational institutions, the press, and other walks of life for the exchange of information about the Moon
- **Promoting** collaboration between various societies and groups interested in developing and utilizing the Moon.
- **Informing** the public on matters related to the Moon
- **Provision** of suitable recognition and honor to individuals and organizations that have contributed to the advancement of the exploration, research, development, and habitation of the Moon, as well as scientific and technological developments related thereto.

Our Vision says it all – “Who We Are and What We Do” – www.moonsociety.org/spreadtheword/whowhat.html

We envision a future in which the free enterprise human economy has expanded to include settlements on the Moon and elsewhere, contributing products and services that will foster a better life for all humanity on Earth and beyond, inspiring our youth, and fostering hope in an open-ended positive future for humankind.

Moon Society Mission: to inspire and involve people everywhere, from all walks of life, to create an expanded Earth–Moon economy that contributes solutions to the major problems that challenge our home world.

Moon Society Strategy: We seek to address these goals through education, outreach to young people and to people in general, competitions & contests, workshops, ground level research and technology experiments, private entrepreneurial ventures, moonbase simulation exercises, tourist centers, and other means.

Interested in having input? Any member may ask to join the Leadership Committee and attend our Management Committee meetings held twice monthly. You may even express opinions. Decisions are often made by consensus, so this input has value. Write president@moonsociety.org

From Moon Society President Ken Murphy

Pass the Torch – Aeronautics: the science or art of ascending and traveling in the air in lighter-than-air vehicles.

This last month saw an interesting exchange in Congress between Senator Ted Cruz (R–TX) and NASA Administrator Charles Bolden. Sen. Cruz asked, quite reasonably, if NASA is the government's space agency, why do they put so much effort into the study of the Earth? Should not the space agency be studying space?

This of course blew up into the usual climate change, Republican versus Democrat, and myriad other ker-fuffles. What it represents, ultimately, is none of that, but rather the infantilization of both politics and public discourse.

We now live in a society where government can spend however much it wants on projects for politician's friends. Debt ceilings are mere suggestions. We have been at war for over a decade, with the concomitant cost of trillions of dollars and untold lives. Balanced budgets are for other people – why shouldn't we ladle more debt on our grandchildren?

All of these things will have consequences. Maybe not today, or tomorrow, but someday, and for the rest of our lives. As an economist I fundamentally understand that we cannot keep pulling consumption from the future into the present (debt) without consequences. Oceans of made up money (fiat currency) must ultimately be measured against real resources. Resources that on Earth are finite.

For past articles, Visit http://www.moonsociety.org/publications/mmm_classics/ or [mmm_themes/](http://www.moonsociety.org/publications/mmm_themes/)

The Moon Society – Lunar Frontier Settlement – www.moonsociety.org p.2

This is why The Moon Society is concerned with things like the cislunar economy. We understand that there are vast expanses of resources in our Solar System, and it behooves us to reach out to those resources to secure our future prosperity. In the end we can continue to tear apart our own planet to get what we need, or we can seek a different path.

Another aspect of prosperity is humanity's climb up the technological ladder of progress. While not without its consequences, technological development has nevertheless given humanity a level of prosperity unparalleled in history. To that end The Moon Society supports STEM education to encourage future generations to make the effort to continue that climb. Events like Moon Day, which your president organizes annually in North Texas is a perfect example. The space advocacy community is often accused of talking only to itself, something seen all too often in the many annual conferences that rarely reach any sizeable audience of the general public. Moon Day gathers together dozens of space and STEM themed organization to highlight to their community the many resources available to them to learn more. TMS members are strongly encouraged to organize their own Moon Days in their own communities to reach out to a larger audience than space advocates.

Another aspect of STEM education is to have projects involving scientific and engineering principles that anyone can undertake for their own edification. That's why we're undertaking a variety of projects to help illustrate those concepts relevant to future Moon development, from an update of our power-beaming demo to concrete substitutes.

We are limited, though, by the resources available to The Moon Society, and so projects may take longer than we would like, as with the update to our website. We don't have the liberty of creating a nigh unlimited supply of Moon bucks to pay for whatever we desire.

In the end, it is necessary for the leadership of the United States to pass the torch to a new generation of leaders. After decades of mismanagement it is time for a new leadership to take the reins and guide the nation back to a path of grounded and real progress. This is no less true for NASA, which finds itself adrift, doing too many tasks for too many masters and without any real direction as to what to do next. It remains fixated on the goal set by Wernher Von Braun in the 1950s of Mars as the 'ultimate' goal, and yet after all these decades has no real means of achieving that goal.

It is time to pass the torch to a new generation to create our space future. The longer we wait for this transition, the longer it will take to bring to fruition. There are now two generations waiting in the wings for their chance on the stage of history, each with their own visions, dreams and ambitions. Continuing the old ways has not and will not advance our cause.

Moon Society Elections

Speaking of passing the torch, it is time for the annual Moon Society elections. If you have a vision for where The Moon Society should go, step up to the plate and run for office. If you feel you have what it takes to make The Moon Society the cultural phenomenon it can be, throw your hat in the ring and make your voice heard.

Candidate statements (260 words max) are due by the end of April at elections@MoonSociety.org. The future of the society is in your hands – what will you do with it?

Another aspect of prosperity is humanity's climb up the technological ladder of progress. While not without its consequences, technological development has nevertheless given humanity a level of prosperity unparalleled in history. To that end The Moon Society supports STEM education to encourage future generations to make the effort to continue that climb. Events like Moon Day, which your president organizes annually in North Texas is a perfect example. The space advocacy community is often accused of talking only to itself, something seen all too often in the many annual conferences that rarely reach any sizeable audience of the general public. Moon Day gathers together dozens of space and STEM themed organization to highlight to their community the many resources available to them to learn more. TMS members are strongly encouraged to organize their own Moon Days in their own communities to reach out to a larger audience than space advocates.

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The Moon Society – Lunar Frontier Settlement – www.moonsociety.org p. 3

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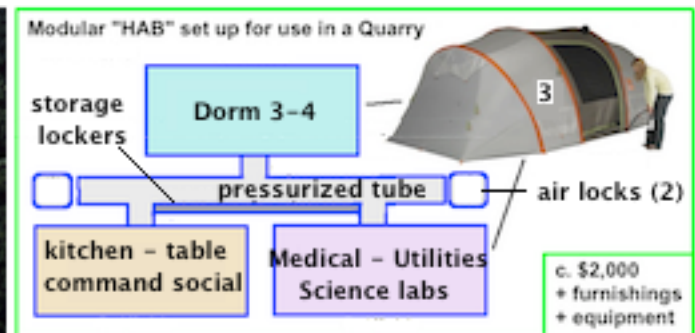
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Ken Murphy, Moon Society President. ##

Analog Moon/Mars Base Exercises in dry stone Quarries no longer mined For Junior High School Student Participation

By Peter Kokh

The Mars Desert Research Station is a great place to simulate missions to Mars, even for the Moon, with its all but token vegetation and surroundings that look very Marslike. But an abandoned and dry stone quarry – even in forested countryside – could do, if from the bottom of the quarry, any surrounding vegetation was out of sight. We may have a few of such quarries in Wisconsin, but we need to plan a field trip to double check, and most importantly, to see if we could get permission for temporary use, with portable equipment, easily brought in and set up, and easily packed up and removed.



Not addressed: electricity, heating, water, sewerage, etc

Full size quarry image: <http://geoscience.wisc.edu/~maher/air/444-24v.jpg>

Tent information: <http://www.kelty.com/p-759-sonic-8.aspx?category=tents-shelters>

The quarry pictured is 5 miles SE of Baraboo, Wisconsin which is about 115 miles WNW of Milwaukee and 230 miles SE of Minneapolis–St. Paul. The unnumbered access road is likely to have very light traffic – minimal surrounding noise to break “the spell” of being on Moon or Mars.

A field trip is in order. Permission might not be forthcoming, and/or the quarry floor may be occasionally flooded. How and where to get permission is something yet to be determined.

The “modular” hab complex depicted above has 3 tents, serving different functions (a modular outpost as it should be!) all interconnected by “tubes” simulated by an easy-erect-easy-dismantle PVC pipe framework covered with canvas, and “airlocks” at both ends. The tents cost \$300 apiece. Not factored in yet: water/wastewater system, power system, tent flooring to keep dry, etc. A 4th tent may be needed. One truckload or car-pulled trailer load should do it. Storage off-season to be determined.

Crews of 3, 4 (5 at most). One week or two week simulations. We would have to arrange for “communications” with an advisorsory team of relevant types of expertise as at MDRS.

TARGET: crew members: Junior High School students. **GOAL:** getting across concepts of how we could field outposts on the Moon or Mars. Maybe a “teacher” as crew leader?

At present, this is just a pipedream. The author is quite familiar with the type of PVC construction proposed, having build a similarly designed “tunnel” between the MDRS hab and Greenhouse during the Moon Society exercise in Utah in 3006.

For past articles, Visit http://www.moonsociety.org/publications/mmm_classics/ or http://www.moonsociety.org/publications/mmm_themes/

The Moon Society – Lunar Frontier Settlement – www.moonsociety.org p. 4

Again, task #1 is to visit the site, make sure it is available, and, of equal importance, “dry.”

If a first exercise proved successful, perhaps two or three could be run each summer with the support of surrounding Moon Society and partner NSS chapters.

Again, until we visit the place and find out what we need to know, this is just a pipe dream.

Even if the idea gets enough support, working out the planning could take some time.

If a first “uncrewed” run is “successful enough” (any kinks appear to be easily enough addressed) it may take months to plan the first “crewed” exercise.

Two to four exercises a season, from different Junior High Schools in Wisconsin and neighboring states (MN, IL, IA, Upper MI), should keep such a complex going for many years.

Hopeful, some of the participants will become future leaders of the Moon Society, the Mars Society, and the National Space Society, whose memberships have been “aging” in a way that spells trouble ahead.

At this stage, the above proposal is just a dream. But dreams are the start to everything! PK

March

Chapters & Outposts

2015

ORGANIZED CHAPTERS

Milwaukee Lunar Reclamation Society – <http://www.moonsociety.org/chapters/milwaukee/>

<http://www.meetup.com/Milwaukee-Space-Exploration-Meetup/> – <http://www.space-Milwaukee.com>

Contact: Peter Kokh – kokhmmm@aol.com – MEETINGS, 2nd Saturday 1–4 pm monthly except July, August, At Mayfair Mall lower level Community room G150 for all meetings except December, in G110:

March 14th Meeting Report: We decided to make the April 11th Meeting our Yuri's Night Event and registered it on www.yurisnight.net. Pot-luck refreshments, exhibits, 2 pm SciFi film “Gravity”, quizzes, door prizes & more.....

Upcoming Meetings: APR 11 (Yuri's Night), MAY 9, JUN 29, (JUL-AUG) SEP 12, OCT 10, NOV 14, DEC 12

Moon Society St./NSS Louis Chapter – <http://www.moonsociety.org/chapters/stlouis/>

<http://www.meetup.com/Saint-Louis-Space-Frontier-Meetup/>

Contact: Robert Perry surfer_bob@charter.net – Meetings 2nd Wed monthly at Buder Branch Library, 4401 S. Hampton, in the basement conference room. – MAY 8 – JUN 13 – JUL 8 – AUG 12
On Saturday, Fk.”

NSS/Moon Society Phoenix Chapter – <http://nssphoenix.wordpress.com/> – c/o Mike Mackowski.

<http://www.meetup.com/NSSPhoenix/events/161939572/>

Meeting 3rd Saturdays monthly at Humanist Community Center, Mesa, 627 W. Rio Salado Parkway.

The F, APR 18, MAY 16, JUN 20

The March meeting was to host and participate in SpaceUp Phoenix. This was an un-conference held on Saturday, March 7, 2015 as part of the Arizona Science & Technology Festival. The event ran from 9 am – 4 pm at the Mesa Community College (MCC) and was sponsored by our joint chapters, and by the American Institute of Aeronautics and Astronautics (AIAA). The Arizona State U (ASU) branch of the Students for the Exploration and Development of Space (SEDS) were very helpful in promoting the event to their members. Mike Mackowski served as the event chair. Speakers included Planetary Society president Jim Bell, Space Access Society president Henry Vanderbilt, former NSS president Charlie Walker, former deputy director of NASA Glenn Research Center Rich Christiansen, and Pete Swan, president of the International Space Elevator Consortium.

Total attendance, including speakers, was around 65 with 42 registered in advance. Remarks from visitors and guest speakers suggested that attendees enjoyed the conference and were happy with the content and quality of the presentations. Attendee comments were very positive. A detailed report is available upon request. For photos and more info, see the SpaceUp Phoenix website: <http://SpaceUpPhx.org> and www.facebook.com/SpaceUpPhoenix

Tucson L5 Space Society – Now serving Moon Society Members www.tucsonspacesociety.org/ (not updated) – www.meetup.com/NSSPhoenix/events/161939572/ (not updated)

Contact: Al Anzaldua – Meets monthly, every 2nd Saturday, 6:30 PM

Clear Lake NSS/Moon Society Chapter (Houston) – <http://www.moonsociety.org/chapters/houston/>

Contact: Eric Bowen eric@streamlinerschedules.com – Meeting 7 pm 3rd Mondays of even # months in the conference room of the Bay Area Community Center at Clear Lake Park: JUN 15 – AUG 17

For past articles, Visit http://www.moonsociety.org/publications/mmm_classics/ or [mmm_themes/](http://www.moonsociety.org/publications/mmm_themes/)

MARCH 2015 SPACE NEWS BROWSING LINKS**SPACE STATIONS + ROCKETS + COMMERCIAL SPACE**

www.nasa.gov/press/2015/march/media-invited-to-see-bigelow-expandable-space-station-module-ahead-of-shipment-to/

www.esa.int/Our_Activities/Human_Spaceflight/Research/The_next_generation_of_Space_Station_experiments

www.space.com/28945-mock-mars-mission-hexoskin-shirt.html

www.space.com/28687-russia-space-station-parts-plan.html

www.space.com/28960-one-year-space-station-trip-begins.html

EARTH + NEAR SPACE

www.space.com/28822-double-crater-two-asteroid-impacts.html

MOON

www.space.com/28810-moon-history-chinese-lunar-rover.html

www.asianscientist.com/2015/03/topnews/chinas-yutu-exposes-layers-moon/

www.space-travel.com/reports/Extent_of_Moons_giant_volcanic_eruption_is_revealed_999.html

www.space.com/28900-moon-iron-core-solar-system-secrets.html

www.space.com/28959-did-iron-rain-bypass-the-moon-to-fall-mostly-on-earth.html

www.space.com/28870-amelia-earhart-moon-crater.html

www.space.com/28943-opportunity-rover-lro-nasa-budget.html

MARS

www.space.com/28943-opportunity-rover-lro-nasa-budget.html

www.space.com/28946-maven-mars-probe-atmosphere-deep-dip.html

www.space.com/28742-ancient-mars-ocean-water-lost.html

www.marsdaily.com/reports/Scientists_fly_kites_on_Earth_to_study_Mars_999.html

www.space.com/28774-robots-intelligence-space-exploration.html

www.space.com/28922-mars-marathon-opportunity-rover.html

www.space.com/28793-nasa-insight-mars-lander-landing-site.html

<http://www.space.com/28877-mars-one-colony-launch-delay.html>

www.space.com/28938-mars-mission-astronaut-vision-tech.html

ASTEROIDS + COMETS

http://dawn.jpl.nasa.gov/feature_stories/Dawn_First_Orbit_Dwarf_Planet.asp

www.space.com/28699-comet-lovejoy-dark-energy-camera-photo.html

www.nasa.gov/press/2015/march/nasa-asteroid-hunter-spacecraft-data-available-to-public/

www.space.com/28934-nasa-asteroid-capture-mission-boulder.html

www.spacedaily.com/reports/A_second_minor_planet_may_possess_Saturn_like_rings_999.html

www.space.com/28884-rosetta-comet-nitrogen-discovery.html

www.space.com/28915-philae-comet-lander-not-responding.html

www.space.com/28699-comet-lovejoy-dark-energy-camera-photo.html

OTHER PLANETS + MOONS

www.space.com/28836-mercury-surface-mapped-nasa-messenger.html

<http://www.space.com/28948-messenger-mercury-probe-final-days.html>

www.space.com/28807-jupiter-moon-ganymede-salty-ocean.html

www.spacedaily.com/reports/A_new_spin_on_Saturns_peculiar_rotation_999.html

www.spacedaily.com/reports/Life_not_as_we_know_it_possible_on_Saturns_moon_Titan_999.html

www.spacedaily.com/reports/Life_not_as_we_know_it_possible_on_Saturns_moon_Titan_999.html

www.esa.int/Our_Activities/Space_Science/Cassini-Huygens/Hot_water_activity_on_icy_moon_s_seafloor

www.spacedaily.com/reports/Science_Shots_How_Big_Is_Plutos_Atmosphere_999.html

ASTRONOMY + ASTROBIOLOGICS

www.space.com/28925-giant-alien-planet-four-suns.html

www.space.com/28819-sideways-alien-earth-exoplanet-habitable.html



Detroit MI: Ford Motor Company Aviation Division is reborn with a whoosh!

Way back in the in 1925-33 period, Ford Motor Company had an Aviation Division.

http://en.wikipedia.org/wiki/Ford_Trimotor

199 Ford "Trimotors" were produced from 1925 until June 1933 both for the civil aviation market, and for the military, and sold all over the world. The craft carried a crew of three, a pilot, a copilot, and a stewardess as well as 8-9 passengers.

As of 2012, a dozen of these venerable vintage aircraft were still flight-worthy.



A Detroit Ford Engineers' fun think tank exercise for Halloween 2001 had brainstormed a "Flying Saucer Passenger aircraft" just to see how far they could push the concept.

Evidently, they came up with some ideas that could make such a craft both hyper fast and supremely maneuverable, even on a scale with a capacity to carry several hundred passengers. That got the attention of Ford Motor Company Executives.



The key: the outer section of the saucer must rotate swiftly in order to move forward. Inside bottom center, a flywheel rotates in the opposite direction. They discovered that it would work if an inner passenger cabin was retracted during supersonic flight, but it could be elevated for passengers to see the scenery in subsonic flight, as well as above the atmosphere at hypersonic speeds to anywhere in the world within an hour.

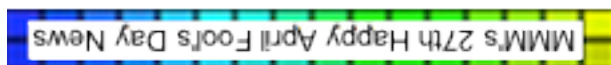
The saucer craft will be able to take off and land vertically from any flat terrain, including calm waters. That ability should make it a good rescue craft in places far from any established airport or air fields.

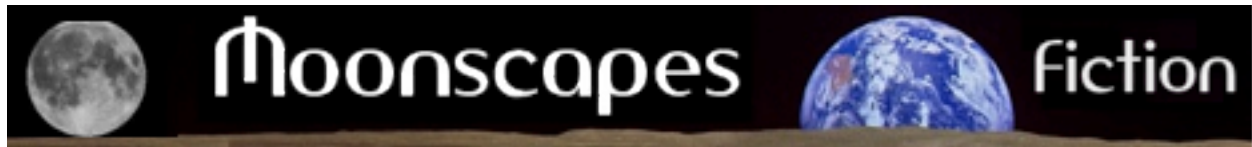
That ability will also make it the aircraft of choice for tourist flights to undeveloped territory, deserts, grasslands, even calm seas or lakes and ice flows.

The proposed passenger version will be able to hold 500 persons with 250 staterooms within the outer rim, and serve as their hotel in undeveloped areas. Ford expects to see great demand for the craft in refugee situations as well as tourist excursions to undeveloped areas. and hypersonic city to city transglobal flights.

The prototype has been doing top secret tests over a seldom visited part of Antarctica. Ford expects to begin trials above the atmosphere in two years and begin same-cabin port to port service from anywhere on Earth to anywhere on the Moon. The production version, scheduled for a 2020 debut, is tentatively named the **Ford Frisbe**.

Meanwhile, the new plant, built in inner ring razed areas of Detroit, is adding to the accelerating "comeback" of that once thriving metropolis. ##





Simon Sidekick (cont. Part 3)

By John E. Stith

MISSED THE PREVIOUS INSTALLMENTS? <http://www.moonsociety.org/publications/fiction/SS-JES.pdf>

It didn't take long before Carl started leaving Simon on all the time. Simon learned quickly. He could distinguish the times when communications were OK, and usually kept quiet except for them. They were in Carl's room, taking a break between lessons, when the subject of the search finally came up.

Simon was the one who started it.

"I have heard a few references to something called the 'search'. And you usually veer away from the subject. What is it?" he asked.

"It's an initiation test and it's stupid," Carl replied, finding himself terminating the conversation out of habit. Then he realized that he did want to talk about it, if only to complain. "You have to use a direction finder to locate a transmitter. The older kids have hidden it in one of the craters around here."

"That does not sound too bad," Simon said.

"But it's outside on the surface."

Simon apparently noticed the catch in his voice more than what he said. "Outside. What is so bad about that? Surely you may wear a pressure suit?"

Carl ignored the sarcasm. "Obviously. But there are so many things that can go wrong with a suit. Pressure, temperature, communications, who knows what?"

"Failures are rare, correct?"

"Of course, but--" His hesitation was brief. A few days ago he couldn't have imagined himself explaining about his father to a computer. But today, Simon didn't seem like a computer.

So he told Simon about the accident, about how he had watched in horror as his father died in less than a minute out there on that stark surface. About how the laser cutter was jammed against his suit by a freak explosion of the material he was slicing. About how it felt to be a sixyearold and to know your father was dying and to be totally helpless to do anything about it. About how he so wanted to trade places, and how the pain inside himself seemed worse than trying to breathe air which was being sucked into the void.

After Carl's shakes stopped and he could use his voice again, he told Simon what kind of man his father had been: so careful, so kind, so loving. Carl had never seen him angry. He had been unbelievably patient, always ready to answer the questions that only sixyearolds can think of. And Carl had asked an enormous number of questions.

"So you do not like the idea of going out on the surface," Simon said at last, giving Carl a chance to recover. "Maybe you should skip the search. Why bother?"

"You don't understand. These kids are fanatical about it. Anyone who doesn't pass it soon enough gets nothing but trouble from the others. If the suits didn't have to be easy to use in an emergency, the adults would have locked them up long ago. But it's a ritual you're not a teenager until you do it. Peter Tahale went almost a year earlier than he had to. And now, he's already teasing me. I don't want to be teased. I just want to be left alone."

"Have you made any new good friends since your father died?" Simon asked.

"No." Not unless he counted Simon, came the thought.

####

Apparently Peter never knew when to quit. He seemed almost attracted to Carl, as though it was his responsibility to goad him into going on the search. But Carl didn't want to be dependent on anyone.

He managed to avoid Peter at the next few recesses, but, during a field trip to the zoo, he wasn't so lucky.

The zoo was tiny. A couple dozen animals seemed like enough to qualify for the name though. There weren't any large animals but there were mice, squirrels, gerbils, hamsters, guinea pigs, and several other rodents.

One of the squirrels was still in a padded cell since it was newly arrived from Earth. Squirrels weren't the fastest to adapt to the gravity. New animals always spent at least a week in the padded cell for their own protection.

For past articles, Visit http://www.moonsociety.org/publications/mmm_classics/ or [mmm_themes/](http://www.moonsociety.org/publications/mmm_themes/)

They were likely to jump too hard, particularly if they were startled.

The class was on its own during a break when Peter found him again.

"Are you ready for the search?" he asked, sitting down beside Carl.

"Are you about ready for a suntan session without a suit?" Simon asked.

Carl coughed and looked quickly at Peter. His dark eyes were inquisitive but not astonished. He apparently hadn't heard. Simon must have still been using the implant.

"Why do you care?" Carl asked.

"I just figured I could give you some help."

"Why would I need your help?" Carl probably couldn't trust it even if he got it.

"Because I've been out there. I've got experience. And you need someone else."

"You sound just like your father." Peter's dad was a councilman. The class had listened to him talk at school a couple of months ago. And there was that word again: "need." Carl didn't need anyone.

"What do you mean by that?" Peter asked. The skin around the corners of his eyes tightened.

"I mean you've been acting like a politician. Going outside once doesn't make you an expert."

"It makes me more of an expert than someone who hasn't ever been outside."

Carl didn't mention the one trip he could remember, but it certainly hadn't made him an expert. Simon spoke while he was preparing a reply: "He sounds like he is interested in helping."

"Besides," Peter continued. "You can't do it by--"

"I'm not even sure I want to bother with the search," Carl interrupted. "It seems like such a waste of time."

"A waste of time?" ("Do you hear an echo in here?" came from Simon.) "Do you realize--" Peter's voice cut off, perhaps at seeing Carl's grin. "Go right ahead, Carl. Be a jerk." With that, he got back on his feet and hurried away.

"Thanks a lot, Simon," he whispered. "You might get me in trouble by butting in on a conversation."

"Have I yet?"

"No. I guess not. But be careful, OK?"

"So, that was Peter Tahale, I suppose?"

"Right." He turned his head away from the activity in the rest of the room so no one would notice his lips move as he whispered.

"He did not seem quite so malicious as I expected," Simon said.

"Malicious might be too strong a word."

"How does he fit in with the rest of the group?"

"Perfectly. They all seem to go along with his ideas. I wish I knew why he picks on me."

"Maybe he--"

"Oh, never mind. Simon, I really don't care about Peter. I don't need him. Let's just skip it, OK?"

"Very well."

(continued next issue)

MISSED THE PREVIOUS INSTALLMENTS? <http://www.moonsociety.org/publications/fiction/SS-JES.pdf>

Have you been reading **To The Stars International Quartely**?
Summary Articles of all the Space News of the previous three months?

Past TTSIQ issues are online at both these locations in PDF format:

www.moonsociety.org/international/ttsiq/

www.nss.org/tothestars/

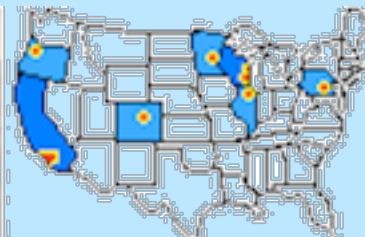
Yes, they are free!

The current issue, #11 is published April 1st

150 pages of News and Photos

TTSIQ will keep you up to date!

NSS Chapters that share Moon Miners' Manifesto



Space Chapter HUB Website: <http://nsschapters.org/hub/>
 Feature Page: Project Menus Unlimited <http://nsschapters.org/hub/projects.htm>

WISCONSIN



MLRS – Milwaukee Lunar Reclamation Society

PO Box 2101, Milwaukee, WI 53201 – www.moonsociety.org/chapters/milwaukee/
www.Space-Milwaukee.com – <http://www.meetup.com/Milwaukee-Space-Exploration-Meetup/>

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

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 NSS (414) 273-1126 – SECRETARY – Charlotte Dupree NSS (262) 675-0941 grdupree@charter.net
 • James Schroeter (414) 333-3679 – james_schroeter@yahoo.com TREASURER/Database • Robert Bialecki (414)
 372-9613 – bobriverwest@yahoo.com (• Current Members of the MLRS Board of Directors)

Our 2015 Meeting Schedule: We switch to room G150 for all meetings except December, in G110:

APR 11, MAY 9*, JUN 29, (SUMMER BREAK) SEP 12, OCT 10, NOV 14, DEC 12

Saturday, April 11th, 1-4pm Yuri's Night Party – pot-luck refreshments, displays, 2pm Sci-Fi film "Gravity,"
 Quizzes Door Prizes, and more!

WISCONSIN



SSS – Sheboygan Space Society

728 Center St. Kiel, WI 54042-1034

www.sheboyganspacesociety.org c/o Will Foerster 920-894-1344 (h) astrowill@frontier.com

SSS Sec./Tres. c/o B. Pat Knier dcnpatknier@gmail.org

DUES: "SSS" c/o B. P. Knier, 22608 County Line Rd, Elkhart Lake WI 53020

Meetings are at The Stoelting House, 309 Indian Hill, Kiel WI 53042 – 3rd Thurs even # months

2015 MEETINGS: APR 16 – JUN 18 – AUG 20 – OCT 15 – DEC 12 (2nd SAT in Milwaukee)

CALIFORNIA



OASIS: Organization for the Advancement of Space Industrialization & Settlement
 Greater Los Angeles Chapter of the National Space Society
 PO Box 1231, Redondo Beach, CA 902

Events Hotline/Answering Machine: 310-364-2290 – Odyssey Ed: Kat Tanaka odyssey_editor@yahoo.com
oasis@oasis-nss.org – Odyssey Newsletter www.oasis-nss.org/articles.html

Regular Meeting 3 pm 3rd SAT monthly – **2015 SCHEDULE:** APR 19, MAY 16, JUN 20, JUL 18

For past articles, Visit http://www.moonsociety.org/publications/mmm_classics/ or /mmm_themes/

COLORADO



DSS: Denver Space Society fka Front Range L5
1 Cherry Hills Farm Drive, Englewood, CO 80133
<http://www.denverspacesociety.blogspot.com/>

Eric Boethin 303-781-0800 eric@boethin.com – Monthly Meetings every 3rd Thursdays, 7 pm
 Englewood Public Library, Englewood, CO 80110 – 1000 Englewood Parkway, First Floor Civic Center

2015 MEETINGS: APR 16. MAY 21, JUN 18

ILLINOIS



LDAhean@aol.com

CSFL5: Chicago Space Frontier L5 – 610 West 47th Place, Chicago, IL 60609

MINNESOTA



MSFS: Minnesota Space Frontier Society – <http://www.mnsfs.org>
c/o Dave Buth, 433 South 7th St. #1808, Minneapolis, MN 55415
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MNSFS monthly meetings are held on the first Thursday of each month at the Fairview Community Center (Great Room), 1910 County Road B West, in Roseville, MN 55113 Meetings usually start at 7:00 p.m. and last about two hours. Each meeting features Board member introductions, general announcements,

OREGON



Oregon L5 Society – <http://www.OregonL5.org>
PO Box 86, Oregon City, OR 97045

(LBRT – Oregon Moonbase) moonbase@comcast.net – Charles Radley: cfrjlr@gmail.com

We meet the 3rd Saturday of the Month at 2:00 PM – **2015 Meeting Schedule:** APR 19, MAY 16, JUN 20, JUL 18

PENNSYLVANIA



NSS-PASA: NSS Philadelphia Area Space Alliance
928 Clinton Street, Philadelphia, PA, 19107

c/o Earl Bennett, Earlisat@verizon.net – 856/261-8032 (h), 215/698-2600 (w)

<http://pasa01.tripod.com/> - <http://phillypasa.blogspot.com>

NSSPASA Report for March 2015 – Meeting Locations and Times: We will meet in April at our usual location: The Liberty One Food Court on the 2nd floor of Liberty One. See our website for more data. May meeting will be: on May 2nd (Saturday) during The Science Carnival, part of The Science Festival on The parkway in center city. On Sat. May 9th we will be at The New Jersey State Museum (in Trenton just off of Route 1) for Super Science Weekend).

Due to weather Earl was unable to attend the March meeting. Mitch passed along these notes: The meeting began with reflections on the passing of both Leonard Nimoy (well known to most of us as Mr. Spock from “Where No Man Has Gone Before” was new and Space was where we were going), and, Harve Bennett who produced six Star Trek films. The importance of Star Trek in galvanizing enthusiasm for the space program was discussed.

Mention was made by both Mitch and Wallace of the Dawn spacecraft entering orbit around Ceres which was reclassified as a “dwarf planet” (it is spherical and about 635 miles in diameter). Two bright areas were seen on the surface and speculation is that this might be exposed ice caused by a recent pair of impacts. (Earl also found information on this in a recent Science Fact article in Analog magazine).

Dottie brought news of events in New York that included: On the Intrepid Air and Space museum: Hubble @25, commemorating the anniversary of the launch of the Hubble, which will be shown until September 14, 2015. A guided tour on Intrepid Women, which included Sally Ride, The First American Women in Space, will end March

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29. At The American Museum of Natural History (in the Rose Center) will be “Dark Universe” on the hidden materials and energy that makes up most of the mass of the universe, and, at the New York Hall of Science, “Hidden Universe”. See the respective websites. **Larry** reported on a new addition to our website: “This Day in NASA History”.

Hank Smith is taking early retirement and this will free him to spend more time doing what he wants to do: attending various conventions and reporting on them. He has been a fixture at Philcon for years and would like to do public outreach for this event as well as helping the science fiction community in general. **Wallace**, our other frequent convention attendee, went to Boskone (in Boston)! He also became a dues paying member of NSSPASA.

Mitch mentioned that several of our members, Mike Fisher, Dennis Pearson, and, Earl Bennett, were judges at the two levels of the George Washington Carver Science Fairs, while Earl was an Award presenter at the Elementary level awards event. The mid and senior level event was postponed, due to snow, and was pushed to the twentieth. The winner of the Oscar H. Harris Award was Christian Albert for his “Optimizing Solar Panel Output” project. Earl went a little overboard on the award material gifts, but, since Radio Shack is closing some stores the financial cost was not high. Mitch also reported on the Spring Ad Astra which included the launch of Orion “designed to allow us to journey to destination never before visited by humans, including an asteroid and Mars” (quote from Mitch). Other highlighted material: the suborbital market (with XCOR’s Lynx and White Knight Two getting special mention as vehicles that can serve this market, Dream Chasers’ ISS Quest, long duration spaceflight (with a recent launch carrying an American to a one year tour of I.S.S. (Earl) and the implications of 3D printing for space settlements (via 3D printing, we can potentially manufacture tools as well as large structures). What did the 3D printer on the ISS make first? A part for the 3D printer! (Earl). Mitch is working on a public outreach event in the University City section of Philadelphia (which starts at the Drexel campus at 32nd and Market streets) in late March or early April.

Janice spoke on the possibility of getting our group involved with an online “meet-up” group. We could form one for ourselves but that would cost money and would need someone to help with its maintenance and social interactions. It would be necessary for a number of us to contribute responses, I think, and that has to be considered. As Larry already has a number of things going on the web, we need someone else to volunteer for this job.

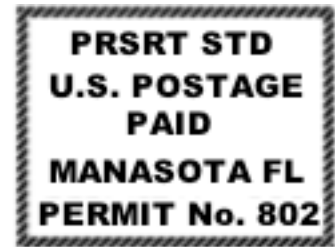
Earl’s post meeting additions: The **rendezvous with Ceres**, and its potential as a “water world” is another hopeful sign for the advancement of human civilization into the solar system. It may be that like **Pluto**, which is being visited by New Horizons this summer, that there may be a large quantity of water below the crust of the body. In the case of Pluto the speculation, reported in the April, 2015, Analog, is that gravitational and radioactive heating effects may have created a liquid filled body for us. It may even have life of some kind under the crust. This could be a great supply of material for eventual terraforming efforts at Mars. If this all works out we would also get a huge, hollow, space where we could set up quite a habitat. But that’s for the future.

From NASA Tech Briefs: in the Who’s Who section is an interview with Carolyn Parcheta a NASA Post Doctoral Fellow at J.P.L. who is working on robotic explorers. Her recent work is on a small rover that can go into volcanoes. Her devices are called “**Volcanobots**” and she is going to The Kilauea Volcano in Hawaii with her second explorer Volcanobot 2. She had begun exploration with Volcanobot 1 in May, 2014.

There were several interesting (and geeky) reports in this March issue, but, I will mention only the report “Design for Improving the Flatness of Solar Sails”. This report describes a problem, and work on a solution, in applying a solar sail structure as part of The Lunar Flashlight Cubsat. This device is to be used as an illuminator of shadowed craters where water may be frozen out at the bottom of perennially dark craters. The researcher, Eric B. Hochberg of Caltech, points out that the problem with the sail stems from its massive amount of folding of the sail to fit into the launch container and then unpacking it. This was a problem also with the design of the Web Space Telescope: the launch configuration sets the way the instrument needs to pack down, the launchers are not built for each cargo (within some constraints of course. The launchers are designed for an anticipated range of cargo sizes to cover the market that the launch manufacturer wants to be in). This kind of constraint is why we now have the phrase “origami spacecraft” as a descriptor. See the article, and the technical support package available from NASA under the Mechanical and Fluid Systems portion of the Tech Briefs site (www.techbriefs.com).

And lastly: from Manufacturing Engineering’s special 2015 Manufacturing Trends Report there is a number of different highlight articles on various techniques being developed to build a number of parts. But one kind of part, currently being built in research labs, should be interesting for future space explorers (and the rest of us): the printing of human body components and support structures to build organs that may need repair and/or replacement. The work being highlighted is being done at Rice University and includes scaffolds for the ear, a kidney prototype, and, finger bone scaffolds, and, at Wake Forrest Institute for Regenerative Medicine, a 3D printer creating a kidney prototype is shown. The report mentions that bone and vasculature structures and more have been successfully printed. For multi-year missions we may be taking a human as well as mechanical systems repair device on our way “out there”. We have NASA supporting this kind of work as well as a large number of other government and other supporters. I am interested in the artificial pancreas myself and I know of others who are looking toward the many other repair and rehabilitation components that can be used on Earth as well as to insure the success of long term missions. Ad Astra! – Submitted by Earl Bennett, President N.S.S.P.A.S.A., KD2CYA.

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