Leap to the Moon

The Epoch of Mankind's Future in Space Has Finally Come

by Benjamin Deniston

Nov. 28—What will NASA's focus be under President Trump? Rather than comment upon ongoing speculation and rumors, let's focus on what needs to happen to secure mankind's prosperous future in the Solar system.

What should the goal of today's space program be? We certainly want to accomplish inspirational and exciting goals—sending mankind back to the Moon, getting people to Mars, and pursuing greater robotic exploration of other planetary systems are all worthy goals now being discussed.

However, there is another, higher, consideration which must guide our actions now: *will the accomplishments we make provide the platform to support qualitative leaps to even greater capabilities in the future?*

Today's space policy should have a generations-long vision to develop the capabilities that will then enable mankind to regularly perform tens or hundreds of the types of missions that we currently see as single flagship missions today. For reasons discussed below, an international mission for the development of the Moon is the clear first step.

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Natural Human Progress Comes in Leaps

Yesterday we cheered with excitement, watching NASA's Curiosity rover make its first explorations of Mars; tomorrow we should have more advanced rovers exploring many more planets and their moons (Venus, Mars, Titan, Europa, Enceladus, Io, Triton, Ganymede, Pluto, and more). A few decades ago the world was gripped by seeing mankind set foot on the Moon; a few decades from now we should witness mankind exploring other planets with relative ease. We must look to interplanetary space travel, exploration, and development, just as mankind looked centuries ago to transoceanic travel or transcontinental travel—voyages that start as risky and expensive exploration missions led by a handful of brave individuals must become increasingly common occurrences for increasingly large fractions of the population. This will take a few generations to accomplish, but ultimately it is the correct perspective needed to guide our actions today.

In the beginning of the 19th Century, Lewis and Clark risked life and limb to traverse the wilderness of the American continent, achieving something that the average retired RV enthusiast of today can accomplish in a span of a week, or the average airline traveler can accomplish in a day. In the middle of the 20th Century, a handful of astronauts were the first to brave the cold vacuum of space in mankind's first trips to the Moon, achieving what will be common a century from now.

Is space travel more difficult than early transcontinental expeditions? Yes, absolutely—but every new challenge is always more difficult than the last; this is the nature of human advancement.

The question to ask is: how does mankind change extraordinary, singular achievements into ordinary, common activities? The unique and incredible into the regular and indispensable? What enables mankind to uniquely make such dramatic shifts? The answer is provided by Lyndon LaRouche's science of physical economics.

LaRouche's Physical-Economic Platform

During this transition period, leading into the new Trump Presidency, it is critical to raise the level of discussion to the right basis. We can have exciting missions, we can have inspiring missions, but the question to ask is: Are we going to have a program where the investments are going to be the basis for creating a whole new level of activity, that will allows us to do orders of magnitude more than we were able to do prior to that investment? Is this going to create what Mr. LaRouche had once defined as a "physical-economic platform"?[1] Is this going to create an entirely new platform of activity, of potential—of infrastructure, of energy-flux density of technologies—which comes together to support a qualitatively new level of potential activity for mankind?


NASA

Krafft Ehricke with a model of an orbital hospital.

That is the issue we want to put on the table right now. This goes directly to the vision of Krafft Ehricke, the early space pioneer who worked very closely with Lyndon and Helga LaRouche in the 1980s. Ehricke was one of the leading space visionaries, who outlined in great detail the initial basis for mankind advancing to become a species that dwells in the entire Solar system.

The real understanding of what qualitative revolutions in infrastructure systems mean for mankind's continual creative progress is not connected to the way most people use that term. A better representation would be to think in terms of advancing "platforms" of human development. Go back to thousands of years ago, when the dominant cultures were trans-oceanic maritime cultures. What you began to see, with the development of inland waterways, inland river systems—such as what Charlemagne was doing during his reign in central Europe in developing these canal systems and river systems—was a qualitative revolution above what had existed prior, with these trans-oceanic civilizations. The development of these inland waterways defined a new platform of activity that supported a qualitative leap in what civilization was able to accomplish.

The next leap came with the development of rail systems, especially trans-continental railroads, typified by what Lincoln had spearheaded with the trans-continental railroad across America. Transcontinental rail systems, and the new energy flux-densities provided by the coal powered steam engine, created a new platform, supporting the development of the interior regions of continents for the first time (opening up vast new territories for development) and providing a new space-time connectivity for the economy (enabling new flows of goods, production processes, and higher levels of overall productivity for the labor force).

These trans-continental rail systems defined a qualitative increase in mankind's "potential relative population density," as LaRouche has developed that metric for understanding the science of economic growth. It made things that were at one point incredibly expensive or challenging or risky, become just day-to-day regular activities.

How will we create a similar shift with respect to mankind's relation to the Solar System? What are the key technologies, energy flux-densities, and infrastructures of a Solar system physical economic platform?

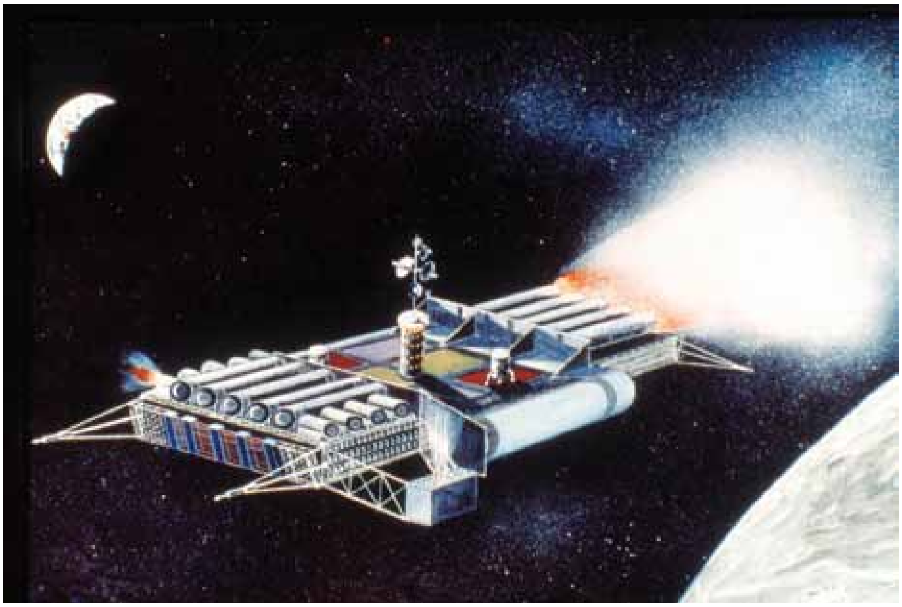
Solar System Physical Economic Platform

Even if not discussed in the same terms of reference, the basic elements of a Solar system platform have been well known since the work of Krafft Ehricke and his colleagues. For convenience here we can identify three critical categories of focus.

• **Access to Space**—Because of the massive energy requirements to overcome Earth's gravity, it has been said, "Once you get to Earth orbit you're halfway to anywhere in the solar system." Speaking strictly in terms of energy requirements, this is absolutely true (for example, the Apollo program's Saturn V rocket used far more fuel simply traveling from the Earth's

1. See the Sept. 24, 2010 international webcast with Lyndon LaRouche, "The New Economy," *Executive Intelligence Review*, October 1, 2010.

surface into Earth orbit than it used traveling the quarter of a million miles from Earth orbit to the Moon). Today it costs $10,000 to put one pound of cargo into Earth orbit with rocket launch systems. With current efforts to lower costs, traditional rocket flights to Earth orbit might be cut down to one tenth of present costs (at best). However, new technologies provide far better improvements. What NASA defines as "third generation launch vehicles" and air-breathing rockets can reduce the costs to between one-tenth and one-hundredth of current levels.[2] With advanced versions of these systems, astronauts could ride a space plane taking off from an airport runway and traveling all the way into Earth orbit.[3] Going further, magnetic-levitation vacuum-tube space launch systems could reduce the costs to merely 0.2% of current levels, making low Earth orbit as accessible as international travels.[4]


Krafft Ehricke

Painting of a nuclear freighter for industrialization of the Moon, by Krafft Ehricke.

• **In-Space Fusion Propulsion**—The energy released by nuclear reactions is an amazing one million times greater than chemical reactions (per mass). For example, the energy contained in the Space Shuttle's 3.8 million pounds of chemical fuel (in its two solid boosters and its liquid fuel tank) could be matched by a mere ten pounds of nuclear fuel. When one grasps the vast distances involved in travel through the Solar system, it becomes clear that deep space travel without nuclear power is as silly as travel across a continent without fossil (chemical) fuels—it may be done to a limited degree, but it does not support the necessary platform level of activity. Fission, and much more importantly fusion, propulsion are critical to fast and regular access to other planetary bodies. While today's trips to Mars require months of travel time, fusion propulsion can put Mars weeks, or even mere days away.

• **Space Resource Development**—The development and utilization of the resources available beyond Earth will lift mankind above self-supplied excursions into space, to the level of an active organizing force in the Solar System. The ability to develop the resources available on the Moon, asteroids, Mars, or any potential destination in the Solar System reduces the extremely costly requirement of bringing everything from Earth, and begins the grand process of creating self-sustaining systems of economic activity in space, providing needed goods to space activities, and even back to Earth. In addition to the most obvious sources of water, oxygen, and hydrogen, a major focus is a fusion fuel which is nearly completely absent from the Earth, but covers the Moon's surface, helium-3. Advanced (aneutronic) fusion reactions powered by helium-3 could propel spacecraft around the entire Solar system, and power the Earth for centuries to come.[5]

2. See NASA's "Advanced Space Transportation Program" webpage, https://www.nasa.gov/centers/marshall/news/background/facts/astp.html

3. For example, the British company Reaction Engines Limited has designed a spaceplane, the Skylon, powered by their Synergetic Air-Breathing Rocket Engine (SABRE). The U.S. Air Force Research Laboratory has been also been developing a spaceplane design which would utilize the same SABRE engine, and China's Aerospace Science and Technology Corporation (CASTC) is pursuing their own spaceplane designs.

4. See "Maglev Launch: Ultra Low Cost Ultra/High Volume Access to Space for Cargo and Humans," 2010, by James Powell, George Maise, and John Rather (http://www.startram.com/). China's Southwest Jiaotong University is working on similar designs under a project led by Dr. Deng Zigang.

5. See "Helium-3 Fusion: Stealing the Sun's Fire," by Natalie Lovegren, *21st Century Science & Technology, Special Report: Physical Chemistry* (2014).

Taken together, technological and infrastructure breakthroughs in each of these three categories combine to create a new physical economic platform that will completely redefine mankind's relation to the Solar system—as railroads and steam engines had transformed mankind's relation to the continents two centuries earlier.

Destination Moon

Done properly, a mission for the development of permanent basing and manufacturing operations on the Moon can be the best driver program for the creation of a Solar System physical economic platform. The Moon's close proximity makes it accessible for development, and its unique helium-3 resources can provide the fuel for fusion propulsion in space (and fusion power back on Earth), as well as defining a driver program for the development of space mining, processing, and manufacturing capabilities. New space launch systems will lower the cost of Earth-Moon transport, and dramatically increase accessibility to the entire Solar system.

And the world is already looking in this direction. Both China and Russia have their sights set on the Moon, with many of these objectives in mind, and the head of the European Space Agency has put Europe's support behind international development of the Moon.

In a recent discussion with Lyndon LaRouche, he stated, "Your starting point is Krafft Ehricke." And Krafft Ehricke's industrialization of the Moon is the critical driver program that can get a lot of this going. We have helium-3 on the Moon; that puts fusion directly right there on the table. You're talking about developing industrial capabilities and mining capabilities on the Moon. If you're serious about doing this, you want to increase our access to space from the Earth's surface. So, it is excellent that we're seeing a lot of discussion about the Moon coming on the table again; but I think the issue is, are we going to pursue this Krafft Ehricke vision for a real industrial development?

For President Trump it seems clear that the Moon is the obvious choice. The question is whether this will be the beginning of a new, transformative platform that will qualitatively raise mankind's capabilities to an entirely new level. Will this initiate the next revolution in mankind's continual creative advance in the Universe? It is the full comprehension of that question which is required at this time.