First Word

Space resources are too important to be left to the vagaries of national politics

By Gerard K. O'Neill

If you want to be sure something gets done, do it yourself. That's an old rule, and it works. A small band of people from all over the world are applying it now in practice. They feel that the breakout of humankind into space is too important to be left to the vagaries of national politics.

With the successes of Apollo, Skylab, Soyuz, Viking, and the planetary survey spacecraft, we humans have shown our ability to break free of the limits a planetary surface imposes. Why battle over fossilized energy when out beyond Earth's shadow there steams by every second, wasted, enough continuous solar energy to power our civilization for thousands of years? Why fight over minerals when there's more iron, nickel, aluminum, silicon, and other useful elements in the asteroids than we could contain by carving away every mountain range on Earth?

NASA conducted technical studies in 1976 and 1977 under my direction, aimed at using non-terrestrial resources. We obtained positive results since confirmed in year long contractor studies by Convair / General Dynamics, MIT and the lunar and Planetary Institute. If there is a need for big construction in space whether it's for radio-telescopes, deep-space laboratories, solar-power satellites, or space colonies, that need can be met most economically getting raw materials from the moon or asteroids. That logical result will endure forever because no one can repeal the law of gravity. It will always take more than 20 times as much energy to haul a ton up into orbit from he earth as from the moon.

Despite all good will on the part of our NASA friends, it became clear late in the 1970s that the space agency couldn't carry this research forward without help. Amid reorganizations, continuing governmental budgetary crises, and potshots from critics, NASA was lucky it could plan even six months ahead. But to get results, research has got to be pushed steadily, and the Space Studies institute (SSI) was formed in 1977 to do just that. It funds research through tax-deductible gifts from individuals. Overhead? No problem. SSI's founding officers serve without pay. So do its senior advisers who include both of the last two NASA administrators, over distinguished scientists, and such visionaries as Buckminster Fuller and Barbara Hubbard.

The institute donors are asked for only $10 to cover the annual subscription but most of them renew at higher figures. By 1979, hundreds of individuals began pledging larger sums annually for five years. SSI's capital resources, acquired by such voluntary gifts will never equal the vast sums that governments extract from citizens by taxation, but SSI is building assets that are even more important: continuity and longevity. It is committed to opening the resources of space for human benefit and it will hold to that commitment no matter what politicians are swept into or out of office by the winds of political fortune. Occasionally an administration may support a project that SSI started. Fine. The institute will turn to the next item on its funding priority list.

SSI funds were allocated first to the construction of a model mass driver, a special type of electric motor that could be used to launch lunar materials to a precise point in space or to drive a space freighter efficiently running on solar power. The model, built mainly by MIT students working as volunteers, demonstrated an acceleration of 35 gravities, zero to 85 mph in 0.1 second. With continued SSI support, an initial design was drawn up for a second model to work at 500 gravities in acceleration. NASA became interested and supported its construction By mid-1980, that machine was working too.

The institute also began supporting workshops to find the quickest, least expensive method of reaching high economic productivity in space using solar energy and lunar materials. Specialists in mass driver design, spacecraft engineering, the chemical separation of lunar materials, and industrial automation cooperated and found that an investment of $6 billion to $8 billion, no more than than the cost of wholly private ventures like the Alaska pipeline would be enough to establish a partially automated industry in space, producing 100,000 tons of products annually with a value over $10 billion.

Recently the institute made a third grant and the research it supported opened the door to what could be the most attractive storehouse of materials in the entire solar system. Following a suggestion by one of SSI's senior advisers, the Nobel laureate Professor Hannes Alfven, a Princeton graduate student named Scott Dunbar wrote his doctoral thesis on a difficult problem in gravitation theory. He showed that small asteroids could be trapped along the earth's orbit. Those nuggets would

be retrievable at almost no cost in energy and an inexpensive telescope probe could find them if they exist.

The breakout into space doesn't depend on our being so lucky as to find those particular asteroids, but it does depend on our learning to separate lunar or asteroidal materials into pure metals, silicon, and oxygen. The institute has now put its highest priority on raising funds to build a working pilot plant at tabletop scale to extract pure elements from minerals identical to those on the moon. With its constancy of purpose and its independence, SSI is proving that a small amount of money spent wisely can be more effective in advancing a cause than much larger sums scattered for purposes that change with every passing year.

The Space Studies Institute, Box 82, Princeton, NJ 08540, publishes a quarterly newsletter for subscribers ($10/year).

Note: As of 2010, the SSI address is 1434 Flightline Street, Mojave, NM 93501, (661) 750-2774, http://www.ssi.org