

Of create things in
space has been



**ASSIGN
BUSTER**

of the American Institute of Aeronautics and Astronautics (AIAA) and the engineering section of the New York Academy of Sciences jointly presented a program on mining the planets. Speakers were Greg Maryniak of the Space Studies Institute (SSI) and Dr. Carl Peterson of the Mining and Excavation Research Institute of M. I. T. Maryniak spoke first and began by commenting that the quintessential predicament of space flight is that everything launched from Earth must be accelerated to orbital velocity.

Related to this is that the traditional way to create things in space has been to manufacture them on Earth and then launch them into orbit aboard large rockets. The difficulty with this approach is the huge cost-per-pound of boosting anything out of this planet's gravity well. Furthermore, Maryniak noted, since (at least in the near to medium term) the space program must depend upon the government for most of its funding, for this economic drawback necessarily translates into a political problem. Maryniak continued by noting that the early settlers in North America did not attempt to transport across the Atlantic everything then needed to sustain them in the New World.

Rather they brought their tools with them and constructed their habitats from local materials. Hence, he suggested that the solution to the dilemma to which he referred required not so much a shift in technology as a shift in thinking. Space, he argued, should be considered not as a vacuum, totally devoid of everything.

Rather, it should be regarded as an ocean, that is, a hostile environment but one having resources. Among the resources of space, he suggested, are

readily available solar power and potential surface mines on the Moon and later other celestial bodies as well. The Moon, Maryniak stated, contains many useful materials. Moreover, it is twenty-two times easier to accelerate a payload to lunar escape velocity than it is to accelerate the identical mass out of the Earth's gravity well.

As a practical matter the advantage in terms of the energy required is even greater because of the absence of a lunar atmosphere. Among other things this permits the use of devices such as electromagnetic accelerators (mass drivers) to launch payloads from the Moon's surface. Even raw Lunar soil is useful as shielding for space stations and other space habitats. At present, he noted, exposure to radiation will prevent anyone from spending a total of more than six months out of his or her entire lifetime on the space station. At the other end of the scale, Lunar soil can be processed into its constituent materials.

In between steps are also of great interest. For example, the Moon's soil is rich in oxygen, which makes up most of the mass of water and rocket propellant. This oxygen could be recovered out of the Lunar soil.

Since most of the mass of the equipment which would be necessary to accomplish this would consist of relatively low technology hardware, Maryniak suggested the possibility that at least in the longer term the extraction plant itself could be manufactured largely on the Moon. Another possibility currently being examined is the manufacture of glass from Lunar soil and using it as construction material. The techniques involved, according to Maryniak, are crude but effective. (In answer to a question posed by a

member of the audience after the formal presentation, Maryniak stated that he believed the brittle properties of glass could be overcome by using glass-glass composites.

He also suggested yet another possibility, that of using Lunar soil as a basis of concrete.) One possible application of such Moon-made glass would be in glass-glass composite beams. Among other things, these could be employed as structural elements in a solar power satellite (SPS). While interest in the SPS has waned in this country, at least temporarily, it is a major focus of attention in the U.

S. S. R.

, Western Europe and Japan. In particular, the Soviets have stated that they will build an SPS by the year 2000 (although they plan on using Earth launched materials. Similarly the Japanese are conducting SPS related sounding rocket tests. SSI studies have suggested that more than 90%, and perhaps as much