

Why Venture?

A memo for the Biden Administration's In-Tray (Space 1-0-1)

Derek Webber

It's that time again. A new administration reassesses the funding, rationale and specific projects being undertaken by the various space related departments. This is an inevitable consequence of the political vicissitudes which operate on a 4-year time horizon as compared with the much longer timescales involved in space development. At least in these still-early years, when most of the funding still comes from government sources. Of course, there will always be geopolitical and even military considerations taken into account, which will vary with the tides of world affairs, but maybe it would be a good idea to re-state those basic rationales which transcend the politics of the moment. Why did Gagarin, Glenn, Armstrong, et al, risk their lives at the onset, and why do today's astronauts line up for the challenges of the future? Space, above all else, is a global endeavor, and we should therefore be able to understand those common perspectives that all occupants of the planet share about the rationale of space exploration, whether it use robotic or human crews. In particular, it can be helpful to do this to get a handle on the timescales involved in developing space policy.

We ultimately undertake space exploration (both robotic and human) to collect knowledge, so that we may have the following benefits, both in the short- and long-term:

1. A better understanding of our home planet, so that we can **protect** it from both human-induced and natural threats
2. Space-based technology businesses that **improve** life on Earth, while generating funding and developing spacefaring skills
3. Access to energy reserves and scarce resources to **sustain** long-term life on Earth; and
4. A space-faring capability to ensure long term species **survival** through eventual life-threatening calamities to the planet

The first two of these categories are well underway and ongoing, and we are just about to start grappling with the third and fourth categories, and may need some perspective in order to assist in policy development. So, let's consider each category in turn.

- Category 1 – Protecting the Earth and its occupants

Under this category, we can certainly record the successes of weather forecasting, and also the Earth observation technologies. Some have pointed out that we needed to leave the Earth in order to be able to look back and truly appreciate it. The task of course continues, and ozone-hole monitoring, climate change indicators, and human threats to the ecosystem continue to be recorded while solutions are proposed and debated and hopefully implemented. Most of this work began as governmental endeavor, but nowadays this has been augmented by commercial operators.

- Category 2 – Improving Life on Earth

Under this category, we can consider initial governmental activities, which however quickly became the province of commercial operators. In fact, these were the first round of successful space businesses. They continue to generate wealth, funding via taxation, and employment opportunities. We include here building the spacecraft and launch vehicles supporting the satellite telecommunications and broadcast businesses, all those activities which rely on GPS or other satellite navigation services, and the nascent space tourism sector. In many ways, these businesses have been, and are, enablers of future space developments. These individual market sectors, and associated spinoffs, are where we have learned to develop spacefaring skills, to improve the reliability and lower the costs of space travel. This is ongoing and good business.

- Category 3 – Sustaining Life on Earth

And now we are at the threshold of the next great step for continuing our space endeavors. This is where there is a need now for a clear visionary assessment of budgets and timeframes. This is where it is necessary to weigh the national and international frameworks for progress. The relevant timescales here are related to the assessed reserves on Earth of materials considered to be essential to humankind's continued progress. Work is beginning to assess the likely future need for such resources as eg rare earth minerals, versus the likely terrestrial reserves. But it is probable that we are talking in decades, which gives us a clue to budgeting needs. And initial experiments are planned to assess the availability of reserves of such materials on the Moon, Mars, and asteroids. Already, NASA is planning the Artemis and supporting missions to the Moon to help derive this knowledge. The Artemis Accords have even been introduced as a way of engaging in peaceful sustainable international operations on the Moon. The Russians and Chinese are also developing their own preferred approach. How should the national space budgets handle the efforts and timescales involved in this work? Is there any urgency? That may depend on external political factors, but with regards to the fundamentals we know that we need the time to study the availability of resources in off-Earth locations, and to learn how to process and extract them for use on Earth. A current endeavor by a Working Group of the Moon Village Association is trying to give guidance on these timescales, and the extent to which commercial entities will be able and willing to undertake the activities, at least in the case of the Moon. It already seems clear that governmental funding will be necessary for at least the next decade; it is not yet clear when it might be possible for commercial businesses on the Moon to be self-sustaining. Meanwhile, governments should budget to pursue the experimentation and development activities, continue to seek improvements and economies in providing the sustaining infrastructure elements, and plan to develop the knowledge gained on the Moon for application elsewhere in the solar system, such as on Mars or asteroids.

- Category 4 – Ensuring Survival

Finally, this category has been on the list of space travel rationales from the very beginning, with such visionaries as Tsiolkovsky even making the point in 1903. There is an *inevitability* about the need, but in most scenarios of Earth catastrophe the time of such an eventuality is so very far

into the future, (at least centuries, possibly millions of years), that it is not possible in normal political discourse to even include budgetary provision to contemplate the requirements for activities to protect life itself. Nevertheless, this does represent the ultimate rationale for space exploration, and was at least alluded to by several of the early astronauts who risked their lives at the beginning of the space era. And, however far-off these eventualities might be, we do know that they would make it *impossible* for life to continue on Earth. For completeness, in this Space 1.0.1 note, we should at least list them for future reference, some of which might well include ongoing negative consequences of human behavior:

Astronomical – Changes to the Sun including expansion to Red Giant phase; Possible arrival of gamma-ray bursts; Collision with asteroid or comet

Geophysical – Possible implications of Earth's magnetic field reversal; Possible eruptions of super-volcanoes

Biological – Possibly increasingly devastating virus pandemics

Human-caused nuclear winter scenarios

At least, some work has begun on how to approach the asteroid threat, and some budget is being allocated, although current indications are that there is no expected existential threat for at least another 100 years.

So, there we have it, for our Space 1.0.1. restatement. I think we can agree, in a non-partisan way (but I may be wrong!) that there are short-term and long-term reasons why we do space exploration, some of them even being existential, but all of them involving protecting, improving and sustaining life on Earth. To the Biden Administration Team, therefore, I hope this is useful, and helps you to relate the appropriate expenditures and incentives for budgeting purposes. In particular, I hope it provides a framework for considering what the future holds in terms of Lunar activities, which represent the next arena for our collective space development endeavor. Remember, we venture because we must!

Derek Webber is Director of Spaceport Associates, the author of several books about commercial space developments, and is Co-Chair of the Working Group on Lunar Commerce and Economics of the Moon Village Association.