

HAS SPACE DEVELOPMENT MADE A DIFFERENCE?

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In his paper in this volume, J. R. McNeill writes that “It is in fact too soon to tell what the real significance of the Space Age may be. At the moment, space exploration, space flight, space research, all seem at most secondary next to the dominant trends of contemporary history. . . . The big things would probably be much the same, for better or for worse.” He adds “space programs changed the history of our times, but not (yet) in any fundamental ways.” Walter McDougall in his paper adds that he senses “that the fiftieth anniversary of the birth of the Space Age is draped with a certain melancholy. Do you sense a mood of disappointment, frustration, impatience over the failure of the human race to achieve much more than the minimum extrapolations made back in the 1950s, and considerably less than the buoyant expectations expressed as late as the 1970s?”

I beg to disagree, at least in part. The assignment for this paper was to discuss this question: “Has the Space Age fostered a new global identity, or has it reinforced distinct national identities? How does space history connect with national histories and with the histories of transnational or global phenomena . . .?” It is an interesting mental exercise to imagine what today’s world would be like, at least in the urbanized Northern hemisphere, if all space systems were shut down for twenty-four hours. I believe that we would quickly realize that those systems have become deeply integrated into the infrastructure of the modern world, and that *neither* the modern nation-state *nor* the global economy could operate effectively without them. If the overall history of most of

the past fifty years has not been fundamentally affected by the development of space capabilities, it is my view that the history being made today and in the recent past is in meaningful ways a product of how nation-states and the private sector have incorporated the possibilities made available through space technology into their everyday operations.¹ In this sense, the ability to operate in outer space is part of history, not an independent variable shaping it.

The Impacts of Space Development

That reality may be part of the problem in identifying the impact of space development during its first half-century. As various capabilities have become operational, they have been subsumed into the larger pattern of human activity, and not usually thought of separately as “space.” McNeill suggests that “Some things would have been a bit different without spy satellites, communications satellites, weather satellites, earth-observation satellites, and so forth,” but, in his view, not dramatically different. He asks whether “the current surge of globalization have derived some of its momentum from an enhanced awareness that we are all in the same boat, all stuck on the same small blue dot spinning through the darkness? Or could it owe something to instantaneous communications via satellites?” His view is that “the best answer is: yes, but not much. If no one had ever seen photos of the earth from space, and if information from India and Indonesia still arrived by telegraph and took a day or two to reach other continents instead of a second or two, would globalization be substantially different?” For at least the latter of his two questions, my answer would be “yes.” It is really difficult to imagine today’s world absent instantaneous information flow; space systems are a

¹ Most of the papers in Steven J. Dick and Roger D. Launius, eds., *Societal Impact of Spaceflight* NASA SP2007-4801 (Washington: Government Printing Office, 2007) provide evidence and analysis in support of this assertion.

crucial part of the global information transmission network that makes such flow possible. Whether the view of Earth from cosmic distances – Earthrise over the barren lunar surface or the “pale blue dot” most recently glimpsed by the Cassini spacecraft as it orbits Saturn has created a global consciousness is more debatable. Certainly the Earthrise image became the icon of the environmental movement in the 1970s and references to “Spaceship Earth” still appear in admonitions of the green movement. But, as McDougall comments, “any global consciousness or Spaceship-Earth mentality inspired by astronautics has worked no metamorphosis in national or international affairs.”

Somewhat the same can be said for the other space capabilities that McNeill cites. For nations with global or regional security interests – during the Cold War, the United States and the Soviet Union, and today an additional small number of other states – the ability to obtain near real-time information on potential security threats is a stabilizing element in international security affairs. But space-derived intelligence information is merged with intelligence from other sources, and it is not possible to measure its independent contribution to avoiding or ameliorating (or abetting) conflict. Information regarding the variables determining short and longer-term weather patterns obtained from meteorological satellites is integrated with other information; there are many projections of the billions of dollars and hundreds of lives saved due to better weather forecasts.

McNeill does not discuss the impact of satellites delivering positioning, navigation, and timing services. But such satellites, most notably to date the U.S. Global Positioning Satellite system, have become the basis for a global utility with multiple applications from guiding precision weapons to their targets to providing the timing

information that makes the internet possible. Again, one does not often think of the space-based source of these capabilities; what matters is the application, not the means that enables it.

Though not the focus of this and the other papers in this volume, it would be remiss to avoid discussing the impact of space capabilities on war fighting in an assessment of the importance of the last fifty years of space development. So far, only the United States has made its approach to power projection and fighting wars strongly dependent on the use of space systems. It is well beyond the scope of this paper to discuss whether that commitment to space as a military tool was a wise one, endowing the United States with decisive military advantages. But certainly space capabilities are central to what has been described in the United States as a “revolution in military affairs.”²

It is instructive to observe that countries pursuing rapid social and economic development – China and India are probably the best examples –are investing significant amounts of their scarce financial and human resources in space development. They seem convinced that space capabilities can have fundamental impacts on their future history.

I conclude, then, that by its contributions to the various ways in which everything from international conflicts to day-by-day life unfolds, space development has indeed been a significant influence in recent human history, though one whose specific contributions are difficult to separate out. Comparing a world today without the capabilities provided by space systems to one in which those systems are fully integrated will, I believe, support this validity of this judgment.

² See for example Steven Lambakis, *On the Edge of Earth: The Future of American Space Power* (Lexington, KY: University Press of Kentucky, 2001) for a discussion of the link between space capabilities and military power.

Forty Years of Frustration

McDougall senses a feeling of “melancholy” because space development has not moved beyond what was predicted for it more than a half century ago. I would substitute the word “frustration” for “melancholy.” Visionaries such as Arthur C. Clarke and hard-nosed analysts at the Rand Corporation by the early 1950s had indeed spelled out most of the various domains in which space capabilities, once they were technologically and financially achievable, could contribute to human life in important ways. What happened in that decade is interesting to remember. First of all, these space visions became part of popular culture well before the first satellites were launched. Those raised in the 1950s (I was among them.) had available in print, in film, and on the then-new medium of television multiple images of a future transformed by space activity. The 1952 *Collier's* cover declaring “Man Will Conquer Space Soon” was typical of the message we were receiving.³

At the same time, the leaders of the two Cold War superpowers, the United States and the Soviet Union, decided that developing the technologies needed to operate in space were linked to their countries' core national interests. More quickly than anyone could have anticipated at the start of the decade, the U.S. and Soviet governments provided the funds needed to develop a broad array of space capabilities, primarily, as McDougall notes, on the basis of national security considerations. But to those steeped in the space visions of the decade, it seemed that the predictions of Clarke, von Braun and their colleagues might soon become reality. We did not sense the contingent character of government commitment to space, which linked space to broader geopolitical interests.

³ Excerpts from the *Collier's* series on space can be found in John M. Logsdon *et al.*, eds. *Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program*, Vol. I, Organizing for Exploration, NASA SP-4407 (Washington: Government Printing Office, 1995), pp. 176-200.

The acme of this linkage was, of course, Project Apollo. As I wrote in 1970, by his decision to use American trips to the Moon as a way of symbolizing U.S. power vis-à-vis the Soviet Union, President John F. Kennedy “linked the dreams of centuries to the politics of the moment.”⁴ By backing up his decision to go to the Moon with a war-like mobilization of human and financial resources to achieve the lunar landing goal, Kennedy created a sense that what was in fact a crash program aimed at a specific political goal was in fact a U.S. national commitment to achieve on an accelerated schedule the various elements of the 1950s space vision. This sense was reinforced by NASA Administrator James Webb’s argument to Kennedy that the real goal was “preeminence” – a clearly leading position in all areas of space activity. Not only human space flight, but all areas of space science and applications, grew rapidly in the 1960s.

Thus it is not surprising that the space community in 1969, as the Apollo goal was achieved, proposed to take the next steps, including large space stations, a lunar base, human missions to Mars, and increasingly ambitious robotic missions. Their expectations were quickly dashed, as President Richard Nixon in March 1970 announced that “We must think of [space activities] as part of a continuing process...and not as a series of separate leaps, each requiring a massive concentration of energy.’ The president added “Space expenditures must take their proper place within a rigorous system of national priorities. . . . What we do is space from here on in must become a normal and regular part of our national life and must therefore be planned in conjunction with all of the other undertakings which are important to us.”⁵

⁴ John M. Logsdon, *The Decision to Go to the Moon: Project Apollo and the National Interest* (Cambridge, MA: MIT Press, 1970), p. 7.

⁵ President Nixon’s statement can be found at <http://www.presidency.ucsb.edu/ws/index.php?pid=2903&st=&st1=> (Accessed April 6, 2008)

This perspective was bound to frustrate those who in the immediate aftermath of the lunar landings thought that the government commitment to space that had fueled Apollo would continue. What is unfortunate is that this frustration continues today; in the almost four decades since Nixon set forth the policy which has in effect guided civilian space decisions since, the space community has not adjusted its expectations to a much slower-paced, but perhaps ultimately more sustainable, approach to space development. Apollo created a large government-industrial-scientific complex optimized for carrying out fast-paced development and operation efforts. That complex exists, albeit in a diminished form today, and it continues to be frustrated that its aspirations are not fully supported by the White House, the Congress, and ultimately the American public. That the space community still hopes to recapture something approaching the Apollo approach to space is what is “melancholy.” As Howard McCurdy has commented

The reality of space travel depleted much of the vision that originally inspired it. Space-flight engineers have not developed technologies capable of achieving the dream; advocates have not formulated alternative visions capable of maintaining it. At the same time, no alternative vision of sufficient force has appeared to supplant the original dream. Advocates still embrace the original vision of adventure, mystery, and exploration. They continue to dream of expeditions to nearby planets and the discovery of habitable worlds. The dreams continue, while the gap between expectations and reality remains unresolved.⁶

That being said, I think one can look back at what has been accomplished over the past fifty years and agree with the late Sir Arthur C. Clarke’s observation: “On the whole, I think we have had remarkable accomplishments during the first 50 years of the Space Age. Some of us might have preferred things to happen in a different style or time frame,

⁶ Howard E. McCurdy, *Space and the American Imagination* (Washington: Smithsonian Institution Press, 1997), p. 243.

but when our dreams and aspirations are adjusted for reality, there is much we can look back on with satisfaction.”⁷

What about Space Exploration?

McNeill comments that “Space exploration, as opposed to the totality of space programs, could well be relegated to the status of historical footnote. . . . [E]xploration programs are another matter: they are especially expensive and they probably won’t cure cancer or defeat terrorism, so they are at high risk of being phased outIf so, in time space exploration will be forgotten, a dead end, a historical cul-de-sac.” He adds “On the other hand, it could be that space exploration will thrive, find new budgetary champions in the corridors of power” McNeill suggests that “Space exploration may survive on one or another basis, but it still will not loom large in terms of human history unless something really new and interesting happens.” If that occurs, “then the first 50 years of space exploration will look like the beginning of something of epic significance.” If it does not, “it will look like a small step for mankind that led nowhere, and did not amount to much in the balance before being consigned to the dustbin of history.” McNeill concludes, and I concur, that “It is indeed to soon to judge whether the whole enterprise is a gigantic folly diverting money and talent from more urgent applications, a noble calling consonant with our deepest nature, or something else altogether.”⁸

⁷ Arthur C. Clarke, “Remembering Sputnik” at <http://spectrum.ieee.org/oct07/5584> (Accessed March 30, 2008)

⁸ McNeill is talking here about both human and robotic space exploration. It is my view that robotic exploratory missions of some character will continue for the foreseeable future, although ambitious multi-billion dollar undertakings may be few. To me the key issue is whether governments in the early 21st century will support human exploration beyond Earth orbit.

In the first fifty years of the Space Age, only twenty seven Americans ventured beyond Earth orbit to begin the exploration of the solar system by voyages to the Moon. In reality, that sentence is not completely accurate. While many space advocates saw Project Apollo as the beginning of a long period of human space exploration, the political leaders who provided the funds for Apollo certainly did not do so out of a commitment to space exploration. Given the dead end character of Apollo and the fact that it was driven by geopolitical considerations, I do not think there is much that can be said about its historical contributions as an exploratory undertaking. The history of human space exploration is yet to be written. Whether it will begin to be written in the next few decades is today's most pressing space policy question.

McNeill cites one of his colleagues, Felipe Fernandez-Armesto, as suggesting that space exploration has been a “gigantic folly.”⁹ He is not alone in that view. The *Economist* recently commented that “a scandalous amount of money has been wasted on the conceit that voyaging across the cosmos is humanity's destiny”¹⁰ Aerospace executive Rick Fleeter in October 2004 criticized advocates of space exploration for taking “as axiomatic that space's highest and true calling is achieving societal goals of research and exploration into the unknown.” In Fleeter's view, “Hauling this burdensome baggage of an aristocratic calling, now bankrupt both ideologically and financially, is not helping space – it is hindering our community from reaching our potential to serve humanity.” This is so, he argued, because these “old ideas are rigid and anachronistic, no

⁹ Felipe Fernandez-Armesto, *Pathfinders: A Global History of Exploration* (New York: Norton, 2006), 399

¹⁰ *Economist*, September 29, 2007, p. 23.

longer pointing us to a brighter tomorrow, but rather back toward a dead end of technological progress for its own sake.”¹¹

I suggest that there is no compelling evidence one way or the other to assess the validity of these assertions, since the actual experience of human space exploration is so limited. In addition, the belief that sending humans beyond Earth orbit is the correct next step in space development is gaining political acceptance around the world. Leaders of the United States and, more recently, France have committed their countries to the support of human exploration, beginning with a return to the Moon before 2020 and including eventual voyages to Mars. To me, the issue is whether this round of human exploration will be designed to answer, at least for this century, the question of whether such steps are indeed a “gigantic folly” or part of future human history.

The requirements for sustained human exploration beyond Earth orbit were perceptively stated by Harry Shipman in his 1989 study, *Humans in Space*.¹² Shipman says that the future of human activity beyond Earth orbit depends on the answer to two questions:

- Can extraterrestrial materials be used to support life in locations other than Earth?
- Can activities of sustained economic worth be carried out at those locations?

Depending on the answer to those questions, Shipman suggests, the following outcomes are probable:

¹¹ Rick Fleeter, *Space News*, October 18, 2004, p. 10. Fleeter’s remarks were in response to an op-ed essay I had published in the same venue two weeks earlier.

¹² Harry Shipman, *Humans in Space: 21st Century Frontiers* (New York: Plenum Press, 1989), p. 17.

CAN *IN SITU* MATERIALS BE USED TO SUPPORT HUMAN LIFE?**NO****YES****NO**

Space science only

Research and tourism

**CAN SPACE
COMMERCE
EMERGE?****YES**Robot mines,
factories, and labs

Full space settlement

Humanity may be at a branch point in future space development, one that could provide the answers to Shipman's questions. . There is on the table a bold proposition, put forth by U.S. President George W. Bush in January 2004 – that the nations of the world, led by the United States, accept as the guiding purpose of their government' space programs carrying out “a sustained and affordable human and robotic program to explore the solar system and beyond.”¹³ It seems as if space leaders in other space-faring countries, and those eager to become more active in space, are also embracing exploration beyond Earth orbit as an essential element in their future activities. For example, fourteen space agencies¹⁴ in May 2007 issued a statement of Global Exploration

¹³ The White House, *A Renewed Spirit of Discovery: The President's Vision for U.S. Space Exploration* January 2004, p.

¹⁴ NASA, Canadian Space Agency, European Space Agency, CNES, DLR, Italian Space Agency, British National Space Center, Russian Space Agency Roscosmos, Ukrainian Space Agency, Indian Space Research Organization, Chinese National Space Administration, Korean Aerospace Research Institute,

Strategy which argued that “This Global Exploration Strategy will bring significant social, intellectual and economic benefits to people on Earth.” The document argued that “space exploration is essential to humanity’s future.” It added that [emphasis added] **“Opportunities like this come rarely. The human migration into space is still in its infancy. For the most part, we have remained just a few kilometers above the Earth’s surface – not much more than camping out in the backyard.”**¹⁵

The key words here are “opportunities like this come rarely.” I would go even further. Never before has a major government, in this case the United States, committed itself to an open-ended vision of space exploration. The pressing issues are: Will the United States sustain that commitment in coming years? Will other countries join the United States in such a long-term exploratory effort? Or will others follow a different path, developing an exploration program of their own? Finally, will space exploration by humans prove not to be sustainable, and thus humans will focus their space efforts on robotic exploration and space applications that provide direct benefits here on Earth?

These are the key questions for the next period of spaceflight. Only after they are answered can we state with any assurance that space exploration was “a false start that led no where and did not amount to much in the balance before being consigned to the dustbin of history.”

Other outcomes are also possible, as space dreamers have reminded us. Looking back fifty years from now, it may be that our evaluation of the historical significance of space exploration can be much more definitive, and much more positive.

Japanese Aerospace Exploration Agency, and Australian Commonwealth Scientific and Industrial Research Organization.

¹⁵ Each of the fourteen agencies issued the document in some form. See, for example, www.nasa.gov/pdf/178109main_ges_framework.pdf, p. 3 (Accessed April 6, 2008)