Chapter 10

The Role of Space Development in Globalization

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Hundreds of books and countless articles have been written since the mid-1990s about the phenomenon of globalization. A Google search on the term "globalization" yielded 18.8 million hits in September 2005—a number that multiplied almost six times (to 109 million) by March 2006. Amazon.com displayed at least 120 new books on the subject that were scheduled to be released between September 2005 and mid-2006. Despite this impressive volume of literature, the author has had little success in finding discussions that directly address the effect of space development on globalization (and vice versa) other than cursory acknowledgments of the role of satellite communications as a key supporting technology.

Globalization has been identified as the dominant trend that has replaced the cold war, although its development overlaps the cold war by at least three decades. For much of that time, U.S. government space activities had fairly well defined roles that were closely associated with the nation's cold war-era interests. If globalization is the successor to the cold war paradigm, then U.S. space efforts, particularly those involving exploration and development, must be redefined appropriately. This is not a simple task, since debates rage as to what globalization means, where it is headed, and whether the net effect will be good or bad. Although globalization debates primarily address economic, social, and environmental issues, the continuing influence of space development cannot be ignored or viewed in isolation from these issues.

This chapter highlights the role of space development in the emergence of the current era of globalization, and briefly discusses how space activities are likely to continue to influence this evolving process. Globalization, in turn, has influenced the course of space development. The implications for the future may be both positive and negative, including the risk of a backlash against space development stemming from anti-globalization movements.

DEFINING GLOBALIZATION

The economic and societal developments that today are labeled globalization have been around for centuries, waxing and waning at least since the sixteenth century. Popular use of the term "globalization" goes back to the late 1980s. The term's popularity is partly due to its ambiguity and ability to assume different connotations depending on who is using it and in which context.[1] For some, it connotes international connectedness; liberation from geographic and nationalistic limits to innovation and growth; leveling of inequalities; improvement of living standards and the human condition; and an avenue for avoiding major conflicts such as the wars of the twentieth century. For others, globalization is just the opposite. They see it as "a project for polarizing and dividing people—along axis of class and economic inequality, axis of religion and culture, axis of gender, axis of geographies and regions . . . a new caste system."[2]

The deep and often heated disagreement over the nature and ramifications of globalization makes it difficult to find a generally accepted definition for the phenomenon that *The New York Times* writer Thomas Friedman calls "the overarching international system shaping the domestic politics and foreign relations of virtually every country."[3] For purposes of this chapter, a good definition that recognizes the contributions of technological development comes from Joseph Stiglitz, Nobel laureate in economics, who describes globalization as "the closer integration of the countries and peoples of the world which has been brought about by the enormous reduction of costs of transportation and communication, and the breaking down of artificial barriers to the flows of goods, services, capital, knowledge, and (to a lesser extent) people across borders."[4]

The literature on globalization tends to mention space technology (if it is mentioned at all) in no more than a sentence or two acknowledging satellite communications as a component of the revolution in telecommunications that enabled the current era of globalization. The following statement is representative:

> The revolution in microelectronics, in information technology and in computers has established virtually instantaneous worldwide links which, when combined with the technologies of the telephone, television, cable and satellite, have dramatically altered the nature of political communication.[5]

1. Mathias Koenig-Archibugi, "Globalization and the Challenge to Governance," in *Taming Globalization: Frontiers of Governance*, David Held and Mathias Koenig-Archibugi, ed. (Cambridge, U.K.: Polity Press, 2003).
2. Vandana Shiva, "The Polarised World of Globalisation," International Forum on Globalization, 27 May 2005, *http://www.zmag.org/sustainers/content/2005-05/27shiva.cfm* (accessed June 2006).
3. Thomas L. Friedman, *The Lexus and the Olive Tree* (New York: Farrar, Straus & Giroux, 1999), p. 7.
4. Joseph E. Stiglitz, *Globalization and Its Discontents* (New York: W. W. Norton & Company, 2003), p. 9.
5. David Held, "From Executive to Cosmopolitan Multilateralism" in *Taming Globalization: Frontiers of Governance*, David Held and Mathias Koenig-Archibugi, ed. (Cambridge, U.K.: Polity Press, 2003).

This cursory treatment is understandable, since most of the literature focuses on international economics, implications for developing countries and the world's poor, and potential impacts to the environment. But there is much more to the story of how space development has made the current globalization experience different from previous ones, and will continue to affect its evolution. As former Secretary of Labor Robert Reich noted, technology and globalization are often discussed as separate trends, but they are becoming one and the same.[6]

Globalization Past and Present

The concept of globalization has been popularized in newspaper articles and best-selling books by Thomas Friedman, who divides its history into three distinct eras:

- Globalization 1.0 (1492–1800). Countries and governments drove global integration. Trade began between the Eastern and Western hemispheres.
- Globalization 2.0 (1800–2000, interrupted by the Great Depression and the two World Wars). The Industrial Revolution and multinational companies were the key agents of change.
- Globalization 3.0 (2000 onward). Individuals have newfound power to collaborate and compete globally.[7]

Friedman's view of globalization history hinges on the increasing empowerment of ever-smaller components of societies. This view, though compelling, is not shared by historians, who perceive three eras of globalization as follows:

- The age of exploration and colonization from the fifteenth century to the early nineteenth century.
- Industrialization and expansion of world trade from the mid-nineteenth century to 1914, at which time globalization was halted by the outbreak of the first World War.
- The current era from the post–World War II recovery of the global economy to the present.[8]

When one looks at the differences between the pre-war and post-war eras, it is clear that this latter view is more accurate—the wars and the Great Depression separated two distinct eras rather than simply being a pause within a single continuous period. This view is also better suited to the analysis of the role of space development in the current era.

6. Robert B. Reich, *The Future of Success* (New York: Vintage Books, 2000), p. 23.

7. Thomas L. Friedman, *The World Is Flat: A Brief History of the Twenty-First Century* (New York: Farrar, Straus & Giroux, 2005), pp. 9–10.

8. Jeffrey A. Frieden, *Global Capitalism: Its Fall and Rise in the Twentieth Century* (New York: W. W. Norton & Company, 2006).

Before looking at the differences between the current and previous experiences with globalization, it is instructive to note characteristics that are similar. For example, nineteenth-century globalization featured the following: unprecedented international movement of capital, raw materials, and people; revolutionary technological innovation, including the telephone, radio, and internal combustion engine; and an ongoing struggle for balance between protectionism and free trade. Allowing for a century of technological advances, these characteristics sound very familiar today. There were also tensions in that era's international order that resemble today's headlines: imperial overstretch, great power rivalry, an unstable alliance system, rogue regimes sponsoring terror, and the rise of a revolutionary terrorist organization (the Bolsheviks) hostile to capitalism.[9]

The end of World War II launched the current era by heralding a revitalization of the economies of the industrialized nations, particularly the U.S. An important legacy of the war that would stimulate the re-emergence of globalization was the new relationship between the U.S. government and the research community. Always a key supporter of infrastructure projects, the U.S. government became the nation's primary patron of science and engineering. An effort to sustain this relationship beyond the war years was spearheaded by President Franklin Roosevelt's director of scientific research and development, Vannevar Bush.[10] The result was what some have called a "social contract with science" that portrays the pursuit of scientific knowledge as intrinsically good and useful: as long as the nation maintains its input into the reservoir of knowledge, the system is working as it should, and application of that knowledge will take care of itself. Institutions created in this image, such as the National Science Foundation and NASA, persist to this day, as does the dominance of government funding in certain fields, such as medical research. However, it remains to be seen whether this social contract is sustainable in an evolving post-cold war political environment.[11] Large science budgets will be increasingly difficult to justify if the scientific enterprise, or at least some part of it, is perceived to be isolated from societal needs.

The output of this government partnership with science was the eventual widespread availability of technologies that could only be dreamed of—or in some cases, were unimaginable—in the prior era of globalization. For example, technologies that allowed more rapid movement of people, goods, and information in the latter half of the twentieth century included the following:

- Jet air transport for passengers and cargo multiplied the speed of long-distance travel, effectively shrinking travel times from days to hours. Equally important, it eventually became affordable to a broad swath of society.

9. Niall Ferguson, "Sinking Globalization," *Foreign Affairs* (March/April 2005).

10. Vannevar Bush, *Science—The Endless Frontier: A Report to the President* (Washington, DC: U.S. Government Printing Office, July 1945).

11. Radford Byerly and Roger Pielke, "The Changing Ecology of United States Science," *Science* 269 (1995): pp. 1531–1532.

- Supertankers and container ships have dramatically reduced the cost of transporting cargo across the oceans, and refrigeration allows perishable products to make their way around the world.
- Near-instantaneous, high-bandwidth communications have evolved so far beyond the telegraph and radio of our great-grandfathers' day that the benefits are beyond our ability to quantify. By the 1960s, telephones became ubiquitous and continents were connected by undersea cables. The fax machine became popular in the mid-1980s, at the same time that so-called microcomputers were maturing. By the 1990s, the expectation was that every desktop would have its own computer, probably linked to a corporate network and the Internet.
- Space technology in its various forms started making its contribution to globalization in the 1960s.

Clearly, the contribution of space technology was not limited to the addition of satellites to an already expanding network of global communications, as the globalization literature seems to imply. The full array of emerging space capabilities had significant influence. For example, numerous business and government activities at the local, regional, national, and international level are dependent on the weather. The improved weather forecasts enabled by satellites beginning in the 1960s enhanced productivity and safety of operations in areas such as agriculture, air transport, shipping, construction, mining, and utilities, to name a few. Over time, these improvements had cumulative effects that altered business cycles and planning to reflect an evolving Information Age economy.

As weather monitoring matured, another form of Earth monitoring known as satellite remote sensing became available to civilian users starting in the 1970s. Able to produce images much more detailed than weather satellites, and in some cases using multiple spectral bands that reveal even more information, remote sensing opened new avenues for industries such as those listed above and others, including urban planners, environmentalists, fossil fuel geologists, and even archeologists. Early in NASA's Landsat series, interest in this new capability spread around the world. Assisted by the U.S. policy of nondiscriminatory access to Landsat data, remote sensing became a new tool for resource exploration, environmental stewardship, and disaster assistance, among other applications. Commercial descendants of Landsat are cultivating global markets in ventures that are very much in keeping with the proliferation of know-how and exchange of data that are characteristic of a globalized world.

The use of satellites for navigation began in the 1960s, primarily to serve the needs of military ships and submarines. Today, GPS has become a household word (or more appropriately, a household acronym) even to those who don't know that it stands for Global Positioning System. By the end of the 1980s, the GPS constellation was taking shape and its services—accurate positioning, navigation, and timing—were being shared at no cost with the world. Essentially, those services provide value to anything that moves, and even some things that don't move but

depend on precise timing signals. Though it is often overlooked, this capability is in a class with satellite communications as an enabler of globalization. Its ability to assist the movement of people, goods, capital, and information around the world is widely recognized, as evidenced by several global and regional navigation satellite systems operated or planned by Russia, China, Europe, Japan, and India.

One of the most important but least acknowledged contributions of satellites to globalization is their role in keeping the cold war from turning into a hot war. As noted earlier, the previous era of globalization ended abruptly with the outbreak of major military conflict in 1914. Despite the best efforts of many, it took more than three decades to resurrect globalization. The same thing could have happened in the years following World War II, dramatically worsened by the addition of nuclear weapons into the mix. The "balance of terror" in offensive weapons is generally given credit for the fact that this never happened, but the nuclear arsenal could not have allowed us to achieve this without the support of satellites for surveillance, reconnaissance, and targeting.[12]

Not all observers during the cold war saw the government relationship with science and technology, or space in particular, in a positive light.[13] A noteworthy example that specifically addresses space comes from historian Walter A. McDougall, who received a Pulitzer Prize for his 1985 book on the political history of the early space age.[14] His views on the social consequences of the space program were perhaps more starkly displayed in a 1982 journal article in which he identified the U.S. response to Sputnik as the catalyst that turned the United States into a "full-fledged technocracy" in the 1960s.[15] McDougall proposed his own definition of technocracy (usually taken to mean the management of society by technical experts). He defined it as "the institutionalization of technological change for state purposes." Institutionalized stimulation of science and technology, in his view, is artificial, and in the U.S. it "extended not only to military spending, science, and space, but also to foreign aid, education, welfare, medical care, urban renewal, and more." The "symbol and vanguard" of this movement, he said, was NASA.

12. For a striking example of how satellites helped keep the cold war cold, see the discussion of the Cuban missile crisis in William E. Burrows, *Deep Black* (New York: Random House, 1986). A more recent expression of this view can be found in David Kahn, "The Rise of Intelligence," *Foreign Affairs* (September/October 2006).

13. For example, see Amitai Etzioni, *The Moon-Doggle* (Garden City, NY: Doubleday and Co., 1964).

14. Walter A. McDougall, *. . . the Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, 1985).

15. Walter A. McDougall, "Technocracy and Statecraft in the Space Age: Toward the History of a Saltation," *The American Historical Review* 87 (1982): pp. 1010–1040. For a later reiteration of these views, see Hal Bowser, "How the Space Race Changed America: An Interview with Walter A. McDougall," *Invention & Technology* (Fall 1987): pp. 25–30.

McDougall saw the Space Age as "defined by the discontinuous leap in public stimulation and direction of research and development" and worried that "progress may, at times, undermine the values that make a society worth defending in the first place." He suggested that "[T]he net gains from space technology should be measured not only against the total cost, or the economic cost, of the program itself but also against the continuing loss incurred from misdirected military and social spending encouraged by the same technocratic mentality that inspired Apollo."

McDougall gave NASA and the space program far too much credit for shaping the management of late-twentieth-century society. Many phenomena of equal or greater influence existed, some of which preceded the Sputnik era by many years. The U.S. government turned to centralization of large-scale projects during the New Deal of the 1930s. The war effort continued this trend and increased government influence over technological and industrial development. In the post-war era, as the population and economy grew, the government pursued many macro-projects unrelated to space while exercising its cold war responsibility as the leader of the "free world." These examples put the space program's role into proper perspective: high-profile space research was a product, not the cause, of its socio-political environment.

McDougall's primary focus was on the research and development enterprise, which he saw as a "command economy" approach to "choosing new technology for social (and political) goals . . . abandoning the concept of a free society" and reinforcing "the national state as the most efficient agent of technological change." His skeptical assessment of the nation's research and development enterprise (including the space program)—highlighting centralization, nationalism, and direction of technological development by public institutions—is the polar opposite of the globalization concept we know today. However, the key aspects of the nation's space efforts that have helped to enable globalization are not the direct public funding of research but, rather, the dissemination, adoption, and routine use of the resulting space applications.

Present-day globalization is reaping the benefits of space applications created and disseminated in the cold war in an environment that kept major threats at bay and allowed global markets to flourish. Government space efforts aimed at national security, national prestige, and technology development have led us to a point where civil and commercial space applications are fundamental—though often transparent—in a globalizing world.

Space Development Under a Globalization Paradigm

Friedman believes that the current system of globalization "has come upon us far faster than our ability to retrain ourselves to see and comprehend it."[16] Certainly

16. Friedman, *The Lexus and the Olive Tree*, p. 22.

this has been the case with space development. As in other societal activities, space-related institutions seek to continue their existence and their traditional priorities despite the fast pace of change in key segments of their environment. Since the end of the Apollo era, for example, U.S. civil space efforts have struggled with questions on the role of government vs. the private sector, made all the more difficult by the fact that the answers are moving targets. Who should finance, build, and operate space infrastructure elements such as launch systems and space stations? To what extent should the government support research projects that have the potential to produce private-sector revenues? In an era of tight federal budgets, should the government shift as much responsibility and expertise as possible to the private sector, or is this a short-sighted strategy that will undermine the nation's continuing need for large-scale, evolving space capabilities? Can the private sector, at the current stage of technical development, always be counted on to choose better space investments and technical approaches than the government?

A significant percentage of the space industry is designed to serve governments, since these constitute much of the customer base in key areas such as space hardware manufacturing and launch services. The relatively small number of competitors and customers in these areas, and the dominance of government customers, yield a space industry that is slower to adapt and innovate than most other high-tech industries. The tendency to protect space technologies as sensitive national assets slows their adoption in the world market and may hinder the competitiveness of nations employing export restrictions and protectionist measures. These circumstances do not bode well for the U.S. space community's ability to rapidly adapt to the globalized environment.

In addition to keeping up with the frenetic pace of the world's economic evolution, the U.S. space community also must adapt to changes in its character. In the globalization era, this must take into account the diffusion (or "democratization") of technology, information, economic power, and international influence. The leveling effect that results will change relationships with international partners, increase competition in space products and services on the world market, and challenge U.S. space leadership across the board. This is already forcing the U.S. civil space program to rethink its post-cold war identity, as demonstrated by the shift away from NASA's flagship programs of the 1970s and 1980s and toward ambitious human space exploration.

As before, geopolitics and economics will drive the search for a new national identity in space. The issues are somewhat different today than they were during the cold war, but the challenges and risks remain. The International Forum on Globalization warns of this when it states: "The world's corporate and political leadership is undertaking a restructuring of global politics and economics that may prove as historically significant as any event since the Industrial Revolution. This restructuring is happening at tremendous speed, with little public disclosure of the profound consequences affecting democracy, human welfare, local economies,

and the natural world."[17] Warnings of this type are echoed by many observers of globalization, some of whom see the movement as unsustainable, sparking nonlinear trends that will be impossible to manage.[18] In a recent assessment, the Central Intelligence Agency recognized that sustained financial crises or other prolonged disruptions could occur, but was generally optimistic about the prospects for the global economy by 2015. The implications for geopolitics were also viewed with optimism but were tempered by caution:

> This globalized economy will be a net contributor to increased political stability in the world in 2015, although its reach and benefits will not be universal. In contrast to the Industrial Revolution, the process of globalization is more compressed. Its evolution will be rocky, marked by chronic financial volatility and a widening economic divide . . . Regions, countries, and groups feeling left behind will face deepening economic stagnation, political instability, and cultural alienation. They will foster political, ethnic, ideological, and religious extremism, along with the violence that often accompanies it. They will force the United States and other developed countries to remain focused on "old-world" challenges while concentrating on the implications of "new-world" technologies at the same time.[19]

As noted earlier, supporters of globalization believe it will allow more and more individuals, as consumers and producers, to enjoy the benefits of economic liberalization, competition, and innovation. It is natural to want to see oneself as part of the solution rather than part of the problem, so the space community undoubtedly would like to view itself as an essential tool of globalization for redressing deficiencies and providing solutions for global problems. But general acceptance of this view is not automatic. In fact, there is a risk that the opposite may occur.

Globalization has a dark side, and there is no shortage of critics around the world who are eager to point this out. Among the negative aspects of globalization that have been cited are:

- Exposure of workers and firms to unwelcome competition from abroad, and increased risk that companies will relocate their production elsewhere.
- Competition between locations for mobile capital that may lead to a "race to the bottom" in environmental standards.

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17. The International Forum on Globalization claims to represent more than 60 organizations in 25 countries and identifies itself as "an alliance of sixty leading activists, scholars, economists, researchers, and writers formed to stimulate new thinking, joint activity, and public education in response to economic globalization." See *http://www.ifg.org/* (accessed June 2006).

18. Ervin Laszlo, *Macroshift: Navigating the Transformation to a Sustainable World* (San Francisco: Berrett-Koehler Publishers Inc., 2001), p. 8.

19. Central Intelligence Agency, *Global Trends 2015: A Dialogue About the Future With Nongovernment Experts*, (New York: Cosimo Inc., 2005; originally released as a U.S. government report in December 2000).

- Diffidence to the outside world or fear that a cherished way of life will disappear as a result of cultural standardization.
- Potential worsening of inequality and injustice and erosion of democratic governance.[20]

The challenge for space development is to continue its role as a key element of globalization without becoming associated with its negative consequences. The same entities that dominate space development—government institutions and transnational corporations—are seen by critics as orchestrating globalization to serve the wealthy at the expense of the poor. In this view, observations of Earth from space might be interpreted as security threats or as a way to spy on economic activities in other parts of the world, rather than being seen as an instrument of environmental protection and disaster relief. Satellite communications might be depicted as a tool for extracting information and capital from unsuspecting regions of the world, rather than as a means of bringing information and capital to them. Even incoming information can be pejoratively portrayed as "cultural contamination" or Western propaganda designed to influence national or regional policies and attitudes.

Space technology could be seen by globalization critics as a tool of transnational corporations that exploit workers, of foreign investors who undermine local businesses, or of wealthy (i.e., spacefaring) countries that economically take advantage of developing nations. The result could be neo-Luddite controls on technology and onerous trade protection schemes that suppress economic dynamism.[21] Therefore, it is critical that government-supported space development be directed at—and perceived as—seeking solutions for the planet in areas such as disaster relief, environmental monitoring, climate research, medical research, and in the long term, the use of extraterrestrial resources and capabilities for the benefit of Earth.

So far, the government institutions criticized most often by globalization opponents are the World Bank, the International Monetary Fund, and the World Trade Organization.[22] Multinational corporations typically are disparaged generically rather than by individual sectors,[23] and mention of aerospace companies is notably absent so far. But there is still the possibility for an anti-technology backlash akin to the Vietnam-era experience.[24]

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20. Held, "From Executive to Cosmopolitan Multilateralism," pp. 2–3.

21. Reich, *The Future of Success*, p. 247.

22. For example, see Stiglitz, *Globalization and Its Discontents*; Peter Isard, *Globalization and the International Financial System: What's Wrong and What Can Be Done* (New York: Cambridge University Press, 2005).

23. For example, see Robert O. Keohane, "Global Governance and Democratic Accountability" *Taming Globalization: Frontiers of Governance*, David Held and Mathias Koenig-Archibugi, ed. (Cambridge, U.K.: Polity Press, 2003).

24. W. Henry Lambright, "Managing America to the Moon: A Coalition Analysis" in *From Engineering Science to Big Science: The NACA and NASA Collier Trophy Research Project Winners*, Pamela E. Mack, ed. (Washington, DC: NASA SP-4219, 1998), p. 209.

For at least part of the cold war era, large public expenditures on space projects were widely perceived in the U.S. as good investments to counter powerful, unfriendly forces in the world that could wreak nuclear destruction at any moment. Today, the public's perception of U.S. civil space efforts as a counterweight to unfriendly forces appears much weaker (although this factor is not measured directly by public opinion polls). Certainly the national prestige argument for the space program has lost much of its impact, since terrorist networks and rogue nations are not winning hearts and minds around the world by demonstrating their prowess in spaceflight. Even China's human spaceflight program fails to stir fears in the West as it follows a path that was tread by the U.S. four decades earlier.

In the current era, the value of government space efforts needs to be measured by a different yardstick that takes into account the multipolar geopolitical environment and the globalized nature of economics and technology. The space community must recognize the effect of this environment on trade, technology, and leadership in space, and resist the urge to preserve the outdated aspects of institutions, processes, and relationships that insulate it from the evolving "big picture."

Possible Futures

A recent multiphased study by the Organization for Economic Cooperation and Development (OECD)[25] addressed the future of space applications through the 2030s and perhaps provided some guidance on avoiding an anti-globalization backlash. The study did not express itself in globalization terms but, rather, sought "to understand how OECD countries may reap the benefits of civil and commercial space applications for society at large." It used a scenario approach based on "the interaction of three main drivers of social change: geopolitical, economic, and environmental." Viewed from a globalization perspective, the three scenarios presented in the study ranged from successful globalization to its failure to sustain itself in the face of a combination of unfavorable factors.

Although the OECD effort does not speak in terms of globalization, it nonetheless covers similar ground. Significantly, despite its generally optimistic outlook for civil and commercial space, it identifies obstacles to future growth, including:

- Market access restrictions due to incomplete trade liberalization in some countries.
- Procurement policy problems resulting from the unreliability and unpredictability of government customers.

25. Organization for Economic Cooperation and Development, "Space 2030: Exploring the Future of Space Applications," 3 May 2004, and "Space 2030: Tackling Society's Challenges," 31 May 2005. Both titles are available from *http://www.oecdbookshop.org* (accessed June 2006). The OECD is a multinational forum for addressing economic, social, and environmental challenges. It has 30 member countries in North America, Europe, and the Pacific Rim.

- Export controls and investment restrictions.
- Spectrum allocation problems.
- Insufficient government support for the development of new technologies.
- Legal and regulatory constraints that cause uncertainty and delay in the deployment of new applications.[26]

The OECD frames its recommendations in three "blocks" aimed at what governments can do to strengthen the contributions space can make to solving important socioeconomic challenges:

Block I: Implement sustainable space infrastructure that is fully integrated with ground infrastructure and takes into account user needs, especially in the areas of Earth observation, navigation, communications, and access to space.

Block II: Take advantage of productivity gains that space solutions may offer for delivery of public services and development of new ones, particularly through international cooperation, data sharing, disaster and treaty monitoring, emergency management, and economic development.

Block III: Encourage the private sector to contribute fully to the development of new, innovative applications and to the development and operation of space-based infrastructures by making national and international space laws business-friendly, and by encouraging entrepreneurship, open markets, and international standards.[27]

These recommendations align well with a belief that space development should continue to play a significant role—far beyond just communications—in shaping globalization's evolution and keeping it focused on societal needs. In its detailed recommendations, the OECD study suggests ideas on how we can get there from here. At least for the next three decades, the study sees great hope and promise for applied space research and development, relegates basic research to government space agencies, and seems to marginalize human spaceflight.

Today's space community must consider timeframes even beyond 30 years. Given the scope and difficulty of exploring and developing space, it is not too early to ask: Where do we want the United States to be when it reaches its tricentennial in 2076? Will the United States still be one of the leaders in space at that time?

26. OECD, 2004, p. 16.

27. OECD, 2005, pp. 211–215.

Conclusion

Analyses of the circumstances and outcomes of the previous era of globalization, and the similarities to and differences from the current era, are instructive in defining the role space has played and will play in the years ahead. Will globalization continue to flourish in the decades to come, or will it end relatively soon, perhaps suddenly, as it did nearly a century ago at the outbreak of World War I? At that time, Britain was still the world's financial center but the United States had become the world's largest national market and had surpassed Britain in industrial output.

> Between 1870 and 1913 the size of the British economy well more than doubled; even if one takes into account population growth, British output rose by more than 50 percent per person in those years. Yet the gap between Britain and the rest of the world narrowed continually. British manufacturers were being beaten out of export markets, even out of the British market. The United States and Germany were the world's manufacturing dynamos; the United Kingdom maintained its leadership only in such services as banking, insurance, and shipping. It was no longer a given that the next power plant or railroad built in Africa or eastern Europe would be British; it was just as likely to be German, French, or American. Even in international investment, Continental financial centers—as well as New York—were challenging London's supremacy. It could hardly have been imagined that Britain's enormous industrial lead would last forever, but the speed of its erosion led many Britons to ask how this had happened . . . .[28]

After 1914, the hardship of the war and the faltering economic recovery of the following decade shifted financial leadership to the U.S., where it has remained ever since. But go back and read the above quote again, this time substituting the U.S. for all the references to Britain, and emerging economic powers like China and India for the references to Germany, France, and America. The description becomes eerily familiar, mirroring news media reports of the past quarter-century.

Could either continuation or disruption of globalization shift leadership roles the way it did in the early twentieth century? It happened once, so it can happen again. The story of space development in the globalization era, and of U.S. ambitions in this arena, is still being written.

28. Frieden, *Global Capitalism*, p. 107.