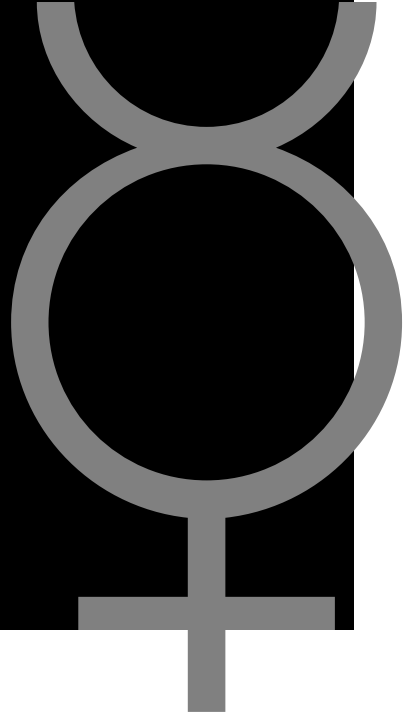


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What Is NASA's Purpose?



Since the opening of the Space Age nearly 50 years ago, the U.S. government has spent close to \$1 *trillion* on space-related activities.¹ Although by no means the largest public expenditure over that period—it is easily dwarfed by national defense, social security, and countless other federal programs—it is still, by any measure, an enormous amount of money. It therefore seems perfectly reasonable to ask: what has the American taxpayer gotten in return for this massive investment?

Most space advocates, of course, will immediately point to the myriad benefits that flow from space-based research and development. They would note the advances and improvements in weather forecasting, communications, and navigation, and argue that the economic impact of these systems alone—which have accounted for the creation of not only thousands of jobs, but of dozens of whole new industries as well—probably exceeds \$1 trillion (it is certainly in the hundreds of billions). They might also claim that satellite and rocket technologies have made a contribution to American national security that is beyond economic calculation.

And these are just the direct applications. Although critics often scoff at the supposedly inflated claims made for the “spin-offs” of the space program,² there is no denying that a large number of commercial products, services, and technologies in common use today were originally developed for space missions. It is, of course, impossible to determine with any degree of precision the total dollar value of these indirect benefits, but they are certainly not insignificant.³

None of these assertions, however, completely answers the question. After all, very few people seriously argue that the United States should have no space program whatsoever. Actually, most—if not all—of the controversy regarding U.S. space policy over the past half century has revolved around the question of how to proceed: what should the U.S. be doing in space, and when?⁴ Indeed, the fact that space represents such an enormously valuable resource only underscores the importance of that \$1 trillion investment. Given what is at stake, can the taxpayers really be assured that these very large sums they have entrusted to their government have always been spent in the most productive fashion?

Inevitably, it is the operation and programs of the National Aeronautics and Space Administration (NASA) that becomes the focus of such questions. Although far from the only (or even, at times, the largest) federal agency engaged in space-related activities,⁵ for more than 40 years, NASA has stood as the country's most visible, and most important, public space organization. Thus, it is NASA, more than any other agency or department, that has been confronted with the vexing question, "Why?"

During the early 1960s, opponents of Project Mercury questioned the rush to place a man in space. A few years later, skeptics were disputing the value of the Apollo moon program. Shortly after that, NASA faced stiff opposition over the development of the space shuttle, and, still later, had to fend off—for a time, on an annual basis—policymakers determined to cancel the International Space Station. In addition, there are a number of cases, such as the post-Apollo proposals for a mission to Mars, the National Aerospace Plane, and the first Bush administration's Space Exploration Initiative, in which proponents could not answer the "why" questions convincingly.⁶

For many critics, however, the problem lies not so much in the value of any specific project as in the agency's overall strategy for exploring and using space. By far the largest of these debates involves NASA's commitment to sending people into space. Opponents of the agency's human spaceflight program have long argued that anything that humans can do in space can almost always be done more easily, at far lower cost, and with much less personal risk by unmanned rockets and automated probes. The fact that this argument has been raging unabated for nearly 50 years, dogging every major project from Mercury to the International Space Station, suggests that it will not be resolved anytime soon.

Another controversy that emerged during the 1980s concerns the agency's role in space "operations." A number of observers, particularly economic and political conservatives, complain that NASA is too involved with providing "space services," a task that is not only inconsistent with its "true" mission as a research and development (R&D) organization, but is also impeding the development of private sector space activities. This particular debate has evolved over the past two decades into a more general discussion about the role of government in space exploration overall.

Of course, there can be no doubt that some of the criticism leveled at NASA over the past 45 years has been fully warranted. Like any human enterprise, the agency has clearly made mistakes, some of which were quite serious (and even lethal).

Moreover, even if it had been operating perfectly (whatever that might mean), any organization that spends billions of the public's dollars every year has to expect to displease someone. Finally, because it combines the elements of very large costs, high visibility, and extreme risk—few public programs face the possibility of failure on the scale of the Mars Polar Lander or the *Challenger* and the *Columbia* shuttles—space-flight is very likely an area of public policy that will always invite controversy.⁷

One of the major themes of this book is that almost all of the controversies surrounding NASA—its priorities, its management, even its occasional (or, as some of its most vocal critics would have it, its frequent) errors—have a common root. There is one fundamental question about the agency that has seldom even been asked directly, let alone examined in any detail. Stated simply: at no point in NASA's history has there ever been a clear, specific statement of its actual purpose. What, in a word, is the agency is *for*?

Of course, asking this question immediately gives rise to another: what is it for, according to whom? NASA officials, obviously, can provide a highly detailed account of what they do and, from their perspective, its value to society. Indeed, they do so every year during budget hearings. Moreover, current management practice—not to mention federal law—requires that the agency publish a “mission statement” that, among other things, lays out its overall purpose (more about this below).

Unfortunately, declarations of this sort cannot (at least not by themselves) provide a completely satisfactory answer to the question that opened this chapter. Every year, for nearly half a century, presidents and their appointees, working in conjunction with the elected members of Congress, have chosen to spend billions of dollars on space instead of defense, education, health care, welfare, or any number of other pressing public needs. Presumably, they have done this not for NASA's comfort and convenience, nor simply to provide work for its employees (although critics charge that it seems that way at times), but because they have believed—we will assume sincerely—that it would in some way promote the public interest. Thus, the issue at hand should more properly be phrased: what does the government—the public's representatives and the guardians of their interests—think that the agency is for?

As might be expected, there cannot be a single answer to this question. During the latter half of the 20th century, conditions in the country and in the world changed considerably, and government priorities, as a matter of course, changed along with them. Since NASA was founded, there have been 22 years of Republican presidents, 16 of Democratic. Thousands of members of Congress have come and gone. There have been recessions, periods of high inflation, and some years of great prosperity. Last, but far from least, the Cold War raged, subsided, and ended altogether. It is therefore only reasonable that succeeding governments spread across nearly 50 years would hold differing views about the U.S. space program in general and NASA's role in particular.

The purpose of this book is to examine those changing views. Drawing on relevant concepts in political science and public administration, it attempts to account for the shifts in U.S. space policy, and to describe the political, economic, and technical factors that helped bring them about. Among the questions to be addressed

are: what did policymakers envision when they created the agency in the first place? Why was there such strong (albeit not entirely unanimous) support for Project Apollo in the early 1960s, and why did it fade away in such a relatively short time? What caused NASA and the program to languish throughout most of the 1970s, and why did it reemerge (after a fashion) in the 1980s? Finally, what role is the agency expected to play today?

Original Intent versus “What’s in It for Me?”

The most obvious place to begin looking for NASA’s purpose would seem to be the legislation that created it, the National Aeronautics and Space Act of 1958. Unfortunately, that document provides very little in the way of a practical guide to the agency’s activities. To begin with, the description of its responsibilities is, to put it mildly, somewhat broad:

- The expansion of human knowledge of the phenomena in the atmosphere and space.
- The improvement of the usefulness, performance, speed, safety, and efficiency of aeronautical and space vehicles.
- The development and operation of vehicles capable of carrying instruments, equipment, supplies, and living organisms through space.
- Conducting “long-range studies” of the potential benefits, opportunities, and problems of aeronautical and space activities.
- The preservation of the United States as a leader in aeronautical and space science and technology.
- Providing relevant information to DOD and related agencies.
- Cooperation with other nations in the peaceful pursuit of aeronautical and space activities.
- Cooperation and coordination with other public agencies to avoid “unnecessary duplication of effort, facilities, and equipment.”⁸

Second, the act makes no effort to assign any sort of priorities to these tasks. Read literally, it appears to give equal weight to the “carrying” of instruments, equipment, supplies, and living organisms (which presumably includes humans) into space. Finally, apart from allowing the agency to enter into contracts with industry and educational institutions⁹ and calling for the “widest possible practicable and appropriate dissemination of information”¹⁰ (which appears to refer to commercial applications as well as scientific research findings), the legislation does not seem to envision any significant role for the private sector.¹¹ In short, the Space Act, for all of its historical importance, really does not help answer any of the current controversies concerning NASA and its operations. Like most other pieces of authorizing legislation, it simply provides the broad contours in which the agency must function.

There are similar problems in NASA's own "vision" and "mission" statements, which, as noted earlier, are now included in all of its public documents. The agency's 2000 Strategic Plan, for example, describes as its vision:

NASA is an investment in America's future. As explorers, pioneers, and innovators, we boldly expand the frontiers in air and space to inspire and serve America and to benefit the quality of life on Earth.

And its mission as:

- To advance and communicate scientific knowledge and understanding of the Earth, the solar system, and the universe.
- To advance human exploration, use, and development of space.
- To research, develop, verify, and transfer advance aeronautics and space technologies.¹²

Although they do make a somewhat more direct acknowledgment of the private sector (such as the references to "innovators" and technology transfer), these statements are just as broadly cast as those of the Space Act. Once again, this is not terribly surprising, inasmuch as that is not really the purpose of a mission statement. It is simply supposed to describe what might be called an organization's "operating philosophy." Despite the name, it cannot—nor is it intended to—provide a precise account of NASA's mission, as that term is being used here.

In actual practice, the agency's long-range goals, priorities, timetables, and even to some degree its method of operation (as with any major public organization) are shaped by a number of complex factors, including the bureaucratic, budgetary, legislative, electoral, and other political processes of the U.S. federal government, as well as the demands of a wide variety of outside interest groups.¹³ In addition, NASA's internal procedures and relationships, its core organizational values, and its view of external events (which includes its understanding of its political, economic, and social environment) are all the product of a rich and diverse organizational culture that has been evolving for nearly a century.¹⁴ The agency is also at the mercy of a whole range of impersonal forces, such as the state of the economy, the pace of scientific discovery and technological development, unplanned events (e.g., the Apollo fire or the *Challenger* and *Columbia* accidents), and—increasingly—international affairs. Making matters even more complicated is the fact that these are all subject to sudden and, for all practical purposes, unpredictable shifts.

Finally, there are the vagaries of Washington politics. NASA does, after all, exist in a highly charged political environment. This can be most clearly seen in the annual appropriations battles, where, under the peculiar structure that makes up the congressional budget-writing process, the agency is required to compete head to head for its funding with completely unrelated organizations, such as the Department of Housing and Urban Development and the Department of Veterans' Affairs. Needless to say, this odd arrangement has led to some unusual political

trade-offs over the years.¹⁵ Finally, NASA has, on occasion, found itself at the center of a political party's—or even an individual policymaker's—ambitions. The impact of this vast array of political, economic, and social forces cannot possibly be captured in formal statements.

Perhaps, then, a better way to approach the question of NASA's mission is simply to ask: what could the agency be for? What are the public benefits that supposedly flow from space-related activities? A list of such benefits would include (in no particular order):

- *Scientific research.* It is difficult to think of an area of basic science that has not been affected by the development of space technologies. Astronomers in particular have benefited from planetary and deep-space probes, as well as automated observatories, like the Hubble telescope, that orbit above the earth's distorting atmosphere. Geologists, geophysicists, and hydrologists make extensive use of remote-sensing satellites. Useful research in biology, chemistry, and physics can be conducted on board orbital facilities.¹⁶
- *Economic and commercial applications; “making life better here on earth.”* As suggested earlier, the advances in weather forecasting made possible by meteorological satellites have led to improvements in such areas as disaster preparedness and agricultural planning, just as the growing number of relay satellites has opened up a vast—and still expanding—global network of radio, television, telephone, and Internet communications. Remote-sensing satellites—which can be used to detect oil, gas, and mineral deposits, as well as to monitor pollution, deforestation, and other changes in the earth's environment—have opened up a whole host of new business opportunities, as has a global network of navigation satellites. Last, but not least, many enthusiasts still hold out hope for space-based manufacturing, which could (in theory) lead to the creation of new metals, medicines, and other useful products.¹⁷
- *Intellectual stimulation and discovery; satisfying the “urge to explore.* It is often said that human beings (and particularly Americans) have an innate desire to understand the unknown. According to this view, it is the mark of a “great nation” to expend some of its resources in meeting this challenge. Space advocates also like to point to the “changes in perspective” that can come from “conquering space,” such as viewing the “whole earth” (i.e., a world without visible national boundaries) from orbit or the surface of the moon, or of finding life on other planets.¹⁸
- *National defense (narrowly conceived).* Obviously, rocket technology (in the form of guided missiles) has direct military application. In addition, the armed forces make extensive use of navigation, communication, and surveillance satellites. Thus, although international treaties ban weapon systems themselves from space, military planners still regard it as a sort of strategic “high ground.”

- *National security (broadly conceived; “national prestige”)*. Success in space, according to some, is the most direct and dramatic demonstration of a country’s talents and abilities (and, by implication, its power). On October 15, 2003, the People’s Republic of China became the most recent example of this. Yang LiWei’s 14 orbits of the earth has underscored China’s status as a rising superpower.¹⁹ Proponents of such a program for Japan have a similar aim.²⁰

What is remarkable about this list is how little it has changed over the last 50 years, despite significant developments in both the relevant technologies and world politics. Enthusiasts were extolling the virtues of communication and weather satellites long before such applications were even remotely feasible (in fact, the earliest articles on radio and television relay satellites appeared even before the end of World War II). Similarly, as late as the mid-1980s, long after the United States had “won” the “space race,” supporters of the space station were painting a vivid picture of the Soviet space station program in an obvious (but ultimately unsuccessful) attempt to appeal to American national pride.

While the contents of the list may have stayed the same, the relative political saliency of the items—that is, the degree of importance attached to them by policymakers—has changed quite dramatically. Forty years ago, fear that it was losing its “prestige” as a world power was enough to push the United States—literally by itself—into the most ambitious (and most costly) space venture in history. Just a few years later, however, such concerns had largely evaporated. The efforts of the station’s proponents notwithstanding, there has not been a single major NASA program initiated since the mid-1960s that can really be said to have been motivated by prestige. Clearly, then, the key to understanding the changing nature of the agency’s mission—and the primary approach of the book—will be to determine exactly which benefits of space technology can be said to be “driving” the program at any given point in time.²¹

The Plan of This Book

Along with providing some new insight into the ups and downs of the U.S. space program, it is hoped that this book will provide a fresh view of a few other space-related subjects as well. First, as numerous historians have noted, there is a tendency in much of the current literature to overemphasize the role of the American president in setting the course of the space program.²² Obviously, some presidents have played key roles in the history of the program, and at times—John F. Kennedy with Project Apollo and Ronald Reagan with the space station program—have been the central, indeed, the pivotal decision maker. The point, rather, is that most of the time that individual is only one actor within a much larger political system. For this reason, it is also important to take into account the actions of other governing institutions—most notably, the U.S. Congress—in setting space policy. Thus, while the analysis by no means ignores the actions of presidents (in fact, the research was conducted at four presidential libraries), every effort will be made to view space as a government—not just a presidential—program.

Second, the concepts that will be used here suggest a different interpretation of some of the major episodes in space history—including the U.S. response to *Sputnik*, Kennedy's lunar landing declaration, the decision to develop the space shuttle, and Reagan's approval of the space station—than that found in some of the existing literature.²³ They also shed light on some issues—Kennedy's proposals for a joint U.S.–USSR moon flight, NASA's post-Apollo decline, and the reformulation of space policy in the 1980s—that have not received as much attention.

Finally, this book attempts to place the history of the space program within the larger context of overall postwar U.S. R&D policy. Although many scientists and engineers have traditionally viewed NASA as a competitor of sorts (and a greedy one at that), it can be shown that many of the same political, economic, and social forces that shaped the course of space policy had a nearly identical impact on most other publicly funded science and technology programs. Indeed, as will be discussed in the concluding chapter, the experiences of NASA after the Apollo era actually provided a preview of sorts of many of the problems facing U.S. R&D policy today.

The argument proceeds as follows. Chapter 2 concludes this introductory section by laying out several concepts from the literature in political science, public administration, and public policy studies that will guide the remainder of the analysis. The three chapters comprising part 2 then apply these concepts to the early history of spaceflight in the United States (and, to a lesser extent, elsewhere), starting with the earliest musings about space and the beginning of rocket research (chapter 3) and continuing through the end of the so-called Golden Age of U.S. space policy (chapters 4 and 5). As will be seen, one of the major factors contributing to NASA's success during this period is that it was the first—and so far the only—time that a common agreement existed among the relevant stakeholders as to the nature of NASA's mission.

The four chapters comprising part 3 examine NASA's struggle to find a new purpose following the Apollo moon landings.²⁴ Chapter 6 describes the "malaise" in the U.S. space program during the 1970s. Chapter 7 looks at the political changes of the early 1980s, which brought a group of policymakers to Washington who were determined to move space policy in a completely new direction. Chapter 8 follows these developments through the end of the 1990s. Finally, chapter 9 assesses the status of NASA, the U.S. space program (or, as will be seen, *programs*), and American R&D policy in general entering the 21st century.

Unfortunately, and at the risk of making the reader feel cheated, one thing this analysis cannot do is answer the question posed at the beginning, that is, whether the taxpayers' \$1 trillion investment in space has been wisely spent. This is not a matter that can be settled objectively. What the following chapters hopefully will do, however, is provide a better understanding of the political, economic, and technical factors guiding policymakers as they decided which space investments were worthwhile. Such an understanding, in turn, may help settle a critical, and much-debated issue: where does the space program—and NASA—go from here?