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Chapter 20

Evolving Public Perceptions of Human Spaceflight in American Culture*

Roger D. Launius†

Abstract

There is a belief that exists in the United States about public support for NASA's human spaceflight activities. Many hold that NASA and the cause of the human exploration of space enjoyed outstanding public support and confidence in the 1960s during the era of Apollo and that public support waned in the post-Apollo era, only to sink to quite low depths in the decade of the 1990s. These beliefs are predicated on anecdotal evidence that should not be discounted, but empirical evidence gleaned from public opinion polling data suggest that some of these conceptions are totally incorrect and others are either incomplete or more nuanced than previously believed. This article explores the evolution of public support for space exploration since the 1960s. Using polling data from a variety of sources it presents trends throughout time and offers comments on the meaning of public perceptions for the evolution of space policy and the development of space exploration in the United States.

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Introduction

If I have heard it once, I have heard it a hundred times, "if NASA just had the popular support that it enjoyed during the 1960s all would be well." Analyzing public opinion polling data in the United States from throughout the history of the space age, however, allows the plotting of trends during a long period of time. The trends reveal several interesting insights about the evolution of spaceflight. For example, most people believe that Project Apollo was enormously popular, but the polls do not support this contention. Consistently throughout the 1960s a majority of Americans did not believe Apollo was worth the cost, with the one exception to this being a poll taken at the time of the *Apollo 11* lunar landing in July 1969. And consistently throughout the decade 45 to 60 percent of Americans believed that the government was spending too much on space.

Clearly, this data does not support a contention that most people approved of Apollo and thought it important to explore space. The decision to proceed with Apollo was not made because it was enormously popular with the public, despite general acquiescence, but for hard-edged political reasons. Most of those were related to the cold war crises of the early 1960s, in which spaceflight served as a surrogate for face-to-face military confrontation.

Of course, as in the case of other historical sources, polling data must be used with caution, and always in relation to other types of data. There is considerable skepticism among Americans that public opinion polls are skewed or otherwise unreliable. While the public generally acknowledges that polls often accurately forecast elections and measure opinion on other issues, they question the scientific sampling foundation on which all polls are based. Most seem to believe that surveys of 1,500–2,000 respondents—a larger than average sample size for national polls—cannot effectively represent the views of all Americans. Of course, in the science of polling, professionals insist that a randomly selected, small percentage of a population of people can indeed represent the attitudes, opinions, and projected behavior of a much larger population.[1] All of the polls used in this article were conducted by professional organizations using acceptable statistical methodology. They represent the best empirical quantitative data available for the subjects they explore in the human spaceflight program of the United States. I have tried to interpret these survey results appropriately, seeking to place them in the context of the times and relating them to other available historical sources. Mostly the polling data squares with other historical information and fills in what is known about the subject with quantitative knowledge.

The Good News?

Overall there is very good news for NASA and the cause of human space exploration. The public has always, insofar as data exists, accorded NASA a quite favorable rating. This is unusual for most federal agencies, as the low opinion held by the public for such organizations as the Internal Revenue Service, the Environmental Protection Agency, and Health and Human Services attest.

For example, while Americans may not know much about the space program, they have a largely favorably opinion of it—more than 70 percent say they have a favorable impression, compared to less than 20 percent who hold an unfavorable impression. And this tracks throughout the entire life of this particular question, from 1978 to the present.[2] In a set of polls conducted in 1995, 1996, and 1997, furthermore, an average of 92 percent of those polled strongly agreed or somewhat agreed with the statement: "The U.S. space program is something this country can be proud of."[3]

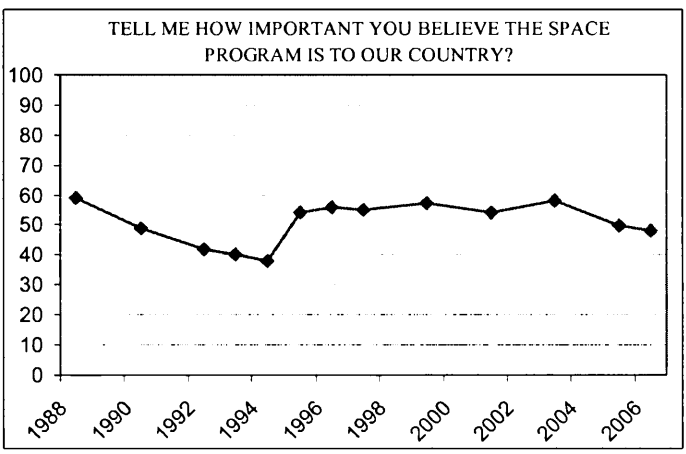

Figure 1

The Yankelovich polling organization also asked this question, "Please tell me how important you believe the space program is to our country. Would you say that it is extremely important, very important, somewhat important, not very important, or not at all important?" Figure 1 shows the percentage who said "extremely" or "very" important, and on average 57 percent of Americans in 1999, the last year that this poll was taken, believed that the space program was extremely or very important to the country. Although Figure 1 shows consistent support, in 1995 it depicts the beginning of consistently high marks for spaceflight after several years of steady decline. This rise in 1995 may have been the

result of the Shuttle/*Mir* docking missions that began in July of that year as well as the release of the *Apollo 13* feature film in the summer of 1995.[4]

In compiling data from several sources on the quality of the work being done by NASA between 1988 and 1999, as shown in Figure 2, an average of more than 60 percent of those polled rated the job being done by NASA as "excellent" or "good."[5] All of this suggests that the cause of human spaceflight in general and NASA in particular enjoys relatively positive public perceptions and has for the entire period for which data exists.

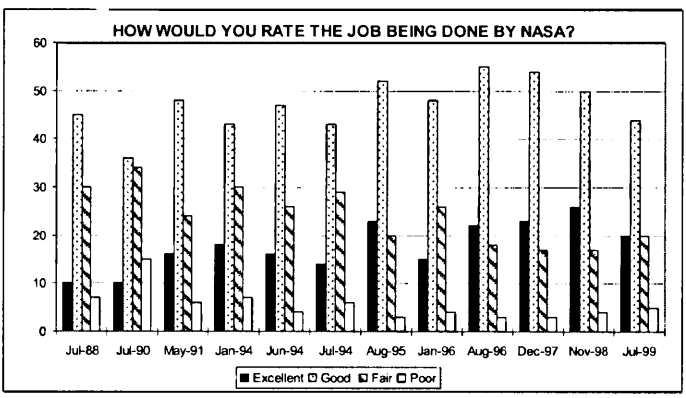

Figure 2

Two anecdotes drawn from television situation comedies also support this overall positive conception. First, in the decade of the 1960s, the space program provided one of the leading examples of a U.S. government program that worked. It inspired public confidence in the ability of government to accomplish great feats. Even as other U.S. government initiatives failed, civilian spaceflights continued to succeed. Actor Carroll O'Connor perhaps said it best in an episode of *All in the Family* in 1971. Portraying the character of Archie Bunker, the bigoted working-class American whose perspectives had more in common with our society than many observers were comfortable with, O'Connor summarized well how most Americans responded to the perceptions that Apollo engendered. He observed in one episode of the popular situation comedy that he had "a genuine facsimile of the *Apollo 14* insignia. That's the thing that sets the U.S. of A. apart from . . . all them other losers."[6] In very specific terms, Archie Bunker encapsulated for everyone what set the United States apart from every other nation in the world, success in spaceflight. At a basic level Apollo provided the impetus for the perception of spaceflight as a great positive for the nation.

The second anecdote, taking place 30 years later, suggests that not much has changed. In the critically acclaimed television situation comedy about a team that produces a nightly cable sports broadcast, *Sports Night*, one episode included simply as a sidebar a discussion of space exploration. The fictional sports show's executive producer, Isaac Jaffee, played by renowned actor Robert Guillaume, was recovering from a stroke and disengaged from the daily hubbub of putting together the nightly show. His producer, Dana Whitaker, played by Felicity Huffman, kept interrupting him in this episode as he was reading a magazine about space exploration. The exchange is telling. Isaac tells her, "They're talking about bio-engineering animals and terraforming Mars. When I started reporting Gemini missions, just watching a Titan rocket liftoff was a sight to see. Now they're going to colonize the solar system." Dana suggests that perhaps Isaac is obsessing about this and he agrees. So Dana asks why? Quietly, Isaac responds, "Because I won't live to see it." It is a touching conversation about hope and aspirations and mortal limitations. But more than that, Jaffee affirms his fundamental faith in the importance of space exploration and in NASA to conduct this important mission. "You put an X anyplace in the solar system," he says, "and the engineers at NASA can land a spacecraft on it."[7] Nothing more effectively states the public's overall confidence in NASA to carry out an exceptionally important task.

At the same time, many Americans hold seemingly contradictory attitudes on NASA and human space exploration. Most are in favor of the human exploration and development of space and view it as important, but also believe that federal money could be better spent on other programs. Most are also in favor of NASA as an organization, but are relatively unfamiliar with the majority of its activities and objectives, and sometimes question individual projects.

Exploding the Myth of Popular Support for Project Apollo

The belief that Apollo enjoyed enthusiastic support during the 1960s and that somehow NASA has lost its compass thereafter enjoys broad appeal to the present. This is an important conception, for without the active agreement of political leaders and at least public acquiescence no exploration effort may be sustained for any length of time.[8] The level of popular support that most people believe the public held for President John F. Kennedy's decision to undertake the Moon landings are, therefore, perceived as something that must be gained for the present space exploration agenda to succeed. Repeatedly a chorus of remorse for the lukewarm popular support enjoyed by specific space exploration activities is

followed with a heavy sigh and the conclusion, "if only our current efforts had the same level of commitment enjoyed by Apollo, all would be well."[9]

While there may be reason to accept that Apollo was enormously important at some basic level, assuming a generally rosy public acceptance of it is at best a simplistic and ultimately unsatisfactory conclusion. Indeed, the public's support for space funding has remained remarkably stable at approximately 80 percent in favor of the status quo since 1965, with only one significant dip in support in the early 1970s. However, responses to funding questions on public opinion polls are extremely sensitive to question wording and must be used cautiously.[10] For example, in the summer of 1965 one third of the nation favored cutting the space budget, while only 16 percent wanted to increase it. During the next three-and-one-half years, the number in favor of cutting space spending went up to 40 percent, with those preferring an increase dropping to 14 percent. At the end of 1965, the *New York Times* reported that a poll conducted in six American cities showed five other public issues holding priority over efforts in outer space (Figure 3).[11] Polls in the 1960s also consistently ranked spaceflight near the top of those programs to be cut in the federal budget (Figure 4). Most Americans seemingly preferred doing something about air and water pollution, job training for unskilled workers, national beautification, and poverty before spending federal funds on human spaceflight. The following year *Newsweek* echoed the *Times* story, stating: "The U.S. space program is in decline. The Vietnam war and the desperate conditions of the nation's poor and its cities—which make space flight seem, in comparison, like an embarrassing national self-indulgence—have combined to drag down a program where the sky was no longer the limit."[12]

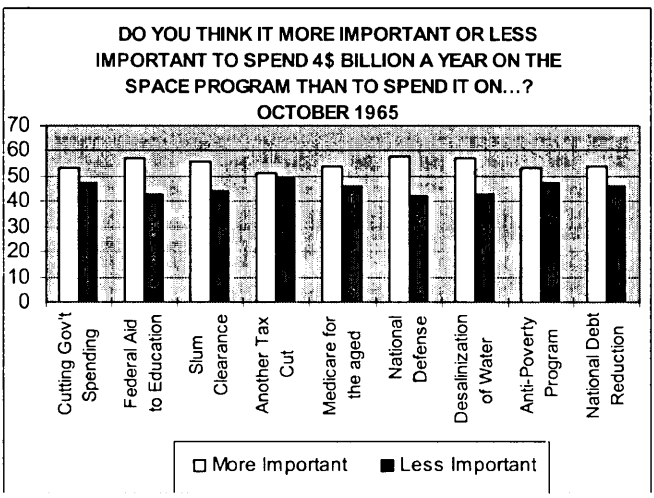

Figure 3

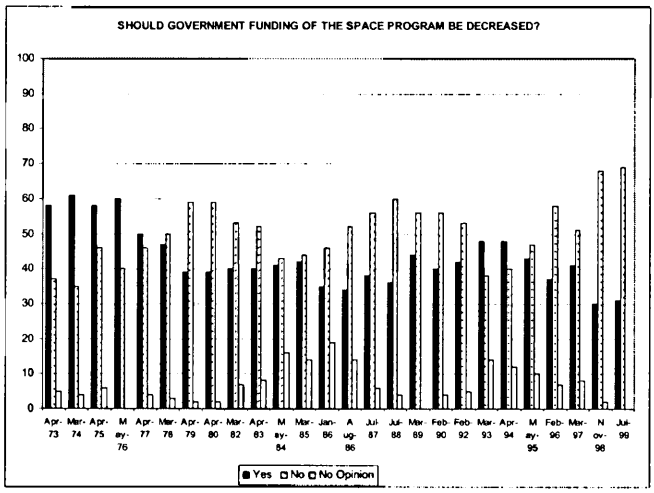

Figure 4

Nor did lunar exploration in and of itself create much of a groundswell of support from the general public. The American public during the 1960s largely showed hesitancy to "race" the Soviet Union to the Moon, as shown in Figure 5. "Would you favor or oppose U.S. government spending to send astronauts to the moon?" these polls asked, and in virtually all cases a majority opposed doing so, even during the height of Apollo. At only one point, October 1965, did even 50 percent of the public support human lunar exploration. In the post-Apollo era, the American public has continued to question the validity of undertaking human expeditions to the Moon. Figure 4 also shows the result of the recent return to the Moon with the Clementine space probe in 1994, which found evidence of embedded ice at the poles, and even then support for human exploration was essentially equally divided.[13]

Some may conclude from these opinion polls that even though the American public might have been generally unsupportive of human lunar exploration, Project Apollo—wrapped as it was in the bosom of American virtue, advocated by the most publicly wholesome of astronaut heroes, and hawked by everyone from journalists to Madison Avenue "marketeers"—enjoyed consistent popularity. There is some evidence to suggest this, but it is, on the main, untrue. From the 1960s to near the present, using the polling data that exists, there is little evidence to support an expansive lunar exploration and colonization program. One must conclude from the results shown in Figure 5 that the United States undertook and completed Project Apollo not because the public clamored for it, but because it served another purpose. Furthermore, if Americans send astronauts to

the Moon anytime soon it will also be because the mission serves a larger political, economic, or national defense agenda.

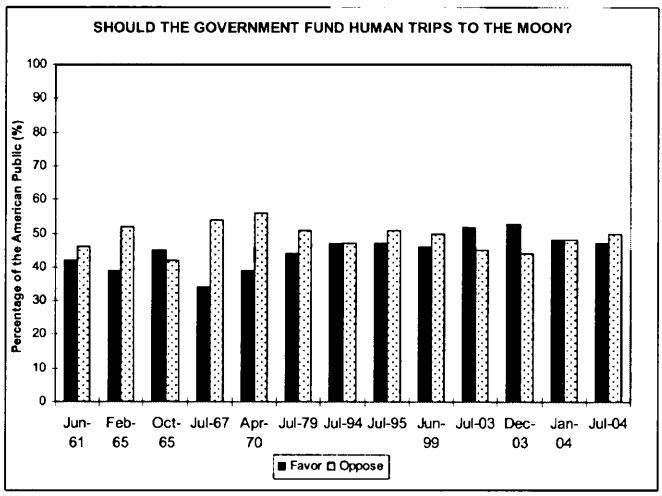

Figure 5

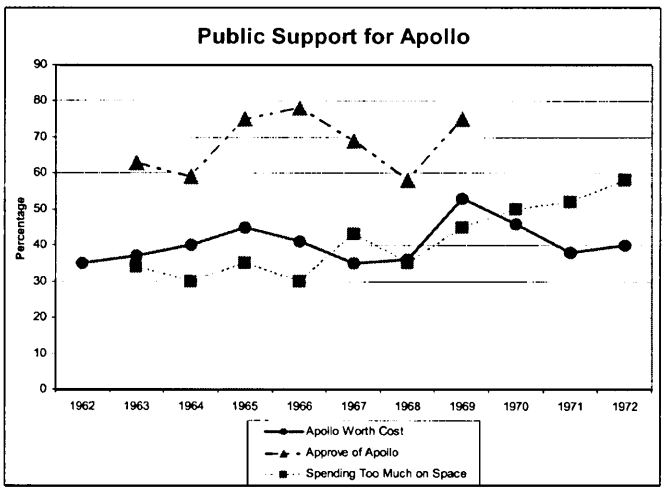

Figure 6

The only point at which the opinion surveys demonstrate that more than 50 percent of the public believed Apollo was worth its expense came in 1969 at the time of the *Apollo 11* lunar landing, as shown in Figure 6. And even then only a measly 53 percent agreed that the result justified the expense, despite the fact that the landing was perhaps the most momentous event in human history since it became the first instance in which the human race became bi-planetary.

These statistics do not demonstrate an unqualified support for NASA's effort to reach the Moon in the 1960s. They suggest, instead, that the political crisis that brought public support to the initial lunar landing decision was fleeting and within a short period the coalition that announced it had to reconsider their decision. It also suggests that the public was never enthusiastic about human lunar exploration, and especially about the costs associated with it. What enthusiasm it may have enjoyed waned throughout time, until by the end of the Apollo program in December 1972 one has the image of the program as something akin to a limping marathoner straining with every muscle to reach the finish line before collapsing.

Whither the Space Shuttle?

In contrast to the lukewarm support the public showed for the efforts to land Americans on the Moon, as shown in Figure 5, the public has consistently agreed that the Space Shuttle is a good investment (see Figure 7).[14] That does not directly translate, however, into willingness on the part of the public to fly in space, as shown in Figure 8.[15]

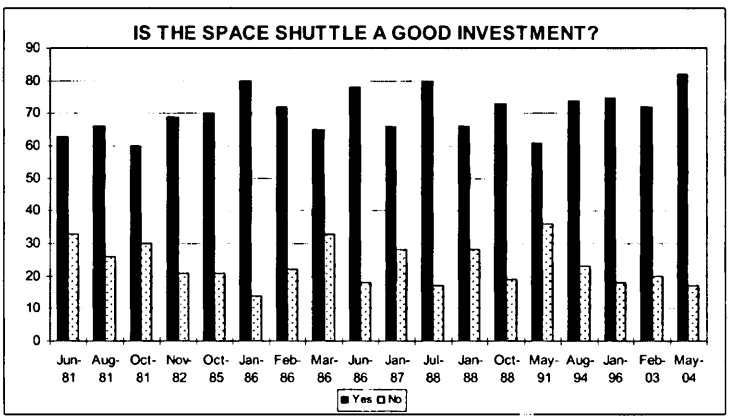

Figure 7

While it is not specifically tied to these public perceptions, some interesting conclusions may be offered about the Space Shuttle program based on these sources and other data. First, and certainly most significant, most agree that the Space Shuttle is a magnificent machine. A massively complex system—with more than 200,000 separate components that must work in synchronization with one another and to specifications more exacting than any other technological system in human history—the Space Shuttle must be viewed as a triumph of engi-

neering and excellence in technological management. Any assessment of the Space Shuttle that does not recognize this basic attribute of the system is both incomplete and inaccurate.[16]

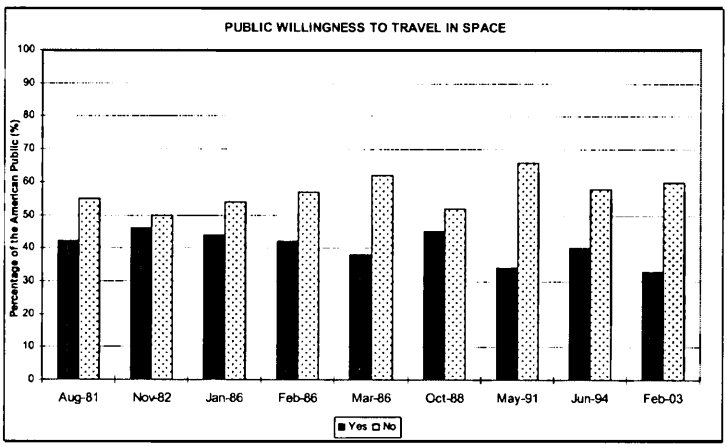

Figure 8

Because of its technological magnificence, the Space Shuttle has become an overwhelmingly commanding symbol of American excellence for the world community. Ask almost anyone outside the United States what ingredients they believe demonstrate America's superpower status in the world, and in addition to military and economic might they will quickly mention the Space Shuttle—as well as NASA's larger space exploration program—as a constant reminder of what Americans can accomplish when they put their minds to it.[17]

Second, the Space Shuttle has been remarkably reliable during the course of its operational history. One exceptionally catastrophic accident, the *Challenger* explosion that killed the crew of seven on 28 January 1986, ruins an otherwise exceptional reliability record.[18] Without minimizing that tragic accident, one is compelled to conclude that the vehicle has been significantly improved since 1986 as NASA engineers worked to correct design flaws and develop more effective operational procedures. Upgrades on many components of the Space Shuttle and organizational changes to the management system have led to the implementation of a strikingly more reliable vehicle than was flying in 1986. The Shuttle is the most reliable launch system now in service anywhere in the world, with a success-to-failure ratio of greater than 0.99.[19]

Third, the Space Shuttle is also a mature system at this point and that is an important factor in the quality of its performance during the last several years. At the end of the 20th century, the Space Shuttle appropriately enjoys many of the

same plaudits and suffers from some of the same criticisms that have been made clear since not long after the program first began. It remains the only vehicle in the world with the dual capability to deliver and return large payloads to and from orbit. The design, now more than two decades old, is still state-of-the-art in many areas, including computerized flight control, airframe design, electrical power systems, thermal protection system, and main engines.[20]

Finally, the Space Shuttle has proven itself one of the most flexible space vehicles ever flown. Most assuredly, the range of possibilities for operations on-orbit expanded dramatically with the launch of *Columbia* in 1981. With its large payload bay, satellite deployment, capture and return to Earth, and repair and redeployment all for the first time became possibilities once the Shuttle first flew. Requirements to perform these tasks have ensured that the crew of every Shuttle mission has a much broader range of required activities than the pioneering astronauts of the Mercury, Gemini, Apollo, and even the Skylab programs.[21]

Despite this, for most of the Shuttle era—1981 to the present—the public has believed that robotic spaceflight should be pursued more aggressively than the human program that relied on the Shuttle. Between 1989 and 1997 several polls asked the question, "Should the U.S. space program concentrate on unmanned missions like planetary probes or on manned programs such as the space shuttle?" Consistently until 1995 the answer came back that more Americans favored robotic missions over Shuttle flights. This changed suddenly in the summer of 1995 and the public has favored human missions over probes since that time. This transformation is depicted in Figure 9.[22]

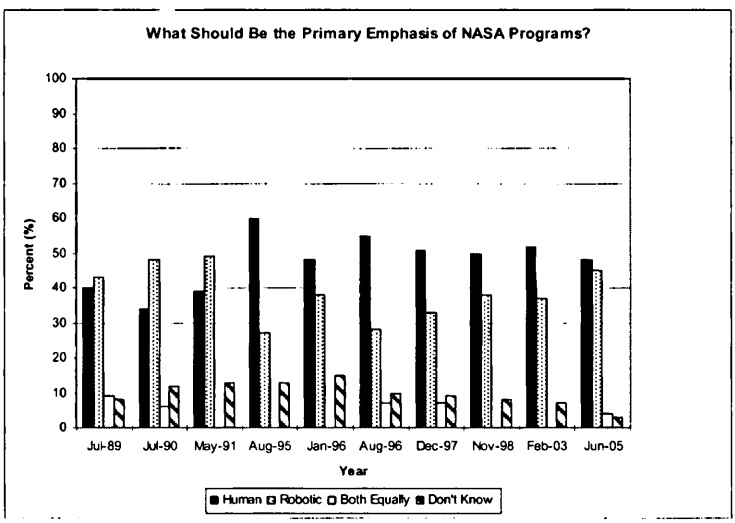

Figure 9

What accounts for this transformation? Several potential explanations are possible. Of course, the 1989–1995 data might be an anomaly of a much longer infatuation with human spaceflight over robotic missions. Since we do not have good polling data for the period before 1989—and after 1997—limitations abound in what we might conclude. At the same time, an intriguing possibility may be that for the first time in the summer of 1995 the Space Shuttle docked with the Russian space station, *Mir*, and began a series of cooperative missions. The excitement of the Shuttle/*Mir* program may have sparked recognition of the importance of human exploration in opening the high frontier of space.[23]

But there seems also to have been more changes than the Shuttle/*Mir* program. The pollsters suggested in their analysis that there seems to have been a close relationship between public perceptions of NASA and spaceflight depictions in popular culture. For example, *Apollo 13* seems to have been an important factor in the shift in favor of human spaceflight over robotic missions in 1995. Coming out in the summer of 1995, it excited the public as the reality of human spaceflight had done for many years. Near-term science fiction films seem to have helped sustain public enthusiasm for human spaceflight, for example, *Armageddon*, *Deep Impact*, *Contact*, *Space Cowboys*. These images from popular culture, coupled with real-world accomplishments in human exploration and development of space, worked together to create powerful visions for the 21st century. There is really nothing very unusual about this connection. Political scientist Howard E. McCurdy and sociologist Constance Penley, among others, have drawn tight connections between popular culture and public perceptions of spaceflight. The relationship between popular culture and public policy requires additional exploration, something I hope to turn my attention to in the near term.[24]

Working for a Living in Space

In the State of the Union Address of 1984 President Ronald Reagan challenged the nation to build a space station. Reagan told Congress and the nation that "sparkling economy spurs initiatives, sunrise industries, and makes older ones more competitive." He added:

> Nowhere is this more important than our next frontier: space. Nowhere do we so effectively demonstrate our technological leadership and ability to make life better on Earth. The Space Age is barely a quarter of a century old. But already we've pushed civilization forward with our advances in science and technology. Opportunities and jobs will multiply as we cross new thresholds of knowledge and reach deeper into the unknown. . . .

> America has always been greatest when we dared to be great. We can reach for greatness again. We can follow our dreams to distant stars, living and working in space for peaceful, economic, and scientific gain. Tonight, I am directing NASA to develop a permanently manned space station and to do it within a decade. A space station will permit quantum leaps in our research in science, communications, in metals, and in lifesaving medicines which could be manufactured only in space.[25]

And, as they say in sports, "the crowd goes wild." The very public announcement by President Reagan of the commitment to build a space station represented the high-water mark of the overall program's support. Clearly, the challenges proved enormous and the trials—political and otherwise—fatiguing but nothing seemed insurmountable in the first few weeks after the president's speech.

Quickly, however, the space station program became controversial. Most of the debate centered on its costs versus its benefits. One NASA official remembered that "I reached the scream level at about $9 billion," referring to how much U.S. politicians appeared willing to spend on the station.[26] As a result, NASA constantly sought to reduce the cost of the station, but this proved to be a losing battle that led to constant controversy, reviews, redesigns, and political hijinks.[27]

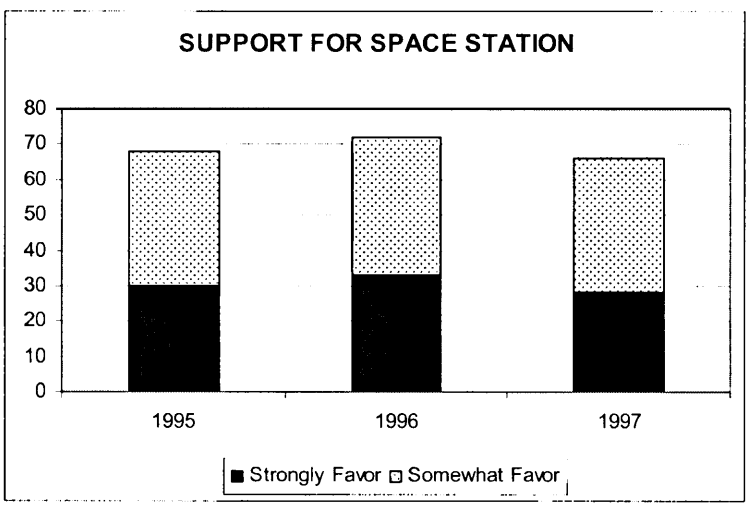

Figure 10

With these difficulties about the space station, one would expect that the public would turn against the project. Such does not seem to be the case. While the polling data is both unsophisticated and limited in time frame, Figure 10 suggests that even during public problems with the program in the mid-1990s that the public supported the effort.[28] When asked about the reality of cooperation with

the former Soviet Union in building the space station, there is even more support. From the point that the Soviet Union began to collapse in the mid-1980s, the public consistently favored large cooperative programs with the former Soviet Union and the Russians, as shown in Figure 11.[29]

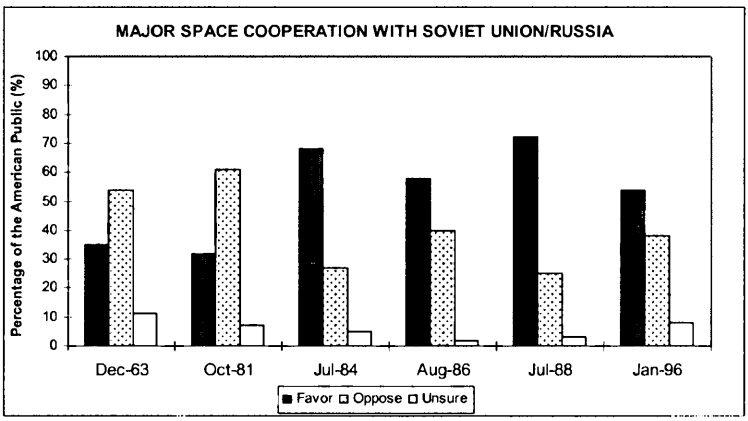

Figure 11

Should We Go to Mars?

Clearly, Apollo was the penultimate activity for the human exploration of space during its first 40 years. Landing humans on the Moon had never been done before in human history and certainly that great accomplishment has lasting importance. Too many space enthusiasts, however, like to point to the bold lunar decision of President Kennedy and lament the lack of political resolve for sending humans to Mars. Believing that Kennedy's Apollo decision was the normative process in policy formulation represents one of the most significant failures of the space community in understanding the nature of the policymaking process.[30]

Unfortunately, too many fail to recognize the real cold war objectives that led Kennedy to his decision. Absent that crisis he would never have committed to Project Apollo. A recently released tape of a White House meeting taking place on 21 November 1962, between President Kennedy and NASA Administrator James E. Webb, demonstrates this fact beyond dispute. Kennedy explained, "Everything that we do should be tied into getting on to the Moon ahead of the Russians. We ought to get it really clear that the policy ought to be that this is the top priority program of the agency and one . . . of the top priorities of the United States government." He added:

> Otherwise we shouldn't be spending this kind of money, because I am not that interested in space. I think it's good. I think we ought to know about it. But we're talking about fantastic expenditures. We've wrecked our budget, and all these other domestic programs, and the only justification for it, in my opinion, is to do it in the time element I am asking.[31]

In the end a unique confluence of foreign policy crisis, political necessity, personal commitment and activism, scientific and technological ability, economic prosperity, and public mood made possible the 1961 decision to carry out a forward-looking lunar landing program.[32]

For those advocating a human Mars mission the challenge is daunting. For one thing, it is technologically much more challenging simply because it is much farther and more difficult to reach than the Moon. Furthermore, the success rate for robotic missions to Mars, outlined in Figure 12, suggests the magnitude of impediments to the effort. With significantly more failures than successes, and half of the eight probes of the 1990s ending in failure, any mission to Mars is at least an order of magnitude greater in complexity, risk, and cost than returning to the Moon.[33]

Nation	Successful Missions	Partially Successful Missions	Unsuccessful Missions
United States	9	0	5
Soviet Union/USSR	2	5	10
Total	11	5	15

Figure 12. Robotic Missions to Mars, 1960–2002

A human Mars mission also has never enjoyed much support from the American public. Consistently, as shown in Figure 13, more people polled have opposed the mission than supported it. With that lukewarm support the nation's elected leaders will certainly not proceed down this policy path unless something else—probably some crisis—requires it. Accordingly, the advocates of human exploration of Mars must appreciate the historical issues at play with the Kennedy decision to move forward with Apollo. And using Apollo as a model—addressed as it was to a specific political crisis relating to U.S./Soviet competition—one question for those seeking a decision to mount a human expedition to Mars is quite simple. "What political, military, social, economic, or cultural scenario can they envision to which the best response would be a national commitment on the part of the president and other elected officials to send humans to Mars?" The answer to that question will go far toward informing the public de-

bate and the presidential commitment to a future aggressive space exploration effort to go back to the Moon or on to Mars.[34]

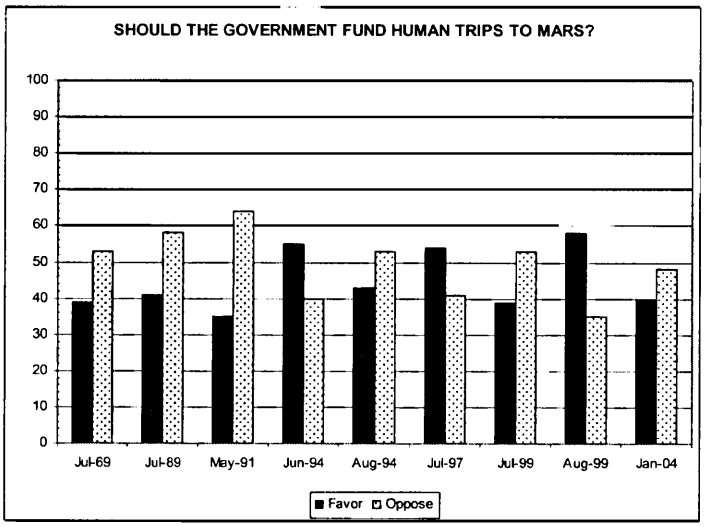

Figure 13

A Final Data Point: False Conceptions about NASA Spending

One final observation from this review of polling data relates to the level of spending for NASA programs. With the exception of a few years during the Apollo era, the NASA budget has hovered at about 1 percent of all money expended by the U.S. treasury. As shown in Figure 14, stability has been the norm as the annual NASA budget has incrementally gone up or down in relation to that 1 percent benchmark.[35] But the public's perception of this is quite different, as shown in Figure 15. For example, in 1997 the average estimate of NASA's share of the federal budget by those polled was 20 percent. Had this been true, NASA's budget in 1997 would have been $328 billion. Of course, if NASA had that amount of money it would have been able to go to Mars.

It seems obvious that most Americans have little conception of the amount of funding available to NASA. As a result there is a general lack of understanding that NASA receives less than 1 percent of the federal budget each year, and that its share of the budget has been shrinking since the early 1990s. Most Americans seem to believe that NASA has a lot of money, much more than it annually receives. Turning around those false perceptions of funding is perhaps the most serious challenge facing those who wish to gain greater public support for space exploration.

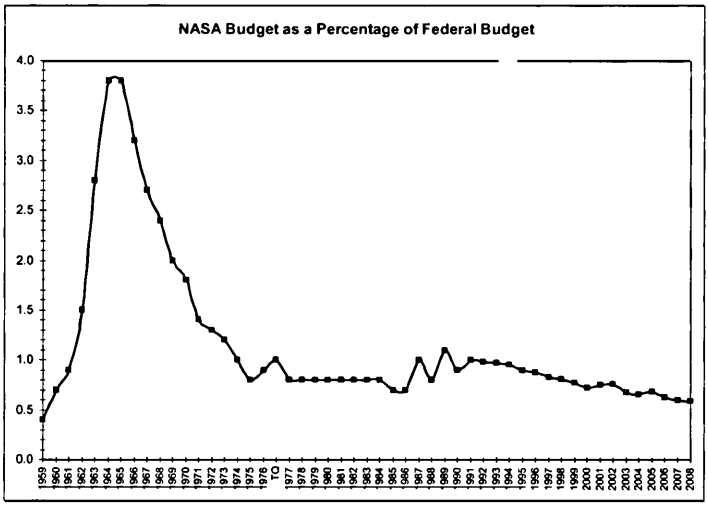

Figure 14

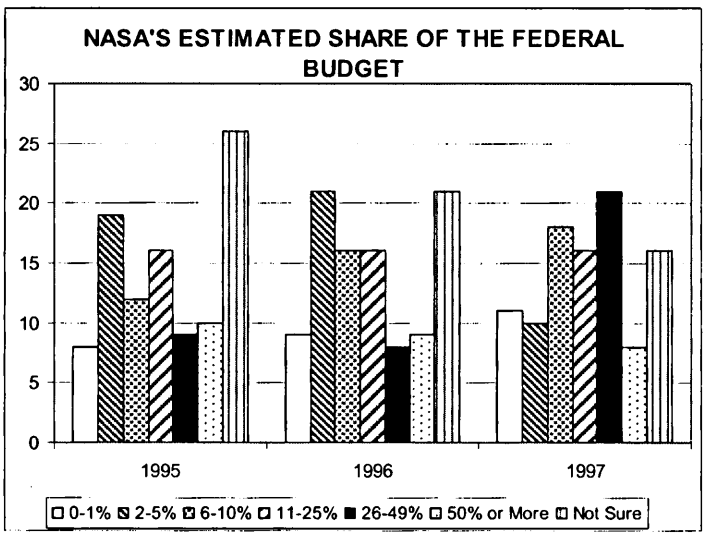

Figure 15

Conclusion

There are several other observations emerging from this review. Some of them are seemingly contradictory to the general findings discussed about support for Apollo. They include the following:

- The American public has long held generally positive attitudes toward the space program, but is not very familiar with its details.

- Throughout the history of the space age, an average of more than 60 percent of those polled rated the job done by NASA as either "excellent" or "good."
- Most Americans have shown support for space exploration and view it as important throughout the years, but also believe that federal money could be better spent on other programs.
- Most are also in favor of NASA as an organization, but are relatively unfamiliar with the majority of its activities and objectives.
- These polls also suggest historically close relationships between public perceptions of NASA and spaceflight depictions in popular culture, especially film. These images from popular culture, coupled with real-world accomplishments in spaceflight, work together to create powerful visions affecting the public consciousness.

Reference Notes

[1] On polling, see Frank Newport, Lydia Saad, and David Moore, *Where America Stands* (New York: John Wiley and Sons, Inc., 1997), chapter 1.

[2] In a set of Yankelovich polls conducted for the Boeing Company between May 1978 and December 1997, the public was asked about its agreement to the following statement: "I approve of America's current civilian space program." On average, 68 percent of those polled agreed with the statement. Polls available in NASA Historical Reference Collection, NASA History Office, Washington, DC.

[3] Yankelovich polls conducted for the Boeing Company between May 1978 and December 1997.

[4] Yankelovich polls conducted for the Boeing Company between May 1978 and December 1997.

[5] Sources are ABC/WP, CNN/USAT, CBS/NYT, Gallup, Media General, and Yankelovich polls from 1988 to 1999. Copies available in NASA Historical Reference Collection.

[6] "Carroll O'Connor Obituary," *Morning Edition*, National Public Radio, 22 June 2001. This report by Andy Bowers is available online at www.npr.org, accessed 2 July 2001.

[7] "The Sweet Smell of Air," *Sports Night*, first aired 25 January 2000, videotape in possession of author.

[8] Stephen J. Pyne, "Space: A Third Great Age of Discovery," *Space Policy* 4 (August 1988): 187–99.

[9] This issue has been explored in James L. Kauffman, *Selling Outer Space: Kennedy, the Media, and Funding for Project Apollo, 1961–1963* (Tuscaloosa: University of Alabama Press, 1994); Mark E. Byrnes, *Politics and Space: Image Making by NASA* (New York, Praeger, 1994).

[10] Stephanie A. Roy, Elaine C. Gresham, and Carissa Bryce Christensen, "The Complex Fabric of Public Opinion on Space," IAF-99-P.3.05, presented at the International Astronautical Federation annual meeting, Amsterdam, The Netherlands, 5 October 1999.

[11] These charts are the result of research throughout time, compiling polls from various sources showing the public's perception of NASA. While one may question the validity of polls, they tend to show several trends that offer verisimilitude. Copies of all polls are available in the NASA Historical Reference Collection, NASA History Office, Washington, DC.

[12] *The Gallup Poll: Public Opinion. 1935–1971*, III: *1959–1971*, 1952, 2183–84, 2209; *New York Times* (3 December 1967); *Newsweek* is quoted in *Administrative History of NASA*, chapter II, 48, NASA Historical Reference Collection.

[13] This analysis is based on a set of Gallup, Harris, NBC/Associated Press, CBS/New York Times, and ABC/USA Today polls conducted throughout the 1960s, copies available in the NASA Historical Reference Collection.

[14] This analysis is based on a set of Harris, Media General, NBC/Associated Press, NBC, Gallup, CBS/New York Times, and ABC/WP polls conducted between the 1980s and the present, available in the NASA Historical Reference Collection.

[15] This analysis is based on a set of NBC/Associated Press, NBC, CBS/New York Times, ABC/WP, Harris, and Gallup polls conducted between the 1980s and the present, available in the NASA Historical Reference Collection.

[16] See T. A. Heppenheimer, The Space Shuttle Decision: NASA's Quest for a Reusable Space Vehicle (Washington, DC: NASA SP-4221, 1999), and T. A. Heppenheimer, Development of the Space Shuttle, 1972–1981 (History of the Space Shuttle, Volume 2) (Washington, DC: Smithsonian Institution Press, 2002).

[17] Roger D. Launius, "Twenty Years On-Orbit: The Space Shuttle Legacy," *Space Times: The Magazine of the American Astronautical Society* 40 (May–June 2001): 7–10.

[18] While there have been many books written about the *Challenger* accident, by far the most sophisticated treatment may be found in Diane Vaughan, *The Challenger Launch Decision: Risky Technology, Culture, and Deviance at NASA* (Chicago: University of Chicago Press, 1996).

[19] B. Peter Leonard and William A. Kisko, "Predicting Launch Vehicle Failure," *Aerospace America* (September 1989): 36–38, 46; Robert G. Bramscher, "A Survey of Launch Vehicle Failures," *Spaceflight* 22 (November–December 1980): 51–58; James A. Vedda, "Long-term Visions for U.S. Space Policy," background paper prepared for the Subcommittee on National Security, International Affairs, and Criminal Justice of the House Committee on Government Reform and Oversight, May 1997, copy in author's possession; Roger D. Launius and Lori B. Garver, "Between a Rocket and a Hard Place: Episodes in the Evolution of Launch Vehicle Technology," IAA-00-IAA.2.2.02, paper presented at 51st International Astronautical Congress, Rio de Janeiro, Brazil, 2–6 October, 2000.

[20] John M. Logsdon, "The Space Shuttle Program: A Policy Failure," *Science* 232 (30 May 1986): 1099–1105; Roger D. Launius, *NASA: A History of the U.S. Civil Space Program* (Malabar, Florida: Krieger Pub. Co., 1994), 114–15.

[21] The range of these missions is discussed in David M. Harland, *The Space Shuttle: Roles, Missions, and Accomplishments* (Chicester, England: Wiley-Praxis, 1998).

[22] This analysis is based on a set of Yankelovich, ABC/WP, and Gallup polls conducted between the 1980s and the present, available in the NASA Historical Reference Collection.

[23] The Shuttle–*Mir* program has received considerable historical discussion. An illustrated history, containing a CD/ROM with oral histories, documents, and multimedia materials is Clay Morgan, *Shuttle–Mir: The U.S. and Russia Share History's Highest Stage* (Washington, DC:

NASA SP-2001-4225, 2001). Bryan Burrough's *Dragonfly: NASA and the Crisis aboard the* Mir (New York: Ballinger Pub. Co., 1998), provides a journalistic analysis of the American–Russian cooperation in space in the mid-1990s about the *Mir* space station. It was a "dress rehearsal" for the two countries' partnership in a new International Space Station they were building back on Earth. On the summer docking mission, see Roger D. Launius, "Making History in Space, Pointing Directions for the Future: A Review of the Recent Atlantis/Mir Docking Mission," *Space Times: Magazine of the American Astronautical Society* 34 (September–October 1995): 4–8.

[24] See Howard E. McCurdy's study, *Space and the American Imagination* (Washington, DC: Smithsonian Institution Press, 1997); Constance Penley, *NASA/TREK: Popular Science and Sex in America* (New York: Verso, 1997).

[25] "State of the Union Message, January 25, 1984," *Public Papers of the Presidents of the United States: Ronald Reagan, 1984* (Washington, DC: Government Printing Office, 1986), 87–95.

[26] Quoted in Howard E. McCurdy, *The Space Station Decision: Incremental Politics and Technological Choice* (Baltimore, Maryland: Johns Hopkins University Press, 1990), 171.

[27] See Marcia S. Smith, Congressional Research Service, "NASA's Space Station Program: Evolution and Current Status," testimony before the House Science Committee, 4 April 2001; NASA Advisory Council, "Report of the Cost Assessment and Validation Task Force on the International Space Station," 21 April 1998, both in NASA Historical Reference Collection.

[28] This data is from a set of Yankelovich polls conducted for the Boeing Company between 1995 and 1997. Polls available in NASA Historical Reference Collection.

[29] This is based on a set of Harris, NBC/Associated Press, Rockwell, and ABC/WP polls available in the NASA Historical Reference Collection.

[30] On Kennedy's decision, see John M. Logsdon, *The Decision to Go to the Moon: Project Apollo and the National Interest* (Cambridge, Massachusetts: MIT Press, 1970); David Baker, "Kennedy and the Moon Goal: A Reassessment," *Spaceflight* 36 (October 1994): 347–49; John M. Logsdon, "An Apollo Perspective," *Astronautics and Aeronautics* (December 1979): 112–17.

[31] Tape recording of meeting between President John F. Kennedy and NASA Administrator James E. Webb, 21 November 1962, White House Meeting Tape 63, John Fitzgerald Kennedy Library, Boston, Massachusetts.

[32] Roger D. Launius, "Apollo 11 at Twenty-Five," *Space Times: Magazine of the American Astronautical Society* 33 (May/June 1994): 12–15.

[33] See Asif A. Siddiqi, *Deep Space Chronicle: Robotic Exploration Missions to the Planets* (Washington, DC: NASA SP-2002-4524, 2002).

[34] Roger D. Launius, "The Next-Generation Space Race: What Lessons Can Future Presidents Learn from JFK?" essay on Space.com, 24 October 2000, available online at http://www.space.com/opinionscolumns/opinions/jfk_election_leaders.html, accessed 21 July 2002.

[35] This observation is based on calculations using the budget data included in the annual *Aeronautics and Space Report of the President* (Washington, DC: NASA Report, 2002), which contains this information for each year since 1959.